

Comisión Nacional contra la **Biopiratería**

Fuente: <https://larepublica.pe/salud/2020/03/14/yacon-es-el-superalimento-del-peru-que-controla-diabetes-salud-peru-lmd/ref-lke>

BIOPAT | PERÚ

TEMA : YACÓN

Smallanthus sonchifolius

TABLA DE CONTENIDOS



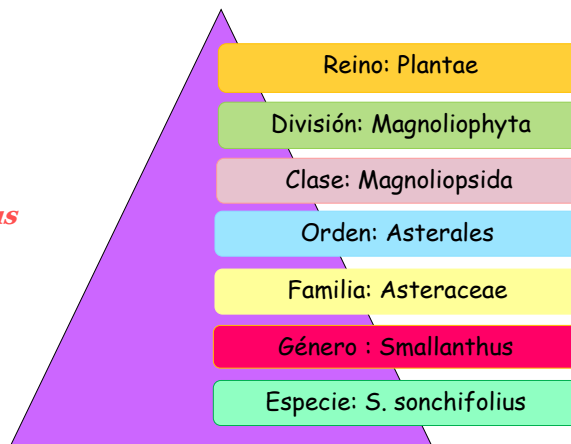
Foto: Google Imágenes

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I. INTRODUCCIÓN

El yacón es una planta de nombre científico *Smallanthus sonchifolius*. Desde sus raíces surge un tubérculo de color entre rojo y marrón, de una jugosa y crujiente textura de sabor dulce. **[Parra; 2019]**. Su origen se remonta a las regiones andinas de América del Sur, en los países de Perú, Ecuador, Colombia y Argentina. En el año 1.200 a.C; la población prehispánica del Tahuantinsuyo consumía con frecuencia el yacón como alimento. Lo colocaban al sol por unos días y luego lo degustaban como fruta. **[Parra; 2019]**

Taxonomía de *Smallanthus sonchifolius*



Distribución de *Smallanthus sonchifolius*



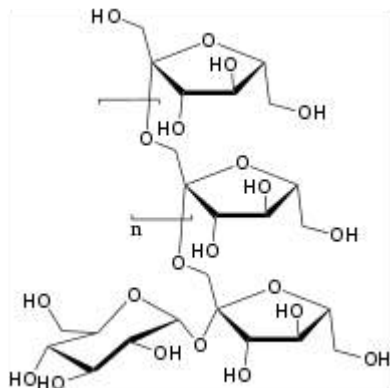
Fuente: <https://www.discoverlife.org/mp/2om?kind=canna+indica>

Es una planta originaria de la región andina, que crece desde el norte de Ecuador al noreste de Argentina (Salta y Jujui) (17, 20 y 55), ocasionalmente reportado en Colombia y Venezuela (41, 45, 67 y 72). El centro de diversidad se encuentra entre la cuenca de Apurímac en el Sur de Perú (14°S) y La Paz en Bolivia (17°S); encontrándose en este territorio tres de las especies silvestres relacionadas. En el Perú se ha reportado en 18 departamentos, asimismo, se ha logrado cultivar fuera de su área de distribución natural en Nueva Zelanda, China, Rusia, Taiwán, Japón, Corea, Brasil, en la antigua Checoslovaquia . **[Flores; 2010]**

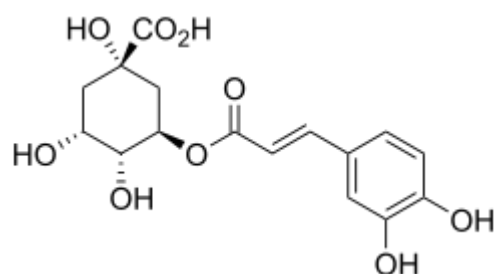
Para el siglo XX, el yacón es llevado hasta Japón a través de las exportaciones comerciales, donde al poco tiempo fue distribuido a China, Filipinas, Taiwán y Corea del Sur, convirtiéndose en un alimento muy solicitado, apareciendo en Nueva Zelanda y Australia. Es en ese momento que se le empieza a conocer como un alimento potencial. **[Parra; 2019]**

II. CARACTERÍSTICAS Y USOS

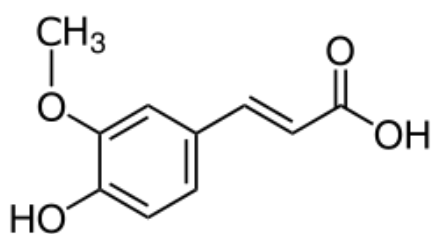
A.- COMPOSICIÓN QUÍMICA



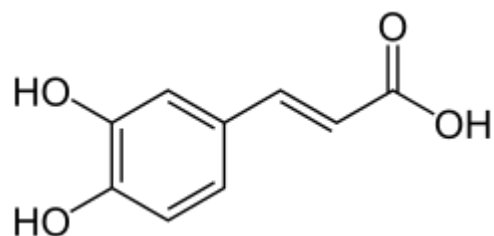
Inulina



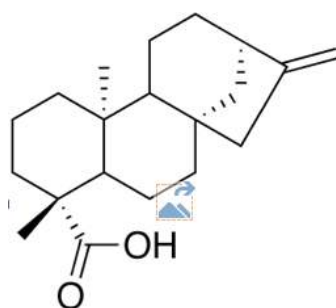
Ácido clorogénico



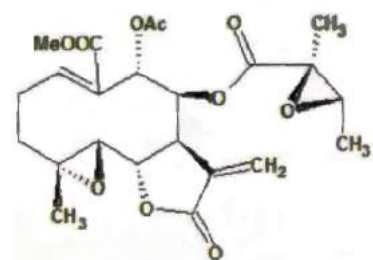
Ácido ferúlico



Ácido cafeico



Ácido kaurénico



Enidrina

C.- USOS ALIMENTICIOS Y ARTESANALES

El yacón puede consumirse en las ensaladas crudas o cocidas, como sobremesa o merienda.

Para consumirla cruda solo es necesario quitarle la cáscara. Además de esto, este tubérculo también puede adquirirse en forma de harina, la cual puede ser utilizada para la elaboración de pan, tartas y galletas, por ejemplo.

Asimismo, también puede conseguirse el extracto de la raíz de yacón en cápsulas, sin embargo, no se ha determinado una dosis segura para su consumo, debiendo consultar al médico o nutricionista antes de su utilización. **[Zanin; 2020]**

USO TRADICIONAL

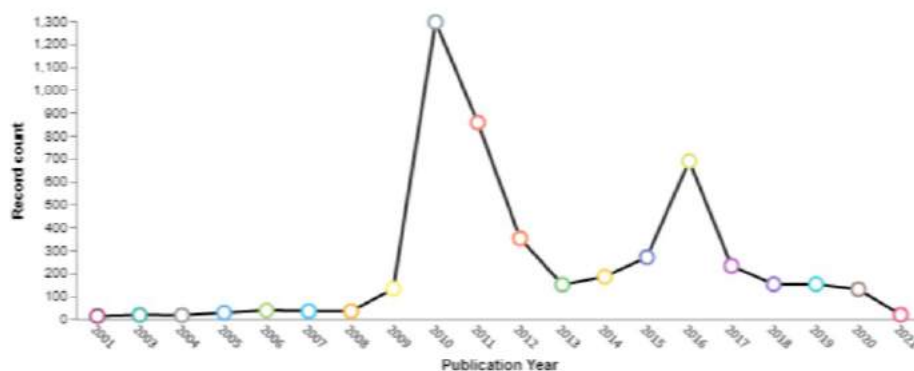
Smallanthus sonchifolius es una raíz carnosa o tubérculo que guarda cierto parecido con otras raíces comestibles en su forma, tamaño y color, como la yuca, el ñame, la bata y la arracacha.

Pese a su sabor dulce, resulta excelente para los diabéticos, pues el tipo de azúcar que contiene no es asimilado por el organismo humano, y por lo tanto, no llega al torrente sanguíneo. La raíz o tubérculo del yacón posee un sabor dulce agradable, muy parecido a la manzana; se consume como fruta fresca, usualmente después de un período de secado al sol, haciéndolo más dulce y con un sabor más agradable en sus raíces. Sin embargo, tiene el mismo inconveniente que la manzana o el banano pues, al exponerse al medio ambiente se oxida muy rápido, aunque no pierde su sabor y sus propiedades.

Otras de las ventajas del yacón es que tiene cualidades hipoglicemiantes, pues cuando se bebe un té, tizana o mate de hojas del yacón, se logra reducir la concentración de glucosa en la sangre. **[Sandy; 2015]**

III. ANÁLISIS DE SOLICITUDES DE PATENTES RELACIONADAS

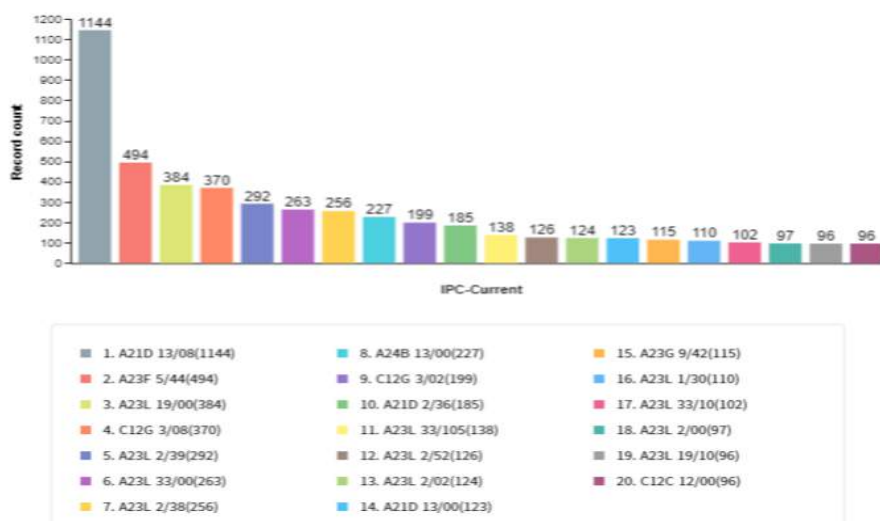
A. Solicitudes de patentes presentadas



Fuente: Clarivate analytics

En este gráfico, la mayor cantidad de solicitudes de patentes pertenece al año 2010, con una cantidad de 1300 solicitudes, continúa el año 2011 con 800, en 2016 la cantidad de 700, y en el 2012, la presentación de 300 solicitudes.

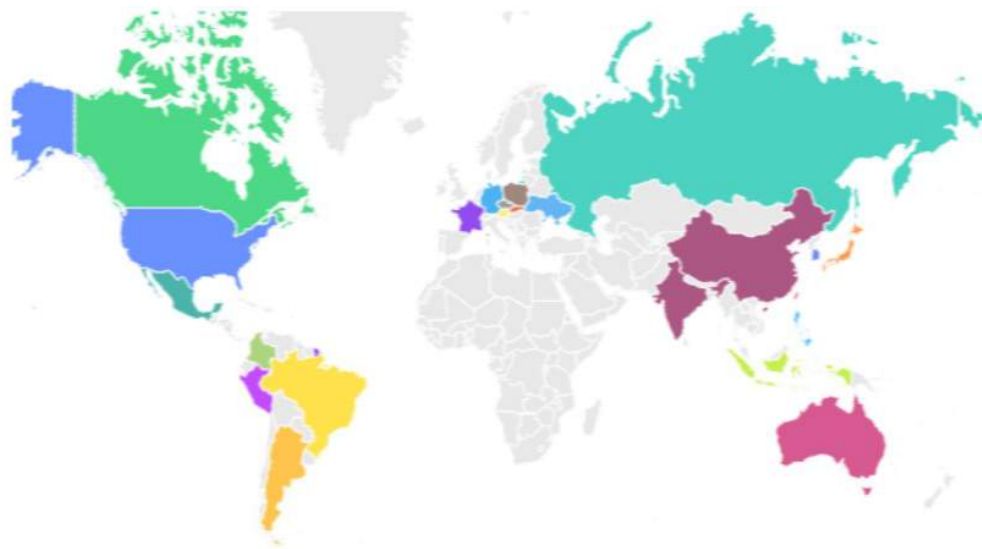
B. Publicaciones según la clasificación IPC



Fuente: Clarivate analytics

La clasificación IPC de las solicitudes sobre *Smallanthus sonchifolius* se han dividido en 20 ítems: 1144 solicitudes presentan una clasificación A21D 13/08, que se refiere a productos de panadería terminados, continúa las 494 solicitudes con IPC A23F 5/44, referidas a café y sucedáneos de café; y la clasificación A23L 19/00, sobre 384 solicitudes de productos de frutas u hortalizas, preparación o tratamiento de los mismos.

C. Países y regiones que utilizan el recurso

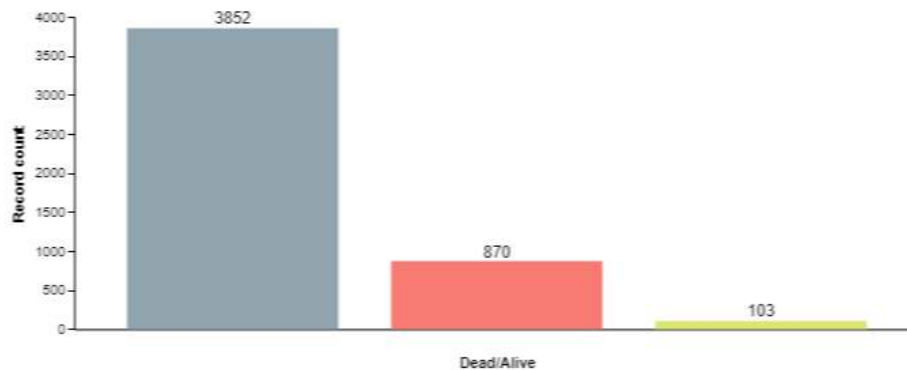


Fuente: Clarivate analytics

Las principales tecnologías proceden de los siguientes países y regiones:

- ♣ Federaci3n Rusia: 3240
- ♣ China: 931
- ♣ Rep3blica de Korea: 288
- ♣ Jap3n: 172
- ♣ Estados Unidos: 56
- ♣ WO: 48
- ♣ EP: 18
- ♣ Brasil: 16
- ♣ Canad3: 8
- ♣ Alemania: 6

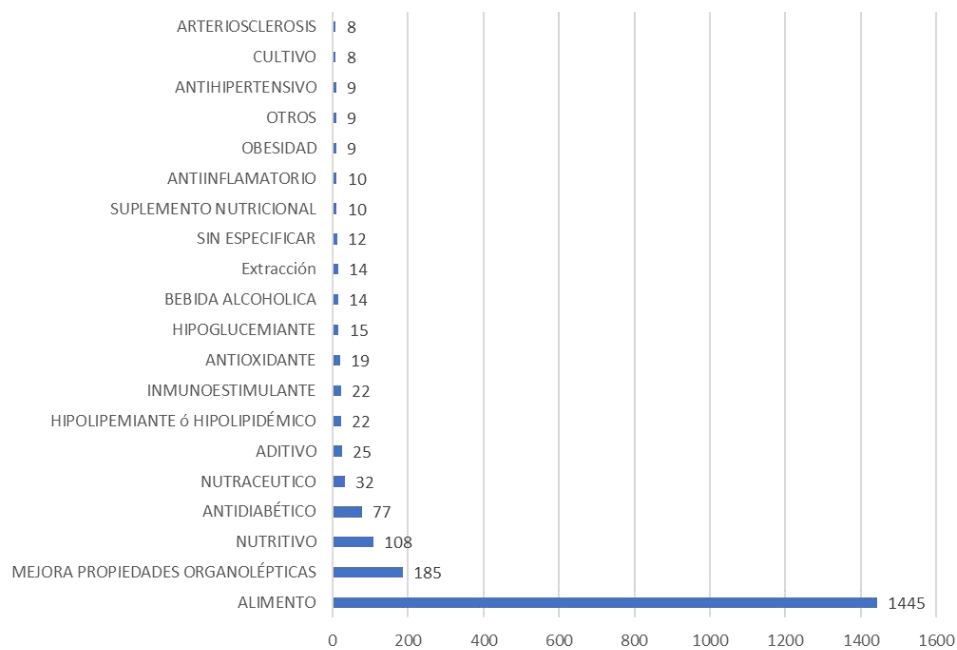
D. Estado de la solicitud



Fuente: Clarivate analytics

En este cuadro se observa el estado de las solicitudes: 3852 se encuentran en trámite u otorgadas, 870 están fuera de trámite y 103 aún se encuentran indeterminadas.

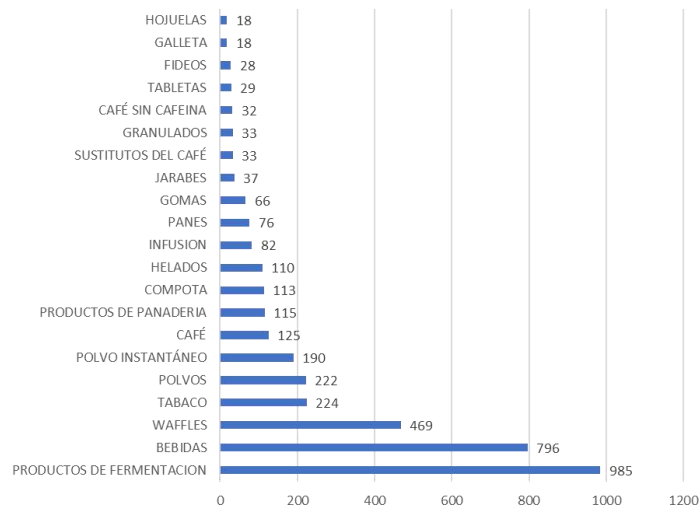
E. Documentos de patentes por actividad farmacológica



Fuente: Clarivate analytics

Solicitudes de patente relacionadas con actividad farmacológica, se tiene 1445 solicitudes como alimento, 185 como mejora de propiedades organolépticas, 108 tienen actividad nutritiva y 77 presenta actividad antidiabético.

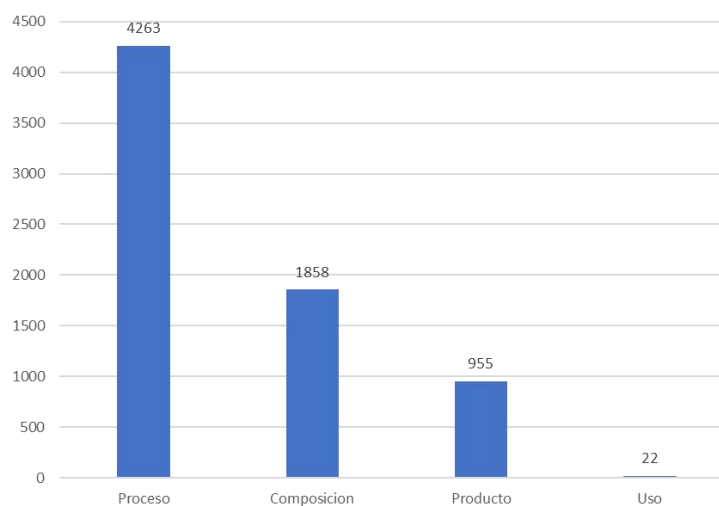
F. Documentos de patentes por formas de aplicación



Fuente: Clarivate analytics

En ésta gráfica se observa las formas de aplicación del *Smallanthus sonchifolius*: 985 solicitudes como productos de fermentación, 796 como bebidas, 469 en forma de waffles, 224 como tabaco, 22 en forma de polvos y 190 como polvo instantáneo.

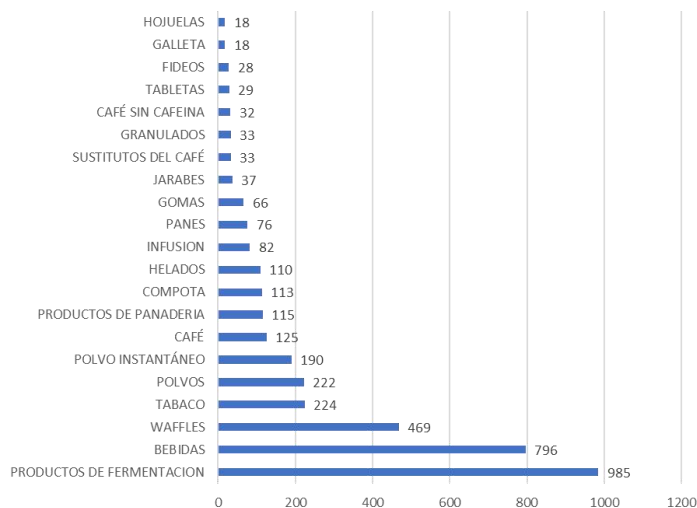
G. Documentos de patentes por categoría de reivindicaciones



Fuente: Clarivate analytics

En esta gráfica se observa las solicitudes por categoría de reivindicaciones, 4263 están relacionadas a proceso, 1858 a composición, 955 a producto y 22 a uso.

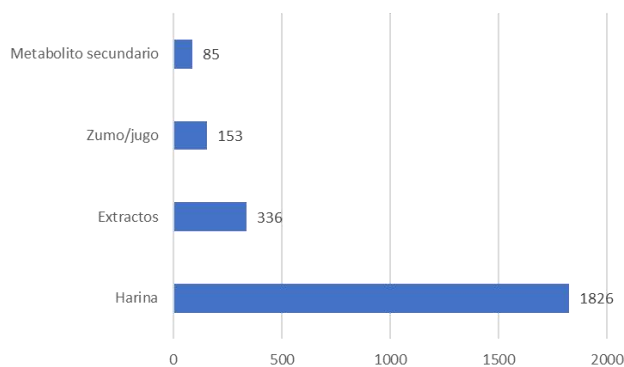
H. Documentos de patentes por formas de aplicación



Fuente: Clarivate analytics

En ésta gráfica se observa las formas de aplicación del *Smilax sonchifolia*: 985 solicitudes como productos de fermentación, 796 como bebidas, 469 en forma de waffles, 224 como tabaco, 22 en forma de polvos y 190 como polvo instantáneo.

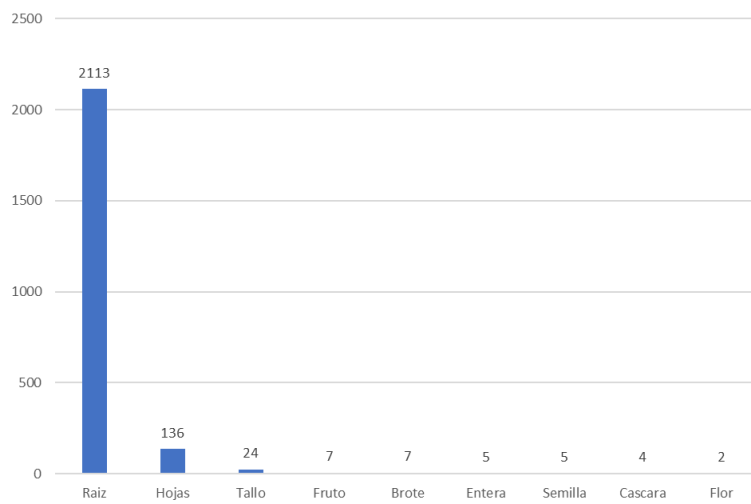
I. Documentos de patentes por la forma de uso del recurso



Fuente: Clarivate analytics

Las solicitudes de patente relacionadas con la forma de uso del *Smilax sonchifolia* son: 1826 como harina, 336 en forma de extractos, 153 como zumo/jugo y 85 en forma de metabolito secundario.

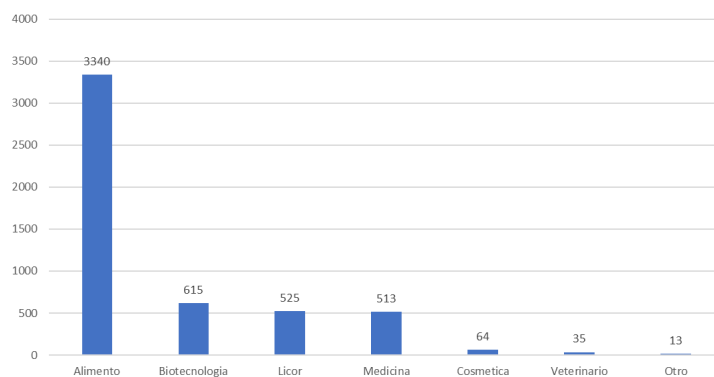
J. Documentos de patentes por la parte usada del recurso



Fuente: Clarivate analytics

En esta gráfica se observa la parte del *Smallanthus sonchifolius* usada en las solicitudes de patente; la parte más usada es la raíz con 2113, seguido de las hojas con 136, le sigue el tallo con 24, el fruto y el con 7, la planta entera con 5, la cáscara con 4 y la flor con 2 solicitudes.

K. Documentos de patentes por el área de uso

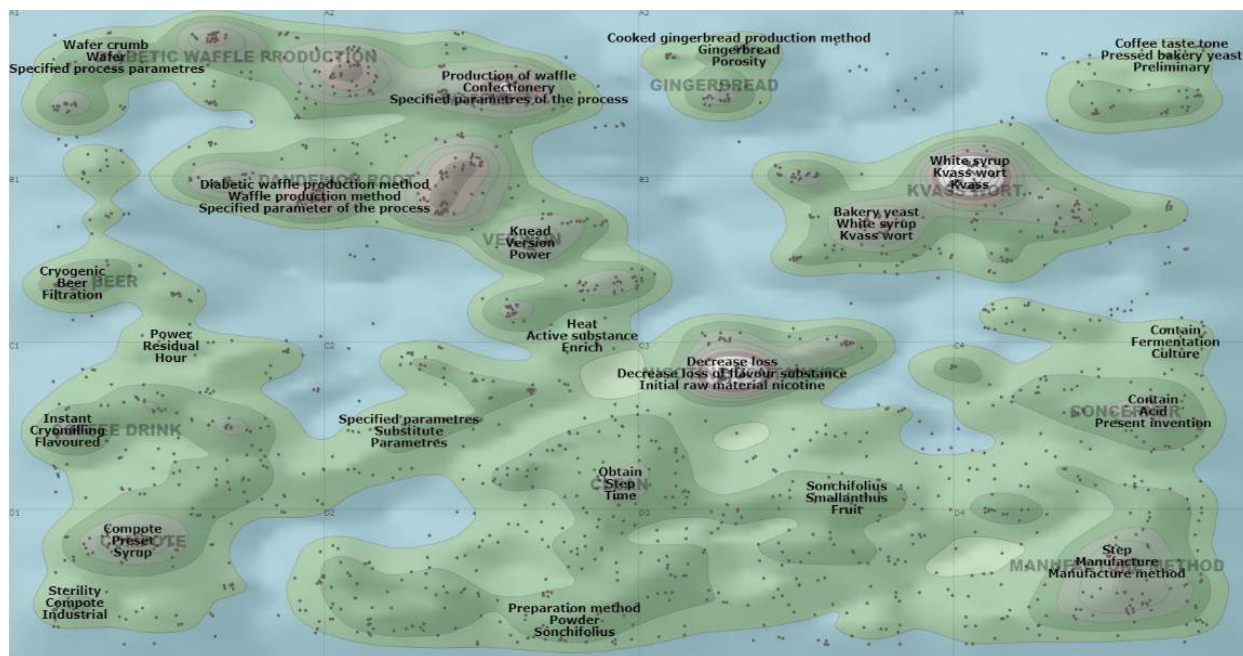


Fuente: Clarivate analytics

Las solicitudes de patente relacionadas por el área de uso del *Smallanthus sonchifolius* son: 3340 en el área de alimentos, 615 en biotecnología, 525 en el licor, 513 en medicina, 64 en cosmética, 35 en el campo veterinario y 13 en otras áreas.

L. Tendencias de uso

En el mapa del gráfico anterior, se pueden identificar como montañas en un mapa cartográfico. Los tópicos, que son objeto de investigación en los últimos años, y a través de publicaciones, nos permiten detectar tecnologías emergentes. Aquí se puede observar que los temas con mayor frecuencia (crestas blancas), corresponden a solicitudes de patente relacionadas con la producción de waffles y parámetros específicos del proceso, uso de la fruta de *S. sonchifolius*, disminución de la pérdida de sustancias aromáticas, fermentación de cultivo, vino blanco, método de fabricación, productos de panadería, método de producción de waffles para diabéticos y parámetros específicos.



Fuente: Clarivate analytics

V. PUBLICACIONES CIENTÍFICAS

Journal of Ethnopharmacology 257 (2020) 112854



Contents lists available at ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jethpharmToxicogenetic evaluation of *Smallanthus sonchifolius* (yacon) as a herbal medicine

Rocio Ayelen Moreira Szokalo^{a,b}, Flavia Redko^c, Jerónimo Ulloa^c, Sabrina Flor^d,
María Soledad Tulino^{a,b}, Liliana Muschietti^{c,*}, Marta A. Carballo^{a,b}

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ARTICLE INFO

Keywords:

Smallanthus sonchifolius

Yacon

Aqueous extract

Enhydrofolin

Genotoxicity

ABSTRACT

Ethnopharmacological relevance: *Smallanthus sonchifolius* (Poepp. & Endl.) H. Robinson, commonly known as yacon, is a medicinal plant belonging to the Asteraceae family used in traditional folk medicine. Its roots and leaves have been used by people suffering from diabetes or from various digestive or renal disorders.

Aim of the study: This study aimed at evaluating the *in vitro* potential genotoxic effects of the aqueous extract of yacon in order to determine its safety and at characterizing its phytochemical composition.

Materials and methods: The aqueous extract of *S. sonchifolius* was prepared in a similar way to that commonly used in popular medicine as tea bags. Thin layer chromatography (TLC) and high-performance liquid chromatography (HPLC-MS/MS) were used to identify the main compounds. The MTT test was performed to determine the range of doses and the Cytochalasin B-blocked micronucleus (Cytome assay) was used to assess genotoxicity.

Results: The chemical analysis of the aqueous extract revealed the presence of the sesquiterpene lactones (STLs) enhydroin and the dimer enhydrofolin, as the main compounds together with phenolic compounds. Increasing concentrations of the extract induced a cytotoxic effect on CHO-K1 and HepG2 cells. A statistically significant increase in the frequency of MNi, NBUDs and NPBs was observed in CHO-K1 cells, while in HepG2 cells a statistically significant frequency increase was observed with three of the four tested doses for MNi and only with the highest dose for NPBs and NBUs (genotoxic effect).

Conclusion: Results demonstrated the inability of the metabolic system to counteract the genetic instability, allowing the safe consumption of the leaves as a 2% tea infusion in quantities of up to 250 mL/day.

* Corresponding author.

E-mail address: lmusch@ffyb.uba.ar (L. Muschietti).

¹ Muschietti L and Carballo M contributed equally to this work.

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Available online 20 April 2020

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Fuente: <https://doi.org/10.1016/j.jep.2020.112854>



Contents lists available at ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

Acute postprandial effect of yacon syrup ingestion on appetite: A double blind randomized crossover clinical trial

Lia Silveira Adriano^{a,b}, Ana Paula Dionísio^{c,*}, Fernando Antônio Pinto de Abreu^c, Nedio Jair Wurlitzer^c, Bárbara Rebeca Cordeiro de Melo^a, Antônio Augusto Ferreira Carioca^b, Helena Alves de Carvalho Sampaio^a

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ARTICLE INFO

Keywords:

Smallanthus sonchifolius
Fructooligosaccharides
Prebiotics
Appetite
Obesity

ABSTRACT

Yacon syrup is a rich source of fructooligosaccharides (FOS); however, its diet supplementation effect on subjective sensation and appetite biomarkers in human is still unknown. This study aimed to evaluate the acute postprandial effect of yacon syrup ingestion on appetite. The double-blind crossover clinical trial was carried out with 40 adult women: 20 eutrophic and 20 obese grade I. On each day, the first blood collection was performed after a 12-h fast. Then, the volunteers ingested either intervention A (breakfast + 40 g of placebo) or intervention B (breakfast + 40 g of yacon syrup, containing 14 g of FOS). New aliquots of blood were collected at 45, 60, 90, 120, and 180 min. Appetite was assessed by estimating ghrelin and glucagon-like peptide-1 (GLP-1) levels and by assessing subjective appetite sensation. Analysis was performed using two-way ANOVA, followed by Bonferroni's multiple comparison test. No effect of yacon syrup was observed on postprandial ghrelin and GLP-1 levels at all times evaluated. Similar observations were made after stratifying the analysis by BMI (body mass index) (eutrophic and obese). The effect of yacon syrup on postprandial subjective sensations of hunger, satiety, fullness, and desire to eat was not evident in the total group of women evaluated and even after BMI stratification. We concluded that yacon syrup had no effect on postprandial ghrelin and GLP-1 levels and on the subjective appetite sensation in young adult women.

<https://doi.org/10.1016/j.foodres.2020.109648>

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Fuente: <https://doi.org/10.1016/j.foodres.2020.109648>



Contents lists available at ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

Yacon (*Smallanthus sonchifolius*) flour soluble extract improve intestinal bacterial populations, brush border membrane functionality and morphology *in vivo* (*Gallus gallus*)

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^b Department of Food Science, Cornell University, Stocking Hall, Ithaca, NY 14853-7201, USA

ARTICLE INFO

Keywords:

Intra amniotic administration
Brush border membrane functionality
Intestinal morphology
Gene expression
Zn-Fe-related proteins
Goblet cell, intestinal bacterial populations

ABSTRACT

This study evaluates the effects of intra-amniotic administration of yacon (*Smallanthus sonchifolius*) flour soluble extracts (YFSE) on intestinal bacterial populations, brush border membrane (BBM) functionality and morphology, by using the *Gallus gallus* model. The YFSE increased ($p < 0.05$) relative abundance of *Lactobacillus*, *Bifidobacterium*, *Clostridium* and *E. coli* compared to 18MΩ H₂O. The YFSE had systematic effect on BBM functionality, via the upregulation of zinc (zinc transporters – ZnT1, ZnT7 and ZIP9) and iron (ferroportin, Duodenal cytochrome (DcytB) transporters, sucrose isomaltase (SI), and down regulation of Interleukin 1 beta (IL1β), and hepcidin genes expression when compared to the inulin administered group. The YFSE administration increased glycogen concentrations in pectoral muscle compared to noninjected and 18 Ω H₂O groups, however, did not change gene expression of enzymes related to glycolysis (phosphofructokinase) and gluconeogenesis (glucose-6 phosphatase). The YFSE increased the depth of crypts, crypt goblet cell diameter, number and type (acidic), and villi goblet cell diameter and type (acidic) when compared to all other groups. Thus, YFSE demonstrated prebiotic effects resulting in improving intestinal bacterial populations profile, BBM functionality, digestive and absorptive capabilities, intestinal morphology, glycogen status and immune system.

<https://doi.org/10.1016/j.foodres.2020.109705>

Received 29 May 2020; Received in revised form 12 August 2020; Accepted 6 September 2020

Available online 17 September 2020

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Fuente: <https://doi.org/10.1016/j.foodres.2020.109705>



Obtención de la inulina a partir de raíces de Yacón (Smallanthus Sonchifolius) a nivel piloto

El presente trabajo de tesis busca la obtención de la inulina a partir de raíces de yacón (*Smallanthus Sonchifolius*) a nivel piloto. Se realizó en las instalaciones del Laboratorio de Química Orgánica de la Facultad de Farmacia y Bioquímica, también en la Unidad de Servicios de Análisis Químico de la Facultad de Química e Ingeniería Química ambas de la Universidad Nacional Mayor de San Marcos, y la planta piloto de la Facultad de Industrias Alimentaria de la Universidad Agraria La Molina. El proceso seguido se inició con la selección de la materia prima, para esto se analizaron 3 lotes de yacón de diferentes localidades (Bagua, Huaraz y Huancayo) con ayuda de un refractómetro, la materia prima seleccionada es la de Huaraz por su alto contenido de azúcares (10.1°Brix); esta materia prima fue caracterizada determinándose de forma cuantitativa (31.69%) y cualitativamente la presencia de Inulina (81.33%) en comparación con un estándar. Luego se procedió al lavado, desinfección y cortado en trozos de las raíces de yacón, las cuales, fueron sometidas a difusión en agua caliente trabajando con los siguientes parámetros: Temperatura de extracción (100°C), tiempo de operación (10 minutos), relación materia prima: solvente (1:3) y una sola etapa. Del extracto se continuó con la etapa de purificación la cual consiste en una etapa carbonatación con la finalidad de eliminar los no azúcares, péptidos, coloides y otros; para ello se utilizó una suspensión de Ca(OH)_2 al 0.2N y burbujeo de CO_2 . Para el filtrado, deionización y decoloración del jugo se realizó a una temperatura de 85°C. El líquido purificado fue llevado a un secado por atomización trabajándose con los siguientes parámetros: temperatura del aire al ingreso (150°C) y temperatura del aire a la salida (82°C). La inulina obtenida tiene las siguientes características: apariencia (polvo ligeramente granulado), color (marrón claro), humedad (2.85%), cenizas totales (5.25%) y Pb (2.13ppm). Este trabajo comprende también el cálculo de variables importantes de operación, balances de materia y energía, rendimientos, tiempo de operación, entre otras, que serían de gran utilidad para el diseño de procesos y de planta a nivel comercial. Los rendimientos para las principales operaciones en planta piloto fueron las siguientes: extracción (65.3%), secado (98.0%) y rendimiento global del proceso (50.57%). Lo que nos indica que por cada 20Kg de yacón utilizados se obtiene 3.20Kg de Inulina. La inulina obtenida a partir de las raíces de yacón cumple los estándares internacionales que maneja la empresa belga Beneo Orafti. Es por lo expuesto líneas arriba que se recomienda un mayor aprovechamiento de la materia prima con relación a su contenido de Inulina; la cual trae beneficios para la salud humana.

URI
<https://hdl.handle.net/20.500.12672/15537>

Colecciones
[Tesis EP Ingeniería Química](#) [45]



Ver/

Descargar

(application/pdf, 163.5Kb)

Fecha
 2010

Autor(es)
 Fabián Arévalo, Carlos J.
 Porras Ricra, Pamela L.

Fuente: <https://cybertesis.unmsm.edu.pe/handle/20.500.12672/15537>



Formulación de la salchicha tipo suizo con sustitución parcial de extracto de yacón (*smallanthus sonchifolius*)

Guillén Quispe, Ami Geraldine

URI: <http://repositorio.unajma.edu.pe/handle/123456789/579>

Fecha: 2019

Resumen:

La presente tesis tuvo como objetivo principal, evaluar la sustitución parcial del extracto de yacón (*Smallanthus sonchifolius*) en la formulación de la salchicha tipo suizo. La metodología utilizada para las pruebas experimentales fueron: Para la textura se utilizó el método del texturómetro TA-XT2, para la determinación del contenido de grasa se usó el método N°920.39 AOAC –Soxhlet–, así como para el color el método del colorímetro (Minolta RC-400) y para las características organolépticas una prueba hedónica. Los resultados obtenidos se realizaron mediante el Diseño Estadístico Completamente al Azar (DCA), donde se realizó un análisis de varianza (ANVA), seguido de una prueba de múltiples rangos, el test de tukey y la prueba de dunnett. Para dichos análisis se empleó el estadístico Statgraphics Centurión XVI, Minitab 17, Excel 2013 (Software libre) y SPSS 21.

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PUBLICACIONES CIENTÍFICAS RELACIONADAS A MACA DESDE EL AÑO 2015

Source: ASIAN JOURNAL OF CHEMISTRY | 22 (7): 5776-5778 JUL 2010

Title: A New Phenylpropanoids From the Leaf of *Smallanthus sonchifolius* and Its Antioxidant Activity

Author(s): Ruan, SC | Liu, MS | Bi, L | Yang, YL

Date: JUL 2010

Author Keywords: *Smallanthus sonchifolius* | Smallanactone A | Antioxilant activity

Keywords Plus: YACON ROOTS

Publication Year: 2010

Volume: 22

Abstract:

Phytochemical investigation of the leaf of *Smallanthus sonchifolius* led to the isolation and identification of a new phenylpropanoids named Smallanactone A. The structures was elucidated by analysis of spectroscopic data and it antioxidant activity was evaluated. It showed antioxidant activity with an IC₅₀ value of 0.46 μ g/mL.

Source: ASIAN JOURNAL OF CHEMISTRY | 23 (2): 933-934 FEB 2011

Title: Lignans from the Leaf of *Smallanthus sonchifolius*

Author(s): Xue, JJ | Wang, L | Chzn, YK | Liao, Z | Liu, W | Yang, GY | Hu, QF

Date: FEB 2011

Author Keywords: *Smallanthus sonchifolius* | Lignan | Antioxidant activity

Keywords Plus: YACON ROOTS

Publication Year: 2011

Volume: 23

Abstract:

Phytochemical investigation of the leaf of *Smallanthus sonchifolius* led to the isolation and identification of a new lignan (smallanlignan A) and five known lignans. The structures were elucidated by the analysis of spectroscopic data. The antioxidant activity of smallanlignan A was evaluated and it showed antioxidant activity with an IC₅₀ value of 1.65 μ g/mL.

Source: EUROPEAN REVIEW FOR MEDICAL AND PHARMACOLOGICAL SCIENCES | 14 (12): 1005-1009 DEC 2010

Title: Antimicrobial activity of the constituents of *Smallanthus sonchifolius* leaves against methicillin-resistant *Staphylococcus aureus*

Author(s): Choi, JG | Kang, OH | Lee, YS | Oh, YC | Chae, HS | Obiang-Obounou, B | Park, SC | Shin, DW | Hwang, BY | Kwon, DY

Date: DEC 2010

Author Keywords: Antibacterial activity | MRSA | *Smallanthus sonchifolius*

Keywords Plus: IDENTIFICATION | DAPTOMYCIN | EXTRACTS

Publication Year: 2010

Volume: 14

Abstract:

Background and Objectives: Methicillin-resistant *Staphylococcus aureus* (MRSA) has been a serious problem as its infection is associated with higher mortality and increase cost worldwide. In the present study, the antibacterial activity of enhydrin, polymatin B, allo-schkuhriolide from the leaves of *Smallanthus sonchifolius* was investigated. Material and Methods: Enhydrin, polymatin B, allo-schkuhriolide from the leaves of *Smallanthus sonchifolius* were tested for antimicrobial activity using micro dilution broth method against 2 strains of ATCC 33591, ATCC 25923 and 15 strains of clinical isolates MRSA. Results: The antibacterial activity of *Smallanthus sonchifolius* can safely be attributed to enhydrin as polymatin B, and allo-schkuhriolide are not showing any activity against *Staphylococcus aureus* strains. The enhydrin showed good antibacterial activity against all tested strains (MIC = 125-500 μ g/ml). Discussion: These results suggest that only enhydrin can be considered as an antibacterial drug against MRSA.

Source: GENETIKA-BELGRADE | 45 (1): 217-226 2013

Title: A REVISED ITS NUCLEOTIDE SEQUENCE GIVES A SPECIFICITY FOR *Smallanthus sonchifolius* (POEPP. AND ENDL.) AND ITS PRODUCTS IDENTIFICATION

Author(s): Ziarovska, J | Fernandez, EC | Millela, L

Date: 2013

Author Keywords: *Smallanthus sonchifolius* (Poepp. and Endl.) H. Robinson | yacon | ITS | Dra III digestion | PCR

Keywords Plus: YACON | LEAVES

Publication Year: 2013

Volume: 45

Abstract:

Yacon (*Smallanthus sonchifolius*) is an Andean crop which is very regarded for its benefits for people suffering from diabetes or various digestive or renal disorders. Because no specific *Smallanthus sonchifolius* identification DNA markers are still known the paper demonstrates ITS regions to be able to detect and differentiate among yacon species and the potential for specific food authentication purposes is reported, too. The newly sequenced ITS of yacon accessions originated in Peru, Ecuador and Bolivia analyse provide the unique sequence site that differs from all of the other yacon species and is recognized by DraIII restriction endonuclease. Restriction cleavage of the PCR amplified ITSs of the twenty-eight yacon accessions was performed and in all cases the recognition site was confirmed as a typical for *Smallanthus sonchifolius*. Based on the nucleotide specificity of *Smallanthus sonchifolius*, ITS sequence the PCR method combined with the restriction cleavage protocol was developed for yacon identification.

Source: PHYTOCHEMISTRY LETTERS | 18: 162-167 DEC 2016

Title: Biosynthesis of (-)-ent-kaurenoic acid in *Smallanthus sonchifolius* and its effect against microbial biofilms

Author(s): Lopes, AA | Pina, ES | Nader, TT | Da Costa, FB | Pereira, AMS | Pupo, MT

Date: DEC 2016

Author Keywords: Diterpene | Ent-kaurenoic acid | Biosynthesis | Methylerythritol-4-phosphate (MEP) pathway | *Smallanthus sonchifolius*

Keywords Plus: SESQUITERPENE GERMACRENE-D | PIMARANE-TYPE DITERPENES | ENT-KAURENOIC ACID | ANTIMICROBIAL ACTIVITY | KAURANE DITERPENES | PATHWAYS | ANTI-BACTERIAL | ISOPRENOIDS | STEVIOL | C-13

Publication Year: 2016

Volume: 18

Abstract:

The biosynthetic pathway of (-)-ent-kaurenoic acid (1) was investigated by incorporation of 1-D-C-13-glucose in *Smallanthus sonchifolius* (Asteraceae) plantlets. The C-13-enrichment pattern indicated that methylerythritol-4-phosphate (MEP) pathway is the biosynthetic pathway involved in diterpenoid biosynthesis. Our studies in *S. sonchifolius* reinforce that the biosynthesis of different classes of terpenes should not be compartmentalized into cytosol and plastids. Additionally, (-)-ent-kaurenoic acid showed antimicrobial activity against *Staphylococcus aureus* biofilm.

Source: EMIRATES JOURNAL OF FOOD AND AGRICULTURE | 26 (1): 60-65 JAN 2014

Title: Difference on ITS regions among Yacon genotypes and *Smallanthus* spp.

Author(s): Ziarovska, J | Cusimamani, EF | Russo, D | Milella, L

Date: JAN 2014

Author Keywords: ITS region | Landraces | Molecular markers | DNA sequence | Yacon

Keywords Plus: SONCHIFOLIUS | IDENTIFICATION | MELAMPOLIDES | RAPD | SEQUENCES | DIVERSITY | DNA

Publication Year: 2014

Volume: 26

Abstract:

Yacon (*Smallanthus sonchifolius*) is an Andean crop which is very regarded for its medicinal properties. Yacon genetic profiles have been slightly studied using molecular markers. The aim of this study was to prepare the protocol for direct sequencing of the ITS (Internal Transcribed Spacers) regions of yacon DNA genome. The identified ITS regions in three Bolivian yacon's landraces (BOL 20, BOL 22 and BOL 24) were sequenced and then compared with ITS regions found in NCBI database, previously isolated in yacon and in other plants belonging to the genus *Smallanthus*. The analysed ITS regions of studied Bolivian landraces showed differences in the nucleotides 163-164 and 235-236 with the sequence previously isolated in yacon. A dendrogram was constructed by comparing the sequence presented in the

manuscript and those in the NCBI database for *Smallanthus*, spp. In the dendrogram, the previously reported ITS sequence of *Smallanthus sonchifolius* was also used. Specific sites of *Smallanthus sonchifolius* ITS region gives a promising base for molecular approach identification of this underutilized crop.

