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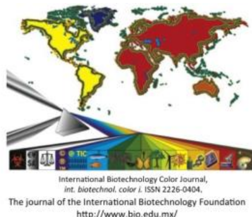

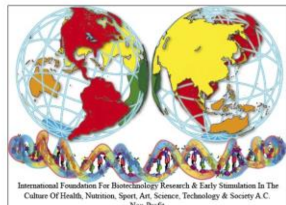

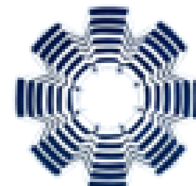

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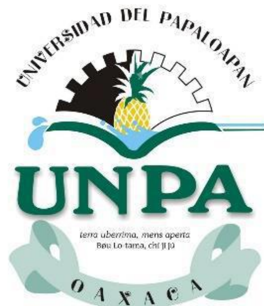

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IV Jornada de Ingeniería en Alimentos
Tuxtepec, Oax
Oct 30-31, 2017
Extended Abstract

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Welcome

Mensaje de la presidencia de la SMBB Nacional a la audiencia de la UNPA

Estimados miembros del presidium y representantes de los Cuerpos Académicos de esta Institución. Por este conducto me permito a nombre de la mesa directiva nacional de la SMBB periodo 2016-2018, manifestarles una cordial felicitación por la organización del evento correspondiente a la Cuarta Jornada de Trabajo del Día Mundial de la Alimentación. Es muy importante que organizaciones a nivel global se preocupen por lo que comemos en nuestra sociedad hoy en día. Desde luego que es muy importante la sostenibilidad de nuestros recursos naturales, además de siempre tener en cuenta que la alimentación que hemos tradicionalmente tenido a través de nuestra ancestral cultura, ha sido un legado de nuestros antepasados que no debemos olvidar y que el abuso de la comida rápida y las bebidas azucaradas nos pueden conducir a un estado nutricio lejos de ser el adecuado.

Agradezco la invitación que recibí por parte de la Dra. Susana Lozano Muñiz para venir a compartir con ustedes un poco de las investigaciones que se realizan en mi grupo de trabajo. Es para nuestra Sociedad una importante misión la de apoyar los eventos académicos que las diferentes delegaciones organizan, todo esto dentro de nuestras posibilidades económicas. Si nuestra sociedad pretende alcanzar mejores niveles de vida, es muy importante que nuestra juventud se prepare lo mejor posible para que al final de su participación en los estudios a nivel superior puedan tener las herramientas necesarias para forjar su destino de la manera más provechosa para sus intereses involucrando lo mejor de sus habilidades. Es por esto que este evento representa una gran oportunidad para que conozcan los trabajos de investigación que se hacen en otras partes del país, así como en el extranjero. Debo mencionar que los sueños que tienen para ser profesionistas exitosos, pueden ser alcanzados, siempre y cuando dediquen una gran parte de su tiempo al esfuerzo, tesón e innovación que los jóvenes como ustedes son capaces de llevar a cabo, con el fin de saber utilizar talentosamente los recursos naturales de que disponen, así como encontrar las forma de obtener mayor valor agregado de los productos ó servicios que se puedan ofertar. Esperando que esta reunión los siga motivando a ser mejores estudiantes y que las investigaciones y comentarios que aquí se viertan, sean un catalizador de sus proyectos personales para que logren llevar a buen fin las metas que se están proponiendo. Es de mi parte el mensaje que nuestra mesa directiva quiere transmitirles por mi conducto, volviendo a comentar que nada que conduzca al éxito profesional se obtiene de la noche a la mañana, pero que con esfuerzo e innovación es posible alcanzar nuestras metas profesionales.

Atentamente,

Dr. Carlos Regalado González

Presidente de la Sociedad Mexicana de Biotecnología y Bioingeniería, Periodo 2016-2018

Mensaje de bienvenida del jefe de la Carrera de Ingeniería en Alimentos a la audiencia

Muy buenos días a todos; Estamos reunidos el día de hoy para llevar a cabo la IV jornada de trabajo con motivo del día mundial de la alimentación. Quiero empezar agradeciendo la asistencia de todos ustedes este encuentro, así como, a nuestros ponentes por haber aceptado la invitación y compartir sus experiencias y conocimientos en sus diferentes áreas del conocimiento y así, enaltecer este evento. También agradecer a todos los organizadores que nos han apoyado: alumnos, profesores y a la Universidad del Papaloapan por brindar las facilidades para la realización de esta jornada. A nombre de nuestras autorizados, Dr. Modesto Seara Vazques; Rector de la Universidad y M.C. Héctor López Arjona. Vicerector de la misma. Muchas gracias. El 16 de octubre de cada año celebramos el día mundial de la alimentación, para recordar el nacimiento de la Organización de las Naciones Unidades para la Alimentación y la Agricultura, sin embargo, no es hasta 1979 cuando la FAO proclamó oficial este dia. Es por ello que en este mes, se organizan eventos en más de 150 países en todo el mundo convirtiéndolo en el día mas celebrado en el calendario de la ONU. Para este año, el lema del evento es; CAMBIAR EL FUTURO DE LA MIGRACION, INVERTIR EN SEGURIDAD ALIMENTARIA Y DESARROLLO RURAL. Por mencionar un dato, actualmente, en el mundo existe alrededor de 2100 millones de personas pobres, de la cual 800 millones se encuentran en zonas rurales. En México, a a pesar de los esfuerzos, a consecuencia de la pobreza, anualmente, mueren cerca de 8500 personas por deficiencias nutricionales. Resultado de esta situación, en la historia moderna se ha hecho más evidente el fenómeno de la migración, acarreando consigo problemas sociales, políticos y económicos cada vez más graves convirtiéndose así en un problemática global y del cual México es testigo fiel de ello. Es por ello que el día mundial de la alimentación es una oportunidad para demostrar nuestro compromiso, con los objetivos del desarrollo sostenible y alcanzar la meta del hambre cero para el 2030, como lo estipula la FAO. Se trata también de un día, en el cual podamos celebrar los avances científicos y tecnológicos realizados en pro de la seguridad alimentaria. Es por ello que la Universidad del Papaloapan a través de la carrera de Ingeniería en alimentos y los profesores adjuntos a la misma, el día de hoy se congratulan en celebrar este evento y poder contribuir mediantes un espacio de divulgación científica los avances en diferentes áreas del conocimiento, y así, unir esfuerzos junto a otras universidades, empresarios, gobierno, instancias públicas y privadas entre otros, a la generación de los planes nacionales de desarrollo y al cumplimiento de los objetivos del desarrollo sostenible que incluye entre otros; erradicar la pobreza, combatir el cambio climático, combatir el hambre garantizando la seguridad alimentaria y el derecho a los alimentos. Sin más preámbulos a nombre de la Universidad del Papaloapan les doy la más cordial de las bienvenidas a este, su evento.

En hora Buena,

Muchas gracias.

Miguel Angel García Muñoz
E mail garcia_m9@hotmail.com

Message from Susana Lozano.

We appreciate the support given to the call for Meeting of Food Engineering 2017 by social networks: Rerearchgate, Facebook, Twitter, Linked in, Whatsapp, Snapshot, CONACYT press, Tab UNAM, email and www.bio.edu.mx etc.

The areas for submitting extender abstract were classified as follows.

Num	*Area categories/Division*	*Example:*
I.	*Education, Extension, Teaching & Learning*	*Education from elementary school to adulthood. Research opportunities, innovative teaching methods & learning techniques, effective methods for serving your clientele and examples of successful outreach. General teaching and learning strategies, improving students critical thinking, TICs, simulation, WHO, Codex*
II.	*Food Chemistry*	*Chemistry and analysis of foods, bulking agents, carbohydrates (cereals, grains, seeds, legumes, pulses)*
III.	*Food Engineering*	*Measurement, modeling, optimization and control of food processing systems. (Distillation, fermentation, nanotechnology. drying, transport processes, (bio) chemical reactors, extraction, dehydration, crystallization, food frying, nonlinear systems, cost of production and transportation, instrumentation of processes, techniques of optimization and decision applied to food processes and impact of automation in food engineering).*
IV.	*Food Health & Nutrition*	*Diet & Health, Dietary Guiderlines, Dietary Supplements, Food Myths & Fads To Address Misconceptions (GMOs, Sugar, etc) Functional Foods, Medical Foods, Microbiome, Omics, Personalized Nutrition, Prebiotics & Probiotics, Sugar & Sweeteners, Vitamins & Minerals*
V.	*Food Microbiology*	*Detection and quantification methods, quality control, survival of microorganisms throughout the food contamination and processing environments, preventive controls of pathogens, characterization of emerging pathogens, and microbiology of health and wellness foods.*
VI.	*Food Processing & Packaging*	*Improve quality, efficiency, sustainability, lead development new product, processes, packaging material or techniques. Chilling & Freezing, Dehydration, Emulsion Technologies, Extraction, Extrusion, Fermentation, Filtration & Separation, High Pressure Processing, Microencapsulation & Nanoencapsulation, Mixing & Blending, process control & Instrumentation, Processing Equipment, Thermal Processing, Food packaging*
VII.	*Food Safety & Defense*	*Risk Assessment, Management and Communication, Traceability, Quality Systems, Product Testing, Auditing, Crisis Management, Recalls, Laws and Regulations, and Standards, Allergens, Food Fraud, Food Safety Modernization Act, Hazard Assessment (Chemical, Physical & Physical Microbiological), Quality Assurance & Control, Shelf Life, Spoilage Organism.*
VIII.	*Food Service*	*Supply preparation, presentation, and delivery of foods*
IX.	*Marketing & Management*	*Development of food and beverage products*
X.	*Nonthermal Processing*	*Pulsed power engineering, ultra high pressure, ozone, and reemerging food irradiation*
XI.	*Product Development*	*Primary aspects of the development and introduction of new food and beverage product innovation to the global marketplace. This category includes consumer research, product innovation procedures and related business information, as well as the technical and marketing aspects of product development. 3D, Antioxidants & preservatives, Aquatics or Aquaculture, Baby foods, Bakery, Beverages, Botanicals or Bioactive, Colors, Confectionary, Consumer Trends, Dairy Foods & Products,*

		Enzymes, Fats & Oils, Fiber, Fish & Seafood, Flavors, Food Retailing, Food service, Formulation, Fruits & Vegetables, Global Markets & Trade, Meat & Poultry, Mergers & Acquisitions, New Products & Culinary Trends, People & Companies in the News, Pet Food, Proteins R&D, Refrigerated & Frozen Foods, Snacks, Sodium & Salt Replacers, Soups, Sauces & Dressings, Spices & Seasonings, Stabilizers & Emulsifiers, Starches, Supply & Price indexes
XII.	*Public Policy, Food Laws And Regulations*	*Practical, real world implication for food and feed industry of legislative, regulatory, and judicial developments in Mexico and global scale. Non GMO, Organic, etc.*
XIII.	*Quality Assurance*	*Quality assurance, quality control, and food wholesomeness*
XIV.	*Refrigerated & Frozen Foods*	*Preservation of foods employing refrigeration or freezing technology*
XV.	*Sensory Science*	*Advancements in the science of sensory and consumer research, for product development and marketing research*
XVI.	*Sustainability*	*Biotechnology, Food Security, Food Waste, Life Cycle Analysis, Water, Management & Energy Management*
XVII.	*Toxicology & Safety Evaluation*	*Science and technology of toxicology and safety evaluation relevant to foods or food components.*

We invite you to be part of Mexican Society of Biotechnology and Bioengineering Oaxaca Delegation. Thank you and we'll see you next year!

The International Biotechnology Foundation is a nonprofit, international association dedicated to dissemination of Biotechnology, join Us.

The 2nd Meeting of Food Engineering Conference on Tuxtepec Oaxaca will be held next October 15 – 16, 2018, at Universidad del Papaloapan to continue its legacy of providing a vital forum for the food research community. It will present the latest advances in food engineering as a multidisciplinary field.

Sincerely

Susana Lozano Muñiz
Universidad el Papaloapan
Sociedad Mexicana de Biotecnología y Bioingeniería Delegación Oaxaca
International Biotechnology Foundation

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Speaker Session

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Título de la Discurso **"Potencial y componentes tecnológicos para producir Stevia en México"**

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researchgate https://www.researchgate.net/profile/Monica_Lozano-Contreras

*** Resumen de conferencia:**

La estevia (*Stevia rebaudiana*, Bertoni) es una especie originaria del Paraguay y Brasil, la cual ha sido usada desde hace siglos como edulcorante y como planta medicinal por los indios guaraníes llamada en su lengua Ka'a Heê (Yerba dulce). Si bien las hojas por sí mismas pueden utilizarse para endulzar, existen procesos industriales para extraer los edulcorantes. Actualmente la industria alimentaria y farmacéutica ha mostrado gran interés en esta planta debido a que los edulcorantes que contiene no aportan calorías. El intenso y marcado sabor dulce de la estevia se debe principalmente a compuestos químicos denominados de forma genérica como glucósidos de esteviol, que son 250 a 300 veces más dulces que la sacarosa. El aumento en la demanda nacional e internacional y la baja disposición de materia prima de estevia ha generado iniciativas para identificar superficies óptimas para su cultivo. La Estevia, puede ser para los productores de México un cultivo innovador y rentable, presentando condiciones promisorias del mercado interno y del exterior. El consumo ya sea como hierba o como productos industrializados, derivados de esta especie vegetal, es muy interesante, pues está destinada a sustituir el uso de edulcorantes sintéticos como el Aspartame, Sacarinas, Ciclamatos, entre otros productos que cada vez son más cuestionados por presentar riesgos para la salud de los usuarios. En México, se cuenta con las condiciones agroecológicas óptimas para producir estevia, por lo que actualmente existen más de 12 estados que la están produciendo en el país.

*** Biografía del autor correspondiente: (50 a 100 palabras)**

La Dra. Mónica Guadalupe Lozano Contreras es investigadora titular del Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP) desde 2008, donde es integrante en el grupo de investigación y transferencia de tecnología sobre el empleo de biofertilizantes y abonos orgánicos en la agricultura. También es profesora invitado en el Instituto Tecnológico de Conkal, donde dirige diversas tesis de licenciatura y posgrado. Además, la Dra. Lozano ha sido Presidenta de la Sociedad Mexicana de Biotecnología y Bioingeniería, Delegación Yucatán, A.C. durante el período del 2014 al 2016. Y participa en comisiones dictaminadoras de CONACYT, como Miembro del Programa de Estímulos a la Investigación, Desarrollo Tecnológico e Innovación y es Miembro del Registro CONACYT de Evaluadores Acreditados (RCEA).

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Título de la Discurso online **"Optimización multi-objetivo, Herramientas de decisión, Aplicación en alimentos"**

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* Afiliación: Pontificia Universidad Católica de Paraná, Brasil.
* Área: Escuela Politécnica, Posgrado en Ingeniería de Producción y Sistemas
* Email: g.reynosomeza@pucpr.br
* Número de contacto: orcid.org/0000-0002-8392-6225
* ResearchGate: https://www.researchgate.net/profile/Gilberto_Reynoso-Meza
* Twitter: @gilreyme

*** Resumen de conferencia:** Muchos de los problemas de ingeniería se plantean como un problema de optimización, típicamente de un índice de desempeño (función de coste u objetivo). Sin embargo, puede acontecer que la solución óptima encontrada no satisfaga al ingeniero/diseñador a cargo. ¿Qué hacer entonces cuando una solución "óptima" no es suficiente? En esta charla se aborda este problema desde un enfoque multi-objetivo, donde un conjunto de soluciones Pareto-óptimas son calculadas. Lo anterior significa que dados dos (o más) objetivos de diseño en conflicto, se calcula un conjunto de soluciones óptimas, con diferente grado de compromiso entre los objetivos de diseño. Dicha estrategia brinda al diseñador alternativas para la selección de la solución más acorde a sus necesidades, tras un proceso de análisis multi-criterio. Se brindará una perspectiva general del proceso de diseño mediante optimización multi-objetivo, orientada al área de alimentos. Así mismo, se le presentará como una técnica de diseño holística, donde convergen la definición del problema, la fase de optimización y la toma de decisiones.

Biografía: Recibió su doctorado (2014) en Automática, Robótica e Informática Industrial de la *Universitat Politècnica de València* (España); su Maestría en Ciencias (2005) con especialidad en automatización y su grado en Ingeniería Mecánica (2001) del Tecnológico de Monterrey, Campus Monterrey y Querétaro (México) respectivamente. Actualmente es profesor asociado del Programa de *Pôs-graduação em Engenharia da Produção e Sistemas* (PPGEPS) de la *Pontifícia Universidade Católica do Paraná* (PUCPR), Brasil. Sus trabajos de investigación se alinean bajo el marco de la iniciativa *Multi-objective optimisation design (MOOD) procedures for engineering systems: Industrial applications, unmanned aerial systems and mechatronic devices*, con particular interés en la inteligencia computacional para sistemas de control, optimización evolutiva multi-objetivo, optimización de muchos objetivos, toma de decisiones multi-criterio y algoritmos evolutivos. Posee las distinciones en investigación SNI-1 del CONACyT (México) y PQ-2 del CNPq (Brasil). Es co-autor del libro *Controller Tuning with Evolutionary Multiobjective Optimization A Holistic Multiobjective Optimization Design Procedure* (Editorial Springer) y co-autor de 27 artículos en revistas indexadas, con 186 citaciones externas e índice H9 (Scopus). Ha participado en la formación de estudiantes de maestría (3) y doctorado (1) como (co-)asesor. Participa en diversos proyectos de investigación con colaboradores en España, México y Brasil. CV-Lattes: http://lattes.cnpq.br/1888359548640986

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Título de la Discurso **“Diseño de recubrimientos comestibles para alargar la vida de anaquel de alimentos”**

* Conferencista: **Dr. Carlos Regalado González** * Afiliación: Departamento de Investigación y Posgrado en Alimentos., PROPAC, Facultad de Química Universidad Autónoma de Querétaro C.U., Cerro de las Campanas s/n Col. Las Campanas Querétaro, 76010 Qro. México *Email: regcarlos@gmail.com, carlosr@uaq.mx *Número de contacto: (+52 442) 1921307, 1921304 Ext. 5573 Researchgate https://www.researchgate.net/profile/Carlos_Regalado4

*** Resumen conferencia** La efectividad de las películas y recubrimientos comestibles (RC) para mantener la calidad e inocuidad de alimentos en fresco por largo tiempo, depende de la caracterización de sus propiedades funcionales. Esta investigación trata sobre el diseño y evaluación de propiedades fisicoquímicas, mecánicas, de barrera y antimicrobianas de RC basados en una mezcla de almidón modificado de maíz, cera de abeja micro-emulsificada (CA) y dos antimicrobianos naturales: arginato láurico y natamicina. Los RC con 1% de CA produjeron películas con superficie homogénea, con permeabilidad al vapor de agua reducida, la resistencia a la tensión y elongación variaron con el tipo de almidón usado. El efecto aditivo de incorporar los dos antimicrobianos en los RC inhibió completamente *Rhizopus stolonifer, Colletotrichum gloeosporioides, Botrytis cinerea*, y *Salmonella* Saintpaul. Estas propiedades permiten recomendar estos RC para extender la vida de anaquel de alimentos en fresco. **Biografía** Presidente de la Sociedad Mexicana de Biotecnologia y Bioingeniería (SMBB), periodo 2016-2018 Profesor-Investigador de Tiempo Completo. Dr. en Biotecnología de Alimentos. School of Food Biosciences. Universidad de Reading, Inglaterra. Junio de 1995. Miembro del Sistema Nacional de Investigadores (SNI), área VI, nivel 3 (2014-2018). Miembro fundador del PROPAC (Programa de Posgrado en Alimentos del Centro de la República). Fundador de la Carrera de Ingeniero en Biotecnología de la Facultad de Química, UAQ. Presidente de la Asociación Mexicana de Ciencia de los Alimentos. (AMECA) periodo 2009-2011, Coordinador de la organización y planeación del Parque Biotecnológico de la Universidad Autónoma de Querétaro. Área de interés: Aditivos de origen natural, Bioseparaciones, Empaques comestibles activos, Producción, modificación por ingeniería genética y modificación química de enzimas. TRABAJO ACADÉMICO Publicaciones usadas como guía del profesor a nivel licenciatura Memorias in extenso, Publicaciones internacionales indizadas en JCR, 4 Publicaciones arbitradas indizadas índice de impacto, 18 capítulos de libro Tesis dirigidas de Licenciatura (L), 28 de Maestría (M), 9 de Doctorado (D). Tesista de L, 2 de M y 2 de D en fase experimental Proyectos (como responsable) de investigación financiados a nivel nacional y Regional, incluyendo como asesor de empresas. 2 vigentes 136 Participaciones orales o en cartel en congresos nacionales e internacionales 123 Cursos semestrales impartidos a nivel Licenciatura; 38 a nivel Maestría; 12 a nivel Doctorado 1 Libro editado por AMECA, 2010. Patente en trámite, 2010. Índice h=17 DISTINCIONES Miembro del Jurado del Premio Nacional en Ciencia y Tecnología de Alimentos, desde Octubre de 2003. Segundo lugar en el concurso de mejores trabajos libres de la División de Biotecnología, dentro del congreso del Instituto de Tecnólogos en Alimentos de EUA (IFT), 2001. Investigación ganadora del Premio Nacional en Alimentos 2001, Categoría Estudiantil. Evaluador de proyectos de investigación del CONACYT en el área de Ciencias Aplicadas a la Biología desde 1996 a la fecha.

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Título de la Discurso **"Aprovechamiento de las cáscaras de frutas coloridas como fuente de colorantes"**

* Conferencista: **Dra. Delia Soto Castro**
Co- Autor: Dr. Miguel Chávez Gutiérrez
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*Número de contacto: +52 951 5170610, ext: 82704
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Researchgate https://www.researchgate.net/profile/Soto_Delia

* Resumen conferencia:

Los colorantes naturales tienen gran importancia dentro de la industria alimenticia y de materiales, recientemente se ha dado mayor importancia debido a la toxicidad que pueden llegar a presentar los colorantes sintéticos. Es sabido que la presencia de betaxantinas y betacianinas son las responsables de las coloraciones naranjas-rojas en las cáscaras de los frutos de pitaya (*Stenocereus queretaroensis*) y jiotilla (*Escontria chiotilla*), sin embargo, esta parte del fruto termina siendo un desecho. Por ello, propusimos una metodología con el uso de mucilago de nopal que nos permitiría extraer el colorante de las cáscaras sin uso de disolventes orgánicos, y que a la vez actuara como agente encapsulante para un proceso de secado por aspersión. Tras optimizar las condiciones de secado, se determinó que el mucilago de nopal (*Opuntia Ficus Indica*) es un buen medio de extracción y agente encapsulate para betalaínas provenientes de las cáscaras de jiotilla y pitaya, obteniendo microcápsulas esféricas después del secado por aspersión. En conjunto se trata de un proceso verde, libre de disolventes orgánicos que puede agregar valor a la cadena productiva de las cactáceas mexicanas.

* **Biografía** La Dra. Delia Soto Castro es investigadora CONACyT en el Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional Unidad Oaxaca del Instituto Politécnico Nacional desde el 2014, donde es integrante de la academia de Ingeniería y desarrolla en las líneas de investigación de macromoléculas en el acarreo de compuestos bioactivos, así como en el estudio de productos naturales con potencial anticancerígeno y/o antiparasitario. Pertenece al núcleo básico de doctorado y maestría, dirige y ha dirigido tesis de maestría y doctorado, cuenta con 13 publicaciones internacionales indexadas y ha participado en congresos nacionales e internacionales. Es miembro del Sistema Nacional de Investigadores Nivel I.

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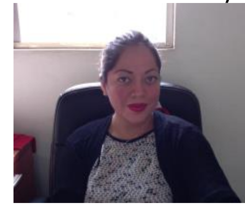
Título de la Discurso **"ALIMENTOS FUNCIONALES"**



* Conferencista: **Dra. Delia Esther Páramo Calderón**
* Afiliación: **Universidad del Papaloapan, Oax., Méx.**
*Área: **Ingeniería de Alimentos,** *Email: deliaep@unpa.edu.mx; deparamo@yahoo.com.mx, *tel: 01(287)8759240 Ext. 220

*** Resumen conferencia:** En los últimos años, la tendencia mundial en la alimentación señala el interés por parte de los consumidores hacia determinados alimentos, que además del valor nutritivo aporten beneficios a la salud. El término "alimento funcional" hace referencia a aquel alimento que además de sus efectos nutricionales, presenta beneficios demostrados en una o más funciones del organismo humano, mejorando el estado de salud o reduciendo el riesgo de enfermedades. Una alimentación sana es fundamental para conseguir el crecimiento y desarrollo intelectual óptimo en niños y adolescentes. De igual manera, una dieta adecuada a lo largo de la vida asegura la energía suficiente para que una persona tenga una actividad física vigorosa y un aprovechamiento óptimo de sus capacidades cognitivas. Por lo tanto, la alimentación es un factor importante en la promoción y mantenimiento de un buen estado de salud durante todo el ciclo de vida. En México, el panorama nutricional es desalentador, pues no solo se han registrado problemas de deficiencia alimentaria y desnutrición, sino que además, ocupa uno de los primeros lugares del mundo en padecer diversas enfermedades crónico degenerativas (ECD) que parecen estar asociadas a una alimentación inadecuada. Como consecuencia, en la actualidad existe un gran interés por desarrollar nuevos alimentos con mejores características nutricionales, o inclusive, mejorar los productos alimenticios ya existentes y que sean capaces de aportar beneficios adicionales para la prevención y tratamiento de enfermedades. Lo anterior ha impulsado a la Industria de Alimentos a buscar estrategias para desarrollar nuevos productos que adicione como ingredientes compuestos bioactivos, antioxidantes naturales, aceites esenciales, ácidos grasos, fibra dietética, almidón resistente, y otros compuestos que permitan obtener un producto final con características de un alimento funcional.

* **Biografía** Tiene un Doctorado en Ciencias en Alimentos, egresada de la Unidad de Investigación y Desarrollo en Alimentos del Instituto Tecnológico de Veracruz con la Tesis titulada: *"Transferencia de masa de los ácidos volátiles durante el secado de granos de cacao"*. Realizó sus estudios de Maestría en Ciencias y Licenciatura en Ingeniería Bioquímica. Realizó una Estancia Doctoral en la Universidad Politécnica de Valencia, España en colaboración con el grupo de Análisis y Simulación de Procesos Agroalimentarios (ASPA). Cuenta con las siguientes distinciones: Nombramiento como Investigador Nacional Nivel I en el Sistema Nacional de Investigadores del Área VII. Tiene Reconocimiento como Profesor con Perfil Deseable por PRODEP, y es Miembro del Registro CONACYT de Evaluadores Acreditados (RCEA). Cuenta con 9 publicaciones en Revistas Indizadas del JCR. Responsable de proyectos Conacyt y PRODEP. Ha dirigido 7 tesis de Licenciatura, 5 tesis de Maestría y 1 tesis de Doctorado. Sus principals Intereses Científicos y Tecnológicos incluyen: Ingeniería, Ciencia y Tecnología de Alimentos. Alimentos funcionales. Desarrollo de nuevos productos. Aprovechamiento de recursos naturales. Innovación Tecnológica. Sus Líneas de Investigación son "Desarrollo y caracterización de Alimentos Funcionales. "Desarrollo de Nuevos Productos". "Estudio del Efecto de las Variables de Proceso durante el Secado de Alimentos".

Título de la Discurso **"RIESGO Y SEGURIDAD ALIMENTARIA"**

* Conferencista: **DRA. ALEJANDRA RAMÍREZ MARTÍNEZ**
* Afiliación: Instituto Tecnológico Superior de Huatusco, Ver., Méx.
*Área: Ingeniería en Industrias Alimentarias
*Email: nashdi.alejandra@gmail.com

*** Resumen conferencia:**
El hombre no podría sobrevivir sin alimentarse. Estos alimentos requieren ser de cierta calidad pero sobre todo seguros, esto es libre de sustancias que puedan causar efectos nocivos sobre la salud humana. Este fenómeno, conocido como seguridad alimentaria se está convirtiendo en una prioridad para varios países del mundo y México no es la excepción. La seguridad alimentaria también contempla al análisis de riesgos como una herramienta para asegurar la inocuidad de los alimentos. De esta manera, los riesgos transmitidos por los alimentos (algunos conocidos desde antiguo y otros nuevos), plantean amenazas para la salud y obstáculos al comercio internacional de alimentos que deben evaluarse y gestionarse. El análisis de riesgos es un instrumento poderoso para la realización de estudios científicos y para la búsqueda de soluciones sólidas y coherentes a los problemas de inocuidad de los alimentos. El uso del análisis de riesgos puede impulsar mejoras constantes en la salud pública además de servir de base para ampliar el comercio internacional de alimentos. La presencia ponencia tiene como finalidad exponer los principios del análisis del riesgo, sus aplicaciones y estatus actual en México.

* Biografía

Realizó sus estudios de Doctorado en Ciencias en Alimentos en la Unidad de Investigación y Desarrollo en Alimentos del Instituto Tecnoógico de Veracruz en cotutela con la Université de Montpellier 2. Es Ingeniero Bioquímico de formación, especializada en Ingeniería Bioquímica en Alimentos y en transferencia de masa con un posdoctorado en evaluación de Riesgo para el consumidor. Pertenece al Sistema Nacional de Investigadores, Nivel 1. Realizó una estancia posdoctoral en el laboratorio LERCCo de la Universidad de Bretaña Occidental con la temática: "Evaluación de la exposición a través de varias vías (inhalación, cutánea y oral) para el consumidor y el profesional". Miembro de la Red Temática "Valorización de las Pérdidas y Desperdicios de Alimentos (VALPDA)". Se ha desempeñado como prestadora de Servicios Profesionales en el Colegio de Posgraduados (COLPOS) Campus Veracruz. Formó parte de la Empresa TMI Orion (Francia) donde participó en el Desarrollo de un prototipo. Ha participado apoyando en el desarrollo tecnológico "Optimización en el secado de café" dentro de la empresa "La Cuchilla". Cuenta con diversas publicaciones en revistas indexadas del JCR. Actualmente se desempeña como Catedrático del Instituto Tecnológico Superior de Huatusco.

