CONGRESO DE LA CAFICULTURA

2022 · Edición 31

Anacafé
ASOCIACION NACIONAL DEL CAFE

Fundación de la Caficultura para el Desarrollo Rural

CONGRESO DE LA
CAFICULTURA
2022 • Edición 31

Controlar la Fermentacion en el café, ¿Una necesidad o una moda?

JULIAN OVIDIO
CUCUÑAME BALCAZAR

DIRECTOR CIENTIFICO

CuBa BIOTEC

Algunas Definiciones:

FERMENTACIÓN: Proceso de oxidación incompleta, producto de actividad microbiana que no requiere de oxígeno para tener lugar, y que produce una sustancia orgánica como resultado. (Existen al menos 7 tipos de fermentaciones)

CONTROL: puede ser el dominio sobre algo o alguien, una forma de fiscalización, un mecanismo para regular algo manual o sistémicamente

SEGÚN EL DRAE: inocuo -cua. 'Que no hace daño'

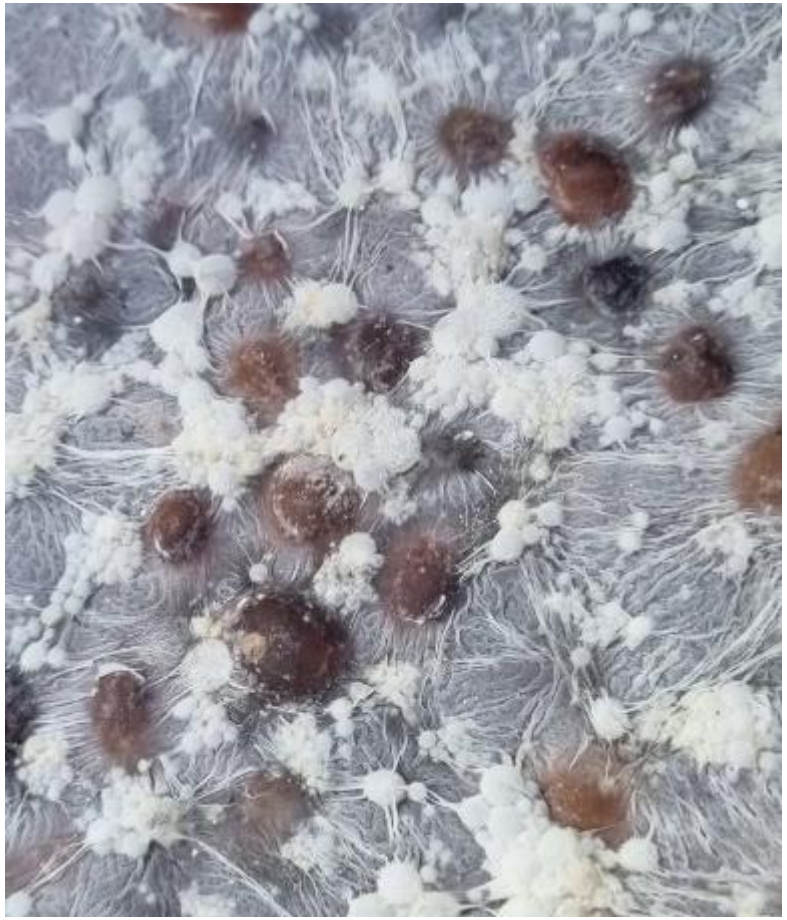
CAFÉ: Fruto tipo drupa del Cafeto; plantas del genero *Coffea arabica o Coffea canephora*