Source: GENETIC RESOURCES AND CROP EVOLUTION | 61 (6): 1209-1217 AUG 2014

Title: Variability in sesquiterpene lactones from the leaves of yacon (*Smallanthus sonchifolius*) accessions of different geographic origin

Author(s): Mercado, MI | Araoz, MVC | Manrique, I | Grau, A | Catalan, CAN

Date: AUG 2014

Author Keywords: Chemical variability | Glandular trichomes | *Smallanthus sonchifolius* | Yacon

Keywords Plus: POLYMNIA-SONCHIFOLIA | LEAF EXTRACTS | ASTERACEAE | POEPP. | INHIBITION | ACIDS | CROP

Publication Year: 2014

Volume: 61

Abstract:

The sesquiterpene lactones (STLs) content of glandular trichomes from the leaves of twenty-five yacon (*Smallanthus sonchifolius*, Asteraceae) accessions, obtained along a latitudinal gradient from Ecuador to northwest Argentina, was characterized by gas chromatography/mass spectroscopy (GC/MS). While accessions from Ecuador, Bolivia and Argentina proved to be very chemoconsistent, significant variation was found in quantitative composition of STLs from accessions in central Peru, the probable region of origin for the species.

Source: BOLETIN DE LA SOCIEDAD ARGENTINA DE BOTANICA | 48 (2): 193-200 AUG 2013

Title: ARBUSCULAR MYCORRHIZAL ASSOCIATIONS AND DARK SEPTATE ENDOPHYTES IN YACON (*SMALLANTHUS SONCHIFOLIUS*) AND A WILD RELATIVE (*SMALLANTHUS MACROSCYPHUS*)

Author(s): Mercado, MI | Araoz, MVC | De Weht, CIB | Ponessa, GI | Grau, A

Date: AUG 2013

Author Keywords: *Smallanthus sonchifolius* | *Smallanthus macroscyphus* | mycorrhizas | arbuscular mycorrhizas | dark septate endophytes

Keywords Plus: ROOTS | LEAVES | FUNGI

Publication Year: 2013

Volume: 48

Abstract:

Mycorrhizal associations in *Smallanthus sonchifolius* (Poepp. & Endl.) H. Robinson (Asteraceae), Yacon, an ancient Andean crop and *Smallanthus macroscyphus* (Baker ex Martius) A. Grau, wild yacon, a close wild relative are described for the first time. Yacon fibrous roots growing under field conditions have

high levels of colonization by arbuscular mycorrhizal fungi (86 %). Other fungi colonizing roots included dark septate endophytes (45 %) and unidentified fungi that are probably saprophytic (25 %) were observed. Only 9% of the samples analyzed were not colonized by any type of fungi. *Glomus*, *Acaulospora*, *Scutellospora*, *Gigaspora* and *Pacispora* were the main genera of arbuscular mycorrhiza identified. A similar high degree of mycorrhizal colonization was observed in *Smallanthus macroscyphus*, in natural populations associated with *Juglans australis* native forest. The high level of mycorrhizal colonization, the low number of fine absorbing roots and the large roots diameters observed, suggest that both *Smallanthus* species are likely dependent on mycorrhiza.

Source: ASIAN JOURNAL OF CHEMISTRY | 24 (1): 312-314 JAN 2012

Title: Extraction of Lignan from the Leaves of *Smallanthus sonchifolius* and its Antioxidant Activity

Author(s): Lv, JL | Liao, Z | Wang, L | Yang, GY | Yang, YL

Date: JAN 2012

Author Keywords: *Smallanthus sonchifolius* | Lignans | Antioxidant activity

Keywords Plus: YACON ROOTS | CONSTITUENTS | LEAF | IDENTIFICATION

Publication Year: 2012

Volume: 24

Abstract:

A new lignan, smallanlignan B (1) together with seven known lignans (2-8) were isolated from the leaves of *S. sonchifolius*. Their structures were elucidated by the analysis of spectroscopic data. The antioxidant activity of smallanlignan B was also evaluated and it showed antioxidant activity with an IC₅₀ value of 2.18 mg/mL.

Source: NATURAL PRODUCT RESEARCH | 24 (17): 1592-1597 2010

Title: A new hexenol glycoside from leaves of *Smallanthus sonchifolius*

Author(s): Xiang, Z | Gai, K | Dou, DQ | Chen, GR | Kang, TG | Shi, YY | Li, XT | Dong, F

Date: 2010

Author Keywords: *Smallanthus sonchifolius* | hexenol glycoside | kaurenoic acid

Keywords Plus: NMR SPECTRAL ASSIGNMENTS | STRUCTURE ELUCIDATION

Publication Year: 2010

Volume: 24

Abstract:

A new hexenol glycoside with two known compounds was isolated from the leaves of *Smallanthus sonchifolius*. The structure of the new compound was elucidated as Z-hex-3-en-1-ol O-alpha-L-arabinopyransyl (1''-2')-beta-D-glucopyranoside (1) on the basis of spectroscopic analysis and chemical evidence. The two known compounds were identified as ent-15-hydroxy-kaur-16-en-19-oic acid (2) and ent-18-hydroxy-kaur-16-en-19-oic acid (3) by comparison of their spectral data with the reported data. Compounds 2 and 3 were isolated for the first time from the title plant.

Source: HORTICULTURA BRASILEIRA | 33 (3): 394-397 JUL-SEP 2015

Title: Occurrence of insects causing injuries to the yacon crop

Author(s): Silva, DMN | Oliveira, FL | Dalvi, LP | Pratissoli, D | Erlacher, WA | Quaresma, MAL

Date: JUL-SEP 2015

Author Keywords: Smallanthus sonchifolius | damage | pest management

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS

Publication Year: 2015

Volume: 33

Abstract:

This research aimed to catalog insects that cause injury to the yacon (*Smallanthus sonchifolius*, familia Asteraceae) crop, in order to identify those who may cause damage. The study was carried out in Alegre, Espírito Santo State, Brazil. Cultivation began in May 2013 and the harvest was done 180 days later. Three species from the Coleoptera order: *Lagria villosa* (Coleoptera: Lagriidae); *Cerotoma arcuata* and *Diabrotica speciosa* (Coleoptera: Chrysomelidae) and two species from the Lepidoptera order: *Spodoptera eridania* (Lepidoptera: Noctuidae) and *Chlosyne lacinia saundersii* (Lepidoptera: Nymphalidae) were observed causing damage to the yacon crop. The caterpillar *C. lacinia saundersii*, known as sunflower caterpillar, was the most important species, being observed throughout the yacon cycle.

Source: BIOCHEMICAL SYSTEMATICS AND ECOLOGY | 38 (5): 1042-1048 OCT 2010

Title: Ent-kaurane derivatives from the root cortex of yacon and other three *Smallanthus* species (*Heliantheae*, Asteraceae)

Author(s): Araoz, MVC | Mercado, MI | Grau, A | Catalan, CAN

Date: OCT 2010

Author Keywords: *Smallanthus sonchifolius* | *Smallanthus macroscyphus* | *Smallanthus connatus* | *Smallanthus siegesbeckius* | Root cortex secretory canals | Kaurenoic acid derivatives

Keywords Plus: OCCURRING TERPENE DERIVATIVES | ACMELA-BRASILIENSIS ASTERACEAE | SIEGESBECKIA-ORIENTALIS | SONCHIFOLIUS YACON | KAURENOIC ACID | SESQUITERPENE LACTONES | COPAIFERA-LANGSDORFFII | CHEMICAL-CONSTITUENTS | POLYMNIA-SONCHIFOLIA | SECRETORY STRUCTURES

Publication Year: 2010

Volume: 38

Abstract:

The metabolites produced by the secretory canals of the root cortex from four *Smallanthus* species belonging to the yacon group were identified as ent-kaurane-type diterpenes. The dichloromethane root cortex extracts of the four species were treated with diazomethane and analyzed comparatively by GC-MS using a simple and rapid procedure which is very sensitive and reproducible permitting detection of minor components. In all cases, ent-16-kauren-19-oic acid (kaurenoic acid) methyl ester was the main component, differences being observed only in the minor components. The minor components identified

were grandiflorenic acid methyl ester, ent-16-kauren-19-al, 16 α ,17-epoxy-15 α -angeloyloxy-kauran-19-oic acid methyl ester and several O-acyl derivatives at C-15 or C-18 of kaurenoic acid. One of the minor components, 18-isobutyroyloxy-ent-kaur-16-en-19-oic acid is a new kaurenoic acid derivative. Grandiflorenic acid and 15- α -angeloyloxy-16,17- α -epoxy-ent-16-kauren-19-oic acid were present only in *Smallanthus sonchifolius* and *Smallanthus siegesbeckius* which showed very similar GC traces. The different GC profile of RC diterpenes from *Smallanthus connatus* and *Smallanthus macroscyphus* supports the view that they are different taxa. Some chemotaxonomic aspects of the genus *Smallanthus* and the subtribe *Milleriinae* are briefly discussed.

Source: INTERNATIONAL JOURNAL OF MASS SPECTROMETRY | 424: 27-34 JAN 2018

Title: Characterisation of yacon tuberous roots and leaves by DART-TOF/MS

Author(s): Rajchl, A | Cusimamani, EF | Prchaloya, J | Sevcik, R | Cizkova, H | Ziarovska, J | Hrdlickova, M

Date: JAN 2018

Author Keywords: *Smallanthus sonchifolius* | Statistical analysis | PCA | LDA | DART

Keywords Plus: IONIZATION-MASS-SPECTROMETRY | SMALLANTHUS-SONCHIFOLIUS | AUTHENTICATION

Publication Year: 2018

Volume: 424

Abstract:

Yacon [*Smallanthus sonchifolius* (Poepp. et Endl.) H. Robinson] is a plant grown worldwide originating in the Andes region. Yacon is grown for its sweet tuberous roots and leaves used for the preparation of herbal infusions. Twenty-six yacon landraces' leaves and roots (both peeled and unpeeled) have been analysed by DART-TOF/MS. The method has been optimised and the fingerprints of the mass spectra have been statistically processed by PCA and LDA statistical analysis. The DART method has succeeded in differentiating between the yacon landraces according to their genotype and geographical origin.

Source: NATURAL PRODUCT COMMUNICATIONS | 5 (1): 95-98 JAN 2010

Title: Anti-diabetes Constituents in Leaves of *Smallanthus sonchifolius*

Author(s): Xiang, Z | He, F | Kang, TG | Dou, DQ | Gai, K | Shi, YY | Young-Ho, K | Dong, F

Date: JAN 2010

Author Keywords: *Smallanthus sonchifolius* | Asteraceae | Yacon | Smallanthaditerpenic acid | HPLC

Keywords Plus:

Publication Year: 2010

Volume: 5

Abstract:

The inhibitory effect of smallanthaditerpenic acids A, B, C and D previously isolated from leaves of *Smallanthus sonchifolius* (yacon) on α -glucosidase were examined and their IC₅₀ were determined to be

0.48 mg/mL, 0.59 mg/mL, 1.00 mg/mL, and 1.17 mg/mL respectively. In addition, a rapid, reliable RP-HPLC method for the analysis of chlorogenic acid, caffeic acid, and smallanthaditerpenic acids A and C in yacon leaves was established, and the variation in their contents in leaves from plants cultivated in different places and collected at different times of the year were compared. The established analytical method for determining smallanthaditerpenic acids A and C, chlorogenic acid and caffeic acid presented good results and could be used as a method for the quality control of *S. sonchifolius* leaves.

Source: BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 53 (3): 629-632 MAY-JUN 2010

Title: Antimicrobial Activity from Endophytic Fungi *Arthrimum* state of *Apiospora montagnei* Sacc. and *Papulaspora immersa*

Author(s): Ramos, HP | Braun, GH | Pupo, MT | Said, S

Date: MAY-JUN 2010

Author Keywords: *Arthrimum* state of *Apiospora montagnei* | *Papulaspora immersa* | *Smallanthus sonchifolius* | yacon

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | IDENTIFICATION | METABOLITES | EXTRACTS | LEAVES

Publication Year: 2010

Volume: 53

Abstract:

Papulaspora immersa and *Arthrimum* state of *Apiospora montagnei* Sacc. were isolated from the roots of *Smallanthus sonchifolius* (yacon). The crude extracts from their cultures inhibited the growth of *Staphylococcus aureus*, *Kocuria rhizophila*, *Pseudomonas aeruginosa* and *Escherichia coli*. The more relevant results were observed in the ethyl acetate extract from *P. immersa* against *P. aeruginosa* (90 µg/mL) and ethyl acetate extract from *Arthrimum* state of *A. montagnei* Sacc. against *P. aeruginosa* (160 µg/mL). The two endophytic fungi isolated from yacon roots as well as their antimicrobial activity detected in the crude extracts cultures were being reported for the first time.

Source: JOURNAL OF THE CHEMICAL SOCIETY OF PAKISTAN | 38 (2): 379-383 APR 2016

Title: Extraction of Yacon Leaves Enhances Enhydrin Degradation

Author(s): Suo, TJ | Wang, XT | Li, DW | Aung, KW | Ran, XK | Dou, DQ | Dong, F

Date: APR 2016

Author Keywords: Yacon leaves | *Smallanthus sonchifolius* | Enhydrin | degradation | Anticancer activity

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | CONSTITUENTS

Publication Year: 2016

Volume: 38

Abstract:

Sesquiterpene lactones (SLs) with various activities, which are primarily composed of enhydrin, are the

primary constituents in the leaves of the yacon, *Smallanthus sonchifolius* (Poepp. & Endl.) H. Robinson. To study the effect of heat extract on the degradation of enhydrin, the hydrolyzed products were isolated and their anticancer activity was assayed. The decoction extraction of yacon leaves under heat could enhance enhydrin degradation. However, the degradation was not observed when the pure compound (i.e., enhydrin) was refluxed. The major degradation products of enhydrin were isolated and identified to be 6-deacetyldeepoxydihydroxyenhydrin (1), deepoxydihydroxyenhydrin (2) and enhydrin chlorohydrin (3). In addition, the cytotoxic activity of the SLs obtained against human gastric cancer cells (MGC80-3) indicated that enhydrin is stronger than its degradation products. Our results further confirmed that the traditional tea using way of yacon leaves in the folks is reasonable.

Source: CHEMICAL COMMUNICATIONS | 49 (85): 9989-9991 2013

Title: A biosynthetic pathway of sesquiterpene lactones in *Smallanthus sonchifolius* and their localization in leaf tissues by MALDI imaging

Author(s): Lopes, AA | Pina, ES | Silva, DB | Pereira, AMS | da Silva, MFGF | Da Costa, FB | Lopes, NP | Pupo, MT

Date: 2013

Author Keywords:

Keywords Plus: TIGLOYL ESTERS | ISOPRENE UNITS | GLANDULAR TRICHOMES | GERMACRENE-D | DATURA | ACID | IDENTIFICATION | ISOLEUCINE | YACON | MELAMPOLIDES

Publication Year: 2013

Volume: 49

Abstract:

The biosynthetic route for epoxyangelate esters of the sesquiterpene lactones (STL) uvedalin and enhydrin from in vitro cultures of *Smallanthus sonchifolius* (Asteraceae) was investigated with C-13-precursors for the first time in the literature. Photomicroscope analyses and studies using MALDI-MS imaging confirmed that glandular trichomes accumulate STL.

Source: GENETIC RESOURCES AND CROP EVOLUTION | 58 (4): 545-551 MAR 2011

Title: Total phenolic content, RAPDs, AFLPs and morphological traits for the analysis of variability in *Smallanthus sonchifolius*

Author(s): Milella, L | Martelli, G | Salava, J | Fernandez, E | Ovesna, J | Greco, I

Date: MAR 2011

Author Keywords: DNA fingerprinting | Genetic dissimilarity | Molecular marker | Phenolic content | *Smallanthus sonchifolius* | Yacon

Keywords Plus:

Publication Year: 2011

Volume: 58

Abstract:

Smallanthus sonchifolius is a perennal herb originally cultivated in South America and now grown in several other countries. Recently, greater attention has been focused on this plant due to its agronomical, nutritional and pharmacological characteristics. In this paper the application of RAPDs and AFLPs for the analysis of genetic diversity in a group of 5 *Smallanthus sonchifolius* landraces is presented. Both methods proceed through the direct analysis of DNA, and their results were compared with the total phenolic content of each landrace and its morphological traits. Using 61 RAPD primers, 85 informative bands were identified, corresponding to 28.7% of polymorphism. In comparison, only six selected AFLP primer pairs produced 84 informative bands, with a similar percentage of polymorphism (23.4%). RAPD and AFLP markers were analyzed separately. Total phenolic content varied twofold among the five landraces analysed, ranging from 3,494 to 6,849 mg/g. Each type of molecular marker resolved two main groups that included the same genotypes, but with different within-group relationships among genotypes. The two groups are consistent with some phenotypic characters but they do not reflect faithfully their geographical origin. Most notably, the two groups comprise landraces with higher and lower total phenolic content, respectively. Dendrograms based on the two molecular data sets graphically depicted the ability of both methods to differentiate all the cultivars studied. Data obtained suggest that the two molecular markers applied are useful to investigate intra-specific genetic variability in *Smallanthus sonchifolius*, and predict well the total phenolic content of each landrace.

Source: NATURAL PRODUCT COMMUNICATIONS | 5 (11): 1721-1726 NOV 2010

Title: New Acyclic Diterpenic Acids from Yacon (*Smallanthus sonchifolius*) Leaves

Author(s): Mercado, MI | Araoz, MVC | Grau, A | Catalan, CAN

Date: NOV 2010

Author Keywords: *Smallanthus sonchifolius* | yacon | acyclic diterpenes | geranylnerol derivatives | sesquiterpene lactones epicuticular wax

Keywords Plus: SESQUITERPENE LACTONES | LEAF EXTRACTS | CONSTITUENTS | MELAMPOLIDES | INHIBITION

Publication Year: 2010

Volume: 5

Abstract:

Two new acyclic diterpenoids, smaditerpenic acid E (1a) and F (2a), along with nineteen melampolide-type sesquiterpene lactones, six of them not previously reported in yacon, were isolated from the methylene chloride leaf rinse extract. Their structures were elucidated from 1D and 2D NMR experiments and gas chromatography coupled to mass spectrometry.

Source: NATURAL PRODUCT RESEARCH | 24 (18): 1771-1782 2010

Title: Hypoglycaemic effects of tea extracts and ent-kaurenoic acid from *Smallanthus sonchifolius*

Author(s): Raga, DD | Alimboyoguen, AB | del Fierro, RS | Ragasa, CY

Date: 2010

Author Keywords: *Smallanthus sonchifolius* | Asteraceae | yacon | ent-kaurenoic acid | hypoglycaemic

Keywords Plus:

Publication Year: 2010

Volume: 24

Abstract:

Hypoglycaemic activity was observed in normoglycaemic mice orally administered with the aqueous *Smallanthus sonchifolius* leaf tea extract, alloxan-induced diabetic mice orally administered with ent-kaurenoic acid (1), and normoglycaemic mice intraperitoneally administered with 1 from *S. sonchifolius* leaves. A single dose administration of 50 mg kg⁻¹ BW yacon leaf tea extract demonstrated immediate but relatively short hypoglycaemic activity, with significant effects observed during 1-2 h. Similarly, administration with 100 mg kg⁻¹ BW yacon leaf tea extract obtained by heavy stirring in hot water demonstrated a more potent activity compared to the positive control at 1.5-2.0 h. Oral administration of 1 did not affect the blood glucose level of the alloxan-induced diabetic mice, but a single intraperitoneal injection of 10 mg kg⁻¹ BW in normoglycaemic mice had consistent percent blood glucose reduction persisting from 1 to 2 h observation periods.

Source: LATIN AMERICAN JOURNAL OF PHARMACY | 36 (5): 866-872 2017

Title: Hypoglycemic and Hypolipidemic Effect of Smaditerpenic Acid A on Normal and Obese Mice Induced with High Fat Diet

Author(s): Ran, XK | Aung, KKW | Dou, DQ | Dong, F

Date: 2017

Author Keywords: hypoglycemic | hypolipidemic | smaditerpenic acid A | *Smallanthus sonchifolius*

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS LEAVES | DIABETIC-RATS | YACON LEAVES | EXTRACT | CONSTITUENTS

Publication Year: 2017

Volume: 36

Abstract:

The aim of this study was to explore the hypoglycemic and hypolipidemic effect of smaditerpenic acid A from the leaves of *Smallanthus sonchifolius* and acarbose on normal and obese mice induced with high fat diet. Our results showed that both of smaditerpenic acid A and acarbose could enhance the sucrose tolerance on normal mice at a dose of 20 mg/kg body weight. Furthermore, both of smaditerpenic acid A and acarbose could significantly lower the levels of non-esterified fatty acid, total cholesterol, and triglycerides, as well as ameliorate hyperlipidemia and hyperglycemia at a dose of 40 mg/kg body weight on obese mice induced with high fat diet. It is for the first time to report the hypoglycemic and hypolipidemic effect of smaditerpenic acid A and acarbose on obese mice.

Source: NATURAL PRODUCT RESEARCH | 31 (1): 43-49 2017

Title: A new sesquiterpene lactone from yacon leaves

Author(s): Yuan, Y | Aung, KKW | Ran, XK | Wang, XT | Dou, DQ | Dong, F

Date: 2017

Author Keywords: Smallanthus sonchifolius | yacon | sesquiterpene lactone | chemical constituent | cytotoxic activity

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | ANTIOXIDANT ACTIVITY | LEAF EXTRACTS | CONSTITUENTS | ACIDS

Publication Year: 2017

Volume: 31

Abstract:

The chemical constituents of 60% EtOH extract of yacon leaves were separated to yield a new compound, together with four known compounds, which were isolated for the first time from yacon. The new compound was characterised and named as chlorodalin (1) on the basis of NMR (1D and 2D), HR-MS and other spectral methods. The cytotoxic activities of 1-5 were evaluated on two human tumour cell lines and the new compound showed significant cytotoxic activity.

Source: GENETIC RESOURCES AND CROP EVOLUTION | 61 (1): 163-172 JAN 2014

Title: Ontogeny and total sugar content of yacon tuberous roots and other three Smallanthus species (Heliantheae, Asteraceae), insights on the development of a semi-domesticated crop

Author(s): Araoz, MVC | Gonzalez, AMK | Mercado, MI | Ponessa, GI | Grau, A | Catalan, CAN

Date: JAN 2014

Author Keywords: Domestication | Fructooligosacharides | Ontogeny | Root anatomy | Smallanthus sonchifolius | Yacon

Keywords Plus: SONCHIFOLIUS | DERIVATIVES | ANATOMY

Publication Year: 2014

Volume: 61

Abstract:

The ontogeny of the tuberous roots of yacon (*Smallanthus sonchifolius*), an ancient Andean crop, is described for the first time along with three other wild species of *Smallanthus*: *S. connatus*, *S. macrocyphus* and *S. siegesbeckius*. Tuberous storage roots are present in the four species. Tuberization results from unusual secondary thickening. A meristematic endodermis maintains the primary cortex by generating cortex cells continuously. Secretory schizogenous canals develop adjacent to the endodermis in opposition to the phloem poles. Phellogen originates in the outer layers of the parenchymatic cortex. The four species develop a parenchymatous pith that stores mainly fructooligosacharides (FOS) and plays an important role in storing water, protecting the plant from drought stress and environmental hazards in the Andean climate. In yacon, domestication has produced a wide pith that stores water, reducing sugars and FOS with low degree of polymerization, that could have eventually made it more palatable as compared to the wild counterparts.

Source: ASIAN PACIFIC JOURNAL OF TROPICAL BIOMEDICINE | 9 (9): 365-372 SEP 2019

Title: Smallanthus sonchifolius roots ameliorate non-alcoholic fatty liver disease by reducing redox imbalance and hepatocyte damage in rats fed with a high fructose diet

Author(s): Aleman, MN | Sanchez, SS | Honore, SM

Date: SEP 2019

Author Keywords:

Keywords Plus: OXIDATIVE STRESS | YACON ROOTS | ANTIOXIDANTS | FENOFIBRATE | LEAVES

Publication Year: 2019

Volume: 9

Abstract:

Objective: To evaluate the potential of *Smallanthus sonchifolius* (*S. sonchifolius*) roots in ameliorating hepatic damage of rats fed with a high fructose diet. Methods: The effect of *S. sonchifolius* roots on energy intake, body weight, fat and liver mass was determined in male rats fed with a high-fructose diet. Plasma glucose, triglycerides, total cholesterol, lipoproteins and aspartate aminotransferase and alanine aminotransferase were analyzed. Histological changes of the livers were evaluated by electronic microscopy and apoptosis was examined using the TUNEL method. The levels of malondialdehyde, reduced-glutathione and antioxidant enzymes (catalase, superoxide dismutase, glutathione peroxidase, glutathione S-transferase) activities were also determined. Results: *S. sonchifolius* roots significantly decreased energy intake, body weight, fat and liver mass ($P < 0.05$). *S. sonchifolius* roots ameliorated liver steatosis and mitochondrial morphology, avoiding cellular apoptosis and normalizing transaminase activity in the liver of rats fed with high fructose. Enzymatic assays revealed that *S. sonchifolius* roots had a modulatory effect on the oxidative stress induced by fructose-feeding by reducing lipid peroxidation ($P < 0.05$) and antioxidant enzyme activities ($P < 0.05$) in liver. Conclusions: *S. sonchifolius* roots can ameliorate non-alcoholic fatty liver disease by improving oxidative stress and liver injury.

Source: NATURAL PRODUCT COMMUNICATIONS | 11 (3): 315-337 MAR 2016

Title: Bioactive Compounds from Plants Used in Peruvian Traditional Medicine

Author(s): Lock, O | Perez, E | Viliar, M | Flores, D | Rojas, R

Date: MAR 2016

Author Keywords: Croton lechleri | Lepidium meyenii | Peru | Physalis peruviana | Smallanthus sonchifolius | Traditional medicine | Uncaria tomentosa

Keywords Plus: LEPIDIUM-MEYENII MACA | YACON SMALLANTHUS-SONCHIFOLIUS | INCHI PLUKENETIA-VOLUBILIS | QUINOVIC ACID GLYCOSIDES | VITRO ANTIBACTERIAL ACTIVITY | UNCARIA-TOMENTOSA EXTRACTS | DRAGONS BLOOD CROTON | LECHLERI MUELL-ARG | ENTKAURENOIC ACID | PHYSALIS-PERUVIANA

Publication Year: 2016

Volume: 11

Abstract:

It is estimated that there are as many as 1400 plant species currently used in traditional Peruvian medicine; however, only a few have undergone scientific investigation. In this paper, we make a review of the botanical, chemical, pharmacological and clinical properties of the most investigated Peruvian medicinal plants. The plant species selected for this review are: *Smallanthus sonchifolius* (yacon), *Croton lechleri* (sangre de grado), *Uncaria tomentosa/U. guianensis* (una de gato), *Lepidium meyenii* (maca), *Physalis peruviana* (aguaymanto), *Minthostachys mollis* (muna), *Notholaena nivea* (cuti-cuti), *Maytenus macrocarpa* (chuchuhuasi), *Dracontium lorentense* (jergon sachá), *Gentianella nitida* (hercampuri), *Plukenetia volubilis* (sacha inchi) and *Zea mays* (maíz morado). For each of these plants, information about their traditional uses and current commercialization is also included.

Source: BIOCHEMICAL SYSTEMATICS AND ECOLOGY | 50: 383-389 OCT 2013

Title: Genetic diversity of yacon (*Smallanthus sonchifolius* (Poepp. & Endl.) H. Robinson) and its wild relatives as revealed by ISSR markers

Author(s): Svobodova, E | Dvorakova, Z | Cepkova, PH | Viehmannova, I | Havlickova, L | Cusimamani, EF | Russo, D | Zela, GM

Date: OCT 2013

Author Keywords: Clonal plant | Genetic diversity | ISSR | *Smallanthus* | Wild yacon

Keywords Plus: VARIABILITY

Publication Year: 2013

Volume: 50

Abstract:

Set of 29 accessions of *Smallanthus sonchifolius*, an important tuber crop from South America, and its three wild relatives were analysed using the Inter Simple Sequence Repeats (ISSR) markers. Seven primers out of 30 primers screened gave clear and reproducible spectra. The range of amplified bands was from 2500 bp to 300 bp. These seven primers generated in total 77 bands, from which 75 (97.4%) were polymorphic. Nei's genetic distances between samples varied from 0.01 to 0.24. The Shannon's index (I) was estimated as 0.0392. The UPGMA dendrogram created using the Neighbour joining method and based on the Dice's dissimilarity coefficient separated clearly the wild accessions from all *S. sonchifolius* samples, which remained close to each other, confirming the clonal origin and thus a very low genetic variability within the genus.

Source: CANADIAN JOURNAL OF MICROBIOLOGY | 58 (10): 1202-1211 OCT 2012

Title: Antifungal activity of extracts from endophytic fungi associated with *Smallanthus* maintained in vitro as autotrophic cultures and as pot plants in the greenhouse

Author(s): Rosa, LH | Tabanca, N | Techen, N | Pan, ZQ | Wedge, DE | Moraes, RM

Date: OCT 2012

Author Keywords: antifungal | diversity | plant tissue culture | medicinal plant | cryptic fungal symbionts

Keywords Plus: ANTIMICROBIAL ACTIVITY | SONCHIFOLIUS ASTERACEAE | TRICHODERMA | IDENTIFICATION | LECYTHOPHORA | COMMUNITIES | DITERPENES | SYMBIOSIS | FUSARIUM | BIOLOGY

Publication Year: 2012

Volume: 58

Abstract:

The endophytic fungal assemblages associated with *Smallanthus sonchifolius* (Poepp.) H. Rob. and *Smallanthus uvedalius* (L.) Mack. ex Small growing in vitro autotrophic cultures and in the greenhouse were identified and evaluated for their ability to produce bioactive compounds. A total of 25 isolates were recovered that were genetically closely related to species of the genera *Bionectria*, *Cladosporium*, *Colletotrichum*, *Fusarium*, *Gibberella*, *Hypocrea*, *Lecythophora*, *Nigrospora*, *Plectosphaerella*, and *Trichoderma*. The endophytic assemblages of *S. sonchifolius* presented a greater diversity than the group isolated from *S. uvedalius* and demonstrated the presence of dominant generalist fungi. Extracts of all fungi were screened against the fungal plant pathogens. Ten extracts (41.6%) displayed antifungal activities; some of them had a broad antifungal activity. The phylotypes *Lecythophora* sp. 1, *Lecythophora* sp. 2, and *Fusarium oxysporum* were isolated from in vitro autotrophic cultures and displayed antifungal activity. The presence of bioactive endophytic fungi within *S. sonchifolius* and *S. uvedalius* suggests an ecological advantage against pathogenic attacks. This study revealed reduced numbers of endophytes in association with both *Smallanthus* species in controlled cultivation conditions compared with the endophytic communities of hosts collected in the wild environments. Even as reduced endophytic communities, these fungi continue to provide chemical protection for the host.

Source: PHYTOCHEMISTRY | 117: 332-339 SEP 2015

Title: The sesquiterpene lactone polymatin B from *Smallanthus sonchifolius* induces different cell death mechanisms in three cancer cell lines

Author(s): De Ford, C | Ulloa, JL | Catalan, CAN | Grau, A | Martino, VS | Muschietti, LV | Merfort, I

Date: SEP 2015

Author Keywords: *Smallanthus sonchifolius* | Asteraceae | Sesquiterpene lactones | Cytotoxicity

Keywords Plus: OCCURRING TERPENE DERIVATIVES | CYTO-TOXICITY | MELAMPOLIDES | CONSTITUENTS | GERMACRANOLIDES | LEAVES | ASSAY | GUAIANOLIDES | INHIBITION | APOPTOSIS

Publication Year: 2015

Volume: 117

Abstract:

A 8 beta-angeloyloxy-9 alpha-hydroxy-14-oxo-acanthospermolide and five known melampolide sesquiterpene lactones (uvedalin, enhydrin, polymatin B, sonchifolin, and fiuctuanin) were isolated from the leaves of *Smallanthus sonchifolius*. The compounds were identified by 1D-, 2D-NMR, HRMS, IR and UV analyses. In vitro cytotoxicity assays (MTT) showed that these sesquiterpene lactones display poor

cytotoxic effects on peripheral blood mononuclear cells (PBMC) of healthy human subjects, whereas a strong cytotoxicity was observed in leukemia and pancreas cancer cells. For the mechanism of action of polymatin B, oxidative stress seems to be involved. Interestingly, reactive oxygen species (ROS) formation mainly induced different effects: apoptosis in CCRF-CEM cells, necroptosis in CEM-ADR5000 cells through induction of RIP1K, neither apoptosis nor necroptosis in MIA-PaCa-2 cells. Additionally, cells also died partly by necrosis.

Source: PLANT PHYSIOLOGY AND BIOCHEMISTRY | 141: 183-192 AUG 2019

Title: Genetic and chemical diversity among yacon [*Smallanthus sonchifolius* (Poepp. et Endl.) H. Robinson] accessions based on iPBS markers and metabolomic fingerprinting

Author(s): Ziarovska, J | Padilla-Gonzalez, GF | Viehmannova, I | Fernandez, E

Date: AUG 2019

Author Keywords: Genetic diversity | iPBS | Metabolomic fingerprints | Retrotransposons | *Smallanthus sonchifolius*

Keywords Plus: SESQUITERPENE LACTONES | VARIABILITY | ASTERACEAE | POPULATIONS | EXTRACTS | LEAVES | ANTIOXIDANT | RELATIVES | PLANTS | ROOTS

Publication Year: 2019

Volume: 141

Abstract:

The present study is focused on the characterization of yacon [*Smallanthus sonchifolius* (Poepp. et Endl.) H. Robinson] accessions from different geographic origins (Bolivia, Ecuador, and Peru) by iPBS markers and metabolomic fingerprinting. The results showed that the number of amplified polymorphic fragment levels ranged from 20 up to 27 with a level of polymorphism ranging from 80 to 100%. Five of the iPBS primers used in this study provided no specific banding pattern able to discriminate between the different yacon accessions. However, two iPBS primer pairs were able to separate Peru accessions from those of Ecuador and Bolivia. The UPLC-HRMS/MS-based metabolomic fingerprinting showed highly similar metabolomic fingerprints characterized by the accumulation of high quantities of sesquiterpene lactones and diterpenes, but no apparent geographic clustering. The present study demonstrates that yacon accessions from different geographical origins maintained ex situ (in the Czech Republic) present a rather low chemical and genetic diversity.

Source: INTERNATIONAL JOURNAL OF BIOLOGICAL MACROMOLECULES | 108: 1074-1081 MAR 2018

Title: Yacon fructans (*Smallanthus sonchifolius*) extraction, characterization and activation of macrophages to phagocyte yeast cells

Author(s): Paredes, LLR | Smiderle, FR | Santana, AP | Kimura, A | Iacomini, M | Sasaki, GL

Date: MAR 2018

Author Keywords: Fructooligosaccharides | Phagocytic activity | THP-1 cells | *Smallanthus sonchifolius*

Keywords Plus: GC-MS | FRUCTOOLIGOSACCHARIDES | QUANTIFICATION | INULIN | OLIGOSACCHARIDES | POLYSACCHARIDES | MODULATION | PREBIOTICS | RECEPTOR | MICE

Publication Year: 2018

Volume: 108

Abstract:

Yacon (*Smallanthus sonchifolius*) originates from the Andean region and has spread across South America, Europe and Japan. In contrast with most roots, yacon stores its carbohydrates in fructooligosaccharides (FOS) and contains approximately 37% of FOS in its root dry matter. Aqueous extracts of yacon were characterized through TLC, methylation, NMR, and ESI-MS. FOS of yacon showed as linear fructooligosaccharides containing almost exclusively (2 → 1)-linked beta-fructofuranosyl units, with terminal alpha-glucopyranosyl and beta-fructofuranosyl units. ESI-MS analyses indicated a wide degree of polymerization (DP) ranging from 2 to 10. The effect of the isolated FOS on non-specific immune activity by THP-1 cells was evaluated through phagocytic activity against heat-killed yeast (*Saccharomyces cerevisiae*). The stimulant effect of yacon FOS was dose- and time-dependent, showing results more effective than branched FOS observed in previous studies. The results reinforce the use of linear yacon FOS as immunomodulators.

Source: JOURNAL OF NATURAL MEDICINES | 64 (2): 212-215 APR 2010

Title: Antibacterial and synergistic effects of *Smallanthus sonchifolius* leaf extracts against methicillin-resistant *Staphylococcus aureus* under light intensity

Author(s): Joung, H | Kwon, DY | Choi, JG | Shin, DY | Chun, SS | Yu, YB | Shin, DW

Date: APR 2010

Author Keywords: *Smallanthus sonchifolius* | Yacon | Methicillin-resistant *Staphylococcus aureus* | Ampicillin | Oxacillin | Synergism | Light intensity

Keywords Plus: LEAVES | MELAMPOLIDES

Publication Year: 2010

Volume: 64

Abstract:

Smallanthus sonchifolius (yacon) is a perennial plant mostly cultivated in South America, primarily for use of the tubers as a food crop and the leaves as fodder for livestock. The antibacterial activities of the methanol extract of yacon leaves (*S. sonchifolius*) and its n-hexane, ethyl acetate, n-butanol and water fractions were evaluated against 6 strains of methicillin-resistant *Staphylococcus aureus* (MRSA) and 1 standard methicillin-susceptible *S. aureus* (MSSA) strain by using the disc diffusion method and minimal inhibitory concentrations (MICs) assay in the presence and absence of light. No activity was detected when the two methods were performed without light; however, under illumination at 4000 lux, the n-hexane fraction of yacon (HFY) had a MIC of 15.6 µg/ml. HFYL, prepared by exposure of HFY to 4000 lux for 18 h, was more effective than HFY in terms of antimicrobial activity against the 6 MRSA strains and 1 standard MSSA strain. HFYL mixed with ampicillin or oxacillin showed a synergistic effect

with all fractional inhibitory concentrations values being below 0.5. The present study demonstrates the enhancement and antimicrobial activity of yacon leaves against MRSA in the presence of light.

Source: JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY | 63 (50): 10856-10861 DEC 23 2015

Title: New Sesquiterpene Lactone Dimer, Uvedafolin, Extracted from Eight Yacon Leaf Varieties (*Smallanthus sonchifolius*): Cytotoxicity in HeLa, HL-60, and Murine B16-F10 Melanoma Cell Lines

Author(s): Kitai, Y | Hayashi, K | Otsuka, M | Nishiwaki, H | Senoo, T | Ishii, T | Sakane, G | Sugiura, M | Tamura, H

Date: DEC 23 2015

Author Keywords: dimer sesquiterpene lactone | cytotoxicity | *Smallanthus sonchifolius* | 'Sarada otome'

Keywords Plus: PARTHENOLIDE | APOPTOSIS | LEAVES | PURIFICATION | MELAMPOLIDES | INHIBITION

Publication Year: 2015

Volume: 63

Abstract:

Uvedafolin, 1, a new sesquiterpene lactone dimer, was isolated from the leaves of *Smallanthus sonchifolius* with five related compounds, 2-6, and their cytotoxicity was assessed against three tumor cell lines (HeLa, HL-60, B16-F10 melanoma). The stereostructure of 1 was newly elucidated by ESI-TOF-MS, 1D/2D NMR, and single-crystal X-ray diffraction. Dimers 1 and 2 had the most effective IC₅₀ values, 0.2-1.9 μ M, against the three tumor cell lines when compared with monomers 3-6 (IC₅₀ values 0.7-9.9 μ M) and etoposide (IC₅₀ values 0.8-114 μ M). The ester linkages of two sets of monomers, uvedalin, 5, and sonchifolin, 6, for 1, and enhydrin, 4, and sonchifolin, 6, for 2, as well as the acetyl group at the C-9 position, were essential for the high cytotoxicity. Dimers 1 and 2 would have potential as anticancer agents.

Source: JOURNAL OF ASIAN NATURAL PRODUCTS RESEARCH | 20 (6): 538-544 2018

Title: Two new sesquiterpene lactones from leaves of yacon, *Smallanthus sonchifolius*

Author(s): Ran, XK | Aung, KKW | Bai, J | Dou, PY | Zeng, Z | Dou, DQ

Date: 2018

Author Keywords: NMR | sesquiterpene lactones | yacon | chemical constituents | *Smallanthus sonchifolius*

Keywords Plus: EXTRACTS | CONSTITUENTS | ASSIGNMENTS

Publication Year: 2018

Volume: 20

Abstract:

The chemical constituents of 95% EtOH extract of yacon leaves were separated to yield two new

sesquiterpene lactones, together with three known compounds. The two new compounds were characterized to be 8-angeloyloxy-13-methoxyl-11, 13-dihydromelampolid-14-oic acid methyl ester (1) and 8-(3-methylbut-2-enoyl) oxy-13-methoxyl-11, 13-dihydromelampolid-14-oic acid methyl ester (2) on the basis of NMR spectra, HR-MS and other spectroscopic methods. The cytotoxicity of compounds 1-5 were evaluated on human hepatoma cell Bel-7402 and all the compounds showed moderate cytotoxicity. [GRAPHICS].

Source: JOURNAL OF CLINICAL BIOCHEMISTRY AND NUTRITION | 48 (3): 194-202 MAY 3 2011

Title: Ipomoea batatas and Agaricus blazei ameliorate diabetic disorders with therapeutic antioxidant potential in streptozotocin-induced diabetic rats

Author(s): Niwa, A | Tajiri, T | Higashino, H

Date: MAY 3 2011

Author Keywords: hypoglycemic effect | oxidative stress | pancreatic islet beta-cells | Ipomoea batatas (Caiapo) | Agaricus blazei (Agaricus)

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | LINKED INSULIN-RESISTANCE | CAFFEIC ACID-DERIVATIVES | SWEET-POTATO CULTIVARS | BETA-CELL APOPTOSIS | ANTIDIABETIC ACTIVITY | NITRIC-OXIDE | SUPEROXIDE-PRODUCTION | SIGNAL-TRANSDUCTION | PHENOLIC-COMPOUNDS

Publication Year: 2011

Volume: 48

Abstract:

Ipomoea batatas, Agaricus blazei and Smallanthus sonchifolius are known to favorably influence diabetes mellitus. To clarify their antidiabetic efficacy and hypoglycemic mechanisms, we treated streptozotocin-induced diabetic rats with daily oral feeding of powdered Ipomoea batatas (5 g kg⁻¹ d⁻¹), Agaricus blazei (1 g kg⁻¹ d⁻¹) or Smallanthus sonchifolius (4 g kg⁻¹ d⁻¹) for 2 months. Treatments with Ipomoea batatas or Agaricus blazei, but not Smallanthus sonchifolius, significantly suppressed the increases of fasting plasma glucose and hemoglobin A1c levels, and restored body weight loss during diabetes. Serum insulin levels after oral glucose administration tests increased along the treatments of Ipomoea batatas or Agaricus blazei. Moreover, Ipomoea batatas and Agaricus blazei reduced superoxide production from leukocytes and vascular homogenates, serum 8-oxo-2'-deoxyguanosine, and vascular nitrotyrosine formation of diabetic rats to comparable levels of normal control animals. Stress-and inflammation-related p38 mitogen-activated protein kinase activity and tumor necrosis factor-alpha production of diabetic rats were significantly depressed by Ipomoea batatas administration. Histological examination also exhibited improvement of pancreatic beta-cells mass after treatments with Ipomoea batatas or Agaricus blazei. These results suggest that hypoglycemic effects of Ipomoea batatas or Agaricus blazei result from their suppression of oxidative stress and proinflammatory cytokine production followed by improvement of pancreatic beta-cells mass.

Source: JOURNAL OF FUNCTIONAL FOODS | 55: 333-342 APR 2019

Title: Yacon (*Smallanthus sonchifolius*)-based product increases fecal short-chain fatty acids and enhances regulatory T cells by downregulating ROR gamma t in the colon of BALB/c mice

Author(s): Marcon, LD | Moraes, LFD | Cruz, BCD | Teixeira, MDD | Bruno, TCV | Ribeiro, IE | Messias, AC | Ferreira, CLDF | de Oliveira, LL | Peluzio, MDG

Date: APR 2019

Author Keywords: Yacon | Fructooligosaccharides | Prebiotic | Treg cell | Short-chain fatty acids | ROR gamma t

Keywords Plus: TRANSCRIPTION FACTOR GATA-3 | SMALLANTHUS-SONCHIFOLIUS | FRUCTO-OLIGOSACCHARIDES | RATS | EXPRESSION | FLOUR | BIOAVAILABILITY | MODULATION | PARAMETERS | MICROBIOTA

Publication Year: 2019

Volume: 55

Abstract:

Although yacon (*Smallanthus sonchifolius*) is a known source of prebiotics (fructooligosaccharides (FOS) and inulin) and phenolic compounds beneficial to gut microbiota and intestinal immune response modulation, its regulatory mechanisms still remain unclear. Therefore, we investigated whether the consumption of a yacon-based product (PBY) modulates the population of intestinal lymphocytes as well as transcription factors that drive host adaptive immune responses. For this purpose, BALB/c male mice were fed either a standard AIN-93M diet or AIN-93M diet supplemented with PBY (6.0% FOS + Inulin) for 8 weeks. We found that PBY consumption in mice reduced food intake, improved fecal humidity and viscosity, intensified fecal short-chain fatty acid production, increased the number of regulatory T cells, and downregulated the expression of ROR gamma t transcription factor in the colon. Thus, it can be inferred from the findings that PBY consumption improves satiety and mucosal integrity, and possibly favors anti-inflammatory immune responses in the colon.