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Título de la Discurso: **"Actividad de probioticos"**

* Autor Correspondiente Nombre Completo:

Mario Alberto De Jesús Domínguez Magaña †

* Afiliación: (Universidad y país) Universidad del Papaloapan México
*Área: ingeniería de alimentos
*Email: mdominguez@unpa.edu.mx
http://www.unpa.edu.mx/profesores/tuxtepec/mario_alberto_de_jesus_dominguez_magania.html

*** Resumen Descripción: (150 a 200 palabras)**
Trabajo en pro bióticos y péptidos con actividad inhibidora.

*** Biografía del autor** Grado académico Doctorado en Ciencias en Alimentos, Maestría en Ciencias y Tecnología en Alimentos; Línea de Investigación actual, Obtención y caracterización de péptidos con actividad inhibitoria de la enzima convertidora de angiotensina-I (antihipertensivos) a partir de proteínas de origen vegetal; Últimas Publicaciones:

Francisco Inurreta, Rolando González, Mario Domínguez, Jorge Ruiz, David Betancur Y Luis Chel (2007). "incorporación de hidrolizados proteicos de diversas fuentes vegetales en extrudidos de mezclas de maíz-leguminosa. caracterizacion física y evaluación de la actividad antioxidante". revista salud pública y nutrición. edición especial no. 12 (ISSN 1870-0160)

Maira Segura Campos, Juan Torruco Uco, Mario Domínguez Magaña, Luis Chel Guerrero Y David Betancur Ancona (2007). "péptidos bioactivos con actividad biológica, una alternativa en la prevención de enfermedades". revista de la facultad de ingeniería química, uady. vol. 45. edición de diciembre. pp: 27-45 (ISSN 0188-5006)

Torruco-Uco, J.G.; Domínguez-Magaña, M.A.; Dávila-Ortiz, G; Martínez-Ayala, A.; Chel-Guerrero, L.A.; Betancur-Ancona, D.A. (2008) "péptidos antihipertensivos, una alternativa de tratamiento de origen natural: una revisión". ciencia y tecnología alimentaria. vol 6, no.2:158-168. (ISSN 1135-8122)

Amaya-Paredes, R. Tarkus-Patiño, M. Domínguez Magaña (2008). "extracción y caracterización cinética de la enzima polifenoloxidasa del aguacate (persea americana miller) var. hass" revista de la facultad de ingeniería química. uady. diciembre. vol.47:10-16.(ISSN 0188-5006)

Abstract *in extenso*

Num	Area categories/Division	
I	Education, Extension, Teaching & Learning	24

Diagnosis of education in food engineering in the SUNEO

Susana Lozano Muñiz[1,2,3] *, Rosalva Moya Suarez[1], María del Carmen Urzúa Hernandez[4], Miguel Ángel García Muñoz[1]
[1]University of Papaloapan [2]International Biotechnology Foundation, [3]Society of Mexican Biotechnology and Bioengineering Delegation Oaxaca, [4]UNAM
*E mail: susana_lozano@hotmail.com

ABSTRACT: An analysis of the SUNEO databases was carried out in terms of the engineering career in food science, comparing it with biotechnology, and in various national and international databases to make comparative graphs regarding education on its various stages and in higher education. Undoubtedly higher education (ES) constitutes the most important gateway to the knowledge about society, since it represents the ideal means for enhancement of human capital and its individual and collective intelligence: World Conference on Higher Education organized by the UNESCO, (1998). It is required to make a great effort to promote the career as the Meeting of Food Engineering 2017 <www.bio.edu.mx/mfe>, spread the advantages of studying this career and maintain a direct relationship with the productive sector in order to understand its correlation between what is produced in higher education and what the productive sector requires. Implement sustainable public policies to reduce the effects of temperature in the classroom

KEYWORDS: Education, Oaxaca, food, SUNEO. Temperature

INTRODUCTION: In the locality there are diverse needs of the agri-food sector and several career options that impact on food production. There is a low number of aplications to pursue the career of food engineering. It is required to implement strategies to increase the number of applicants and graduates.

MATERIALS AND METHODS: An exhaustive search was carried out for data analysis and comparative graphs in several databases such as INEGI, World Bank, SUNEO, and SEP.

RESULTS AND DISCUSSION: Figure 1 shows a map indicating the academic life expectancy after high school with gender parity, where Mexico is not visible.

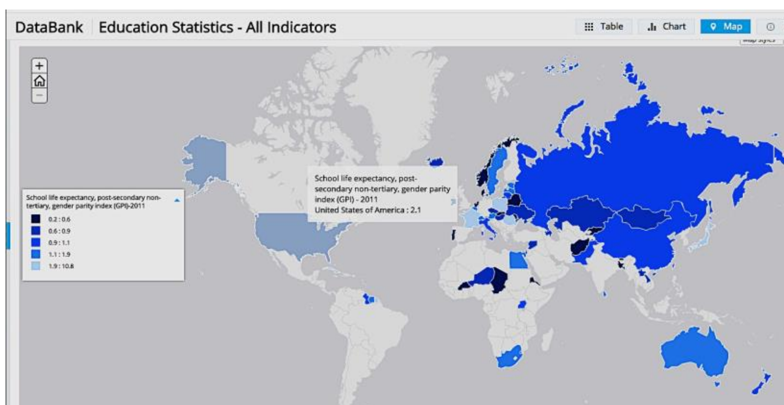

Figure 1. Expectation of academic life after high school with gender parity http://databank.worldbank.org/data/reports.aspx?source=Education%20Statistics.

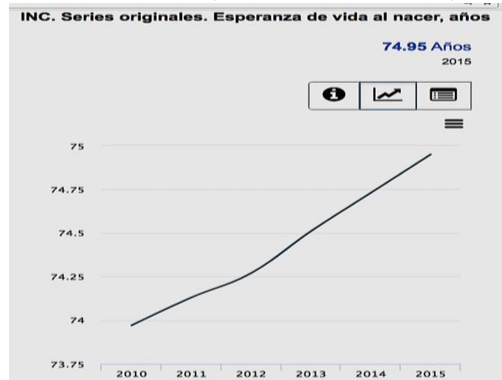

Figure 2 Life expectancy at birth in Mexico 75 years INEGI

On figure 2.A shows the coverage on higher education from 18 to 22 years and in Figure 1B the population of 24 years and older with some degree approved in higher education with a total of 10,586,814 Number of people.

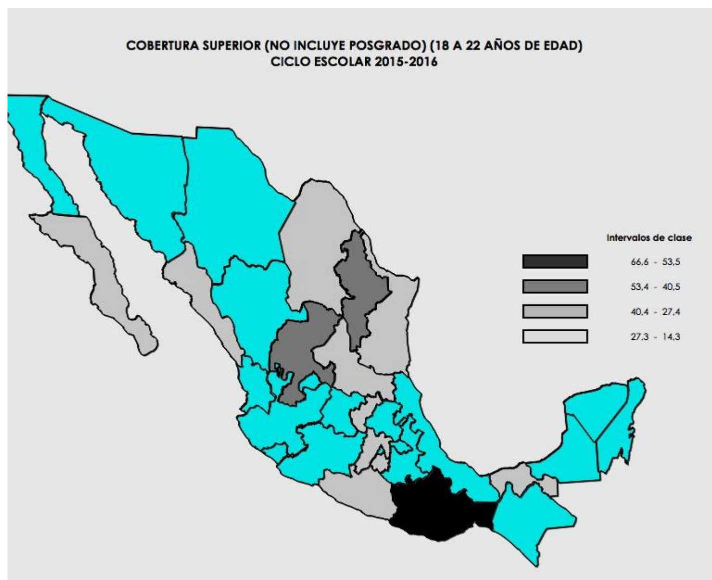

Figure 3 Map of Mexico showing higher education from 18 to 22 year old.

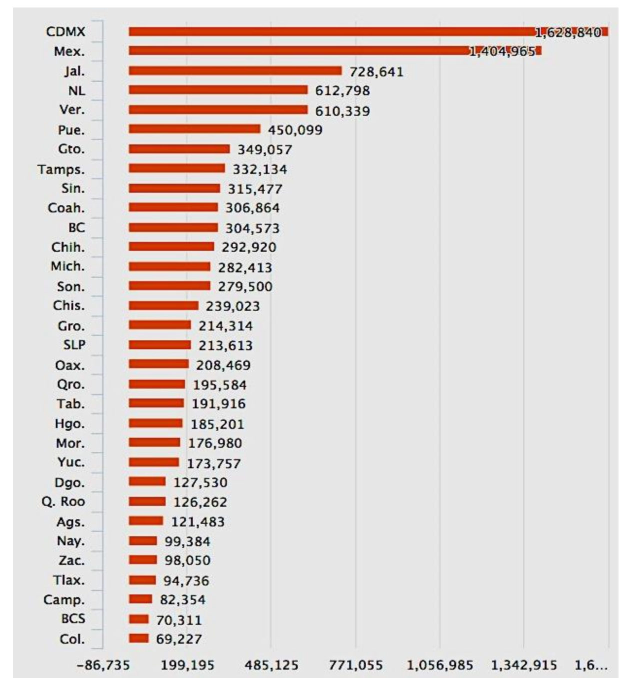

Figure 4. Population aged 24 and over with some degree approved in higher education.

Figure 5 School Registration for all the entities of the Mexican republic in higher education SEP.

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Schooll year cycle 2015-2016Oaxaca State Education system Statistics

PRIVADO
PÚBLICO
CAPACITACIÓN PARA EL TRABAJO e/
PRIVADO
PÚBLICO
POSGRADO
UNIVERSITARIA Y TECNOLÓGICA
NORMAL
LICENCIATURA
EDUCACIÓN SUPERIOR 4/
PRIVADO
PÚBLICO
PROFESIONAL TÉCNICO
PROFESIONAL TÉCNICO BACHILLER 3/
BACHILLERATO TECNOLÓGICO
BACHILLERATO GENERAL
EDUCACIÓN MEDIA SUPERIOR 4/
EDUCACIÓN MEDIA SUPERIOR 4/
PRIVADO
PÚBLICO
TÉCNICA
TELESECUNDARIA
GENERAL 2/
EDUCACIÓN SECUNDARIA
PRIVADO
PÚBLICO
CURSOS COMUNITARIOS
INDÍGENA
GENERAL
EDUCACIÓN PRIMARIA
PRIVADO
PÚBLICO
CURSOS COMUNITARIOS
INDÍGENA
GENERAL 1/
EDUCACIÓN PREESCOLAR
PRIVADO
PÚBLICO
EDUCACIÓN BÁSICA
PRIVADO
PÚBLICO

.0
100000.0
200000.0
300000.0
400000.0
500000.0
600000.0

ESCUELAS
DOCENTES
HOMBRE
MUJER

Figure 6 Statistics of the Educational System for the State of Oaxaca. School Year 2015-2016 SEP Secretariat of Public Education Undersecretary of Planning, Evaluation and Coordination General Directorate of Planning, Programming and Educational Statistics.

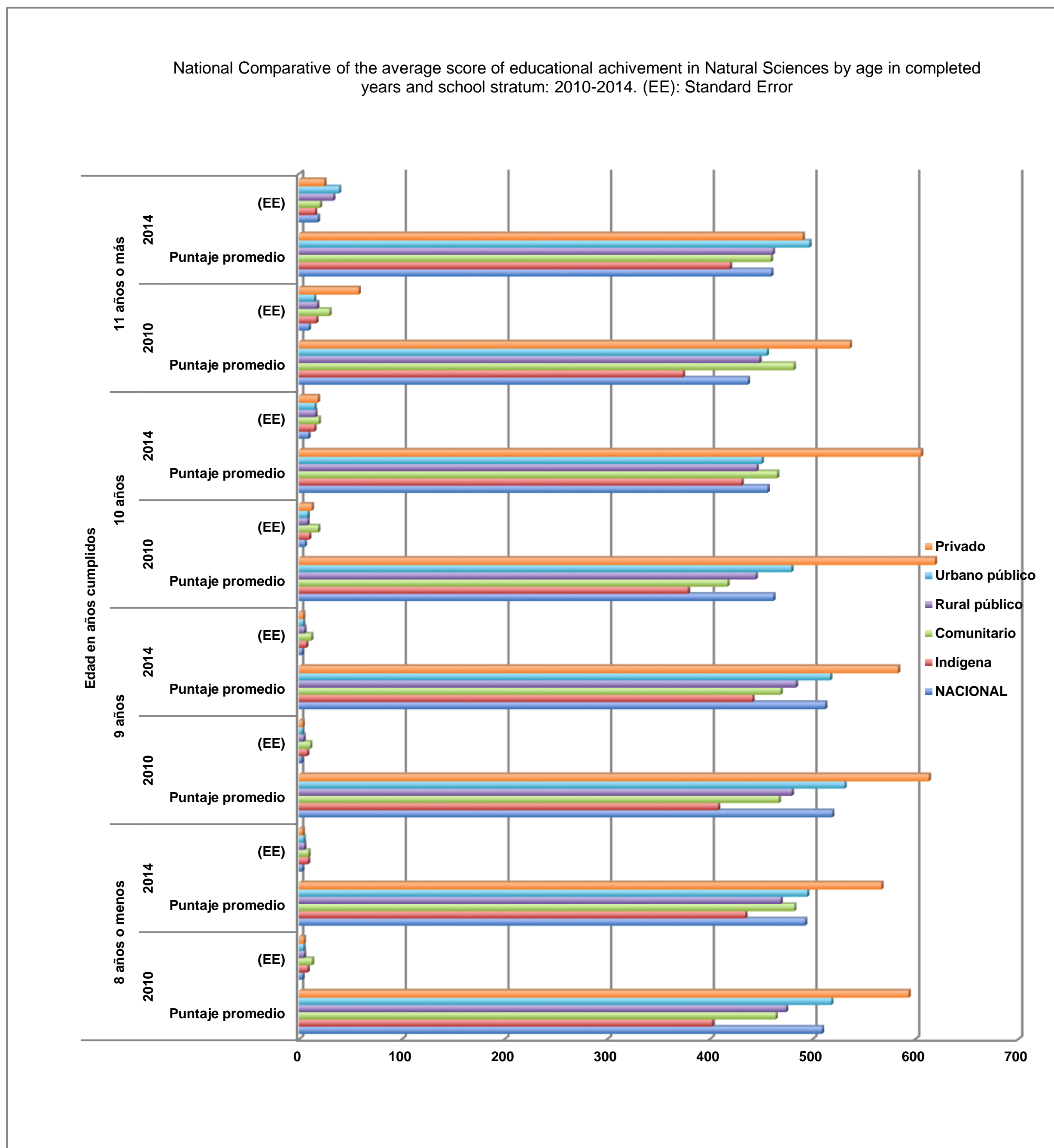
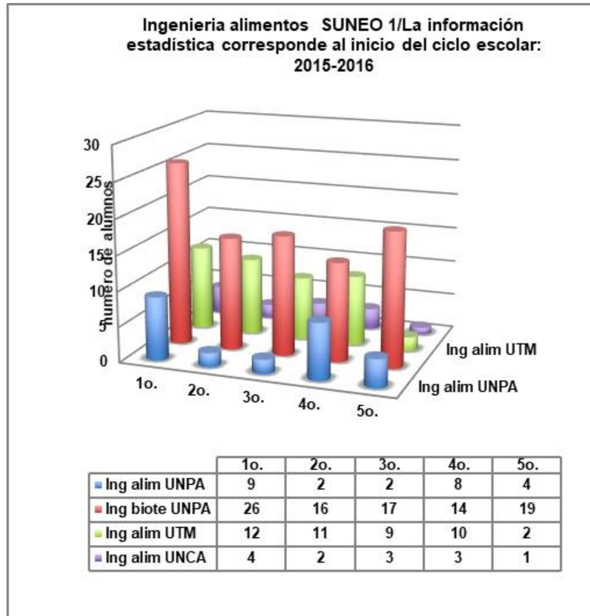
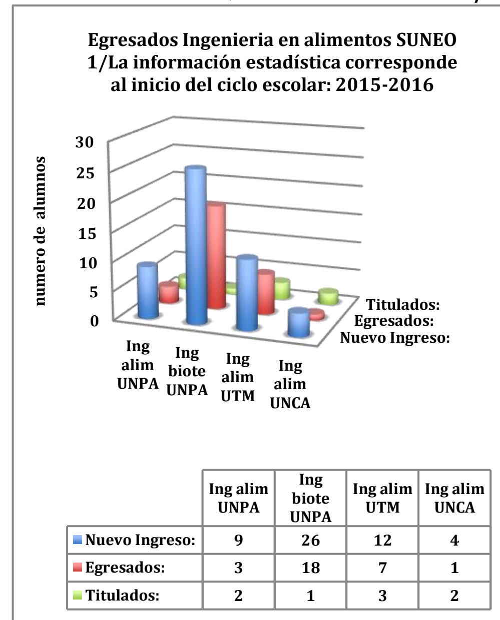


Figure 7 National comparison of the average score on educational achievement in Natural Sciences by age in years completed and school stratum: 2010-2014. (EE): Standard Error.



	1o.	2o.	3o.	4o.	5o.
Ing alim UNPA	9	2	2	8	4
Ing biote UNPA	26	16	17	14	19
Ing alim UTM	12	11	9	10	2
Ing alim UNCA	4	2	3	3	1



	Ing alim UNPA	Ing biote UNPA	Ing alim UTM	Ing alim UNCA
Nuevo Ingreso:	9	26	12	4
Egresados:	3	18	7	1
Titulados:	2	1	3	2

Figure 8 A Number of Students in Food Engineering in SUNEO compared to Biotechnology Engineering 2015-2016.

Figure 9 B Number of new students, graduates and graduates in the 2015-2016 school year.

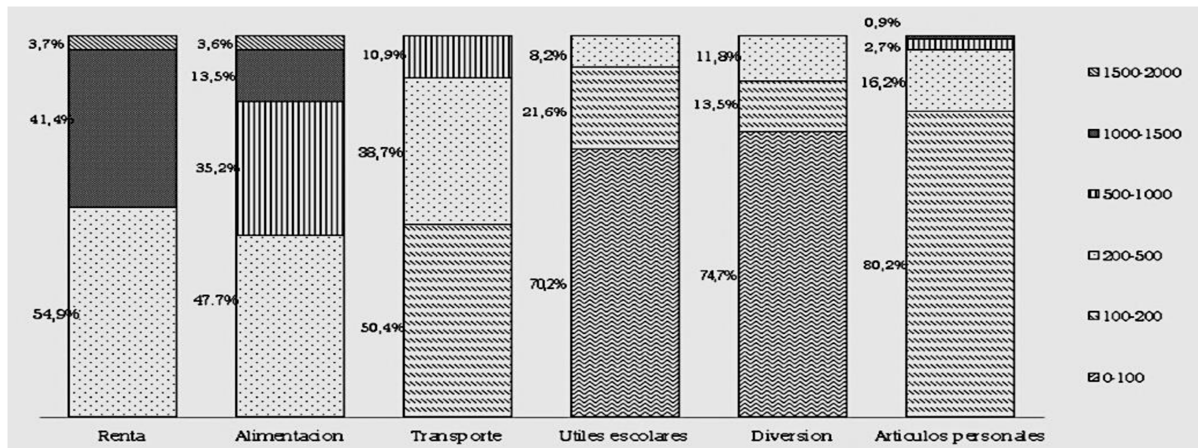


Figure 10 Distribution of monthly expenses of the students of the Universidad de la Sierras Sur.

In Figure 10 you can see the expenses in Mexican pesos of students in the UNSIS, to this we should add the inclement weather as the temperatures which can be seen in figure 11 are in kelvin degrees and vary during the year.

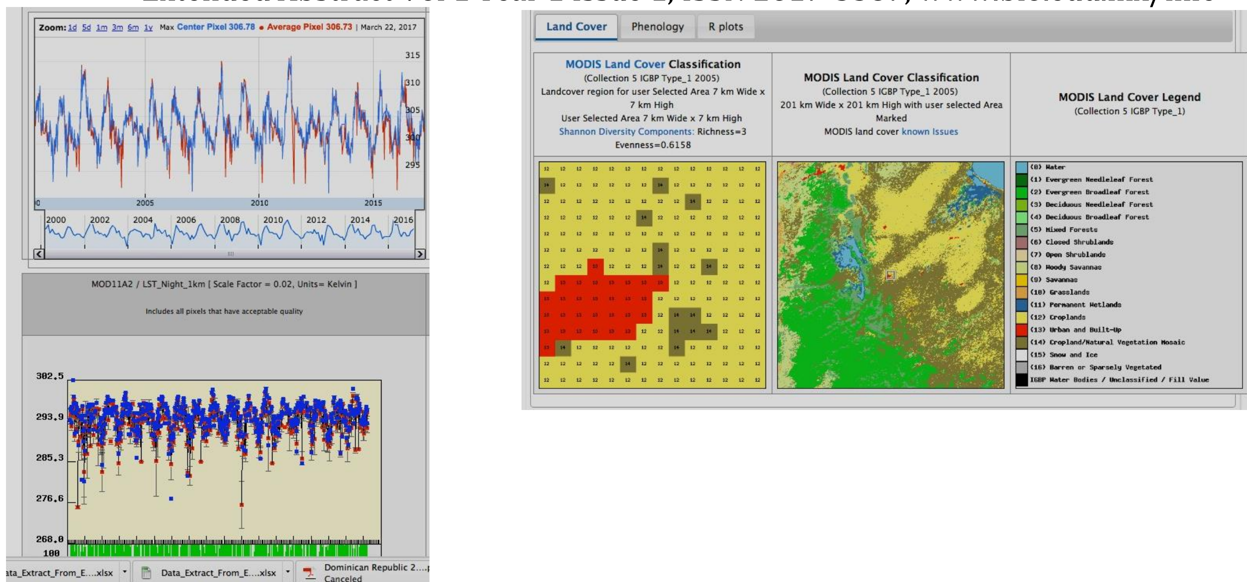


Figure 11. Record of temperatures during the years 2000 to 2016 in Tuxtepec Oaxaca. MODIS.

CONCLUSIONS:

It is necessary to increase the correspondence between the sector of education and the productive sector; introduce universal public scholarship policies to increase retention and terminal efficiency; establish specific programs that open opportunities in the productive and/or postgraduate sector through internship grants that finance the stay of a student in a company or university, and/or business incubators to start their microenterprise; informational programs of vocational education for EMS, which is the link where the highest desertion rate is recorded; census of human resources needs; linkage with job boards; identification of human resources development, opportunities and virtual register of graduates; use new mechanisms of communication with the productive sector such as the National System of Labor Competences officially operated by the National Council for Standardization and Certification of Labor Competences (CONOCER), to align the training of human resources through the Technical Standards of Labor Competence (NTCL) ; economic stimulus policy linked to improvements in the quality and accreditation of the ES; identifies profiles of graduates required by the productive sector and a virtual database of employers. Implement sustainable public policies to reduce the effects of temperature in the classroom.

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9. http://www.unca.edu.mx/ing_alimentos.html Acceso 15 oct 2017
10. http://www.unpa.edu.mx/ing_alimentos.html Acceso 15 oct 2017
11. http://www.beta.inegi.org.mx/app/areasgeograficas/ Acceso 15 oct 2017
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Use of ICT's for the teaching of microbiology in food chemistry career

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ABSTRACT: In the subject Experimental Microbiology there are challenges related to the teaching, execution and integration of the different techniques and their foundation. In order to find solutions for challenges such as: objectively evaluate and deliver results as soon as possible, provide feedback, share information of interest to the class, the following ICTs were used: Facebook and Moodle. The results show that in Facebook the activities related to the organization of work have greater acceptance and incidence within the laboratory, however those that are related to the feedback and resolution of questions stated by teachers, do not have the same impact. The Moodle platform is considered a useful tool to share information and evaluate, however students request timely feedback or correction to their exams or practice reports. We conclude that the use of these tools has a strong impact on practical work and motivation in students, but that they need to work more on teaching strategies that encourage their use.

KEY WORDS: ICT, Microbiology, Practical teaching, Food Chemistry.

INTRODUCTION

The introduction of ICT in universities is generating changes in teaching activity because this leads to the use of new instructional strategies mediated by the use of computers, electronic devices and the Internet. The use of ICT in science education such as microbiology also requires considering the following facts and challenges: predominance of the traditional model with unidirectional information (like the master class) (Pintó, Saez and Tortosa, 2008, Ezquerra and Polo, 2011, Rodríguez, Restrepo and Aranzazu, 2014); dubious information available on the network; development of the potentialities of ICT in the classroom and the reduction of the gap between the way to access the information that currently has the students and the one used in the classroom, so it is necessary to establish bridges between the way of teaching and learn the use of technologies.
On the other hand, there are studies on the use of some ICTs as support for theoretical face-to-face subjects, however there is little literature on their use in support of practical or experimental subjects at the university level. Also, Montagut, Sansón and González (2002) mention that there are large gaps in the evaluation of learning that occurs in the laboratory, a situation that is favored by the classical separation between "theories" and "practices" which contributes to transmit a deformed view of science.

Context of the subject Experimental Microbiology.

Experimental Microbiology is a compulsory subject taught semiannually by the Faculty of Chemistry of the UNAM in the fifth semester of the careers in Chemistry Pharmaceutical Biological (QFB) and Food Chemistry (FCh). The previous subject is General Microbiology, in which the theoretical knowledge of the area is taught, as well as the fundamentals of the techniques to be performed in the laboratory.
As the name implies, this subject is experimental in nature and is therefore taught in the laboratory. The course is taught by two teachers who share the same activities and responsibilities, as for the

work of the students, it is done by teams of two. The activities to be carried out during the class are: request of material at the beginning of the class, explanation of the technique and resolution of doubts about it, execution of techniques or review of results and delivery of material at the end of the class. In some sessions, the time allocated to the evaluation must also be considered.

Challenges of the subject:

According to the above, it is possible to see that the main problem faced by the teacher is that three hours that each session lasts are insufficient to comply with the initial planning. In addition to the foregoing, the following describes other problems faced by the laboratory professor:

The syllabus is broad and in several sessions there are two practices, which sometimes confuses the students.

Insufficient time for activities to be carried out, so group discussions are usually sacrificed, doubts about solved tasks, feedback of reports, evaluations or requested material.

Bad organization of time by students.

Sometimes, the initial explanations take more than 45 minutes due to some of the following situations: doubts about the procedures or the basis thereof; the techniques or their foundations have been misunderstood or the students did not read the information about the practice to be performed.

Spontaneous participation is usually among the most extroverted students in the group and time is lost in encouraging the rest of the group to answer the questions posed.

In order to find solutions to face these challenges, two ICTs were used: Facebook, and Moodle with the aim of knowing their potential for the teaching of an experimental subject such as Microbiology.

MATERIALS AND METHODS

The general objective of this study was to identify the advantages and disadvantages of using Facebook and Moodle as tools to promote the theoretical and practical learning of Microbiology in order to implement and improve its use in subsequent courses. The experience presented below corresponds to three continuous courses of the subject Experimental Microbiology, where the opinions of the students were collected and complemented by the observation of the teachers, with the aim of having a broader picture of the use of these ICT.

This work is descriptive and aims to expose the experience of the authors on the use of different teaching strategies through the use of Facebook and the Moodle platform.

Facebook and Moodle: Only students enrolled in the course had access to these tools. This allows the teacher to have more control over the material and the participations; in addition some of the information that is shared. Facebook was used to share doubts, notices, class organization, feedback, etc., information that is of exclusive interest to the teachers and students of the group. In the case of Moodle plataform, it was used as a repository of information and evaluation (application of exams).

To know the opinion of the students, anonymous questionnaires and open questions were applied in order to have as much information as possible. The answers issued by the students were grouped by tool and then identifying the advantages and disadvantages, as well as the likes about their employment, as well as comments for their improvement.

RESULTS AND DISCUSSION

In accordance with the way in which the opinions issued by the students were analyzed, the results corresponding to each ICT is presented below:

Facebook.

100% of students mention that Facebook was useful in the subject. In relation to the moment they check the messages 53% of them check them when the notification arrives, of them 37% read the message immediately when the message arrives and 16% clarify that they do it later if they are in class; 42% reviews them at night and the remaining 5% in the evening. This indicates that the selection of the tool was adequate for our purposes.

On Table 1 shows the results in terms of the uses granted to this tool.

Table 1. Uses given to Facebook.

OBJECTIVE	USE
Communication	Share information such as notices, assignments, exam reminders, biological material that should be brought to class Group feedback on reports, exams and laboratory work.
Share images	Photos obtained by students. Especially when it was about the type of microorganisms. Links with photos of interest for the subject. With the objective of comparing observations under a microscope with identified microorganisms.
Share links	Links to pages that will complement the topics reviewed in class.
Encourage participation	Through open questions posed by this means or, left as homework in class.
Inform about the work of each session	It indicated the sequence of activities to be carried out and the time allocated for them.

Next are some of the challenges that were addressed: Facebook:

The sharing of information increased the reception of tasks in a timely manner, as well as the students' carrying the necessary material. However, the feedback did not have the expected impact, since the same mistakes were repeated both in the techniques and in the theoretical part.

Although it was a common activity on Facebook to share images, few students did the activity, so to promote it, a photo contest was organized, which stimulated the participation of the students.

Another common Facebook activity is sharing links, however only 10% of students consulted the material.

Encourage more efficient use of class time, by sending an agenda, so that students came to the class with a clear idea of the activities to be carried out, even when two or three practices were carried out simultaneously.

Encourage participation. The questions posed and their resolution by this means, was especially useful for those introverted students, in whom a constant and quality participation was observed.

As can be seen, the uses that were given to the Facebook group where the teachers carried the baton (notices on material and the publication of the agenda) were the activities with greater acceptance by the students and therefore those that had an influence on practical work.
However, it is still necessary to find strategies for students to become more involved in their learning, such as participating in the resolution of questions and sharing other types of information, as well as to encourage discussion of results, for example, the creation of a virtual learning community or activities that encourage students' creativity and investigative abilities (Barajas and Álvarez, 2013).

Moodle Plataform

Table 2 shows the results in relation to the uses given to this tool.

Table 2. Uses of the Moodle platform.

OBJECTIVE	USE
Evaluation	Apply exams and evaluate the report's results
Repository of information	Share the files of the protocols of the practices, presentations used in class and links to videos or simulations of the techniques to study.

Of the challenges worked with the use of Moodle are the following:

In relation to the application of Moodle exams, an immediate and personalized feedback was programmed at the end of the test. The comments issued indicated which topic or aspects should be reviewed again. Only in those questions where more than 50% of the students answered erroneously was given more extensive feedback through the Facebook group.
According to some comments issued by the students, they prefer a more extensive and punctual feedback on the platform, most of them request that they be told the reason for their error and what was the correct answer.

With respect to the results reports, these were requested in Word format or in Adobe reader so that through the revision or underline tools and comments, respectively, the pertinent observations could be made.

On the platform students were scheduled to receive notification as soon as their report was qualified. It was detected that the students only saw their grade, and only a quarter of the group reviewed the comments issued by the teachers.
In the opinion of the students, they request that the correction of the report be made in order to see what they should have included, losing sight of the fact that the feedback must comply with a training objective.
Regarding its use as a repository of information, 100% of students express their pleasure for this modality since they have all the necessary information at their disposal and can consult it when they require it.

Finally, among the advantages and disadvantages that students mention in relation to the tools used, Table 3 presents a summary of them. As it is possible to appreciate, among the main advantages are the access and its ease of use.

Table 3. Advantages and disadvantages of the use of Facebook and Moodle.

ICT	Advantages	Disadvantages
Facebook	Facilitates communication with teachers and other colleagues, sometimes immediately. Encourages the participation of shy students. It allows to know what other students do when they see their results. It is a tool with which students are familiar, so it is not necessary to have a special session to know their job.	It is considered not very academic. Distracted since after reading a message from the group, it continues with the reading of others that have no relationship with the school.
Moodle-evaluation	Use of real images of the results to interpret. The monotony of paper exams is broken. Your rating is objective. Time management to solve the exam. To know immediately the qualification.	Existence of questions of relation of columns with abundant information. Pressure to see the remaining time.
Moodle-repository	All the material is organized in the same site, which decreases the time allocated to look for it. The links have the approval of the teachers. It's an easy-to-use tool.	Connection problems. Many other Moodle functions are wasted. A session is required to know its use.