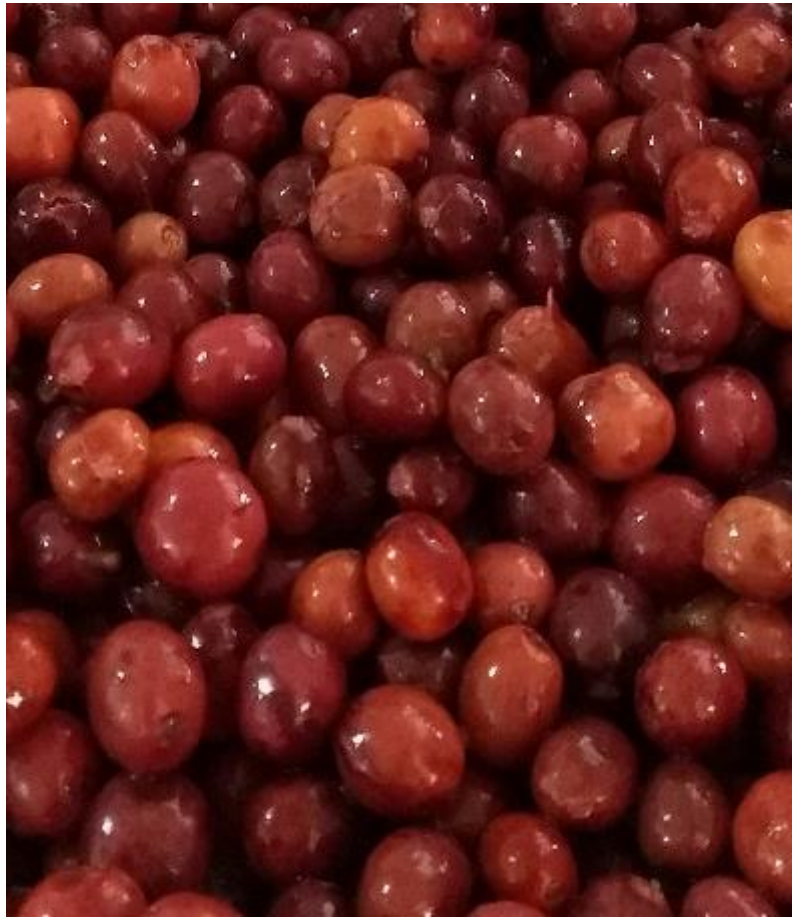
CALIDAD: Conjunto de propiedades inherentes a una cosa que permite caracterizarla y valorarla con respecto a las restantes de su especie

SEGÚN EL DRAE: de define **Moda** como Uso, modo o costumbre que está en boga durante algún tiempo, o en determinado país.

Porque nos preguntamos si ¿Fermentar el café es una necesidad o una moda?

En principio siempre se considero que fermentar el café era unicamente para retirar el mucilago en cafés lavados.



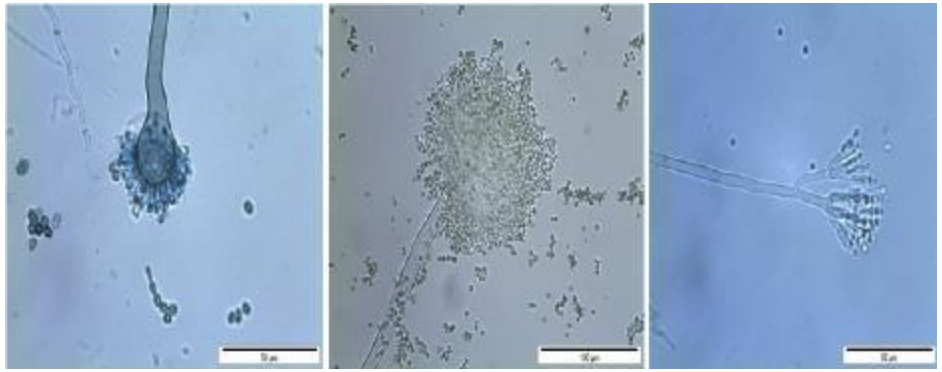


Diferentes procesos de degradación

Degradación	Sustrato	Microorganismos	Proceso	Productos
Aerobia	Carbohidratos	Bacterias, enzimas	Oxidación completa, respiración celular	Dióxido de carbono (CO_2) y agua (H_2O)
	Proteínas	Bacterias	-	CO_2, iones amonio (NH_4^+), iones sulfato ($SO_4^=$) y agua
	Lípidos	Bacterias	Enranciamiento	Ácidos grasos
Anaerobia	Azúcares, lactosa, glucosa	Bacterias lácticas	Fermentación láctica	Ácido láctico ($CH_3CH(OH)$-$COOH$)
	Azúcares, glucosa	Levaduras	Fermentación alcohólica	CO_2 y etanol (CH_3CH_2-OH)
	Proteínas	Bacterias	Putrefacción	CO_2 + metano (CH_4) + sulfuro de hidrógeno (H_2S) + ión amonio (NH_4^+)

Tomado de Cenicafe - FNCC

¿Que ocurre cuando perdemos el control en la fermentación?



A. ochraceus (A), A. flavus (B), P. spinulosum (C).

Tomado de: Cenicafe

Figura 1. Frecuencia del hongo *Aspergillus ochraceus* en instalaciones de las fincas cafeteras (9).