Source: FOOD CHEMISTRY | 223: 76-81 MAY 15 2017

Title: Characterization of a water soluble, hyperbranched arabinogalactan from yacon (*Smallanthus sonchifolius*) roots

Author(s): Castro, A | Vilaplana, F | Nilsson, L

Date: MAY 15 2017

Author Keywords: AF4 | Asymmetric flow field-flow fractionation | Arabinogalactan | Yacon | *Smallanthus sonchifolius*

Keywords Plus: FIELD-FLOW FRACTIONATION | LIGHT-SCATTERING | ALDITOL ACETATES | FRUCTOOLIGOSACCHARIDES | PROTEINS | INULIN | CARBOHYDRATE | SEPARATION | POEPP. | ENDL

Publication Year: 2017

Volume: 223

Abstract:

Yacon (*Smallanthus sonchifolius* Poepp. & Endl.) roots are largely grown in Andean countries and have attracted recent interest due to their antioxidant and prebiotic effects. Yacon is typically consumed as a fruit due to its sweet taste and juiciness. The macromolecular properties of an aqueous extract of yacon are investigated using asymmetric flow field-flow fractionation (AF4) coupled to UV, multiangle light scattering (MALS) and differential refractive index (dRI) detection. The method allows for determination of molar mass and size over the size distribution. Three major populations were found of which one strongly dominates in concentration. Through collection of fractions from AF4, carbohydrate composition and glycosidic linkage analysis for the dominating population was performed. The results show that the dominating population consists of a highly branched arabinogalactan (type 2) with a molar mass of approximately 1-2.10(5) g/mol, a hydrodynamic radius of approximately 6-10 nm and a relatively high apparent density (approx. 70-150 kg/m(3)).

Source: INTERNATIONAL JOURNAL OF PHARMACOLOGY | 13 (4): 361-369 2017

Title: Nutritional and Healthical Aspects of Yacon (*Smallanthus sonchifolius*) for Human, Animals and Poultry

Author(s): Saeed, M | Xu, YT | Rehman, ZU | Arain, MA | Soomro, RN | Abd El-Hack, ME | Bhutto, ZA | Abbasi, B | Dhama, K | Sarwar, M | Chao, S

Date: 2017

Author Keywords: Yacon | prebiotic | fructooligosaccharides | inulin | nutritional aspects | poultry

Keywords Plus: (SMALLANTHUS-SONCHIFOLIUS)-DERIVED FRUCTOOLIGOSACCHARIDES | SUPPLEMENTATION | PERFORMANCE | PARAMETERS | EXTRACTS | IMPROVES | GLUCOSE | TRANSIT | MIXTURE | POEPP.

Publication Year: 2017

Volume: 13

Abstract:

Non-digestible oligosaccharides as well as phenolic compounds in ulins and fructooligosaccharides of *Smallanthus sonchifolius* make it an attractive functional food. Consumption of these non-digestible oligosaccharides improves gastrointestinal metabolism, increases the growth of bifido bacteria in the colon and also acts as antioxidant, antimicrobial, prebiotic, growth promoter, hypoglycemic, hepatoprotective compounds via lowering alanine aminotransferase (ALT) and increasing mineral absorption to maintain bone homeostasis and also help to reduce cholesterol and triglyceride levels. Past to present literature have been reviewed and the results indicated that *Smallanthus sonchifolius* root consumption modulates the immune system by regulating the intestinal secretion of IgA and interferon IFN-gamma subsequently enhancing resistance to infections and allergic reactions. This role not only facilitates the exclusion of potential pathogenic bacteria but also ultimately increases defense of the host. Previously published literature has focused on rat, human, pig and livestock but biological and clinical evidence is scarce on the same aspect in poultry. Therefore, this review article aimed to highlight the origin, chemical

composition, different beneficial uses and biohazards of yacon plant (which contains 70-80% fructooligosaccharides (FOS)) that could be used as a novel natural prebiotic in poultry feed. The FOS could improve different health aspects and productive performance criteria of different poultry species. To recommend yacon plant as a natural and safe medicinal agent, more indices need to be determined in further studies on different livestock and poultry species on molecular level to assure its benefits and to give accurate recommendation for the optimal levels to be added as feed additive.

Source: INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING | 13 (3): 123-128 MAY 2020

Title: Calibration and validation of FAO-AquaCrop model to estimate the total biomass and yacon root yield

Author(s): de Sales, RA | Xavier, AC | de Oliveira, EC | de Oliveira, FL | da Silva, DMN | Berilli, SD

Date: MAY 2020

Author Keywords: Smallanthus sonchifolius | root yield simulation | modelling | agrometeorology

Keywords Plus: CROP MODEL | SMALLANTHUS-SONCHIFOLIUS | WATER | IRRIGATION | PARAMETERIZATION | DEFICIT | GROWTH | FULL

Publication Year: 2020

Volume: 13

Abstract:

Due to the current water scarcity in the world, it is extremely important to improve the use of this natural and exhaustible resource in agriculture, by contributing to increase agricultural production and sustainability. Several models of crop growth simulation were developed to predict the edaphoclimatic effects on crop yield. These models are calibrated and validated for a given region using the data generated from field experiments. Therefore, the objective of this study was to calibrate and validate the FAO AquaCrop model for yacon (*Smallanthus sonchifolius*) crop in a tropical climate. The experiment was conducted in an experimental area located in the municipality of Ibatiba, state of Espírito Santo (Brazil) during the years of 2013 and 2014. The calibration was done using the Autumn planting and validation with the Winter and Spring plantings. For the statistical analysis, the coefficient of determination, Willmott concordance index, bias for the systematic error, root mean square error and the mean absolute error to test the model performance were used. In general, the FAO AquaCrop model predicted the root yield, total biomass and harvest index with acceptable accuracy, and with deviations of less than 6% for total and root biomass. Late planting of yacon showed a reduction in yield as well as total biomass.

Source: CIENCIA E AGROTECNOLOGIA | 40 (5): 596-605 SEP-OCT 2016

Title: Total antioxidant activity of yacon tubers cultivated in Brazil

Author(s): Pereira, JAR | Teixeira, MC | Saczk, AA | Barcelos, MDP | de Oliveira, MF | de Abreu, WC

Date: SEP-OCT 2016

Author Keywords: Smallanthus sonchifolius | total phenolics | tannins | phenolic acids

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | PHENOLIC-ACIDS | LEAVES | ROOTS | CAPACITY | POEPP.

Publication Year: 2016

Volume: 40

Abstract:

Yacon (*Smallanthus sonchifolius*) is a tuberous root from the Andean region in the South America rich em water, fructooligosaccharides and phenolic compounds, some of which are natural antioxidants and may help prevent the deleterious action of free radicals in the body. The yacon has attracted much attention due to their potential health benefits to humans. In this study the levels of total phenolics, tannins, phenolic acids, and total antioxidant activity were measured in the peel and pulp of yacon tubers both in the fresh and flour forms. The flours of yacon presented higher concentrations of total phenolics and tannins, especially peel flour. The yacon pulp flour stood out as the main source of phenolic acids, mainly caffeic and chlorogenic acid. The total antioxidant activity assessed by DPPH (2,2-Diphenyl-1-picrylhydrazyl) and ABTS (2,2'-Azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) assays was higher in the yacon peel flour. The total antioxidant activity was correlated with the total phenolic content and tannins by the DPPH and ABTS assays. These results suggest that yacon can be used as an alternative food source of phenolic compounds that help prevent degenerative processes caused by oxidative stress, especially in the flours form.

Source: INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER | 67: 1163-1169 DEC 2013

Title: Determination of thermophysical properties of yacon (*Smallanthus sonchifolius*) to be used in a finite element simulation

Author(s): Perussello, CA | Mariani, VC | Masson, ML | de Castilhos, F

Date: DEC 2013

Author Keywords: Drying | Thermophysical properties | Numerical modeling | Yacon

Keywords Plus: OSMOTIC DEHYDRATION | OPTIMIZATION | BEHAVIOR

Publication Year: 2013

Volume: 67

Abstract:

Thermophysical properties of yacon (*Smallanthus sonchifolius*) - specific mass, specific heat and thermal conductivity were obtained experimentally at 30 min intervals in order to model and simulate the mass and heat transfer phenomena involved in a drying process. Thermal diffusivity was calculated using the former properties. Empirical models obtained by nonlinear regression were successfully fitted to the thermophysical properties rates. Using the data of thermophysical properties in function of moisture content, the theoretical drying model was simulated and validated by the experimental results of yacon's moisture content and temperature, providing determination coefficients higher than 0.97.

Source: LWT-FOOD SCIENCE AND TECHNOLOGY | 75: 220-226 JAN 2017

Title: Evaluation of dried yacon (*Smallanthus sonchifolius*) as an efficient probiotic carrier of *Lactobacillus casei* LC-01

Author(s): Leone, RD | de Andrade, EF | Ellendersen, LN | da Cunha, AT | Martins, AMC | Granato, D | Masson, ML

Date: JAN 2017

Author Keywords: Dried yacon | *Lactobacillus casei* | Probiotics | *Smallanthus sonchifolius*

Keywords Plus: SIMULATED GASTROINTESTINAL CONDITIONS | SURVIVAL | MICROENCAPSULATION | YOGURT | MICROCAPSULES | RESISTANCE | PREBIOTICS | MICROBIOTA | PLANTARUM | VIABILITY

Publication Year: 2017

Volume: 75

Abstract:

Recent studies have associated the consumption of yacon root (*Smallanthus sonchifolius*) with reduced glycemic index. Yacon is rich in fructans and the consumption of its root promotes a prebiotic effect, which can be amplified in the presence of probiotic bacteria. This research studied the viability of *Lactobacillus casei* (LC-01) in dried yacon that was stored at room temperature. Dried yacon and LC-01 biomass remained in contact for 1 h in temperature 25 degrees C or 37 degrees C in the presence or absence of trehalose. The conditions of treatment A (25 degrees C/without trehalose) proved to be most favorable for the survival of the probiotics, presenting 5.65 log CFU.g(-1) after 56 days of storage. The storage time reduced ($p < 0.05$) the initial amount of probiotics in the sample from 9.35 log CFU.g(1) to 7.24 log CFU.g(-1) on day 1 and day 56 of storage, respectively. In the case of the sample of treatment A, 84.87% of LC-01 cells survived the simulated stomach conditions and 89.36% survived the simulated intestinal conditions after 56 days.

Source: TOXICOLOGY MECHANISMS AND METHODS | 23 (7): 509-518 SEP 2013

Title: A mixture of extracts from Peruvian plants (black maca and yacon) improves sperm count and reduced glycemia in mice with streptozotocin-induced diabetes

Author(s): Gonzales, GF | Gonzales-Castaneda, C | Gasco, M

Date: SEP 2013

Author Keywords: Antioxidants | black maca | diabetes | *Lepidium meyenii* | polyphenols | *Smallanthus sonchifolius* | sperm count | yacon

Keywords Plus: LEPIDIUM-MEYENII MACA | SONCHIFOLIUS LEAF EXTRACTS | BETA-CELL DAMAGE | ADULT MALE RATS | SMALLANTHUS-SONCHIFOLIUS | ANTIOXIDANT ACTIVITY | SEXUAL DYSFUNCTION | OXIDATIVE STRESS | LIVER-INJURY | FLAVONOID ANTIOXIDANT

Publication Year: 2013

Volume: 23

Abstract:

We investigated the effect of two extracts from Peruvian plants given alone or in a mixture on sperm count and glycemia in streptozotocin-diabetic mice. Normal or diabetic mice were divided in groups receiving vehicle, black maca (*Lepidium meyenii*), yacon (*Smallanthus sonchifolius*) or three mixtures of extracts black maca/yacon (90/10, 50/50 and 10/90%). Normal or diabetic mice were treated for 7 d with each extract, mixture or vehicle. Glycemia, daily sperm production (DSP), epididymal and vas deferens sperm counts in mice and polyphenol content, and antioxidant activity in each extract were assessed. Black maca (BM), yacon and the mixture of extracts reduced glucose levels in diabetic mice. Non-diabetic mice treated with BM and yacon showed higher DSP than those treated with vehicle ($p < 0.05$). Diabetic mice treated with BM, yacon and the mixture maca/yacon increased DSP, and sperm count in vas deferens and epididymis with respect to non-diabetic and diabetic mice treated with vehicle ($p < 0.05$). Yacon has 3.05 times higher polyphenol content than in maca, and this was associated with higher antioxidant activity. The combination of two extracts improved glycemic levels and male reproductive function in diabetic mice. Streptozotocin increased 1.43 times the liver weight that was reversed with the assessed plants extracts. In summary, streptozotocin-induced diabetes resulted in reduction in sperm counts and liver damage. These effects could be reduced with BM, yacon and the BM+yacon mixture.

Source: PLANT FOODS FOR HUMAN NUTRITION | 68 (3): 222-228 SEP 2013

Title: Yacon (*Smallanthus sonchifolius*): A Functional Food

Author(s): Delgado, GTC | Tamashiro, WMDC | Marostica, MR | Pastore, GM

Date: SEP 2013

Author Keywords: Fructans | Fructooligosaccharides | Phenolic compounds | Prebiotics | Yacon

Keywords Plus: LEAVES | ROOTS | INULIN | EXTRACTS | FRUCTOOLIGOSACCHARIDES | PARAMETERS | TOXICITY | CALCIUM | ACID

Publication Year: 2013

Volume: 68

Abstract:

Yacon (*Smallanthus sonchifolius*) is an Andean tuberous root that is regarded as a functional food given that it contains fructooligosaccharides (FOS), inulin and phenolic compounds. The consumption of FOS and inulin improves the growth of bifidobacteria in the colon, enhances mineral absorption and gastrointestinal metabolism and plays a role in the regulation of serum cholesterol. Furthermore, the literature reports that the consumption of these prebiotics promotes a positive modulation of the immune system, improving resistance to infections and allergic reactions. Certain studies have demonstrated the potential of yacon as an alternative food source for those patients with conditions that require dietary changes. This review intends to describe the potential of yacon as a prebiotic and its cultivation and industrial processing for human consumption.

Source: PLANT FOODS FOR HUMAN NUTRITION | 72 (2): 156-160 JUN 2017

Title: Enhydrin Regulates Postprandial Hyperglycemia in Diabetic Rats by Inhibition of alpha-Glucosidase Activity

Author(s): Serra-Barcellona, C | Habib, NC | Honore, SM | Sanchez, SS | Genta, SB

Date: JUN 2017

Author Keywords: Smallanthus sonchifolius | Enhydrin | Antihyperglycemic effect | alpha-glucosidase inhibition

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | CHLOROGENIC ACIDS | YACON LEAVES

Publication Year: 2017

Volume: 72

Abstract:

During the last few years, numerous attempts were made to identify effective alpha-glucosidase inhibitors from natural sources in order to develop new alternatives for diabetes management. Smallanthus sonchifolius (yacon) leaves were found to be effective in controlling postprandial hyperglycemia. Enhydrin, a constituent of yacon leaves, was noted for its significant hypoglycemic properties in diabetic rats. These properties were also demonstrated for yacon leaves decoction, which is rich in phenolic compounds such as chlorogenic acid and its derivatives. The purpose of the present study was to evaluate the potential of yacon leaves decoction and the isolated compound enhydrin to inhibit alpha-glucosidase enzyme, a possible mechanism of the above antihyperglycemic effect. In vitro assays showed that both 10% decoction and enhydrin significantly inhibited the activity of the yeast alpha-glucosidase enzyme in a dose-dependent manner, IC₅₀ values being 50.40 and 134.17 µg/ml, respectively. In vivo experiments showed a rapid decrease in the hyperglycemic peak after sucrose load (2 g/kg body weight) in normal rats treated with the 10% decoction (140 mg/kg) and enhydrin (0.8 mg/kg). Both treatments caused a significant decrease in blood glucose levels in diabetic rats after sucrose load compared to diabetic control. These results suggest that both products assayed could be effective in the management of postprandial hyperglycemia through inhibition of alpha-glucosidase in the small intestine.

Source: FOOD CHEMISTRY | 135 (3): 1592-1599 DEC 1 2012

Title: Prebiotic effects of yacon (Smallanthus sonchifolius Poepp. & Endl), a source of fructooligosaccharides and phenolic compounds with antioxidant activity

Author(s): Campos, D | Betalleluz-Pallardel, I | Chirinos, R | Aguilar-Galvez, A | Noratto, G | Pedreschi, R

Date: DEC 1 2012

Author Keywords: Yacon | Smallanthus sonchifolius | Accessions | Phenolic compounds | Antioxidant activity | Fructooligosaccharides

Keywords Plus: CHAIN FATTY-ACIDS | TROPAEOLUM-TUBEROSUM RUIZ | POLYMNIA-SONCHIFOLIA | RATS | ROOTS | OLIGOSACCHARIDES | IDENTIFICATION | FERMENTATION | PROFILES | STORAGE

Publication Year: 2012

Volume: 135

Abstract:

Thirty-five different yacon (*Smallanthus sonchifolius* Poepp. & Endl) accessions were evaluated as potential alternative sources of fructooligosaccharides (FOS) and phenolic type natural antioxidants. FOS, total phenolics (TPC) and antioxidant capacity (AC) contents in the ranges of 6.4-65 g/100 g of dry matter (DM), 7.9-30.8 mg chlorogenic acid (CAE)/g of DM and 23-136 μ mol trolox equivalente (TE)/g DM were found. Accession AJC 5189 sparked attention for its high FOS content while DPA 07011 for its high TPC and AC. In addition, the prebiotic effect of yacon FOS was tested in vivo with a guinea pig model. A diet rich in yacon FOS promoted the growth of bifidobacteria and lactobacilli, resulting in high levels of short chain fatty acids (SCFAs) in the cecal material and enhancement of cell density and crypt formation in caecum tissue, being indicative of colon health benefits. This study allowed identification of yacon cultivars rich in FOS, AC and/or FOS and AC for nutraceutical applications.

Source: JOURNAL OF PLANT RESEARCH | 130 (2): 327-337 MAR 2017

Title: Flower structure and developmental stages of the capitulum of *Smallanthus sonchifolius* (Asteraceae): reproductive implications

Author(s): Ibanez, MS | Mercado, MI | Araoz, MVC | Zannier, ML | Grau, A | Ponessa, GI

Date: MAR 2017

Author Keywords: Anatomy | Capitulum | Morphology | Reproductive organs | *Smallanthus sonchifolius* | Yacon

Keywords Plus: H. ROBINSON | YACON | POEPP. | VARIABILITY | ACCESSIONS | MORPHOLOGY | EVOLUTION | LEAVES | LEAF

Publication Year: 2017

Volume: 130

Abstract:

Yacon (*Smallanthus sonchifolius*, Asteraceae) is an ancient andean crop that has numerous dietary and medicinal properties. Morphological and anatomical features and developmental changes of the capitulum were studied. A ray floret is a pistillate, female flower, while a disc floret is a staminate male flower, and the former opens before the latter, being pseudanthium protogynous. The capitulum presents interesting attributes for pollinators such as flower structure, nectaries and pollenkit. Gynoecial nectaries were found on undeveloped ovary in the disc floret, but not in the ray floret. Glandular trichomes were observed on the abaxial epidermis of corolla in the ray floret, but not in the disc floret. Capitulum development was divided into eight stages. Stigma receptivity varied with these stages. Pollen viability was low (15%). In accordance with low viability, pollen grains exhibit diverse sizes and shapes, reduction in length of spines, and abnormal protoplasm. Examination of ovary development in the ray floret showed that a mature ovule was formed, but fertilization did not occur. In advanced developmental stages, the capitulum showed proliferation of the endothelium, degeneration of the embryo sac, and all harvested

cypsels had aborted seeds. Problems found in pollen viability and aborted cypsels could be the result of a history of vegetative propagation in the domestication process.

Source: NATURAL PRODUCT RESEARCH | 29 (17): 1673-1677 SEP 2 2015

Title: Antioxidant activities and quali-quantitative analysis of different *Smallanthus sonchifolius* [(Poepp. and Endl.) H. Robinson] landrace extracts

Author(s): Russo, D | Malafronte, N | Frescura, D | Imbrenda, G | Faraone, I | Milella, L | Fernandez, E | De Tommasi, N

Date: SEP 2 2015

Author Keywords: yacon | plant extract | phenolic acid | flavonoid glycoside

Keywords Plus:

Publication Year: 2015

Volume: 29

Abstract:

Five landraces of *Smallanthus sonchifolius* [(Poepp. and Endl.) H. Robinson], known as yacon, were investigated in total phenolic content, antioxidant activity and chemical composition of ethanol extracts (EEs) and decoction extracts (DEs). The results demonstrated that DEs are rich in phenolic acids as caffeic acid, while the EEs show an higher amount of flavonoids, as luteolin 3,7-O-diglucoside and luteolin 7-O-glucoside. These flavonoid glycosides were identified for the first time in yacon extracts, together with apigenin and luteolin. The phytochemical profile explains the different antioxidant activities shown in our study. The landraces PER6-DE and PER4-DE showed the highest radical-scavenging activity and reducing power related to their polyphenolic contents. Results also show that yacon can be considered an important source of bioactive compounds with significant differences among the analysed landraces.

Source: JOURNAL OF FOOD AND DRUG ANALYSIS | 25 (3): 619-627 JUL 2017

Title: Induction of G(2)/M arrest and apoptosis through mitochondria pathway by a dimer sesquiterpene lactone from *Smallanthus sonchifolius* in HeLa cells

Author(s): Kitai, Y | Zhang, X | Hayashida, Y | Kakehi, Y | Tamura, H

Date: JUL 2017

Author Keywords: apoptosis | dimer sesquiterpene lactone | G(2)/M arrest | HeLa cells | *Smallanthus sonchifolius*

Keywords Plus: CASPASE-DEPENDENT APOPTOSIS | CANCER | CYTOTOXICITY | PARTHENOLIDE | MECHANISMS | SKELETON | DRUG

Publication Year: 2017

Volume: 25

Abstract:

Dimer sesquiterpene lactones (SLs), uvedafolin and enhydrofolin, against four monomer SLs isolated from yacon, *Smallanthus sonchifolius*, leaf were the most cytotoxic substances on HeLa cells (IC₅₀

values 2.96-3.17 μM at 24 hours). However, the cytotoxic mechanism of dimer SL has not been elucidated yet. Therefore, in this study, we clarified the in vitro cytotoxic mechanism of uvedafolin on the HeLa cells, and evaluated the cytotoxicity against NIH/3T3 cells which were used as normal cells. In consequence, the dimer SLs had low toxicity for the NIH/3T3 cells (IC_{50} 4.81-4.98 μM at 24 hours) and then the uvedafolin mediated cell cycle arrest at the G(2)/M phase and induced apoptosis on the HeLa cells evidenced by appearance of a subG1 peak. Uvedafolin induced apoptosis was attributed to caspase-9 and caspase-3/7 activities. An effectively induced apoptosis pathway was demonstrated from mitochondria membrane potential change and cytochrome c release to cytosol. These results reveal that uvedafolin induced apoptosis via the mitochondria pathway. The present results indicate the potential of uvedafolin as a leading compound of new anticancer agents.

Source: PHYTOTAXA | 214 (1): 1-84 JUN 19 2015

Title: A revision of *Smallanthus* (Asteraceae, Millerieae), the "yacon" genus

Author(s): Vitali, MS | Sancho, G | Katinas, L

Date: JUN 19 2015

Author Keywords:

Keywords Plus: HELIANTHEAE | COMPOSITAE | SONCHIFOLIUS | LEAVES

Publication Year: 2015

Volume: 214

Abstract:

Smallanthus (Asteraceae, Millerieae), the "yacon" genus, comprises 23 species ranging from southeastern United States to central Argentina, with the greatest diversity in Peru and Mexico. Species of *Smallanthus* are herbs, shrubs or small trees with tuberous roots, opposite, trinerved or triplinerved leaves, paleate receptacle, ray corollas externally hairy at the base, pappus lacking, and marginal cypselae partially embraced by the inner phyllaries of the involucre. As a result of this revision: *Smallanthus araucariophilus* and *S. riograndensis* are considered synonyms of *S. macroscyphus*; lectotypes are designated for nine names; and the geographical distribution of *S. latisquamus*, *S. lundelli*, *S. riparius*, and *S. siegesbeckia* is extended. A comprehensive key to the species and detailed descriptions, geographical distribution, phenology, illustrations and distribution maps are provided for all taxa.

Source: INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES | 16 (8): 17696-17718 AUG 2015

Title: Evaluation of Antioxidant, Antidiabetic and Anticholinesterase Activities of *Smallanthus sonchifolius* Landraces and Correlation with Their Phytochemical Profiles

Author(s): Russo, D | Valenta, P | Andrade, PB | Fernandez, EC | Milella, L

Date: AUG 2015

Author Keywords: *Smallanthus sonchifolius* | phytochemical profile | antioxidant activity | anticholinesterase activity | anti-diabetic activity

Keywords Plus: PHENOLIC-COMPOUNDS | QUANTITATIVE-DETERMINATION | LIPID-PEROXIDATION | NITRIC-OXIDE | H. ROBINSON | IN-VITRO | EXTRACTS | LEAVES | CONSTITUENTS | MECHANISM

values 2.96-3.17 μM at 24 hours). However, the cytotoxic mechanism of dimer SL has not been elucidated yet. Therefore, in this study, we clarified the in vitro cytotoxic mechanism of uvedafolin on the HeLa cells, and evaluated the cytotoxicity against NIH/3T3 cells which were used as normal cells. In consequence, the dimer SLs had low toxicity for the NIH/3T3 cells (IC_{50} 4.81-4.98 μM at 24 hours) and then the uvedafolin mediated cell cycle arrest at the G(2)/M phase and induced apoptosis on the HeLa cells evidenced by appearance of a subG1 peak. Uvedafolin induced apoptosis was attributed to caspase-9 and caspase-3/7 activities. An effectively induced apoptosis pathway was demonstrated from mitochondria membrane potential change and cytochrome c release to cytosol. These results reveal that uvedafolin induced apoptosis via the mitochondria pathway. The present results indicate the potential of uvedafolin as a leading compound of new anticancer agents.

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Date: AUG 2015

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Keywords Plus: PHENOLIC-COMPOUNDS | QUANTITATIVE-DETERMINATION | LIPID-

PEROXIDATION | NITRIC-OXIDE | H. ROBINSON | IN-VITRO | EXTRACTS | LEAVES | CONSTITUENTS | MECHANISM

Publication Year: 2015

Volume: 16

Abstract:

The present study aimed to investigate the phytochemical profile of leaf methanol extracts of fourteen *Smallanthus sonchifolius* (yacon) landraces and their antioxidant, anticholinesterase and antidiabetic activities that could lead to the finding of more effective agents for the treatment and management of Alzheimer's disease and diabetes. For this purpose, antioxidant activity was assessed using different tests: ferric reducing ability power (FRAP), 2,2-diphenyl-1-picryl hydrazyl (DPPH), nitric oxide (NO) and superoxide (O₂⁻) scavenging and lipid peroxidation inhibition assays. Anticholinesterase activity was investigated by quantifying the acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) inhibitory activities, whereas antidiabetic activity was investigated by -amylase and -glucosidase inhibition tests. To understand the contribution of metabolites, phytochemical screening was also performed by high performance liquid chromatography-diode array detector (HPLC-DAD) system. Among all, methanol extract of PER09, PER04 and ECU44 landraces exhibited the highest relative antioxidant capacity index (RACI). ECU44 was found to be rich in 4,5-di-O-caffeoylquinic acid (CQA) and 3,5-di-O-CQA and displayed a good -amylase and -glucosidase inhibition, showing the lowest IC₅₀ values. Flavonoids, instead, seem to be involved in the AChE and BChE inhibition. The results of this study revealed that the bioactive compound content differences could be determinant for the medicinal properties of this plant especially for antioxidant and antidiabetic activities.

Source: JOURNAL OF ETHNOPHARMACOLOGY | 257: - JUL 15 2020

Title: Toxicogenetic evaluation of *Smallanthus sonchifolius* (yacon) as a herbal medicine

Author(s): Szokalo, RAM | Redko, F | Ulloa, J | Flor, S | Tulino, MS | Muschietti, L | Carballo, MA

Date: JUL 15 2020

Author Keywords: *Smallanthus sonchifolius* | Yacon | Aqueous extract | Enhydrofolin | Genotoxicity

Keywords Plus: SESQUITERPENE LACTONES | AQUEOUS EXTRACT | PLANTS

Publication Year: 2020

Volume: 257

Abstract:

Ethnopharmacological relevance: *Smallanthus sonchifolius* (Poepp. & Endl.) H. Robinson, commonly known as yacon, is a medicinal plant belonging to the Asteraceae family used in traditional folk medicine. Its roots and leaves have been used by people suffering from diabetes or from various digestive or renal disorders. Aim of the study: This study aimed at evaluating the in vitro potential genotoxic effects of the aqueous extract of yacon in order to determine its safety and at characterizing its phytochemical composition. Materials and methods: The aqueous extract of *S. sonchifolius* was prepared in a similar way to that commonly used in popular medicine as tea bags. Thin layer chromatography (TLC) and high-

performance liquid chromatography (HPLC-MS/MS) were used to identify the main compounds. The MTT test was performed to determine the range of doses and the Cytochalasine B-blocked micronucleus (Cytome assay) was used to assess geneotoxicity. Results: The chemical analysis of the aqueous extract revealed the presence of the sesquiterpene lactones (STLs) enhydrin and the dimer enhydrofolin, as the main compounds together with phenolic compounds. Increasing concentrations of the extract induced a cytotoxic effect on CHO-K1 and HepG2 cells. A statistically significant increase in the frequency of MNi, NBUDs and NPBs was observed in CHO-K1 cells, while in HepG2 cells a statistically significant frequency increase was observed with three of the four tested doses for MNi and only with the highest dose for NPBs and NBUs (genotoxic effect). Conclusion: Results demonstrated the inability of the metabolic system to counteract the genetic instability, allowing the safe consumption of the leaves as a 2% tea infusion in quantities of up to 250 mL/day.

Source: CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION | 55 (1): 32-40 2015

Title: Yacon (Smallanthus Sonchifolius): A Food with Multiple Functions

Author(s): Paula, HAD | Abranches, MV | Ferreira, CLDF

Date: 2015

Author Keywords: Functional food | prebiotic | insulin-type fructans | antioxidant | antimicrobial

Keywords Plus: INULIN-TYPE FRUCTANS | BIOMECHANICAL PROPERTIES | IMMUNE FUNCTION | LEAF EXTRACTS | BONE MASS | PREBIOTICS | FRUCTOOLIGOSACCHARIDES | PROBIOTICS | RATS | POEPP.

Publication Year: 2015

Volume: 55

Abstract:

Functional foods are the focus of many studies worldwide. This is justified by the effects they have on public health and thus interest in elucidation of the mechanisms involved in their actions. The present review aims to broaden the discussions of the functional properties attributed to yacon (*Smallanthus sonchifolius*), considered a food with multiple functions since it possesses bioactive compounds (antimicrobial, antioxidant, and probiotic substances) that exert beneficial effects on the body. Although some studies have already demonstrated several of these functions, clinical evidence is scarce, making it necessary that more studies are conducted in this area. Still, since the availability of this food in the market is relatively new, its popularity depends on publications aimed at consumer education and development of new products by the food industry.

Source: CIENCIA RURAL | 45 (5): 912-919 MAY 2015

Title: Yacon: health benefits and technological applications

Author(s): Gusso, AP | Mattanna, P | Richards, N

Date: MAY 2015

Author Keywords: functional food | *Smallanthus sonchifolius* | health and food technology

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | IN-VITRO | ROOTS | FRUCTOOLIGOSACCHARIDES | PARAMETERS | PROBIOTICS | PREBIOTICS | PROFILE

Publication Year: 2015

Volume: 45

Abstract:

In the early nineties was introduced in Brazil the yacon potato planting. This tuberous roots have been attracting interest from researchers due to their nutritional and technological properties. Yacon is its mainly characterized by being rich in fructans and phenolic acids, with prebiotic and antioxidant effects, respectively. Many studies in vivo and in vitro were carried out with yacon and products produced from it, showing its health benefits, besides having great technological potential for developing new food products. This review aimed to outline some of these studies, in both health and food technology. The prebiotic potential, glycemic index reduction and improvement of bone health are the effects that stand out in the in vivo researches. It can be noted a trend for bakery products formulations using yacon flour, and the outcomes were positive for both technological properties as well as for sensory evaluations.

Source: MOLECULES | 22 (12): - DEC 2017

Title: Impact of Ohmic-Assisted Decoction on Bioactive Components Extracted from Yacon (*Smallanthus sonchifolius* Poepp.) Leaves: Comparison with Conventional Decoction

Author(s): Khajehei, F | Niakousari, M | Damyeh, MS | Merkt, N | Claupein, W | Graeff-Hoenninger, S

Date: DEC 2017

Author Keywords: antioxidant activity | decoction | flavonoids | ohmic-assisted decoction | phenolic acids | *Smallanthus sonchifolius* Poepp | yacon leaves

Keywords Plus: ANTIOXIDANT ACTIVITY | PHENOLIC-COMPOUNDS | ESSENTIAL OIL | FLAVONOIDS | FOOD | HYDRODISTILLATION | CONSTITUENTS | POLYPHENOLS | PROFILES | PRODUCTS

Publication Year: 2017

Volume: 22

Abstract:

Yacon (*Smallanthus sonchifolius* Poepp.) leaves are a potentially rich source of bioactive compounds, such as phenolic acids and flavonoids. In this study, the effect of the extraction method (ohmic-assisted decoction (OH-DE) and decoction (DE)), yacon cultivar (red and white), and leaf age (young and old) on the quality/quantity of extracted phytochemicals were investigated. Extraction yield, energy consumption, total phenolic content (TPC), total flavonoid content (TFC), ABTS and DPPH radical scavenging activity, and ferric reducing antioxidant power (FRAP) were determined. Additionally, HPLC-DAD was used to identify the major individual phenolic and flavonoid compounds of yacon leaves. The results showed that a three-way interaction of process-variables (extraction methodx yacon cultivarx age of leaves) influenced the extraction yield, TPC, TFC, ABTS, and DPPH radical scavenging activity, and FRAP, significantly ($p < 0.05$). However, energy consumption of the extraction process was only affected by

method of extraction ($p < 0.05$) and was halved when OH-DE was applied as compared to DE alone. Additionally, the phytochemical quality of extracts was either improved or comparable when OH-DE was used for extraction. Also, it was shown that yacon leaves contained considerable amounts of caffeic acid, chlorogenic acid, ferrulic acid, myricetin, p-coumaric acid, and rutin, while leaves of the red cultivar had higher contents of each compound compared to leaves of the white cultivar.

Source: AGRICULTURE-BASEL | 8 (12): - DEC 2018

Title: Total Phenolic Content and Antioxidant Activity of Yacon (*Smallanthus Sonchifolius* Poepp. and Endl.) Chips: Effect of Cultivar, Pre-Treatment and Drying

Author(s): Khajehei, F | Hartung, J | Graeff-Honninger, S

Date: DEC 2018

Author Keywords: functional foods | yacon | *Smallanthus sonchifolius* Poepp, and Endl | convective hot air drying | freeze drying | total phenolic content | ABTS radical scavenging activity | DPPH radical scavenging activity | ferric-reducing antioxidant power

Keywords Plus: HOT AIR | CHEMICAL-COMPOSITION | POLYPHENOL OXIDASE | ORGANIC-ACIDS | CAPACITY | FRUITS | ROOTS | FOOD | L. | DEHYDRATION

Publication Year: 2018

Volume: 8

Abstract:

Recent studies have associated the consumption of yacon root as a functional plant food with reduced glycemic index and, due to its considerable phenolic acid levels, a protection of cell membranes against free radical damage. This study examined the effect of four different treatments including: (1) storage duration after harvest (one and three weeks after harvest); (2) pre-treatment before drying (untreated, pre-treatment with diluted lime juice); (3) drying method (freeze drying (FD) and convective hot air drying (CHAD)); and (4) cultivar (white and red), on the quality of yacon (*Smallanthus sonchifolius* Poepp. and Endl.) chips in terms of their total phenolic content (TPC) and antioxidant activity (AA) (ABTS (2,2-Azino-Bis (3-Ethylbenzothiazoline-6-Sulfonic Acid) Diammonium Salt) radical scavenging activity, DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging activity and ferric reducing antioxidant power (FRAP)). Overall, the chips that were produced using pre-treatment with diluted lime juice and FD had the highest amounts of TPC and AA. Regarding the chips produced by means of CHAD, retention of higher TPC and AA was possible with lime-juice pre-treatment and use of higher hot air temperatures. Moreover, chips produced from the white cultivar had higher TPC and AA than chips produced from the red cultivar.

Source: JOURNAL OF FUNCTIONAL FOODS | 37: 666-675 OCT 2017

Title: Yacon flour (*Smallanthus sonchifolius*) attenuates intestinal morbidity in rats with colon cancer

Author(s): Grancieri, M | Costa, NMB | Tostes, MDV | de Oliveira, DS | Nunes, LD | Marcon, LD | Veridiano, TA | Viana, ML

Date: OCT 2017

Author Keywords: Fructooligosaccharides | Prebiotics | Intestinal permeability | SCFA | pH

Keywords Plus: INULIN-TYPE FRUCTANS | COLORECTAL-CANCER | PERMEABILITY | FRUCTOOLIGOSACCHARIDES | OLIGOSACCHARIDES | PREBIOTICS | REDUCTION | HEALTH | CECUM | RISK

Publication Year: 2017

Volume: 37

Abstract:

Yacon flour (YF) (*Smallanthus sonchifolius*) is source of fructooligosaccharides (FOS) which are prebiotic with effects unknown in the colorectal cancer (CRC). This study investigated the intestinal effects of supplementation with 7.5% FOS from YF for 8 weeks on CRC induced by 1.2-dimethylhydrazine (25 mg/kg/body weight) in male Wistar rats. The animals were divided in groups: S (without YF and without induced CRC, n = 10), Y (with YF and without induced CRC, n = 10), C (without YF and with induced CRC, n = 10) and CY (with YF and with induced CRC, n = 10). The animals that received YF had a percentage reduction of aberrant crypts focus in more than 40%, lower intestinal permeability, luminal content more acidic and with higher concentrations of SCFA. In addition, there was an increase in the depth and number of colonic crypts. In conclusion, we observed that YF promoted beneficial effects on the intestinal health of animals with induced CRC.

Source: MOLECULES | 24 (17): - SEP 1 2019

Title: Anticancer Activity of *Smallanthus sonchifolius* Methanol Extract against Human Hepatocellular Carcinoma Cells

Author(s): Myint, PP | Dao, TTP | Kim, YS

Date: SEP 1 2019

Author Keywords: *S. sonchifolius* leaf | HepG2 cells | MTT assay | cell cycle arrest | anti-liver cancer drug | antioxidant

Keywords Plus: LEAVES | INHIBITION

Publication Year: 2019

Volume: 24

Abstract:

This research aimed to investigate the cytotoxicity of methanol extract of *Smallanthus sonchifolius* leaf (YLE) against a human hepatocellular carcinoma cell line (HepG2). This plant is currently used as a traditional herbal remedy in the treatment of liver diseases in some rural parts of Myanmar. Methods: The cytotoxic activity of the plant extract against the cancerous cell line was assessed using an MTT assay. YLE demonstrated a significant effect ($IC_{50} = 58.2 \pm 1.9 \mu g/mL$) on anti-cancer activity, which was further investigated using various assays including an in vitro cell migration assay, a colony formation assay, cell cycle analysis, western blot analysis, and a ROS assay. The significance of the phytochemical constituents of YLE could be identified using LC/Q-TOF-MS techniques. Results: We putatively

identified the active components in YLE, which were possibly melampolide-type sesquiterpenoids. YLE showed an inhibitory effect on HepG2 cell proliferation and cell migration. YLE also induced cell cycle arrest and necrosis in a dose-dependent manner. Additionally, YLE significantly suppressed ROS formation in HepG2 cells. Conclusions: These findings suggest that YLE is sufficient for application as a promising anti-liver drug in herbal medicine.

Source: FOOD CHEMISTRY | 245: 1239-1247 APR 15 2018

Title: Evaluation of nutritional and chemical composition of yacon syrup using H-1 NMR and UPLC-ESI-Q-TOF-MSE

Author(s): da Silva, MDG | Dionisio, AP | de Abreu, FAP | de Brito, ES | Wurlitzer, NJ | Silva, LMAE | Ribeiro, PRV | Rodrigues, S | Taniguchi, CAK | Pontes, DF

Date: APR 15 2018

Author Keywords: Prebiotic | Chlorogenic acid | Fructooligosaccharides | Smallanthus sonchifolius

Keywords Plus: CAFFEIC ACID-DERIVATIVES | SMALLANTHUS-SONCHIFOLIUS | ANTIOXIDANT ACTIVITY | PHENOLIC-COMPOUNDS | GALINSOGA-PARVIFLORA | BIOACTIVE COMPOUNDS | FRUIT JUICE | DEGRADATION | FRUCTOOLIGOSACCHARIDES | STABILITY

Publication Year: 2018

Volume: 245

Abstract:

A complete characterization of yacon syrup was performed by analytical techniques, including NMR and UPLC-QTOF-MSE. The effect of the different stages of yacon syrup production on fructooligosaccharides (FOS) and chlorogenic acid (CGA) contents were also evaluated. As a result, in addition to higher levels of FOS and CGA, some mineral elements, such as K, Ca and P, and essential amino acids, such as tryptophan, valine, and threonine, were determined in yacon syrup. Twenty-five compounds were putatively identified, and the main compounds were phenolics derived from quinic and trans-cinnamic acids. Considering the different stages of yacon syrup production, the results indicate that the contents of FOS and CGA were maintained in the pulping, enzymatic maceration and microfiltration, leading to a concentration of these components in the last stage of processing (vacuum concentration). These results will be used to fortify this innovative and promising product in the area of functional foods.

Record 99/312: WOS:000446982700016

Source: HORTICULTURA BRASILEIRA | 36 (3): 389-394 JUL-SEP 2018

Title: Mulches for yacon cultivation

Author(s): Oliveira, FL | Venturim, CHP | Silva, DMN | Quaresma, MAL | Dalvi, LP

Date: JUL-SEP 2018

Author Keywords: Smallanthus sonchifolius | tuberous root | yield | soil protection

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | DIABETIC-RATS | FRUCTOOLIGOSACCHARIDES | CARROT | ROOTS | YIELD

Publication Year: 2018

Volume: 36

Abstract:

In Brazil, studies on commercial exploitation of yacon are still scarce. A growing interest in this vegetable has demanded some researches on this crop cultivation management, though. Considering that yacon has a long cycle, which exposes the soil, studies on mulch management will be of great value. We used a randomized complete block design, with five replicates, under different soil mulches for yacon cultivation: two plastic film covers (black and double-sided), four mulches (corn husk, coffee husk in three levels), and the control (bare soil). Plastic mulch can be used for yacon cultivation, considering that the double sided plastic provides greater production of total roots; however, the same yield of the most valued roots was obtained using black plastic. The second highest total productivity and the highest commercial yield in the most valued root classes were obtained using 50 L m⁻² of coffee husk as mulch, representing a good alternative for farmers.

Source: NUTRIENTS | 8 (7): - JUL 2016

Title: Yacon (*Smallanthus sonchifolius*) as a Food Supplement: Health-Promoting Benefits of Fructooligosaccharides

Author(s): Caetano, BFR | de Moura, NA | Almeida, APS | Dias, MC | Sivieri, K | Barbisan, LF

Date: JUL 2016

Author Keywords: yacon | prebiotics | fructooligosaccharides | functional food | chronic diseases

Keywords Plus: CHAIN FATTY-ACIDS | DIETARY FRUCTOOLIGOSACCHARIDES | METABOLIC SYNDROME | PHENOLIC-COMPOUNDS | COLORECTAL-CANCER | MICROBIOTA | ROOTS | CARBOHYDRATE | OBESITY | RISK

Publication Year: 2016

Volume: 8

Abstract: Yacon (*Smallanthus sonchifolius*), a perennial plant of the family Asteraceae native to the Andean regions of South America, is an abundant source of fructooligosaccharides (FOS). This comprehensive review of the literature addressed the role of yacon supplementation in promoting health and reducing the risk of chronic diseases. According to several preclinical and clinical trials, FOS intake favors the growth of health-promoting bacteria while reducing pathogenic bacteria populations. Moreover, the endproducts of FOS fermentation by the intestinal microbiota, short chain fatty acids (SCFA), act as substrates or signaling molecules in the regulation of the immune response, glucose homeostasis and lipid metabolism. As a result, glycemic levels, body weight and colon cancer risk can be reduced. Based on these findings, most studies reviewed concluded that due to their functional properties, yacon roots may be effectively used as a dietary supplement to prevent and treat chronic diseases.

Source: FOOD SCIENCE AND TECHNOLOGY RESEARCH | 21 (2): 255-262 MAR 2015

Title: Effect of Yacon Tuber (*Smallanthus sonchifolius*)-derived Fructooligosaccharides on the Intestinal

(s): Miyaguchi, Y | Tomatsuri, T | Toyoda, A | Inoue, E | Ogawa, Y

Date: MAR 2015

Author Keywords: cytokines | fructooligosaccharides | ovalbumin | probiotics | yacon

Keywords Plus: AIRWAY INFLAMMATION | ALLERGEN | OLIGOSACCHARIDES | INTERLEUKIN-4 | EXPRESSION | CYTOKINES | ASTHMA | ROOTS

Publication Year: 2015

Volume: 21

Abstract:

Yacon (*Smallanthus sonchifolius*) tuber contains fructooligosaccharides (FOS). FOS are known as prebiotics that beneficially affect the host, i.e., improve the intestinal flora balance and enhance the immunomodulatory potential. In this study, we investigated the effect of a yacon extract rich in FOS (YOS) on the intestinal flora and immune system of BALB/c mice sensitized and challenged with ovalbumin in comparison with an extract with acid-degraded FOS (YAH). During the 4-week test period, the amount of YOS intake was lower than that of YAH; however, a significant increase in body weight was not shown among any of the test groups. Sneezing events were observed in OVA-treated mice. It was found that administration of yacon FOS improved the intestinal flora. Further, it was suggested that administration of yacon-derived FOS could epidemiologically improve the Th1/Th2 cytokine balance through its prebiotic effect on the number of beneficial bacteria in the animal.

Source: REVISTA DE LA FACULTAD DE CIENCIAS AGRARIAS | 52 (2): 52-63 DEC 2020

Title: Yacon (*Smallanthus sonchifolius*), propagation from rhizophores with different numbers of buds

Author(s): Pedrosa, JLF | de Oliveira, FL | Zucoloto, M | Teixeira, AD | Parajara, MD | Tomaz, MA

Date: DEC 2020

Author Keywords: asexual | *Polymnia sonchifolia* | propagule | production | *Smallanthus sonchifolius*

Keywords Plus: QUALITY | FLUORESCENCE | PLANTLETS | SEEDLINGS | YIELD

Publication Year: 2020

Volume: 52

Abstract:

Yacon (*Smallanthus sonchifolius*) is a plant of Andean origin currently cultivated and consumed in several parts of the world for having numerous nutraceutical properties. An increasing interest in its cultivation demands advanced technical information on this crop, still scarce. Considering this, our study aimed to evaluate the propagation of yacon by rhizophores with different bud number. The experiment was conducted in two phases: the first phase was developed in a seedling nursery, using a completely randomized design with four treatments and 50 repetitions. The treatments consisted of rhizophores with: one to two buds (T1), three to four buds (T2), five to six buds (T3), and seven to eight buds (T4). The second phase was performed in the field with random blocks, four treatments, four repetitions, and the same treatments of the first phase. The following morphological and growth characteristics were assessed: plant height, stem diameter, number of leaves, number of stems per plant, Dickson quality index

(DQI), leaf area, leaf dry mass, rhizophores, tuberous root, and productivity. The following physiological features were also analyzed: chlorophyll content (FCI - Falker chlorophyll index), net carbon assimilation rate, leaf transpiration, stomatal conductance, internal carbon concentration, water use efficiency and instantaneous carboxylation efficiency. Seedlings from rhizophores with three to four buds presented the best morphological and growth characteristics, DQI = 0.47 and good performance in the field. In addition, the plants originated from this material (rhizophores with three to four buds) showed greater accumulation of dry matter in the aerial part and tuberous roots, and consequently higher productivity in fresh tuberous roots, constituting a suitable propagation form for the cultivation of yacon.