CONCLUSION

According to the comments of the students and the observations of the teachers, it is possible to see that both tools are useful to complement the microbiology classes, however as reported by Urzúa and Rodríguez (2017) "A challenge that must be overcome in the courses face-to-face is to exploit Moodle's teaching potential, seeing it as an extension of teaching in the classroom, that is it can be used to carry out those activities that are important for professional training "which implies greater use of the different tools that make up on the platform. Likewise, it is important to promote strategies for students to take responsibility for their learning and to encourage them to review supplementary material useful for their professional training, such as links to pages showing the use of techniques in the food industry.

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II	Food Chemistry	38

Estudio del efecto gelificante de las pectinas de bajo metoxilo mediante la incorporación de diferentes precursores

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El objetivo de este trabajo fue estudiar la formación de geles con pectinas de bajo metoxilo empleando diferentes iones de calcio (citrato, carbonato y cloruro de calcio) a diferentes concentraciones (50, 100 y 150 mg/L). Todos los tratamientos fueron comparados en cuanto a su valor de firmeza con el testigo (sin adición de iones de calcio). El análisis de textura se realizó en un texturometro Brookfield CT3. Los resultados demuestran que las pectinas de bajo metoxilo tienen buena sinergia con la goma arábiga en presencia de cloruro de calcio ya que se obtuvieron geles con valores de firmeza hasta de 4.8 N y en ausencia de la goma arábiga este valor descendió hasta 2.7 N. Un efecto importante; no mencionado en la literatura fue apreciado en la formación de geles con citrato de calcio ya que su actividad fue inhibida en presencia de goma arábiga. En la formación de geles con pectinas de bajo metoxilo; el cloruro de calcio garantiza la firmeza requerida del gel; este efecto positivo se mantiene con y sin adición de goma arábiga. Debido a la complejidad de su estructura química el carbonato de calcio tuvo nula actividad gelificante en presencia de pectinas de bajo metoxilo.

PALABRAS CLAVE: Pectina, geles, iones de calico, firmeza, Newton

INTRODUCCIÓN

La pectina es uno de los principales componentes estructurales de las paredes celulares de las plantas. Este polisacárido está compuesto por una cadena principal de unidades de ácido α-D-galacturonico. Las regiones homogéneas se interrumpen por regiones ramnogalacturónicas donde se intercalan unidades de ácido galacturonico. La pectina forma geles bajo ciertas circunstancias, el mecanismo de gelificación depende en gran medida del grado de metoxilacion (GM). Convencionalmente, la pectina se divide en pectina de alta metoxilacion (AM) con GM> 50% y pectina de baja metoxilacion (BM) con GM <50 %. Pectina con GM> 50 % forma geles en presencia de alta concentración de azúcar, usualmente sacarosa o fructosa y un pH bajo; Mientras que la pectina con GM <50% forma geles en la presencia de iones divalentes, por ejemplo el calcio; mediante la interacción de grupos ionizados (COO-) con iones de calcio formando el mecanismo "caja de huevos" (Urías *et al.,* 2010) ya que la habilidad de las pectinas para interaccionar con cationes divalentes, principalmente calcio es de suma importancia en sus propiedades funcionales (Rascón *et al*., 2016). Otro de los factores que influyen en la formación de geles son los hidrocoloides, principalmente gomas ya que su mecanismo de acción es encapsular las partículas del agua en una red tridimensional lo cual conlleva a la formación de geles, lo cual se desea para la elaboración de confitería, jaleas y mermeladas. La elaboración de mermeladas (geles) consiste en el cocimiento de la fruta y mediante ella se propicia la liberación de pectina y su conversión a

protopectina (pectina soluble). Dependiendo de los requerimientos del proceso la pectina puede adicionarse en alguna etapa del proceso. La pectina puede ser adicionada como polvo seco mezclado con azúcar siendo esta el medio dispersante de la pectina o como una solución. El objetivo del presente trabajo fue estudiar el efecto gelificante de las pectinas de bajo metoxilo en presencia de diferentes iones de calcio a diferentes concentraciones, correlacionando así la acción de los diferentes iones con la firmeza del gel.

MATERIALES Y MÉTODOS

Reactivos.

Pectina de bajo metoxilo, cloruro de calcio, citrato de calcio, carbonato de calcio y goma arábiga fueron adquiridos en el mercado local. Su presentación fue grado alimenticio con una pureza del 99 %.

Elaboración de geles.

Se realizaron diferentes geles (mermeladas) a base de mango, el cual presentó un alto grado de madurez. Los geles fueron adicionados con diferentes tipos (citrato, carbonato y cloruro de calcio) y concentraciones (50, 100, 150 y 200 mg/L) de iones de calcio; posteriormente fueron almacenados a temperatura ambiente. Todos los tratamientos fueron comparados con el testigo (sin adición de iones de calcio). Aunado a lo anterior todas las muestras fueron comparadas en cuanto a su valor de firmeza con una marca comercial que emplea iones de calcio en su formulación. Se evaluó la sinergia de las pectinas de bajo metoxilo con la goma arábiga; la cual su concentración en todos los tratamientos se mantuvo constante. En cuanto al resto de los componentes (sacarosa, pectina de bajo metoxilo, y los conservadores) sus concentraciones se mantuvieron constantes durante el desarrollo de ese proyecto.

Diseño de experimentos.

Se construyeron tres tratamientos los cuales se identificaron con los textos T1, T2, y T3. Se utilizó un diseño de experimentos completamente al azar (DCA), comparando con la tabla de distribución F de Fischer. Estos análisis se llevaron a cabo por medio del software de excel, con la herramienta para el análisis de datos de un solo factor V-BA. Se realizó un análisis de comparación de medias entre los tratamientos para detectar si existen diferencias significativas.

Análisis y perfil de textura (TPA).

Los análisis de textura fueron realizados con un texturómetro BROOKFIELD CT3. El test empleado para medir la fuerza de los diferentes geles fue el TPA (análisis y perfil de textura) por la facilidad que brinda este análisis al arrojar la firmeza de los geles en cada prueba. Los parámetros utilizados en el TPA fueron los siguientes: punto de ruptura: 1.0; deformación: 4.0 mm y velocidad: 1.0 $\frac{mm}{s^{-1}}$. La temperatura de análisis de los diferentes geles fue de 35°C. Los resultados de firmeza de los diferentes geles en este apartado fueron registrados y graficados. La sonda empleada para todos los análisis fue de geometría cilíndrica y de 3.0 cm de diámetro.

ANDEVA

El análisis de datos de los diferentes tratamientos (distintos iones de calcio) se realizó mediante un análisis de varianza (ANDEVA) conforme a un Diseño Completamente al Azar (DCA). La comparación y agrupamiento de medias se hicieron por medio de la prueba LSD, los cuales fueron llevados a cabo en el software de Excel.

RESULTADOS Y DISCUSIÓN

Comportamiento de las pectinas de bajo metoxilo en presencia de cloruro de calcio.

La evolución de sol a gel se puede apreciar en la figura 1. Ya que la firmeza en los soles es muy baja (0.2 N) debido a que la fase líquida del coloide se encuentra en mayor concentración que en los geles. La firmeza de los geles en presencia de cloruro de calcio alcanzó un valor máximo (4.8 N) a una concentración de 150 mg/L en presencia de goma arábiga; este valor indica que el aditivo antes mencionado refuerza la firmeza de los geles. Así también el gráfico antes mencionado rompe con la lógica común que se esperaría ya que después de adicionar mayores concentraciones de cloruro de calcio >150 mg/L no corresponde un valor máximo de fuerza del gel, el efecto contrario sucede después de aumentar la concentración a 200 mg/L de cloruro de calcio y la firmeza del gel baja hasta alcanzar valores por debajo del máximo. Los geles comerciales (mermeladas) presentan un valor promedio de 1.4 N y se pueden lograr con la incorporación solamente del cloruro de calcio sin la adición de goma arábiga u otros hidrocoloides comerciales: lo cual representa un ahorro económico en la industria alimentaria ya que la adición de un hidrocoloide para reforzar la firmeza del gel pudiera ocasionar un gasto adicional innecesario ya que como se demuestra en esta investigación solo el cloruro de calcio en conjunto con la pectina de bajo metoxilo otorgan los valores deseados a los geles.

Comportamiento de las pectinas de bajo metoxilo en presencia de citrato de calcio.

Los geles preparados con citrato de calcio muestran un comportamiento muy singular ya que a bajas concentraciones y sin la adición de goma arábiga brindan la firmeza suficiente al gel; pero su efecto gelificante se demerita al aumentar su concentración y aunado a lo anterior la adición de goma arábiga provoca un decremento mayor en la firmeza del gel. En base a lo anterior se pudiera establecer que la goma arábiga es un inhibidor de este ion de calcio, y como se aprecia en la figura 1 a bajas concentraciones de citrato de calcio se obtuvieron valores de 1.3 N muy parecidos a los geles comerciales.

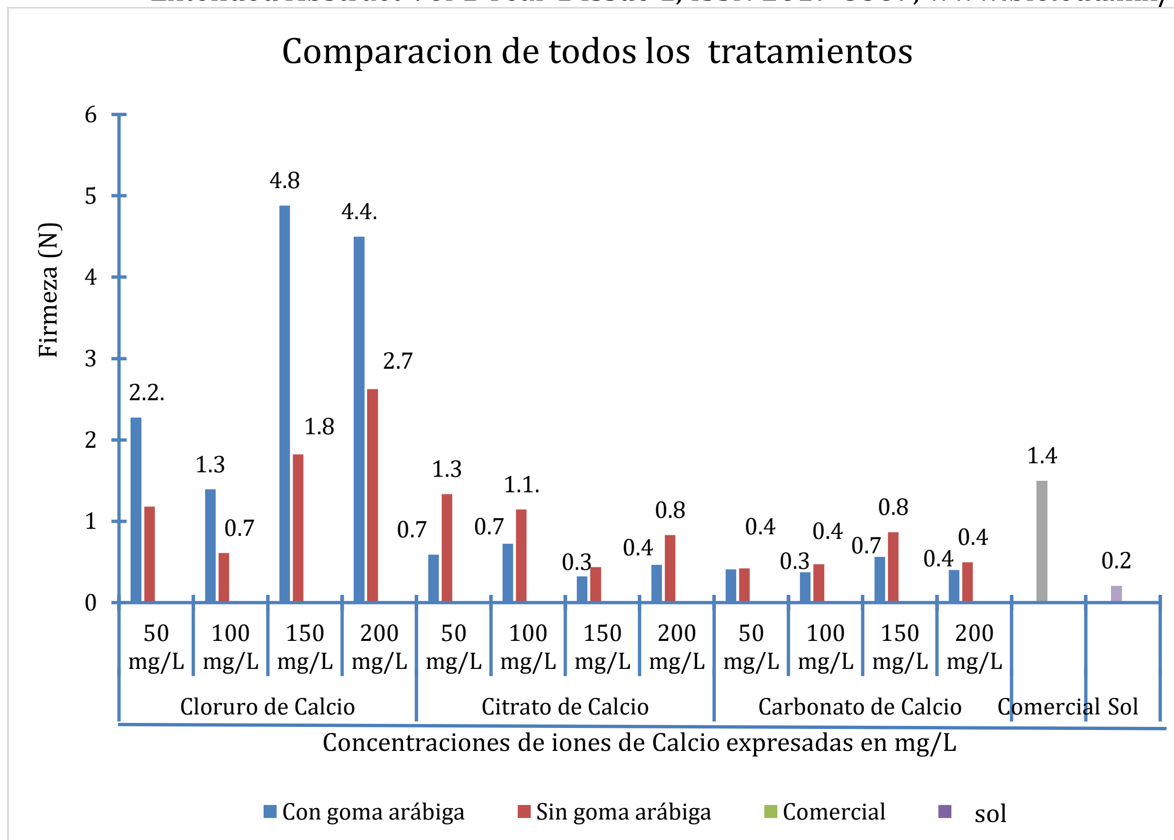

Figura 1. Comparación de los valores de firmeza de todos los tratamientos.

Y valores inferiores hasta de 0.4 N de firmeza del gel se hicieron presentes al aumentar la concentración del citrato de calcio. Los resultados demuestran que la formación de soles se ve favorecida al aumentar la concentración de los iones de calcio, lo cual no es benéfico en la industria alimenticia ya que la percepción de los soles ante el consumidor final es sinónimo de mala calidad. La utilización del citrato de calcio pudiera ser una alternativa para la industria alimenticia ya que su uso en la formación de geles quedo demostrada en este trabajo y a bajas concentraciones y sin la adición de hicrocoloides forman geles con valores cercanos a los comerciales; lo cual representaría un ahorro económico en la industria alimenticia ya que se emplearían bajas concentraciones de este ion de calcio y no se necesitaría reforzar su firmeza con hidrocoloides.

Comportamiento de las pectinas de bajo metoxilo en presencia de carbonato de calcio.

La adición del carbonato de calcio en los geles preparados con pectinas de bajo metoxilo no aportó la firmeza deseada a los geles, ya que la concentración del carbonato puede ir en aumento y eso no garantiza un aumento en la firmeza del gel. En la figura 1 se aprecia que el valor máximo de firmeza obtenida por este ion de calcio fue de 0.8 N; valor que se encuentra muy por debajo de los geles comerciales. El carbonato de calcio puede ser considerado como un promotor de en la formación de soles y no de geles, ya que sin importar su concentración este ion de calcio no propicia la formación de geles. Su tendencia se orienta a formar soles (sistemas coloidales con mayor

presencia del líquido y no del sólido) ya que en presencia de goma arábiga su efecto alcanza un máximo hasta de 0.8 N equivalente al 60 % de la firmeza de los geles comerciales y su comportamiento general de este ion de calcio pareciera gaussiano.

ANDEVA.

Derivado de la comparación de varianzas entre los diferentes tratamientos (T1, T2 y T3) se tiene que para todos los casos $F < F_0$ y con $\alpha = 0.05$ la decisión fue aceptar H_a ($\sigma_A \neq \sigma_B \neq \sigma_C$) y se concluye que estadísticamente todos los tratamientos son diferentes, y por lo tanto los iones de calcio y la concentración del mismo influyen directamente en la dureza de los geles.

CONCLUSIONES

En la formación de geles con pectinas de bajo metoxilo; el cloruro de calcio y citrato de calcio garantizan la firmeza requerida del gel, ya que la aplicación a bajas concentraciones de estos iones de calcio brindaron una acción positiva en cuanto a la formación de geles. Sin embargo, el carbonato de calcio pudiera ser considerado un promotor en la formación de soles y ser contemplado en la formulación de purés, salsas, cremas, papillas y sopas dado que estos alimentos requieren características de un sol.

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Effect of storage on physicochemical properties of dehydrated cheese

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ABSTRACT
The fresh cheese has a very short shelf life due to its pH (near to neutrality), high water activity and low salt content. However, the necessity for proper packaging for traditional products has pushed to study packaging conditions that ensure desired shelf life while maintaining their stability. For this reason, the aim of this work was to evaluate the physicochemical changes during storage of dehydrated artisanal cheese. A mixed experimental design 2^3 was adopted. In this design, two qualitative variables were analyzed: type of packing (polyethylene and metalized) and atmosphere type (air and vacuum), and a quantitative storage variable: temperature (5 and 25°C). After three months, samples stored at 5 °C had the highest moisture content (0.72 and 0.71%) than cheese samples stored at 25 °C (0.61 and 0.60%) for both types of packing. Statistical analysis indicated that atmosphere and packing type have significant effect on color difference. The lowest color difference (from 14.32 and 17.12) was obtained in cheese samples stored in metalized packages under vacuum conditions at 5 and 25 °C. The sodium chloride and fat content of storage samples had no significant variations compared with initial dehydrated samples.

KEYWORDS: Dehydrated cheese, storage, water activity, type of packing.

INTRODUCTION

Artisanal cheese is the most recognized cheese of Latin American origin and the most consumed internationally. Fresh cheeses have short shelf life because of their pH (near to neutrality), the high water activity and the low salt content. Usually, the shelf life of fresh cheese under refrigeration is seven days (Del Caro et al. 2012; Faccia et al., 2012). For this reason, fluidized bed drying was employed as an efficient alternative to preserve perishable food (Domínguez-Niño et al., 2016). However, the need for proper packaging for traditional products has pushed to design packaging conditions according to the characteristics of each food (Costa et al., 2016). Shelf life is an important feature of all foods and it may be define as the period that the food retains an acceptable level of eating quality from a safety and organoleptic point of view (Ucherek, 2004). It is well known that vacuum packaging not only reduces the incidence of oxidative damage and inhibits aerobic bacteria, but also preserves sensory quality in foods, because under vacuum conditions, oxygen in the package headspace is reduced to <1%, maintaining stable moisture and water activity (Garabal et al., 2010). For this reason, vacuum packaging is an interesting alternative to storage in dehydrated samples as cheese.

MATERIALS AND METHODS

Drying process

The artisanal cheese was obtained from a cheese making group located in the city of Tlalixcoyan, Veracruz, México. A fluidized bed dryer (Model Restch TG-200) was employed for the drying process. Drying conditions for this study were selected according to results reported by Domínguez-Niño et al. (2016) (air temperature of 60 °C, drying time of 90 min and particle size of 2 cm).

Packaging of dehydrated cheese

The dehydrated cheese samples (12.1 g), were packaged in two types of packing (13.2 x 9.5 cm) made out of polyethylene and metalized with 30 µ thickness. The samples were sealed by means of a vacuum packing machine (Food saver model sealing system FSFSSL3880) under atmospheric conditions: air and vacuum (VP), and were stored at 5 and 25 ±1 °C.

Physicochemical characterization

Moisture content: The moisture content was determined using an infrared moisture balance (MA35 SARTORIUS, Germany). A temperature of 65 °C and 1 g of cheese was used.

Water activity (a_w): the dehydrated cheese samples was measured at, 25 °C using Aqualab water activity meter (model SERIES 3 TE, DECAGON, Washington).

Color difference: the sample color was measured by colorimeter of HunterLab (model MiniSccan XE plus, Associates Laboratory, Retson, VA, USA). The equipment was calibrated with white and black standards tiles. The experimental color was determined by reflectance mode and expressed by L^*, a^* and b^* parameters. The color difference (ΔE) was calculated using the following equation used by Lozano-Acevedo et al. (2011).

$$\Delta E = \sqrt{(\Delta L *)^2 + (\Delta a *)^2 + (\Delta b *)^2}$$

Where $\Delta L = L^*$ of dried sample at storage time-L of initial dried sample, $\Delta a = a$ of dried sample at storage time -a of initial dried sample and $\Delta b = b$ of dried sample at storage time-b of initial dried sample.

Protein, sodium chloride and fat content: the protein content of the stored cheese was determined by a standard Kjeldahl method, using a nitrogen conversion factor of 6.38 for dairy products. Sodium chloride was assessed following the method described by James (1995) and fat content was quantified by extraction method using (Soxhlet) equipment.

Experimental design

A mixed experimental design 2^3 was adopted. In this design two qualitative variables were analyzed (type of packing made out of polyethylene and metalized) and atmosphere type (air and vacuum), and, as a quantitative variable, storage temperature of 5 and 25 °C, thus making a total number of eight experimental storage condition (Table 1).

Table 1. Experimental storage conditions of dehydrated artisanal cheese

Exp.	Packing type	Storage conditions	Temperature (°C)
1	Polyethylene	Air	5
2	Polyethylene	Air	25
3	Polyethylene	Vacuum	5
4	Polyethylene	Vacuum	25
5	Metalized	Air	5
6	Metalized	Air	25
7	Metalized	Vacuum	5
8	Metalized	Vacuum	25

RESULTS AND DISCUSSION

Moisture content

Figure 1 shows the evolution of moisture of dehydrated cheese under different storage conditions (Table 1). The statistical analysis with Tukey test α = 0.10 indicated that there is significant difference in moisture content for experiments 1, 2, 5 and 6, which correspond to samples of cheese stored in polyethylene packaging and metallized packaging under atmospheric conditions (air) at temperatures of 5 and 25 °C. Experiments 2, 4, 5, 7 and 8 showed an increasing trend in moisture content, possibly due to the increase in the water retention capacity of the cheese matrix for sodium chloride (Faccia et al., 2012). The metallized packaging was suitable for storage during 3 months.

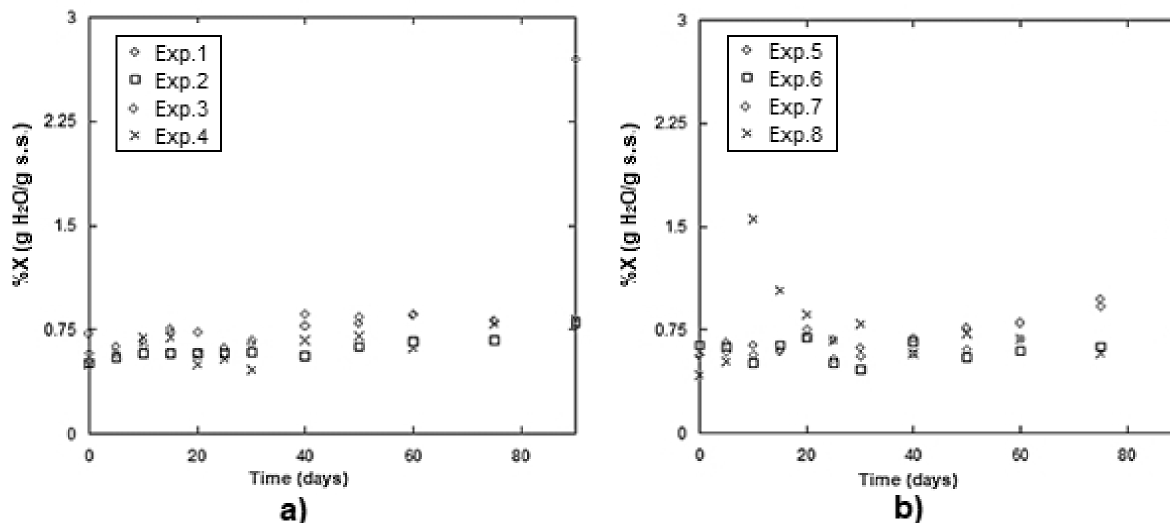

Figure 1. Evolution of moisture content in dehydrated cheese stored under different conditions: a) polyethylene and b) metalized.

Water activity

Figure 2 shows the evolution of the water activity (a_w) in samples of dehydrated cheese under different storage conditions (Table 1). The statistical analysis with Tukey's test α = 0.10 indicated that there is no significant difference in the water activity content between experiments 1 and 2; whereas, the influence of storage temperatures and packing type was evident on a_w values in experiments 3, 4, 5, 6, 7 and 8, the influence of storage temperatures and packing type was evident.

Figure 2 clearly shows that during the first 5 days of storage at 5 and 25 °C, the increase to the water activity of dehydrate cheese samples. In general, the increase in a_w did not affect the stability of the product because the values of water activity were lower than 0.60, therefore, it can be considered free of microbial growth (Cantalejo et al., 2016).

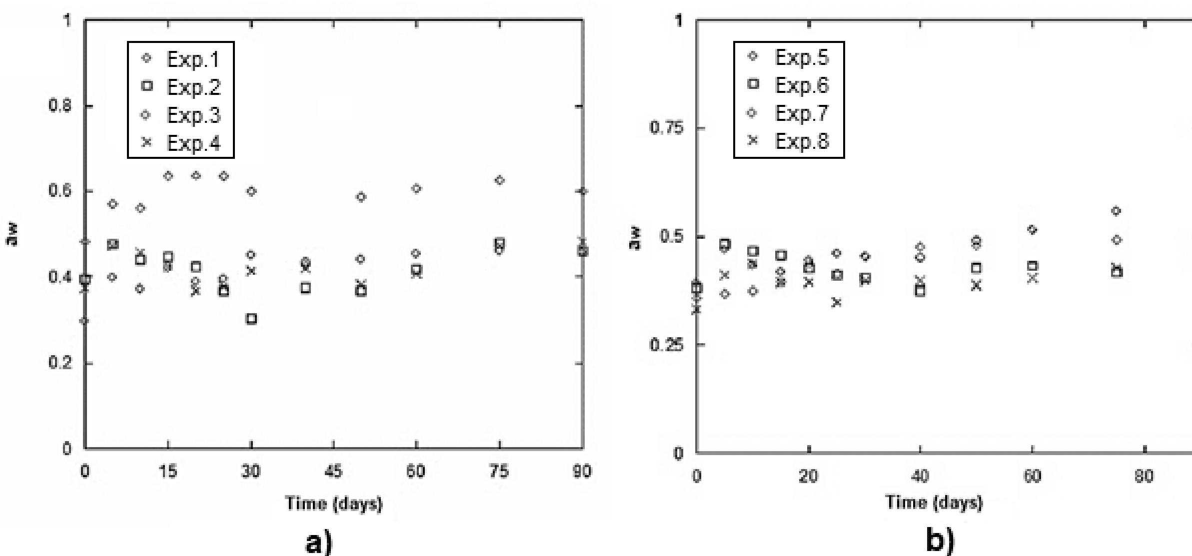

Figure 2. Evolution of water activity in dehydrated cheese stored under different conditions: a) polyethylene and b) metalized.

Color difference

The figure 3 shows the evolution of the color difference (ΔE) in samples of dehydrated cheese at different storage conditions (Table 1). The statistical analysis with Tukey's test α = 0.10 indicated that there is no significant difference in moisture content between experiments 3, 4, 5 and 6.

During storage, a slight increase in *a* values and a clear increase in *b* values were observed. Therefore, a tendency towards yellowing occurred. According to the literature, dehydrated foods lose color due to the oxidation of highly unsaturated molecules once exposed to light, air and chemical changes (Koca et al., 2007).

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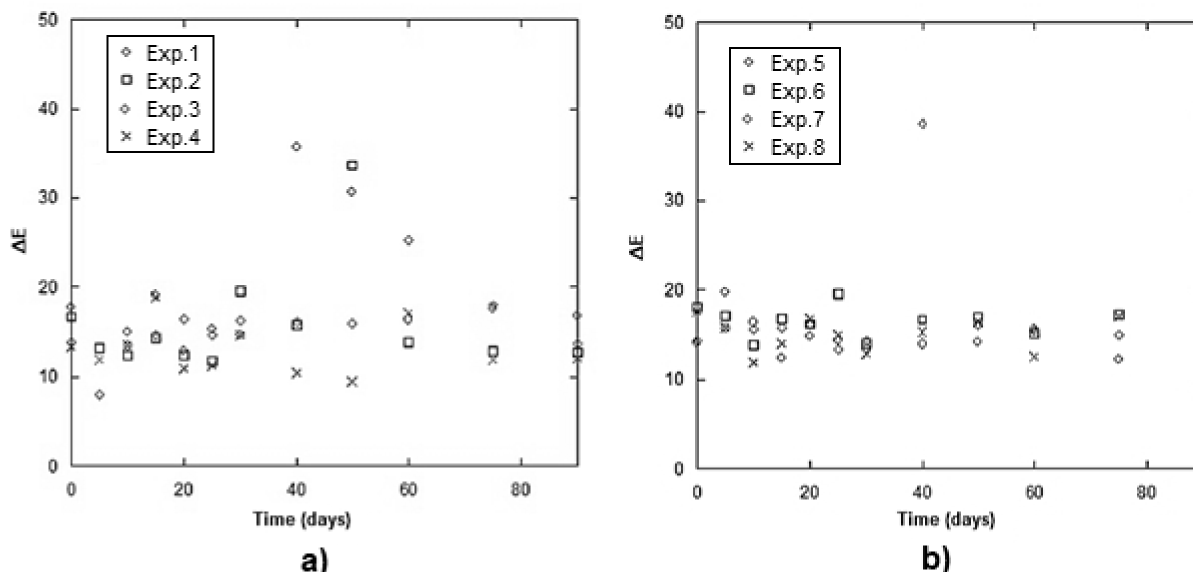

Figure 3. Evolution of color difference in dehydrated cheese stored under different conditions: a) polyethylene and b) metalized.

Protein, fat and sodium chloride content

The results obtained at the end of the storage period for the content of protein, fat and sodium chloride are presented in Table 2. The values showed an increase in protein, sodium chloride and fat content with respect to the sample analyzed at time zero, 35.2352, 3.1382 y 41.885%; it was observed that treatments 5, 7 and 8 had the highest percentage of proteins, the sodium chloride content in the dehydrated cheese samples showed non-significant variations during storage. Finally, the fat percentage for each of the treatments in the dehydrated cheese samples increased up to 6% with respect to the initial value. The increase in protein, sodium chloride and fat content is related to the loss of moisture during storage. Ehsannia and Sanjabi (2015) reported that the storage at 4 °C of processed cheese affected the chemical composition and the moisture content, therefore an increase was observed in the content of fats, proteins, salt and ashes.

Table 2. The experimental results of protein, sodium chloride, fat content of dehydrated cheese at the end of storage period.

Exp.	Protein content (%)	NaCl (%)	Fat content (%)
1	35.8275	3.0049	45.4034
2	35.0513	2.9052	46.8496
3	34.3033	2.0827	45.9366
4	35.7833	3.311	42.088
5	37.5552	2.9390	42.6093
6	33.0771	3.2371	47.87
7	37.2600	3.1488	48.4769
8	37.4097	2.9552	47.5404

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CONCLUSIONS

According to results obtained in the study, the samples stored in metalized packages and atmospheric vacuum conditions proved adequate for the storage of dehydrated cheese for three months, the color difference using these storage conditions was maintained between 14.32 to 17.12. The moisture content and water activity were kept within the limits allowed to ensure product stability. The content of fat and sodium chloride did not show significant differences at the end of the storage with respect to the initial values. Finally, the results show that temperature does not represent a significant factor in storage stability.

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Moisture sorption isotherms and isosteric heat of sorption of habanero chili powder

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ABSTRACT
Moisture sorption isotherms of the habanero chili powder were determined using the Dynamic Vapor Sorption (DVS) method at 25, 35, 45 and 55 °C in a range of relative humidity from 0.05 to 0.95. The sorption isotherms were sigmoid form (Type II). The experimental sorption curves were fitting by GAB and BET models. The GAB model was the most suitable for describing the sorption data. Based on Clausius-Clapeyron equation, the isosteric heat of sorption was calculated with the moisture content in equilibrium data at different temperatures. The desorption isotherms present a higher isosteric heat in relation to the adsorption isotherms. In both, the isosteric heat decreased as the moisture content increased.

Key words: Habanero chili, sorption isotherms, isosteric heat of sorption.

INTRODUCTION

Habanero chili is a variety of red pepper most popular in the Mexican territory. The main characteristics of the pepper are the color (carotenoids), aroma and mainly to the pungencia due to the capsaicinoids (Rhim and Hong 2011; Sganzerla et al. 2014). Therefore, the export of fresh fruit has several disadvantages; has a high moisture content (> 85% w.b.), is very perishable and has a limited shelf life. Drying is one of the methods that allows to take advantage of prolong the useful life of foods by reducing water activity (a_w) and decreasing moisture content (Schmidt and Won, 2012).