@LIMENTECH CIENCIA Y TECNOLOGÍA ALIMENTARIA
ISSN 1692-7125. Volumen 13, No. 2, p. 96-107, año 2015
Facultad de Ingenierías y Arquitectura
Universidad de Pamplona

Aislamiento de hongos en las diferentes etapas del beneficio de café cultivado y comercializado en Toledo, Norte de Santander

Mushroom Isolation in the Different Phases of Cultivated and Commercialized Coffee Processing in Toledo, Norte de Santander.

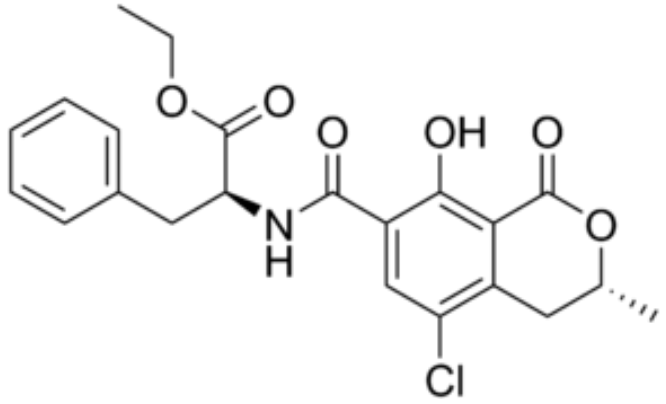
¿Desde cuando los humanos controlamos la fermentación?

Hace miles de años (desde la revolución del neolítico), personas de todo el mundo han descubierto que fermentar ciertos alimentos de manera controlada aumenta la digestibilidad de los alimentos crudos y añade efectos saludables.

Hombres cazadores y recolectores, Sumerios, Egipcios, Mongoles, Griegos, Romanos, Monjes, e industriales.

Estas Nuevas Modas pueden terminar muy mal…

ESTRUCTURA MOLECUAR DE LA OCHRATOXINA



Food Control 20 (2009) 784–790

Contents lists available at ScienceDirect

Food Control

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

Ochratoxin A in coffee beans (*Coffea arabica* L.) processed by dry and wet methods

Luís Roberto Batista [a,*], Sara Maria Chalfoun [b], Cristina Ferreira Silva [c], Marcelo Cirillo [d], Eugênia Azevedo Varga [e], Rosane Freitas Schwan [c]

[a] Departamento de Ciência dos Alimentos, Universidade Federal de Lavras, Caixa Postal 3037, Campus Universitário da UFLA, CEP: 37.200-000, Lavras – MG, Brazil
[b] Empresa de Pesquisa Agropecuária de Minas Gerais, CTSM/EcoCentro, Caixa Postal 137, Campus Universitário da UFLA, CEP: 37.200-000, Lavras – MG, Brazil
[c] Departamento de Biologia, Universidade Federal de Lavras, Caixa Postal 3037, Campus Universitário da UFLA, CEP: 37.200-000, Lavras – MG, Brazil
[d] Departamento de Ciências Exatas, Universidade Federal de Lavras, Caixa Postal 3037, Campus Universitário da UFLA, CEP: 37.200-000, Lavras – MG, Brazil
[e] Laboratório de Controle de Qualidade e Segurança Alimentar/LACQSA, Ministério da Agricultura. Cidade Jardim, CEP: 30380-090, Belo Horizonte– MG, Brazil

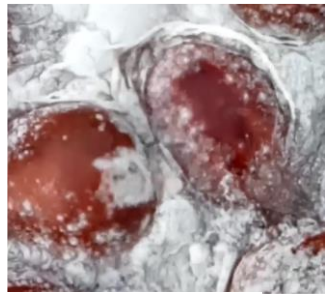


Table 4
Occurrence of ochratoxin A in roasted coffee samples commercialized in different countries.

Country	No Positive/Total	% Positive	Range of ochratoxin A (μg/kg)	Reference
France	30/30	100	tr – 11.9	(Tozlovanu & Pfohl-Leszkowicz, 2010)
Chile	24/24	100	tr – 0.84	(Galarce-Bustos et al., 2014)
Brazil	23/34	68	0.3–6.5	(Leoni et al., 2000)
Brazil	5/16	31	0.09–9	(Bandeira et al., 2012)
Argentina	13/24	54	0.11–5.78	(Drunday & Pacin, 2013)
UK	17/20	85	0.2–2.1	(Patel et al., 1997)
Spain	35/72	49	1.21–4.21	(Coronel et al., 2011)
Germany	273/490	56	0.2–12.1	(Otteneder & Majerus, 2001)
Canada	42/71	59	0.1–2.3	(Lombaert et al., 2002)
Hungary	22/38	58	0.17–0.91	(Fazekas et al., 2002)

tr, traces (values of ochratoxin A between LOD and LOQ).