Source: HORTICULTURA BRASILEIRA | 36 (2): 199-204 APR-JUN 2018

Title: Physical and chemical characterization of yacon tuberous roots at different altitudes and planting times

Author(s): Silva, DMN | Lima, RR | Oliveira, FL | Teixeira, LJQ | Machado, LCA

Date: APR-JUN 2018

Author Keywords: Smallanthus sonchifolius | post-harvest quality | instrumental coloration | sensorial traits

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS

Publication Year: 2018

Volume: 36

Abstract:

The post-harvest quality of yacon tuberous roots produced at different altitudes and planting times were characterized in this study. The experiment was conducted in the South of Espírito Santo State in two locations, one at 837 m altitude and the other one at 113 m altitude. The experimental design, in each place, was randomized blocks with four replications, and the treatments consisted of three planting seasons: April (autumn), July (winter) and September (spring). After harvest of the tuberous roots, we evaluated pH, titratable total acidity, moisture content, soluble solids, reducing sugars, crude fiber and ash, as well as color, hardness (maximum force recorded in the first penetration or compression cycle) and chewiness index (energy required to chew food, given by gumminess x elasticity). Tuberous roots grown at 837 m altitude, independent of planting times, presented higher soluble solids content and lighter juice, conferring better quality. However, at 113 m altitude, from April to July, the roots showed better quality, since it presents lower hardness and lighter juice.

Record 107/312: WOS:000426436300058

Source: MOLECULES | 23 (2): - FEB 2018

Title: Yacon (*Smallanthus sonchifolius* Poepp. & Endl.) as a Novel Source of Health Promoting Compounds: Antioxidant Activity, Phytochemicals and Sugar Content in Flesh, Peel, and Whole Tubers of Seven Cultivars

Author(s): Khajehei, F | Merkt, N | Claupein, W | Graeff-Hoenninger, S

Date: FEB 2018

Author Keywords: yacon | *Smallanthus sonchifolius* Poepp. and Endl. | sugar | total phenolic content | total flavonoid content | ABTS radical scavenging activity | DPPH radical scavenging activity | Ferric reducing antioxidant power

Keywords Plus: TOTAL PHENOLIC CONTENT | FLAVONOIDS | LEAVES | FOOD | POTATOES | ROOTS | ACIDS | RED | FRUCTOOLIGOSACCHARIDES | CLASSIFICATION

Publication Year: 2018

Volume: 23

Abstract:

The aim of this study was to evaluate the quality characteristics of seven yacon (*Smallanthus sonchifolius* Poepp. and Endl.) cultivars (Cajamarca, Cusco, Early White, Late Red, Morado, New Zealand and Quinault) cultivated in the southwest of Germany. The following phyto/chemical traits were investigated in different yacon tuber parts (flesh, peel, and whole tubers): total dry matter, sugar content (fructose, glucose, and sucrose content), total phenolic content (TPC), total flavonoid content (TFC), 2,20-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical scavenging activity, 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity, and Ferric reducing antioxidant power (FRAP). The results indicated a significant interaction between cultivar and tuber part on all of the examined traits ($p < 0.0001$). Of flesh and whole tuber, cv. Late Red, cv. Morado, and cv. Cajamarca had the highest TPC, TFC, DPPH radical scavenging activity, and FRAP. They also had relatively higher total sugar content. Cv. New Zealand had the lowest amount of sugars, TPC, TFC, DPPH radical scavenging activity, and FRAP, but the highest ABTS radical scavenging activity content in its flesh and whole tuber. Moreover, the results indicated that the peel of yacon tubers contained considerably high amounts of phytochemicals while possessing low sugar contents. Overall, this study provides a broad insight into the phyto/chemical content of yacon tubers from different cultivars, which can be used for further breeding programs, and the selection of proper cultivars for specific food product development.

Source: JOURNAL OF SUPERCRITICAL FLUIDS | 146: 55-64 APR 2019

Title: Antioxidant activity and fatty acid profile of yacon leaves extracts obtained by supercritical CO₂ + ethanol solvent

Author(s): Cruz, PN | Fetzer, DL | do Amaral, W | de Andrade, EF | Corazza, ML | Masson, ML

Date: APR 2019

Author Keywords: *Smallanthus sonchifolius* | Supercritical fluid extraction | Soxhlet extraction | Extraction curves | Phenolic content

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | FLUID EXTRACTION | PHENOLIC ANTIOXIDANTS | SUBCRITICAL PROPANE | POMACE EXTRACTS | GRAPE POMACE | OIL | INHIBITION | SOLVENTS | KINETICS

Publication Year: 2019

Volume: 146

Abstract:

Extraction efficiency of bioactive compounds from yacon leaves using supercritical CO₂ + ethanol (scCO₂ + EtOH) fluid extraction and a conventional method were investigated. scCO₂ + EtOH runs were performed under the following conditions: 30-70 degrees C, 15-25 MPa and varying the ethanol (co-solvent) to solid (raw material) mass ratio (MR). All extractions were evaluated in terms of overall extraction yield (X-o), fatty acid composition, total phenolic content (TPC) and antioxidant activity (AA). Results indicated that scCO₂ + EtOH presented the highest extraction yield 5.22 wt% at 70 degrees C/25 MPa/MR 3:1. High values of TPC and AA were found in all extracts. Major unsaturated fatty acids found in yacon leaves extracts were gamma-linolenic (omega-6), eicosapentaenoic (omega-3) and linoleic (omega-6) acids. The highest omega-6/omega-3 fatty acids ratios were found in the extracts obtained using scCO₂ + EtOH.

Source: JOURNAL OF FUNCTIONAL FOODS | 51: 86-93 DEC 2018

Title: Andean roots and tubers crops as sources of functional foods

Author(s): Leidi, EO | Altamirano, AM | Mercado, G | Rodriguez, JP | Ramos, A | Alandia, G | Sorensen, M | Jacobsen, SE

Date: DEC 2018

Author Keywords: Ahipa | Arracacha | Mashua | Yacon | Functional foods

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | PACHYRHIZUS-AHIPA ROOTS | ANTIOXIDANT CAPACITY | PHENOLIC-COMPOUNDS | (SMALLANTHUS-SONCHIFOLIUS)-DERIVED FRUCTOOLIGOSACCHARIDES | ARRACACIA-XANTHORRHIZA | PERUVIAN CARROT | H. ROBINSON | RUIZ | STARCH

Publication Year: 2018

Volume: 51

Abstract: There are many valuable plant species improved by ancient cultures and cultivated locally but of very limited expansion worldwide. Some are considered neglected and underutilized species, such as the root and tuber crops from the Andes. They constitute traditional energy sources basic for the food security in the region but they also are great source of functional foods and there is a traditional associated knowledge on their properties. In this review, we focus on a few species (ahipa, arracacha, mashua, yacon) evaluated in the LATINCROP project which gathered information regarding their conservation status, cultivation practices and traditional uses and to promote new culinary uses. At the same time, this review covers the latest studies on their nutritional components and functional properties which may increase the public awareness to promote their adoption. It provides a view on the available facts and considers what is still to be done.

Source: JOURNAL OF FUNCTIONAL FOODS | 44: 58-64 MAY 2018

Title: Acute consumption of yacon shake did not affect glycemic response in euglycemic, normal weight, healthy adults

Author(s): Rocha, DMUP | Ribeiro, PVD | Caldas, APS | da Silva, BP | da Silva, A | de Almeida, AP | da Silva, NBM | Machado, AM | Alfenas, RDC

Date: MAY 2018

Author Keywords: Yacon root | Functional food | Nutraceutical | Glucose | Intake

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | ROOTS | FRUCTOOLIGOSACCHARIDES | GLUCOSE | INULIN | LEAVES | ENDL

Publication Year: 2018

Volume: 44

Abstract:

Yacon (*Smallanthus sonchifolius* (Poepp.) H. Rob) is a natural source of fructooligosaccharides (FOS) studied for its potential as a functional food for prevention and management of chronic diseases, in part associated with its positive impact on glycemic response and body weight. However, yacon beneficial effect on glucose response and food intake control are still controversial. We investigated the acute effect of yacon consumption on glycemic response, subjective appetitive sensations, and food intake in a crossover trial. Fifteen healthy adults consumed 350 mL of yacon (21 g of yacon flour with 7.4 g of FOS) or control shake, on two non-consecutive days (washout). Yacon shake did not affect glycemic response, appetite or food intake. However, it is possible that positive effects of yacon consumption may turn evident only after its chronic consumption. Further studies are needed to assess the long-term effect of yacon consumption on glucose response and body weight control.

Source: FOOD SCIENCE AND TECHNOLOGY | 40 (1): 194-201 JAN-MAR 2020

Title: Effect of yacon syrup on blood lipid, glucose and metabolic endotoxemia in healthy subjects: a randomized, double-blind, placebo-controlled pilot trial

Author(s): Dionisio, AP | da Silva, MDG | Carioca, AAF | Adriano, LS | de Abreu, FAP | Wurlitzer, NJ | Pinto, CD | Pontes, DF

Date: JAN-MAR 2020

Author Keywords: *Smallanthus sonchifolius* | fructooligosaccharides | prebiotics | lipopolysaccharides

Keywords Plus: INULIN-TYPE FRUCTANS | SMALLANTHUS-SONCHIFOLIUS | GUT MICROBIOTA | ENRICHED PASTA | OLIGOSACCHARIDES | INFLAMMATION | CONSUMPTION | PREBIOTICS | MECHANISM | WOMEN

Publication Year: 2020

Volume: 40

Abstract:

We investigate the impact of yacon syrup consumption on glycemic, lipid and metabolic endotoxemia in healthy subjects. Thus, 32 healthy were randomized into two groups that consumed 40 g of yacon syrup/day (= 8.74 g FOS/day) or a placebo, for 2-weeks. Anthropometric assessments, gastrointestinal effects, glycemic and lipid profile, and LPS were performed at the beginning and at the end of the study. The

results obtained shown that the 2-weeks consumption of yacon syrup does not promote serum LPS alteration in healthy volunteers. Moreover, the glycemic and lipid profile were also similar between the groups before and after the intervention. Yacon syrup did not affect blood lipid, glucose or metabolic endotoxemia. However, it is possible that positive effects of yacon syrup will turn evident only in a long-term intervention. Further studies are needed to assess the long-term effect of yacon syrup consumption, and its use in obese and diabetic individuals.

Source: INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES | 21 (12): - JUN 2020

Title: Metabolomic and Gene Expression Studies Reveal the Diversity, Distribution and Spatial Regulation of the Specialized Metabolism of Yacon (*Smallanthus sonchifolius*, Asteraceae)

Author(s): Padilla-Gonzalez, GF | Amrehn, E | Frey, M | Gomez-Zeledon, J | Kaa, A | Da Costa, FB | Spring, O

Date: JUN 2020

Author Keywords: *Smallanthus sonchifolius* | Asteraceae | LC-MS | MS | metabolomics | gene expression | chalcone synthase | germacrene A oxidase

Keywords Plus: CAPITATE GLANDULAR TRICHOMES | OCCURRING TERPENE DERIVATIVES | SESQUITERPENE LACTONES | ANTIOXIDANT ACTIVITY | AQUEOUS EXTRACT | LEAVES | LEAF | MELAMPOLIDES | IDENTIFICATION | BIOSYNTHESIS

Publication Year: 2020

Volume: 21

Abstract:

Smallanthus sonchifolius, also known as yacon, is an Andean crop species commercialized for its nutraceutical and medicinal properties. The tuberous roots of yacon accumulate a diverse array of probiotic and bioactive metabolites including fructooligosaccharides and caffeic acid esters. However, the metabolic diversity of yacon remains unexplored, including the site of biosynthesis and accumulation of key metabolite classes. We report herein a multidisciplinary approach involving metabolomics, gene expression and scanning electron microscopy, to provide a comprehensive analysis of the diversity, distribution and spatial regulation of the specialized metabolism in yacon. Our results demonstrate that different metabolic fingerprints and gene expression patterns characterize specific tissues, organs and cultivars of yacon. Manual inspection of mass spectrometry data and molecular networking allowed the tentative identification of 71 metabolites, including undescribed structural analogues of known bioactive compounds. Imaging by scanning electron microscopy revealed the presence of a new type of glandular trichome in yacon bracts, with a distinctive metabolite profile. Furthermore, the high concentration of sesquiterpene lactones in capitate glandular trichomes and the restricted presence of certain flavonoids and caffeic acid esters in underground organs and internal tissues suggests that these metabolites could be involved in protective and ecological functions. This study demonstrates that individual organs and tissues make specific contributions to the highly diverse and specialized metabolome of yacon, which is proving to be a reservoir of previously undescribed molecules of potential significance in human health.

Source: FOOD BIOSCIENCE | 35: - JUN 2020

Title: Andean tubers grown in Ecuador: New sources of functional ingredients

Author(s): Pacheco, MT | Hernandez-Hernandez, O | Moreno, FJ | Villamiel, M

Date: JUN 2020

Author Keywords: Andean tubers | Smallanthus sonchifolius | Tropaeolum tuberosum | Ullucus tuberosus | Ipomea batatas | Arracacia xanthorrhiza | Fructooligosaccharides | Resistant starch

Keywords Plus: PHYSICOCHEMICAL PROPERTIES | DIETARY FIBER | ULLUCUS-TUBEROSUS | MEDICINAL-PLANTS | RESISTANT STARCH | YACON FLOUR | VITAMIN-C | QUALITY | HEALTH | POTATO

Publication Year: 2020

Volume: 35

Abstract:

Five unexplored Andean tubers grown in Ecuador were characterized. Yacon (Smallanthus sonchifolius, var. INIAP-ECU-1247) showed a high level of prebiotic inulin-type fructooligosaccharides with a degree of polymerisation from 2 to 6 and the highest content of phenolic compounds. Mashua (Tropaeolum tuberosum, var. INIAP-ECU-Izano) showed high antioxidant capacity, attributed to its high carotenoid and vitamin C content. Melloco (Ullucus tuberosus, var. INIAP-ECU-amarillo-rosa) had the highest content of fibre and crude protein, while purple sweet potato (Ipomea batatas, var. INIAP-ECU-morado) and white carrot (Arracacia xanthorrhiza, var. INIAP-ECU-blanca) showed a high yield of starch rich in amylose, with possible better functional properties than potato starch. Fructose, glucose and sucrose were found in all samples. These ancestral crops can be useful as non-traditional sources of bioactive compounds with applications in the development of biomaterials, pharmacological products or new functional ingredients.

Source: JOURNAL OF FOOD SCIENCE | 80 (11): C2420-C2429 NOV 2015

Title: Antioxidant Effects of Herbal Tea Leaves from Yacon (Smallanthus sonchifolius) on Multiple Free Radical and Reducing Power Assays, Especially on Different Superoxide Anion Radical Generation Systems

Author(s): Sugahara, S | Ueda, Y | Fukuhara, K | Kamamuta, Y | Matsuda, Y | Murata, T | Kuroda, Y | Kabata, K | Ono, M | Igoshi, K | Yasuda, S

Date: NOV 2015

Author Keywords: antioxidant | herbal tea | Smallanthus sonchifolius | superoxide anion radical | yacon

Keywords Plus: CATION DECOLORIZATION ASSAY | XANTHINE-OXIDASE | REACTIVE OXYGEN | DIABETIC-RATS | PHENOLIC-COMPOUNDS | MEDICINAL-PLANTS | OXIDATIVE STRESS | FRUIT EXTRACTS | MOUSE SKIN | IN-VIVO

Publication Year: 2015

Volume: 80

Abstract:

Yacon (*Smallanthus sonchifolius*), a native Andean plant, has been cultivated as a crop and locally used as a traditional folk medicine for the people suffering from diabetes and digestive/renal disorders. However, the medicinal properties of this plant and its processed foods have not been completely established. This study investigates the potent antioxidative effects of herbal tea leaves from yacon in different free radical models and a ferric reducing model. A hot-water extract exhibited the highest yield of total polyphenol and scavenging effect on 1,1-diphenyl-2-picryl hydrazyl (DPPH) radical among four extracts prepared with hot water, methanol, ethanol, and ethylacetate. In addition, a higher reducing power of the hot-water extract was similarly demonstrated among these extracts. Varying concentrations of the hot-water extract resulted in different scavenging activities in four synthetic free radical models: DPPH radical (EC₅₀ 28.1 µg/mL), 2,2-azinobis(3-ethylbenzothiazoline-6-sulfonic acid) cation radical (EC₅₀ 23.7 µg/mL), galvinoxyl radical (EC₅₀ 3.06 µg/mL), and chlorpromazine cation radical (EC₅₀ 475 µg/mL). The yacon tea-leaf extract further demonstrated superoxide anion (O₂⁻) radical scavenging effects in the phenazine methosulfate-NADH-nitroblue tetrazolium (EC₅₀ 64.5 µg/mL) and xanthine oxidase assay systems (EC₅₀ 20.7 µg/mL). Subsequently, incubating human neutrophilic cells in the presence of the tea-leaf extract could suppress the cellular O₂⁻ radical generation (IC₅₀ 65.7 µg/mL) in a phorbol 12-myristate 13-acetate-activated cell model. These results support yacon tea leaves may be a good source of natural antioxidants for preventing O₂⁻ radical-mediated disorders.

Source: FOOD AND BIOPROCESS TECHNOLOGY | 8 (9): 1982-1994 SEP 2015

Title: Evaluating Strategies to Control Enzymatic Browning of Minimally Processed Yacon (*Smallanthus sonchifolius*)

Author(s): Vasconcelos, CM | de Oliveira, EB | Rossi, SN | Arantes, LF | Puschmann, R | Chaves, JBP

Date: SEP 2015

Author Keywords: Yacon | Tartaric acid | Sensory quality | Enzymatic browning | Minimal processing | Modified atmosphere

Keywords Plus: TOTAL PHENOLIC CONTENT | ANTIOXIDANT ACTIVITY | POLYPHENOL OXIDASE | QUALITY | FRESH | BIOCHEMISTRY | SELECTIVITY | PEROXIDASE | EXTRACTION | DIOXIDE

Publication Year: 2015

Volume: 8

Abstract:

To control enzymatic browning in minimally processed yacon (*Smallanthus sonchifolius*), strategies combining anti-browning agents and modified atmosphere were investigated. Yacon slices were immersed in anti-browning agent solutions-sodium metabisulfite (0.5 %), L-cysteine (0.5 %), or the acids lactic (1 %), malic (1 %), succinic (1 %), ethylenediaminetetraacetic (EDTA; 1 %), ascorbic (3 %), citric (3 %) or tartaric (3 %), or a control (0.5 % de sugar)-for 5 min, then packaged with air or modified atmosphere

(N-2) and stored at 5 A degrees C. Sensory and physical-chemical (soluble solids, phenolic content, peroxidase activity, pH, color, instrumental texture, and mass variation) analyses were performed. For a given anti-browning agent, any significant difference was not found between yacon slices stored under air or N-2. However, when comparing the different anti-browning agents, only ascorbic, citric, and tartaric acids were effective enzymatic browning inhibitors without significantly changing typical sensory attributes of yacon. Among them, tartaric acid is not often reported in literature for controlling enzymatic browning in vegetal products, contrarily to the two others.

Source: BIOSCIENCE JOURNAL | 31 (6): 1738-1749 NOV-DEC 2015

Title: USE OF YACON IN NATURA AND ITS FLOUR IN THE DEVELOPMENT OF DIET AND CONVENTIONAL CAKES

Author(s): Rocha, LS | da Silva, R | da Silva, EMM

Date: NOV-DEC 2015

Author Keywords: Smallanthus sonchifolius | Cakes | Chemical composition | Nutrition | Bioactive | Fructooligosaccharides

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | FRUCTOOLIGOSACCHARIDES | OLIGOSACCHARIDE | BREAD | FIBER

Publication Year: 2015

Volume: 31

Abstract:

Yacon is a tuberous root that has bioactive components in its composition, such as fructooligosaccharides (FOS). The objective of this study was to evaluate physicochemical and sensory characteristics of diet and conventional cakes made with yacon in natura and its respective flour. Cakes were prepared in chocolate and carrot flavors with the addition of 50% yacon in natura and 70% yacon flour. Cakes prepared with 50% yacon in natura with the addition of sucrose in the formula showed physical aspects closer to conventional cakes. The yield of the cakes was considered satisfactory at around 90%, regardless of yacon in natura or yacon flour usage. The chocolate cakes had higher ratings regarding the sensory attributes and the purchase intent in relation to the carrot cakes, especially when using yacon in natura in the formula. The cakes containing sweetener were rated as good as those with sucrose, especially in regards to the flavor of the chocolate cakes. According to the chemical composition, cakes with 70% yacon flour had higher dietary fiber content as well as FOS, giving credit to their claim as a bioactive component.

Source: METABOLITES | 10 (10): - OCT 2020

Title: Feature-Based Molecular Networking to Target the Isolation of New Caffeic Acid Esters from Yacon (Smallanthus sonchifolius, Asteraceae)

Author(s): Padilla-Gonzalez, GF | Sadgrove, NJ | Ccana-Ccapatinta, GV | Leuner, O | Fernandez-Cusimamani, E

Date: OCT 2020

Date: OCT 2020

Author Keywords: molecular networking | metabolomics | chlorogenic acids | caffeic acid esters

Keywords Plus: DERIVATIVES | ENVIRONMENT | EXTRACT | ROOTS

Publication Year: 2020

Volume: 10

Abstract:

Smallanthus sonchifolius (yacon) is an edible tuberous Andean shrub that has been included in the diet of indigenous people since before recorded history. The nutraceutical and medicinal properties of yacon are widely recognized, especially for the improvement of hyperglycemic disorders. However, the chemical diversity of the main bioactive series of caffeic acid esters has not been explored in detail. In this metabolomics study, we applied the latest tools to facilitate the targeted isolation of new caffeic acid esters. Using liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS), we analyzed extracts from different organs (roots, vascular tissues of the stems, stem epidermis, leaves, bracts, and ray flowers) and followed a feature-based molecular networking approach to characterize the structural diversity of caffeic acid esters and recognize new compounds. The analysis identified three potentially new metabolites, one of them confirmed by isolation and full spectroscopic/spectrometric assignment using nuclear magnetic resonance (NMR), high-resolution mass spectrometry (HRMS), and MS/MS. This metabolite (5-O-caffeoyl-2,7-anhydro-d-glycero-beta-d-galacto-oct-2-ulopyranosonic acid), along with eight known caffeic acid esters, was isolated from the roots and stems. Furthermore, based on detailed tandem MS analyses, we suggest that the two isomeric monocaffeoyl-2,7-anhydro-2-octulopyranosonic acids found in yacon can be reliably distinguished based on their characteristic MS² and MS³ spectra. The outcome of the current study confirms the utility of feature-based molecular networking as a tool for targeted isolation of previously undescribed metabolites and reveals the full diversity of potentially bioactive metabolites from *S. sonchifolius*.

Source: INTERNATIONAL JOURNAL OF FOOD SCIENCE AND TECHNOLOGY | 51 (5): 1177-1185
MAY 2016

Title: Stability of fructooligosaccharides, sugars and colour of yacon (*Smallanthus sonchifolius*) roots during blanching and drying

Author(s): Campos, D | Aguilar-Galvez, A | Pedreschi, R

Date: MAY 2016

Author Keywords: Blanching | colour | drying | fructooligosaccharides

Keywords Plus: PROCESSING CONDITIONS | PHENOLIC-COMPOUNDS | SOLIDS LOSS | POEPP.
| STEAM | POLYPHENOLOXIDASE | DEGRADATION | HYDROLYSIS | KINETICS | FRUCTAN

Publication Year: 2016

Volume: 51

Abstract:

Yacon (*Smallanthus sonchifolius*) root is an important source of fructooligosaccharides (FOS). This study evaluated the influence of the blanching and drying processes on the sugars, FOS and colour of the obtained flour. Blanching in boiling water of 5mm slices for 6min allowed to inactivate 95% of polyphenol oxidase and peroxidase activity. Blanching solutions containing ascorbic, citric and lactic acid were detrimental in terms of FOS retention (68.2-87.4%) due to hydrolysis mainly of GF3, GF4 and GF5 FOS, and also important losses of reducing sugars (RS) were observed (69.5-87.4% retention). Blanching treatments that included ascorbic acid/CaCl₂ prevented RS and FOS losses and improved colour of the obtained flour. The drying tested temperatures of 50-80 degrees C did not affect the RS retention and FOS losses associated to hydrolysis and the use of 80 degrees C rapidly reduced the water content and minimised browning reactions yielding flours with excellent colour characteristics with high FOS content that can be derived to the elaboration of prebiotic containing functional foods or for the extraction and purification of FOS.

Source: ARQUIVO BRASILEIRO DE MEDICINA VETERINARIA E ZOOTECNIA | 69 (3): 695-703 JUN 2017

Title: Use of yacon (*Smallanthus sonchifolius*) protect against intestinal colonization of broilers infected by *Salmonella* Enteritidis

Author(s): Oliveira, MGX | Porretta, MC | Itaya, NM | Oliveira, MCV | Reple, JN | Cunha, MPV | Sanches, LA | Davies, YM | Menao, MC | Borges, JCS | Polaquini, LEM | Knobl, T

Date: JUN 2017

Author Keywords: aviculture | inulin | prebiotics | *Salmonella*

Keywords Plus: SUNFLOWER MEAL | DIETS | EXPRESSION | CHICKENS | FLOUR

Publication Year: 2017

Volume: 69

Abstract:

The fructan inulin-type oligosaccharides favor the multiplication of some bacterial genera in the intestine, promoting a prebiotic effect. This study evaluated the effect of inulin extracted from yacon roots (*Smallanthus sonchifolius*) on intestinal colonization of broilers experimentally infected with *Salmonella* Enteritidis. Sixty-one day old chicks were grouped into three treatments, with two replicates, and reared until 21 days. Birds in the yacon group received 100mg of inulin/day orally for three consecutive days. On the seventh day of life the treated birds and the positive control were challenged orally with a culture of *S. Enteritidis*. There were no differences between groups in live performance. The infectivity index of the chicks supplemented with yacon was lower until the sixth day after the challenge, but at the end of the experiment it was higher than the positive control. Data from this study show that the use of inulin during the first 3 days of life caused a reduction of intestinal colonization of chickens by *Salmonella* Enteritidis in the first week after challenge. Further studies are needed to determine the dose and the ideal time of treatment necessary for a longer protective effect.

Source: FOOD SCIENCE AND TECHNOLOGY RESEARCH | 25 (1): 131-139 JAN 2019

Title: Optimization of Hot-water Extraction of Dried Yacon Herbal Tea Leaves: Enhanced Antioxidant Activities and Total Phenolic Content by Response Surface Methodology

Author(s): Ueda, Y | Apiphuwasukcharoen, N | Tsumumi, S | Matsuda, Y | Areekul, V | Yasuda, S

Date: JAN 2019

Author Keywords: yacon tea leaves | antioxidant | response surface methodology | central composite design | optimization

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | POWER | FRAP | GENERATION | ASSAYS | BLACK | ACID

Publication Year: 2019

Volume: 25

Abstract:

Yacon (*Smallanthus sonchifolius*) is an herbal plant and its root has been historically consumed as a sweet vegetable in the Andes. With the research goal of establishing yacon leaves, grown in Japan, as a foodstuff with health benefits, we previously reported the antioxidant effects of yacon tea leaves using concentrated extracts. In this study, we determined the optimum conditions for regular hot-water extraction of yacon tea leaves, intended for normal consumption, aiming for higher activity in several antioxidant assays and total phenolic content (TPC). Response surface methodology was used to optimize the extraction by central composite design. Extraction temperature (ranging from 75.0 to 96.0 degrees C) and time (from 2.00 to 5.50 min) were set as the two independent variables. Based on a composite desirability value of 0.863, the hot-water extraction of yacon tea at 89.3 degrees C for 2.50 min was found to be the optimized condition providing higher antioxidant activity and TPC.

Source: INTERNATIONAL JOURNAL OF FOOD SCIENCE AND TECHNOLOGY | 52 (12): 2637-2646 DEC 2017

Title: Effect of Yacon (*Smallanthus sonchifolius*) fructooligosaccharide purification technique using activated charcoal or ion exchange fixed bed column on recovery, purity and sugar content

Author(s): Campos, D | Mescua, L | Aguilar-Galvez, A | Chirinos, R | Pedreschi, R

Date: DEC 2017

Author Keywords: Activated charcoal | fixed-bed column | fructooligosaccharides | ion exchange | purification | *Smallanthus sonchifolius* | yacon

Keywords Plus: FRUCTO-OLIGOSACCHARIDES | PHENOLIC-COMPOUNDS | SEPARATION | ADSORPTION | OPTIMIZATION | SACCHARIDES | PREBIOTICS | POEPP. | RESINS | ENDL

Publication Year: 2017

Volume: 52

Abstract:

A rich in FOS and simple sugar yacon extract was clarified and decoloured and subsequently purified in an activated charcoal column at 25 and 40 degrees C using two or three stepwise elution with yields of

72.0-86.7% and 90-92.4% purity. Best results were obtained at 25 degrees C and two stepwise elution, with yield and purity of 81.5% and 92% but 9% sucrose and no glucose and fructose. Different cationic exchange resins on a clarified and demineralised extract at 25 and 60 degrees C had yields and purity of 73.1-99.4% and 75.0-88.2%, respectively. Best results were obtained with Diaion UBK530Na at 60 degrees C (99.4% yield and 88.2% purity) but 1.6, 2.7 and 7.5% of fructose, glucose and sucrose. The by-product was rich in sugars (59-60.1% fructose, 28.3-32.8% glucose, 7.2-8.4% sucrose) and could be used by the feed and food industry.

Source: REVISTA BRASILEIRA DE ENGENHARIA AGRICOLA E AMBIENTAL | 22 (8): 564-569 AUG 2018

Title: Effective diffusivity in yacon potato cylinders during drying

Author(s): de Lisboa, CGC | Gomes, JP | de Figueiredo, RMF | Queiroz, AJD | Diogenes, ADG | de Melo, JCS

Date: AUG 2018

Author Keywords: Smallanthus sonchifolia | mathematical modelling | diffusion

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | KINETICS

Publication Year: 2018

Volume: 22

Abstract:

The aim of this study was to obtain the effective diffusivity of yacon potato in fixed-bed dryer at different temperatures (50, 60 and 70 degrees C) and drying air velocities (1.0, 1.5 and 2.0 m s⁻¹). Non-linear regression analysis was performed by the Quasi-Newton method using the program Slalística 7.0, where the parameters of the models were estimated as a function of the drying air temperature. Approximation of Diffusion, Two Terms, Henderson & Pabis, and Page models fitted well the experimental data. Drying air temperature and speed influenced the drying time of the samples. The effective diffusivity increased with increasing temperature, ranging from 1.18 x 10⁻⁹ to 2.15 x 10⁻⁹ m² s⁻¹.

Source: ACTA SCIENTIARUM-AGRONOMY | 40: - 2018

Title: Growth and development of yacon in different periods of planting and growing regions

Author(s): da Silva, DMN | de Oliveira, FL | Cavatte, PC | Quaresma, MAL | Christo, BF

Date: 2018

Author Keywords: Smallanthus sonchifolius | growth analysis | production

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | DIABETIC-RATS | ROOTS

Publication Year: 2018

Volume: 40

Abstract:

The increasing interest in the commercial exploitation of yacon has demanded adequate technological knowledge for the implantation and management of the crop, including planting periods and cultivation

regions that contribute to the satisfactory growth and development of the species. This study was conducted in two different locations, one in a mountainous region and another in a lowland region. In each location, yacon was planted in four different seasons, fall (April), winter (July), spring (September) and summer (December). We collected primary dry matter accumulation data for different parts of the plant and the leaf area at 30 day intervals. We used these values to calculate the following morphophysiological indexes: specific leaf area, leaf area index, tillage growth rate and net assimilation rate. We concluded that planting in the fall in mountainous or lowland sites favoured the growth and development of yacon. Cultivation in mountainous regions, regardless of the planting season, promoted a greater mass accumulation of tuberous roots, which may be reflected in higher productivity. Both fall and winter planting in the mountainous region allows root harvesting at the same time.

Source: INTERNATIONAL JOURNAL OF AGRICULTURE AND NATURAL RESOURCES | 47 (1): 46-57 2020

Title: Yacon potato propagation from herbaceous cuttings with different numbers of buds

Author(s): Pedrosa, JLF | de Oliveira, FL | Zucoloto, M | Cabral, MO | de Sales, RA | Carvalho, AHD

Date: 2020

Author Keywords: Asexual propagation | Asteraceae | Cutting | *Smallanthus sonchifolius*

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | YIELD

Publication Year: 2020

Volume: 47

Abstract:

The objective of this study was to evaluate yacon potato propagation from herbaceous cuttings with different numbers of buds. Therefore, an experiment was carried out in two phases. The first phase was carried out in a greenhouse with seedlings using a randomized complete block design with 40 replicates. The treatments consisted of varying the number of buds per cutting: two buds (T1), three buds (T2), or four buds (T3). The second phase was carried out in the field following a randomized complete block design with 4 replicates, and the treatments were the same as those used in the seedling phase. The following morphological characteristics were evaluated: number of leaves per plant, leaf area, plant height, stem diameter, number of stems per plant, leaf dry mass, stems, rhizophores, tuberous roots, and tuberous root yield. The physiological characteristics evaluated were the relative chlorophyll content (FCI - Falker chlorophyll index), net CO₂ assimilation rate, leaf transpiration, stomatal conductance, internal CO₂ concentration, water use efficiency and instantaneous carboxylation efficiency. It was observed that the seedlings from cuttings with 3 buds presented higher stomatal conductance (g(s)), which reflected their higher transpiration rates. The yacon potato presented the best vegetative and productive development when propagated by herbaceous cuttings with three buds.

Source: SCIENTIFIC REPORTS | 9: - SEP 11 2019

Title: Metabolomic and gene expression approaches reveal the developmental and environmental

regulation of the secondary metabolism of yacon (*Smallanthus sonchifolius*, Asteraceae)

Author(s): Padilla-Gonzalez, GF | Frey, M | Gomez-Zeledon, J | Da Costa, FB | Spring, O

Date: SEP 11 2019

Author Keywords:

Keywords Plus: CAPITATE GLANDULAR TRICHOMES | SESQUITERPENE LACTONES | CHLOROGENIC ACID | UV-B | STRESS | BIOSYNTHESIS | LEAVES | PLANTS | VARIABILITY | EXTRACTS

Publication Year: 2019

Volume: 9

Abstract:

Acting as chemical defense or signaling compounds, secondary metabolites (SMs) play an essential role in the evolutionary success of many angiosperm plant families. However, the adaptive advantages that SMs confer, and the influence of environmental and developmental factors on SMs expression, remains poorly understood. A study of taxa endemic to the variable Andean climate, using a metabolomics approach, may provide further insight. By analyzing gene expression patterns and metabolic fingerprints, we report herein the developmental and environmental regulation of the secondary metabolism of *Smallanthus sonchifolius* (yacon), a medicinal Andean plant. Our results demonstrate a clear developmental stage dependent regulation of the secondary metabolism of yacon leaves wherein the metabolic diversity increases with plant age. However, environmental factors seem to regulate biosynthetic pathways, creating differences in the expression of chemical classes, pointing to an association between transcription levels of relevant genes and the relative amounts of more than 40 different metabolites. This study suggests that the secondary metabolism of yacon is regulated by a complex interplay between environmental factors and developmental stage and provides insight into the regulatory factors and adaptive roles of SMs in Andean taxa.

Source: FOOD RESEARCH INTERNATIONAL | 137: - NOV 2020

Title: Yacon (*Smallanthus sonchifolius*) flour soluble extract improve intestinal bacterial populations, brush border membrane functionality and morphology in vivo (*Gallus gallus*)

Author(s): Martino, HSD | Kolba, N | Tako, E

Date: NOV 2020

Author Keywords: Intra amniotic administration | Brush border membrane functionality | Intestinal morphology | Gene expression | Zn-Fe-related proteins | Goblet cell, intestinal bacterial populations

Keywords Plus: IRON | EXPRESSION | BUTYRATE | PROTEIN | MICROBIOTA | ROOTS | RATS

Publication Year: 2020

Volume: 137

Abstract:

This study evaluates the effects of intra-amniotic administration of yacon (*Smallanthus sonchifolius*) flour soluble extracts (YFSE) on intestinal bacterial populations, brush border membrane (BBM) functionality and morphology, by using the *Gallus gallus* model. The YFSE increased ($p < 0.05$) relative

abundance of *Lactobacillus*, *Bifidobacterium*, *Clostridium* and *E. coli* compared to 18M Omega H₂O. The YFSE had systematic effect on BBM functionality, via the upregulation of zinc (zinc transporters - ZnT1, ZnT7 and ZIP9) and iron (ferroportin, Duodenal cytochrome (DcytB) transporters, sucrose isomaltase (SI), and down regulation of Interleukin 1 beta (IL1 beta), and hepcidin genes expression when compared to the inulin administered group. The YFSE administration increased glycogen concentrations in pectoral muscle compared to noninjected and 18 Omega H₂O groups, however, did not change gene expression of enzymes related to glycolysis (phosphofructokinase) and gluconeogenesis (glucose-6 phosphatase). The YFSE increased the depth of crypts, crypt goblet cell diameter, number and type (acidic), and villi goblet cell diameter and type (acidic) when compared to all other groups. Thus, YFSE demonstrated prebiotic effects resulting in improving intestinal bacterial populations profile, BBM functionality, digestive and absorptive capabilities, intestinal morphology, glycogen status and immune system.

Source: MOLECULES | 25 (21): - NOV 2020

Title: Extraction of Inulin from Andean Plants: An Approach to Non-Traditional Crops of Ecuador

Author(s): Escobar-Ledesma, FR | Sanchez-Moreno, VE | Vera, E | Ciobota, V | Jentzsch, PV | Jaramillo, LI

Date: NOV 2020

Author Keywords: inulin | *Smallanthus sonchifolius* | Agave Americana | fructans | polysaccharide

Keywords Plus: AGAVE | KINETICS | FRUCTANS | THERAPY | HEALTH | CANCER

Publication Year: 2020

Volume: 25

Abstract:

Inulin is a polysaccharide of fructose widely used in the food and pharmaceutical industry due to its physicochemical properties and technological applications. Inulin from jicama (*Smallanthus sonchifolius*) and cabuya (*Agave americana*) was obtained. The steps for inulin obtention were: raw material preparation, extraction and purification. The extraction conditions were determined using a random design with three levels of stirring speed (0, 130 and 300 rpm), and a 3(2) factorial experimental design with three levels of temperature (40, 60 and 80 degrees C) and solid:liquid ratio (1:2, 1:3 and 1:5 S:L). The results showed that the best extractions conditions for jicama were 130 rpm, 75 degrees C, 1:5 S:L and 25 min; while for cabuya were 80 degrees C, 300 rpm, 1:5 S-L and 100 min. The weight average molecular weight of inulin from jicama and cabuya were 5799.9 and 4659.75 g/mol, respectively. The identity of the obtained inulin from jicama and cabuya were confirmed by infrared (IR) and Raman spectroscopy. In addition, scanning electron microscopy, differential scanning calorimetry and thermogravimetry analyses were performed to characterize both inulins.

Source: OXIDATIVE MEDICINE AND CELLULAR LONGEVITY | 2018: - 2018

Title: Recovery of Cardiac Remodeling and Dysmetabolism by Pancreatic Islet Injury Improvement in

Diabetic Rats after Yacon Leaf Extract Treatment

Author(s): dos Santos, KC | Cury, SS | Ferraz, APCR | Corrente, JE | Goncalves, BM | Machado, LHD | Carvalho, RF | Nakamune, ACDS | Fabro, AT | Freire, PP | Correa, CR

Date: 2018

Author Keywords:

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS YACON | OXIDATIVE STRESS | CARDIOMYOPATHY | LEAVES | COMPLICATIONS | DYSFUNCTION

Publication Year: 2018

Volume: 2018

Abstract:

Yacon (*Smallanthus sonchifolius*) is a native Andean plant rich in phenolic compounds, and its effects on dysmetabolism and cardiomyopathy in diabetic rats was evaluated. The rats (10/group) were allocated as follows: C, controls; C + Y, controls treated with Yacon leaf extract (YLE); DM, diabetic controls; and DM + Y, diabetic rats treated with YLE. Type 1 diabetes (T1DM) was induced by the administration of streptozotocin (STZ; 40 mg(-1)/kg body weight, single dose, i.p.), and treated groups received 100 mg/kg body weight YLE daily via gavage for 30 d. The YLE group shows an improvement in dysmetabolism and cardiomyopathy in the diabetic condition (DM versus DM + Y) promoting a significant reduction of glycemia by 63.39%, an increase in insulin concentration by 49.30%, and a decrease in serum triacylglycerol and fatty acid contents by 0.39- and 0.43-fold, respectively, by ameliorating the pancreatic islet injury, as well as increasing the activity of the antioxidant enzymes (catalase, superoxide dismutase, and glutathione peroxidase) and decreasing the fibrosis and cellular disorganization in cardiac tissue. The apparent benefits of YLE seem to be mediated by ameliorating dysmetabolism and oxidative stress in pancreatic and cardiac tissues.

Source: NUTRIENTS | 11 (11): - NOV 2019

Title: A Sustainable Wholesome Foodstuff; Health Effects and Potential Dietotherapy Applications of Yacon

Author(s): Yan, MR | Welch, R | Rush, EC | Xiang, XS | Wang, X

Date: NOV 2019

Author Keywords: yacon | public health | chronic diseases | prebiotic | fructooligosaccharides | inulin | phenolic compounds

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS YACON | INULIN-TYPE FRUCTANS | PHENOLIC-COMPOUNDS | AQUEOUS EXTRACT | DIABETIC-RATS | CELL-DEATH | ANTIOXIDANT | LEAVES | ROOTS | FRUCTOOLIGOSACCHARIDES

Publication Year: 2019

Volume: 11

Abstract:

A sustainable food supply is an ever-growing public and planetary health concern influenced by food

culture, food practices, and dietary patterns. Globally, the consumption of plant foods that offer physiological and biochemical benefits is increasing. In recent years, products made from yacon (*Smallanthus sonchifolius*) tubers and leaves, e.g., in the form of syrup, powder, and herbal tea, have steadily emerged with scientific evidence to validate their possible health claims. Yacon was introduced to New Zealand in 1966, and its products can now be produced on a commercial scale. This paper reviews literature published mainly in the last 10 years concerning the health-related properties of yacon as a wholesome foodstuff and its bioactive components, e.g., fructooligosaccharides. Literature was sourced from Web of Science, PubMed, EBSCO Health, and Google Scholar up to June 2019. The potential markets for yacon in the field of food technology and new dietotherapy applications are discussed. Furthermore, the unique features of New Zealand-produced yacon syrup are introduced as a case study. The paper explores the scientific foundation in response to the growing public interest in why and how to use yacon.

Source: PLANTS-BASEL | 9 (7): - JUL 2020

Title: Chemical Defense of Yacon (*Smallanthus sonchifolius*) Leaves against Phytophagous Insects: Insect Antifeedants from Yacon Leaf Trichomes

Author(s): Tsunaki, K | Morimoto, M

Date: JUL 2020

Author Keywords: Asteraceae | *Smallanthus sonchifolius*(Poepp | & Endl |) H | Rob | sesquiterpene lactones | uvedalin | enhydrin | insect antifeedants | Spodoptera lituraF

Keywords Plus: SESQUITERPENE LACTONES | GLANDULAR TRICHOMES | HERBIVORE | RESISTANCE | CONSTITUENTS

Publication Year: 2020

Volume: 9

Abstract:

Yacon is a perennial crop with high insect resistance. Its leaves have many glandular trichomes, which may be related to pest resistance. In order to collect the constituents of glandular trichomes, leaves were rinsed using dichloromethane (DCM) to obtain the rinsate, and the plant residues were subsequently extracted by DCM to obtain a DCM extract containing the internal constituents of yacon leaves. Biologic evaluations revealed that insect antifeedant activity was stronger for the rinsate than for the DCM extract against the common cutworm. The major constituents of rinsate were isolated by silica gel flash chromatography and were identified as sesquiterpene lactones (SLs), uvedalin (1) and enhydrin (2) and uvedalin aldehyde (3), collectively known as melampolides. Although SLs1and2exhibited remarkably strong insect antifeedant activity, SL3and reduced corresponding derivatives (4and5) of1and2exhibited moderate insect antifeedant activity. Additionally, the two analogs, parthenolide (6) and erioflorin (7) showed moderate insect antifeedant activity. The results indicate that the substituent patterns of SLs may be related to the insect antifeedant activities. The insect antifeedant activities of SLs1and2were similar to that of the positive control azadirachtin A (8), and thus these natural products may function in chemical defense against herbivores.

Source: BIOSCIENCE JOURNAL | 35 (4): 992-1001 JUL-AUG 2019

Title: YACON PRODUCTION AT DIFFERENT PLANTING SEASONS AND GROWING ENVIRONMENTS

Author(s): da Silva, DMN | de Oliveira, FL | Quaresma, MAL | Erlacher, WA | Mendes, TP

Date: JUL-AUG 2019

Author Keywords: Smallanthus sonchifolius | Polymnia sonchifolia | Tuberous root | Yield | Temperature

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | IMMUNE-RESPONSE | DIABETIC-RATS | ROOTS

Publication Year: 2019

Volume: 35

Abstract:

Yacon is a functional food with great potential for horticultural exploitation and its cultivation demands the generation of agronomic information. To address these needs, this study was performed to evaluate the production of yacon planted in different planting seasons under two growing conditions in Brazil. The experiments were conducted in two different locations, one in the mountain region (tropical microclimate at altitude with milder temperatures) and the other in the lowland region (warm tropical microclimate with higher temperatures). At both sites, yacon was planted in four seasons: autumn (April), winter (July), spring (September) and summer (December). At harvest, the tuberous roots were evaluated for leaf area index and the variables of vegetative development and productivity of plants (for total and standard commercial roots). It was concluded that yacon cultivation in mountain conditions (tropical climate with milder temperature) promotes the development and production of yacon. Additionally, planting in the autumn for both growing conditions (mountain or lowland) promotes the development and production of yacon, including increased production of roots of better commercial grade, allowing greater economic profitability. These results indicate that temperature has an influence on the growth and yield of the tuberous roots of yacon, and milder temperatures were more favourable.