The state of water plays an important role in the preservation of food. The degree of sorption of water from a food system depends on the vapor pressure of the water present in the food sample and in the surroundings. The equilibrium moisture content (EMC) is obtained when the vapor pressure of water present in food is equal that to the vapor pressure of the surroundings. According to Basu et al. (2006), the water activity (a_w) of a food is an equilibrium property of the water and its constituents present, which defines as the ratio of the partial pressure of the water vapor in the food (p) and the partial pressure pure water vapor (p_o) at the same temperature, as shown in equation 1:

$$a_w = \frac{p}{p_0} = \frac{HR}{100} \quad (1)$$

The relationship between EMC and a_w in a range of values at a constant temperature generates an evaluation tool very useful called ``Moisture sorption isotherm´´, which relates the amount of water adsorbed or desorbed in equilibrium. An adsorption isotherm refers to the behavior of dehydrated

foods, which tend to adsorb water against the surrounding relative humidity to have equilibrium pressures. While a desorption isotherm refers to the behavior of hydrated foods, which tend to eliminate water to have equilibrium conditions at a given temperature. These behaviors depend on the interaction between water and food components (Tsotsas and Mujumdar, 2014).
Sorption isotherms provide information for a variety of processing applications and product stability, such as prediction of moisture transfer, determination of product stability and shelf life, design and process control (Schmidt and Won, 2012). In practice, isosteric sorption heat is important for the model of various processes in the food industry and food storage. In this regard, isosteric heat of sorption is used to estimate energy requirements in dehydration or hydration during storage, this knowledge relates to the state of the free water bound in the surfaces of the food components (Gill et al., 2013). Therefore, the aim of this study was to analyze the isotherms (adsorption and desorption) and isosteric heat of sorption of the habanero chili in powder.

MATERIALS AND METHODS

Raw material and convective drying of habanero chili

Habanero chili was obtained from the city of Orizaba, Veracruz, Mexico. The selected fruits showed an orange-red color and similar size (4-7 cm length, 3-5 cm width). Samples of habanero chili were placed on metal trays of a convective dryer (Polinox SEM-2). The convective drying process was performed at a temperature of 60 °C and at an air velocity of 1.5 m/s for 24 h until moisture ≥10% d.b. Habanero chili peppers were milled in a manual grinder of blades to obtain homogenous habanero chili powder. The powder was packed, sealed in polyethylene bags and stored in a desiccator until further analysis.

Physicochemical analysis

For the physicochemical analysis, the moisture content, water activity and color difference were determined for samples of dehydrated habanero chili. The water activity was determined at 25 ± 1 ° C using a water activity meter (AQUALAB series 3 model TE). The moisture content (g H_2O/ g solid dry) of habanero chili was measured with a halogen thermobalance (OHAUS, model MB35).

The color parameters (brightness L^*, chromaticity a^* and b^*, and ΔE color difference) were determined using a MiniScan XE plus (HunterLab) colorimeter. Data was captured on an integrated computer using software version 4.10.

Moisture sorption isotherms

The sorption isotherms (adsorption and desorption) were determined by a vapor sorption analyzer (AquaLab VSA), which consists of an equipment that automatically generates moisture sorption isotherms in foods, allowing the determination of the complex relationship between a_w at each reading and the EMC of the sample at a constant temperature. The isotherms were determined at 25, 35, 45 and 55 °C. The VSA equipment generates the static isotherms in equilibrium by the Dynamic Vapor Sorption (DVS) method, which consists of monitoring the weight change of the sample as the sample is exposed to different controlled relative humidities. The sample is maintained at each humidity for a period of time until the sample reaches a steady state weight change, where the objective is to achieve the equilibrium between the a_w and the controlled humidity inside the generator chamber. The experimental sorption isotherms of the habanero chili powder were performed in duplicate.

Prediction of mathematical models and calculation of isosteric sorption heat

The mathematical models GAB (Guggenheim & Anderson de Boer) and BET (Branauer, Emmett & Teller) represented by equations 2 and 3 were used to predict the experimental values of sorption isotherms (adsorption and desorption).

$$M_{eq} = \frac{CKX_m a_w}{(1 - Ka_w)(1 - Ka_w + CKa_w)} \quad (2)$$

$$M_{eq} = \frac{CX_m a_w}{(1 - a_w)(1 - a_w + Ca_w)} \quad (3)$$

Where: C and K are constants of the models, a_w is the water activity, M_{eq} is the moisture content at equilibrium (g H_2O/g dry solids) and X_m is the moisture content in the monolayer (g H_2O/g of dry solids) (Yanniotis and Blahovec 2009).

The net isosteric heat of sorption was determined from moisture sorption data according to Faria et al., (2016) using equation 4, derived from the Clausius Clapeyron equation:

$$\frac{\partial \ln(a_w)}{\partial T} = \frac{q_{st}}{RT^2} \quad (4)$$

Where a_w is the water activity, T is the absolute temperature (K), q_{st} is the net isosteric heat of sorption (J mol^{-1}), R is the gas constant (J mol^{-1} K^{-1}). Assuming that q_{st} is independent of temperature and integrating equation 4, give the equation 5:

$$\ln(a_w) = -\left(\frac{q_{st}}{R}\right)\frac{1}{T} + C_1 \quad (5)$$

Where, C_1 is an integration constant.
The isosteric heat of sorption (Q_{st}) can be calculated by equation 6:

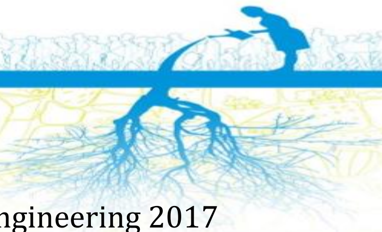
$$Q_{st} = q_{st} + L = a * exp(-bMeq) + L \quad (6)$$

Here Q_{st} is the isosteric heat of sorption (J mol^{-1}), L is the latent heat of free water vaporization (J mol^{-1}), a and b are constants. The latent heat of free water vaporization (L) was obtained by equation 7 using the average temperature (Faria et al. 2016).

$$L = 2502.2 - 2.39(T - 293.15) \quad (7)$$

RESULTS AND DISCUSSION

Table 1 shows the results of water activity (a_w), moisture content and color parameters of the fresh and dehydrated habanero chili, observing that the a_w and moisture content of the fresh fruit is relatively high. However, when the drying process is performed, the values of moisture content, a_w



and the color parameters (L^*, a^* and b^*, decreased significatly. Villegas et al. (2011) refer to that a food with an a_w less than 0.60 and moisture content low is considered safe and stable during storage in relation to microbial growth. Rhim and Hong (2011) reported that the decrease in color is attributed mainly to the degradation of some pigments such as carotenoids.

Table 1. Physicochemical characteristics of fresh and dehydrated habanero chili.

Sample	**Water activity**	**% Moisture content (g H_2O/g dry solids)**	**L^***	**a^***	**b^***	**Color difference (ΔE)**
fresh	$0.993^{\pm0.002}$	$83.3^{\pm0.402}$	$22.58^{\pm0.318}$	$5.34^{\pm0.330}$	$10.83^{\pm0.215}$	—
dehydrated	$0.286^{\pm0.009}$	$3.18^{\pm0.121}$	$12.42^{\pm0.340}$	$1.92^{\pm0.380}$	$5.01^{\pm0.291}$	$11.98^{\pm0.370}$

The hygroscopic behavior of dried habanero chili powder is represented with adsorption and desorption isotherms at 25, 35, 45 and 55 ° C are shown in Figure 1. A strong increase in moisture content in equilibrium was observed in a_w higher (a_w> 0.55 at 55 °C, a_w> 0.6 at 45 °C, a_w> 0.62 at 35 °C and a_w> 0.65 at 25 °C). This is related with the composition of the food that affects the sorption capacity of moisture and the drying behavior of the food with high temperatures (Labuza and Altunakar, 2007). According to the classification described by Basu et al. (2006), these isotherms presented a typical sigmoid form.

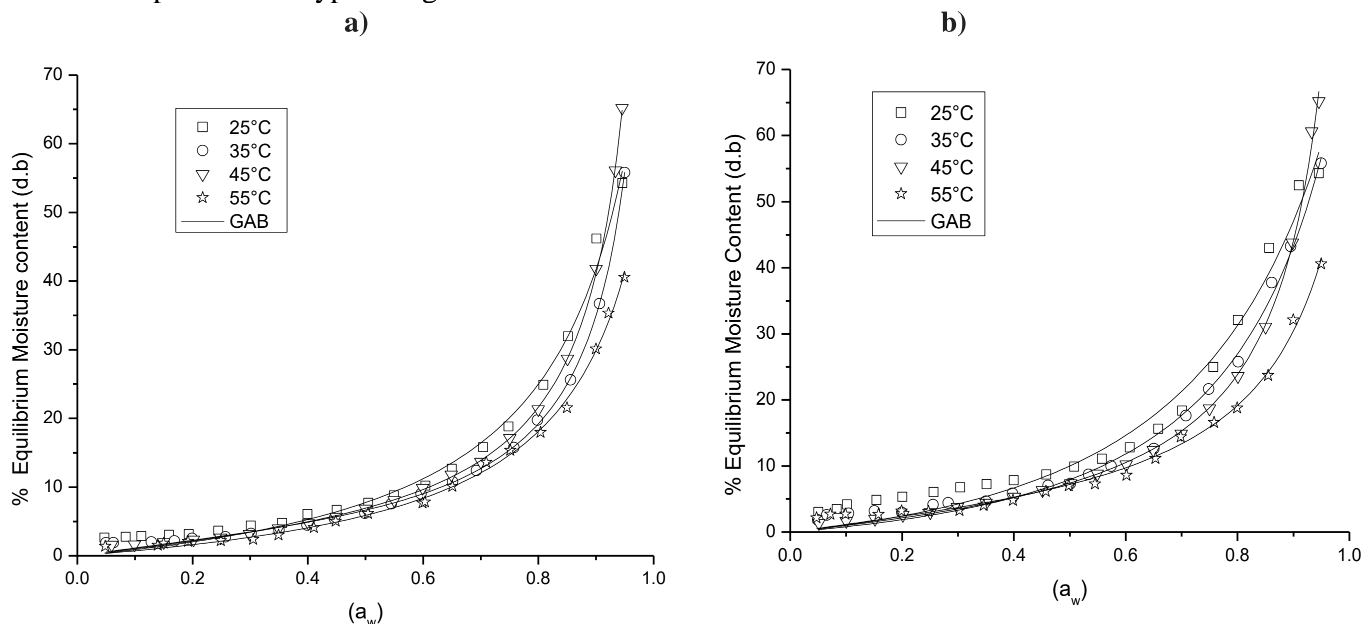


Figure 1. Isotherms of habanero chili: a) adsorption and b) desorption

The best fit was obtained with the GAB model at different temperatures and the results of nonlinear regression analysis (R^2>0.9736) are presented in Table 2. It was observed that BET model had lower determination coefficient (R^2) in comparation with GAB model, a similar behavior was

reported by other researchers for tapioca flour (Chisté et al., 2012) and nixtamilized corn flour (Ramirez et al., 2014).

Table 2. Parameters and adjustment of GAB and BET models of isotherms of sorption at 25, 35, 45 and 55 °C

	GAB model					BET model		
Type isotherm	Temperature (°C)	Xm (% d.b)	C	K	R^2	Xm (% d.b)	C	R^2
Adsorption	25	10.01	0.9115	0.8993	0.989	3.606	79.32	0.9048
	35	4.949	2.46	0.963	0.9987	3.107	28.59	0.9689
	45	5.544	1.907	0.9715	0.9995	3.811	9.468	0.9889
	55	6.821	1.096	0.902	0.9968	2.539	73.56	0.909
Desorption	25	46.24	0.2751	0.7323	0.9736	3.977	16900	0.8119
	35	20.55	0.4207	0.8232	0.9929	3.52	104.9	0.8618
	45	6.707	1.478	0.9585	0.9988	3.999	11.84	0.9796
	55	6.296	2.034	0.9044	0.9918	2.57	17410	0.855

The isosteric sorption heat (Qst) decreased with increasing moisture content (Figura 2). The higher values of Qst were found at low moisture contents, this can be explained by the fact that the water molecules are tightly bound to the monolayer structure and food components (Faria et al., 2016); and therefore, the quantity of energy needed to adsorb or desorb these water molecules is very high. However, a rapid decrease in sorption isosteric heat was observed when the moisture content began to increase due to the sorption of water molecules in the multilayer (Chenlo et al., 2011).

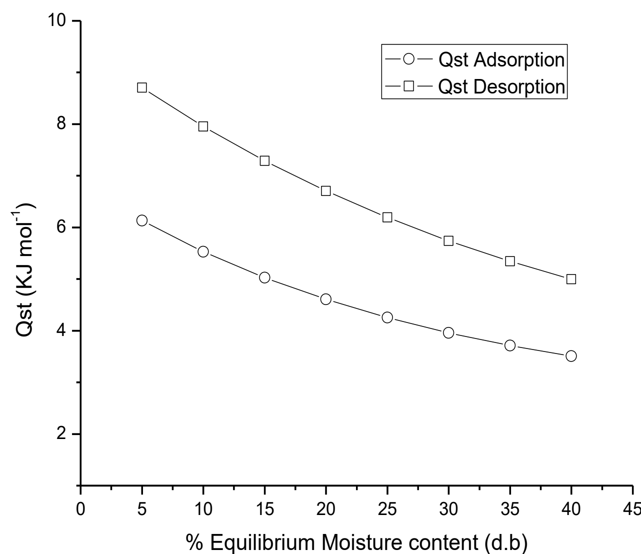


Figure 2. Isosteric sorption heat for habanero chili powder as a function of equilibrium moisture content

CONCLUSIONS

The adsorption and desorption isotherms of habanero chili powder at four different temperatures: 25, 35, 45 and 55 °C exhibed a sigmoid form (Type II) classification shape. According to the results of this study, the GAB model presents a better fit of the experimental results of the sorption isotherms of the habanero chili powder. The isosteric sorption heat of habanero chili powder, which was determined using the Clausius-Clapeyron equation, decrease with an increase of moisture content, ranging from 3,857 KJ mol^{-1} to 1,206 KJ mol^{-1} for adsorption and for desorption of 6,173 KJ mol^{-1} to 2,275 KJ mol^{-1}.

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Evaluación del contenido de β-carotenos en polvos de zanahorias (*Daucus carota L*) obtenidos por dos métodos de secado

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RESUMEN
La zanahoria es una fuente rica en carotenoides, su importancia radica a su función como pro-vitamina A, E y C. Los carotenoides son un grupo de pigmentos presentes en vegetales y animales, producen colores que van desde al amarillo hasta el rojo intenso. El consumo de zanahoria y sus productos ha aumentado debido a su contenido de antioxidantes naturales y la actividad anticancerígena que tienen los β-Carotenos. El objetivo de este estudio fue la caracterización fisicoquímicamente, análisis químico proximal, colorimetría y evaluar contenido de β-carotenos en polvos de zanahorias obtenidos por dos métodos de secado (deshidratación por aire forzado y liofilización). Los polvos secados por el primer método presentaron una coloración más intensa en comparación con el método de liofilizado. El método de deshidratación por aire forzado fue el proceso que mejor conservo el contenido de β-caroteno (28.455 µg de β-caroteno/100g) en comparación con las muestras liofilizadas (1.237 µg β-caroteno/100g).

PALABRAS CLAVE: Métodos de secado, zanahoria, β-Caroteno.

INTRODUCCIÓN
El proceso de secado es uno de los métodos más utilizado para conservar y aumentar la vida de anaquel de algunos productos alimenticios, debido a bajo consto en comparación con otros procesos. Sin embargo, algunas veces la deshidratación basada en el uso de aire caliente durante períodos prolongados puede deteriorar la calidad del producto final, generando algunas ocasiones sabores no agradables, pérdida del color, degradación de proteínas, vitamina y algunos otros micronutrientes (Chen y Mujumdar, 2009). Por esta razón diversos trabajos de investigación han sido enfocados al perfeccionamiento de estos métodos de secado y estudio de algunas nuevas tecnologías análogas al proceso de secado, con la finalidad de conservar algunos micronutrientes de vital importancia como vitaminas o β-caroteno en alimentos de origen vegetal como son las zanahorias (*Daucus carota* L). Estas son fuentes importantes de vitaminas (provitamina A, E y C), ricas en carotenoides, fibra dietética contienen algunos minerales como: Ca, K, Mg, Fe, Cu y Zn. Actualmente el consumo de zanahoria y productos derivados de estas aumentó considerablemente, debido a las propiedades benéficas que son atribuidas con su consumo, como por ejemplo a su propiedad como antioxidante natural y actividad anticancerígena que tienen los β-Carotenos (Sharma et al., 2012).

El color anaranjado de las zanahorias se debe al contenido de carotenoides, los carotenoides son un grupo de pigmentos orgánicos liposolubles, que se divide en dos grupos; los carotenos y xantofilas, en el grupo de los carotenos se encuentra el β-Caroteno, que se utiliza como colorante en productos a base de grasa, en alimentos, en la industria farmacéutica, cosmética, también actúa como antioxidante, como protector de los rayos UV, comunicador celular, y reduce el riesgo de enfermedades degenerativas como el cáncer, enfermedades cardiovasculares, y degeneración macular (Cavalcanti et al., 2013).

MATERIALES Y MÉTODOS

Las zanahorias (*Daucus carota L*) fue adquirida del CEDIS de Walmart ubicado en carretera Villahermosa-Cárdenas Km 159, Tabasco. Los análisis químicos proximales (AQP) y fisicoquímico fueron realizados por la metodología establecida de la AOAC (2000). Para el primer método de secado (deshidratación por aire forzado) fue utilizada la metodología propuesta por Hernández y Blanco. (2015) con algunas modificaciones. La cual consistió en lavar y cortar (tiras de aproximadamente 2 mm de espesor) primero las zanahorias, posteriormente estas fueron secadas dentro de un horno de convección (Oven Scientific Scorpions) a 40 ºC por 24 h. Para el caso del segundo método de secado (liofilización) se utilizó la metodología propuesta por Almeida y Zambrano., (2007) con modificaciones. Antes del proceso de secado las muestras de zanahoria fueron moliendas con ayuda de un equipo NUTRIBULLE por 30 s. Posteriormente la muestra fue llevada a liofilización. Los polvos obtenidos por ambos métodos por ambos secados, se les analizo el AQP y cuantifico el contenido total de carotenoides siguiendo la metodología propuesta por Burgos y Calderón. (2009).

RESULTADOS Y DISCUSIÓN

En la tabla 1 se presenta el análisis físico realizado en polvos de zanahorias obtenidos por ambos métodos de secado. Las zanahorias procesadas entran dentro de la clasificación de calidad, México extra esto de acuerdo a lo establecido a la norma NMX-FF-024-1982. No presentaban daño mecánico ni presencia de raicillas, buena firmeza, color anaranjado fuerte en el exterior e interior (ver Figura 1). Respecto al análisis fisicoquímico (tabla 2) no se encontró diferencia significativa entre el contenido total de solidos solubles, pH e índice de madurez, en ambos métodos Gabriel et al., (2005) reportan un contenido de ºBrix que va de 7-14, y Hernández & Blanco. (2015) reportan un pH de 6 y Bonilla (1997) reporta un índice de madurez de 1.63, estos valores varían ligeramente debido a las técnicas de cultivo, suelo, clima etc.

Tabla 1. Análisis físico de la materia prima.

Hombros	Aproximadamente 4 cm
Longitud	20 cm
Pesos	160 g
Raicillas	Ausencia
Firmeza	Excelente
Daño mecánico	Ausente

Figura 1. A) Materia prima procesada (zanahorias), B) interior de las zanahorias.

Tabla 2. Análisis fisicoquímico de la materia prima

Lote	Contenido total de solidos solubles (ºBrix)	pH	Índice de madurez
[a]Zanahorias usadas para liofilización	7.66 ± 0.208[a]	6.51 ± 0.030[a]	1.16 ± 0.030[a]
[a]Zanahorias usadas en el secado por convección	7.47 ± 0.150[a]	6.55 ± 0.008[a]	1.13 ± 0.023[a]

[a]Promedio de tres repeticiones ± error estándar

Letras diferentes en una misma columna indican diferencia estadística ($p<0.05$) con la prueba Tukey**.**

En la figura 2 se muestran los polvos obtenidos en ambos métodos de secado, se observa una menor coloración a los polvos obtenidos por secado en charola de por lo cual se evaluaron los parámetros de calidad de color en las zanahorias en fresco, en los polvos obtenidos por liofilización y secado en charola. En la tabla 3 se muestran que la muestra que presenta mayor luminosidad es el polvo liofilizado (71.89 ± 0.629), seguido del secado en charola (67.66 ± 0.314) comparado con el estándar que es la zanahoria fresca, en el parámetro a* las zanahorias en polvo secado en charola presento mayor coloración a rojo que las zanahorias liofilizada.

Figura 2. Polvos de zanahoria A) liofilizado B) secado en charola

Tabla 3. Análisis fisicoquímico de la materia prima.

	L*	a*	b*
Zanahoria fresca	56.28 ± 1.25[c]	33.99 ± 0.86[a]	44.32 ± 3.17[a]
Liofilizado	71.89 ± 0.63[a]	14.17 ± 0.14[c]	29.05 ± 0.47[b]
Secado en charolas	67.66 ± 0.31[b]	32.51 ± 0.35[b]	32.11 ± 0.42[b]

Respecto a la composición química proximal de los polvos de zanahoria (tabla 4) fue muy similar a lo reportado por otros autores con excepto el contenido de grasas (4.08%) y proteína (3.81% y 4.19%) los cuales fue ligeramente mayor y menor (respectivamente) de acuerdo a lo reportado por Hernández & Blanco., (2015), ellos obtuvieron un contenido de grasa 1.42 % y para proteína 7.95%.

Tabla 4. Análisis químico proximal de los polvos de zanahoria

Polvos de zanahoria	[*]Humedad (%)	[*b]Cenizas (%)	[*b]Grasa (%)	[*b,c]Proteína (%)
Secado en charola	14.13 ± 0.16[a]	6.57 ± 0.024[a]	2.21 ± 0.13[b]	4.19 ± 0.27[a]
Liofilización	11.37 ± 0.4[b]	5.42 ±0.09[b]	4.08 ± 0.28[a]	3.81 ± 0.27[b]

Contenido de β-Caroteno en los polvos de zanahoria por espectrofotometría UV-vis

Respecto al contenido de β-Caroteno hubo una mayor concentración de β-Caroteno en los polvos obtenidos por secado por charola (28.455 µg/100 g de β-Caroteno) respecto a la concentración de los polvos obtenidos por liofilización (1.237 µg/100 g de β-Caroteno) esto se debe que en los polvos obtenidos por liofilización presentaban una coloración menos intensa, y el color es una medida directa para evaluar el contenido de β-Caroteno.

CONCUSIONES

El análisis físico y fisicoquímico permitió conocer las condiciones en las que se encontraba la materia prima antes de ser procesadas, los valores se encuentran dentro de lo reportado por otros autores. La composición química proximal fue muy similar a lo reportado por otros autores con excepción del contenido de grasas (4.08%) y proteína (3.81% y 4.19%) los cuales fue ligeramente mayor y menor (respectivamente) al reportado en otras investigaciones.

La concentración de β-Caroteno presentes en los polvos de zanahoria usando el método de secado en charolas fue mayor (28.455 mg de β-Caroteno/g de biomasa) en comparación con los polvos obtenidos por liofilización (1.237 mg de β-Caroteno/g de biomasa).

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Development of a wall material from modified corn starch for use in microencapsulation of bioactive compounds

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ABSTRACT

Modified porous starch was obtained by first crosslinking corn starch with sodium trimetaphosphate (STMP) at different concentrations (4, 6 and 8%) followed by partial hydrolysis using a mixture of α-amylase and glucoamylase. The morphology of the starch was determined by scanning electron microscopy (SEM), the results showed that the non-crosslinked porous starch present a larger number of pores, however, they merged with each other, increasing the pore size, while crosslinked starch with 8% STMP showed lower number of pores, in both cases some deeper pores were observed.

KEY WORDS

Modified porous starch • Cross-linking • Morphology • Enzymatic hydrolysis.

INTRODUCTION

Microencapsulation is a process wherein the active compound is encapsulated with materials of different nature, resulting in small capsules which release their contents at controlled rates, under specific conditions (Desai & Park, 2005; Gharsallaoui *et al.*, 2007). The different types of capsules are produced from different microencapsulation processes, with spray drying being the most used encapsulation method because it is economical and flexible (Desai & Park, 2005). Various coating materials are used better known as carrier materials, the choice of carrier material is important for the efficiency of the encapsulation and the stability of the product. The selection criteria of the carrier material are based primarily on the physicochemical properties such as solubility, molecular weight, glass transition, crystallinity, film formation and emulsifying properties (Gharsallaoui *et al.,* 2007), and also in protecting the core of external factors such as oxygen, light, moisture or other factors which cause its deterioration (Shahidi & Han, 1993). Give the above, there is a limited availability of encapsulating agents that meet these criteria (Vasisht, 2014). This gives rise to the importance of the development of new carrier materials.

Carbohydrates, such as starch, are considered to be good encapsulating agents, yet lack the interfacial properties required for efficient encapsulation that are usually associated with gums and proteins.(Gharsallaoui *et al.*, 2007). Therefore, it seeks to improve its properties, through the modification of its native structure.

In the present work, the dual modification (cross-linking and enzymatic hydrolysis) of corn starch is proposed to obtain materials with good encapsulating properties.

MATERIALS AND METHODS

Materials

Corn starch was obtained from IMSA S.A. of C.V. (Gudalajara, Mex). Sodium trimetaphosphate (STMP), α- amylase (activity= 3.7 unites/mg) and glucoamylase (activity= 100 unites/mg) were purchased form Sigma Aldrich Co (México, Mex). All of these reagents were of analytical grade.

Chemical modification of starch by crosslinking with STMP

Crosslinking of the starch was carried out by the proposed method by (Gao *et al.,* 2014). 100 mL of distilled water was prepared by adding 50 g of corn starch to 1 g Na_2CO_3 (2 g/100 g dry starch) and 2.5 g NaCl (5 g/100 g dry starch). The crosslinking agent (STMP) was dissolved in the starch suspension, three samples were made with three different degrees of crosslinking (4%, 6% and 8% w/w). Subsequently, the suspension was stirred using a magnetic stirrer at 200 rpm for 80 min at 50 °C in a thermostated water bath. Hydrochloric acid (1 M) was used to adjust the pH of suspension to 6.5. After the solid portion was precipitated, the supernatant was discarded and the solid portion was washed with deionized water. The cross-linking reaction of STMP-starch is shown below.

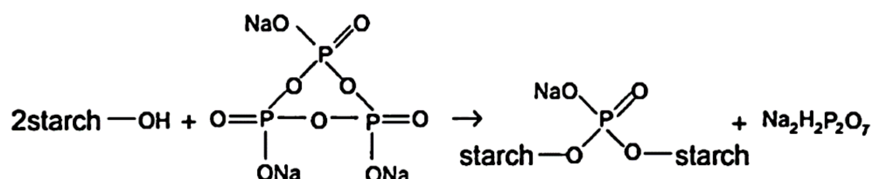

Figure 3. Crosslinking reaction with SMTP (Gao *et al.*, 2014)

Preparation of crosslinked porous starch

The crosslinked starch suspension (25% w/v) was prepared using 200 mL of sodium acetate buffer (pH=4.6). This suspension was stirred for 20 min at 150 rpm in a water bath maintained at 40°C as proposed by Whistler (1991). After preheating the suspension for 20 min, a mixture of α-amylase and glucoamylase at the ratio of 1:4 was added into the suspension. The enzyme to starch ratio was 1:100 (w/w). The suspension samples were then stirred using a magnetic stirrer at 150 rpm for 14 h while maintaining the temperature at 40°C. Upon completion of the enzymatic reaction (14 h), the enzymes were inactivated and the hydrolysis was stopped by adding 20 mL of NaOH solution (4%, w/w). The resultant hydrolyzed starch suspension was centrifuged (Hettich, Mod. Rotina 420) at 1007g for 6 min. The starch product obtained by centrifugation was washed three times in order to remove the non-starch components. Finally, the washed product was collectedand dried using a vacuum freeze dryer (LABCONCO, FreeZone Mod. 7740060). The starch product was first frozen at -30 °C for 6 h and then it was dried for 20 h.

Scanning Electron Microscopy (SEM)

Scanning electron microscopy (SEM) was used to study the morphological characteristics of the modified starch using a Cryo Transfer System microscope (Jeol, Mod. IT300). The samples

were placed on double-sided carbon tape and shaded for 5 min with gold-palladium. Samples were analyzed at a voltage of 15kV.

RESULTS AND DISCUSSION

Morphology of starch granules

The morphology of native maize and modified starch granules was observed by SEM, as shown in Figure 2. Figure 2 a) shows the morphology of the native corn starch being able to appreciate the granular round and polygonal shape, and the relatively smooth surface. Figure 2 b) shows the maize starch subjected to enzymatic hydrolysis, it can be observed that the granular form is also round and polygonal, but the surface has many pores, in some pores it is observed that they extend from the surface to the interior of the starch granule may also be observed that some of the pores have merged with each other resulting in a larger pore size.

In Figure 2 c) the crosslinked porous starch (8% STMP) shows a decreased number of pores coinciding with the results of (Gao *et al.,* 2014) is observed, this may be due to the effect of crosslinked it strengthens the bonds between the chains preventing the enzymes from acting in that area resulting in the spacing of pores between them; in the same way you can see some deeper pores.

According to (Zhang *et al.,* 2012) the porous starch has a good adsorption capacity, being able to be used as an adsorbent in various applications.

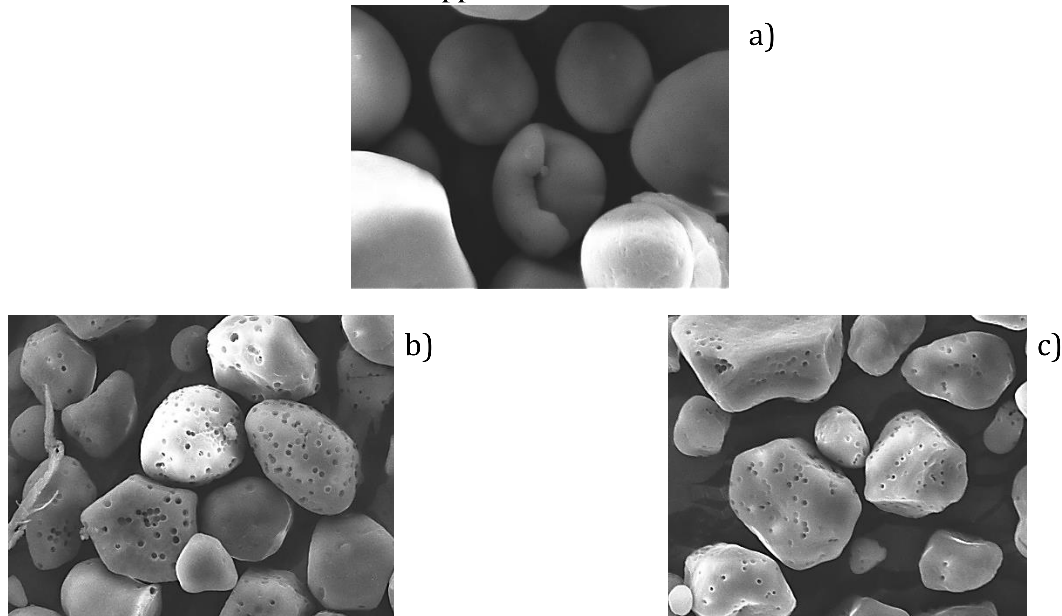

Figure 2. SEM micrographs of a) native starch, b) porous starch and c) crosslinked porous starch.