Table 3. Levels of ochratoxin A found in 68 commercial green coffee bean samples

Origin	No. of samples	Found, μg/kg
Brazil[a]	10	<20
Colombia[a]	10	<20
Angola[a]	13	<20
Colombia	7	<20
Mexico	2	<20
Brazil	7	trace[b] (1 sample), <20 (6 samples)
Ivory Coast	5	80[c] (1 sample), <20 (4 samples)
Angola[d]	4	trace (1 sample), <20 (3 samples)
Cameroon	2	<20
Uganda	2	<20
Madagascar	1	<20
Ecuador	1	<20
Ethiopia	1	<20
Indonesia	2	<20
Togo	1	<20

[a] Samples flown directly from country of origin.
[b] Estimated at about 20 μg/kg.
[c] A second subsample from the same batch did not show ochratoxin A.
[d] Severe TLC interference; however, samples spiked at 20 μg/kg show clear separation of spots.

Es Necesario controlar la Fermentacion Secado y Almacenamiento

Journal of Toxicology and Environmental Health, Part B: Critical Reviews

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/uteb20

Ochratoxin a: Its Cancer Risk and Potential for Exposure

Heather A. Clark [a] & Suzanne M. Snedeker [a]

[a] Program on Breast Cancer and Environmental Risk Factors (BCERF) , Sprecher Institute for Comparative Cancer Research, College of Veterinary Medicine, Cornell University , Ithaca, New York, USA

Published online: 24 Feb 2007.

To cite this article: Heather A. Clark & Suzanne M. Snedeker (2006) Ochratoxin a: Its Cancer Risk and Potential for Exposure, Journal of Toxicology and Environmental Health, Part B: Critical Reviews, 9:3, 265-296, DOI: 10.1080/15287390500195570

To link to this article: http://dx.doi.org/10.1080/15287390500195570

toxins

MDPI

Article

Maternal-Fetal Cancer Risk Assessment of Ochratoxin A during Pregnancy

Chit Shing Jackson Woo and Hani El-Nezami *

School of Biological Sciences, Faculty of Science, Kadoorie Biological Sciences Building, The University of Hong Kong, Pokfulam, Hong Kong, China; jw86@connect.hku.hk

* Correspondence: elnezami@hku.hk; Tel.: +852-2299-0834

Academic Editors: Richard A. Manderville and Annie Pfohl-Leszkowicz

Received: 27 January 2016; Accepted: 17 March 2016; Published: 23 March 2016

Abstract: Increasing evidence has demonstrated that *in utero* exposure to environmental chemicals may interfere with fetal development and increase the risk of disease and cancer development later in life. Ochratoxin A (OTA) has been proven to induce diverse toxic effects including teratogenicity, carcinogenicity, immunotoxicity and potential endocrine disruption. Due to the continuous and widespread occurrence of OTA as a potential contaminant of staple foods, there is increasing concern of *in utero* exposure of fetus to this mycotoxin. In this study, maternal-fetal risk assessment of OTA during pregnancy was conducted using the benchmark dose approach for genotoxic carcinogens. The daily intake of OTA for Egyptian pregnant women was estimated based on their serum OTA level using the refined Klaassen equation for pregnancy. Fetal exposure level was also estimated based on the maternal data. Comparison between the estimated daily exposure and the negligible cancer risk intake (NCRI), and the calculation of margin of exposure (MOE) implicated that OTA exposure from dietary intake would be of low health concern for this general subpopulation of Egyptian women. This subpopulation of pregnant women was generally estimated not to be in high-risk for toxicity induced by OTA.

Es Necesario controlar la Fermentacion Secado y Almacenamiento

Study of the Occurrence of Ochratoxin A in Green Coffee Beans

COLETTE P. LEVI, HUGH L. TRENK, and HERMAN K. MOHR
Technical Center, General Foods Corp., White Plains, N.Y. 10625

Moldy green coffee beans were found to contain *Aspergillus ochraceus* and detectable levels of ochratoxin A. The official first action method for the detection of ochratoxins in barley, 26.C15–26.C22, was modified for analysis of coffee beans and a number of survey samples of coffee beans were analyzed. *A. ochraceus* was found to be present in almost all samples but ochratoxin A was infrequently observed. Ochratoxin A production in sterile green coffee beans inoculated with *A. ochraceus* under optimal conditions was maximal at 13 days at room temperature but the total amount was low (450 μg/kg). Considerable destruction (approximately 80%) of ochratoxin A occurred during a heat treatment which simulated the roasting of coffee

for the determination of ochratoxins in barley 26.C15–26.C22 (10), was modified for use in green coffee. Using this modified procedure we could both confirm the presence and estimate the levels of this toxin in moldy green coffee beans.