Source: FOODS | 7 (4): - APR 2018

Title: Phytochemical Properties and Nutrigenomic Implications of Yacon as a Potential Source of Prebiotic: Current Evidence and Future Directions

Author(s): Cao, Y | Ma, ZF | Zhang, HX | Jin, YF | Zhang, YH | Hayford, F

Date: APR 2018

Author Keywords: yacon | Smallanthus sonchifolius | prebiotic | fructooligosaccharides | underutilized

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | CHAIN FATTY-ACIDS | HEALTH-BENEFITS | LEAF EXTRACTS | DIABETIC-RATS | ANTIOXIDANT ACTIVITY | COLON-CANCER | POLYMNIA-SONCHIFOLIA | CALCIUM-ABSORPTION | NUTRITIONAL-STATUS

Publication Year: 2018

Volume: 7

Abstract:

The human gut is densely populated with diverse microbial communities that are essential to health. Prebiotics and fiber have been shown to possess the ability to modulate the gut microbiota. One of the plants being considered as a potential source of prebiotic is yacon. Yacon is an underutilized plant consumed as a traditional root-based fruit in South America. Yacon mainly contains fructooligosaccharides (FOS) and inulin. Therefore, it has bifidogenic benefits for gut health, because FOS are not easily broken down by digestive enzymes. Bioactive chemical compounds and extracts isolated from yacon have been studied for their various nutrigenomic properties, including as a prebiotic for intestinal health and their antimicrobial and antioxidant effects. This article reviewed scientific studies regarding the bioactive chemical compounds and nutrigenomic properties of extracts and isolated compounds from yacon. These findings may help in further research to investigate yacon-based nutritional products. Yacon can be considered a potential prebiotic source and a novel functional food. However, more detailed epidemiological, animal, and human clinical studies, particularly mechanism-based and phytopharmacological studies, are lacking for the development of evidence-based functional food products.

Source: EUROPEAN FOOD RESEARCH AND TECHNOLOGY | 243 (12): 2155-2161 DEC 2017

Title: Identification and antimicrobial activity of the sesquiterpene lactone mixture extracted from *Smallanthus sonchifolius* dried leaves

Author(s): de Andrade, EF | Carpine, D | Dagostin, JLA | Barison, A | Rudiger, AL | de Muniz, GIB | Masson, ML

Date: DEC 2017

Author Keywords: Yacon | Gram-positive bacteria | *Staphylococcus aureus* | GC-MS | NMR

Keywords Plus: NF-KAPPA-B | INHIBITORY-ACTIVITY | LEAF EXTRACTS | YACON | ANTIBACTERIAL | CONSTITUENTS | MELAMPOLIDES | ANTIOXIDANT | MECHANISMS | APOPTOSIS

Publication Year: 2017

Volume: 243

Abstract:

The present study aimed to identify and screen the antibacterial activity of a mixture of sesquiterpene lactones (SLs) obtained from the dichloromethane extract of *Smallanthus sonchifolius* leaves. *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Salmonella enterica* strains were used as bacterial tests. The identification and quantification of compounds were established by GC/MS and H⁻¹, C-13 2D NMR spectroscopic analysis. The antimicrobial activity was measured by the disk diffusion method and minimal inhibitory concentration assay (MIC). In vitro antimicrobial assays showed that the mixture of SLs found (uvedalin and enhydrin) displays poor antibacterial activity against the Gram-negative bacteria and appreciable antibacterial properties against the Gram-positive bacterial strain tested when 90 A mu g of the SLs mixture per disk was used. The MIC determination against *S. aureus* revealed that a concentration of 750 A mu g of SLs mixture mL(-1) should be necessary to inhibit the

strain. These results indicate that the SLs mixture of enhydrin and uvedalin from yacon leaves presents promising antibacterial properties against *S. aureus* and apparent lack of activity against the Gram-negative bacterial strains tested at the concentrations applied.

Record 146/312: WOS:000502310500002

Source: BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 62: - 2019

Title: Relationship Between Parameters of Development and Functional Compounds of Yacon Leaves

Author(s): Ferreira, BMR | Dagostin, JLA | de Andrade, EF | Takashina, TA | Ellendersen, LDN | Masson, ML

Date: 2019

Author Keywords: Smallanthus sonchifolius | sesquiterpene lactones | physical parameters | chemical parameters | phenolic content

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS ASTERACEAE | SESQUITERPENE LACTONES | ANTIOXIDANT ACTIVITY | LEAF EXTRACTS | IDENTIFICATION | MELAMPOLIDES

Publication Year: 2019

Volume: 62

Abstract:

Yacon is a tuberous root from the Andean region being increasingly grown across the world due to the low caloric values of their roots and the functional properties of extractions of its leaves. However, there is still a gap in the knowledge of how the plant develops, and if physical and chemical changes are noticed regarding maturity. The subject of this work was to investigate the dynamics of a group of parameters and to establish correlations across them. To achieve this goal, leaves collected from three different parts of the plant in three months were assessed regarding size (plant height and leaf area), color and the presence of sesquiterpene lactones. Different methods of extraction were also studied and the total phenolic content was analyzed. The analysis of the results revealed different patterns in the quantity, size and leaf distribution according to the age of the plant. From three different methods of extraction studied, decoction seems to be the most appropriate one to obtain phenolic compounds with greater yield and safety. Besides, the greenness of yacon leaves showed a linear correlation to the total phenolic content, being a simple and promising estimator of the corresponding bioactive group. Sesquiterpene lactones were identified in all extracts, indicating the ease of their extractability even in simple procedures of tea-making.

Source: BOLETIN LATINOAMERICANO Y DEL CARIBE DE PLANTAS MEDICINALES Y AROMATICAS | 14 (5): 355-363 SEP 2015

Title: Composition of the essential oil from leaves of *Smallanthus quichensis* (Asteraceae) from Costa Rica

Author(s): Chaverri, C | Ciccio, JF

Date: SEP 2015

Author Keywords: *Smallanthus quichensis* | Asteraceae | Costa Rica | essential oil | GC-FID | GC-MS | alpha-pinene | p-cymene | 1,8-cineole | beta-phellandrene | alpha-phellandrene | limonene

Keywords Plus: OCCURRING TERPENE DERIVATIVES | SESQUITERPENE LACTONES | CHEMICAL-CONSTITUENTS | ACID-DERIVATIVES | LEAF EXTRACTS | SONCHIFOLIUS | MELAMPOLIDES

Publication Year: 2015

Volume: 14

Abstract:

Smallanthus is a genus of flowering plants in the Asteraceae family, which has about 24 species, ranging mostly from southern Mexico and Central America to the Andes in South America. The aim of the present study was to identify the chemical composition of leaf essential oil of *S. quichensis*, growing wild in Costa Rica. The extraction of the oils was carried out by the hydrodistillation method, using a modified Clevenger type apparatus. The chemical composition of the oils was analyzed by capillary GC-FID and GC-MS using the retention indices on DB-5 type capillary column. A total of 100 compounds were identified, accounting for about 90% of the total amount of the oils. *Smallanthus quichensis* leaf produced a monoterpenoid-rich oil, whose composition was dominated by alpha-pinene (64.5%) and 1,8-cineole (9.7%) or, in a different sample, by alpha-pinene (35.5%) with moderate amounts of p-cymene (11.5%), beta-phellandrene (9.2%), alpha-phellandrene (9.0%) and limonene (5.8%). This is the first report of the chemical composition of the essential oil obtained from this plant species.

Source: SUSTAINABILITY | 11 (17): - SEP 1 2019

Title: Environmental and Economic Performance of Yacon (*Smallanthus sonchifolius*) Cultivated for Fructooligosaccharide Production

Author(s): Wagner, M | Kamp, L | Graeff-Honninger, S | Lewandowski, I

Date: SEP 1 2019

Author Keywords: yacon | fructooligosaccharides | environmental performance | LCA | production cost | LCC

Keywords Plus: HELIANTHUS-TUBEROSUS L. | POEPP. | IMPACT | YIELD | ALLOCATION | BIOMASS | STORAGE | ENDL | CROP

Publication Year: 2019

Volume: 11

Abstract:

As the prevalence of diabetes is predicted to rise globally in the coming decades, the demand for sugar substitutes is expected to increase significantly. In this context, natural sweeteners have been receiving particular attention, as artificial sweeteners have been associated with obesity and cardiovascular disease. One natural sweetener is yacon (*Smallanthus sonchifolius*) ((Poepp. and Endl.) H. Robinson), which could play a prominent role due to its high fructooligosaccharides yield. Yacon is currently only a minor crop in Europe and there is little information available on the environmental and economic impacts of

its various cultivation systems. These are especially affected by nitrogen fertilization levels and genotype selection. Thus, before the crop is introduced on a larger scale, it is expedient to identify the most sustainable cultivation system. The life-cycle assessment (LCA) and life-cycle costing (LCC) analysis of yacon cultivation systems conducted in this study revealed significant differences between yacon genotypes and found that a nitrogen fertilization level of 80 kg N ha⁻¹ significantly decreased production costs and simultaneously led to a comparatively good environmental performance. The results indicated that, for the holistic evaluation of agricultural systems, it is crucial to assess both the economic and environmental performance of new crops.

Source: ARCHIVOS LATINOAMERICANOS DE NUTRICION | 66 (2): 148-155 JUN 2016

Title: Stability of a functional beverage composed by tropical fruits and yacon (*Smallanthus sonchifolius*) under refrigerated storage

Author(s): Dionisio, AP | Wurlitzer, NJ | Goes, TDS | Borges, MDF | Garruti, D | Araujo, IMDS

Date: JUN 2016

Author Keywords: *Smallanthus sonchifolius* | storage | quality

Keywords Plus: ANTIOXIDANT CAPACITIES | BIOACTIVE COMPOUNDS

Publication Year: 2016

Volume: 66

Abstract:

The development of beverages with functional properties must consider the preservation of the bioactive or functional properties during storage. For this reason, the aim of this study was to evaluate the stability of a functional beverage of tropical fruits and yacon, stored under refrigeration. The beverage, composed by 50% of yacon and 50% of a blended tropical fruits (camu-camu, acerola, cashew-apple, yellow mombin, acai and pineapple), was pasteurized (90 seconds/85 degrees C) and stored under refrigeration (5 degrees C). After processing and on 45 day intervals until the end of storage, were assayed the bioactive compounds (ascorbic acid and total extractable polyphenols), antioxidant activity, total soluble solids, titra-table total acidity, pH, color (L*, a* and b*), total sugar content, sucrose, glucose and fructose, and the physical and chemical analyzes were limited by decreased total antioxidant activity and their bioactive components. The beverage showed relative physical and chemical quality during storage period, and in the 225 days of storage, the total extractable polyphenols and total antioxidant activity showed a significantly decline, and thus, these parameters were evaluated only until this period. However, the main limitation for the beverage storage was due to sensory acceptability and microbiological safety, which although in accordance with Brazilian legislation, limited storage period for 90 days.

Record 155/312: WOS:000389204700004

Source: PHYTOTHERAPY RESEARCH | 30 (12): 1937-1942 DEC 2016

Title: Inulin-Type Oligosaccharides Extracted from Yacon Produce Antidepressant-Like Effects in Behavioral Models of Depression

Author(s): An, L | Yang, JC | Yin, H | Xue, R | Wang, Q | Sun, YC | Zhang, YZ | Yang, M

Date: DEC 2016

Author Keywords: behavior | inulin-type oligosaccharides | antidepressant | Yacon

Keywords Plus: MORINDA-OFFICINALIS | SMALLANTHUS-SONCHIFOLIUS | MICROBIOTA | MEDICINE

Publication Year: 2016

Volume: 30

Abstract:

Yacon (*Smallanthus sonchifolius*), a traditional food in the Andean diet, is attracting global attention for its medicinal properties, which are mainly because of its high content of non-digestible oligosaccharides. The purpose of this study is to evaluate the antidepressant-like effects of inulin-type oligosaccharides extracted from yacon (YOs) in behavioral models of depression. Behavioral despair models in mice including the tail suspension test (TST) and the forced swimming test (FST) were used to determine the effects of acute YOs administration. The locomotor activity was also explored to eliminate any false-positive activity. In addition, to further investigate the antidepressant-like effects of subchronic YOs administration, the learned helplessness (LH) paradigm in rats was performed. The results demonstrated that YOs (25, 50, or 100 mg/kg, p.o.) treatment significantly reduced the immobility time in the mouse TST and FST in a U-shaped, dose-dependent manner, and showed no stimulatory effect on the locomotor activity. Furthermore, subchronic YOs (25, 50, or 100 mg/kg, p.o.) treatment significantly reversed the escape deficits in LH rats, including an increased number of escape failures and prolonged escape latency. These findings suggest that the inulin-type oligosaccharides extracted from yacon may be a prospective natural source for antidepressants.

Source: FOOD RESEARCH INTERNATIONAL | 126: - DEC 2019

Title: Yacon syrup reduces postprandial glycemic response to breakfast: A randomized, crossover, double-blind clinical trial

Author(s): Adriano, LS | Dionisio, AP | de Abreu, FAP | Carioca, AAF | Zocolo, GJ | Wurlitzer, NJ | Pinto, CD | de Oliveira, AC | Sampaio, HAD

Date: DEC 2019

Author Keywords: *Smallanthus sonchifolius* | Fructooligosaccharides | Prebiotics | Women | Postprandial period

Keywords Plus: PLASMA-GLUCOSE | INSULIN-RESISTANCE | SMALLANTHUS-SONCHIFOLIUS | GHRELIN RESPONSES | BLOOD-GLUCOSE | SOLUBLE FIBER | ALL-CAUSE | DIETARY | DISEASE | CONSUMPTION

Publication Year: 2019

Volume: 126

Abstract:

Yacon is a root rich in fructooligosaccharides (FOS), which act as prebiotics. Numerous studies have

shown promising results in the technological aspects of producing yacon syrup. However, uncertainties exist concerning whether yacon syrup can modulate postprandial glucose and lipid profiles. In order to assess the effect of yacon syrup on postprandial glucose, insulin and triglyceride (TG) responses, a randomized, crossover, double-blind clinical intervention with 40 women (20 normal weight and 20 grade I obese) was performed. Participants underwent two-arms of intervention with at least a one-week wash-out period between visits. On each intervention day, after 12 h of fasting, an aliquot of blood was collected. For intervention A, volunteers consumed breakfast + 40 g of placebo, whereas for intervention B, participants consumed breakfast + 40 g of yacon syrup (14 g of FOS). Blood samples were drawn at 15, 30, 45, 60, 90, and 120 min. Glucose and insulin concentrations were lowered after yacon syrup intake as compared to placebo at following times: 30 min for glucose and 15, 30 and 45 min for insulin. In conclusion, yacon syrup has a postprandial decreasing effect glucose and insulin concentrations in adult women. This effect was not evident for triglyceride concentration.

Source: PARASITES & VECTORS | 10: - NOV 13 2017

Title: Germacranolide-type sesquiterpene lactones from *Smallanthus sonchifolius* with promising activity against *Leishmania mexicana* and *Trypanosoma cruzi*

Author(s): Ulloa, JL | Spina, R | Casasco, A | Petray, PB | Martino, V | Sosa, MA | Frank, FM | Muschietti, LV

Date: NOV 13 2017

Author Keywords: Sesquiterpene lactones | *Smallanthus sonchifolius* | Leishmanicidal activity | Trypanocidal activity | In vitro assays | In vivo assays

Keywords Plus: PROTOZOAN NEGLECTED DISEASES | CHAGAS-DISEASE | SECONDARY METABOLITES | TRYPANOCIDAL ACTIVITY | NATURAL-PRODUCTS | INFECTION | DRUGS | PSILOSTACHYIN | BENZNIDAZOLE | MECHANISMS

Publication Year: 2017

Volume: 10

Abstract:

Background: Leishmaniasis and Chagas disease are life-threatening illnesses caused by the protozoan parasites *Leishmania* spp. and *Trypanosoma cruzi*, respectively. They are known as "neglected diseases" due to the lack of effective drug treatments and the scarcity of research work devoted to them. Therefore, the development of novel and effective drugs is an important and urgent need. Natural products are an important source of bioactive molecules for the development of new drugs. In this study, we evaluated the activity of enhydrin, uvedalin and polymatin B, three sesquiterpene lactones (STLs) isolated from *Smallanthus sonchifolius*, on *Leishmania mexicana* (MNYC/BZ/62/M) and *Trypanosoma cruzi* (Dm28c). In addition, the in vivo trypanocidal activity of enhydrin and uvedalin and the effects of these STLs on parasites' ultrastructure were evaluated. Methods: The inhibitory effect of the three STLs on the growth of *L. mexicana* amastigotes and promastigotes as well as *T. cruzi* epimastigotes was evaluated in vitro. The changes produced by the STLs on the ultrastructure of parasites were examined by

electron microscopy (TEM). Enhydrin and uvedalin were also studied in a murine model of acute *T. cruzi* infection (RA strain). Serum activities of the hepatic enzymes alanine aminotransferase, aspartate aminotransferase and lactate dehydrogenase were used as biochemical markers of hepatotoxicity. Results: The three compounds exhibited leishmanicidal activity on both parasite forms with IC₅₀ values of 0.42-0.54 µg/ml for promastigotes and 0.85-1.64 µg/ml for intracellular amastigotes. Similar results were observed on *T. cruzi* epimastigotes (IC₅₀ 0.35-0.60 µg/ml). The TEM evaluation showed marked ultrastructural alterations, such as an intense vacuolization and mitochondrial swelling in both *L. mexicana* promastigotes and *T. cruzi* epimastigotes exposed to the STLs. In the in vivo study, enhydrin and uvedalin displayed a significant decrease in circulating parasites (50-71%) and no signs of hepatotoxicity were detected. Conclusions: Enhydrin, uvedalin and polymatin B possess significant leishmanicidal and trypanocidal activity on different parasite stages. These results show that these compounds may provide valuable leads for the development of new drugs against these neglected parasitic diseases.

Source: GENETIKA-BELGRADE | 50 (3): 803-816 2018

Title: ASSESSMENT OF GENETIC DIVERSITY OF *Smallanthus sonchifolius* (Poepp. & Endl.) H. ROBINSON LANDRACES BY USING AFLP MARKERS

Author(s): Ovesna, J | Russo, D | Frescura, D | Cusimamani, EF | Svobodova, E | Milella, L

Date: 2018

Author Keywords: Amplified Fragment Length Polymorphism | DNA | genetic variation | molecular markers | Yacon

Keywords Plus: L. CULTIVARS | YACON | RAPD | ISSR | GENOTYPES | ANTIOXIDANT | LEAVES | SSR | IDENTIFICATION | CONSERVATION

Publication Year: 2018

Volume: 50

Abstract:

AFLP (Amplified Fragment Length Polymorphism) analysis was carried out on *Smallanthus sonchifolius* to increase the knowledge on its genetic diversity. It is an ethnomedical and edible plant native of Peru and cultivated in many other countries. Thirteen landraces were analyzed by selected AFLP primer combinations generating a number of 185 fragments, of which 180 were polymorphic (97.00% of polymorphism). The mean value of fragments per primer combination was 37, but MseI (M)-CAG/EcoRI (E)-ACT primer combination reported the highest number with 63 amplicons, instead only 27 were revealed by M-CAG/E-ACC. The marker attributes such as resolving power (RP), marker index (MI) and polymorphism information content (PIC) were determined. RP values varied from 11.54 (M-CAG/E-ACC) to 27.54 (M-CAG/E-ACT), PIC ranged from 0.25 (M-CAG/E-AGC) to 0.28 (M-CAG/E-ACA), whereas MI values were found to be in the range from 6.18 (M-CAG/E-ACC) to 15.95 (M-CAG/E-ACT). Cluster analysis and PCA were evaluated for determining relationships among yacon landraces. We concluded that AFLP markers showed a highest efficiency in estimating genetic diversity in yacon despite to previous paper in which 3 times lower samples have been analyzed.

Source: FOOD AND BIOPRODUCTS PROCESSING | 95: 96-105 JUL 2015

Title: In vitro evaluation of yacon (*Smallanthus sonchifolius*) tuber flour prebiotic potential

Author(s): Sousa, S | Pinto, J | Pereira, C | Malcata, FX | Pacheco, MTB | Gomes, AM | Pintado, M

Date: JUL 2015

Author Keywords: Yacon | Prebiotic | Probiotic | Fructooligosaccharides | *Lactobacillus* | *Bifidobacterium* | *Enterococcus*

Keywords Plus: PROBIOTIC BACTERIA | ORGANIC-ACIDS | ENTEROCOCCI | SURVIVAL | POEPP. | FRUCTOOLIGOSACCHARIDES | IDENTIFICATION | ENUMERATION | ENDL

Publication Year: 2015

Volume: 95

Abstract:

Yacon [*Smallanthus sonchifolius* (Poepp. and Endl.) H. Robinson; Asteraceae] roots have been shown to be a source of prebiotic compounds. However, there are no known studies concerning processed yacon roots. The objective of this study was to investigate the potential prebiotic activity of yacon tuber flour. For this purpose, an aqueous extract was tested for selection of yacon incorporation and sterilization method and selection of the most favourable concentration to be tested for prebiotic activity. Once these conditions were identified, the potential prebiotic activity of the yacon extract was evaluated by determination of viable cell numbers and metabolic activity against four probiotic strains, namely, *Enterococcus faecium* 32, *Bifidobacterium animalis* Bo, *Lactobacillus acidophilus* Ki and *Lactobacillus casei* L26). Results showed that the best incorporation and sterilization method was to autoclave the supernatant, resultant from the yacon tuber flour suspension, at 121 degrees C for 20 min and add it to sterilized basal medium. For the confirmation of potential prebiotic activity, de Man-Rogosa-Sharpe (MRS) medium without a conventional carbon source (negative control), with 2% (w/v) glucose per se (positive control) and associated with 1% (w/v) yacon tuber flour were chosen. Yacon tuber flour revealed a potential prebiotic activity upon the growth of the probiotic strains tested, probably due to its fructooligosaccharides (FOS) content. (C) 2015 The Institution of Chemical Engineers. Published by Elsevier B.V. All rights reserved.

Source: PHARMACEUTICAL BIOLOGY | 53 (8): 1183-1193 2015

Title: Yacon roots (*Smallanthus sonchifolius*) improve oxidative stress in diabetic rats

Author(s): Habib, NC | Serra-Barcellona, C | Honore, SM | Genta, SB | Sanchez, SS

Date: 2015

Author Keywords: Andean tubers | antihyperlipidemic | antioxidant | diabetes | fatty acids

Keywords Plus: LIPID-PEROXIDATION | SUPEROXIDE-DISMUTASE | ANTIOXIDANT ENZYMES | FREE-RADICALS | KIDNEY | COMPLICATIONS | ERYTHROCYTES | MECHANISMS | REDUCTION | EXTRACTS

Publication Year: 2015

Volume: 53

Abstract:

Context: *Smallanthus sonchifolius* (Poepp. and Endl.) H. Robinson, Asteraceae (yacon) roots are a natural product recognized by the traditional medicine to treat diabetes-related problems. There are no reports concerning the potential of yacon roots to reduce oxidative stress and ameliorate diabetes complications in diabetic animals. **Objective:** This work analyzes the in vivo antioxidant activity and beneficial effects of yacon roots, using a model of streptozotocin-induced diabetes in rats. **Materials and methods:** Lipid peroxidation and other indicators of oxidative stress were determined in liver and kidney homogenates from non-diabetic rats, untreated diabetic rats, and diabetic rats treated orally with yacon flour (340mg fructooligosaccharide/kg/d) as a diet supplement for 90 d. Biochemical parameters were determined in liver, kidney, and blood at the end of the experimental period. **Results:** Yacon supplementation to diabetic rats produced a significant decrease in malondialdehyde levels in both liver (-30.97%) and kidney (-19.15%). Hepatic superoxide dismutase and catalase activities were significantly lower in diabetic-treated rats (-13.46 and -64.33%, respectively) compared with diabetic controls. Similar results were observed in kidney. The treatment of diabetic rats produced an increase of glutathione peroxidase and glutathione levels in liver (172.50 and 35.91%, respectively) and kidney (177.78 and 57.76%, respectively). Plasma cholesterol and triacylglycerol levels and liver fatty acid composition, which were altered in diabetic rats, reverted back to nearly normal with yacon treatment. **Conclusions:** These results indicate that yacon root flour is a potential diet supplement with high in vivo antioxidant activity.

Source: PHYTOCHEMISTRY REVIEWS | 19 (4): 983-1043 AUG 2020

Title: Natural disesquiterpenoids: an overview of their chemical structures, pharmacological activities, and biosynthetic pathways

Author(s): Ma, YH | Dou, XX | Tian, XH

Date: AUG 2020

Author Keywords: Natural disesquiterpenoids | Structures | Pharmacological activity | Biosynthetic pathway

Keywords Plus: SESQUITERPENE LACTONE DIMERS | CRYPTOPORIC ACID-DERIVATIVES | POTENTIAL ANTIINFLAMMATORY ACTIVITY | A-D | FRUITING BODIES | GUAIANE DIMERS | CYTOTOXIC SESQUITERPENOID | SMALLANTHUS-SONCHIFOLIUS | ABSOLUTE-CONFIGURATION | CHLORANTHACEAE PLANTS

Publication Year: 2020

Volume: 19

Abstract:

Disesquiterpenoids are constructed by two sesquiterpenoid molecules, containing at least 30 carbons with various connection patterns, and numerous new skeletons have been constructed. The aim of this review is to comprehensively summarise the isolation, structural elucidation, chemical synthesis, possible biogenetic pathways, and important pharmacological activities of the natural disesquiterpenoids discovered between 2010 and 2020. Modern analytical tools and synthetic means that have led to structural

revisions as well as name corrections have also been included. Here, 227 references and 470 compounds are summarized.

Source: INTERNATIONAL JOURNAL OF FOOD SCIENCE AND TECHNOLOGY | 56 (1): 392-401 JAN 2021

Title: Vacuum impregnation of apple slices with Yacon (*Smallanthus sonchifolius*Poepp. & Endl) fructooligosaccharides to enhance the functional properties of the fruit snack

Author(s): Mejia-aguila, RA | Aguilar-Galvez, A | Chirinos, R | Pedreschi, R | Campos, D

Date: JAN 2021

Author Keywords: Apple slices | fructooligosaccharides | *Smallanthus sonchifolius* | vacuum impregnation

Keywords Plus: OSMOTIC DEHYDRATION | FRUCTO-OLIGOSACCHARIDES | ANTIOXIDANT ACTIVITY | COMPONENTS | STABILITY | CAPACITY | SUCROSE | CALCIUM | POEPP. | TISSUE

Publication Year: 2021

Volume: 56

Abstract:

This work aimed to incorporate prebiotic FOS from yacon in apple slices using vacuum impregnation (VI). Three FOS concentrations (10.3, 14.1 and 18.9 g per 100 g of dry matter (DM)), two temperatures (25 and 35 degrees C), reuse of extracts and stability of the impregnated slices were evaluated. The highest impregnation level (30.5 g per 100 g DM) was obtained at 35 degrees C with 14.1% FOS extract while levels of common sugars were reduced. Total phenolics and ABTS antioxidant capacity (AC) slightly decreased while ORAC AC was reduced by 55%. Reuse of the impregnation solution in successive cycles after restoring the FOS level maintained the FOS concentration and profile (GF2-GF7), sugars and phenolic antioxidants. FOS in apple slices remained stable during 4 week storage, while a(w), colour and fracture point changed during storage. This work demonstrated the feasibility of yacon FOS to improve the functional properties of dehydrated apple slices.

Source: FOOD RESEARCH INTERNATIONAL | 100: 460-467 Part 1 OCT 2017

Title: Yacon syrup: Food applications and impact on satiety in healthy volunteers

Author(s): da Silva, MDG | Dionisio, AP | Carioca, AAF | Adriano, LS | Pinto, CO | de Abreu, FAP | Wurlitzer, NJ | Araujo, IM | Garruti, DD | Pontes, DF

Date: OCT 2017

Author Keywords: *Smallanthus sonchifolius* | Focal group | Yogurt | Satiety

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | DIETARY FIBER | RHEOLOGICAL PROPERTIES | YOGURT | FRUCTOOLIGOSACCHARIDES | ENRICHMENT | APPETITE | HUNGER | ROOTS

Publication Year: 2017

Volume: 100

Abstract:

Syrup obtained from yacon roots could be well positioned as a nutritional product due to its high fructooligo-saccharides (FOS) content. Considering this, we examined the potential food applications of yacon syrup, using the focal group methodology, and its sensorial acceptability when incorporated in yogurt. The beneficial effects of the consumption of yacon syrup were studied over a 2-week period in a double-blind placebo-controlled experiment (namely Test A) and other consistent of only one day of yacon syrup consumption (namely Test B) were also evaluated. The doses of yacon syrup for both experiments were 8.74 g of FOS/day. Energy intake, hunger, satiety, fullness and prospective food consumption were assessed with analogue scales at the end of each test. The results indicate that the yogurt was the food most suggested by the focus group, and, the average of the scores given to the attributes when the yacon syrup was incorporated into a yogurt were: 7.78 for appearance; 7.72 for aroma; 7.02 for flavor and 6.96 for overall acceptability, corresponding to "like very much" and "like moderately". Furthermore, the results indicate that yacon syrup has a positive effect on appetite and its effect was dependent on gender and period of intervention, being statistically significant ($P < 0.05$) in women, after 2-week period. These findings suggested that increasing FOS intake could help to increase satiety, and consequently, be helpful in the management of type 2-diabetes or control of the current high prevalence of overweight or obesity.

Source: BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 58 (1): 34-40 JAN-FEB 2015

Title: Use of Different Kinds of Solutes Alternative to Sucrose in Osmotic Dehydration of Yacon

Author(s): Brochier, B | Marczak, LDF | Norena, CPZ

Date: JAN-FEB 2015

Author Keywords: osmotic dehydration | osmotic agent | yacon | FOS | inulin | prebiotic

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | MASS-TRANSFER | MALTODEXTRIN | COEFFICIENTS | FOODS

Publication Year: 2015

Volume: 58

Abstract:

The present work aimed to evaluate glycerol, maltodextrin, polydextrose and sorbitol for the osmotic dehydration of yacon for diabetics, keeping its properties as prebiotic. Osmotic dehydration was carried out using a yacon to 33% concentrated syrup weight ratio of 1: 12, with magnetic stirring at 23 degrees C and atmospheric pressure. The best results were achieved for glycerol and sorbitol with 80 +/- 4% and 81 +/- 1% of water removal and increase of 3.73 +/- 0.11 and 4.30 +/- 0.16 times in total soluble solids respectively. Maltodextrin did not promote dehydration.

Source: SEPARATION SCIENCE AND TECHNOLOGY | 52 (9): 1531-1536 2017

Title: Sugaring-out-assisted aqueous two-phase extraction of fructooligosaccharides from yacon (Smallanthus sonchifolius)

Author(s): Zhang, C | Liu, Y

Date: 2017

Author Keywords: Extraction | fructooligosaccharides | yacon | purification | sugaring-out

Keywords Plus: FRUCTO-OLIGOSACCHARIDES | LIQUID-CHROMATOGRAPHY | ACETONITRILE | SEPARATION | SYSTEM | POEPP.

Publication Year: 2017

Volume: 52

Abstract:

Yacon roots contain about 80 wt% of -(2-1)-fructooligosaccharides (FOS). This work aims to use water extraction method combined with sugaring-out technology to extract FOS from yacon. Most of FOS was extracted into the acetonitrile (ACN)-rich top phase, when yacon roots were dissolved in an ACN-yacon water extract mixture without extra sugar addition. Experimental results indicated that the partitioning behavior of FOS was closely correlated with the concentration of sugar in water extract of yacon, the system temperature and the volume ratio between ACN solution and yacon water extract.

Source: INDUSTRIAL CROPS AND PRODUCTS | 97: 431-439 MAR 2017

Title: A holistic anti-aging approach applied in selected cultivated medicinal plants: A view of photoprotection of the skin by different mechanisms

Author(s): Duque, L | Bravo, K | Osorio, E

Date: MAR 2017

Author Keywords: Anti-aging | Photoprotection | Holistic approach | Rosmarinus officinalis | Thymus vulgaris | Smallanthus sonchifolius

Keywords Plus: MATRIX-METALLOPROTEINASE-1 | ANTIOXIDANT ACTIVITY | BIOACTIVE COMPOUNDS | OFFICINALIS L. | ANTI-ELASTASE | ACID | HYALURONIDASE | FIBROBLASTS | IRRADIATION | EXPRESSION

Publication Year: 2017

Volume: 97

Abstract:

Medicinal plants are recognized by their large number of bioactive secondary metabolites. They have been used to treat several human ailments and are believed to possess many biological activities. However, little is known about the photoprotective and anti-aging properties of important medicinal plants as assessed by integrative studies. To find new bioactive ingredients of cosmetic interest, seven cultivated medicinal plants were systemically evaluated in an integrated manner. Extracts obtained from each species using solvents of diverse dielectric constants were tested on different molecular targets related to skin aging, with a focus on the protection of the main components of the extracellular matrix (ECM). Thus, the inhibition of the enzymes collagenase, elastase and hyaluronidase was determined, and antioxidant properties were evaluated. Subsequently, a photoprotective approach was taken in human dermal fibroblasts (HDF) stimulated with ultraviolet B (UVB)-radiation through the measurement of

matrix-metalloproteinases (MMP-1) and procollagen Production, as well as intracellular reactive oxygen species (ROS) levels, in pretreatment with bioactive extracts. The species with higher biological activity were chemically characterized through fingerprint analysis by HPLC-DAD and comparison with reference standards. The results showed the ability of some extracts from *Rosmarinus officinalis*, *Thymus vulgaris* and *Smallanthus sonchifolius* to protect the major components of the ECM from UVB irradiation-induced damage. Additionally, useful information, including various bioactivities and the chemical diversity of the extracts of medicinal plants, which could not be acquired from individual assessments of anti-aging activity, was obtained using a holistic anti-aging approach. (C) 2016 Elsevier B.V. All rights reserved.

Source: HORTICULTURA BRASILEIRA | 34 (3): 422-427 JUL-SEP 2016

Title: Models for estimating yacon leaf area

Author(s): Erlacher, WA | Oliveira, FL | Fialho, GS | Silva, DMN | Carvalho, AHO

Date: JUL-SEP 2016

Author Keywords: *Smallanthus sonchifolius* | leaf size | mathematical modeling

Keywords Plus: ALLOMETRIC MODELS | STATISTICS

Publication Year: 2016

Volume: 34

Abstract:

The recent exploration of yacon demands scientific information for improving the crop production technology. This study aimed to set a leaf area estimate model for yacon plants, using non-destructive measurements of leaf length (L) and/or width (W). Sixty-four representative yacon plants were randomly selected in an experimental field during the full vegetative growth. One thousand leaves of various sizes were taken from those plants for setting and validating a model. The logarithmic model best fitted this purpose, the result of multiplying length by width being used as independent variable. Yacon leaf area can be determined with high precision and accuracy by $LA(LW) = (-27.7418 + (3.9812LW / \ln LW))$, disregarding the leaf size.

Source: JOURNAL OF NATURAL PRODUCTS | 79 (11): 2780-2787 NOV 2016

Title: Terpenoids from *Melampodium perfoliatum*

Author(s): Arciniegas, A | Perez-Castorena, AL | Nieto-Camacho, A | Villasenor, JL | de Vivar, AR

Date: NOV 2016

Author Keywords:

Keywords Plus: SESQUITERPENE LACTONES | DITERPENE LACTONES | *SMALLANTHUS-SONCHIFOLIUS* | *MELAMPOLIDES* | MACROPHAGES | DERIVATIVES | INHIBITION | *LEUCANTHUM* | LEAVES

Publication Year: 2016

Volume: 79

Abstract:

The phytochemical study of the aerial parts of *Melampodium perfoliatum* afforded six melampolides (1, 3, 5-8), a eudesmanolide (9), two diterpene lactones (10, 11), and two entkaurane derivatives (12, 13), together with the known melampodin (2) and polymatin A (4). The structures of the compounds were elucidated by physical data analysis and chemical reactions. Compounds 2, 4, 5, and 10 exhibited dose-dependent anti-inflammatory activity on the 12-O-tetradecanoylphorbol-13-acetate-induced ear edema model, with ID₅₀ values of 1.14, 0.56, 1.15, and 1.49 $\mu\text{mol/ear}$, respectively, compared to the reference compound indomethacin (0.24 $\mu\text{mol/ear}$).

Source: EUROPEAN JOURNAL OF MEDICINAL CHEMISTRY | 203: - OCT 1 2020

Title: Natural sesquiterpenoid oligomers: A chemical perspective

Author(s): Zhao, WY | Yan, JJ | Liu, TT | Gao, J | Huang, HL | Sun, CP | Huo, XK | Deng, S | Zhang, BJ | Ma, XC

Date: OCT 1 2020

Author Keywords: Sesquiterpenoid oligomers | Biosynthetic pathways | Bioactivities | Biomimetic synthesis

Keywords Plus: DIMERIC SESQUITERPENE | LACTONE DIMERS | A-C | CYTOTOXIC SESQUITERPENOID | SMALLANTHUS-SONCHIFOLIUS | STRUCTURAL REQUIREMENTS | BIOMIMETIC SYNTHESIS | MEDICINAL-PLANTS | NUPHAR ALKALOIDS | CANCER-CELLS

Publication Year: 2020

Volume: 203

Abstract:

Sesquiterpenoid oligomers, biogenetically assembled by at least two monomeric sesquiterpenoid units via diverse pathways, represent a unique class of natural products with distinct bioactivities. Herein, we provide a review covering the dimeric, trimeric, and tetrameric sesquiterpenoids categorized by reaction types in biosynthesis from a chemical perspective. Emphasis is focused on the biosynthetic oligomerization pathways of these interesting molecules and their related biological functions, which will supply inspiration for the total synthesis or biomimetic synthesis of more oligomeric sesquiterpenoids and further pharmacological investigations.

Source: AGRONOMY-BASEL | 9 (6): - JUN 2019

Title: Tuber Yield Formation and Sugar Composition of Yacon Genotypes Grown in Central Europe

Author(s): Kamp, L | Hartung, J | Mast, B | Graeff-Honninger, S

Date: JUN 2019

Author Keywords: fructooligosaccharides | sugar yield | sugar content

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | NITROGEN-FERTILIZATION | H. ROBINSON | L. | FRUCTOOLIGOSACCHARIDES | OLIGOSACCHARIDES | CARBOHYDRATE | ROOTS | CROPS

Publication Year: 2019

Volume: 9

Abstract:

Yacon (*Smallanthus sonchifolius*) is a tuberous root crop native to the Andean region. The eatable tubers contain up to 70% fructooligosaccharides (FOS) on a dry matter (DM) basis. These FOS are not digestible by the human intestinal tract and do not cause an increase of blood glucose level. Therefore, the consumption of yacon tubers offers health promoting benefits. With regard to cultivation, little to no information about yield potential and FOS content as well as sugar composition of diverse genotypes is known. However, this information is crucial for the development of new health beneficial food products out of different genotypes of yacon. In the present study nine different genotypes were studied in a field experiment in 2017 and 2018 regarding their tuber yield formation, sugar yield, and sugar composition. The genotypes red-shelled (RG'), brown-shelled (BG'), and Morado' reached the highest tuber yields of 46.6, 43.5, and 41.6 t ha⁻¹ FM, respectively. These three genotypes also had the highest sugar yields in the same order (2.2, 2.0, and 1.9 t ha⁻¹). Considering the sugar composition and sugar content, these three genotypes were outstanding, with a sugar content up to 66% of DM (RG', 2018). With regards to the development of possible food products, cv. Peru' can be considered as favorable for the fresh market due to high amounts of both monosaccharides and FOS. Genotypes BG', RG', and Morado' seem to offer various options for the food processing industry, due to their high amounts of FOS.

Source: JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE | 100 (15): 5442-5449 DEC 2020

Title: Yacon (*Smallanthus sonchifolius*) prevented inflammation, oxidative stress, and intestinal alterations in an animal model of colorectal carcinogenesis

Author(s): Verediano, TA | Viana, ML | Tostes, MDV | de Oliveira, DS | Nunes, LD | Costa, NMB

Date: DEC 2020

Author Keywords: fructooligosaccharides | prebiotics | inflammation | intestinal barrier | oxidative stress

Keywords Plus: CHAIN FATTY-ACIDS | GUT MICROBIOTA | CANCER | BARRIER | COLON | ANTIOXIDANT | PREBIOTICS | CELLS | PERMEABILITY | PROBIOTICS

Publication Year: 2020

Volume: 100

Abstract:

BACKGROUND Yacon (*Smallanthus sonchifolius*) roots store carbohydrate in the form of prebiotic fructooligosaccharides (FOS), which improve intestinal health. Yacon has the potential to prevent the intestinal barrier alterations associated with colorectal cancer (CRC). This study aimed to investigate the preventive effects of yacon flour (YF) on alterations promoted by CRC induced by 1,2-dimethylhydrazine in rats. **RESULTS** CRC increased tumor necrosis factor alpha levels (group CY = 10.2 +/- 0.72; group C = 9.6 +/- 1.0; group Y = 5.8 +/- 0.54; group S = 5.95 +/- 0.6 pg mL⁻¹) and short-chain fatty acid

production, and decreased total antioxidant capacity (group CY = 4.7 ± 0.72 ; group C = 3.3 ± 0.3 ; group Y = 4.1 ± 0.47 ; group S = 6.7 ± 0.78 U mL(-1)). Furthermore, YF treatment reduced intraluminal pH (group CY = 6.45 ± 0.47 ; group C = 7.65 ± 0.44 ; group Y = 6.75 ± 0.46 ; group S = 8.13 ± 0.2), lactulose/mannitol ratio, tumor necrosis factor-alpha (TNF-alpha)/interleukin (IL)-10 ratio, and increased secretory immunoglobulin A (group CY = 9.48 ± 1.46 ; group C = 10.95 ± 3.87 ; group Y = 15.95 ± 7.36 ; group S = 9.19 ± 1.52), but did not affect IL-10, IL-12, and TNF-alpha levels nor the IL-12/IL-10 ratio. **CONCLUSION** YF as a source of fructooligosaccharides may help to maintain the integrity of intestinal health, which is altered in induced CRC in rats. (c) 2020 Society of Chemical Industry.

Source: DRYING TECHNOLOGY | 34 (4): 386-394 2016

Title: Optimization of osmotic dehydration of yacon slices

Author(s): de Mendonca, KS | Correa, JLG | Junqueira, JRD | Pereira, MCD | Vilela, MB

Date: 2016

Author Keywords: Fructan depolymerization | fructooligosaccharides | osmotic dehydration | ultrasound | yacon

Keywords Plus: RESPONSE-SURFACE METHODOLOGY | MASS-TRANSFER KINETICS | SMALLANTHUS-SONCHIFOLIUS | PULSED-VACUUM | MICROWAVE-VACUUM | CELL STRUCTURE | HIGH-FREQUENCY | ULTRASOUND | VARIABLES | PRETREATMENT

Publication Year: 2016

Volume: 34

Abstract:

Osmotic dehydration assisted by ultrasound (ODAU) at low temperatures reduces water activity (a_w) and maintains nutrients. The influence of solution concentration (SC; 20 to 60 degrees Brix, xylitol and sorbitol) and ultrasound application time (t_{us}), 0 to 40min) in ODAU of yacon was studied with the aid of a response surface method. The optimum condition with respect to mass transfer parameters, a_w , and fructan retention was SC of 60 degrees Brix for both solutions and t_{us} of 2.67min for xylitol samples and 0min for sorbitol samples. The application of ultrasound improved dehydration but resulted in depolymerization of fructans.

Source: NUTRITION RESEARCH AND PRACTICE | 9 (3): 256-261 JUN 2015

Title: The effect of yacon (Samallanthus sonchifolius) ethanol extract on cell proliferation and migration of C6 glioma cells stimulated with fetal bovine serum

Author(s): Lee, KP | Choi, NH | Kim, JT | Park, IS

Date: JUN 2015

Author Keywords: Yacon | Samallanthus sonchifolius | ERK1/2 | MMP9 | C6 glioma

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | MATRIX METALLOPROTEINASES | INVASION | FRUCTOOLIGOSACCHARIDES | PATHWAYS

Publication Year: 2015

Volume: 9**Abstract:**

BACKGROUND/OBJECTIVES: Yacon (*Smallanthus sonchifolius*), a common edible plant grown throughout the world, is well known for its antidiabetic properties. It is also known to have several other pharmacological properties including anti-inflammatory, anti-oxidant, anti-allergic, and anti-cancer effects. To date, the effect of yacon on gliomas has not been studied. In this study, we investigated the effects of yacon on the migration and proliferation of C6 glioma cells stimulated by fetal bovine serum (FBS). **MATERIALS/METHODS:** Cell growth and proliferation were determined by evaluating cell viability using an EZ-Cytox Cell Viability Assay Kit. FBS-induced migration of C6 glioma cells was evaluated by performing the scratch wound healing assay and the Boyden chamber assay. We also used western blot analysis to determine the expression levels of extracellular signal-regulated kinase 1/2 (ERK1/2), a major regulator of migration and proliferation of glioma cells. Matrix metalloproteinase (MMP) 9 and TIMP-1 levels were measured by performing reverse transcription PCR. **RESULTS:** Yacon (300 μ g/mL) reduced both the FBS-induced proliferation of C6 glioma cells and the dose-dependent migration of the FBS-stimulated C6 cells. FBS-stimulated C6 glioma cells treated with yacon (200 and 300 μ g/mL) showed reduced phosphorylation of ERK1/2 and inhibition of -MMP 9 expression compared to those shown by the untreated FBS-stimulated C6 cells. In contrast yacon (200 and 300 μ g/mL) induced TIMP-1 expression. **CONCLUSIONS:** On the basis of these results, we suggest that yacon may exert an anti-cancer effect on FBS-stimulated C6 glioma cells by inhibiting their proliferation and migration. The most likely mechanism for this is down-regulation of ERK1/2 and MMP9 and up-regulation of TIMP-1 expression levels.