CONCLUSIONS

In the present work, crosslinked porous corn starch was prepared using a dual modification, first subjecting it to cross-linking with STMP in order to provide greater stability to the granule and subsequent enzymatic modification with a mixture of α-amylase and glucoamylase enzymes. It was obtained a starch with deep pores that was appreciated in the micrographs obtained by SEM, this result is favorable to fulfill the next objective of the work, the microencapsulation of bioactive compounds.

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Rehydration of Mexican plum (*Spondias purpurea* L.) dehydrated by freeze drying and tray drying

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ABSTRACT
The aim of this study was to assess the rehydration capacity of freeze dried and hot-air dried plums. A complete factorial design 2x3x2 was applied to study the effect of independent variables: drying method (freeze drying and tray drying), rehydration temperature (10, 20 and 30 °C) and immersion media (water and milk). The statistical analysis (Tukey $p<0.05$) indicated that rehydration capacity of plum slices was significantly influenced by drying method and immersion media. Immersion in water of plum slices reached higher values of rehydration capacity than milk immersed ones. As expected freeze dried plums rehydrated faster than hot-air dried plums. With respect to rehydration temperature, analysis of variance revealed that there was no significant difference between the three temperatures used; however, values of rehydration capacity were higher as the temperature increased.

KEYWORDS Mexican plum, drying methods, rehydration capacity, rehydration temperature, immersion media.

INTRODUCTION

Mexican plum (*Spondias purpurea* L.) is an important fruit with high nutritional content and potential as a raw material for the food industry. Due to it is a highly perishable fruit, conservation methods, as drying, are necessary to apply so as to contribute to its preservation and distribution. Food drying prevents microbial growth, reduces transportation and storage costs because of the reduction of water content, weight and volume of the products (Orrego-Alzate 2003). Nowadays, exist several drying techniques in food dehydration, such as spray drying, freeze dehydration, tray drying, cabinet drying, and osmotic dehydration.

Hot-air drying consists on exposing foodstuffs to a direct stream of hot air that heats up the product and removes the water vapor (Barbosa-Cánovas and Vega-Mercado 1996). In this drying method, any foodstuff is possible to be treated and the optimal conditions are easy to set but it has the disadvantage of not drying the product uniformly (Barbosa-Cánovas and Ibarz 2005). On the other hand, freeze drying, based on dehydration by sublimation of the ice fraction of a frozen product, is used when the quality of the product is important for the acceptance by the consumers (Chen and Mujumdar 2008).

During the drying process, physicochemical changes, including textural and structural modifications, migration of solutes, and loss of volatiles and nutrients, occur in an irreversible manner and have an impact on the quality of the final product. Therefore, the drying process needs

to be understood and controlled in order to create a dried product with optimal nutritional, sensorial, and rehydration characteristics (Ratti 2009).

Most of the dehydrated products are usually rehydrated during their use so the rehydration can be considered as a measure of the injury to the material caused by drying and treatment preceding dehydration (Krokida and Marino-Kouris 2003).

The immersion medias most commonly used are water, sugary solutions (glucose, sucrose), milk, yogurt, fruit juices and vegetables etc., where periods of immersion should be brief, and these medias help to reach similar characteristics to the fresh product (Marin et al. 2006).

The aim of this study was to assess the rehydration of Mexican plum dehydrated by freeze drying (FD) and tray drying (TD) using two immersion medias at three different temperatures.

MATERIALS AND METHODS

Raw material

Mexican plums ("beetroot" ecotype) were obtained from Orizaba and Coscomatepec, Veracruz, Mexico and selected according to the ripening degree (30 % green, 70 % red). The plums were washed and cut into slices of 3 cm of diameter and 0.2 cm of thickness for tray drying and 1.5 cm of diameter and 0.2 cm of thickness for freeze drying.

Drying conditions

Optimal conditions reported by Muñoz-López *et al.* (2017) were used in both drying methods.
Convective drying (TD) was performed in a tray dryer (Polinox, mod-SEM-2, México) at air temperature of 53 °C during 4.5 h. For freeze drying (FD), the plum slices were frozen at -53 °C during 2 hours in the freezing chamber of the equipment (LABCONCO 12 L Mod-742004, USA). Subsequently were freezing dried at 0.1 mbar vacuum pressure for 4.8 h.

Moisture content

As the beginning like the end of the drying processes moisture was measured using an infrared moisture balance (MA35 HALOGEN, SARTORIUS, GERMANY) at 65 °C.

Rehydration experiments

For the rehydration experiments a complete factorial design 2x3x2 was applied. Consisting in two drying methods (freeze drying and tray drying), three temperatures (10, 20 and 30 °C) and two immersion media (water and milk). The rehydration experiments consisted on immersing 0.5-0.6 g of dried product in 150 mL of the immersion media during 60 min. The samples were taken from the immersion media every 2, 4, 6, 10, 15, 20, 25, 30, 35, 40, 50 and 60 min, drained in absorbent paper and weighed. The rehydration capacity (RR) was calculated by the maximum amount of absorbed solution (g) per g of dried solids (g H_2O /g d.s.). Experiments were performed by duplicate.

Statistics

Statistical analysis of the data was performed using Minitab 16.1.0. Analysis of variance was completed, followed by Tukey's test to determine differences among the treatment groups. Statistical significance was expressed at the $p<0.05$ level.

RESULTS AND DISCUSSION

Initial moisture content of the plum was 0.7814 g H_2O/g d.s. and after drying, plum slices showed values of 0.0391 for freeze drying and 0.0231 g H_2O/g d.s. for tray drying.
The results of the rehydration capacity to different conditions of the dried plum slices are shown in Table 1.

Table 1. Rehydration capacity of dried plum slices.

Experiment	Drying method	Temperature (°C)	Immersion Media	Rehydration (RR g H_2O/g d.s.)
1	TD	10	Water	0.7479^{bc}
2	TD	10	Milk	0.7397^{a}
3	TD	20	Water	0.7609^{cde}
4	TD	20	Milk	0.7410^{ab}
5	TD	30	Water	0.7595^{cd}
6	TD	30	Milk	0.7468^{abc}
7	FD	10	Water	0.7771^{fg}
8	FD	10	Milk	0.7672^{defg}
9	FD	20	Water	0.7810^{g}
10	FD	20	Milk	0.7649^{def}
11	FD	30	Water	0.7813^{g}
12	FD	30	Milk	0.7750^{efg}

The different letters after the values (^{a,b,c,d,e,f,g}) indicate that one-way ANOVA of the means is significantly different. The statistical analysis (Tukey $p<0.05$) indicated that drying method and immersion media affected significantly on rehydration capacity of the plum slices. With respect to drying method, rehydration capacity of freeze dried plums was higher than hot-air dried plums. It can be attributed to the porous structure of the freeze dried products which allows a quicker and more complete rehydration than dehydrated ones by hot air (Barbosa-Cánovas and Ibarz 2005). Kim et al. (2013), concluded that water removal rate in hot-air drying is faster than other methods, resulting in tissue damage of samples and slower rehydration as a consequence.

Although statistical analysis indicates that drying method affected rehydration capacity of dried plums, both drying methods allowed to reach high rehydration values, comparing moisture content of the fresh plums, 0.7814 g H_2O/g d.s., to freeze drying final moisture 0.77443 H_2O/g d.s. and tray drying 0.74814 H_2O/g d.s. is possible to see an efficient rehydration process with values very close to original.

The composition of the immersion media is another important factor affecting the process. Results indicated that rehydration capacity was smaller in milk immersion than water immersion, it is due to milk is a more viscous liquid and it has been demonstrated that increased viscosity and the presence of particles lead to slower rehydration kinetics of dried foodstuffs (Ratti 2009)

Based on Tukey´s test for a level of 95% of significance, there was no significant difference between the 3 rehydration temperatures. Nevertheless, final results of rehydration capacity were increasing slightly with higher temperatures. According to Marin et al. (2006), foodstuffs increase its equilibrium moisture content as the rehydration temperature increases.

Rehydration kinetics of the freeze dried plums are shown in Figure 1, which represents rehydration behavior for each immersion media. As seen in Figure 1a, rehydration capacity of plums in water immersion became constant after 25 min and Figure 1b, shows milk immersion of plum where rehydration capacity stabilized after 30 minutes.

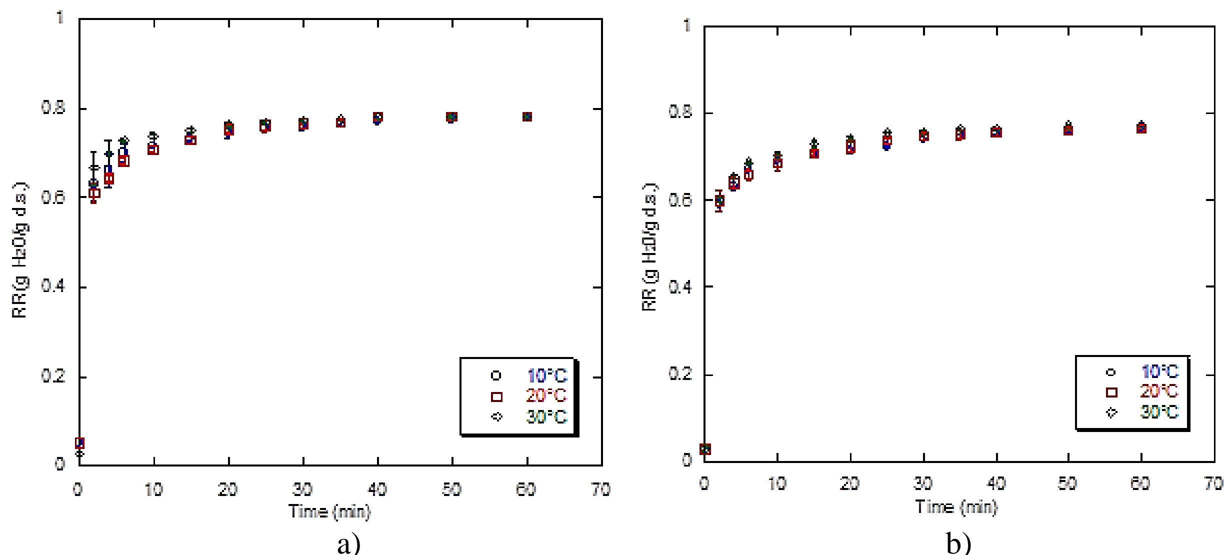

Figure 1. Rehydration of freeze dried plum slices a) water and b) milk.

Figure 2 represents rehydration of hot-air dried plums. Water immersion of the plum slices was slower but reached a higher rehydration value (0.7561 g H_2O/g d.s.) than immersed ones in milk which mean final value is 0.7425 g H_2O/g d.s. As can be seen after 35 min rehydration capacity became constant for dried plums immersed in water (Figure 2a). On the other hand, for milk immersion stability appeared after 40 minutes, however, is possible to see high levels of rehydration capacity from 30 minutes (Figure 2b).

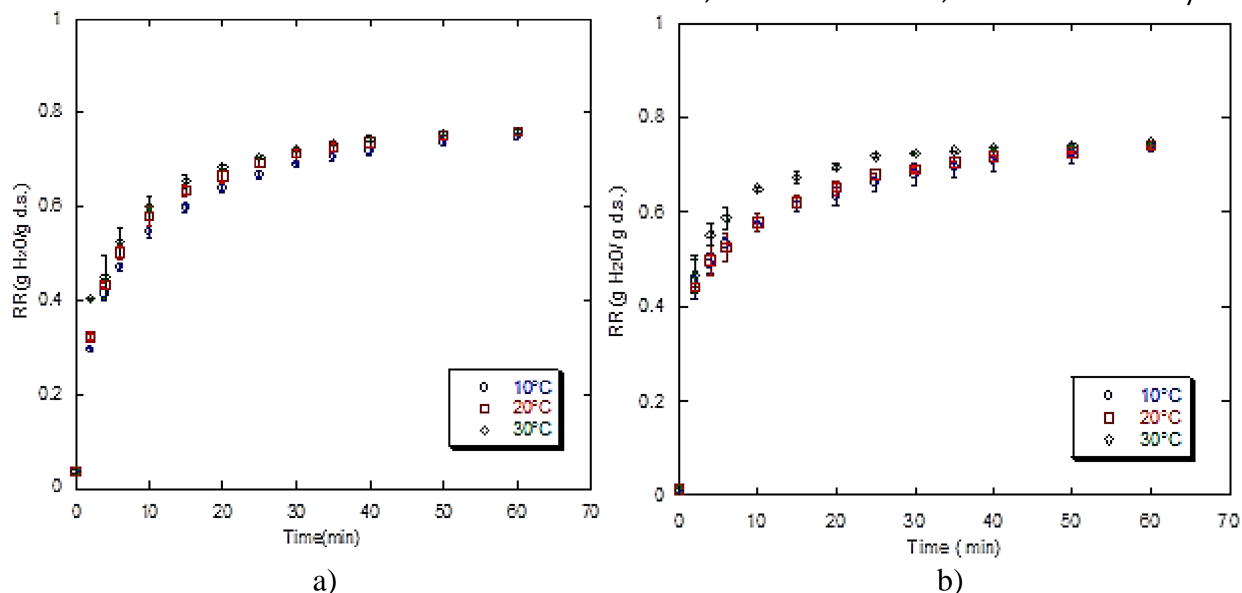

Figure 2. Rehydration of hot-air dried plums a) water and b) milk.

Figure 3 shows plum slices after rehydration process compared to fresh plum.

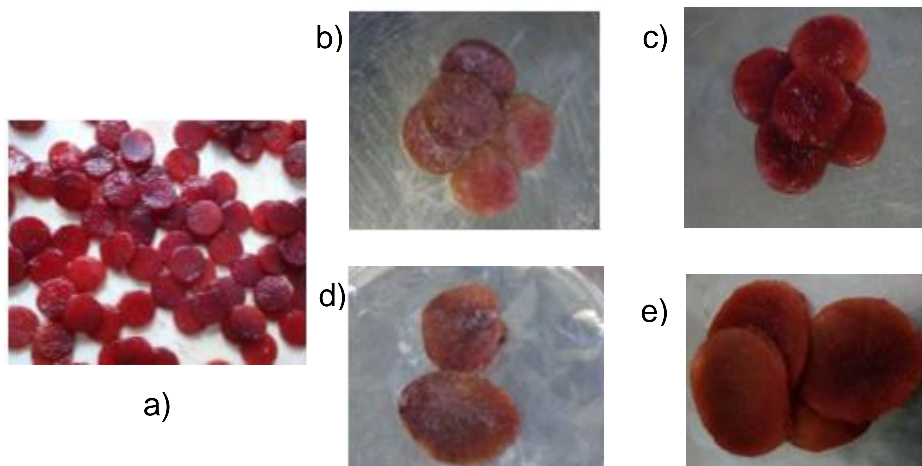

Figure 3. Plum a) fresh; FD rehydrated in b) milk, c) water; TD rehydrated in d) milk, e) water.

CONCLUSIONS

Freeze drying and tray drying of Mexican plum, were useful to obtain products with high capacity of rehydration. Freeze dried plums presented higher rehydration capacity as compared to dried ones by tray drying, similar behavior was found comparing immersion media, where rehydration capacity was higher in water immersion than milk immersion of dried plum slices. Although statistical analysis demonstrated a significant influence on rehydration capacity of drying method

and immersion media, all experiments reached values between 0.7397- 0.7813 g H_2O/g d.s very close to moisture of fresh plum. The comparison between rehydration temperatures resulted not having influence on rehydration of plum slices, however high temperatures increased slightly rehydration capacity values. Due to dried plum slices absorbed water to a very close moisture content as the fresh fruit, is possible to conclude that there was no significant damage in the tissue structure of the plums and consequently a high quality product was obtained to be used as a complement in cereals, as a food snack, etc.

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Obesity

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ABSTRACT. Obesity has reached epidemic proportions globally, with at least 2.8 million people dying each year as a result of being overweight or obese. Once associated with high-income countries, obesity is now also prevalent in low- and middle-income countries. Governments, international partners, civil society, non-governmental organizations and the private sector all have vital roles to play in contributing to obesity prevention WHO. The Epidemiological Bulletin of Mexico at Week 40, reports the state of Mexico with more obesity were Mexico City and Jalisco. The states of Mexico with more problems as anorexia, bulimia and other disorders were Jalisco, Tamaulipas, Veracruz, Nuevo Leon and Baja California. The states of Mexico with more problems of malnutrition were Gunajuato, Jalisco, Veracruz and Mexico Cd.

KEY WORDS: obesity, overweigh, Mexico

INTRODUCTION:

World Health Organization determines the overweight and obesity are defined as "abnormal or excessive fat accumulation that may impair health" Body mass index (BMI) the weight in kilograms divided by the square of the height in meters (kg / m2) is a used index to classify overweight and obesity in adults. WHO defines overweight as a BMI equal to or more than 25, and obesity as a BMI equal to or ore than 30. In 2016, More than 1.9 billion adults were overweight in 2016, and 650 million obese. At least 2.8 million people each year as a result of being overweight or obese. The prevalence of obesity nearly tripled between 1975 and 2016. Globally, 41 million preschool children were overweight in 2016. Childhood obesity is one of the most serious public health challenges of the 21st century. Overweight children are likely to become obese adults. They are more likely than non-overweight children to develop diabetes and cardiovascular diseases at a younger age, which in turn are associated with a higher chance of premature death and disability. Diabetes, ischemic heart disease and certain cancer are attributable to overweight and obesity. For an individual, obesity is usually the result of an imbalance between calories consumed and calories expended. An increase of energy dense foods, without an increase in physical activity, leads to imbalance and lead to weight gain. Supportive environments and communities are fundamental in shaping people's choices and preventing obesity. Individual responsibility can only have its full effect where people have access to a healthy lifestyle, and are supported to make healthy choices. Children's diet and their surrounding environment influences physical activity habits. Social and economic development as well as policies in the areas of agriculture, transport, urban planning, environment, education, food processing, distribution and marketing influence children's dietary habits and preferences as well as their physical activity patterns. Increasingly, these influences are promoting unhealthy weight gain leading to a steady rise in the prevalence or childhood obesity. Eating a healthy diet can help prevent obesity. People can: maintain a health weight, limit total fat intake and shift from fat saturated to unsaturated fats, increase in fruit, vegetables, pulses, whole grains and nuts, limit the intake of free sugars and salt. Regular physical activity helps maintain a healthy body. People should engage in adequate levels of physical activity throughout their lives.
At least 150 minutes of regular, moderate-intensity physical activity per week reduces the risk of cardiovascular disease, diabetes, colon cancer and breast cancer. Muscle strengthening and balance

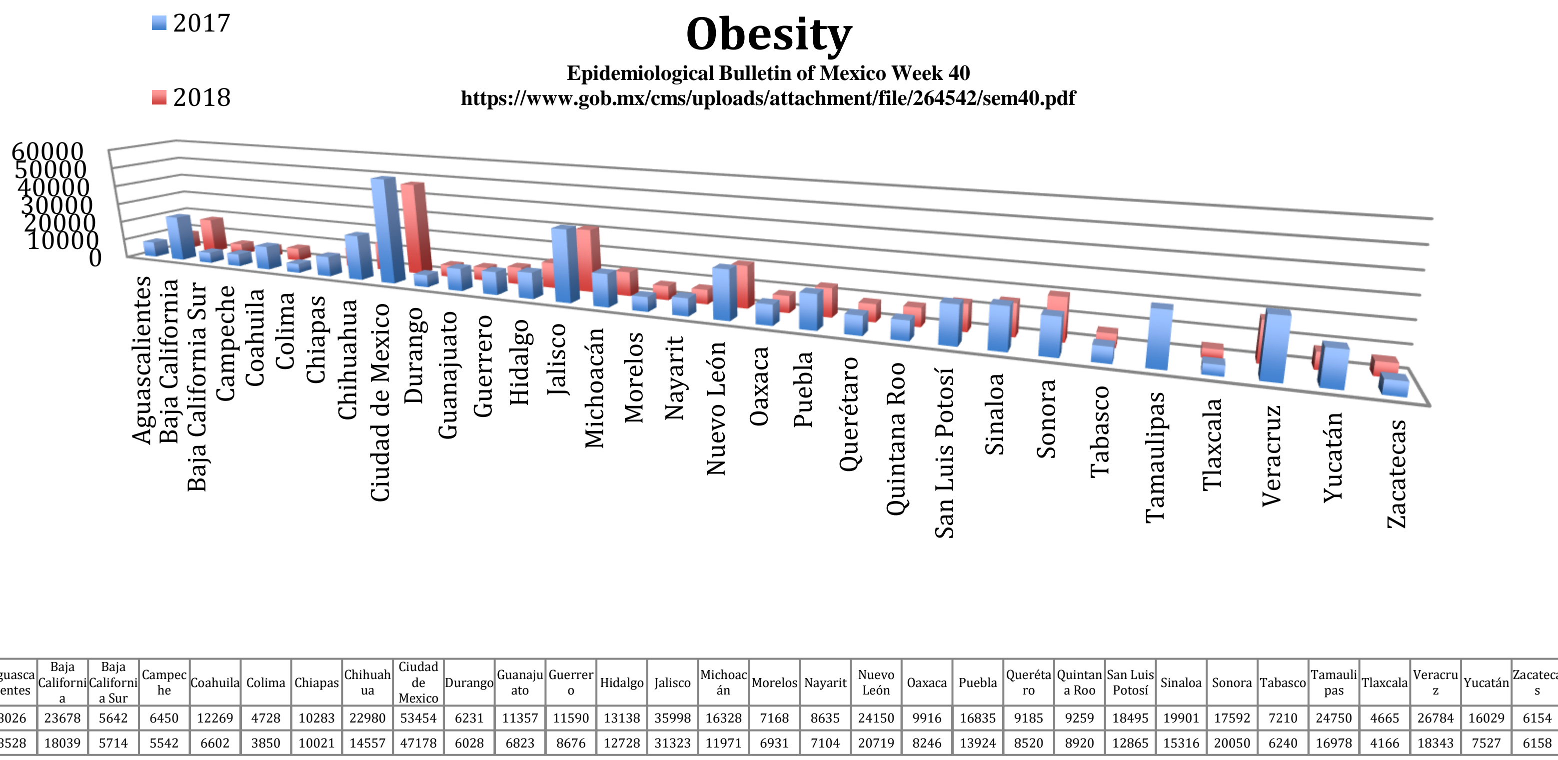
training can reduce falls and improve mobility among older adults. More activity may be required for weight control. Curbing the global obesity epidemic requires a population based multi sectorial multidisciplinary, and culturally relevant approach. WHO's Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases provides a roadmap to establish and strengthen initiatives for the surveillance, prevention and management of non-communicable diseases, including obesity. The number of obese children and adolescents has increased tenfold in the last 40 years, according to a study published in the Lancet today. The Ending Childhood Obesity Implementation Plan guides policy-makers on the recommended actions to prevent and treat childhood obesity. http://www.who.int/end-childhood-

Obesity in Mexico

Methods: we analyzed the data of epidemiological bulletin of Mexico in the 40-week with information of states of Mexico form 2016 and 2017 year. For Anorexia, bulimia, other disorders and malnutrition.

RESULTS:

The Epidemiological Bulletin of Mexico at Week 40, reports the state of Mexico with more obesity were Mexico City and Jalisco. The states of Mexico with more problems as anorexia, bulimia and other disorders were Jalisco, Tamaulipas, Veracruz, Nuevo Leon and Baja California. The states of Mexico with more problems of malnutrition were Guanajuato, Jalisco, Veracruz, Mexico City.



	Aguascalientes	Baja California	Baja California Sur	Campeche	Coahuila	Colima	Chiapas	Chihuahua	Ciudad de Mexico	Durango	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán	Morelos
2017	8026	23678	5642	6450	12269	4728	10283	22980	53454	6231	11357	11590	13138	35998	16328	7168
2018	8528	18039	5714	5542	6602	3850	10021	14557	47178	6028	6823	8676	12728	31323	11971	6931

	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas
2017	8635	24150	9916	16835	9185	9259	18495	19901	17592	7210	24750	4665	26784	16029	6154
2018	7104	20719	8246	13924	8520	8920	12865	15316	20050	6240	16978	4166	18343	7527	6158

Figure 1. Obesity in States of Mexico

Anorexia bulimia and other disorders
Epidemiological Bulletin of Mexico Week 40
https://www.gob.mx/cms/uploads/attachment/file/264542/sem40.pdf

2017
2016

300
250
200
150
100
50
0

Aguascalientes
Baja California
Baja California Sur
Campeche
Coahuila
Colima
Chiapas
Chihuahua
Ciudad de Mexico
Durango
Guanajuato
Guerrero
Hidalgo
Jalisco
Michoacán
Morelos
Nayarit
Nuevo León
Oaxaca
Puebla
Querétaro
Quintana Roo
San Luis Potosí
Sinaloa
Sonora
Tabasco
Tamaulipas
Tlaxcala
Veracruz
Yucatán
Zacatecas

	Aguascalientes	Baja California	Baja California Sur	Campeche	Coahuila	Colima	Chiapas	Chihuahua	Ciudad de Mexico	Durango	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán	Morelos
2017	22	132	16	12	82	40	60	76	88	12	60	53	39	275	61	49
2016	36	97	34	17	31	19	49	37	149	15	27	34	46	248	34	51

	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas
2017	15	151	43	52	41	19	31	83	105	27	193	15	144	28	22
2016	12	77	25	73	24	16	29	80	96	22	114	2	126	25	18

Figure 2. Anorexia bulimia and other disorders

Malnutrition
Epidemiological Bulletin of Mexico Week 40
https://www.gob.mx/cms/uploads/attachment/file/264542/sem40.pdf

	Aguascalientes	Baja California	Baja California Sur	Campeche	Coahuila	Colima	Chiapas	Chihuahua	Ciudad de Mexico	Durango	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán	Morelos	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas
severe 2017	40	225	18	37	64	51	193	296	234	24	81	284	181	200	76	81	40	73	172	213	33	62	91	176	119	114	239	16	285	153	107
severe 2016	63	78	31	24	58	42	269	272	307	27	102	348	175	301	55	220	39	87	154	164	26	32	70	176	93	81	75	23	284	95	108
moderate 2017	110	106	28	60	59	112	532	455	606	85	188	509	383	331	201	263	107	83	326	983	95	81	236	404	158	127	216	31	654	235	297
moderate 2016	140	116	51	101	68	104	465	423	654	81	221	444	427	464	206	318	85	105	349	611	111	63	183	313	160	176	219	65	493	153	247
mild 2017	774	957	420	453	1004	699	2360	2368	3682	794	11913	3231	3672	3793	1924	2258	616	969	2928	4404	640	592	2189	1914	1225	885	1805	642	3857	1741	1430
mild 2016	870	960	568	669	946	552	2463	2256	4312	912	2028	2875	3770	4553	1416	2190	685	1165	2945	3142	745	580	1432	1758	1464	989	1470	618	3475	1366	1389

Figure 3. Malnutrition

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DISCUSSION: we need to implement public policies to support the dissemination of the necessary methods to reduce the weight of children and adults, such as healthy food, recreational parks near each house, dissemination of sports activities and centers accessible for training. As well as access to healthy food. lower working hours and increase the standard hours of work paid to the OECD countries so that workers have more access in time to train and the monetary need does not cause so many hours of work or several jobs to be able to afford their living expenses.

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https://www.worldobesity.org/data/

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Lifestyles and food styles

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ABSTRACT: This work presents a study on the concept of lifestyles and feeding, analyzing the relationship between health, departs from the hypothesis of the construction of the individual shaped by the family, education and society with its components, the changes that have occurred and the relationship that these changes have on the health of people in different social and economic contexts. This paper describes the conceptual approach to lifestyle, and its relationship with food and health.

METHOD: It is a study with bibliographic design of narrative review of the literature. Qualitative, quantitative and the review of articles published in Spanish and English. The existing data from different sources were related, providing a panoramic and systematic view of a specific issue elaborated in multiple dispersed sources. **Conclusions:** more than half of people do not have lifestyle and food because those behaviors that involve a risk to health and others that protect and is characterized by a behavioral and observable nature, that's why values and motivations in different dimensions (chemical, physiological, anthropological, psychological, sociological, economic, political) that focus on different levels (subcellular, cellular, organ or tissue processes, individuals, families or groups), the same under normality as in its alterations. This work can serve as a basis for new research that contributes to reveal how behaviors that define lifestyle and food are constructed.

KEYWORDS: Lifestyle, Food, Health.

INTRODUCTION

Lifestyles is a construct that has been used in a generic way, as equivalent to the way in which the way of living in the world is understood, expressed in the areas of behavior, fundamentally in customs, is also shaped by the housing, urbanism, the possession of goods, the relationship with the environment and interpersonal relationships On the other hand, the construct lifestyle is associated with the ideas of individual behavior and behavior patterns, permeable aspects that depend on socio-educational systems. Lifestyle refers to the way of living, a series of activities, daily routines or habits, such as the number of daily meals, food characteristics, and sleep hours, alcohol consumption, cigarettes, stimulants and physical activity among others. We propose as objectives: Describe the conceptual approach to lifestyle looking at the way of feeding. It is for this reason that it is considered necessary that the actions of health promotion go directed to the set of determining factors linked to the lifestyle. Equally, it is important to maintain an adequate diet and move in a healthy environment. Among them, lifestyle and nutrition is especially important in the promotion of health, the prevention of disease and the recovery of health, and is also a factor modifiable by the will of the subject, although sometimes conditioned by social aspects that escape the will cpapacity of the individual. To achieve a healthy lifestyle, food is essential.

LIFE STYLES AND EVOLUTION The first contributions to the conceptualization of the expression "lifestyle" were already made in the nineteenth century by philosophers such as Karl Marx (1818-1883) and Max Weber (1864-1920), who advocated a sociological vision of the concept, considering it as a pattern of activities or behaviors that individuals choose to adopt among those that are available depending on their social context. The application of the term life style to the Psychology of the Personality was introduced by Wilken (1927) first and by Adler (1973) later, with his theory of Individual Psychology. For this last author, the lifestyle is a unique pattern of behaviors and habits with which the individual seeks to achieve a state of superiority. Thus, the lifestyle would be unique for each individual and would develop in childhood from the absences of innate aptitudes, the environment and education. Until the mid-twentieth century will coexist two different ideas of lifestyles, one focused on socio-economic conditions and the other centered on the individual and individual factors of personal experience that determine the behavior. Another piece about the impulse acquired by the study of lifestyle research is picked up by Castillo (1995), who stresses that "interest in lifestyles emerged in the 1950s from the public health sphere when chronic diseases began to emerge as the central problem of the health system. However, it will be in the decade of the eighties, in the last quarter of the twentieth century, when "the concern to study the possible relationships between lifestyles and health increases dramatically, interest that has its origin in the accelerated increase of patients with chronic diseases derived to a large extent from unhealthy lifestyles ... " (Gutiérrez Sanmartín, 2000). In this same sense, Rodriguez (1996) would emphasize that the Declaration of Experts in Cardiovascular Health of Victoria (Canada), in 1992, advocated the prevention of diseases classified as "modern" and the promotion of health through the establishment of more active lifestyles, alluding to epidemiological studies that confirmed that food is considered a risk factor for diseases with higher morbidity and mortality rates in developed countries (Hein et al., 1992, Bouchard et al., 1994). In this way interest in the study of lifestyles will become a priority and interdisciplinary theme. Both anthropology and sociology, psychology and health isuuses (Coreil et al., 1992) will be interested in the operational revival of the concept above all, beginning to use the term lifestyle in the context of research on public health from a medical-epidemiological position, interested in analyzing the health problems generated by the unhealthy lifestyles that had spread in Western industrialized societies (Wold, 1989), as already mentioned. The picture changes when in 1981 the European Committee of the World Health Organization proposed a change of medical model that emphasized much in the importance of biological problems for others of a more psychosocial nature. Since then, the scope of application in which the term "lifestyle" has had more impact has been in the area of health, being used in the search of explanations to the health alterations that begin to afflict the industrialized societies since the 50s. The scientific community exclusively held the individual responsible for their own lifestyle, without recognizing social, economic, psychological or cultural factors. If we try at this moment to conceptualize the expression «lifestyle», we can stick with the one that appears in the glossary of health promotion of the World Health Organization (WHO) published in 1999, and that defines lifestyle of a person like: «composed of their habitual reactions and behavior patterns that have developed during their socialization processes. These guidelines are learned in the relationship with parents, classmates, friends and siblings, or by the influence of the school, the media. These behavioral patterns are continuously interpreted and tested in the various social situations and therefore are not fixed, but subjected to modifications ». The life

course perspective tries to explain or predict the health and well-being of a person based on past and present experiences and recognizing the consequences that social, economic and cultural factors may have on health. In the following Table No1, it can be deduced that the lifestyle of the individuals or groups is molded by four large categories of related characteristics in an indissoluble way.