Studies were also undertaken to determine the conditions, moisture, and incubation time necessary for the production of ochratoxin A in this substrate. The stability of the toxin after addition to wheat and green coffee beans and heat treatment was also studied.

EXPERIMENTAL

Analytical Procedure

Food Control 30 (2013) 675–678

Contents lists available at SciVerse ScienceDirect

Food Control

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

Occurrence of Ochratoxin A in coffee beans, ground roasted coffee and soluble coffee and method validation

Drunday Vanesa*, Pacin Ana

Fundación de Investigaciones Científicas Teresa Benedicta de la Cruz, Martín Darronzoro 141, Luján, CP 6700 Buenos Aires, Argentina

ARTICLE INFO

Article history:
Received 26 June 2012
Received in revised form
29 August 2012
Accepted 4 September 2012

Keywords:
Mycotoxin
Ochratoxin A
Coffee
Exposure assessment

ABSTRACT

The purpose of this work was to determine the occurrence of Ochratoxin A (OTA) in coffee beans, ground roasted coffee and soluble coffee, which is imported by Argentina and manufactured in this country and also to perform a single laboratory validation for the analysis of OTA. Validation was done with certified reference material and with spiked samples. Certified material showed 104% of toxin recovery in the case of roasted coffee and 100% for green coffee. Spiked samples with levels from 1.98 to 10.18 μg/kg for soluble coffee had an average recovery rate of 79.4%. The limits of detection and quantification in coffee were 0.02 μg/kg and 0.05 μg/kg respectively. A good correlation ($r = 0.9989$) was found for this method. Fifty one samples were investigated to determine the presence of OTA, extracted by Ochraprep® immunoaffinity columns for cleaning up and analysed by high performance liquid chromatography (HPLC). The results showed that a high percentage (69%) of the coffee was contaminated with OTA at different levels. The median obtained for green coffee was 2.7 μg/kg, for ground roasted coffee was 0.24 μg/kg and 0.43 μg/kg for soluble coffee. A possible exposure assessment was evaluated.

Es Necesario controlar la Fermentacion Secado y Almacenamiento

Study of the Occurrence of Ochratoxin A in Green Coffee Beans

COLETTE P. LEVI, HUGH L. TRENK, and HERMAN K. MOHR
Technical Center, General Foods Corp., White Plains, N.Y. 10625

Moldy green coffee beans were found to contain *Aspergillus ochraceus* and detectable levels of ochratoxin A. The official first action method for the detection of ochratoxins in barley, 26.C15–26.C22, was modified for analysis of coffee beans and a number of survey samples of coffee beans were analyzed. *A. ochraceus* was found to be present in almost all samples but ochratoxin A was infrequently observed. Ochratoxin A production in sterile green coffee beans inoculated with *A. ochraceus* under optimal conditions was maximal at 13 days at room temperature but the total amount was low (450 μg/kg). Considerable destruction (approximately 80%) of ochratoxin A occurred during a heat treatment which simulated the roasting of coffee

for the determination of ochratoxins in barley 26.C15–26.C22 (10), was modified for use in green coffee. Using this modified procedure we could both confirm the presence and estimate the levels of this toxin in moldy green coffee beans.

Studies were also undertaken to determine the conditions, moisture, and incubation time necessary for the production of ochratoxin A in this substrate. The stability of the toxin after addition to wheat and green coffee beans and heat treatment was also studied.