Source: INNOVATIVE FOOD SCIENCE & EMERGING TECHNOLOGIES | 64: - AUG 2020

Title: Lactobionic acid as a suitable food preservative for yacon juice

Author(s): Marques, C | Wojeicchowski, JP | Cardoso, T | Mafra, MR | Mitterer-Dalton, ML | Masson, ML

Date: AUG 2020

Author Keywords: Smallanthus sonchifolius | Enzyme kinetics | Polyphenol oxidases | Refrigerated storage | Antioxidants | Color

Keywords Plus: ANTIOXIDANT ACTIVITY | SMALLANTHUS | EXTRACTS | COLOR | FRUCTOOLIGOSACCHARIDES | POLYPHENOLOXIDASE | PEROXIDASE | BEVERAGE | LEAVES

Publication Year: 2020

Volume: 64

Abstract:

Yacon root is known for its antioxidant, prebiotic and insulin modulator benefits. However, like the root, yacon juice exhibits rapid enzymatic browning, requiring treatments such as acidification. Lactobionic acid (LBA) is a promising food ingredient, which contains not only preservative but also nutritional properties. The first goal of this study was to evaluate the influence of combined treatments (blanching, acid

pretreatment) and LBA on refrigerated yacon juice (8 degrees C; 48 h). The analysis of pH, antioxidants, total polyphenols and color, were used to select the optimal combined conditions, which were steam blanching (10 min) + LBA 1%. Secondly, the LBA was compared with citric, malic, tartaric, and ascorbic acids (at 1% levels), where the kinetics of polyphenol oxidases were determined in refrigerated storage of the juice at 8 degrees C for 48 h. Results showed that LBA, malic and tartaric acids maintained the color of yacon juice and preserved bioactive compounds. LBA and malic acid prevented enzymatic browning with PPO reductions of 80.4% and 79.4%, respectively. This was the first time that LBA has been tested in a refrigerated juice showing significant potential for preservation of color and bioactive compounds in food products.

Source: FOOD AND BIOPROCESS TECHNOLOGY | 8 (3): 623-636 MAR 2015

Title: Osmotic Dehydration of Yacon Using Glycerol and Sorbitol as Solutes: Water Effective Diffusivity Evaluation

Author(s): Brochier, B | Marczak, LDF | Norena, CPZ

Date: MAR 2015

Author Keywords: Osmotic dehydration | Yacon | Fructooligosaccharides | Effective diffusivity | Mass transfer

Keywords Plus: MASS-TRANSFER | SMALLANTHUS-SONCHIFOLIUS | KINETICS | APPLE | IMPREGNATION | CALCIUM | PINEAPPLE | COEFFICIENTS | AQUAPORINS | VEGETABLES

Publication Year: 2015

Volume: 8

Abstract:

Osmotic dehydration of yacon (*Smallanthus sonchifolius*) was carried out in varying temperatures (30 and 50 A degrees C) and glycerol or sorbitol concentration (30, 50, and 70 %). The solution of Fick's law for unsteady state mass transfer in a plane sheet configuration was used to calculate the effective diffusivities of water. Peleg's model was used to predict the equilibrium condition, which was shown to be appropriate for water loss and solute uptake. It was found to have two rate periods of dehydration. For the above conditions of osmotic dehydration, the effective diffusivity of water was found to be in the range of $5.82 \text{ A} \pm 0.68 \times 10^{-10}$ to $2.15 \text{ A} \pm 0.61 \times 10^{-10} \text{ m}^2/\text{s}$ in first period and $1.60 \text{ A} \pm 0.28 \times 10^{-10}$ to $1.29 \text{ A} \pm 0.24 \times 10^{-10} \text{ m}^2/\text{s}$ in second period for glycerol tests and, for sorbitol, was $3.82 \text{ A} \pm 0.17 \times 10^{-10}$ to $1.54 \text{ A} \pm 0.50 \times 10^{-10} \text{ m}^2/\text{s}$ for the first period and $1.73 \text{ A} \pm 0.04 \times 10^{-10}$ to $1.33 \text{ A} \pm 0.06 \times 10^{-10} \text{ m}^2/\text{s}$ for the second. The greatest reduction in water activity was achieved when 70 % of glycerol was used at 50 A degrees C (final a_w $0.704 \text{ A} \pm 0.010$). The treatments with 70 % of solution concentration at 30 A degrees C were repeated, and by adding 20 g/L of calcium lactate in the osmotic solution, it resulted in higher calcium content, strengthening the cell wall for both solutes. Microstructure of the yacon samples (fresh, blanched, and in different conditions of osmotic dehydration) was examined by scanning electron microscopy.

Source: CIENCIA E AGROTECNOLOGIA | 40 (5): 585-595 SEP-OCT 2016

Title: Characterization of powder from the permeate of yacon extract by ultrafiltration and dehydrated by spray drying

Author(s): Brites, ML | Meira, SM | Brandelli, A | Norena, CZ

Date: SEP-OCT 2016

Author Keywords: Encapsulation | inulin | prebiotic activity

Keywords Plus: SONCHIFOLIUS TUBER FLOUR | SMALLANTHUS-SONCHIFOLIUS | PHYSICO-CHEMICAL PROPERTIES | FRUCTO-OLIGOSACCHARIDES | COMMERCIAL PREBIOTICS | MEMBRANE TECHNOLOGY | JUICE POWDER | INULIN | FRUCTOOLIGOSACCHARIDES | MICROENCAPSULATION

Publication Year: 2016

Volume: 40

Abstract:

Yacon root is a functional food which contains antioxidants and prebiotics compounds. This study aimed to evaluate the physical, chemical and prebiotic characteristics of a yacon extract powder obtained by ultrafiltration (UF) with membranes of 10 and 30 kDa and encapsulation of the resulting permeate by spray drying. Drying air temperatures of 140 and 160 degrees C and concentrations of gum arabic of 10 and 15% were tested. The samples had solubility values greater than 90% while the hygroscopicity decreased with increasing gum concentration and drying temperature. Electron microscopy showed a strong tendency to agglomeration of smaller particles around the larger ones, mainly at a temperature of 140 degrees C. Regarding color, the parameter L* showed that drying at 160 degrees C produced darker samples and the parameters a* and b* indicated that all samples were greenish yellow. The concentration of inulin decreased during drying, whereas the levels of glucose and fructose increased due to the thermolysis reaction, which led to degradation of inulin chains at drying temperature. The permeates and retentates from the UF membranes had prebiotic activity, while only the encapsulated product from UF-30 membrane, metabolized by *Lactobacillus acidophilus* LA-5 (R), presented activity scores without significant difference to that of glucose.

Source: PEST MANAGEMENT SCIENCE | : - JAN 26 2021

Title: Yacon as an alternative host plant for *Encarsia formosa* mass-rearing: validating a multinomial theorem for bootstrap technique in life table research

Author(s): Zhao, Y | Zhao, CL | Yang, XB | Chi, H | Dai, P | Desneux, N | Benelli, G | Zang, LS

Date:

Author Keywords: age-stage two-sex life table | Aphelinidae | host-feeding | parasitoid | *Smallanthus sonchifolius* | *Trialeurodes vaporariorum* | whiteflies

Keywords Plus:

Publication Year:

Volume:

Abstract:

BACKGROUND: Yacon (*Smallanthus sonchifolius*) is a broadleaf host plant suitable for rearing the greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood). Here, the possibility of using yacon as an alternative host plant for production of the parasitoid, *Encarsia formosa* Gahan, one of the most important natural enemies of whiteflies, was explored. Data on the demographic characteristics, parasitism rate, and host-feeding rate were collected and analyzed using the TWOSEX-MSChart, CONSUME-MSChart, and TIMING-MSChart computer programs, and then contrasted with comparable data from the more commonly utilized host plant, tobacco. **RESULTS:** Higher fecundity (F) (190.13 eggs/female) and more oviposition days (O-d) (16.60 days) were observed in *E. formosa* when yacon was used as the host plant for rearing *T. vaporariorum*, compared with when tobacco was used (F = 150.13 eggs/female, O-d = 15.27 days). The intrinsic rate of increase (r), finite rate of increase (λ), and net reproduction rate (R₀) were significantly higher in *E. formosa* parasitizing *T. vaporariorum* reared on yacon compared with those parasitizing tobacco-reared *T. vaporariorum*. Furthermore, the net host-feeding rate (C-o = 40.87 prey/parasitoid), net killing rate (Z(o) = 239.73 prey/parasitoid), and finite killing rate (ϵ = 0.2560/day) for *E. formosa* on yacon-reared whiteflies were significantly higher than those from tobacco-reared whiteflies. **CONCLUSION:** Our results showed that yacon is more suitable than tobacco as a host plant for mass-rearing *E. formosa* for biological control programs to manage whiteflies. An innovative application of the multinomial theorem for calculating the exact probability of bootstrap samples in life table research was also introduced.

Source: PLANTA DANINHA | 38: - 2020

Title: INFLUENCE OF WEEDS ON YACON INITIAL GROWTH AND DEVELOPMENT

Author(s): Cabral, MO | Oliveira, FL | Dalvi, LP | Teixeira, AG | Rocha, LJFN | Pedrosa, JLF

Date: 2020

Author Keywords: *Smallanthus sonchifolius* | *Commelina benghalensis* | *Amaranthus viridis* | *Cyperus rotundus* | *Bidens pilosa* | competition

Keywords Plus:

Publication Year: 2020

Volume: 38

Abstract:

The consumption of yacon has been increasing around the world due to the nutritional and pharmaceutical properties of this plant. The growing commercial interest in yacon (*Smallanthus sonchifolius*) generates a demand for crop management research studies, including the effect of weed competition on yacon, which was not yet studied. Thus, this study was performed with the objective of evaluating the effects of weed competition on yacon development and growth. The experimental design was completely randomized with four treatments and seven replicates. Treatments were yacon with the interference of four weed species: *Cyperus rotundus* L. (nutgrass), *Commelina benghalensis* L. (tropical spiderwort), *Amaranthus viridis* L. (slender amaranth) and *Bidens pilosa* L. (hairy beggarticks). The experiment was conducted in a greenhouse, using 10 dm(3) pots. Plant height, number of leaves, number of stems, leaf

area, fresh and dry mass weight (total and partial), and chlorophyll A, B and total were evaluated. The weed competition resulted in a decrease in the yacon development (height, number of leaves, number of stems, leaf area), photosynthetic rate (decreased chlorophyll content A, B and total) and yield, as also decreased the accumulation of fresh and dry biomass of tuberous roots. *C. benghalensis* L. and *A. viridis* L. were the weeds most affecting the development and growth of yacon.

Source: CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION | 60 (5): 873-886 MAR 8 2020

Title: Impact of plant extracts upon human health: A review

Author(s): Veiga, M | Costa, EM | Silva, S | Pintado, M

Date: MAR 8 2020

Author Keywords: Health promotion | plant extracts | functional foods | phenolic compounds | dietary fiber

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | GUT MICROBIOTA COMPOSITION | BILBERRY VACCINIUM-MYRTILLUS | IN-VITRO EVALUATION | PHENOLIC-COMPOUNDS | ANTI-OXIDANT ACTIVITY | DIETARY FIBER | CARDIOVASCULAR-DISEASE | ANTIMICROBIAL ACTIVITY | MEDICINAL-PLANTS

Publication Year: 2020

Volume: 60

Abstract:

With the increase in evidences directly linking diet and health, several foodstuffs, such as phenolic rich fruits and vegetables, have emerged as possessing potential health benefits. Plants, given their fiber and phenolic content (and their intrinsic biological potential), have long been considered as contributing to health promotion. Therefore, the present work aimed to review the existing evidences regarding the various potential benefits of plant extracts' and plant extract-based products' consumption, with emphasis on in vivo works and epidemiological studies whenever available. Overall, the information available supports that, while there are indications of the potential benefits of plant extracts' consumption, further human-based studies are still needed to establish a true cause-effect.

Source: FOOD RESEARCH INTERNATIONAL | 77: 171-176 Part 2 Sp. Iss. SI NOV 2015

Title: Cashew-apple (*Anacardium occidentale* L.) and yacon (*Smallanthus sonchifolius*) functional beverage improve the diabetic state in rats

Author(s): Dionisio, AP | de Carvalho-Silva, LB | Vieira, NM | Goes, TD | Wurlitzer, NJ | Borges, MD | de Brito, ES | Ionta, M | de Figueiredo, RW

Date: NOV 2015

Author Keywords: Diabetes mellitus | Antidiabetic properties | Phenolic compounds | Fructooligosaccharides | In vivo test | *Anacardium occidentale* | *Smallanthus sonchifolius*

Keywords Plus: PHENOLIC-COMPOUNDS | CHLOROGENIC ACID | ANTIOXIDANT | EXTRACT | ALLOXAN | FRUCTOOLIGOSACCHARIDES | IDENTIFICATION | POEPP. | ANALOG | ROOTS

Publication Year: 2015

Volume: 77

Abstract:

Cashew-apple and yacon have been widely recognized as an excellent source of bioactive compounds, including prebiotics and antioxidants, which may be beneficial to health. Experimental data indicates that prebiotics and some specific polyphenols could reduce the severity or incidence of degenerative diseases, such as diabetics. The aim of this study was evaluate the hypoglycemic effect of a functional beverage composed of yacon and cashew-apple in alloxan-induced diabetic rats. The growth of lactobacilli in the cecal material, catalase activity in liver and antiproliferative activity using HepG(2) cells were also evaluated. The total antioxidant capacity was determined in the beverage, showing values of $6.45 \pm 0.40 \mu\text{M Trolox} \cdot \text{g}^{-1}$ of fresh matter (FM), $15.58 \pm 0.38 \mu\text{M Fe}_2\text{SO}_4 \cdot \text{g}^{-1}$ of FM and $1780.14 \pm 99.01 \text{ g}$ of functional beverage $\cdot \text{g}^{-1}$ of DPPH, measured by ABTS, FRAP and DPPH assays, respectively. The fructooligosaccharides (FOS) content ($2.97 \pm 0.07 \text{ FOS/100 mL}$) and total phenolic were determined ($66.52 \pm 1.17 \text{ mg gallic acid equivalent/100 g of FM}$), and the majoritarian phenolic compounds were identified by LC-DAD-ESI-MS. In the antiproliferative assay, HepG(2) was significantly inhibited, in a dose-dependent manner, by exposure to the functional beverage. In addition, the functional beverage was tested in vivo. Male Wistar rats were divided into five groups: control, non-treated diabetic, and diabetic treated with 100, 200 or 400 mg of lyophilized functional beverage per kg/day. The results showed a decrease in the glucose levels, a promotion of the growth of lactobacilli in cecal material and an increase in catalase activity in the liver. The results strongly support that yacon and cashew-apple have important hypoglycemic properties that could ameliorate the diabetic state.

Source: INDUSTRIAL CROPS AND PRODUCTS | 132: 1-11 JUN 2019

Title: Plant growth, tuber yield formation and costs of three different propagation methods of yacon (*Smallanthus sonchifolius*)

Author(s): Kamp, L | Hartung, J | Mast, B | Graeff-Honninger, S

Date: JUN 2019

Author Keywords: Yacon | Propagation method | Tuber yield | Direct planting | Production costs

Keywords Plus: ECONOMIC-FEASIBILITY | H. ROBINSON | OLIGOSACCHARIDES | CULTIVATION | HARVEST | POEPP. | CROP

Publication Year: 2019

Volume: 132

Abstract:

Yacon (*Smallanthus sonchifolius*) ((Poepp. and Endl.) H. Robinson) is a perennial plant native to the Andean region. Its tubers contain high amounts of fructooligosaccharide and inulin (up to 60% of DM) which are supposed to have positive effects on human health. One major aspect currently limiting yacon cultivation is the high cost of propagation. The aim of the present study was to investigate three different propagation methods i) divided seedling after budding from mother plants with pre-cultivation in the

greenhouse (DSAB), ii) seedlings from rhizome pieces pre-cultivated in the greenhouse (RP1), and iii) rhizome pieces directly planted into the field (RP2) in regard to plant growth, tuber yield formation and costs. The propagation methods DSAB (92 cm) and RP2 (85 cm) produced significant bigger plants than RP1 (70 cm). Leaves and ramifications showed a similar trend, additionally number of ramifications of DSAB (24) differed significantly to RP1 (16) but not to RP2 (18). The average rhizome weight at harvest was highest for DSAB with 871 g and lowest for RP1 with 561 g. Contrary to that, on a hectare basis RP1 achieved highest tuber yields (29.8 t FM ha⁻¹). The tuber yields of DSAB and RP2 were considerably lower with 21.3 and 17.8 t FM ha⁻¹ respectively. Mean fresh weight of tubers differed significantly between RP1 (308 g) and RP2 (196 g), whereas DSAB (255 g) did not differ significantly from RP1 or RP2. Furthermore, RP1 reached the highest number of tubers per plant (8.2) compared with DSAB (5.6) and RP2 (6.6). Due to the highest tuber yield and low investment costs, RP1 turned out to be the cheapest propagation method for the cultivation of yacon. The most important cost factors were the procurement of plant material and pre-cultivation. A further mechanization of direct planting of yacon rhizomes (RP2) would offer the chance to decrease the propagation costs within this method significantly.

Source: REVISTA DE NUTRICAÇÃO-BRAZILIAN JOURNAL OF NUTRITION | 29 (5): 709-719 SEP-OCT 2016

Title: Product based yacon and modulation of microbiota, fatty acid profile and lipid in ovariectomized female rats

Author(s): Martins, JDFL | Rafael, VDC | Filomena, EA | Rodrigues, FC | Sartori, SSR | Ferreira, CLDLF

Date: SEP-OCT 2016

Author Keywords: Dyslipidemias | Ovariectomy | Prebiotics | Yacon

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | FRUCTOOLIGOSACCHARIDES | COMBINATION | HEALTH | FLOUR | DIET

Publication Year: 2016

Volume: 29

Abstract:

Objective Fructans, a type of inulin present in yacon based products, can modulate microbiota and fatty acid profile, performing many beneficial roles. From this perspective, this study assessed the modulation of the gastrointestinal microbiota, organic acid profile, and lipid profile of ovariectomized Wistar rats fed or not a diet containing 6% fructooligosaccharides and inulin from a yacon based product. Methods Cecum weight, pH, and organic acids, cecal content microbiota, total cholesterol, and fractions were analyzed. Results The group fed the diet supplemented with fructooligosaccharides and inulin during the study period experienced beneficial modulation of their intestinal microbiota stemming from fructooligosaccharide/inulin fermentation and increased lactate profile ($p < 0.05$) and high-density lipoprotein cholesterol ($p < 0.05$). Conclusion This suggests that regular yacon intake can potentially modulate the intestinal microbiota and organic acid profile, and reduce dyslipidemia.

Source: NATURAL PRODUCT COMMUNICATIONS | 13 (10): 1239-1242 OCT 2018

Title: Synthetic Esterification of Yacon Sesquiterpene Lactone, Sonchifolinic Acid led to Cytotoxic SARs Study

Author(s): Kitai, Y | Nishiwaki, H | Yonekura, L | Tamura, H

Date: OCT 2018

Author Keywords: Yacon | Sesquiterpene lactone | Sonchifolinic acid | Esterification | Cytotoxicity | HeLa cell line | Hydrophobicity | Bulkiness

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | APOPTOSIS | LEAVES | INHIBITION | INDUCTION | DIMER | HELA

Publication Year: 2018

Volume: 13

Abstract:

Cytotoxicity on sonchifolinic acid (1) isolated from Samallunthus leaf and synthetic compounds related to compound 1 were comparatively studied for the first time. Derivatives of 1 such as propyl (1a), butyl (1b), pentyl (1c) and 2-methoxy ethyl (1d) sonchifolate were prepared and their cytotoxic activity on HeLa cells were compared with sonchifolin (2), a structurally related natural compound. Alkylation of the carboxylic acid group at C-14 position in 1 enhanced the cytotoxic activity 2-5 times (1a - 1d and 2, IC₅₀ 5.29 - 21.07 μ M) compared with that of sonchifolinic acid (1) (IC₅₀ 47.12 μ M). Higher lipophilicity and moderate bulkiness of the inserted alkyl group contributed to the increased SL cytotoxicity in vitro. This result shows sonchifolinic acid (1) could be a valuable leading compound for semi-synthetic derivatives in order to develop new potent anticancer drugs.

Source: JOURNAL OF THERMAL ANALYSIS AND CALORIMETRY | 126 (3): 1841-1849 DEC 2016

Title: Thermal analysis as screening technique to assess spray-drying process of encapsulated "yacon" juice

Author(s): Bisinella, RZB | de Oliveira, CS | Zappani, PSC | Schnitzler, E | Masson, ML

Date: DEC 2016

Author Keywords: TG/DTG | DSC | Spray-drying | Encapsulation process | Yacon juice | FEG-SEM

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | PHYSICOCHEMICAL PROPERTIES | FRUCTOOLIGOSACCHARIDES | EXTRACT | POWDER | WHEY | MICROENCAPSULATION | ENDL

Publication Year: 2016

Volume: 126

Abstract:

"Yacon" is a plant from Andean region (South America) whence it has spread to other countries. It produces roots with high content of fructooligosaccharides, inulin, some phenolic compounds among others substances. With sweet taste and low-energetic value, these roots are considered prebiotic food due to some medicinal properties. The encapsulation process via spray drying was used in this work from a pilot plant with aim to obtain a juice from this root (YJ). Solid whey (W) and maltodextrin (MD) was

added in different ratios. Optimisation conditions were determined, and the best encapsulation process was YJ with MD: W ratio 80: 20, which results are in agreement with those obtained by thermogravimetry/derivative thermogravimetry, differential scanning calorimetry and confirmed by field emission gun scanning electron microscopy. Thus, thermoanalytical techniques are important tools that can be used in quality control of industrial encapsulation process.

Source: BRAZILIAN JOURNAL OF CHEMICAL ENGINEERING | 33 (4): 1011-1020 OCT-DEC 2016

Title: OBTAINING FRUCTOOLIGOSACCHARIDES FROM YACON (*Smallanthus sonchifolius*) BY AN ULTRAFILTRATION PROCESS

Author(s): Brites, ML | Norena, CPZ

Date: OCT-DEC 2016

Author Keywords: Yacon | Fructooligosaccharides | Ultrafiltration

Keywords Plus: CROSS-FLOW ULTRAFILTRATION | OPERATING PARAMETERS | PRETREATMENT METHODS | FOULING MECHANISMS | POMEGRANATE JUICE | PERMEATE FLUX | MEMBRANES | CLARIFICATION | PURIFICATION | INULIN

Publication Year: 2016

Volume: 33

Abstract:

The objective of this study was to evaluate the separation of fructooligosaccharides (FOS) from yacon extract by an ultrafiltration process using membranes of 10 and 30 kDa. The total resistance (R-t), membrane resistance (R-m), fouling resistance (R-f), and concentration polarization (R-c) during the separation process were also assessed. The operating pressures were 1.2 and 0.75 bar for UF-10 and UF-30, respectively. The permeate flux increased upon increasing the pressure from 0.5 to 2 bar and the resistance values showed a slight increase with increasing pressure. The fouling percentages were 61.24% and 57.33% for the membranes UF-10 and UF-30, being reversible after the cleaning procedure with acidic and basic solution, resulting in high percentages of flux recovery of 76.46% and 83.56% for U-10 and UF-30, respectively. The FOS retention values were 24.48% and 6.49% for both membranes UF-10 and UF-30, corresponding to 24% and 18.4% purity.

Source: HEAT AND MASS TRANSFER | 54 (10): 2951-2961 OCT 2018

Title: The influence of convection drying on the physicochemical properties of yacon (*Smallanthus sonchifolius*)

Author(s): Salinas, JG | Alvarado, JA | Bergenstahl, B | Tornberg, E

Date: OCT 2018

Author Keywords:

Keywords Plus: AIR | FRUCTOOLIGOSACCHARIDES | TEMPERATURE | VEGETABLES

Publication Year: 2018

Volume: 54

Abstract:

Yacon root is a natural source of fructans, which has many potential benefits. Convective drying has been applied to increase the shelf life of yacon roots. However, this processing may lead to detrimental effects on the physicochemical functionality. The drying was investigated using different conditions (drying temperatures of 45 degrees C, 50 degrees C and 55 degrees C at a drying air velocity of 2m/s and 60 degrees C at a drying air velocity of 2m/s, 3m/s and 4m/s). The dried samples were compared to the original yacon with regard to their physicochemical properties. From all the properties that were studied, the color of the dried material and the elastic modulus of the reconstituted yacon were the most important properties being minimized respectively. The results of this investigation indicate that the best drying conditions, where the physicochemical properties of the samples are kept closest to the original material, are obtained either by using temperatures of 55 degrees C and 2m/s or using higher temperatures but increasing the air velocity.

Source: FOOD SCIENCE & NUTRITION | 8 (11): 5953-5961 NOV 2020

Title: Physicochemical composition, lipid oxidation, and microbiological quality of ram mortadella supplemented with *Smallanthus sonchifolius* meal

Author(s): Santos, AC | de Oliveira, RF | Henry, FD | Maia, JD | Moulin, MM | Della Lucia, SM | Quirino, CR | Martins, MLL | Rampe, MCC

Date: NOV 2020

Author Keywords: food safety | fructooligosaccharides | lamb | meat products

Keywords Plus: SHELF-LIFE | NATURAL ANTIOXIDANTS | GOAT MEAT | SENSORY CHARACTERISTICS | WHEAT FIBER | LAMB MEAT | LOW-FAT | EXTRACTS | INULIN | CAPACITY

Publication Year: 2020

Volume: 8

Abstract:

This study evaluated the physicochemical, lipid peroxidation, and microbiological quality of mortadellas prepared with ram and supplemented with different amounts of *Smallanthus sonchifolius* meal. Three mutton mortadella formulations supplemented with 1.25%, 2.50%, and 5% yacon meal and control formulation without yacon meal was included. The physicochemical, lipid peroxidation, and microbiological analyses were carried out in the time periods 10, 45 days, three, and six month after the preparation of mortadella. The control formulation presenting lighter and more intense red tone compared with the other formulations. All formulations presenting lipid peroxidation increased 90 days after processing; already the pH and Aw values were constant for all formulations at the experimental times stipulated. All formulations had the physicochemical characterization and microbiological quality standards, according to defined in regulations for mortadella production in Brazil. The results show that mutton mortadella supplemented with yacon meal is a promising alternative in the manufacture of healthy meat products.

Source: JOURNAL OF FOOD SCIENCE AND TECHNOLOGY-MYSORE | 54 (13): 4197-4204 DEC 2017

Title: Thermodynamic and kinetics study of phenolics degradation and color of yacon (*Smallanthus sonchifolius*) microparticles under accelerated storage conditions

Author(s): Lago, CC | Norena, CPZ

Date: DEC 2017

Author Keywords: Yacon | Accelerated test | Phenolics | Kinetic | Thermodynamic

Keywords Plus: SHELF-LIFE | STABILITY | JUICE | ANTHOCYANIN | INACTIVATION | PEROXIDASE | QUALITY | OIL

Publication Year: 2017

Volume: 54

Abstract:

This study aimed to investigate the kinetics and thermodynamic of the phenolics degradation and the kinetics of degradation of the total color difference of yacon juice microcapsules produced by spray drying using Gum Arabic and polydextrose as wall materials. The degradation of the microcapsule was evaluated by accelerated tests under controlled conditions at 35 and 45 A degrees C, and relative humidity of 75 and 90%, for 35 days. Degradation of phenolics followed the first order model and the degradation constant was in the range of 0.0124-0.0209 days⁻¹. The microparticles with gum Arabic were more stable than those with polydextrose for all conditions studied, with longer half-lives. Both wall materials showed similar thermodynamic characteristics, indicating similar mechanism of degradation of phenolics. With respect to the color parameters, the first order model adjusted to data of the total color difference, and no significant differences were observed for the conditions studied.

Source: FOOD CHEMISTRY | 188: 504-509 DEC 1 2015

Title: Antioxidant properties of sterilized yacon (*Smallanthus sonchifolius*) tuber flour

Author(s): Sousa, S | Pinto, J | Rodrigues, C | Gíao, M | Pereira, C | Távora, F | Malcata, FX | Gomes, A | Pacheco, MTB | Pintado, M

Date: DEC 1 2015

Author Keywords: Yacon flour | Antioxidant | Phenolic compounds

Keywords Plus: PHENOLIC-COMPOUNDS | ACID-DERIVATIVES | AQUEOUS EXTRACTS | CAPACITY | ROOTS | VEGETABLES | LEAVES | FRUITS

Publication Year: 2015

Volume: 188

Abstract:

The objective of this research work was to investigate the antioxidant properties of sterilized yacon tuber flour. The results revealed for the first time the high antioxidant activity of sterilized yacon flour. The best extract obtained by boiling 8.9% (w/v) of yacon flour in deionised water for 10 min exhibited a total antioxidant capacity of 222 +/- 2 mg (ascorbic acid equivalent)/100 g DW and a total polyphenol content of 275 +/- 3 mg (gallic acid equivalent)/100 g DW associated to the presence of four main phenolic

compounds: chlorogenic acid, caffeic acid, coumaric acid and protocatechuic acid, as well as the amino acid tryptophan. The most abundant was chlorogenic acid, followed by caffeic acid. Biological assays revealed that the extract had indeed antioxidant protection, and no pro-oxidant activity. In conclusion, sterilized yacon tuber flour has the potential to be used in the food industry as a food ingredient to produce functional food products.

Source: BIOSCIENCE BIOTECHNOLOGY AND BIOCHEMISTRY | 83 (12): 2288-2297 DEC 2 2019

Title: Increased phenolic content and antioxidant capacity of the heated leaves of yacon (*Smallanthus sonchifolius*)

Author(s): Ueda, Y | Matsuda, Y | Murata, T | Hoshi, Y | Kabata, K | Ono, M | Kinoshita, H | Igoshi, K | Yasuda, S

Date: DEC 2 2019

Author Keywords: Yacon leaves | heat processing | antioxidant | polyphenol | caffeic acid

Keywords Plus: SUPEROXIDE GENERATION | TEA | ACID | VEGETABLES | EXTRACTS | ASSAYS

Publication Year: 2019

Volume: 83

Abstract:

We investigated the content of phenolic compounds and antioxidant capacity of two batches of non-heated and heated leaves of the yacon cultivar "Andes no yuki", grown in Japan. Lyophilized yacon leaves heated at 160 degrees C for 20 min and 100 degrees C for 60 min had a 1.96 to 9.69-times higher total phenolic content than that of the non-heated leaves. Heated leaves exhibited a 1.98 to 4.07-times higher antioxidant capacity than that of the non-heated leaves in three different free radical scavenging assays. Heated leaves were more efficient at attenuating the superoxide anion radical production in human granulocytic cells than the non-heated leaves. High-performance liquid chromatography analysis revealed that, in the heated leaves, the caffeic acid content was 2.13 to 3.64-times higher and the chlorogenic acid content was slightly lower than those in the non-heated leaves. Hence, heat processing may affect the active constituent contents in yacon leaves, potentiating its antioxidant capacity.

Source: HORTICULTURA BRASILEIRA | 38 (1): 83-88 JAN-MAR 2020

Title: Yacon planting density in intercropping with corn under banana orchard

Author(s): Teixeira, AD | de Oliveira, FL | Parajara, MD | Zucoloto, M | Dalvi, LP

Date: JAN-MAR 2020

Author Keywords: *Smallanthus sonchifolius* | spacing | polyculture | shading

Keywords Plus: PHOTOSYNTHESIS

Publication Year: 2020

Volume: 38

Abstract:

Yacon is a crop which requires development of strategies for its cultivation. One of the possibilities is to

introduce yacon in perennial crops using intercropping system. The aim of this study was to evaluate different planting densities of yacon grown in intercropping with corn under banana orchard, verifying its development and production. At 90 days after planting, morphological and physiological evaluations were done, at 210 days yacon was harvested, and its productivity calculated using the fresh tuberous root production. The Area Equivalence Index (IEA), and the Relative Contribution of Crops (CRC) to IEA were calculated. Yacon development and production were hampered by the corn intercropping (under the banana orchard), regardless of the yacon density used. IEA increased with yacon and corn intercropping in relation to greater CRC of corn to the intercropping and its market value, the system presented higher gross income. Planting yacon under banana orchard optimizes the use of the area and it is profitable for the farmer, especially when yacon is planted in double rows, alternating between banana rows, spacing 0.3 and 0.4 m.

Source: SCIENTIA HORTICULTURAE | 235: 407-412 MAY 17 2018

Title: Impact of soil cover systems on soil quality and organic production of yacon

Author(s): da Silva, DMN | Venturim, CHP | Capucho, MEOV | de Oliveira, FL | Mendonca, ED

Date: MAY 17 2018

Author Keywords: Soil protection | Soil organic matter | Carbon balance | *Smallanthus sonchifolius* | Productivity

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | RESPIRATION | CARBON | MINERALIZATION | TILLAGE | YIELD | MULCH | AGRICULTURE | TEMPERATURE | CULTIVATION

Publication Year: 2018

Volume: 235

Abstract:

The use of soil cover in vegetables is a widespread practice that provides innumerable advantages to the soil and crop. The objective of this study was to evaluate the soil attributes and the organic production of yacon in different soil cover systems in the Atlantic Forest Biome, Brazil. The experiment was conducted in a randomised complete block design with five replicates. The treatments consisted of seven soil covers: two covers with plastic film, one black and one two-sided white/black, with the white surface facing the atmosphere; a cover with corn straw (30 Mg ha⁻¹); three covers with different levels of coffee husk (1 = 37.5 Mg ha⁻¹; 2 = 75.00 Mg ha⁻¹; and 3 = 112.50 Mg ha⁻¹); and a treatment with no soil cover (NC). During the crop growth cycle, data and soil samples (0-5 cm) were collected monthly, and the following were evaluated: total organic carbon, total nitrogen, potentially mineralisable nitrogen, microbial biomass carbon, C-CO₂ emissions, temperature, moisture, metabolic quotient, and microbial quotient. The dry mass of the spontaneous vegetation was determined at 60, 100, 140, 180, and 210 days after yacon planting. At the end of the growth cycle (210 days after planting), the yield of yacon tuberous roots and the net carbon balance were evaluated. Independent of the cover material, the soil cover systems led to greater stability of soil microbial activity and CO₂ emissions, in addition to greater immobilisation of C in the microbial biomass, promoting a positive C balance in the soil covered with corn straw

(10.99 Mg ha (-1)) and coffee husk at levels 1 (12.88 Mg ha (-1)), 2 (28.12 Mg ha (-1)), and 3 (43.28 Mg ha (-1)). The soil cover reduced temperatures (mean of 6.43%) and greater soil moisture retention capacity (mean of 35%), with the black plastic film being the least efficient. Additionally, the soil covers suppressed spontaneous vegetation, especially the plastic films (100% suppression) and coffee husk at levels 2 (50% suppression) and 3 (74% suppression). These benefits led to higher yields of yacon tuberos roots, most notably the double-sided plastic film cover (31.71 Mg ha (-1)) and coffee husk at level 2 (28.35 Mg ha (-1)).

Source: JOURNAL OF FOOD PROCESS ENGINEERING | 40 (1): - FEB 2017

Title: EFFECT OF PROCESS PARAMETERS ON FOAM MAT DRYING KINETICS OF YACON (SMALLANTHUS SONCHIFOLIUS) AND THIN-LAYER DRYING MODELING OF EXPERIMENTAL DATA

Author(s): Franco, TS | Perussello, CA | Ellendersen, LN | Masson, ML

Date: FEB 2017

Author Keywords:

Keywords Plus: MOISTURE DIFFUSIVITY | MINT LEAVES | SLICES | OPTIMIZATION | QUALITY | DEHYDRATION | TEMPERATURE | PRODUCTS | EQUATION | BEHAVIOR

Publication Year: 2017

Volume: 40

Abstract:

Because of the health benefits provided by the consumption of yacon and its perishability, the foam mat drying (FMD) was applied in order to increase its shelf life. Yacon juice foams formed by the addition of two different foaming agents (emulsifier and egg albumin) and incorporation of air were subjected to dehydration, with different air temperatures (50, 60 and 70C) and layer thicknesses (0.5, 1.0 and 1.5 cm). The drying rate and effective diffusivity increase with the rise in temperature and the thickness of foam, being higher for the foam formed with egg albumin rather than emulsifier. The experimental data were fitted to several thin-layer models, among which the logarithmic model was the most suitable to represent the process. The effect of temperature, thickness and foaming agent on the drying kinetics has not been studied previously; hence, this research can aid the design of optimized FMD processes.

Source: INTERNATIONAL JOURNAL OF FOOD ENGINEERING | 12 (8): 729-737 OCT 2016

Title: A Novel Color Parametric Technique for Kinetic Evaluation of Thermal Degradation and Stability of Fresh-Cut Yacon Slices

Author(s): Zhu, SM | Hu, FF | Zhang, QT | Yu, Y | Ramaswamy, HS

Date: OCT 2016

Author Keywords: thermal treatment | color | kinetics | yacon

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS ROOTS | VISUAL COLOR | CHILIC PUREE | POLYPHENOLOXIDASE | INACTIVATION | ANTHOCYANIN | JUICE

Publication Year: 2016

Volume: 12

Abstract:

Fresh-cut yacon slices were first heat treated (60-80 degrees C, 5-25 min) and then exposed to air at room temperature for up to 10 min. Color parameters of internal surface were measured and two kinetic models were evaluated: 1) Color degradation during thermal treatment, and 2) Color stability during subsequent air exposure. More severe treatments led to lower color quality but higher stability. The relative white index was the best color parameter and the color changes followed a zero-order kinetics. The temperature dependence of rate constants were evaluated using the Arrhenius model. The activation energy for color degradation was 14.7 kJ/mol, and for color stability it was 47.9 kJ/mol indicating color stability parameters to be more sensitive to temperatures than color degradation. The color parameter models developed were comparable to polyphenoloxidase inactivation model and provided a rapid physical method for evaluating color degradation and subsequent color stability of yacon slices.

Source: FOOD AND BIOPROCESS TECHNOLOGY | 11 (8): 1605-1614 AUG 2018

Title: Influence of Linseed Mucilage Incorporated into an Alginate-Base Edible Coating Containing Probiotic Bacteria on Shelf-Life of Fresh-Cut Yacon (*Smallanthus sonchifolius*)

Author(s): Rodrigues, FJ | Cedran, MF | Garcia, S

Date: AUG 2018

Author Keywords: Edible coatings/films | *Lactobacillus casei* | Minimally processed | Simulated gastrointestinal conditions | Functional food

Keywords Plus: MINIMALLY PROCESSED VEGETABLES | FUNCTIONAL FOODS | QUALITY | FRUITS | STORAGE | APPLE | FILMS | SURVIVAL | ATMOSPHERE | HUMIDITY

Publication Year: 2018

Volume: 11

Abstract:

The aim of this study was to evaluate the influence of edible coatings based on linseed mucilage, alginate, and fructooligosaccharide containing *Lactobacillus casei* LC-01 on the shelf-life of fresh-cut yacon cubes. The cell viability and survival under in vitro gastrointestinal conditions analysis were performed to evaluate the stability of the microorganism. To evaluate the influence of edible coatings on fresh-cut yacon, physicochemical parameters pH, acidity, soluble solids, color, and weight loss were analyzed. Edible coatings were efficient probiotic cells carrier, preserving the number of viable cells at about 8 log CFU g⁻¹. Under simulated gastrointestinal conditions, the reduction in the number of viable cells of the microorganism was on average 2.96 log CFU g⁻¹, indicating the yacon as viable matrix to carrier probiotic bacteria. The edible coatings helped to preserve the physicochemical parameters of the vegetable, reducing the weight loss and darkening, important factors for the commercialization of the product.

Source: JOURNAL OF SUPERCRITICAL FLUIDS | 160: - JUN 1 2020

Title: Encapsulation of yacon (*Smallanthus sonchifolius*) leaf extract by supercritical fluid extraction of emulsions

Author(s): Cruz, PN | Reis, PMCL | Ferreira, SRS | Masson, ML | Corazza, ML

Date: JUN 1 2020

Author Keywords: Miniemulsion | Suspension | Particles | Microcapsules | Antioxidant activity

Keywords Plus: ANTIOXIDANT ACTIVITY | FISH-OIL | LEAVES | PHBV | COPRECIPITATION | PRECIPITATION | STARCHES | BEHAVIOR | PROFILE | MICRO

Publication Year: 2020

Volume: 160

Abstract:

Extracts with biological activities need to be preserved, as they can be degraded if exposed to light or heat. This work reports results of microparticles formation of yacon leaf extract with modified maize starch as encapsulated agent using Supercritical Fluid Extraction of Emulsions (SFEE). The variable investigated were pressure (9-13 MPa) and emulsion flow rate (Q(E)) (0.5-1.5 mL/min) on the encapsulation efficiency (EE) and residual ethyl acetate content. The highest EE was 68.2 %, performed at 9 MPa and Q(E) of 1.5 mL/min. The obtained particles were spherical, with size ranging from 92 to 450 nm. Analyses showed that: (i) the particles presented an amorphous characteristic; (ii) there was no degradation of the extract during the encapsulation; (iii) the SFEE improved the preservation of the antioxidant activity of the samples. This study shows the potential of using a new technology for particle production.

Source: CIENCIA E AGROTECNOLOGIA | 39 (5): 523-529 SEP-OCT 2015

Title: YACON INULIN LEACHING DURING HOT WATER BLANCHING

Author(s): Scher, CF | Brandelli, A | Norena, CZ

Date: SEP-OCT 2015

Author Keywords: Glucose | fructose | prebiotic | response surface

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | POTATO SLICES | QUALITY | SUGAR | INACTIVATION | OPTIMIZATION | KINETICS | TEXTURE | ROOTS

Publication Year: 2015

Volume: 39

Abstract:

Yacon roots contain inulin, which has prebiotic properties and it may be used as sucrose or fat substitutes. However, inulin is very soluble in water. The loss of this important nutrient during blanching is caused mainly by diffusion or leaching, which might be diminished if blanching temperature - time conditions are correctly employed. The aim of this study was to determine the leaching of the sugars inulin, glucose and fructose, present in yacon roots, during hot water blanching under different time/temperature conditions. The samples were cleaned and peeled and cut into geometric forms of 1.75 +/- 0.35 mm thick disks. A complete factorial experimental design was used, and the treatments of the

samples were compared using the Tukey test. The results indicated that the time and temperature were significant in the dissolution of the sugars. The lowest inulin losses occurred at temperatures and times lower than 60 degrees C and 3 minutes. For all temperatures, the lowest glucose and fructose losses were obtained at time lower than 3 and 5 minutes, respectively.

Source: JOURNAL OF FOOD ENGINEERING | 158: 48-57 AUG 2015

Title: Foam mat drying of yacon juice: Experimental analysis and computer simulation

Author(s): Franco, TS | Perussello, CA | Ellendersen, LDN | Masson, ML

Date: AUG 2015

Author Keywords: Yacon | Foam mat drying | Mass transfer | Heat transfer | Modeling | Simulation

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | EGG-WHITE | OSMOTIC DEHYDRATION | OPTIMIZATION | KINETICS | QUALITY | ROOTS | ANTIOXIDANTS | PARAMETERS | STABILITY

Publication Year: 2015

Volume: 158

Abstract:

The foam mat drying of yacon juice (YJ) and concentrate yacon juice (CYJ) was conducted under various conditions of thickness of product (0.5, 1.0 and 1.5 cm) and air temperature (50, 60 and 70 degrees C). After drying the resulted dry powder was removed from the metallic tray and pulverized. Layer thickness and air temperature influenced statistically ($p > 0.5$) drying time, moisture content and water activity (A_w) of the product. The shortest drying time to reach the desired A_w (0.1-0.3) corresponds to the condition of 0.5 cm and 70 degrees C for both juices - 59 and 65 min for the YJ and CYJ, respectively. The process was modeled in terms of heat and mass transfer and then simulated by a finite element method software. The model was able to predict the process satisfactorily and the foam drying technique allowed to obtain yacon powder of good quality, which can be inserted in various food formulations. (C) 2015 Elsevier Ltd. All rights reserved.

Source: CZECH JOURNAL OF FOOD SCIENCES | 34 (6): 495-502 2016

Title: Identification of *Smallanthus sonchifolius* in Herbal Tea Mixtures by PCR and DART/TOF-MS Methods

Author(s): Ziarovska, J | Rajchl, A | Fernandez, E | Prchalova, J | Milella, L

Date: 2016

Author Keywords: authentication | DraIII | ITS | yacon

Keywords Plus: FLIGHT MASS-SPECTROMETRY | ITS2 | DNA | AUTHENTICATION | IONIZATION | MARKERS | RFLP | DISCRIMINATION | SEQUENCE | QUALITY

Publication Year: 2016

Volume: 34

Abstract:

The identification of yacon, a medicinal plant, in tea mixtures by rapid Polymerase Chain Reaction

(PCR) and the Direct Analysis in Real Time coupled with Time-of-Flight Mass Spectrometry (DART/TOF-MS) method were evaluated. Three tea products and a pure yacon tea were analysed using the molecular method PCR, concretely the intraspecific variation of the internal transcribed spacer (ITS) regions of rDNA and the DART method coupled with TOF-MS. The results show the reliability of PCR and restriction cleavage of the ITS as a combined approach to confirm the presence of yacon in herbal tea mixtures. Three fragments of approximately 700, 408, and 235 bp in length are present when yacon is a part of the herbal tea mixture. The Principal Component Analysis (PCA) based on the fingerprints of the complete Total Ion Current (TIC) mass spectra shows sufficient separation of herbal teas with and without yacon leaves. The reported methods are technically rapid and can be used as an effective tool for the purposes of yacon identification or authentication.

Source: APPLIED THERMAL ENGINEERING | 105: 483-489 Sp. Iss. SI JUL 25 2016

Title: Evaluation of a concentrated parameters mathematical model applied to drying of yerba mate leaves with variable mass transfer coefficient

Author(s): Pilatti, D | Johann, G | Palu, F | da Silva, EA

Date: JUL 25 2016

Author Keywords: Fixed bed drying | Yerba mate leaves | Variable mass transfer coefficient

Keywords Plus: CONVEYOR-BELT DRYER | ILEX-PARAGUARIENSIS | SMALLANTHUS-SONCHIFOLIUS | MINT LEAVES | KINETICS | SHRINKAGE | DIFFUSIVITY | ISOTHERMS | L.

Publication Year: 2016

Volume: 105

Abstract:

In this study, fixed bed drying characteristics of yerba mate leaves were investigated experimentally and numerically, in a convective drier, on the drying air conditions, at temperatures of 55, 65 and 75 degrees C and 1.0, 1.5 and 2.0 m Beyond four simplified mathematical models, selected to describe and compare the drying kinetics of yerba mate, was developed a phenomenological model with variable mass transfer coefficient, dependent on the concentration of water in the yerba mate leaves and air temperature. The fit qualities of the simplified models and the developed model were evaluated by using the determination of coefficient, reduced chi-square, root means square error and Akaike Criterion. The selected simplified models and the developed model described well the drying process, with determination of coefficient, for all simulated drying conditions, values higher than 98%. The moisture diffusivity values varied between 1.037×10^{-7} and 5.463×10^{-7} m². (C) 2016 Elsevier Ltd. All rights reserved.