Characteristics of lifestyles			
Individuals	**Microsocial environment**	**Macrosocial environment**	**Physical or geographic media**
Age. Personality. Education received.	Individual. Living place. Family. Friends. Students Work environment.	Social Cultural System. Media. Social networks.	Living conditions. The weather Availability of food

Source: Elaborated on according to owr theoretical review.

The World Health Organization (WHO) suggests that there is increasing evidence that there are critical periods of growth and development during childhood, childhood and adolescence in which environmental exposures, for example the poor quality of feeding, can cause more damage to long-term health. These can be improved or reduced through training programs and solutions, whereby the consequences of these behaviors can be stopped or limited.

FOOD Among the components of living lifestyle we are going to deal with food and its consequences on health, based on the most important changes that have occurred in recent years. For almost 99% of man's presence on Earth, human beings were food hunter-gatherers who are related to their environment, but were also limited by it. The variety of foods they consumed could provide them with the necessary nutrients but their quantity varied greatly, thus limiting the number of people to whom a specific area could provide sustenance under acceptable conditions. During the 1% of the time remaining until today, decisive changes occurred that totally modified the supply of provisions, such as the settlement of crops, the grazing, and the discovery of the New World, the Industrial Revolution and, in the last decades, the application of science to food production. And more recently arises the need in addition to producing food that these be healthy and safe even that they have specific properties in relation to health, new and unknown concepts appear.¡

FOOD AND HEALTH Althought all the social advances contrary to what might be expected do not imply that we have achieved a healthy diet but rather the opposite, since according to the WHO the diet in many developed countries is characterized by an excess of foods rich in fats and refined sugars and a deficiency of complex carbohydrates and that does not guarantee the necessary contribution of fiber and micronutrients. In most countries of the European Union and North America, paradigms as developed countries, the type of food differs significantly from what experts consider an optimal diet, with serious consequences on health and high economic costs, giving rise to called diseases of civilization associated with diet and type of consumption, although some of these diseases are a logical consequence of the increase in life expectancy. This developed society, also called knowledge, risk, network, postindustrial, or First World is also called consumer society. And in western societies consumption practices occupy the fundamental axis of the economic and social process that conditions production and major social changes. The food and nutritional panorama of Mexico is complicated, in particular by the so-called epidemiological transition in which the country finds itself, characterized by the persistence of old problems of nutrition and

health linked to poverty, as well as by new problems associated with wealth. It is necessary to start from the idea that food is not simply a matter of nutrition in terms of efficiency or deficiency. But it is established as a complex and dynamic sociocultural ordering system within which values, beliefs, symbols, norms and social representations are put into play, and the alimentary traits that are established in each society are the expression of beliefs and traditions and they evolve over the years in response to the social, economic or demographic changes that may occur such as the appearance of new foods, contact with different cultures or the aging of the population.
Considering all these aspects and their influence on the consumption of some or other foods and on the planning of food in families, with the subsequent impact on health, becomes a challenge for research and for plans, projects or programs that are implemented within the health promotion by the responsible institutions. The model of mortality changes in relation to the wealth of a nation. From communicable diseases by the reproductive health and status, which is the cause of death at an earlier age, to noncommunicable diseases, particularly cardiovascular and cancer, with the life styles, those behaviors that imply a risk to health. Poverty that limits access to food for the most vulnerable populations.
The majority of people threatened by hunger live on less than a dollar a day: with this they can not access the food available in the market or productive resources such as land and water. Poverty fuels hunger but, conversely as we have already seen, malnutrition consequents to hunger, complicates physical and intellectual development and with it the productive capacity of individuals and societies. Discrimination against women although they are responsible for half of global food production and play a crucial role in ensuring adequate food, in many parts of the world there are cultural, social and legal barriers that prevent women from accessing production media and exclude them from decision-making, harming their own development and that of society. The trade policies of the last 20 years with very important fluctuations in food prices that are at the origin of many of the major food crises in sub-Saharan Africa which have occurred in the context of well-supplied markets, where the poorest can not pay for the high prices reached by food in the period of shortage between harvests and also natural disasters, armed conflicts, situations of exile, epidemics or pandemics. All this in a world where agricultural production could be enough to feed twice the world's population. In the year 2050 the world population will be approximately 9100 million people, and practically all of this increase in population will take place in developing countries. To feed this population, the production of food (excluding those used in the production of biofuels) should increase by 70%, which experts say can be achieved if the necessary investments are made and policies that favor production are applied. Agriculture must be complemented with the fight against poverty, especially in rural areas. These can be improved or reduced through training programs and solutions, by which the consequences of these behaviors can be stopped or limited.

RESULTS: Existing data from different sources were analysed providing a panoramic and systematic view of this specific area elaborated from multiple dispersed sources. **Conclusions**: more than half of people do not have a healthyy lifestyle and food acces because those behaviors that involve a risk to health and others that protect them and are characterized by a behavioral and observable nature that's why the values and motivations in different dimensions (chemical, physiological, anthropological, psychological, sociological, economic, political) that focus on different levels (subcellular, cellular, organ or tissue processes, individuals, families or groups)

same in normality than in its alterations. This work can serve as a basis for new research that could contribute to reveal how behaviors that define lifestyle and food are constructed.

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Genetic marker for detection of *Salmonella spp*.

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Foodborne diseases are one of the main public health problems. Disease-causing bacteria include pathogens of the genus *Salmonella spp*, which are described by the World Health Organization as "a new and significant threat to public health". In this study, we compared the efficacy of the PCR technique, based on the recognition of a specific region of the *invA* gene of the *Salmonella* genus, with that of conventional culture for the determination of the presence of this pathogen in Top-sirloin-type meat cuts. For the first test we conducted: 1) Pieces of meat were inoculated with different concentrations of *Salmonella enterica* serotype *Typhimurium* cultivated. In this first comparison, the sensitivity of the PCR test against the microbiological test was verified and the result was that both tests showed the same sensitivity detecting up to 1 CFU / 25 g of sample.
2) Subsequently, 30 samples of meat taken at random and without any inoculation with *Salmonella* were analyzed. By means of the microbiological method, 2 samples contaminated with *Salmonella spp*. were detected, and with PCR these same samples were detected plus another one that was negative by culture. Among the different fruits and vegetables associated with foodborne diseases, melon fruits stand out, thus, in a second trial, both microbiological and PCR methods were evaluated, now in samples from melon fruits. The detection of S*almonella spp* through the polymerase chain reaction (PCR) from samples of melon fruit, personnel, water, and soil. In the PCR reaction, primers are used that amplify a fragment of 287 base pairs within the conserved sequence of the invA gene of *Salmonella spp*. The DNA was obtained by washing the outer surface of melon fruits. Each melon fruit was placed in an individual bag, each melon was taken with gloves (for each sample a pair of gloves and a bag were used) in order to avoid cross-contamination. In the same place, bottles were taken with 250 mL of PBS + 1% Tween 80 solution, pH 7.0, and the solution were emptied into each bag with the fruit. The fruit was then washed inside the bag and homogenized very well for at least 2 min. The washes of each one of the five fruits that correspond to a sampling point were mixed in a single bottle (1.25 l). Each sample of 1.25 l with PBS + Tween 80 solution was homogenized and 225 mL were taken, which were incubated to make the pre-enrichment from which the DNA was obtained. In the case of water, the sample was 250 mL, for soil 10 g of soil was taken and diluted in 90 mL of 0.1% peptone solution and for personnel, a template for surfaces of 20X20 cm, and sterile swabs and 9 mL were used of saline solution. Twenty samples from the field were analyzed (each sample consisted of washing five fruits with peptone-water). A pre-enrichment of each sample and the extraction of DNA was done with the CTAB method. In general, by the microbiological method, the presence of *Salmonella spp* was detected in nine of 20 samples (45%), while the PCR detected the pathogen in 12 samples (60%), showing 15% more sensitivity than the microbiological one. Meat is a product sensitive to bacterial contamination, with the presence of pathogens such as *Salmonella spp*. A molecular

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method was developed to detect the *Salmonella* DNA fragment in different types of food. In 1992 a PCR-based method was developed for the detection of Salmonella in foods, by the use of a and b primers, which amplify a fragment of the invA gene of 287 base pairs, allowing the analysis with a maximum of 12 hours and obtaining that this method presents excellent correlation with the conventional reference method when naturally contaminated foods were analyzed.

Keywords: safety, PCR, typhoid

Introduction: Belonging to the family Enterobacteriaceae *Salmonella spp*. Is a genus of Gram-negative bacilli bacteria, facultative anaerobes, not spore-forming, have more than 2000 serotypes according to the system based on somatic (O) and flagellar (H) antigens, known as the scheme Kauffmann-White. It is considered that all members of the genus are pathogenic, but fortunately, the number of serotypes that infect humans is small. PATHOGENESIS: After ingestion and passing through the stomach, the bacteria multiply and adhere to the surface of the epithelial cells at the end of the small intestine and colon. After multiplying in the lymphoid follicle in the development of the leukocyte response, a hypertrophic lymphoid hyperplasia follows. This inflammatory response mediates the release of prostaglandins, which stimulate cAMP and produce active fluid secretion, resulting in diarrhea. CLINICAL ASPECTS AND PROGNOSIS: The incubation period is from 12 to 36 hours. Symptoms of *Salmonella* infection usually appear 12-72 hours after infection and include fever, abdominal pain, diarrhea, and nausea and, sometimes, vomiting. The disease usually lasts 4 to 7 days, and most people recover without treatment. However, in the weak, very young, and the elderly patients, and in cases where bacteria enter the bloodstream, antibiotic therapy may be needed, rehydration is recommended in the presence of acute and severe diarrhea, and scrupulous hygiene. Patients usually recover after 7 days and the antibiotic is not prescribed if it only has gastrointestinal symptoms. Some complications due to *S. enteritidis* are renal failure, osteomyelitis, and meningitis, which require appropriate antimicrobial therapy. However, in some cases, especially in children and elderly patients, the associated dehydration can be serious and life-threatening. Although large outbreaks of *Salmonella* generally attract media attention, between 60 and 80% of all cases of salmonellosis are not recognized as part of a known outbreak and are classified as sporadic or not diagnosed as such. TREATMENT: Treatment in severe cases is the replacement of electrolytes (to provide electrolytes, such as sodium, potassium and chloride ions, lost through vomiting and diarrhea) and rehydration. Routine antimicrobial therapy is not recommended for mild or moderate cases in healthy individuals. This is because antimicrobials may not completely eliminate bacteria and can select resistant strains, which can subsequently render the drug ineffective. However, risk groups for health, such as infants, the elderly and immunocompromised patients, may need to receive antimicrobial therapy. Antimicrobials are also given if the infection spreads from the intestine to other parts of the body. Due to the overall increase in antimicrobial resistance, treatment guidelines should be periodically reviewed taking into account the resistance pattern of the bacteria depending on the local surveillance system. EPIDEMIOLOGY: Within 2 species, *Salmonella bongori* and *Samonella enterica*, more than 2,500 serotypes have been identified to date. Although all serotypes can cause diseases in humans, some are host-specific and may reside in only one or several animal species: for example, *Salmonella enterica* serotype Dublin in cattle and *Salmonella enterica* serotype Choleraesuis in pigs. When these particular serotypes cause diseases in humans, they are often invasive and can be life-threatening. Most serotypes, however, are present in a wide range of hosts. Typically, these serotypes cause gastroenteritis, often not complicated and do not need treatment,

but the disease can be severe in young people, the elderly, and patients with weakened immunity. This group presents the two most important serotypes of Salmonella transmitted from animals to humans in most of the world *Salmonella enterica* serotype Enteritidis and *Salmonella enterica* serotype Typhimurium. The increase in *S. enteritidis* and *S. typhimurium* type DT104 in England has been due to resistance to ampicillin, chloramphenicol, streptomycin, sulfonamides, and tetracyclines. *S. thypi* and *S. paratyphi* are responsible for epidemics of typhoid and paratyphoid, named enteric fevers, which are rarely involved with food and are not usually referred to as causing food-borne damage. They have been implicated in immunosuppressed or AIDS patients and can be taken from one country to another by tourists.

It is observed in figure 1 that a typhoid fever in Tamaulipas has increased drastically from one year to the next and even more in Sinaloa, probably due to a relaxation of the quality assurance of food and epidemiological surveillance. Where there is very good quality control is in Durango, Hidalgo, Quintana Roo, followed by Yucatan and Colima.

ECOLOGY: It is widely distributed in nature and is usually found in the intestinal tract of humans and animals. It is characterized by its frequent presence in foods such as chicken; it grows and multiplies in a wide range of temperatures and foods, it is easy to spread and pass from person to person; there is a prolonged period for elimination after being acquired. Bacteria are generally transmitted to humans through the consumption of contaminated food of animal origin, mainly meat, poultry, eggs, and milk. Salmonella is a ubiquitous and resistant bacterium that can survive several weeks in a dry environment and several months in the water.
FOOD (Sources and transmission): Usually found in chicken meat, eggs and egg-based products, untreated milk and milk products contaminated with feces, and homemade mayonnaises. Salmonella bacteria are widely distributed in domestic and wild animals. They are frequent in food animals such as poultry, pigs and cattle; and in pets, including cats, dogs, birds, and reptiles such as turtles. Salmonella can pass through the entire food chain from animal feed, primary goods and even homes or food service establishments and institutions. Salmonellosis in humans is usually contracted through the consumption of contaminated food of animal origin (mainly eggs, meat, poultry, and milk), although other foods, including green vegetables contaminated by manure, have been implicated in its transmission. Transmission from person to person can also occur through the fecal-oral route. Human cases also occur where people have contact with infected animals, including pets. These infected animals often show no signs of disease.
CONTROL: Regulate the importation of live and processed animals, the use of animal feed free of Salmonella, good sanitary practices when obtaining eggs, vaccination of chickens, basic knowledge of food preparation techniques such as adequate refrigeration, cooked meals, accompanied by hygiene in the kitchens, preventing cross-contamination of cooked and raw foods.

Typhoid fever
Epidemiological Bulletin of Mexico Week 40https://www.gob.mx/cms/uploads/attachment/file/264542/sem40.pdf

2016 paraqtifoidea
2017 paratifoidea
2016 tifoidea
2017 tifoidea

	Aguascalientes	Baja California	Baja California Sur	Campeche	Coahuila	Colima	Chiapas	Chihuahua	Ciudad de Mexico	Durango	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán
2016 paraqtifoidea	359	156	49	89	101	31	880	560	111	9	37	259	0	545	70
2017 paratifoidea	87	175	121	49	143	20	1151	244	22	0	60	332	47	543	221
2016 tifoidea	354	786	65	277	1431	143	2624	1754	76	58	340	1127	28	349	469
2017 tifoidea	222	906	93	192	1776	18	2618	299	145	33	480	1005	15	393	574

	Morelos	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas
2016 paraqtifoidea	27	121	224	58	121	5	224	57	657	56	1135	468	200	657	15	123
2017 paratifoidea	13	103	170	113	103	10	275	55	935	30	1985	1089	161	935	6	175
2016 tifoidea	135	217	576	428	215	95	0	310	1626	190	988	4833	54	1623	26	1884
2017 tifoidea	219	84	1089	306	145	47	4	320	7281	104	2021	8519	72	3200	28	3026

Figure 1 Typhoid-paratyphoid fever in states of Mexico. Epidemiological Bulletin week 40

KEY FACTS: *Salmonella* is one of the four main global causes of diarrheal diseases. Most cases of salmonellosis are mild; however, it can sometimes be life-threatening. The severity of the disease depends on the host factors and the Salmonella serotype. Antimicrobial resistance is a global public health problem and Salmonella is one of the microorganisms in which some resistant serotypes that affect the food chain have emerged. The basic practices of food hygiene, such as "cooking thoroughly", are recommended as a preventive measure against salmonellosis.

JOINT VISION: The burden of foodborne diseases is considerable: every year, almost 1 in 10 people get sick and 33 million healthy lives are lost.

Foodborne diseases can be serious, especially for young children. Diarrheal diseases are the most common diseases that result from unsafe food, 550 million people get sick each year, including 220 million children under 5 years old. Salmonella is one of the 4 key global causes of diarrheal diseases. METHODS OF PREVENTION: Prevention requires control measures at all stages of the food chain, from agricultural production to processing, manufacturing and food preparation both in commercial establishments and at home. Contact between infants/toddlers and pets that may be carrying Salmonella (such as cats, dogs, and turtles) needs careful supervision. Recommendations for the public and travelers that will help ensure safety during the trip: Make sure the food is well cooked and still hot when it is served. Avoid raw milk and products made with raw milk. Drink only pasteurized or boiled milk. Avoid ice unless it is made of safe water. When the safety of drinking water is questionable, boil it or, if this is not possible, disinfect it with a reliable slow release disinfectant (usually available in pharmacies). Wash your hands thoroughly and often using soap, particularly after contact with pets or farm animals, or after being in the bathroom. Wash fruits and vegetables carefully, especially if eaten raw. If possible, vegetables and fruits should be peeled.

Table 1 Components of reaction of PCR

Component	Final concentration	Volume for a PCR reaction (μl)
Buffer PCR	1X	2,5
$MgCl_2$	1.5 mM	2
dNTP`s	0.2 mM	2
Primer 287a	25 pico Moles	1
Primer 287b	25 pico Moles	1
Taq dna Pol	2.5 U	0,5
H_2O		14
Template DNA		2
	Total volume	25

Table 2 Primers for *S. typhimurium*

Author	Primers	Temple sequence	Detect
Rahn *et al*	287 a and b	Gene *inv*	*S. typhimurium*

Table 3 Amplification conditions

Activity	Temperature	Time	Cycles
Initial denaturation	94	1 min	1
Denaturation	94	30 seq	35
Alignment	55-60	30 seq	
Extension	72	30 seq	
Final extension	72	10 min	1

Figure 2 Simulation in Amplify

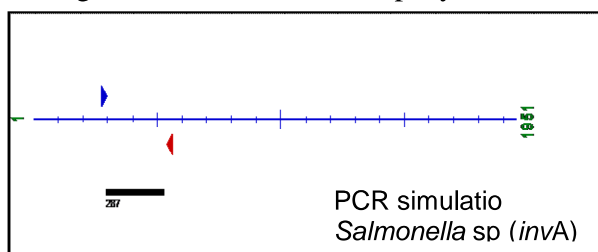

Table No. 4. Initiators design:

	Primer		
139	GTGAAATTATCGCCACGTTCGGGCAA	287 pb	Rahn, *et al.* 1992
141	TCATCGCACCGTCAAAGGAACC		

METHODOLOGY:

Microbiological analysis of *Salmonella*

In the case of the meat samples, 25 ± 0.5 g of meat was weighed in a sterile Whirl-Pak bag and 225 ml of buffered Peptone Water (BPW) were added. For the samples from the melon production systems, since almost all were liquid samples (washes or water samples), 50 ml of BPW were added to each sample. The samples were manually homogenized for 2 min and incubated at 35 ± 2 ° C for 20-24 h. After this time, 0.5 ± 0.05 ml was transferred into 10 ml of tetrathionate (TT) and 0.1 ± 0.02 ml into 10 ml of modified Rappaport Vassiliadis broth (mRV). They were incubated at 42 ± 0.5 ° C for 18-24 h in a shaking bath. From these culture media, sowing was carried out in 4 quadrants in selective culture media of doubly modified lysine agar and Bright Green agar with Sulfadiazine (BGS). A single handle and plate per sample was used. The plates were incubated at 35 ± 2 ° C for 24 h. After this time the growth on the plates was examined. The plates without growth were re-incubated another 18-24 h and re-examined.

For the determination of the colonial morphology on BGS agar, pink and opaque colonies with smooth appearance and surrounded by a red halo were selected. These characteristics correspond

to lactose and negative sucrose colonies typical in *Salmonella* spp. In the determination of the colonial morphology on DMLIA agar, the purple colonies with or without black center were selected, based on the fact that *Salmonella* strains typically in DMLIA medium use lysine and do not metabolize lactose. For the preliminary biochemical identification, 3 probable colonies of *salmonella* were selected from each selective medium and each of them was inoculated in media for the preliminary identification of the microorganisms: in agar three sugars and iron (TSI) and the iron-lysine agar (LIA), were inoculated by puncture and striae on the surface and incubated at 35 ° C for 24 h. The medium of Motility-Indol-Ornithine (MIO) was also used, which was inoculated by puncture and incubated the same time and temperature as the TSI and LIA media.
Salmonella were considered those organisms with a K / A reaction (base on acid) with or without gas production and H_2S in TSI, a K / K reaction (base on base) in LIA with or without H_2S production and a decarboxylation of positive ornithine without indole production.

Identification: biochemical tests and antisera.
The colonies whose clone turned out to have bacillary morphology and which reacted negatively to the Gram stain (data not shown), were identified by the API 20 E system (bioMérieux Marcy I'Etoile France) according to the manufacturer's technical specifications and were agglutinated with the antiserum for *Salmonella* O poly A-1 & Vi (Difco).

Preparation of the sample
1. Weigh 25 g of ground beef and place in 500 ml whirl-pack bags.
2. Add 225 ml of Buffered Peptone Water
3. Homogenize the sample for 1 minute and incubate at 35 ° C / 20-24 hours.
4. At the end of this time, gently shake the sample to resuspend.
5. Take aseptically a 10 ml aliquot and store for DNA extraction

The DNA was extracted by the CTAB method.
PCR reaction: A positive control of *Salmonella typhimurium* strain and a negative control with water or negative tissue are included in the PCR reactions.

RESULTS: In the PCR reaction with the primers 287 a and b, only the amplification of a 287 bp fragment will be seen for the reference strain DNA, in the test samples it is expected to obtain a fragment of similar size if the pathogen is present. This fragment indicates the amplification of a part of the genome of *S. typhimurium*.

Figure 3 Reference strain of *S. typhimurium*, negative control and molecular weight marker.

Agarose gel electrophoresis: To visualize the results, fractionate the PCR products in 1.5% agarose gel. For a higher resolution of the amplification products can be fractionated in 10% polyacrylamide gel. Lane 1 = Positive strain control, lane 2 = negative control and lane 3 = 100 bp molecular weight marker.

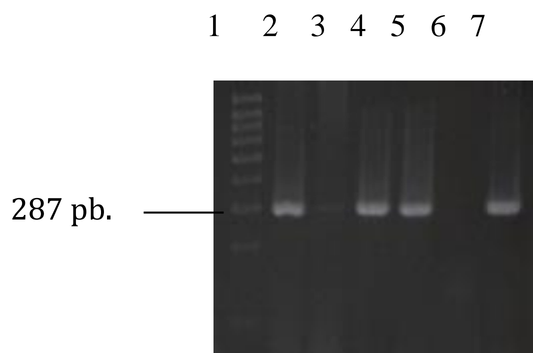

Figure 4 PCR products

PCR products from pre-enrichments of commercial samples of meat. Lane 1, 100 bp marker (Bioline); lanes 2 to 5, meat samples 3, 12, 33 and 41 respectively; lane 6, negative control; lane 7, positive control.

CONCLUSION: In both types of food (fruits and meat), the expected 287 bp fragment that forms part of the Salmonella invA gene sequence was amplified, confirming the presence of the pathogen in these foods. The results in both trials show the usefulness of this molecular test for the detection of the bacteria in different types of food samples where it is suspected and/or want to corroborate its presence, especially when reliable and fast techniques are required today to know the incidence of pathogenic microorganisms in food and the risk factors associated with them. The PCR showed a sensitivity of 100%, to detect the pathogen *S. typhimurium*.

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Genetic marker for *Escherichia coli* O157: H7 detection in meat

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Escherichia coli O157: H7 is a human pathogen transmitted by food. Mainly those of animal origin are reservoir and transmission vehicle since the majority of infections by this microorganism are associated with the ingestion of contaminated and improperly cooked meat. As an enteropathogen, the generally accepted figures acquire a new meaning, since only the presence of one bacterium per gram represents a serious risk of infection. Currently, PCR is used to detect strains producing verotoxins and serotypes O157 and H7.

KEYWORD: harmlessness, food poisoning

INTRODUCTION: *Escherichia coli* is a Gram-negative, facultatively anaerobic, non-spore-forming bacillus which is divided into several subgroups, the most important being the enteropathogenic EPEC, enteroinvasive EIEC, enterotoxigenic ETEC, enterohemorrhagic EHEC and *Escherichia coli* shigatoxigenic ECST. Groups EPEC and EIEC: PATHOGENESIS: It is part of the normal flora of the large intestine of animals and humans, many of the strains are not pathogenic, however, some can cause enteric and urinary infections, as well as cause damage and/or epidemics due to contaminated food intake, they occasionally cause septicemia and meningitis. They are divided based on serotypes of the O antigen and although there are many serotypes few are causing infection. It can multiply in food and requires many to cause infection 105-107 organisms / g. EPEC produces a toxin that induces secretion of fluids from the intestine, the adherence of the microorganism to the mucosa of the intestine causes alterations in its function producing diarrhea similar to that of *Shigella dysenteriae* origin and is responsible for dysentery. The EIEC serotypes have the ability to invade and proliferate within cells and cause eventual death of them, such invasive capacity is related to the presence of a large plasmid which codes for outer membrane proteins associated with the invasive property of the cell. Clinical aspects and prognosis: After an incubation period of 12 to 72 h the symptoms are diarrhea, requiring rehydration and treatment. EPIDEMIOLOGY: It is commonly found in the lower intestine of warm-blooded animals. Most strains of *E. coli* are harmless, but some can cause severe food poisoning. ECOLOGY AND FOOD: It is transmitted by fecal contamination by direct or indirect contact via water affecting meat, meat products, and fresh vegetables, turning them into a source of infection. Because *E. coli* is commonly found in human and animal feces, it is common to use it as an indicator of fecal contamination in food. They are closely related to *Shigella spp* in pathogenic aspects. Group (ETEC): PATHOGENESIS: After ingestion, the bacterium can survive in the hostile environment of the stomach, penetrates the mucosa of the small intestine and adheres to the mucous cells producing one or both enterotoxins (labile or heat-stable), which causes diarrhea characteristic of the disease. Clinical aspects and prognosis: After the incubation period of 12 to 72 h, symptoms include diarrhea, fever, and abdominal pain; nausea can be common and vomiting is rare. Incidence and epidemiology: It is responsible for traveler's diarrhea as a consequence of the

ingestion of contaminated food or water in endemic areas. Ecology and food: It is found in foods of animal origin, its presence indicates poor handling of food and contamination of fecal origin. CONTROL of the first three groups EPEC, EIEC, ETEC: Avoid direct fecal contamination of food with strict personal hygiene practices, avoid contaminated water, cross-contamination of cooked and raw food, untreated waste can under no circumstances be used to fertilize vegetable crops. Group (EHEC): PATHOGENESIS: The disease is the result of the action at the intestinal level of one or more toxins (verotoxins) encoded in a plasmid that has the bacteria and produced by the bacteria as a result of their phages that code for their production. The pathological effects include morphological changes in epithelial cells, an increased mitotic activity of crypts, lack of mucin and infiltration of polymorphonuclear cells in the mucosa. These changes are associated with the presence of free verocytotoxins in the colon and result in watery and/or bloody diarrhea. The infective dose is less than 100 cells. Clinical aspects and prognosis: Hemorrhagic colitis, bleeding accompanied by abdominal pain, which causes confusion with appendicitis, a little vomiting, and no fever. 10% of cases develop hemolytic uremic syndrome, which consists of acute renal failure, thrombocytopenia and microangiopathic hemolytic anemia and permanent liver damage. Their incubation period varies from 2 to 8 days, extending to 12. Although in most patients' recovery occurs after eight days, death has been reported in children with medical problems. Antimicrobial therapy is not very effective, but in serious cases, ciprofloxacin is the drug of choice. Incidence and epidemiology: The first report of hemorrhagic colitis caused by EHEC was in 1982 in the United States of America (USA). Subsequently, epidemics and sporadic cases have been reported in Canada, Japan and the United Kingdom (UK). Between 10,000 and 20,000 *E. coli* O157: H7 infections occur each year in the USA. Sixteen epidemics were reported in 1993 and another 11 during the first 6 months of 1994. Its epidemiological aspect is not very clear since it is very rare to isolate *E. coli* O157: H7 from food. Ecology and food: Bovines are considered as the main reservoirs of the bacteria from which the infection can reach humans as a consequence of the consumption of inadequately cooked contaminated meat. Hamburgers have been involved in several outbreaks of this microorganism, although cider, salami, and water, among others, have also been established as causing this disease. It was reported in the UK in 1989 in cattle feces and indicated that the cow could be the possible reservoir of the infection, being able to be transmitted from the cows to humans, either by raw or inadequately cooked meat, as well as by not pasteurized dairy products. Control: Consumers should avoid raw or partially cooked animal foods, avoid cross-contamination between raw and cooked foods. After growing the microorganism in sorbitol MacConkey medium, serologically determine flagellar antigen H7, as well as differentiate the serotype of *E. coli* O157, which does not ferment sorbitol. ECST Group Shiga toxin-producing *E. coli* (ECST) is a bacterium that can cause serious foodborne illness. The primary sources of ECST outbreaks are raw or undercooked meat products, raw milk and faecal contamination of vegetables. In most cases, the disease is self-limiting, but it can lead to a life-threatening illness, which includes hemolytic uremic syndrome (HUS), especially in young children and the elderly. ECST is sensitive to heat. ECST produces toxins known as Shiga toxins due to their similarity to the toxins produced by *Shigella dysenteriae*. ECST can grow in temperatures ranging from 7 °C to 50 °C, with an optimum temperature of 37 °C. Some STECs can grow in acidic foods, up to a pH of 4.4, and in foods with a minimum water activity (aW) of 0.95. ECST is destroyed by thoroughly cooking the food until all parts reach a temperature of 70 °C or higher. *E. coli* O157: H7 is the most important STEC serotype in relation to public health; however, other serotypes have been frequently involved

in sporadic cases and outbreaks. Symptoms include abdominal cramps and diarrhea that in some cases may progress to bloody diarrhea (hemorrhagic colitis). Fever and vomiting may also occur. The incubation period can vary from 3 to 8 days, with a median of 3 to 4 days. Most patients recover within 10 days, but in a small proportion of patients (especially young children and the elderly), the infection can lead to a life-threatening disease, such as hemolytic uremic syndrome (HUS). HUS is characterized by acute renal failure, hemolytic anemia, and thrombocytopenia (low blood platelets). It is estimated that up to 10% of patients with ECST infection can develop HUS, with a mortality rate between 3 and 5%. In general, HUS is the most common cause of acute renal failure in young children. It can cause neurological complications (such as seizures, strokes and coma) in 25% of patients with HUS and chronic renal sequelae, usually mild, in about 50% of survivors. A series of ECST infections have been produced by contact with recreational water. Therefore, it is also important to protect such areas of water, as well as sources of drinking water, from animal waste.