EXPERIMENTAL

Analytical Procedure

Food Control 30 (2013) 675–678

Contents lists available at SciVerse ScienceDirect

Food Control

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

Occurrence of Ochratoxin A in coffee beans, ground roasted coffee and soluble coffee and method validation

Drunday Vanesa*, Pacin Ana

Fundación de Investigaciones Científicas Teresa Benedicta de la Cruz, Martín Darronzoro 141, Luján, CP 6700 Buenos Aires, Argentina

ARTICLE INFO

Article history:
Received 26 June 2012
Received in revised form
29 August 2012
Accepted 4 September 2012

Keywords:
Mycotoxin
Ochratoxin A
Coffee
Exposure assessment

ABSTRACT

The purpose of this work was to determine the occurrence of Ochratoxin A (OTA) in coffee beans, ground roasted coffee and soluble coffee, which is imported by Argentina and manufactured in this country and also to perform a single laboratory validation for the analysis of OTA. Validation was done with certified reference material and with spiked samples. Certified material showed 104% of toxin recovery in the case of roasted coffee and 100% for green coffee. Spiked samples with levels from 1.98 to 10.18 μg/kg for soluble coffee had an average recovery rate of 79.4%. The limits of detection and quantification in coffee were 0.02 μg/kg and 0.05 μg/kg respectively. A good correlation ($r = 0.9989$) was found for this method. Fifty one samples were investigated to determine the presence of OTA, extracted by Ochraprep® immunoaffinity columns for cleaning up and analysed by high performance liquid chromatography (HPLC). The results showed that a high percentage (69%) of the coffee was contaminated with OTA at different levels. The median obtained for green coffee was 2.7 μg/kg, for ground roasted coffee was 0.24 μg/kg and 0.43 μg/kg for soluble coffee. A possible exposure assessment was evaluated.

Es Necesario Controlar la Fermentacion Secado y Almacenamiento

J. Agric. Food Chem. 1998, 46, 673–675

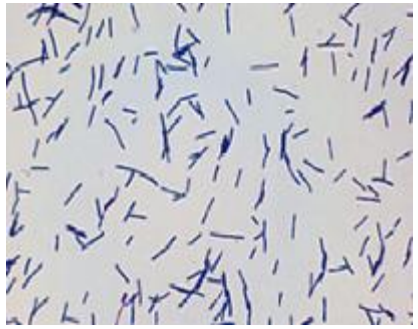
Behavior of Ochratoxin A during Green Coffee Roasting and Soluble Coffee Manufacture

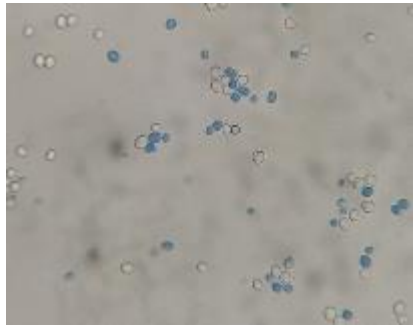
Maurice Blanc,[†] Alain Pittet,*[,‡] Rafael Muñoz-Box,[‡] and Rinantonio Viani[§]

Nestlé Research and Development Center, CH-1350 Orbe, Switzerland; Nestlé Research Center, Nestec Ltd., Vers-chez-les-Blanc, P.O. Box 44, CH-1000 Lausanne 26, Switzerland; and Nestec Ltd., Avenue Nestlé 55, CH-1800 Vevey, Switzerland

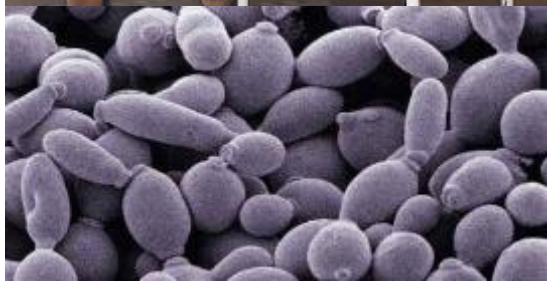
"La reducción más significativa de OTA se produce durante el tostado. Con el café verde particular utilizado en estos ensayos, el café tostado y molido contenía solo un 16% residual del la OTA originalmente presente en los granos verdes, el café soluble solo el 13% de OTA.

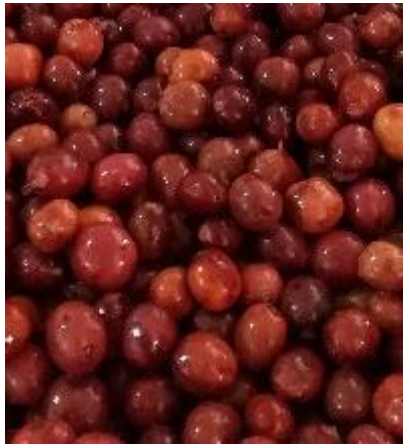
Caficultores empoderados buscando mejorar sus sistemas de procesamiento





Enseñamos a aislar microrganismos del café, a cultívalos, a inocularlos, y a construir bioreactores de bajo costo para tener verdadero control.