Source: JOURNAL OF FUNCTIONAL FOODS | 48: 665-675 SEP 2018

Title: Yacon leaf extract supplementation demonstrates neuroprotective effect against memory deficit related to beta-amyloid-induced neurotoxicity

Author(s): Martinez-Oliveira, P | de Oliveira, MF | Alves, N | Coelho, RP | Pilar, BC | Gullich, AA | Stroher, D | Boligon, A | Piccoli, JDE | Carpes, PM | Manfredini, V

Date: SEP 2018

Author Keywords: Alzheimer's disease | Yacon | Memory | Oxidative stress

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS YACON | OXIDATIVE STRESS | ALZHEIMERS-DISEASE | BIOCHEMICAL PARAMETERS | COGNITIVE IMPAIRMENT | ANTIOXIDANT ACTIVITY | PHENOLIC-ACIDS | DIABETIC-RATS | CELL-CULTURE | LEAVES

Publication Year: 2018

Volume: 48

Abstract:

Yacon is an Andean plant used as food and medicine; it is rich in phenolic compounds with several activities described. Thus, we investigated the neuroprotective effects of the leaves and roots of yacon in beta-amyloid (A beta)induced neurotoxicity in rats. Wistar male rats were supplemented with extracts of the leaves or roots of yacon for 14 d before intra-hippocampal injection with 2 μ L of A beta-25-35. The groups were submitted to memory tests and euthanized, and oxidative stress parameters (hippocampus) and biochemical parameters (serum) were analyzed using classical methodologies. Yacon leaf and root extract supplementation decreased oxidative stress and damage in the hippocampus of Alzheimer-like disease (AD-like), but only the leaf extract prevented A beta-induced memory deficits. The leaf presents more effective neuroprotection than the root and appears to be a likely candidate for future use in the prevention and/or treatment of AD, however further studies are needed to prove this hypothesis.

Source: AGRICULTURE-BASEL | 10 (7): - JUL 2020

Title: Linking Endophytic Fungi to Medicinal Plants Therapeutic Activity. A Case Study on Asteraceae

Author(s): Caruso, G | Abdelhamid, MT | Kalisz, A | Sekara, A

Date: JUL 2020

Author Keywords: compositae | fungi | herbs | secondary metabolites | symbiosis

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS ASTERACEAE | SECONDARY METABOLITES | BIOACTIVE METABOLITES | ANTIMICROBIAL ACTIVITY | CHEMICAL-CONSTITUENTS | DIVERSITY | ANTIBACTERIAL | ASSOCIATION | ANTIOXIDANT | GROWTH

Publication Year: 2020

Volume: 10

Abstract:

Endophytes are isolated from every plant species investigated to date, so the metabolome coevolution has been affecting the plants' (microbiota) ethnobotanic, especially therapeutic, usage. Asteraceae fulfill the rationale for plant selection to isolate endophytes since most of the species of this family have a long tradition of healing usage, confirmed by modern pharmacognosy. The present review compiles recent references on the endophyte-Asteraceae spp. interactions, targeting the secondary metabolites profile as created by both members of this biological system. Endophyte fungi associated with Asteraceae have been collected globally, however, dominant taxa that produce bioactive compounds were specific for the plant populations of different geographic origins. Endophytic fungi richness within the host plant and

the biological activity were positively associated. Moreover, the pharmacological action was linked to the plant part, so differential forms of biological interactions in roots, stem, leaves, inflorescences were developed between endophytic fungi and host plants. The comparative analysis of the Asteraceae host and/or fungal endophyte therapeutic activity showed similarities that need a future explanation on the metabolome level.

Source: FOOD AND BIOPROCESS TECHNOLOGY | 9 (12): 2103-2113 DEC 2016

Title: Polydextrose as Wall Material for Microencapsulation of Yacon Juice by Spray Drying

Author(s): Lago, CC | Norena, CPZ

Date: DEC 2016

Author Keywords: Yacon | Spray drying | Polydextrose | Microencapsulation

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | PHYSICOCHEMICAL PROPERTIES | ANTIOXIDANT PROPERTIES | NATURAL ANTIOXIDANTS | DIETARY FIBER | GUM | FRUCTOOLIGOSACCHARIDES | ENCAPSULATION | STABILITY | EXTRACT

Publication Year: 2016

Volume: 9

Abstract:

The juice from yacon roots was encapsulated by spray drying using polydextrose and gum Arabic as wall materials. The effects of the concentration of the encapsulating agents and drying temperature on total phenolics, antioxidant activity, fructooligosaccharides, moisture content, water activity, solubility, hygroscopicity, color, and morphology of the microparticles were investigated to assess the potential use of polydextrose as wall material. The microparticles produced with polydextrose showed retention of bioactive compounds and physicochemical characteristics similar to those produced with gum Arabic. The phenolic retention ranged from 73.67 to 85.49 %, and the antioxidant activity by DPPH varied from 80.78 to 90.58 %. The fructooligosaccharides have undergone little depolymerization into simple sugars even at high temperatures. With respect to the physicochemical characteristics, high stability (low moisture and water activity), low hygroscopicity, and high solubility were observed in the microparticles. The spray dried samples showed a hue angle close to 100, indicating yellow color of the particles. Regarding the microstructure, particle agglomeration was observed in both treatments, probably due to the hygroscopic characteristic of the spray dried powders.

Source: ITALIAN JOURNAL OF FOOD SCIENCE | 31 (4): 731-748 2019

Title: ANTIOXIDANT CAPACITY AND HEAT DAMAGE OF POWDER PRODUCTS FROM SOUTH AMERICAN PLANTS WITH FUNCTIONAL PROPERTIES

Author(s): Brizzolari, A | Brandolini, A | Glorio-Paulet, P | Hidalgo, A

Date: 2019

Author Keywords: camu camu | cat's claw | maca | mashua | mesquite | yacon

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | 2-FUROYLMETHYL AMINO-ACIDS |

IN-VITRO ANTIOXIDANT | PHENOLIC-COMPOUNDS | BIOACTIVE COMPOUNDS | CAROTENOID CONTENT | MAILLARD REACTION | OXIDATIVE STRESS | FRUITS | DEHYDRATION

Publication Year: 2019

Volume: 31

Abstract:

Aim of the study was to evaluate color, total polyphenol content (TPC), antioxidant capacity (ABTS, FRAP, DPPH), reducing sugars and heat damage (furosine, hydroxymethylfurfural, glucosylisomaltol) of 21 commercial powder products obtained from South-American fruits (mesquite, lucuma, camu camu), seeds (amaranth, purple maize), roots and tubers (yacon, maca, mashua, tocosh), bark (cat's claw) and leaves (graviola). TPC and antioxidant capacity were maximum in camu camu and cat's claw powders, and minimum in tocosh, amaranth, lucuma and maca; graviola, mashua, purple maize and mesquite also showed good antioxidant properties. Yacon, mashua and lucuma powders had high reducing sugars content (40.9, 34.4 and 21.2 g/100 g DM, respectively) and heat damage (HMF 146.6 mg/kg, furosine 2399.8 and 2228.4 mg/100 g protein, respectively). Overall, camu camu powders and cat's claw were the most interesting products, having high levels of total polyphenols and antioxidant capacity together with very low heat damage.

Source: FOOD & FUNCTION | 6 (10): 3266-3274 2015

Title: Health properties of oca (*Oxalis tuberosa*) and yacon (*Smallanthus sonchifolius*)

Author(s): Jimenez, ME | Rossi, A | Samman, N

Date: 2015

Author Keywords:

Keywords Plus: RESISTANT STARCH | PHENOLIC-COMPOUNDS | DIETARY-FIBERS | FOOD | FRUCTOOLIGOSACCHARIDES | METABOLITES | ROOTS | BIOAVAILABILITY | ANTIOXIDANTS | POLYPHENOLS

Publication Year: 2015

Volume: 6

Abstract:

Andean roots and tubers are underexploited crops; many contain compounds beneficial to health, so a greater knowledge of their properties is important for encouraging their consumption. The aim of this work was to study the content of bioactive compounds of yacon and oca and their effect on intestinal health using as a model rats of the Wistar strain. Two varieties of oca (Overa and Rosada) and yacon, which contain significant amounts of fructooligosaccharides and phenolic compounds, were chosen. Rats of the Wistar strain were fed for two months with diets containing these foods in amounts sufficient to provide 8% of fiber. A significant decrease in pH values and an increment in lactobacilli and bifidobacteria counts in the cecum of rats fed with inulin, oca Rosada and Overa were observed; there was no significant decrease in enterobacteriaceae and enterococci counts. The cecum antioxidant activity was incremented in rats fed with the experimental foods with respect to the control diets. The components of

dietary fiber and phenolic compound contents in yacon and oca produce effects that contribute to the intestinal health of the experimental animals.

Source: JOURNAL OF FUNCTIONAL FOODS | 49: 447-457 OCT 2018

Title: Metabolic effects of goat milk yogurt supplemented with yacon flour in rats on high-fat diet

Author(s): Fabersani, E | Grande, MV | Araoz, MVC | Zannier, ML | Sanchez, SS | Grau, A | Oliszewski, R | Honore, SM

Date: OCT 2018

Author Keywords: Prebiotics | Probiotics | Yacon flour | Goat yogurt | Functional food | Metabolic effects

Keywords Plus: INDUCED IMMUNE SUPPRESSION | SMALLANTHUS-SONCHIFOLIUS | WISTAR RATS | PROBIOTIC CARRIER | DIABETIC-RATS | PARAMETERS | CHEESE | ROOTS | FOODS | INGREDIENTS

Publication Year: 2018

Volume: 49

Abstract:

This study aimed to evaluate the effects of addition of yacon flour on the quality parameters of goat milk yogurt and investigate the metabolic effects of its regular consumption on high fat diet-fed Wistar rats (30 days). The formulation containing 7% (w/v) yacon flour had higher nutritional values, acceptable sensory attributes and higher count (10(7) cfu/g) of viable probiotic microorganisms, with shelf life of at least 30 days. 7% yacon flour addition improved goat yogurt sugar profile, reducing lactose (0.94%) and increasing prebiotic fructooligosaccharides (4.55%) content in the final product. Supplementation of goat yogurt + yacon to a high fat diet resulted in lower body weight, body mass index, fasting glucose levels, HOMA-IR and atherogenic indices of rats, improving the effects of goat yogurt or yacon flour alone ($P < 0.05$). Our results showed conclusive evidence indicating that goat yogurt + yacon is an excellent functional food that avoids the metabolic impact of high fat feeding.

Source: JOURNAL OF THERMAL ANALYSIS AND CALORIMETRY | 119 (1): 727-735 JAN 2015

Title: Thermal transition and state diagram of yacon dried by combined heat pump and microwave method

Author(s): Shi, QL | Zheng, YQ | Zhao, Y

Date: JAN 2015

Author Keywords: Glass transition temperature | State diagram | Differential scanning calorimetry | Adsorption isotherm | Yacon

Keywords Plus: WATER SORPTION ISOTHERMS | GLASS-TRANSITION | SMALLANTHUS-SONCHIFOLIUS | FOOD | TEMPERATURE | STABILITY | SLICES | FRUITS | VEGETABLES | SHRINKAGE

Publication Year: 2015

Volume: 119

Abstract:

Adsorption isotherm and thermal transition of yacon dried by combined heat pump and microwave method were developed to investigate the interactions between water and biopolymers. Adsorption isotherm of yacon was determined by the gravimetric method, and the data were modeled by GAB model. The GAB monolayer moisture content was observed to be 0.0795 g H₂O g⁻¹ dry solids. Thermal transitions of yacon powders equilibrated at various water activities were analyzed using differential scanning calorimetry. The state diagram was developed using glass transition line and freezing curve, which were modeled by Gordon-Taylor equation and Clausius-Clapeyron equation, respectively. The maximal-freeze-concentrated condition was estimated as the solid content of 0.706 g g⁻¹ yacon with the glass transition temperature of -66.6 degrees C. The adsorption properties and state diagram of yacon are useful in optimizing conditions of freezing and drying of yacon as well as in evaluating its storage stability as a function of moisture content and temperature.

Source: ASIAN PACIFIC JOURNAL OF TROPICAL MEDICINE | 9 (5): 420-424 MAY 2016

Title: Hydroethanolic extract of *Smallanthus sonchifolius* leaves improves hyperglycemia of streptozotocin induced neonatal diabetic rats

Author(s): Baroni, S | da Rocha, BA | de Melo, JO | Comar, JF | Caparroz-Assef, SM | Bersani-Amado, CA

Date: MAY 2016

Author Keywords: Yacon extract | Hyperglycemia | Insulin sensibility | Streptozotocin

Keywords Plus: INSULIN | PANCREAS | ACID

Publication Year: 2016

Volume: 9

Abstract:

Objective: To evaluate the effect of hydroethanolic extract of yacon on the hyperglycemia induced by streptozotocin (STZ) in neonatal rats. Methods: Wistar rats aged two days old received an intraperitoneal injection of STZ (160 mg/kg); after seven weeks, glycosuria was determined and animals with glucose levels above 250 mg/dL were included in the study. Groups of diabetic and non-diabetic rats were treated orally with yacon extract at a dose of 400 mg/kg/d for 14 d. Tests were made for phytochemical characterization, glucose tolerance and toxicity. Results: The results showed that treatment with the extract reduced the glucose levels of fed diabetic rats and did not change the glucose levels of fasting diabetic and normal rats. Additionally, also it was observed that treatment with the extract reduced blood glucose levels of diabetic rats during the oral and intravenous glucose tolerance tests. There was no change in body weight, liver enzymes or mortality with yacon extract treatment. The phytochemical screening revealed the presence of caffeic acid, chlorogenic acid, ferulic acid and gallic acid. Conclusions: The data suggest that yacon extract reduces hyperglycemia, possibly by improving insulin sensibility through its phytochemicals constituents (phenolic compounds).

Source: FOODS | 8 (11): - NOV 2019

Title: Assessing the Nutritional Value of Root and Tuber Crops from Bolivia and Peru

Author(s): Choquechambi, LA | Callisaya, IR | Ramos, A | Bosque, H | Mujica, A | Jacobsen, SE | Sorensen, M | Leidi, EO

Date: NOV 2019

Author Keywords: arracacha | mashua | yacon | functional foods | fructooligosaccharides | glucosinolates

Keywords Plus: PERFORMANCE LIQUID-CHROMATOGRAPHY | YACON SMALLANTHUS-SONCHIFOLIUS | ANTIOXIDANT CAPACITY | PROTEIN-QUALITY | PROSTATE-CANCER | AMINO-ACIDS | RUIZ | FLOUR | FOOD | DERIVATIZATION

Publication Year: 2019

Volume: 8

Abstract:

All over the world, there are species which may be considered as neglected or underutilized despite their nutritious properties. At present, such crops contribute to food security in isolated areas by providing energy and nutrients in a diversified diet. Such genetic heritage-improved by ancient cultures-is under threat of losing biodiversity as well as the traditional knowledge associated with their cultivation and usage. Among these species, the Andean root and tuber crops (ARTCs) constitute a valuable resource which should be preserved and popularized because of their food and functional properties. We studied three ARTC species (mashua, arracacha, and yacon) to provide data on their composition, essential for increasing their use globally. We compared their nutritional values with the values of more widely used crops. Important differences in nutrient composition among ARTC landraces were found. Mineral nutrients showed significant differences among species. Considerable variations in the contents of prebiotics like fructooligosaccharides or functional elements (antioxidants and glucosinolates) were found among species and intraspecific samples. Certainly, these species are important assets to complement human nutrition and to secure supply of functional elements for healthy diets.

Source: FOOD AND BIOPROCESS TECHNOLOGY | 8 (10): 2012-2026 OCT 2015

Title: Influence of the Addition of Ovalbumin and Emulsifier on the Physical Properties and Stability of Yacon (*Smallanthus sonchifolius*) Juice Foams Prepared for Foam Mat Drying Process

Author(s): Franco, TS | Ellendersen, LN | Fattori, D | Granato, D | Masson, ML

Date: OCT 2015

Author Keywords: Ovalbumin | Emulsifier | Stability | Rheology | Optical microscopy

Keywords Plus: EGG-WHITE PROTEIN | CARAMBOLA L. PUREE | YIELD-STRESS | RHEOLOGICAL PROPERTIES | INTERFACIAL PROPERTIES | CHEMICAL-COMPOSITION | SENSORY PROPERTIES | AQUEOUS FOAMS | HOT AIR | WHEY

Publication Year: 2015

Volume: 8

Source: VIRUS RESEARCH | 282: - JUN 2020

Title: Characterization of distinct strains of an aphid-transmitted ilarvirus (Fam. Bromoviridae) infecting different hosts from South America

Author(s): Silvestre, R | Fuentes, S | Risco, R | Berrocal, A | Adams, I | Fox, A | Cuellar, WJ | Kreuze, J

Date: JUN 2020

Author Keywords: Iilarvirus | Alfamovirus | Solanum | Smallanthus | Potato yellowing virus | HTS | NGS

Keywords Plus: ALFALFA MOSAIC-VIRUS | COAT PROTEIN | NUCLEOTIDE-SEQUENCE | SEED TRANSMISSION | SOLANUM-BREVIDENS | H. ROBINSON | REPLICATION | SUPPRESSORS | DISCOVERY | PATHOGENS

Publication Year: 2020

Volume: 282

Abstract:

Potato yellowing virus (PYV, original code SB-22), an unassigned member of the Genus Iilarvirus Family Bromoviridae, has been reported infecting potatoes in Peru, Ecuador and Chile. It is associated with symptomless infections, however yellowing of young leaves has been observed in some potato cultivars. Thirteen potato and yacon isolates were selected after routine screening of CIP-germplasm and twenty-four were identified from 994 potato plants collected in Peru whereas one was intercepted from yacon in the UK. These isolates were identified using high throughput sequencing, ELISA, host range and RT-PCR. Here we report the sequence characterization of the complete genomes of nine PYV isolates found infecting *Solanum tuberosum*, four complete genome isolates infecting *Smallanthus sonchifolius* (yacon), and in addition 15 complete RNA3 sequences from potato and partial sequences of RNA1, 2 and 3 of isolates infecting potato and yacon from Ecuador, Peru and Bolivia. Results of phylogenetic and recombination analysis showed RNA3 to be the most variable among the virus isolates and suggest potato infecting isolates have resulted through acquisition of a movement protein variant through recombination with an unknown but related ilarvirus, whereas one yacon isolate from Bolivia also had resulted from a recombination event with another related viruses in the same region. Yacon isolates could be distinguished from potato isolates by their inability to infect *Physalis floridana*, and potato isolates from Ecuador and Peru could be distinguished by their symptomatology in this host as well as phylogenetically. The nonrecombinant yacon isolates were closely related to a recently described isolate from *Solanum muricatum* (pepino dulce), and all isolates were related to *Fragaria chiloensis* latent virus (FCiLV) reported in strawberry from Chile, and probably should be considered the same species. Although PYV is not serologically related to Alfalfa mosaic virus (AMV), they are both transmitted by aphids and share several other characteristics that support the previous suggestion to reclassify AMV as a member in the genus Iilarvirus.

Source: NOTULAE BOTANICAE HORTI AGROBOTANICI CLUJ-NAPOCA | 47 (3): 813-820 JUL-SEP 2019

Abstract:

Yacon juice and concentrated yacon juice were added with an ovalbumin or emulsifier in order to form foams which were subjected to different whipping times according to a 2(2) factorial design. After formation of the foams, their density, overrun, physical stability, yield stress, and structural microscopy were assessed. The data analysis obtained by response surface methodology was able to identify that the concentration of the foaming agent together with the time of air incorporation led to reduced density, increased expansion and air volume fraction, and physical stability of the product. Foams formed with the addition of an ovalbumin showed higher yield stress values than those added with an emulsifier. During the resting period, the yield stress was reduced for both foaming agents. By analyzing the images of the foams, it was found that the greater the number of air bubbles present, the smaller their diameter, a behavior affected by the resting time. Foams formed with higher concentrations of foaming agent and longer whipping times showed the most desirable characteristics for the purpose of foam mat drying.

Source: EVIDENCE-BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE | 2017: - 2017

Title: Yacon (*Smallanthus sonchifolius*) Leaf Extract Attenuates Hyperglycemia and Skeletal Muscle Oxidative Stress and Inflammation in Diabetic Rats

Author(s): dos Santos, KC | Bueno, BG | Pereira, LF | Francisqueti, FV | Braz, MG | Bincoletto, LF | da Silva, LX | Ferreira, ALA | Nakamune, ACDS | Chen, CYO | Blumberg, JB | Correa, CR

Date: 2017

Author Keywords:

Keywords Plus: BETA-CELL FUNCTION | ANTIOXIDANT ACTIVITY | INSULIN-RESISTANCE | PLASMA-GLUCOSE | CAFFEIC ACID | QUERCETIN | LEAVES | SUPPLEMENTATION

Publication Year: 2017

Volume: 2017

Abstract:

The effects of hydroethanolic extract of Yacon leaves (HEYL) on antioxidant, glycemic, and inflammatory biomarkers were tested in diabetic rats. Outcome parameters included glucose, insulin, interleukin-6 (IL-6), and hydrophilic antioxidant capacity (HAC) in serum and IL-6, HAC, malondialdehyde (MDA), superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx) in soleus. The rats (10/group) were divided as follows: C, controls; C + Y, HEYL treated; DM, diabetic controls; and DM + Y, diabetic rats treated with HEYL. Diabetes mellitus was induced by administration of streptozotocin. C + Y and DM + Y groups received 100 mg/kg HEYL daily via gavage for 30 d. Hyperglycemia was improved in the DM + Y versus DM group. Insulin was reduced in DM versus C group. DM rats had higher IL-6 and MDA and lower HAC in the soleus muscle. HEYL treatment decreased IL-6 and MDA and increased HAC in DM rats. DM + Y rats had the highest CAT activity versus the other groups; GPx was higher in C + Y and DM + Y versus their respective controls. The apparent benefit of HEYL may be mediated via improving glucoregulation and ameliorating oxidative stress and inflammation, particularly in diabetic rats.

Title: Physicochemical Quality, Antioxidant Capacity and Nutritional Value in Tuberous Roots of Some Wild Dahlia Species

Author(s): Rivera-Espejel, EA | Cruz-Alvarez, O | Mejia-Munoz, JM | Garcia-Mateos, MR | Colinas-Leon, MTB | Martinez-Damian, MT

Date: JUL-SEP 2019

Author Keywords: Dahlia sp. | edible tuber | fiber crude | nutraceutical and functional food | inulin content

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | CHEMICAL-COMPOSITION | ASCORBIC-ACID | INULIN YIELD | FOOD QUALITY | STORAGE | FRUCTOOLIGOSACCHARIDES | GENOTYPES | NUTRIENT

Publication Year: 2019

Volume: 47

Abstract:

The aim of this research was to evaluate the physicochemical quality, antioxidant capacity and nutritional value in tuberous roots of some wild dahlia species. The experiment was carried out in the Department of Plant Science of the Autonomous University Chapingo, Mexico. Plants were established in a randomized complete block design with five replications. The total soluble solids (TSS), titratable acidity (TA), vitamin C (VC), total phenols (TP), antioxidant capacity (AC), inulin and its proximate composition were evaluated. Among the materials analyzed, the most outstanding wild species were *Dahlia campanulata*, *D. coccinea* and *D. brevis*, where *D. campanulata* stood out for its concentration of VC (0.05 mg 100 g(-1)), AC (1.88 mg VCEAC g(-1)), inulin, DM and TC (72.25, 24.38 and 88.37%, respectively), however, the inulin content was similar to *D. coccinea* (66.17%), which was also outstanding with respect to the content of TP (1.74 mg GA g(-1)). Likewise, *D. brevis* presented the highest values of RFI (5.49%) and A (78.42%). According to our results, the tuberous roots of wild dahlia species can be used as food, as well as being a source of selection of traits of nutraceutic interest for genetic improvement.

Source: FOOD SCIENCE AND TECHNOLOGY | 40 (1): 202-208 JAN-MAR 2020

Title: Antioxidant and prebiotic effects of a beverage composed by tropical fruits and yacon in alloxan-induced diabetic rats

Author(s): Dionisio, AP | de Carvalho-Silva, LB | Vieira, NM | Wurlitzer, NJ | Pereira, ACD | Borges, MD | Garruti, DD | Araujo, ID

Date: JAN-MAR 2020

Author Keywords: diabetes | oxidative estress | antioxidants | tropical fruits | prebiotics

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | BIOACTIVE COMPOUNDS | FRUCTOOLIGOSACCHARIDES | CAPACITIES | EXTRACT | HEALTH | ENDL

Publication Year: 2020

Volume: 40

Abstract:

The aim of this study was to evaluate the antioxidant and prebiotic effect of a beverage composed by tropical fruits and yacon in alloxan-induced diabetic rats. To obtain the beverage, a Response Surface Methodology was used, with concentration of yacon extract (x1) and the sweetener (x2) added to a mixture of tropical fruits as independent variables, and the sensorial acceptance as response. The optimized beverage showed higher values for antioxidant capacity, measured by ABTS, FRAP and DPPH assays. Thus, the fructooligosaccharides content (2.32 ± 0.65 g FOS/100 g), total phenolic (126.83 ± 9.48 mg gallic acid equivalent/100 g) and ascorbic acid (171.64 ± 7.31 mg/100 g) shows that the beverage contains high levels of these bioactive compounds. In addition, the beverage was tested in vivo, using male Wistar rats, divided into five groups (control, non-treated diabetic, and diabetic treated with 100, 200 or 400 mg of lyophilized beverage/kg/day). The results showed a promotion of the growth of lactobacilli in cecal material and an increase in catalase activity in the liver, in a dose-dependent manner, showing the prebiotic and antioxidant effects of the beverage in the diabetic model.

Source: PLANT FOODS FOR HUMAN NUTRITION | 73 (3): 172-179 SEP 2018

Title: Fructan-Enriched Diet Increases Bone Quality in Female Growing Rats at Calcium Deficiency

Author(s): Topolska, K | Radzki, RP | Filipiak-Florkiewicz, A | Florkiewicz, A | Leszczynska, T | Cieslik, E

Date: SEP 2018

Author Keywords: Fructans | Calcium deficiency | Rats | Femur | pQCT

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | INULIN-TYPE FRUCTANS | MINERAL METABOLISM | FUNCTIONAL FOOD | CORTICAL BONE | HEALTH | OLIGOFRUCTOSE | OSTEOPOROSIS | ABSORPTION | RETENTION

Publication Year: 2018

Volume: 73

Abstract:

This study was designed to determine the effect of feeding female rats with low-calcium diet containing one of three fructan sources (Jerusalem artichoke, yacon, Beneo Orafit Synergy¹), on selected bone parameters. Growing Wistar rats were fed modified AIN-93 G diet enriched in fructan sources (8%), added alone or as a strawberry sorbet ingredient. Two of eight groups were a validation model, where the positive control group was fed with recommended calcium dose in the diet (RCD), and negative one - with low calcium diet (LCD). After 12 weeks, femoral Ca content, bone densitometry, architecture and hardness were examined. The positive effects on femoral Ca content and cortical thickness, area and content in distal part of bone was observed after feeding animals diet enriched in Jerusalem artichoke sorbet. Beneficial action on other bone tomographic parameters (particularly trabecular volumetric bone mineral density) in this part of femur were associated mainly with the consumption of the diet with sorbet

containing yacon. Our results showed an important role of diet containing frozen strawberry desserts enriched in fructan sources in the maintenance of healthy bones of growing organism. It may suggest possible synergisms between fructans and bioactive substances of strawberry.

Source: FOOD TECHNOLOGY AND BIOTECHNOLOGY | 53 (2): 190-200 APR-JUN 2015

Title: Concentration and Purification of Yacon (*Smallanthus sonchifolius*) Root Fructooligosaccharides Using Membrane Technology

Author(s): Alles, MJL | Tessaro, IC | Norena, CPZ

Date: APR-JUN 2015

Author Keywords: yacon | fructooligosaccharides | purification | ultrafiltration | nanofiltration

Keywords Plus: OLIGOFRUCTOSE-ENRICHED INULIN | SACCHARIDE FRACTIONATION | CALCIUM-ABSORPTION | ENZYME-ACTIVITIES | NANOFILTRATION | OLIGOSACCHARIDES | POEPP. | GIRLS | ULTRAFILTRATION | OPTIMIZATION

Publication Year: 2015

Volume: 53

Abstract:

Yacon is a perennial plant originating from the Andean region whose roots have been receiving increased attention due to their high content of prebiotic fructooligosaccharides (FOS). Apart from many health benefits, FOS have interesting characteristics as food ingredients, so are used as sugar substitute, and their extraction from yacon roots may be an alternative to commercially available FOS. This work evaluates membrane technology for concentration and purification of FOS from yacon root extract, combining ultrafiltration (UF) with nanofiltration (NF), with and without the use of discontinuous diafiltration (DF). After UF, 63.75 % of the saccharides from the initial feed were recovered in total permeate. DF did not largely influence FOS retention during NF (it increased from 68.78 % without DF to 70.48 % with DF), but decreased glucose and fructose retentions, from 40.63 to 31.61 % and 25.64 to 18.69 %, respectively, which was desirable, allowing greater purification of FOS in the retentate. The yield of total saccharides in the final retentate after combined UP and NF processes was 50.89 % and of FOS was 51.85 %, with 19.75 % purity. The results indicate that the combined UP and NF is a promising technique for concentrating yacon saccharides, but more diafiltration steps are required for the improvement of FOS purity.

Source: AGRONOMY-BASEL | 9 (3): - MAR 22 2019

Title: Impact of Nitrogen Fertilization on Tuber Yield, Sugar Composition and Nitrogen Uptake of Two Yacon (*Smallanthus sonchifolius* Poepp. & Endl.) Genotypes

Author(s): Kamp, L | Hartung, J | Mast, B | Graeff-Honninger, S

Date: MAR 22 2019

Author Keywords: fructooligosaccharide | yacon | nitrogen content

Keywords Plus: ARTICHOKE HELIANTHUS-TUBEROSUS | POTATO | QUALITY | BEET | L. |

CARBOHYDRATE | STORAGE | CROPS | OLIGOSACCHARIDES | GROWTH

Publication Year: 2019**Volume:** 9**Abstract:**

The tuberous root crop, yacon, is native to the Andean region and contains high amounts of fructooligosaccharides (FOS) with up to 70% of dry matter. Due to FOS, consumption of tubers may have health-promoting effects. However, regarding the overall cultivation system, no recommendations exist for farmers on nitrogen fertilization and nitrogen (N) uptake of yacon. Therefore, three different N fertilization levels (0, 40, and 80 kg N ha⁻¹) and two genotypes (brown-shelled (BG) and red-shelled (RG)) were examined in a two-year field experiment regarding their tuber yield, sugar composition, and nitrogen uptake. Tuber yields increased with increasing fertilization level and were highest for B80 and R80 (50 and 67 t FM ha⁻¹), while significant differences between the genotypes existed. Sugar and the amount of FOS slightly decreased with increasing N fertilization level, and ranged between 36% and 73% and 30% and 58% of dry matter, respectively. An overall decreasing amount of FOS led to a slight increase in the amount of FOS with a higher degree of polymerization. Regarding the N-use efficiency of tubers and the total plant, an N fertilization level of 40 kg N ha⁻¹ seems to favor tuber yield.

Source: JOURNAL OF FOOD PROCESS ENGINEERING | 42 (7): - NOV 2019**Title:** Evaluation of different bleaching methods applied to yacon**Author(s):** Macedo, LL | Araujo, CD | Vimercati, WC | Saraiva, SH | Teixeira, LJQ**Date:** NOV 2019**Author Keywords:****Keywords Plus:** HIGH-INTENSITY ULTRASOUND | SMALLANTHUS-SONCHIFOLIUS | INHIBITION | FLOUR | ACID | ROOTS**Publication Year:** 2019**Volume:** 42**Abstract:**

This work aimed to evaluate the effects of bleaching of yacon using ascorbic acid, citric acid, sodium bisulfite, and l-cysteine hydrochloride, in 400 ppm concentrations and the heat treatment at 100 degrees C/8 min. The roots were washed, sanitized, and peeled. One batch of the peeled roots was sliced and subjected to heat treatment, with subsequent extraction of juice. Another batch was intended for juice extraction and subjected to chemical bleaching. The bleached samples, along with their respective control samples (not bleached) were evaluated for the total color difference (Delta E) in relation to time zero, over 240 min. Data were subjected to regression analysis and exponential models were adjusted. The values of the horizontal asymptotes were plotted in a bar chart. The treatments with ascorbic and citric acids showed low bleaching capacity in the concentrations studied. l-Cysteine hydrochloride, sodium bisulfite, and heat treatment were good methods for minimizing yacon juice browning. Practical Applications Yacon is a perishable tuberous root and when processed has a high rate of enzymatic

browning. This fact makes it indispensable to apply a bleaching method during processing to minimize browning. Therefore, the study of different methods of bleaching provides useful information that enables both practical application by the food industries and the development of new research with yacon.

Source: ACTA SCIENTIARUM-TECHNOLOGY | 37 (1): 167-173 2015

Title: Thermophysical properties of yacon (*Smallanthus sonchifolius*): experimental determination and effect of moisture content

Author(s): Perussello, CA | Mariani, VC | Masson, ML | de Castilhos, F

Date: 2015

Author Keywords: thermophysical properties | yacon | osmotic dehydration | convective drying | heat and mass transfer

Keywords Plus: OSMOTIC DEHYDRATION | MASS-TRANSFER | KINETICS | DIFFUSIVITY | CARROT | SUGAR | MEAT

Publication Year: 2015

Volume: 37

Abstract:

The knowledge about thermophysical properties of foods is especially important in thermal processing, influencing the design, optimization and cost reduction of the process, as well as the quality and safety of the final product. This article deals with the determination of some thermophysical properties of yacon, namely, specific mass, specific heat, thermal conductivity and thermal diffusivity during the osmo-convective drying. Yacon is a root with approximately 90% w. b. of moisture content, whose high concentration of fructooligosacharydes and antioxidants has gained attention in the food research field. Yacon slices were osmotically dehydrated for 2 hours in a sucralose solution and then dried in a convective tray dryer for 2 hours, varying the osmotic solution's temperature and stirring rate and temperature of the drying air. All thermophysical properties were determined during the drying process at 30-minute intervals. The thermophysical properties were determined not only experimentally but also calculated by models available in literature based on the product's centesimal composition. A satisfactory agreement between experimental and predicted results was obtained. Further, empirical models obtained by nonlinear regression were successfully fitted to the experimental data, as a function of moisture content, within a 94% - 3% w. b. range.

Source: INTERNATIONAL JOURNAL OF FRUIT SCIENCE | 20: S1784-S1804 Suppl. 3 SEP 21 2020

Title: Functional Foods from Crops on the Northern Region of the South American Andes: The Importance of Blackberry, Yacon, Acai, Yellow Pitahaya and the Application of Its Biocompounds

Author(s): Sanin, A | Navia, DP | Serna-Jimenez, JA

Date: SEP 21 2020

Author Keywords: Emerging Technologies | Functional compounds | Natural Antioxidants | Properties | Stability

Keywords Plus: EUTERPE-OLERACEA MART. | SMALLANTHUS-SONCHIFOLIUS YACON | ANTI-OXIDANT ACTIVITY | BIOACTIVE COMPOUNDS | OSMOTIC DEHYDRATION | PHENOLIC-COMPOUNDS | GASTROINTESTINAL DIGESTION | RED RASPBERRY | HIGH-PRESSURE | ANT-HOCYANINS

Publication Year: 2020

Volume: 20

Abstract:

The search for new nutritional alternatives that favor human health is related to one of the world's tendencies in science and food technology nowadays: research on food with functional properties (antioxidant activity, prebiotic activity, intestinal motility, among others), mainly regions' autochthonous products, from which the productive sector can benefit thanks to its transformation and added value generation. In this review, the importance of four Andean food items with the potential to be explored and maximized by obtaining functional products is described. Because of the fact that blackberry, yacon, acai and yellow pitahaya are promissory Andean foods with exceptional qualities for consumers' health, information was gathered about studies and possible effects in treatment of diseases, and the most used methods for the product and therefore for their biocompounds. It was concluded that this kind of food items represents important alternatives for the transformation and extraction of biocompounds (pigments, antioxidants, fructo-oligosaccharides, fiber, among others), in which non-thermal technologies play a fundamental role in conserving their functional properties, and at the same time, strengthen rural agro-industry and the exploitation of autochthonous products for strengthening region's and world's economy.

Source: BRITISH FOOD JOURNAL | 122 (1): 26-35 NOV 11 2019

Title: Low phenylalanine breads as an alternative for patients with phenylketonuria

Author(s): Scortegagna, ML | de Oliveira, VR | Pasini, I | Silva, M | Rios, AD | Doneda, D

Date: NOV 11 2019

Author Keywords: Diet | Amino acid | Food

Keywords Plus: NUTRITION MANAGEMENT | GLYCOMACROPEPTIDE | PRODUCTS | PROTEIN | FOODS

Publication Year: 2019

Volume: 122

Abstract:

Purpose Patients with phenylketonuria (PKU) require a phenylalanine (Phe)-restricted diet due to its toxic effects on such subjects. Considering the low availability of specific foods for these patients, the purpose of this paper is to make breads with low Phe content while also conducting physicochemical and sensory analysis of the samples. Design/methodology/approach Five bread formulations with a common base were prepared, in which manioc - Manihot esculenta (T1); Baroa potato - Arracacia xanthorrhiza (T2); sweet potatoes - Ipomoea batatas (T3); potatoes - Solanum tuberosum (T4); and, finally, yacon

potato - *Smallanthus sonchifolius* (T5) were added. Findings The physical analysis showed that the samples had similar weight, height and size values, indicating that the use of different types of vegetables does not compromise the final result of the preparation. The chemical analysis showed that the loaves were low in protein and Phe and, therefore, are considered safe preparations for patients with PKU. In the sensory analysis, all the preparations presented satisfactory characteristics for consumption, specially the one with the addition of potato. Originality/value PKU has a direct influence on the daily diet of the patient, interfering with life decisions that go from eating at their home to where and what to eat in environments out of their control. Therefore, creating specific preparations for such patients is a challenge that assists in adherence to dietary therapy.

Source: FOOD RESEARCH INTERNATIONAL | 74: 48-54 AUG 2015

Title: Yacon (*Smallanthus sonchifolius*) and *Lactobacillus acidophilus* CRL 1014 reduce the early phases of colon carcinogenesis in male Wistar rats

Author(s): Almeida, APD | Avi, CM | Barbisan, LF | de Moura, NA | Caetano, BFR | Romualdo, GR | Sivieri, K

Date: AUG 2015

Author Keywords: Chemical carcinogenesis | Colon | Prebiotic | Probiotic | Synbiotic

Keywords Plus: ABERRANT CRYPT FOCI | CELL-PROLIFERATION | KI-67 EXPRESSION | COMET ASSAY | DNA-DAMAGE | CANCER | INULIN | FRUCTOOLIGOSACCHARIDES | MECHANISMS | PREVENTION

Publication Year: 2015

Volume: 74

Abstract:

The modifying effects of aqueous yacon extract (AYE) and *Lactobacillus acidophilus* CRL 1014 against colon carcinogenesis induced by 1,2-dimethylhydrazine (DMH) in male Wistar rats were investigated. Animals were allocated into five groups: Cl: untreated group; G2: DMH-treated group; G3: DMH + *L. acidophilus*-treated group; G4: DMH + AYE-treated group; G5: DMH + *L. acidophilus* and AYE-treated group. A significant reduction ($p < 0.05$) in leukocyte DNA damage and in colonic cell proliferation was observed after the first DMH administration in G3 (probiotic), G4 (prebiotic) and G5 (synbiotic) groups. In this moment, a significant increase ($p < 0.05$) in colonic apoptosis was also observed in G3 (probiotic) and G5 (synbiotic) groups. In special, at five months after DMH administrations, a significant reduction ($p < 0.05$) in ACF development was observed in G3 (probiotic), G4 (prebiotic) and G5 (synbiotic) groups. Incidence of colon tumors was lower at five months in G4 (prebiotic) and G5 (synbiotic) groups but not in eight months after DMH administrations. In conclusion, the findings suggest that the oral treatments have potential effects as a chemopreventive agent against colon carcinogenesis on an early stage of tumor development.

Source: LWT-FOOD SCIENCE AND TECHNOLOGY | 71: 77-87 SEP 2016

Title: Osmotic dehydration of yacon (*Smallanthus sonchifolius*): Optimization for fructan retention

Author(s): de Oliveira, LF | Correa, JLG | Pereira, MCD | Ramos, ADS | Vilela, MB

Date: SEP 2016

Author Keywords: Pulsed vacuum osmotic dehydration | Prebiotic | FOS

Keywords Plus: MASS-TRANSFER | HEAT-PUMP | KINETICS | COLOR | TOMATOES | SORBITOL | FRUIT | JUICE

Publication Year: 2016

Volume: 71

Abstract:

Yacon presents prebiotic and hypoglycemic properties with a high fructan content. Pulsed vacuum osmotic dehydration (PVOD) is a process that can reduce water activity with small variations in nutritional properties. Yacon slices were dehydrated with two different solutions: fructose and sorbitol. The experiments were based on a central composite rotational design and the optimum condition set for the highest retention of fructans. The PVOD experiments were performed in 300 min, with vacuum pulse in the first 10 min. The independent variables were temperature (24-44 degrees C), vacuum pressure (49.4 - 200.6 mmHg) and osmotic solution concentration (22.0-60.8 degrees Brix). The dependent variables were fructan retention, weight reduction, water loss, solid gain, water activity and total color difference. The highest fructan retention was obtained with sorbitol, ranging from 28.13 to 82.03%, in contrast to the range of 2.79-39.48% obtained for the sample dehydrated with fructose. The optimum PVOD condition with sorbitol was concentration of 38 degrees Brix, temperature of 35 degrees C and vacuum pressure of 74 mmHg. For PVOD with fructose, the best results were obtained with a solution concentration of 35 degrees Brix, temperature between 24 and 30 degrees C and vacuum pulse above 100 mmHg.

Source: IN VITRO CELLULAR & DEVELOPMENTAL BIOLOGY-PLANT | 52 (1): 38-44 FEB 2016

Title: Evaluation of aqueous chlorine dioxide for disinfecting plant explants

Author(s): Duan, YB | Zhao, FL | Li, H | Zhou, YY | Zhu, XY | Li, FL | Chen, WL | Xue, JP

Date: FEB 2016

Author Keywords: Aqueous chlorine dioxide | Explant disinfection | Polyphenol-limited explants

Keywords Plus: REGENERATION | GROWTH | GAS

Publication Year: 2016

Volume: 52

Abstract:

Sterilization of explants while maintaining viability is a major task for those working in plant tissue culture. This task is usually accomplished through the use of mercuric chloride or sodium hypochlorite. Due to environmental and health concerns, however, new disinfectants are desired. Chlorine dioxide is an environmentally friendly disinfectant that has been used for many purposes, though its use in plant tissue culture has not been thoroughly investigated. This report describes the application of aqueous chlorine dioxide for the disinfection of yacon (*Smallanthus sonchifolius*) and pomegranate (*Punica granatum*) explants. The threshold concentration for obtaining high antimicrobial efficiency with aqueous

chlorine dioxide was determined to be 1.25-2.5 mM; however, the viability of the explants from the two species differed with treatment. While the viability of yacon explants remained high at 1.25-1.67 mM aqueous chlorine dioxide, pomegranate explant viability was severely impaired at all tested concentrations. The level of explant viability was negatively correlated with high levels of endogenous polyphenol and subsequent free radical accumulation following treatment. Aqueous chlorine dioxide at concentrations of 1.25-2.5 mM was also suitable for explant disinfection in other low-polyphenol-containing plant species such as rice (*Oryza sativa*), *Pinellia ternata*, and *Isodon amethystoides*. This work shows that aqueous chlorine dioxide can be effectively utilized as an alternative disinfectant for low-polyphenol-containing explants in general.

Source: LWT-FOOD SCIENCE AND TECHNOLOGY | 66: 503-513 MAR 2016

Title: Effects of foam mat drying on physicochemical and microstructural properties of yacon juice powder

Author(s): Franco, TS | Perussello, CA | Ellendersen, LN | Masson, ML

Date: MAR 2016

Author Keywords: Temperature | Thickness | Hygroscopicity | Color | Density | Solubility

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | PHYSICAL-PROPERTIES | ANTIOXIDANT PROPERTIES | MALTODEXTRIN | PULP | FRUCTOOLIGOSACCHARIDES | OPTIMIZATION | MONOSTEARATE | TEMPERATURE | EXTRACT

Publication Year: 2016

Volume: 66

Abstract:

Yacon juice powder can be used as a highly nutritious ingredient in several food preparations. To this purpose, factors such as moisture content, density, porosity and solubility should be optimized as they are determinant to the product's ease of reconstitution, stability and sensory quality. In this work, yacon juices with two different concentrations (8 degrees Brix and 24 degrees Brix), both added of egg albumin as foaming agent, were subjected to foam mat drying using different temperatures (50 degrees C, 60 degrees C and 70 degrees C) and thicknesses of the foam layer (0.5 cm, 1.0 cm and 1.5 cm). The resulting juice powders were assessed for color, moisture, chemical composition, water activity, solubility in water, water absorption rate, absolute and bulk densities, intragranular porosity, microstructure and hygroscopicity. The drying conditions did not affect solubility index, density, microstructure and porosity of the particles, however the temperature increase reduced moisture content, water activity and, consequently, hygroscopicity. The powders of concentrate juice resulted lighter and reddish respect to the non concentrate juices, which tended to green. The highest air temperature coupled with reduced thickness for both juices was found to be the best drying condition, yielding juice powders with low water activity and satisfactory physicochemical characteristics.