Table 1. Diarrheic *Escherichia coli* from border to border. Does not include imports of individual cases.

Years	Country **	Originated **	Place	Cases	Deaths
1976		Haiti	Cruise	386	
1981		Mexico	Cruise	98	
1983	The United States	France	Imported gifts		
1997		The Canary Islands	Travel		
1999	The United Kingdom	Turkey	Travel	5	
2002	The United Kingdom	France	Travel	10	
2004	Japan	The Republic of Korea	Trailer parking	107	
2004		Sweden	Sporting event	12	
2004	The United States	Japan	Military	3	
2005*	Cambodia	Japan	Travel	24	
2005	Scotland	Turkey	Travel	15	
2007	Scotland	Turkey	Travel	3	
2009	The United Kingdom	Spain	Travel	14	
2010	Denmark	France	Imported gifts	260	
2011		Germany	Travel	126	2
2011	France	Turkey	Travel	8	
2011*	The United States	Peru	Shipping		
2013	Sweden	The Netherlands	Imported gifts	2	
2013		Sweden	Travel		
2013	The United States	Mexico	Imported gifts	9	
2014	The United Kingdom	Spain	Travel	4	

Points of conversation: From 2006 to 2007, 41.9% of American travelers to Mexico developed diarrhea - 33.9% due to LT-EHEC 276. Source https://web.gideononline.com

Table 2. Notable epidemics

Year	Country	Originated	Cases	Deads	Source	Potage
1963	Glen		1,071	100		*E. coli* O111: B4
1992	Swaziland		64,699		Wat4er	*E. coli* O157
1992 - 1993	The U.S		732	4	Meat - Hamburger	*E. coli* O157:H7
1996	Japan	Multiple places	11,826	12		*E. coli* O157: H7
1998	The U.S		4		French fries	
1998	The U.S		4		French fries	
2000	Mexico		1,521			ETEC
2011	Multiple places		3,91	46		*E. coli* O104: H4
2013*	The Republic of Korea	School	1,642		Vegetal - kimchi	*E. coli* O169

* Indicates the year published (not necessarily the year the event) Source https://web.gideononline.com

METHODOLOGY: Preparation of the meat sample: 25 g of the sample are weighed aseptically and 225 ml of Ec Broth are prepared. The sample is homogenized and incubated at 37 °C / 18-24 hours. An aliquot of 10 ml is taken for PCR analysis. The DNA is extracted by the CTAB method.

PCR reaction: A positive control strain of *Escherichia coli* O157: H7 and a negative control with water will be included in the PCR reactions. Agarose gel electrophoresis: The PCR products will be visualized on 1.5% agarose gels and analyzed by means of photographs taken with a Polaroid camera and A667 film adapted with a filter for ultraviolet light.

Table 3. PCR components

Component	Final concentration	Volume for a PCR reaction (µl)
Buffer PCR	1X	2,5
$MgCl_2$	1.5 mM	2
dNTP`s	0.2 mM	2
Primer 1	25 pico Moles	1
Primer 2	25 pico Moles	1
Taq dna Pol	2.5 U	0,5
H_2O		14
Template DNA		2
	Total volume	25

Table 4. Initiators, gene to which they are addressed, fragment size and reference

Gene		Initiator		
VT1	VT1-A VT1-B	CGCTGAATGTCATTCGCTCTGC CGTGGTATAGCTACTGTCACC	302 pb	Blanco, M., *et al*. 2003
VT2	VT2-Am VT2-Bm	CTTCGGTATCCTATTCCC* CTGCTGTGACAGTGACAAAACG*	518 pb	Blanco, M., *et al*. 2003
*eae*A	AE-19 AE-20	CAGGTCGTCGTGTCTGCTAAA TCAGCGTGGTTGGATCAACCT	1087 pb	Gannon, *et al*. 1993
O157	O157-AF O157-AR	AAGATTGCGCTGAAGCCTTTG CATTGGCATCGTGTGGACAG	497 pb	Desinarchelier, *et al*, 1998
H7	H7-F H7-R	GCGCTGTCGAGTTCTATCGAGC CAACGGTGACTTTATCGCCATTCC	625 pb	Gannon, *et al*. 1997

Table 5. Amplification conditions

Activity	Temperature	Time	Cycles
Initial denaturation	94	1 min	1
Denaturation	94	30 seq	35
Alignment	55-60	30 seq	
Extension	72	30 seq	
Final extension	72	10 min	1

PCR simulation through the Amplify 1.2 program.
The following figures (1 to 5) show the graphic maps of the white genetic sequence, the binding sites of the primers and the amplified fragments obtained with each pair of primers used in multiplex PCR assays by the Amplify 1.2 program.

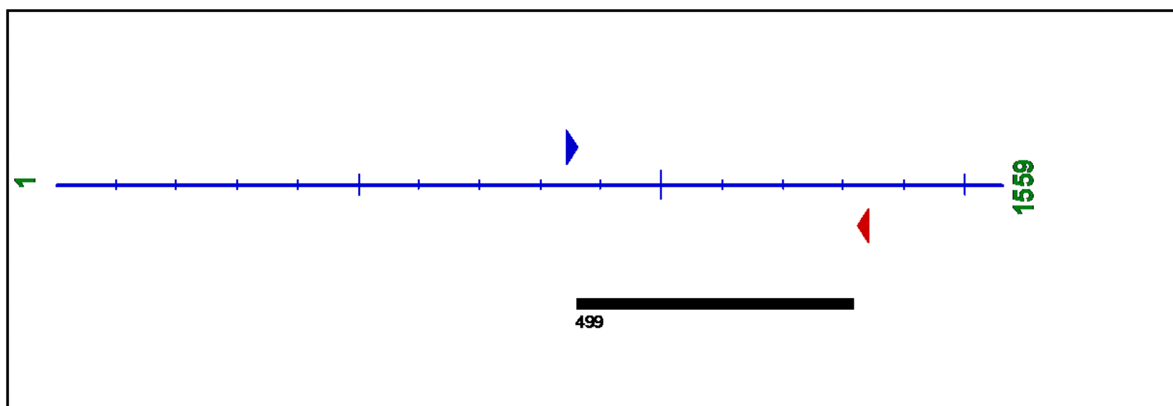

Figure 1. Simulation of PCR using primers O157-AF and O157-AR directed to the rfbE gene.

Figure 2. Simulation of PCR using primers H7-F and H7-R directed to the fliC gene.

Figure 3. Simulation of PCR using the VT1-A primers VT1-B directed to the VT1 gene.

Figure 4. Simulation of PCR using primers VT2-Am and VT2-Bm directed to the VT2 gene.

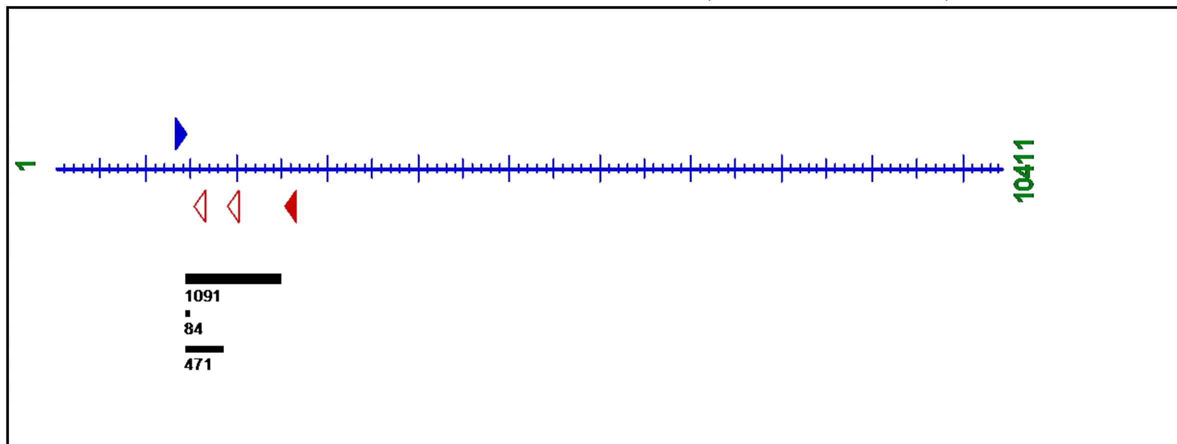

Figure 5. Simulation of PCR using the AE-19 and AE-20 primers directed to the eaeA gene.

EXPECTED RESULTS:
DNA extraction was performed from the reference strains of *E. coli* O157: H7 (INDRE, IPN), as well as the generic strain *E. coli* ATCC 4350. Subsequently, multiplex PCR assays were performed. The fragments generated in tests A and B were of the expected size with each pair of primers using DNA from strains O157: H7, the opposite occurring with the non-toxigenic generic strain (Figure 6 A and B).

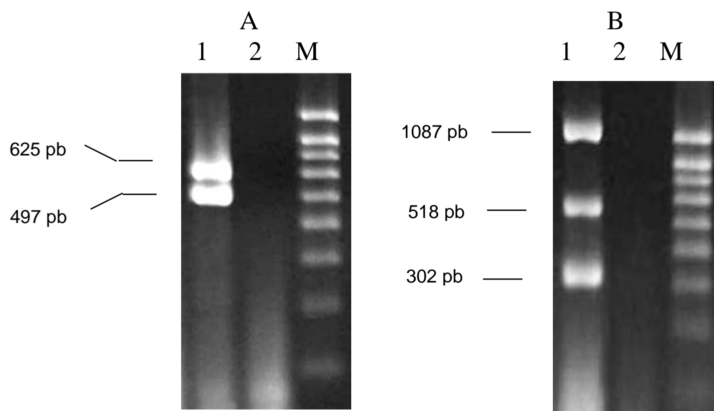

Figure 6 A and B

The detection limit of trial A was 1 CFU / g in the 9 performed trials. Regarding trial B, at this concentration, positive results were obtained in less than half of the trials. By means of the microbiological method, the bacterium was detected in 4 of the 9 tests carried out. Using the Mann-Whitney U statistical test ($z = -2.557$, $P < 0.05$) it was found that there is a significant difference between the multiplex PCR assays and the microbiological method at this cell concentration. However, at a concentration of 10 CFU / g, satisfactory results were obtained in the 9 tests performed by both methods. No positive results were obtained when the bacteria were at a concentration of 10-1 CFU / g by neither of the two methods (Fig 7 and 8).

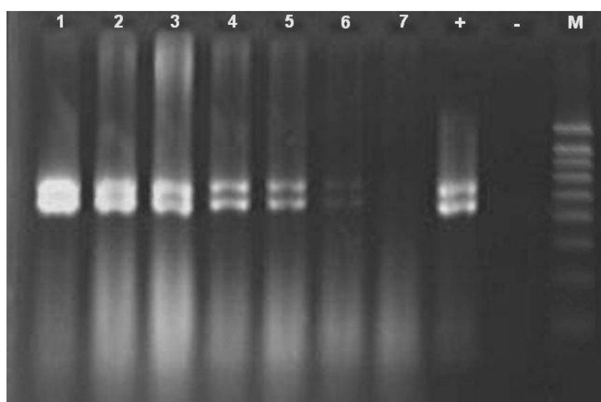

Figure 7. Multiplex PCR in artificially inoculated samples using CST + ccv as an enriched medium. Lanes 1 to 7 = 105 to 10-1 CFU / g of meat; lane (+) = positive control, (-) = negative control, M = marker 100 bp Ladder.

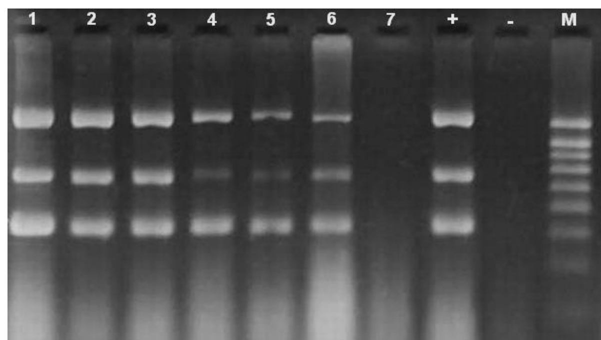

Figure 8. Multiplex PCR in artificially inoculated samples using CST + ccv as an enriched medium. Lanes 1 to 7 = 105 to 10-1 CFU / g of meat; lane (+) = positive control, (-) = negative control, M = marker 100 bp Ladder.

The limit of detection in trial A was 10-1 CFU / g in the 9 performed. At this cell concentration, by test B, positive results were obtained in less than half of the tests performed. Regarding the microbiological method, positive results were obtained in 4 of the 9 trials carried out (Fig. 8 and 9).

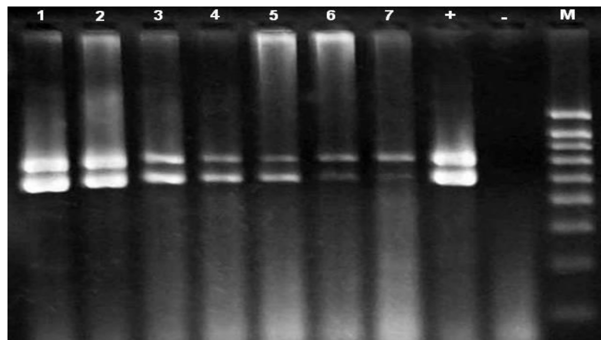

Figure 9. Multiplex PCR in samples inoculated artificially using Ecm + n as enrichment medium. Lanes 1 to 7 = 105 to 10-1 CFU / g of meat; (+) = positive control, (-) = negative control, M = marker 100 bp Ladder.

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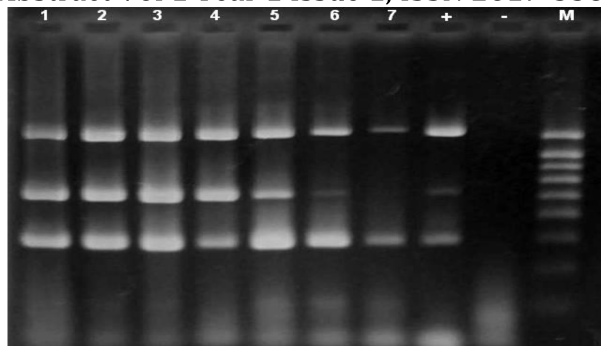

Figure 10. Multiplex PCR in artificially inoculated samples using Ecm + n as an enrichment medium. Lanes 1 to 7 = 105 to 10-1 CFU / g of meat; lane (+) = positive control, (-) = negative control, M = marker 100 bp Ladder.

To evaluate the applicability or diagnostic utility of the multiplex PCR assay in the detection of *E. coli* O157: H7 with respect to the microbiological method, 40 samples of meat were analyzed from the metropolitan area of Monterrey, Nuevo León, Mexico. In this case, the broth Ecm + n was used as an enrichment medium.

E. coli O157: H7 was not isolated by the microbiological method in any of the samples, whereas by multiplex PCR assays it was detected only in 2 (5%); one of the strains found was not verotoxigenic, nor did it harbor the eaeA gene, while the second one only presented the VT2 gene.

By means of A test, 10 additional positive samples were also detected, but they only harbored the fliC gene. (25%), while trial B also allowed the detection of verotoxigenic strains belonging to other serotypes (not O157: H7); 5 positive gene coding for VT1 (12.5%), 2 positive for harboring VT2 gene (5%), 4 positive for both genes (10%), and one for harboring the eaeA gene (2.5%) (Figure 12 and 13).

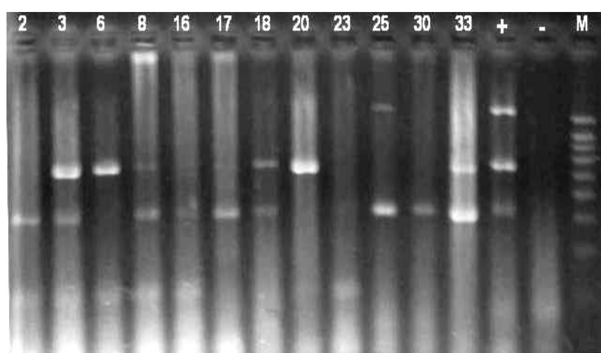

Figure 11. Field samples analyzed. Test B. Positive samples 2, 16, 17, 25 and 30 for containing the gene coding for the VTI; positive samples 6 and 20 for containing the gene coding for VT2; samples 3, 8, 18 and 33 positives for containing both genes; 25 shows positive for harboring the eae gene; 23 shows negative. (+) = positive control; (-) = negative control; M = 100 bp Lader marker.

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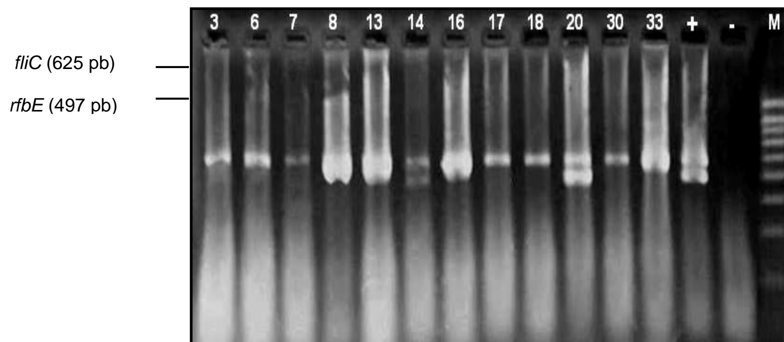

Figure 12. Field samples analyzed. Assay A, samples 14 and 20 positives in harboring the gene rfbE (O157) and fliC (H7), samples 3, 6-8, 13, 16-18, 30 and 33 positives in harboring the gene fliC. (+) = Positive control; (-) = negative control; M = score 100 bp Ladder.

CONCLUSIONS

The multiplex PCR technique was standardized for the detection of E. coli O157: H7 and the most important pathogenicity factors in this bacterium in samples of artificially inoculated beef. There is a significant difference between the results obtained by multiplex PCR and the microbiological method. The sensitivity and relative precision, as well as the agreement obtained in the Multiplex PCR, were higher than those obtained by the microbiological method in artificially inoculated meat samples. The Ecm + n broth showed to have an upper limit of detection (≤10-1 CFU / g) with respect to the CST + ccv (≤10 CFU / g) in the artificially inoculated meat samples. In 40 field samples analyzed, the multiplex PCR with two positive tests exceeded the microbiological method where all were negative. In general, the incidence of *E. coli* O157: H7 was low (5%) in the commercial meat samples analyzed.

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Genetic marker for detection of *Staphylococcus aureus* on colonies isolates from meat samples

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The conventional methods for detection of *S. aureus* in food require a minimum of 4 to 5 days to obtain presumptive results after beginning the analysis of the sample. A growing number of reports have indicated that the application of the polymerase chain reaction (PCR) is reliable and quickly detects pathogens in food being a promising diagnostic tool for monitoring food safety.

KEYWORD: harmlessness, food poisoning

INTRODUCTION: Staphylococcus aureus is a coco Gram + bacteria, arranged in pairs, short chains or clusters, immobile, not sporulated, facultative anaerobe, ferments glucose and produces lactic acid. It is catalase and coagulase positive and on agar No. 110 the colonies are golden yellow. PATHOGENESIS: The poisoning is a consequence of the consumption of food contaminated with high amounts of the bacteria that carried out the production of the appropriate concentration of the toxin, which is directly responsible for the clinical portrait. The toxin does not act directly in the intestinal cell; it acts in a receptor of the intestine, which stimulates in the brain the reaction to vomit, considering it as a neurotoxin. The toxin is produced by the active growth of the bacteria in the food during storage at temperatures favorable for its growth, and consists of a single polypeptide chain resistant to proteolytic enzymes and is stable to heat for more than 30 min, although the vegetative cells do not survive such conditions, the toxin remains active and intact. 15 to 20% of *S. aureus* isolates from humans are enterotoxigenic, which explains the importance of transmission by food handling. CLINICAL ASPECTS AND PROGNOSIS: It is characterized by nausea, vomiting, abdominal pain and prostration with diarrhea but no fever, from 1 to 6 hours after the ingestion of contaminated foods, although some patients recover at 24 h without specific therapy, only 10% of cases admitted to the hospital become serious. INCIDENCE AND EPIDEMIOLOGY: Humans who handle food transmit it to food, by cross-contamination from other sources such as utensils previously contaminated by humans, occasionally by milk products from cows, sheep, and goats. ECOLOGY AND FOOD: It is found as a commensal in the skin and nose of humans, it can be present in the air, in milk, and in waste. The foods involved are those that are cooked and not stored at adequate temperatures to inhibit contamination after cooking itself, which, having no competition for other bacterial can grow without any interference and produce sufficient amount of the toxin. CONTROL: Avoid contamination by the unhygienic handling of food; cook and refrigerate food properly to avoid multiplication. Immediate consumption of food after cooking or serving is adviced.

Table 1. Notable Epidemics, Source https://web.gidononline.com

Year	Country	Place	Cases	Source
1962*	The U.S	Cafeteria	852	
1969	Slovakia		1	Ice cream
1998	Brazil	Religious event celebration	2	
1999	Brazil		706	Dairy products
2000	Japan		13,42	Milk
2005	Greece	Military base	600	Cheese
2012	Mexico		709	

Table 2. Staphylococcal food poisoning <Outbreaks>

Year	Country	Year	Country
1933:	The U.S	1991:	The U.S
1935:	The U.S	1994:	Brazil
1937:	The U.S	1996:	Trinidad and Tobago
1940:	The U.S	1997:	Australia, United States
1944:	Glen	1997:	Australia, United States
1950:	Sudan	1998:	Brazil, Mexico
1956:	Croatia	1999:	Brazil
1961:	Glen	2000:	Australia, Japan
1962:	Canada, United States of America	2001:	Japan
1964:	The U.S	2002:	Australia, Spain, United States
1965:	Australia, India	2003:	France, Guam, Norway
1969:	Slovakia	2004:	The Netherlands
1971:	Glen	2005:	Greece, Venezuela
1973:	Italy, Portugal, United States	2006:	Argentina, Austria, Hong Kong, United States
1975:	The U.S	2007:	Austria, Canada, China, Paraguay
1976:	Brazil	2008:	Argentina, Germany, Macedonia
1982:	Portugal	2009:	France, Japan, United Kingdom
1983:	Malaysia, United States	2010:	Czech Republic, France, Taiwan, United States
1984:	Italy, Luxembourg, Scotland, United Kingdom, United States	2011:	Guam, Italy, Myanmar (Burma)
1985:	The Netherlands	2012:	Australia, Cayman Islands, Mexico, United States
1986:	The U.S	2013:	Canada, Germany, Republic of Korea!
1987:	The U.S	2014:	Bulgaria, Luxembourg, Peru, Romania, Switzerland, United States, Zimbabwe
1988:	Israel	2015:	Australia, Italy, United States
1989:	Canada, China, United States	2016:	Japan, Thailand
1990:	Thailand, United States	2017:	Japan, United States

Total of epidemics: 108, Cases of total (approximate) outbreaks: 26,710. Source https://web.gideononline.com

METHODOLOGY

Preparation of the sample:

1.- Weigh 10 g of food sample (meat) and homogenized with 99 ml of phosphate buffer to start a series of 3 dilutions, inoculate each with 0.1 ml dilution in Petri dishes with Baird Parker Agar.

2.- The inoculum was distributed on the surface of the agar with sterile glass rods at right angles, using one for each dilution.

3.- The plates were incubated for 48 h at 35 ° C and count the typical colonies of *S. aureus* in each plate (black, circular, bright, convex, smooth, with a diameter of 1 to 2 mm and showing an opaque zone). a clear halo around the colony) showing between 15 and 150 typical colonies of *S. aureus* (2).

Selection of colonies: Depending on the number of suspicious colonies counted in each plate; they were selected for molecular analysis:

Table 3 Number of colonies to be selected

Number of suspicious colonies on plates	Number of colonies to test
< 50	3
51 – 100	5
101 – 150 or more	7

Table 4 Components of the PCR reaction

Component	Final concentration	Volume for a PCR reaction (µl)
Buffer PCR	1X	2,5
$MgCl_2$	1.5 mM	2
dNTP`s	0.2 mM	2
Primer A	25 pico Moles	1
Primer B	25 pico Moles	1
Taq dna Pol	2.5 U	0,5
H_2O		14
Template DNA		2
	Total volume	25

Table 5 Initiators to amplify S. aureus

Author	Primers	Temple sequence	Lenght	Detect
Brakstad, O.G *et al* 1992	A and B	Gene *nuc*	270bp	*S. aureus*

Table 6. Initiators, gene to which they are addressed, fragment size and reference

Gene		Initiators		Literature
nuc	nuc-A	GCGATTGATGGTGATACGGGTT	281 pb	Brakstad, O.G, *et al* 1992
	nuc-B	AGCCAAGCCTTGACGAACTA AAGC		

Table 7 Condition of PCR

Activity	Temperature	Time	Cycles
Initial denaturation	94	1 min	1
Denaturation	94	30 seq	35
Alignment	58	30 seq	
Extension	72	30 seq	
Final extension	72	10 min	1

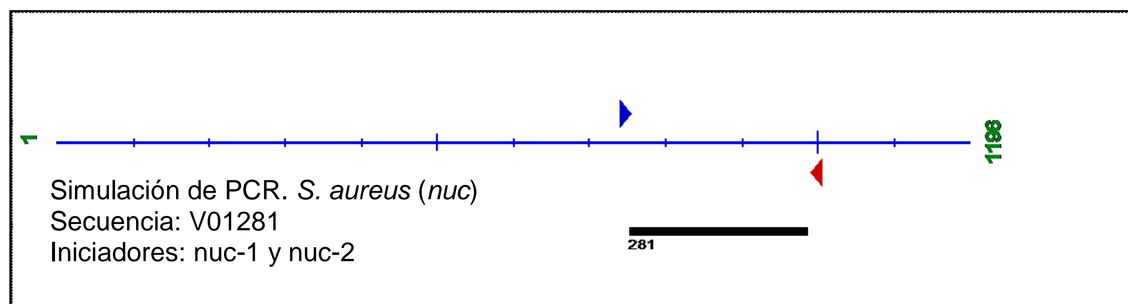

Figure 1 PCR simulations for each pair of primers used

Preparation of the sample for PCR (crude extract)
Each of the selected colonies was taken separately and were resuspended separately in 200 µl of buffer TE 1X pH = 8. Subsequently, they were incubated in a water bath at 100ºC / 10 min. Afterwards, DNA extraction was continued following the CETAB method, reported by Doyle. PCR reaction: A positive control of S. aureus strain ATCC 6538 and a negative control with water were included in the PCR reactions. Agarose gel electrophoresis: To visualize the results, the PCR products were fractionated on 1.5% agarose gel, stained with study bromide and observed in UV light transilluminator.

RESULTS We observed the amplification of a fragment of approximately 281 bp for the reference strain DNA, in the problem colonies that are presumptive for this microorganism it is expected to observe the same fragment if the colony is positive for such a test.

Graphic representation of the expected DNA fragments.

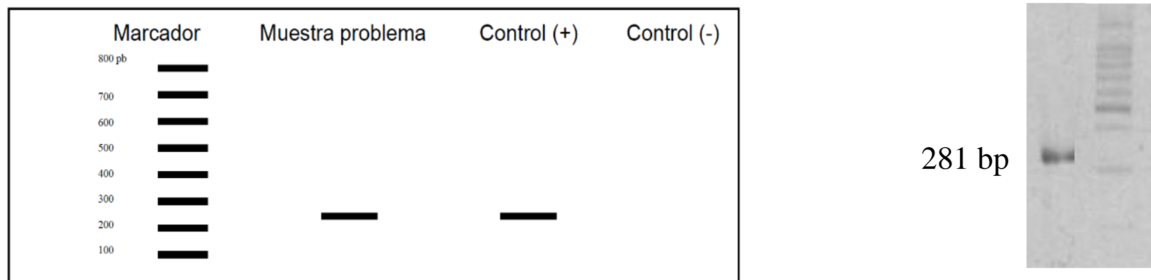

Figure No. 1. A Graphic representation of the expected DNA fragments, B PCR test

Calculations to obtain CFU / g CFU / g = (No. of suspicious colonies on plate x No. of PCR positive reactions) x Dilution factor x 10 Total number of colonies tested B. Positive amplifications

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7. http://www.who.int/mediacentre/factsheets/fs125/en/

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Genetic marker detection for *Listeria monocytogenes* in meat

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The recent importance for the detection of pathogenic microorganisms in meat and derivatives is due in large part to the increase that this has suffered from export and import both nationally and internationally. The Ministry of Health reports that meat and derivatives are the main vehicles that cause gastrointestinal diseases. Which is why it being necessary to establish ongoing surveillance programs, thus reducing health risks. An increasing number of reports have indicated that the application of the polymerase chain reaction (PCR) is reliable and quickly detects pathogens in food being a promising diagnostic tool for monitoring food safety. The PCR test presented here allows the identification of pathogenic microorganisms such as *L. monocytogenes*. The DNA is obtained by the CTAB method. The PCR reaction is carried out with a pair of primers which amplify a fragment of 420 pb of the hlyA gene which codes for listeriolysin O of *L. monocytogenes* as reported by Vines, A., et al. (1992), allowing the analysis with a maximum of 12 hours and presents excellent correlation with the conventional method of reference when naturally contaminated foods were analyzed.