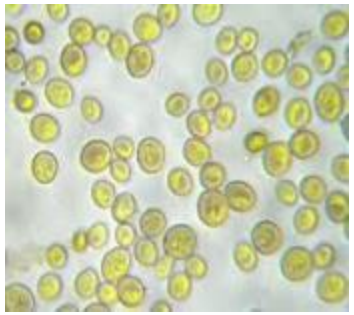


Es Necesario Controlar la Fermentacion Secado y Almacenamiento

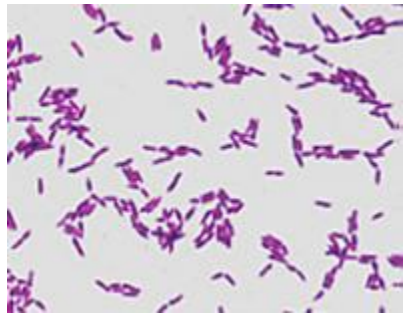
Planta Vino

Planta Yogurt

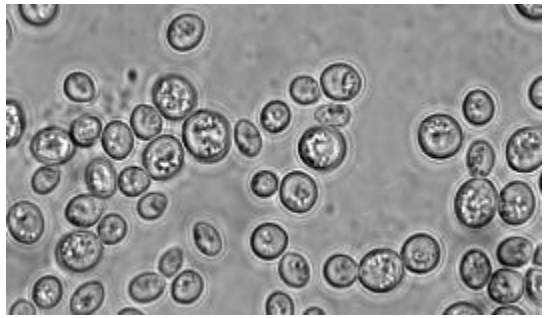
Planta Cerveza



Saccharomyces Cerevisiae



Lactobacillus corinyformis



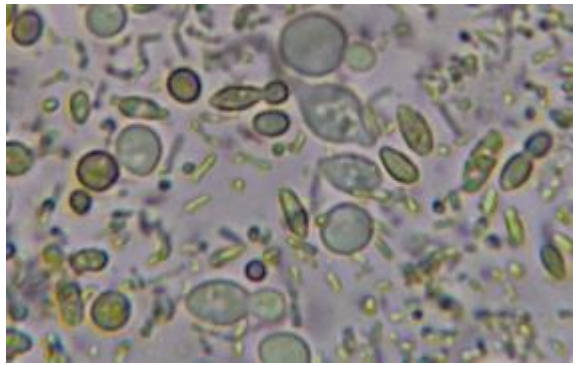
Saccharomyces Cerevisiae

Tipo de fermentación	Microorganismos fermentadores	Sustratos	Productos
Alcohólica o etanólica	*Saccharomyces cerevisiae, S. ellipsoideus, S. anamensisi, S. carlsbergnesis, Candida seudotropicalis, Torulopsis* spp., *Mucor* spp., *Kluyveromyces fragilis, Sarcina ventriculi, Zymomonas mobilis*	Malta de cebada, cereales, arroz, maíz, trigo, jugo de la vid, caña de azúcar, melaza, sorgo, jugos de frutas, remolacha, suero de leche, soya	Etanol, vinos, cerveza, licores, bebidas destiladas, pan, salsas
Láctica homofermentativa	*Streptococcus thermophilus S. lactis, S. faecalis, Pediococcus cerevisiae* y por la mayoría de los *Lactobacillus* como *L. lactis, L. acidophilus, L. bulgaricus, L. casei.*	Leche, suero de leche, vegetales, sacarosa	Yogur, suero de leche, quesos, mantequilla, kumis, encurtidos
Láctica heterofermentativa	*Leuconostoc mesenteroides, Lactobacillus brevis* y *L. fermenti, Bifidobacterium bifidus.*	Leche, suero de leche, vegetales, sacarosa	
Propiónica o propanoica	*Propionibacterium freundenreichii, P. shermanii, P. pentosaceum, Micrococcus lactylicus, Clostridium propionicum,* entre otras	Productos lácteos, glucosa, sacarosa, lactosa, pentosas, ácido láctico, ácido málico, glicerina	Ácido propiónico, ácido acético y otros ácidos
Butírica o butanoica	*Clostridium butyricum* y *Clostridium* spp.	Polisacáridos (almidón, glucógeno, pectina), glucosa, proteínas, aminoácidos, purinas, etanol, ácido úrico, xantina	Ácidos butírico, acético, fórmico, láctico, succínico, butanol y otros alcoholes y cetonas
Fórmica o ácidomixta	*Enterobacter* spp., *Escherichia coli, Aerobacter aerogens, Erwinia* spp., *Serratia marcescens, Proteus vulgaris, Salmonella thypho, Shigella* spp., y las bacterias luminosas	Glucosa o lactosa	Ácidos, acético, láctico, málico, fórmico vinagre, glicerina y disolventes
Metánica	*Methanobacterium omelianski, M. formicium* y *M. ruminantium, Methanosarcina methanica, M. barkeri, Methanococcus mazei* y *M. vannieli*	Alcoholes, ácidos, CO_2	Gas metano
Maloláctica	*Leuconostoc oenos*	Ácido málico	Vinos blancos y rojos, cidra