Source: ACTA CIRURGICA BRASILEIRA | 30 (5): 366-370 MAY 2015

Title: Fructo-oligosaccharide effects on serum cholesterol levels. An overview

Author(s): Costa, GT | de Abreu, GC | Guimaraes, ABB | de Vasconcelos, PRL | Guimaraes, SB

Date: MAY 2015

Author Keywords: Oligosaccharides | Dietary Fiber | Cholesterol | Dyslipidemias | Review

Keywords Plus: SHORT-CHAIN FRUCTOOLIGOSACCHARIDES | YACON SMALLANTHUS-SONCHIFOLIUS | HEPATIC GLUCOSE-PRODUCTION | LIPID CONCENTRATIONS | CHRONIC CONSUMPTION | BLOOD-LIPIDS | INSULIN | INULIN | BENEFITS | FIBERS

Publication Year: 2015

Volume: 30

Abstract:

PURPOSE: To address the effects of fructooligosaccharides (FOS) intake on serum cholesterol levels. **METHODS:** We performed a search for scientific articles in MEDLINE database from 1987 to 2014, using the following English keywords: fructooligosaccharides; fructooligosaccharides and cholesterol. A total of 493 articles were found. After careful selection and exclusion of duplicate articles 34 references were selected. Revised texts were divided into two topics: "FOS Metabolism" and "FOS effects on plasma cholesterol." **RESULTS:** The use of a FOS diet prevented some lipid disorders and lowered fatty acid synthase activity in the liver in insulin-resistant rats. There was also reduction in weight and total cholesterol in beagle dogs on a calorie-restricted diet enriched with short-chain FOS. Another study found that 2g FOS daily consumption increased significantly serum HDL cholesterol levels but did not ensure a significant reduction in levels of total cholesterol and triglycerides.. Patients with mild hypercholesterolemia receiving short-chain FOS 10.6g daily presented no statistically significant reduction in serum cholesterol levels. However, when FOS was offered to patients that changed their lifestyle, the reduction of LDL cholesterol and steatosis was higher. **CONCLUSIONS:** Fructooligosaccharides intake may have a beneficial effect on lipid metabolism and regulation of serum cholesterol levels in individuals that change their lifestyle. FOS supplementation use in diets may therefore be a strategy for lowering cholesterol.

Source: LWT-FOOD SCIENCE AND TECHNOLOGY | 125: - MAY 2020

Title: Yacon (Smallanthus sonchifolius) flour obtention: Effect of process conditions on quality attributes and its incorporation in gluten-free muffins

Author(s): Lancetti, R | Palavecino, PM | Bustos, MC | Leon, AE

Date: MAY 2020

Author Keywords: Dehydration | Fructo-oligosaccharides | Antioxidant activity | Yacon roots | Gluten-free muffins

Keywords Plus: ANTIOXIDANT PROPERTIES | POLYPHENOL OXIDASE | INULIN | ROOTS | FRUCTOOLIGOSACCHARIDES | POEPP. | BREAD | STEAM | ACID

Publication Year: 2020

Volume: 125

Abstract:

Yacon is a little-known, non-starchy Andean root crop recognized as a rich source of beta-(2-1)

fructooligo-saccharides. The aim of this research is to study different drying conditions to obtain yacon flour with high color and bioactive conservation to be used as a functional ingredient. Three different types of pre-drying processing were tested: pulped, cut as cubes and sliced with addition of bisulfite, and drying for 16 h at 65 degrees C. Dried sliced-yacon remained light-yellow with the lowest anti-browning index. The flour obtained from this sample also showed high reducing sugar content, and good fructans conservation (around 60% compared to freeze-dried) and the highest total polyphenol content (approximate to 450 mg GAE/100 g) and antioxidant activity. Starch-based glutenfree muffins were made with 5% and 10% of substitution of corn starch by flour obtained from dried sliced yacon with minimal effect on crust and crumb color. Addition of yacon flour made muffins less firm and more cohesive with a decrease in chewiness as compared to control. Its addition also generated a larger number of smaller pores in the muffin's microstructure. The results highlight that yacon flour may be produced by different methods and this powder represents an ingredient with considerable potential for food enrichment.

Source: FOOD SCIENCE AND TECHNOLOGY | 37 (2): 166-175 APR-JUN 2017

Title: Optimization of synbiotic yogurts with yacon pulp (*Smallanthus sonchifolius*) and assessment of the viability of lactic acid bacteria

Author(s): Padilha, VM | Andrade, SAC | Valencia, MS | Stamford, TLM | Salgado, SM

Date: APR-JUN 2017

Author Keywords: response surface methodology | fructo-oligosaccharides | *L. paracasei* ssp *Paracasei* LBC 81 | sensory analysis

Keywords Plus: IN-VITRO EVALUATION | PROBIOTIC BACTERIA | SENSORY PROPERTIES | LACTOBACILLUS-PARACASEI | GLUCOSE-OXIDASE | PREBIOTICS | INULIN | TEMPERATURE | PRODUCTS | SURVIVAL

Publication Year: 2017

Volume: 37

Abstract:

The aim of this study was check the effects of sugar, yacon pulp and skimmed milk powder in the aroma, flavour, texture, appearance, overall impression and intent to purchase on synbiotic yogurts to optimize the formulation using Response Surface Methodology. The most accepted formulations were subjected to viability tests during 21 days by counting traditional and probiotic bacteria. Were constructed a complete 2(3) factorial design, totalling 17 experiments, and considered independent variables (percentage of ingredients) and dependent variables (sensory attributes). All attributes were graded using an acceptability assessment, for this balanced incomplete block was applied. The number of viable cells was determined using specific culture medium for each species. The percentage of yacon pulp had a pronounced negative influence on flavour, texture, appearance, overall impression and intent to purchase. Model predictions adjusted to the variables aroma, flavour, texture, appearance, overall impression and intent to purchase exhibited good predictive ability and hence could be used as tools for process control. Traditional bacterial strains and probiotic remained viable throughout the storage period. The counts of

probiotic bacterial in the formulations were above 6 log CFU/g. The addition of *Lactobacillus paracasei* ssp. *paracasei* LBC 81 and yacon pulp to yogurt increased product acceptability.

Source: JOURNAL OF MEDICINAL FOOD | : - NOV 11 2020

Title: Evaluation In Vitro of Toxicity of Hydroalcoholic Extract of Leaves and Roots from Yacon (*Smallanthus sonchifolius*)

Author(s): Martinez-Oliveira, P | Zuravski, L | de Oliveira, MF | Stroher, DJ | Coelho, RP | Pilar, BC | de Oliveira, LFS | Piccoli, JDE | Machado, MM | Denardin, CC | Manfredini, V

Date:

Author Keywords: apoptosis | cytotoxicity | genotoxic activity | mutagenic activity | yacon

Keywords Plus: COMET ASSAY | APOPTOSIS | ACTIVATION

Publication Year:

Volume:

Abstract:

Yacon is an Andean plant that has been used in folk medicine for its medicinal properties. The beneficial effects of this plant are possibly due to the high content of phenolic compounds present in its leaves and roots. This study evaluated the in vitro toxicity of the hydroalcoholic extract of leaves and roots from yacon (1, 10, 50, and 100 μ g/mL) through cell viability tests, genotoxic and mutagenic activity in leukocytes culture cells; and cytotoxicity and apoptosis cell death (1, 10, 50, 100, and 500 μ g/mL) in cell line originally established from the primary mouse embryonic fibroblast cells that were cultured by the designated protocol, so-called 3T3 protocol "3-day transfer, inoculum 3×10^5 cells" (3T3 cell line). No mutagenic and cytotoxic activities were observed in leukocyte cultures. Cytotoxic activity was evidenced in the highest concentrations of yacon leaf extract (50 and 100 μ g/mL), whereas all concentrations tested with yacon leaf extract there was induction for apoptosis in the 3T3 cells. Genotoxic potential was observed only at higher doses of leaf (50 and 100 μ g/mL) and root (100 μ g/mL) extract. These results suggest that yacon leaf at high concentrations may present toxic potential showing concentration-dependent behavior; however, in vivo studies should be performed to validate these results.

Source: JOURNAL OF FOOD PROCESS ENGINEERING | 40 (2): - APR 2017

Title: Effect of Vacuum Drying Temperature on Drying Kinetics, Effective Moisture Diffusivity and Quality of Peeled Litchi (*Litchi chinensis* Sonn.)

Author(s): Reis, FR | Ivahashi, MM | Rosa, AHG

Date: APR 2017

Author Keywords:

Keywords Plus: YACON SMALLANTHUS-SONCHIFOLIUS | POLYPHENOL OXIDASE | ASCORBIC-ACID | DRIED APPLES | SLICES | OPTIMIZATION | DEHYDRATION | SHRINKAGE | MICROWAVE | MODEL

Publication Year: 2017

Volume: 40

Abstract:

This study aimed at investigating the effect of vacuum drying temperature on drying kinetics, drying rates, effective moisture diffusivity and quality parameters of litchi fruits. Peeled litchi quarters were dried at 50-70 degrees C at an absolute pressure of 8kPa. Results show that the vacuum drying occurred in the falling rate period. Drying rates increased with drying temperature. The Page model provided the best fit to the drying kinetics. Effective moisture diffusivity ranged between 1.997×10^{-9} and 5.012×10^{-9} m²/s. The temperature dependence of the effective moisture diffusivity was well described by an Arrhenius-type equation. The activation energy for moisture diffusion was 41.81kJ/mol. Drying temperature did not significantly affect product sensory acceptance, density, shrinkage and rehydration. The products dried at 50 and 70 degrees C presented slightly superior texture and flavor, while the product dried at 60 degrees C presented significantly higher lightness and lower water activity. Practical Applications This work provides valuable information on the vacuum drying of litchi fruits, which are appreciated in many countries due to their pleasant sensory characteristics. Vacuum drying is not a costly drying method. At the same time, vacuum drying produces dried foods of relatively good quality. This study could be used as a reference by small and medium scale food processors interested in producing dried litchi of good quality with relatively low investment in equipment. The understanding of the influence of drying temperature on quality parameters is useful for deciding which temperature is more appropriate depending on the desired quality aspects, while the calculation of engineering parameters is important for designing the drying process.

Source: JOURNAL OF MEDICINAL FOOD | 18 (9): 980-986 SEP 1 2015

Title: Yacon-Based Product in the Modulation of Intestinal Constipation

Author(s): Sant'Anna, MDL | Rodrigues, VC | Araujo, TF | Oliveira, TT | Peluzio, MDG | Ferreira, CLDF

Date: SEP 1 2015

Author Keywords: yacon | constipation | prebiotics | functional food

Keywords Plus: DOUBLE-BLIND | SMALLANTHUS-SONCHIFOLIUS | FECAL BIFIDOBACTERIA | INULIN | OLIGOFRUCTOSE | MICROBIOTA | SUPPLEMENTATION

Publication Year: 2015

Volume: 18

Abstract:

This study aimed to assess the effects of a yacon-based product (YBP) on constipation in adults, including the elderly. Forty-eight individuals were recruited and divided into equal intervention groups named the test and control groups. The YBP (test) and the control (maltodextrin) were dissolved in commercial orange juice. The volunteers for the YBP/test group consumed, on a daily basis, orange juice containing 10 g fructooligosaccharide (FOS)/inulin per day. The control group consumed, on a daily basis, orange juice containing 25 g of maltodextrin. The study had a span of 30 days. We evaluated the

participants' frequency of evacuation, consistency of the feces, constipation score, abdominal symptoms (flatulence, pain, and abdominal strain), and effects upon the microbiota, pH, lactate, and short-chain fatty acids (SCFAs) of the feces. The study showed an increased number of evacuations after the consumption of the YBP as well as an improvement in the consistency of the feces and a reduction in the constipation score. After 30 days of intervention, the group that consumed the YBP showed higher counts of *Bifidobacterium*, lower *Clostridium* and enterobacteria counts, and lower fecal pH. In relation to SCFAs, no significant change was found after the intervention. However, the lactate concentration was higher in the test group when compared to the post-treatment control group. The YBP was effective in improving constipation symptoms; not only was its functional characteristic in reducing constipation symptoms evident but it also demonstrated usefulness as a potential therapy.

Source: FOOD RESEARCH INTERNATIONAL | 137: - NOV 2020

Title: Acute postprandial effect of yacon syrup ingestion on appetite: A double blind randomized crossover clinical trial

Author(s): Adriano, LS | Dionisio, AP | de Abreu, FAP | Wurlitzer, NJ | de Melo, BRC | Carioca, AAF | Sampaio, HAD

Date: NOV 2020

Author Keywords: *Smallanthus sonchifolius* | Fructooligosaccharides | Prebiotics | Appetite | Obesity

Keywords Plus: GLUCAGON-LIKE PEPTIDE-1 | GHRELIN RESPONSES | SATIETY | GLUCOSE | INSULIN | OLIGOFRUCTOSE | IMPACT | MANAGEMENT | BENEFITS | VALIDITY

Publication Year: 2020

Volume: 137

Abstract:

Yacon syrup is a rich source of fructooligosaccharides (FOS); however, its diet supplementation effect on subjective sensation and appetite biomarkers in human is still unknown. This study aimed to evaluate the acute postprandial effect of yacon syrup ingestion on appetite. The double-blind crossover clinical trial was carried out with 40 adult women: 20 eutrophic and 20 obese grade I. On each day, the first blood collection was performed after a 12-h fast. Then, the volunteers ingested either intervention A (breakfast + 40 g of placebo) or intervention B (breakfast + 40 g of yacon syrup, containing 14 g of FOS). New aliquots of blood were collected at 45, 60, 90, 120, and 180 min. Appetite was assessed by estimating ghrelin and glucagon-like peptide-1 (GLP-1) levels and by assessing subjective appetite sensation. Analysis was performed using two-way ANOVA, followed by Bonferroni's multiple comparison test. No effect of yacon syrup was observed on postprandial ghrelin and GLP-1 levels at all times evaluated. Similar observations were made after stratifying the analysis by BMI (body mass index) (eutrophic and obese). The effect of yacon syrup on postprandial subjective sensations of hunger, satiety, fullness, and desire to eat was not evident in the total group of women evaluated and even after BMI stratification. We concluded that yacon syrup had no effect on postprandial ghrelin and GLP-1 levels and on the subjective appetite sensation in young adult women.

Source: JOURNAL OF FOOD PROCESSING AND PRESERVATION | 41 (6): - DEC 2017

Title: Reuse of sorbitol solution in pulsed vacuum osmotic dehydration of yacon (*Smallanthus sonchifolius*)

Author(s): de Oliveira, LF | Correa, JLG | Botrel, DA | Vilela, MB | Batista, LR | Freire, L

Date: DEC 2017

Author Keywords:

Keywords Plus: OPTIMIZATION | FOOD

Publication Year: 2017

Volume: 41

Abstract:

The osmotic solution (OS) used in pulsed vacuum osmotic dehydration (PVOD) could represent an environmental problem. The reuse of the solution minimizes the cost, but has to consider the properties of the dehydrated product and the solution itself. The reuse of sorbitol solution, 38 kg/100 kg solution, in 15 successive PVOD of yacon slices (35 degrees C, 300 min) was studied. The evaluation was based on alterations of soluble solids, water activity, pH, turbidity, electrical conductivity, viscosity, density, color, and microbiological stability. The weight loss, moisture content, and soluble solids of the food were also evaluated. Among the OS characteristics, only the color, electrical conductivity, and turbidity of the solution changed significantly, alterations that could be reduced with filtration. The food properties were not significantly affected. The microbiological content was retained in acceptable levels. The reuse of the sorbitol solution could be performed without relevant alterations in the food or the solution. Practical applications The osmotic solution is used in osmotic dehydration to promote a partial removal of the moisture content of the food. However, after the osmotic process, the solution is diluted and contains native solutes from the food. For obtaining a dehydrated product within a standard production, the solution should also present standard characteristics. This work presents the evolution of some analysis as soluble solids, water activity, pH, turbidity, electrical conductivity, viscosity, density, color, and microbiological stability in a solution of sorbitol. Sorbitol solution is an alternative to sucrose for obtaining semidehydrated products with glycemic index. It was shown that the solution could be used for at least 15 times in yacon dehydration.

Source: JOURNAL OF ANIMAL AND PLANT SCIENCES | 25 (6): 1753-1763 DEC 2015

Title: IN VITRO INDUCTION OF YACON TUBEROUS ROOT AND IDENTIFICATION OF GENES ASSOCIATED WITH TUBEROUS ROOT EXPANSION

Author(s): Duan, Y | Xue, T | Li, J | Teng, J | Zhang, A | Sheng, W | Zhu, Y | Chang, L | Xue, J

Date: DEC 2015

Author Keywords: in vitro manipulation | *Smallanthus sonchifolius* | suppression subtractive hybridization | tuberous root expansion

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS POEPP. | XYLOGLUCAN ENDOTRANSGLYCOSYLASE | RESISTANCE | FRUCTOOLIGOSACCHARIDES | EXPRESSION | TOMATO | ENDL | TIME

Publication Year: 2015

Volume: 25

Abstract:

Yacon (*Smallanthus sonchifolius*) has become increasingly popular worldwide owing to the nutritional and prebiotic function of its tuberous root. Elucidating the molecular mechanism controlling the expansion of the tuberous root in yacon is important for its breeding and in vitro manipulation. However, both the in vitro induction and the development mechanism of yacon tuberous root are still unclear. In this study, we optimized the medium formula for efficient induction of tuberous root in vitro from leaf-derived adventitious roots using an orthogonal design. The optimal medium for in vivo tuberous root initiation was determined as Murashige and Skoog medium supplemented with 3 mgL⁻¹ 6-benzylaminopurine, 0.1 mgL⁻¹ naphthalene acetic acid, and 70 gL⁻¹ sucrose. Suppression subtractive hybridization (SSH) was performed to identify the transcripts up-regulated during the expansion of yacon tuberous root. The cDNAs of expanded and unexpanded tuberous roots were used as the 'tester', and 'driver', respectively. SSH library sequencing yielded 302 expressed sequence tags (ESTs). Finally, 97 ESTs were retained after screening, 15 of which had no significant homology to any of the previously identified genes. Real-time quantitative RT-PCR analysis of the expression patterns showed that all 11 transcripts were up-regulated during the tuberous root expansion process. These ESTs were highly homologous with expansion, beta-xyloglucan endotransglycosylase, acyl-CoA-binding protein, asparagine synthetase, seed storage protein, lignin-related peroxidase, cytochrome P450, polyubiquitin, translation initiation factor, and nutrient storage protein. These results would facilitate the functional characterization of the genes associated with yacon tuber expansion and subsequent in vitro manipulation.

Source: CRITICAL REVIEWS IN PLANT SCIENCES | 35 (1): 18-37 JAN 2 2016

Title: Sesquiterpene Lactones: More Than Protective Plant Compounds With High Toxicity

Author(s): Padilla-Gonzalez, GF | dos Santos, FA | Da Costa, FB

Date: JAN 2 2016

Author Keywords: Sesquiterpene lactones | anti-herbivory | deterrent | rhizosphere communication | plant phototropism

Keywords Plus: PARTHENIUM-HYSTEROPHORUS L | HELIANTHUS-ANNUUS L | CAPITATE GLANDULAR TRICHOMES | GERMINATION STIMULANTS | BIOLOGICAL-ACTIVITIES | SMALLANTHUS-SONCHIFOLIUS | ISOPRENOID BIOSYNTHESIS | DETERRENT ACTIVITY | TUMOR INHIBITORS | PARASITIC PLANTS

Publication Year: 2016

Volume: 35

Abstract:

Sesquiterpene lactones (STLs) constitute a large group of secondary metabolites that are widely distributed in several angiosperm plant families and a few bryophytes, including liverworts. These metabolites are particularly diversified in the family Asteraceae, in which more than 5,000 compounds have been

reported so far. In addition to their pharmacological importance and potential therapeutic applications, most STLs display a wide range of protective activities in plants, including acting as anti-herbivory and antimicrobial substances or inhibiting growth of competing plants. These activities are mainly related to their characteristic α -unsaturated structural elements, which can participate in Michael-type additions with biological nucleophiles that contain sulfhydryl groups. Supporting the protective roles of STLs, they are mainly located in glandular trichomes of aerial parts because the highly nonspecific toxicity of such compounds necessitates compartmentalization to prevent autotoxicity. However, STLs have also been reported in other aerial and underground organs, where they are assumed to exhibit other biological activities. Recent studies have suggested that these metabolites not only display protective activities due to toxicity but also play key physiological roles in mediating rhizosphere communication among plants, soil microorganisms and plant parasites. STLs have been directly implicated in plant phototropism, resulting in differential growth of a plant organ due to auxin inhibition when accumulated in response to a light stimulus. This review therefore not only highlights the protective roles of STLs in producing plants but also explores the physiological roles of these metabolites, thus providing insights for new research approaches for understanding the roles of STLs in plants and their potential future applications.

Source: INTERNATIONAL JOURNAL OF PHARMACOLOGY | 13 (1): 74-82 2017

Title: Anticancer Action and Pharmacokinetics of Sesquiterpene Lactone Extracts of Yacon Leaves

Author(s): Bai, J | Suo, TJ | Wei, X | Dou, PY | Ran, XK | Aung, KKW | Dou, DQ | Zeng, Z

Date: 2017

Author Keywords: Anti-cancer | high-performance liquid chromatography | pharmacokinetics | rat plasma | anti-cancer

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | CONSTITUENTS

Publication Year: 2017

Volume: 13

Abstract:

Objective: The anticancer actions of extracts of yacon leaves mainly composed of sesquiterpene lactone were assayed with H22 tumor mice model in vivo and pharmacokinetics of the extracts were also examined. About 200 mg kg⁻¹ of the extracts showed 35.99% tumor inhibitory rate and up-regulation of IL-2 levels and down-regulation of TNF- α . **Methodology:** High-performance liquid chromatography (HPLC) method was used for the study of pharmacokinetics of enhydrin and uvedalin of the extract with artemisinin as internal standard after oral administration at a dose of 200 and 100 mg kg⁻¹, respectively. **Results:** Their pharmacokinetics parameters were calculated as follows: The t(max) for enhydrin and uvedalin is similar at 1.5 \pm 0 h in both doses and C-max for enhydrin and uvedalin were 13.416 \pm 0.210 and 8313.31 \pm 0.23 mg mL⁻¹ in high dose and 6.887 \pm 0.120 and 4231.45 \pm 0.17 mg mL⁻¹ in low dose, respectively. The AUC(0-t) of enhydrin and uvedalin were 137.444 \pm 30.782 and 17345.375 \pm 613.231 mg L⁻¹ h⁻¹ in high dose and 43.426 \pm 19.663 and 8831.724 \pm 555.122 mg L⁻¹ h⁻¹ in low dose, respectively. **Conclusion:** The anti-cancer action of sesquiterpene extracts of yacon

leaves was explored. Further, a simple and specific HPLC method was developed for the determination of enhydrin and uvedalin from yacon leaves extract in rat plasma. This study laid a foundation for the further utilization of yacon leaves.

Source: PLANT FOODS FOR HUMAN NUTRITION | 74 (3): 350-357 SEP 2019

Title: Chemical Composition and Antioxidant Activity of the Main Fruits, Tubers and Legumes Traditionally Consumed in the Andean Regions of Ecuador as a Source of Health-Promoting Compounds

Author(s): Perez-Balladares, D | Castaneda-Teran, M | Granda-Albuja, MG | Tejera, E | Iturralde, G | Granda-Albuja, S | Jaramillo-Vivanco, T | Giampieri, F | Battino, M | Alvarez-Suarez, JM

Date: SEP 2019

Author Keywords: Andean fruits | Andean legumes | Andean tubers | Ecuador | Antioxidant capacity | Bioactive compounds

Keywords Plus: ORGANIC-ACIDS | CULTIVARS | CAPACITY | SUGARS

Publication Year: 2019

Volume: 74

Abstract:

Thirteen fruits, eight legumes and three tubers consumed in the Andean regions of Ecuador were studied to determine their bioactive compounds, organic acids, sugars content, total antioxidant capacity, as well as to determine which among them showed the greatest contribution in terms of antioxidant activity and which compounds contributed to it. Among fruits, taxo fruits (*Passiflora mollissima* (Kunth) L.H. Bailey) presented the highest values of total phenolic, carotene content, and total antioxidant capacity. The aji raton (*Capsicum chinense* Jacq) showed the highest content of vitamin C. Taxo showed the highest content of beta carotene, whilst lycopene was identified only in guayaba fruits (*Psidium guajava* L.) and aji raton was the principal source of lutein. In legumes, chocho perla (*Lupinus mutabilis* Sweet) showed the highest values for both total phenolic and flavonoid content, whilst frejol negro (*Phaseolus vulgaris* L.) and frejol canario (*Vigna unguiculata* (L.) Walp) showed the highest values for FRAP and DPPH assay, respectively. Between tubers, the jicama (*Smallanthus sonchifolius* (Poepp.) H. Rob.) had the majors values in terms of total phenolic, flavonoid content, and total antioxidant capacity. In terms of total antioxidant capacity, taxo fruits have the highest contribution in terms of total antioxidant capacity, whilst the dendrogram shown the occurrence of five distinct groups in which taxo was located in the first largest group. Our data contributing towards gaining better knowledge about the Andean Ecuadorian diet and the composition of Andean food in order to estimate dietary intakes of health-promoting components.

Source: JOURNAL OF FOOD PROCESSING AND PRESERVATION | 42 (6): - JUN 2018

Title: Optimization of enzymatic treatment to produce yacon juice clarified by microfiltration with high levels of chlorogenic acid and fructooligosaccharides

Author(s): da Silva, MDG | Dionisio, AP | de Abreu, FAP | Pinto, CO | Silva, LMAE | de Brito, ES | Wurlitzer, NJ | de Lima, ACV | Rodrigues, S | Gomes, WF | Pontes, DF

Date: JUN 2018

Author Keywords:

Keywords Plus: RESPONSE-SURFACE METHODOLOGY | ANACARDIUM-OCCIDENTALE L. | SMALLANTHUS-SONCHIFOLIUS | FRUIT JUICE | ORANGE JUICE | CLARIFICATION | EXTRACT | OLIGOSACCHARIDES | ULTRAFILTRATION | DEGRADATION

Publication Year: 2018

Volume: 42

Abstract:

Response surface methodology (RSM) was employed for the analysis of the effects of the simultaneous enzymatic treatment using pectinolytic and cellulolytic enzyme at different concentrations, agitation, and temperature, on 13 physical and chemical characteristics of yacon pulp. After microfiltration, the characteristics of permeate flow and turbidity were also evaluated. The results indicated that the enzymatic process has been successfully employed, and the recommended conditions treatments were: enzyme concentration of 500 mg/L of Pectinex (R) Ultra SP-L and Celluclast((R)) 1.5 L, at 45 degrees C, and 175 rpm, during 120 min. In this optimized conditions, the permeate flow was almost 40% higher than the control A (without enzymatic treatment). As results, a limpid material with high levels of fructooligosaccharides and chlorogenic acid were obtained. The use of his clarified yacon juice in ready to drink formulations and as food ingredient for other products development is subject of further studies. Practical applicationsYacon is rich in bioactive compounds, such as chlorogenic acid (CGA) and fructooligosaccharides (FOS), which present a positive relationship with human healthy. The clarified yacon is a versatile product, which could be used in ready to drink formulations or as food ingredient for other products. However, to obtain this microfiltered product, the bioactive compounds could be negatively affected by the process. In this sense, this work discussed the influences of the main conditions to produce clarified yacon, optimizing this condition and producing a clarified yacon juice high levels of CGA and FOS. The end-product may have potential use for food industries, especially due to the prebiotic properties.

Source: REVISTA BRASILEIRA DE ZOOTECNIA-BRAZILIAN JOURNAL OF ANIMAL SCIENCE | 48: - 2019

Title: Fermentation characteristics and in vitro ruminal digestion of yacon residue silage with lactic acid bacteria inoculant or beet pulp

Author(s): Wang, LC | Guan, LH | Fang, JC | Cai, YM | Cao, Y

Date: 2019

Author Keywords: dry matter digestibility | microorganism | silage | volatile fatty acids | yacon

Keywords Plus: TOTAL MIXED RATION | FORAGE CROPS | METHANE PRODUCTION | QUALITY | IDENTIFICATION | DIGESTIBILITY | ENSILAGE | MOLASSES

Publication Year: 2019

Volume: 48

Abstract:

In this study, we examined the effects of lactic acid bacteria (LAB) inoculant and beet pulp (BP) on the quality of yacon (*Smallanthus sonchifolius*) residue silage. Yacon silage was prepared using a small-scale system of silage fermentation, and the treatments were as follows: control silage without any additive and silages with LAB inoculant Chikuso-1 (*Lactobacillus plantarum*, 5 mg/kg, fresh matter basis), BP (30% fresh matter basis), and LAB+BP. Silages were opened on days 3, 5, 7, 15, 30, and 60 of fermentation. The chemical composition, organic acid content, and in vitro ruminal digestion of the 60-day silage were determined. The pH of LAB-treated silage was lower than that of the silage without LAB. Furthermore, the LAB-treated silage presented the lowest ammonia-N concentration among the four types of silages, and it inhibited the growth of harmful bacteria including molds and clostridia during the early stages of fermentation. The BP-treated silage had lower contents of crude protein and ether extract than the silage without BP. The 60-day silage inoculated with LAB had the highest in vitro dry matter (DM) digestibility among the four silages, and the production of methane was lower than that of the silage treated with BP. The pH showed a tendency toward stabilization after 30 days of fermentation, although the concentration of lactic acid exhibited fluctuations during fermentation. The results suggest that the addition of LAB and BP can improve the fermentation quality of yacon silage, and the yacon silage with LAB might increase in vitro DM digestibility, but decrease in vitro ruminal methane production.

Source: FOOD RESEARCH INTERNATIONAL | 99: 495-500 Part 1 SEP 2017

Title: Consumption effect of a synbiotic beverage made from soy and yacon extracts containing *Bifidobacterium animalis ssp lactis* BB-12 on the intestinal polyamine concentrations in elderly individuals

Author(s): Manzoni, MSJ | Rossi, EA | Pauly-Silveira, ND | Pinto, RA | Roselino, MN | Carlos, IZ | Quilles, MB | Gloria, MBD | Cavallini, DCU

Date: SEP 2017

Author Keywords: Soy | Yacon | *Bifidobacterium* | Polyamine | Gut environment | Elderly

Keywords Plus: PROBIOTIC YOGURT | BIOACTIVE AMINES | LKM512 YOGURT | MICROBIOTA | GUT | SUPPLEMENTATION | COMBINATION | PARAMETERS | PROFILE | CECUM

Publication Year: 2017

Volume: 99

Abstract:

This study aimed to investigate the effect of a synbiotic beverage made from soy and yacon (*Smallanthus sonchifolius*) extracts containing *Bifidobacterium animalis ssp. lactis* BB-12 on healthy elderly individuals' intestinal polyamine concentrations. A randomized, double-blinded, placebo-controlled trial has been conducted with twenty-nine volunteers (over 65 years of age) who either had a daily intake of 150 mL of synbiotic (synbiotic group - S) or placebo (placebo group - P) beverages. Both had the same

nutrient composition, except that a probiotic culture was added to the synbiotic beverage. Total experiment time was 8 weeks, which was divided into 3 consecutive phases: a prefeeding period (2 weeks), followed by a feeding period (4 weeks) and a postfeeding period (2 weeks). Stool samples were collected at 3 time periods. Fecal concentrations of poly amines, putrescine (PUT), cadaverine (CAD) and spermidine (SPD) that were obtained during the synbiotic and placebo consumption period were significantly higher ($p < 0.05$) than those found during the pre-consumption baseline level period. No significant differences in the number of bifidobacteria, clostridia, or enterobacteria were observed in any of the two groups at the three time periods. Similarly, no significant effect on the production of proinflammatory cytokines tumor necrosis factor-alpha (TNF-alpha), interleukin-6 (IL-6) and anti-inflammatory interleukin-10 (IL-10) was induced by the synbiotic or placebo beverages consumption. The results herein indicate that both the synbiotic and the placebo beverage consumption have increased polyamines levels, which are often reduced in elderly individuals, without influencing inflammatory responses. In addition, both placebo and synbiotic beverages seems to contribute by maintaining increased polyamines levels.

Source: INDUSTRIAL CROPS AND PRODUCTS | 62: 499-506 DEC 2014

Title: Phenolic profile and antioxidant activity of extracts of leaves and flowers of yacon (*Smallanthus sonchifolius*)

Author(s): de Andrade, EF | Leone, RD | Ellendersen, LN | Masson, ML

Date: DEC 2014

Author Keywords: Infusion | Decoction | Solvent extraction | HPLC-DAD | DPPH | ABTS

Keywords Plus: IN-VITRO | FLAVONOIDS | INHIBITION | CAPACITY

Publication Year: 2014

Volume: 62

Abstract:

Yacon is an Andean perennial plant that is cultivated in several countries around the world. The present study aimed to evaluate the potential of extracts of yacon flowers and leaves as a source of antioxidant compounds. After the drying and powdering of the samples, three processes were used to prepare the extracts: infusion, decoction, and solvent extraction (methanol). Total phenolic compounds (using the Folin-Ciocalteu method), total flavonoid compounds (using the UV-vis colorimetric method), and antioxidant activity (by DPPH and ABTS assays) were used to evaluate these extracts. The individual phenolic compounds found in the extracts were characterized and quantified by HPLC-DAD. Decoction extraction of the leaves showed the highest total phenolic and flavonoid values, at 42.20 mg GAE/g dw and 39.71 mg RE/g dw, respectively. Gallic acid (3,4,5-trihydroxybenzoic acid) and rutin (quercetin-3-rutinoside trihydroxydrate) were the most abundant phenolic compounds in the leaf extracts (1.97 and 2.81 mg/g dw, respectively). Myricetin (3,3,4,5,7-hexahydroxyflavone) and gallic acid (3,4,5-trihydroxybenzoic acid) were the phenolic compounds found in the highest amounts in the flower extracts (16.09 and 1.36 mg/g dw, respectively) and these compounds were identified and quantified in this study for the first time. Decoction of the yacon leaves exhibited the highest antioxidant activity in

the DPPH assay at $EC_{50} = 220.50$ g dw. Infusion of extract of the leaves exhibited more antiradical activity in the ABTS assays than the other studied extracts ($422.13 \mu M$ equiv. Trolox/g dw). In conclusion, these results indicate that the infusion and decoction of yacon leaves and flowers can be considered as a promising source of phenolic acids and flavonoid compounds, with appreciable antioxidant properties.

Source: ARCHIVES OF ENDOCRINOLOGY METABOLISM | 64 (5): 597-607 SEP-OCT 2020

Title: Effects of yacon flour associated with an energy restricted diet on intestinal permeability, fecal short chain fatty acids, oxidative stress and inflammation markers levels in adults with obesity or overweight: a randomized, double blind, placebo controlled clinical trial

Author(s): Machado, AM | da Silva, NBM | de Freitas, RMP | de Freitas, MBD | Chaves, JBP | Oliveira, LL | Martino, HSD | Alfenas, RDG

Date: SEP-OCT 2020

Author Keywords: Yacon | white blood cells | obesity | intestinal permeability | oxidative stress

Keywords Plus: SMALLANTHUS-SONCHIFOLIUS | CONSUMPTION | ROOTS | FRUCTOOLIGOSACCHARIDES | CAPACITY | PLASMA

Publication Year: 2020

Volume: 64

Abstract:

Objectives: Yacon flour is rich in bioactive compounds (phenolic compounds and fructooligosaccharides (FOS)), and may therefore reduce the risk of diseases associated with excess body weight. However, its effect on fecal short chain fatty acids (SCFA), intestinal permeability, oxidative stress and inflammation markers has not been studied in adult humans with excess body weight. Thus, we evaluated the effect of the consumption of yacon flour on these variables. Materials and methods Twenty-six excess body weight (30.4 ± 2.4 kg/m²) adults (31.3 ± 8.5 y) were randomized to one of two groups (yacon flour or control; n = 13) on a double blind clinical trial. Subjects received a breakfast drink containing or not yacon flour (25g) associated with an energy restricted diet, for six weeks. The flour chemical characterization, FOS and total phenolics contents were evaluated. Antioxidant capacity was evaluated in vitro and in vivo (plasma). Intestinal permeability, fecal SCFA, oxidative stress and inflammatory markers also were evaluated in vivo. Results: Yacon flour was well tolerated. It presented an in vitro and in vivo antioxidant capacity, increased plasma total antioxidant capacity (Delta(YAC) : $49.16 (-4.20; 156.63)$) and reduced protein carbonyl concentrations (Delta(YAC) : $-0.98 (-1.54; -0.42)$). A reduction in SCFAs was observed in both groups (Delta(acetic:) $-3.16 (-5.07; -0.95)$ vs. $-1.05 (-2.65; 1.11)$; Delta(propionic) : $-1.05 (-2.60; -0.38)$ vs. $-0.41 (-2.08; 0.09)$; Delta(butyric): $-0.75 (-1.38; -0.04)$ vs. $-0.28 (-0.98; 0.11)$, for YAC and CON, respectively). Other variables did not change. Conclusion. The yacon flour increased the plasma antioxidant capacity, decreased oxidative stress and SCFAs in adults with obesity or overweight.

Source: JOURNAL OF FOOD PROCESSING AND PRESERVATION | 44 (2): - FEB 2020

Title: Sensory characterization of gluten-free bread enriched with teff (*Eragrostis tef* (Zucc.) Trotter)

and yacon (*Smallanthus sonchifolius*) using flash profile and common dimension analysis

Author(s): Viell, FLG | Tonon, GC | Perinoto, LC | Braga, ML | Fuchs, RHB | Gomes, STM | Bona, E | Matsushita, M

Date: FEB 2020

Author Keywords:

Keywords Plus: MIXTURE DESIGN | FLOUR | FRUCTANS | QUALITY

Publication Year: 2020

Volume: 44

Abstract:

This research described sensory characteristics of gluten-free bread (GFB) enriched with teff and yacon flour (YF) using flash profile (FP) and common dimension analysis (ComDim). The addition of TF and YF (up to 35%) maintained the sensory attributes. GFB enriched with YF was described by white color, aroma, and taste of white flour, softness and sour aroma. GFB enriched with YF and TF was described by brown color, rougher and aerated texture, wholemeal flour aroma and bitter taste. ComDim explained 96.9% of the total variance with the first three common dimensions (CD). CD1 and CD3 were able to correctly discriminate the products. FP allowed a quick description of the set of products and ComDim proving to be a good alternative to statistical analysis of the data. This study highlights the potential use of TF and YF for the production of gluten-free products with adequate sensory quality. Practical applications Considering that the development of gluten-free products with adequate technological, nutritional, and sensorial properties represents the main challenge for food technology, this study evaluated the descriptive sensory characteristics of gluten-free bread enriched with teff (TF) and yacon flour (YF) using flash profile (FP) technique. FP is a descriptive sensory method that has the main advantage of the elimination of the training phase of the assessors, which makes it faster and more advantageous. Usually, the results from this method are analyzed by generalized procrustes analysis. In this research, the results of the sensory description were analyzed using common dimension analysis (ComDim). The addition of TF and YF to the product is viable as it improves its nutritional composition. Furthermore, ComDim assigns different weights (salience) to the evaluator in each dimension, allowing a differentiated analysis of its importance, proving to be a good alternative to the statistical analysis for FP.

Source: JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE | 97 (11): 3559-3567 AUG 30 2017

Title: Application of multi-block analysis and mixture design with process variable for development of chocolate cake containing yacon (*Smallanthus sonchifolius*) and maca (*Lepidium meyenii*)

Author(s): Tormena, MML | de Medeiros, LT | de Lima, PC | Possebon, G | Fuchs, RHB | Bona, E

Date: AUG 30 2017

Author Keywords: common components and specific weights analysis | simplex-centroid design with process variable | free-choice profiling | taster segmentation | constrained optimization | multi-block analysis

Keywords Plus: SENSORY CHARACTERIZATION | LOW-FAT | PROFILE | YOGURT | INULIN | OPTIMIZATION | MILK | COMBINATION | PERFORMANCE | FORMULATION

Publication Year: 2017

Volume: 97

Abstract:

BACKGROUND: In this study, a chocolate cake formulation was developed with partial substitution of wheat flour by yacon and maca flour. A simplex-centroid design was applied to determine the proportions of the three flours, and the amount of water was included as a process variable at three distinct levels. According to the overall acceptability of the cakes, the tasters were separated into two groups using k-means. **RESULTS:** After segmentation, regression models were constructed for overall acceptability of each group; R-adjusted(2) values of 92.5% for group 1 and 98.9% for group 2 were obtained. Using the sequential simplex method an optimized formulation was determined for group 1 (0.49 kg(wheat) kg(-1) total flour, 0.37 kg(yacon) kg(total flour)(-1), 0.14 kg(maca) kg(total flour)(-1) and 140.0 mL of water) and another for group 2 (0.35 kg(wheat) kg(total flour)(-1), 0.65 kg(yacon) kg(total flour)(-1) and 120.0 mL of water). In addition to these formulations, a third formulation was proposed with a greater maca proportion (0.32 kg(maca) kg(total flour)(-1)), which does not significantly alter the overall acceptability of both groups. The three optimized formulations and two control formulations were evaluated through free-choice profiling. The data were evaluated using the multi-block method common components and specific weights analysis (CCSWA). **CONCLUSION:** It was observed that a greater proportion of maca intensified brownness and burnt aroma and taste, whereas a larger proportion of yacon produced a better appearance, softness, sweetness and chocolate flavor.

VI. TECNOLOGÍA ASOCIADA

BEBIDA SÓLIDA DE FIBRA DIETÉTICA DE FRUTAS Y VERDURAS Y MÉTODO DE PREPARACIÓN DE LA MISMA



Nº DE PUBLICACIÓN	CN111631336
FECHA DE PUBLICACIÓN	08/09/2020
INVENTORES	GAO HAILIANG
SOLICITANTES	SHANDONG YUBIAN BIOLOGICAL TECH CO LTD

RESUMEN

La invención describe una bebida sólida de fibra dietética de frutas y verduras, que pertenece al campo técnico de la alimentación y consta de las siguientes sustancias: polvo de cáscara de psyllium, extracto de semilla de casia, fructooligosacárido, polvo de *Smallanthus sonchifolius*, polvo de papaya, polidextrosa, polvo de fresa, polvo de avena, extracto de calabaza, extracto de pepino y sucralosa. Esta invención describe una bebida sólida de fibra dietética de frutas y verduras, que resuelve el problema de una posible incomodidad al transportar un líquido, además de proporcionar sustancias nutritivas y ricas para el cuerpo humano.



Solicitud de patente no presentada en la oficina peruana

FRUCTOOLIGOSACÁRIDO DE *Smallanthus sonchifolius* Y MÉTODOS DE PREPARACIÓN Y APLICACIÓN DEL MISMO



N° DE PUBLICACIÓN	CN111394524
FECHA DE PUBLICACIÓN	10/07/2020
INVENTOR	MA CHANGHUA; XIAO ZHIJUN; YAN CHANGYANG; YANG XINXIN; LI YAQI; WANG ZIXUAN
SOLICITANTES	UNIV BEIJING CHINESE MEDICINE

RESUMEN

La invención proporciona un fructooligosacárido de *Smallanthus sonchifolius*, así como de un método de preparación y aplicación del mismo, que comprende las siguientes etapas: a) preparar una materia prima de *Smallanthus sonchifolius* en suspensión; b) realizar la separación sólido-líquido primaria, la clarificación y la separación sólido-líquido secundaria, para obtener la suspensión; c) llevar a cabo secuencialmente ultrafiltración, decoloración y concentración sobre la suspensión, para obtener un producto crudo de fructooligosacárido; y d) realizar nanofiltración sobre el producto crudo de fructooligosacárido. El resultado de fructooligosacárido de *Smallanthus sonchifolius* preparado mediante este procedimiento tiene un alto contenido de fructooligosacárido, un bajo contenido de fructosa, glucosa, sacarosa, así como de otros monosacáridos y disacáridos, libre de residuos de disolventes, de alta seguridad, adecuado para pacientes diabéticos y otras poblaciones especiales, y capaz de satisfacer mejor los requisitos de aplicación reales del producto fructooligosacárido.



Solicitud de patente no presentada en la oficina peruana

BEBIDA LÁCTEA FUNCIONAL PROBIÓTICA DE *Smallanthus sonchifolius* Y MÉTODO DE PREPARACIÓN LA MISMA



Nº DE PUBLICACIÓN	CN111194776
FECHA DE PUBLICACIÓN	26/05/2020
INVENTOR	YE GUIYIN
SOLICITANTES	NANJING AIMENG LITE BIOTECHNOLOGY CO LTD

RESUMEN

Esta invención se refiere a una bebida láctea funcional probiótica de *Smallanthus sonchifolius* y un método de preparación de la misma, que se prepara de las siguientes materias primas en porcentaje: 10-16% de jugo de *Smallanthus sonchifolius*, 20-25% de leche, 1-5% de probióticos de fraguado directo en tina y 3-8% de azúcar blanda. El proceso de preparación comprende en: limpiar el *Smallanthus sonchifolius*, pelarlo, cortarlo, agregar 0,4% de vitamina C, remojar durante 20 minutos, exprimir para obtener el jugo de *Smallanthus sonchifolius*, y filtrando groseramente con tela filtrante de malla 100; y añadir celulasa compuesta con una concentración de 0,12 g / 100 ml en el jugo filtrado aproximadamente; luego ajustar un valor de pH a 3.5-4.0, elevar la temperatura a 45-50 DEG C, mantener la temperatura durante 2 horas y luego llevar a cabo la separación centrífuga a 1600r / min para clarificación; mezclar el jugo de *Smallanthus sonchifolius* y la leche según una proporción diseñada, homogeneizar bajo la presión de 10-25MPa, esterilizar a 90 DEG C durante 10 minutos y enfriar a 42 DEG C para uso posterior; inocular un iniciador probiótico de fraguado directo en cubeta para la fermentación en condiciones estériles; refrigerar a 4 ° C durante 12 horas, y finalmente sacar el post-maduración para obtener un producto terminado de bebida láctea funcional probiótica.



Solicitud de patente no presentada en la oficina peruana

FÓRMULA LÍQUIDA HIDRATANTE DE GLUCOSA SEGURA Y PROCESO DE PREPARACIÓN DE LA MISMA



Nº DE PUBLICACIÓN	CN111887432
FECHA DE PUBLICACIÓN	06/11/2020
INVENTOR	GONG PING
SOLICITANTES	SICHUAN LUOYUAN FOOD CO LTD

RESUMEN

La fórmula comprende 2,5-3,5 g de gluconato de zinc, 0,1-1,3 g de fosfopéptidos de caseína, 0,3-0,5 ml de esencia vegetal natural, 5-10 ml de jarabe de *Smallanthus sonchifolius* y 5-10 ml de *Stevia rebaudianum*. Según la invención, se añaden el jarabe de *Smallanthus sonchifolius* y la *Stevia rebaudianum*, estos jarabes se utilizan para sustituir el azúcar blanco granulado en un proceso tradicional de preparación de glucosa, el jarabe de *Smallanthus sonchifolius* y la *Stevia rebaudianum* son, respectivamente, un extracto que puede nutrir a las bacterias beneficiosas en los intestinos y el estómago, y la *Stevia rebaudianum* puede promover la sensibilidad a la insulina, reducir la oxidación de las lipoproteínas de baja densidad y prevenir las placas acumuladas en las arterias. Al agregar la esencia de la planta natural, se evita el uso de aditivos alimentarios sintetizados artificialmente, que son amenazas potenciales para el cuerpo humano, mientras tanto, el líquido hidratante de glucosa es simple y conveniente en el proceso de preparación, su eficiencia de producción y mejora la conveniencia de preparación del líquido hidratante de glucosa.



Solicitud de patente no presentada en la oficina peruana

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Comisión Nacional contra la Biopiratería

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