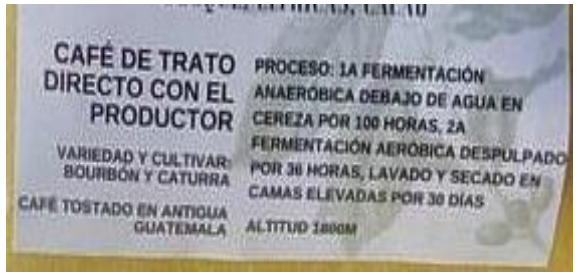
Tomado de Cenicafe - FNCC

En café debemos dejar de seguir modas y enfocarnos en las verdaderas necesidades

Beneficiaderos de café



Microbiota del café



En café debemos dejar de seguir modas y enfocarnos en las verdaderas necesidades

COLOMBIAN COFFEE

PRODUCT OF COLOMBIA

EXPORT BY:
HORTIPROCESS S.A.S
PHONE: 301 519 0187
FDA: 196 724 482 06

FNC CODE

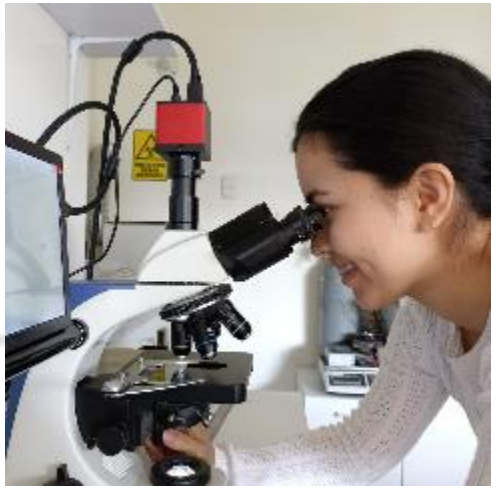
1307

IMPORT BY:
HORTIPROCESS LLC
PHONE: 412 356 3100
FDA: 19246244568

Contact

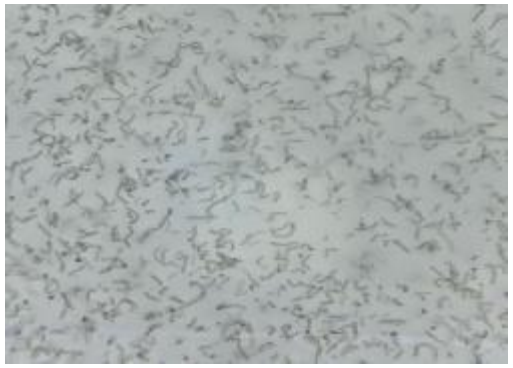
COLOMBINO

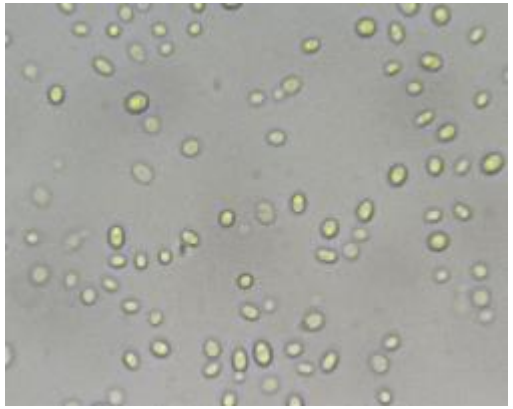
Farmer: Juan O. Cucuñame
Origin: Cauca, Colombia
Variety: Castillo
Process: Natural
W: 24gk
Lot: 3 - 1307 - 00008



Si se puede Lograr Controlar la Fermentacion no por moda, sino por seguridad

Lactobacillus plantarum





Saccharomyces Cerevisiae

Contacto

JULIAN O CUCUÑAME B

DIRECTOR CIENTIFICO

CuBa BIOTEC

directorcientifico@cubabiotec.com

Instagram: @cubabiotec

WhatsApp: +57 3128556258