INTRODUCTION: *Listeria monocytogenes*: Gram-positive, facultative anaerobic, mobile, bacillus or coconut-bacillus, non-spore-forming, occasionally looks like Chinese letters in Gram stain. PATHOGENESIS: Although the human gastrointestinal tract is the portal of entry of *L. monocytogenes* associated with food, the clinical picture of listeriosis is meningitis and / or septicemia. Host resistance to *Listeria* infection determines whether the disease occurs or not; the disease is most often associated with people. It is associated with people where cell-mediated immunity is compromised as in the elderly, in pregnant women, in premature children and AIDS patients (stillbirths). In susceptible people the infective dose is less than 100 bacteria. The most important aspect of the pathogenic property of the virulence of *L. monocytogenes* is β-hemolysin called listeriolysin. It has been shown that the loss of this hemolysin, which causes a decrease in the virulence of the bacteria, is accompanied by a loss of virulence. Other proteins involved in pathogenicity are internalin, which is involved in the invasion of host cells, phospholipase-a, metalloprotease and in the assembly of the actin protein. All the genes that code for these products are under the control of the prfA gene. A correlation has been observed between the production of hemolysin and phospholipase in *L. monocytogenes*. Only virulent strains are lipolytic. In rare cases *L. seeligeri* and *L. ivanovii* have shown to be pathogenic for humans; both are hemolytic, which differentiates them from the saprophytic species of *Listeria*. CLINICAL ASPECTS AND PROGNOSIS: Many healthy people who become contaminated with Listeria will probably have few or no symptoms. When Listeria enters as an opportunistic pathogen of the intestinal tract and causes disease, symptoms may include nausea, vomiting, abdominal pain and fever. In pregnant women the problem is little, but in babies it can reach septicemia. Healthy patients rarely develop serious types of listeriosis, would they have to be exposed to an excessive number of viable cells of *L. monocytogenes* or by rare strains of high virulence. INCIDENCE AND EPIDEMIOLOGY: Its incidence is low as evidenced by the 288 cases of listeriosis reported in England compared to

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the 30,000 cases of gastroenteritis due to *Salmonella spp* and *Campylobacter spp*. In contrast, the current incidence of *Listeria* in foods is high, very similar to that of classical enteric Gram-negative pathogens. Around the world, 7 large-scale, food-related listeriosis events occurred since 1981 when it was first confirmed that *L. monocytogenes* was the cause of food damage: 3 in North America, 2 in France, 1 in the United Kingdom, and 1 in Switzerland. Of these, 4 were involved in dairy products, 2 in pork and others in cole slaw. ECOLOGY: The organism is located and widely distributed in the environment, where it survives for long periods, this due to a number of factors such as its rapid growth at refrigeration temperature up to 0 ℃, survive drying and frozen and sensitive to treatment by heat. There is controversy in the literature regarding its survival to heat in the treatment of pasteurization of milk, remembering that this treatment is not a method of sterilization, but the technique is used to kill certain pathogens and only polluting organisms. Many studies have concluded that the D values (time to decrease the viable population in 10) are long compared with those of other food contaminating bacteria, where the temperature routinely adopted for pasteurization over the recommended timescale is adequate. The exception is with pasteurization with high temperatures and short times (HTST), which fail in the inactivation of *L. monocytogenes* when it occurs in large quantities in the samples. However, such numbers of organisms do not occur in practice, where only some animals excrete them so at the end they are diluted among all the milk collected. In addition to tolerating acidic conditions, *L. monocytogenes* is able to survive under conditions of high osmotic pressure, which has been shown to grow in foods with concentrations close to 10% sodium chloride. Its presence has been reported in feces of animals and humans and consequently in drainage; It has also been isolated in soil, water and vegetation. FOOD: Many cases of listeriosis have not been shown to be directly related to a known food source of *L. monocytogenes* and it is often difficult to differentiate between cases that are food related to and those that do not. Often are commonly isolated from raw meats and chili foods. Of particular interest are the high numbers of *L. monocytogenes* in certain types of soft cheeses and pâté. It has been found in fresh beef, pork, chicken, pasteurized and unpasteurized milk, pasteurized cheeses, ice cream, frozen seafood, pre-packaged salads, pre-cut vegetables and potatoes. CONTROL: *L. monocytogenes* it is particularly difficult to control once it is established in a food plant, because it is widely distributed in the environment where it can be multiplied, since it can grow under conditions that are usually adverse for most pathogens. Therefore, it is preferable to work on its prevention rather than to control it, good hygiene and disinfection practices are of great importance for this purpose.

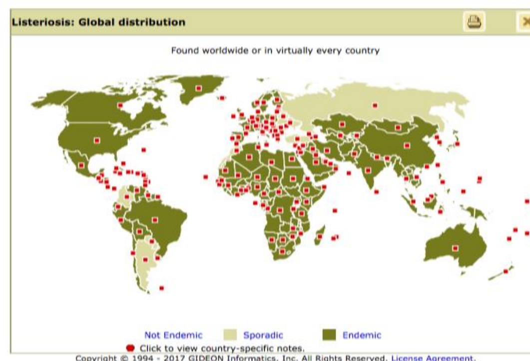

Figure 1 Global distribution of listeriosis. Guideon Font

Table 1 Listeriosis <Outbreaks>

1967: Australia
1969: New Zealand
1975: France, United States
1976: France
1977: South Africa, Sweden
1978: Australia, United Kingdom
1979: United States
1980: New Zealand
1981: Canada, New Zealand, Sweden
1983: Switzerland, United States
1984: Denmark
1985: Denmark, Kuwait, United States
1986: Austria, United States
1987: Switzerland, United Kingdom, United States
1988: Sweden, United States
1989: Canada, Costa Rica, Spain, United Kingdom, United States
1990: Spain
1991: Canary Islands
1992: France, New Zealand, Nigeria
1993: France, Italy
1994: Sweden, United States
1995: France, Switzerland
1996: Canada, France
1997: Italy, United States
1998: Finland, United States
1999: Finland, France, United Kingdom
2000: United States
2001: Japan, Saudi Arabia, Sweden, United States
2002: Canada, France, United Kingdom, United States
2003: Australia, Sweden, United Kingdom, United States
2005: Australia, Switzerland, United States
2006: Belgium, Brazil, Czech Republic, Germany
2007: Norway, United States
2008: Austria, Canada, Chile, Germany, United Kingdom, United States
2009: Australia, Austria, Czech Republic, Denmark, Germany, Italy, Portugal, Spain, United States
2010: Germany, United Kingdom, United States
2011: Belgium, Italy, Switzerland, United Kingdom, United States
2012: Australia, Finland, Germany, Ireland, Italy, New Zealand, Spain, United States
2013: Australia, Chile, Denmark, France, Spain, Sweden, Switzerland, United States
2014: Canada, Denmark, Macedonia, United States
2015: Canada, Denmark, Italy, Scotland, United States
2016: Canda, France, Switzerland, United States

Total of events: 162. Cases of total (approximate) outbreaks: 5,893

METHODOLOGY

Preparation of the sample

1. Weigh 25 g of meat and place in 225 ml of UVM-Modified broth.
2. Homogenize and incubate at 37 ºC for 24 hours.

DNA extraction

1) Take 1 ml of the sample and transfer to a 1.5 ml Eppendorf tube and centrifuged to obtain the pellet.
2) Re-suspend the pellet in 400 µl TE 1X pH 8.0
3) Inactivate microorganisms 5 min in boiling water and then cool at room temperature.

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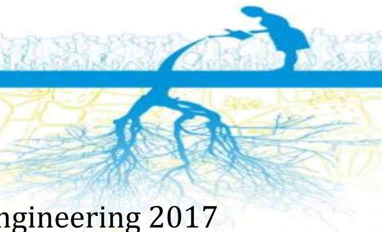


4) Add 50 µl of lysozyme (5 mg/ml), shake and incubate at 37 ° C for 1 h.
5) Add 75 µl of 10% SDS / proteinase K (75 µl of 10% SDS plus 5 -10 µl of proteinase K [10 mg/ml]), shake and incubate at 65 ° C for 10 min.
6) Add 100 µl of 5 M NaCl and stir.
7) Add 100 µl of CTAB / NaCl (this solution must be preheated to 65 °C and shake until the solution takes a milky consistency.) Incubate at 65 °C for 10 min.
8) Boil 5 min to inactivate enzymes.
9) Add 750 µl of chloroform/isoamyl alcohol solution (24: 1), shake to make a homogenous solution. and centrifuge at 10,000 rpm / 6 min.
10) Transfer the supernatant to a new tube (approximately 600 µl) taking care not to take the intermediate phase, as this may contaminate the DNA.
11) Add 0.6 volumes of isopropyl alcohol, to precipitate the nucleic acids, mix and incubate at -20 ° C / 30 min.
12) Centrifuge at 10,000 rpm / 15 min.
13) Discard most of the supernatant, leaving approximately 20 µl above the DNA button.
14) Add 1 ml of ice-cold 70% ethanol (keep it at -20 ° C).
15) Centrifuge at 10,000 rpm for 15 min. Discard the supernatant, leave 20 µl above the DNA.
16) Centrifuge at 10,000 rpm / 1.5 min.
17) Decant and let the DNA dry at room temperature (Approximately 20 min).
18) Resuspend the DNA in 20 µl of 1X TE or sterile bidistilled water and store at -20 ° C until use.
Note: For a rapid estimation of DNA concentration, 1 µl of 0.8% agarose gel can be run.
PCR reaction: Include in the PCR reactions a positive control strain of *L. monocytogenes* strain ATCC 7644 and a negative control with water.

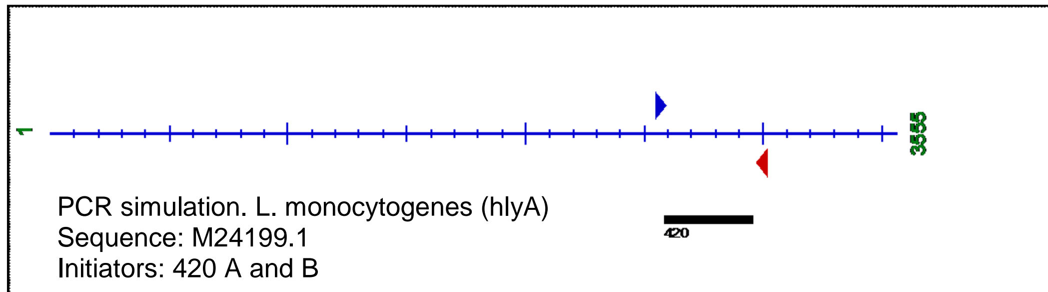


Figure 2 Simulation of PCR program Amplify

Table 2 Components of the PCR reaction

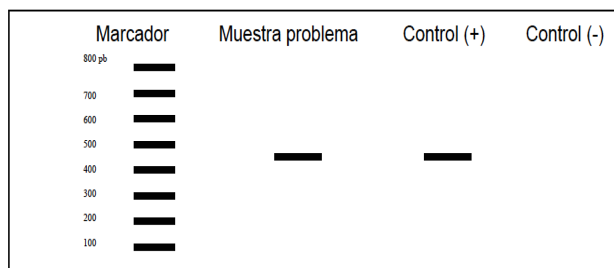
Component	Final concentration	Volume for a PCR reaction (µl)
Buffer PCR	1X	2,5
$MgCl_2$	1.5 mM	1
dNTP`s	0.2 mM	2
Primer A	25 pico Moles	1
Primer B	25 pico Moles	1
Taq dna Pol	2.5 U	0,5
H_2O		15
Template DNA		2
	Total volume	25

Table 3 Primers

Author	Primers	Temple sequence	Lenght	Detect
Vines *et al* 1992	420 A and Vines B	Gene *hlyA*	420bp	*L. monocytogenes*

Table 4 Condition of PCR

Activity	Temperature	Time	Cycles
Initial denaturation	94	1 min	1
Denaturation	94	30 seq	35
Alignment	58	30 seq	
Extension	72	30 seq	
Final extension	72	10 min	1



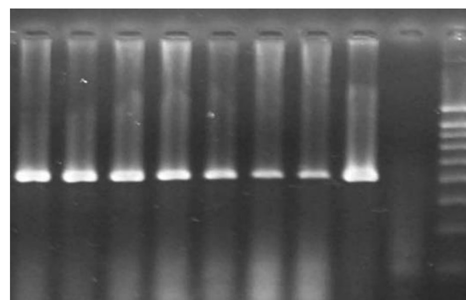


Figure 3 A. Graphic representations of the DNA fragments expected marker where it is shown the control problem (+) control (-) and B gene amplification.

Agarose gel electrophoresis: to visualize the results, fractionate the PCR products in 1.5% agarose gel, for a higher resolution of the amplification products can be fractionated in 10% polyacrylamide gel.

Expected results: in the reaction of PCR with primers 420 A and B, only the amplification of a fragment of 420 pb will be seen for the DNA of reference strain, in the test samples, it is expected to obtain a fragment of similar size if the pathogen is present. This fragment indicates the amplification of a part of the genome of *L. monocytogenes*.

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3 http://www.who.int/mediacentre/factsheets/fs139/en/

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Genetic marker for detection of *Brucella spp*

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The PCR test allows identifying all the *Brucella* species among which are *B. abortus, B. melitensis, B. canis, B. ovis, B. suis and B. neotomae.* This test uses specific primers designed in the sequence of the omp2 target gene present in all *Brucella* genus species.

INTRODUCTION:

The *Brucella* is Gram-negative coccobacilli from 0.5 x 0.6 to 1.5 microns, arranged in pairs, short or isolated chains; immobile, they do not produce capsule or spores. They are slow growing aerobes. Human isolates are catalase and oxidase positive, reduce nitrate and have a variable urease activity. The *Brucella* do not produce indole, nor liquefy the gelatin; they are able to hydrolyze urea and reduce nitrates, they can use citrate as the sole source of carbon and they are negative methyl red, in addition to growing in the presence of certain dyes and antibiotics. They can be agglutinated with monospecific serum and are susceptible to phage lysis. The majority are positive oxidase and catalase except *for B. ovis* and *B.canis*. Pathogenesis: *Brucella* can be transmitted to man through the ingestion of viable bacteria present in products of infected animals or through wounds when handling these animals or their products. It rarely occurs through the conjunctiva, blood transfusion or organ transplantation. Clinical Aspects and Prognosis: In the human, the incubation period varies from three days to several months and in most patients, the most remarkable feature is a weakness, more than 90% have fever and chills, sweating and anorexia. Sometimes generalized pains, nervousness, and depression can be manifested. The complications of brucellosis are attributed to granulomas that form in various organs and tissues such as the spleen, liver and bone marrow and even the joints and spine. The majority of patients with infection due to B. *abortus* have a self-limited disease, whereas *B. melitensis* is the most aggressive species in humans. *B. suis*, on the other hand, produces a condition that can be severe or chronic. Within the host, *Brucella* is opsonized and promote phagocytosis, multiplying intracellularly and thus can reach the ganglia and tissues. The survival of the bacillus is mediated by the inhibition of the degranulation of the polymorphonuclear leukocytes, which allows their multiplication, as well as their distribution to diverse places within the organism. INCIDENCE AND Epidemiology: These microorganisms are differentiated based on their reservoir, their growth properties, their biochemical reactivity, as well as the composition of the fatty acids present in their cell wall. Six species with their respective biovarieties (bv.) are recognized. *B. abortus* associated with cattle (with 7 bv.), *B. melitensis* related to goats and sheep (with 3 bv.), *B. suis* with a preference for pigs (with 5 bv.), *B. canis* that infects dogs, *B. ovis* causing infection specifically to sheep and *B. neotomae* to rodents. Man is susceptible to the first four species since it is considered that *B. ovis* and *B. neotomae* have low virulence, which restricts them only to certain hosts. Finally, a new *Brucella* isolated from marine mammals has been added to this group, which has been called *B. maris*. Within the latter species are distinguished strains from cetaceans and seals.

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Brucella cases by state of Mexico

Boletín Epidemiológico de México Semana 40
https://www.gob.mx/cms/uploads/attachment/file/264542/sem40.pdf

	Aguascalientes	Baja California	Baja California Sur	Campeche	Coahuila	Colima	Chiapas	Chihuahua	Ciudad de Mexico	Durango	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán	Morelos	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas
2016	7	16	4	5	188	10	70	38	4	27	92	6	3	73	203	13	37	138	25	237	4	17	61	209	10	2	92	55	90	2	104
2017	7	16	2	5	142	2	23	14	18	17	79	9	4	63	181	7	11	49	46	158	9	34	48	164	12	9	112	38	50	6	155

Figure 1 Brucella cases by state of Mexico Boletín Epidemiológico de México Week 40

Ecology: In Mexico, an average of 15,363 cases were recorded between 1990 and 1997, 94% of which were associated with the intake of contaminated foods such as cheese, milk and other dairy products.

Table 1 Brucellosis <Outbrakes>

1938: United States
1939: United Kingdom
1946: Italy
1948: United States
1957: Israel
1959: Italy, United States
1961: Russian Federation
1962: India, Liberia
1964: United Kingdom
1965: Italy, United Kingdom
1966: Germany
1967: India
1968: Italy
1970: United States
1974: United States
1976: Germany
1979: Australia, Nigeria, Turkey
1980: United States
1982: Germany
1983: Mexico, United States
1984: Italy, Spain, United States
1986: Canada
1987: Spain
1988: United States
1992: Russian Federation, United States
1994: Argentina, Spain
1995: China, Germany, Malta
1996: Spain
1997: Argentina, Israel
1998: Iraq, Japan, Spain
1999: India, Israel, Kazakhstan
2000: Italy
2001: Azerbaijan, Japan
2002: Russian Federation, Spain
2003: Italy, Republic of Korea, Russian Federation, Thailand
2004: Algeria, Croatia, Lebanon, Panama, Republic of Korea, Saudi Arabia, Serbia and Montenegro, Wallis and Futuna Islands
2005: Bosnia and Herzegovina, Bulgaria, Greece, Ireland, Italy, Kyrgyzstan, Russian Federation, Thailand, Uzbekistan
2006: Brazil, Bulgaria, Chile, Kyrgyzstan, Thailand
2007: Bulgaria, Georgia, Israel, Peru, Russian Federation, United States
2008: Azerbaijan, Bosnia and Herzegovina, Canada, Greece, Romania, Russian Federation, Spain, Sudan, Uruguay
2009: Argentina, China, Ireland, Lebanon, Mexico, Republic of Korea, Russian Federation, Spain, United States
2010: Argentina, Croatia, Germany, Ireland, Kazakhstan, Latvia, Russian Federation, Spain
2011: China, Israel, Kenya, Malaysia, Russian Federation, Somalia
2012: Argentina, Belgium, Bolivia, Canada, China, France, Mexico, Republic of Korea, Russian Federation
2013: Brazil, China, Croatia, Honduras, Panama, Syria
2014: China, Cyprus, Israel, Portugal, Russian Federation
2015: Algeria, Armenia, Bulgaria, Mexico, Russian Federation, Uruguay
2016: Algeria, China, Israel, Oman, Qatar, United States
2017: China, Mexico, Russian Federation, Spain

Total of infection foci: 172
Total outbreaks (approximate): 48,143
Source Guideon

People affected was 15 to 44 years old and of this 40 % reported the consumption of raw milk, another 40% reported having consumed fresh cheese and 4% other unpasteurized dairy products. Therefore, 84% acquired the disease due to the consumption of unpasteurized food. At the national level, the Health Sector Single Information System (Sistema Único de Información del Sector Salud) reported that in the period from 1998 to 1999, 5,807 cases were reported. The states with the highest incidence were Zacatecas, Sinaloa, San Luis Potosí, Puebla, Nuevo León, Guanajuato, Chihuahua, and Coahuila. Food: Raw milk and dairy products made with unpasteurized or improperly pasteurized milk such as yogurt, cream, and butter. CONTROL: Avoid as much as possible eating unpasteurized dairy products. It also exists for livestock, prepared vaccines from live attenuated strains. Among these is strain S19 and RB51 for cattle. A vaccine has also been applied in goats prepared from strain Rev-1 of *B. melitensis*.

METHODOLOGY:

The purposed DNA target will be obtained by means of phenol-chloroform purification method from 0.4 ml of milk or three portions of 0.2 g of cheese.

Protocol for extracting DNA from milk

1. Take a portion of cheese or 400 µl of milk (it is recommended to take from the fat layer) and place it in a 1.5 ml Eppendorf tube.
2.- Add 200 µl of lysis solution, 200 µl of saturated phenol and 200 µl of chloroform-isoamyl (24: 1)
3.- Mix in vortex and centrifuge at 10,000 rpm for 5 min.
4.- Separate the upper part and deposit it in a new tube. Add an equal volume of isoamyl chloroform (24: 1). Mix in vortex and centrifuge at 10,000 rpm for 5 min.
5.- Separate the upper part and deposit it in a new tube. Add 0.6 volumes of isopropanol, mix by inversion and freeze at -20 ° C for at least 2 hours (recommended overnight).
6.- Centrifuge at 10,000 rpm for 5 min. Throw supernatant and add 1 ml of 70% ethanol "iced". Mix by inversion and centrifuge at 10,000 rpm for 5 min.
7.- Discard supernatant and place the tubes in inverted position until alcohol is evaporated.
8.- Resuspend the DNA in 20 µl of ultrapure water and store in freezing until its use in PCR.

PCR reaction

Include in the PCR reactions a positive control of *B. abortus* strain (S19) and a negative control with water or milk negative to *Brucella*.

Table 2 Components of PCR

Component	Final concentration	Volume for a PCR reaction (µl)
Buffer PCR	1X	2,5
$MgCl_2$	1.5 mM	1
dNTP`s	0.2 mM	2
Primer Bru 1	25 pico Moles	1
Primer Bru 3	25 pico Moles	1
Taq dna Pol	2.5 U	0,5
H_2O		15
Template DNA		2
	Total volume	25

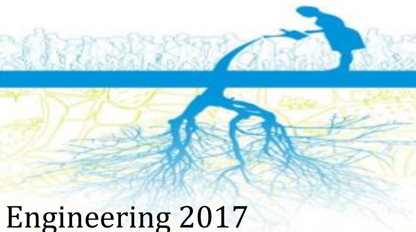

Table 3 Primers

Author	Primers	Temple sequence	Lenght	Detect
Leal Klevezas y cols 1995	Bru 1 y bru 3	Gene *omp2*	200bp	*Genero Brucella*

Table 4 Condition of PCR

Activity	Temperature	Time	Cycles
Initial denaturation	93	1 min	1
Denaturation	93	30 seq	35
Alignment	60	30 seq	
Extension	72	30 seq	
Final extension	72	10 min	1

Agarose gel electrophoresis to visualize the results, fractionate the PCR products in 1.5% agarose gel. The gel can be stained at the end of the electrophoresis with a 0.5 X TBE solution containing 0.5 µg / ml ethidium bromide. For a higher resolution of the amplification products, they can be fractionated in 10% polyacrylamide gel.

Expected results

The amplification of a 200 bp fragment will be seen for the reference strain DNA and in the test samples. This fragment of 200 pb indicates the amplification of a part of the genome of organisms of the genus *Brucella*

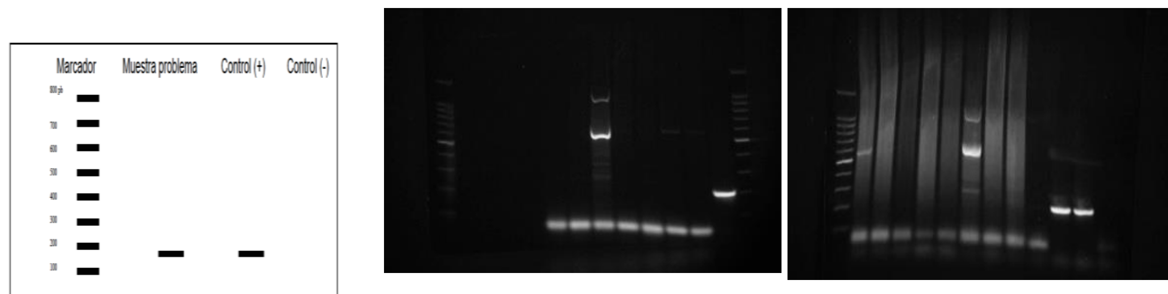

Fig No. 2. Graphic representation of the expected DNA fragments. PCR with primers Bru1 and Bru3 and gels with positive results.

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ange the future of migration. Invest in food security and rural development.

Mycobacterium tuberculosis genetic marker from paraffin-embedded tissues

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The PCR test allows the identification of *Mycobacterium tuberculosis* complex, including *M. bovis, M. tuberculosis, M. africanum and M. microti*. The DNA can be obtained from 3 cuts of 5 microns (µm) thickness of tissue embedded in paraffin by means of two types of extraction (a) Crude extract and (b) Phenol-chloroform purification. The test is performed using the Nested-PCR technique, with primers that recognize the insertion sequence IS6110. The first PCR was performed with a pair of external primers and the second PCR was performed with another pair of internal primers, which recognize the fragment amplified in the first PCR reaction as DNA template to increase the sensitivity of the test, thus avoiding false negative results.

Keywords: safety, PCR, tuberculosis

INTRODUCTION: Mycobacteria are thin, straight or slightly curved bacilli, with rounded ends, aerobic and not sporulated. They measure 0.3 - 0.6 µm wide and 1 to 10 µm long and degrade sugars through the oxidative pathway. The mycobacteria have a generation time of 16 to 20 h and an optimum growth temperature of 30 to 45 ° C. The colonies can be visible in 2 days or up to 8 weeks after inoculating the microorganism in an appropriate medium and incubated at 35-37. ºC. Some species produce carotenoid pigments and form colonies ranging from yellow to orange and sometimes pink. Sometimes these pigments are produced in the absence of light, but some mycobacteria require photoactivation to produce them. Growth-time characteristics separate mycobacteria in slow-growing organisms and relatively fast-growing organisms. Photoactivation separates them into three groups; photochromogens (they produce pigment in the presence of light), scotochromogens (they produce pigment in the absence of light) and not photochromogens (they do not produce pigment in light or in darkness).

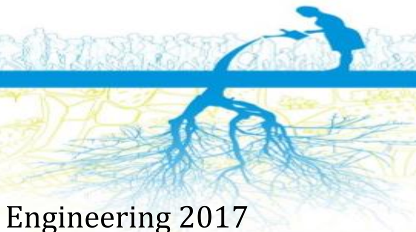
The lipid concentration of its cell wall constitutes 20 to 40% of the dry weight and is rich in mycolic acids. This makes them impermeable to the dyes used in Gram staining, but they are able to form stable complexes with dyes derived from arylmethane such as fuchsin or auramine. The mycolic acids of the cell wall retain the dye even after exposing the preparation to a solution of acid-alcohol or strong inorganic acids. This resistance to discoloration is known as acidic alcohol resistance and this characteristic of mycobacteria is exploited in the Ziehl Neelsen stain. The typical colonies are cream-colored, rough with a cauliflower-like appearance that develops on the surface of the medium and the medium does not change color. PATHOGENESIS: The most common form of pulmonary tuberculosis in humans occurs when inhaled mycobacteria suspended in particles of 1 to 5 µm, which pass to the lungs and tracheobronchial lymph nodes. From the lungs, the bacteria can spread to other organs or tissues and is capable of producing extrapulmonary tuberculosis. When the mycobacteria enter the digestive tract, they penetrate through the mesenteric ganglia and the intestinal wall and into the liver through the portal system;

the ganglia can spread to other tissues. Most of the foci are microscopic and many disappear; however, in some cases they may progress to the characteristic form of tubers. Miliary tuberculosis is an acute form of general dissemination and production of small tubers. Other clinical manifestations include cervical adenitis, skin infection, and meningitis.

CLINICAL ASPECTS AND PROGNOSIS: Tuberculosis does not seem to affect populations of wild animals, as long as there is no contact with cattle or humans. Mainly the respiratory route does the transmission of the bacillus between animals and humans. The proof of this is that most of the lesions observed in cattle are found in nodes of the respiratory tract and in the lung parenchyma. *M. bovis* is responsible for a percentage of cases of human tuberculosis in countries with infection in their livestock, which varies with the application of hygienic measures of protection, such as pasteurization of milk and control of exposed workers. The first contact of the tubercle bacillus with a virgin organism causes a non-specific inflammatory lesion called "inoculation canker". Its location will depend on the entrance door (usually respiratory or digestive). The bacilli are transported inside the macrophages or free by the lymphatic route to the regional lymph nodes, causing a lesion of the same type as the initial one (adenitis or satellite lymphangitis). The association between the initial lesion in the entrance door and the regional nodule constitute what is called the "primary complex". This can be incomplete or dissociated, when one of the elements is absent or goes unnoticed by the naked eye [15, 16]. The primary complex can evolve in different ways, one of which can be towards healing; This usually happens in man, and may or may not leave a scar and then it is said that there was a bacteriological cure. Another is stabilization (latent focus), where the evolutionary process can stop and remain latent for months, years and even throughout the individual's life. It is necessary to remember that for different circumstances, there may be a reactivation of this latent process and then evolve towards the secondary or postprimary period.

INCIDENCIA Y EPIDEMIOLOGIA

In our country, the Unique System for Information on Epidemiological Surveillance (Sistema Único de Información para la vigilance Epidemiológica) revealed that there were 16,455 new cases of respiratory tuberculosis in 1998 and 13,930 in 1999. And Tuberculosis in 2016, 13,454 cases in 2017, 12,882 cases and other forms of Tuberculosis in 2016 there were 2689 and 2017 2744 cases. The states with the most cases were Veracruz and Aguascalientes. The States with the lowest incidence were: Tlaxcala, Zacatecas, Morelos, and Campeche.



Mycobacterium tuberculosis

Epidemiological Bulletin of Mexico Week 40

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	Aguascalientes	Baja California	Baja California Sur	Campeche	Coahuila	Colima	Chiapas	Chihuahua	Ciudad de Mexico	Durango	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán	Morelos
2016 Tuberculosis	26	1373	125	125	336	117	860	452	346	136	171	853	128	544	203	118
2017 Tuberculosis	21	1361	134	97	355	117	824	465	403	126	156	785	82	536	185	106
2016 otras formas	25	317	17	14	58	14	128	99	177	54	60	67	25	219	52	43
2017 otras formas	16	300	24	14	63	25	102	80	203	50	79	65	33	188	66	40

	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas
2016 Tuberculosis	197	1016	229	335	114	229	231	655	795	563	850	26	1468	167	32
2017 Tuberculosis	197	894	427	254	72	317	193	649	709	529	749	19	1545	167	35
2016 otras formas	42	163	74	140	46	33	88	110	82	42	48	9	23	20	22
2017 otras formas	57	130	89	111	72	48	94	100	73	67	59	9	229	36	19

Figure 1 *Mycobacterium tuberculosis* cases by states of Mexico Epidemiological Bulletin of Mexico Week 40

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ECOLOGY: *M. tuberculosis* complex consists of *M. tuberculosis, M. bovis, M. africanum* and *M. microti*, slow-growing non-photochromogenic mycobacteria. These organisms cause a similar disease, characterized by the formation of granulomas. *M. tuberculosis* affects man and has a worldwide distribution. *M. bovis* causes tuberculosis in cattle, humans, primates, cats, pigs, and parrots. In humans, it causes a condition that is indistinguishable from that caused by *M. tuberculosis* and *M africanum*. The differentiation of these microorganisms is based on some physiological tests and biochemical tests. FOOD: Tuberculosis was decreasing in most countries; however, since 1980, there was an increase in the global number of cases and deaths due in part to the migration of sick people and the appearance of Acquired Immune Deficiency Syndrome (AIDS). The importation of animals, extreme poverty, marginalization and lack of pasteurization of milk, among others, cannot be ruled out as favorable conditions for the passage of this microorganism from animals to man.CONTROL: In 1943, streptomycin was administered for the first time for the treatment of tuberculosis. Subsequently aminosalisílico acid in 1949, isoniazid in 1952, pyrazinamide in 1954, cycloserine in 1955, ethambutol in 1962 and rifampicin in 1963. With these discoveries dramatically decreased the incidence of this disease in the United States of America (USA) to the extent that it was estimated that tuberculosis would be eradicated in that country in the year 2000. The BCG vaccine strain of *M. bovis* was developed in the Pasteur Institute between 1906 and 1919 by passing a wild strain of *M. bovis* through a series of cultures, first vaccines used in humans in 1921. From then to 1927 more than 100 million infants were vaccinated. Studies show that BCG vaccine provides protection against military and meningeal tuberculosis in children. In these cases, an efficiency of 46 to 100% has been reported, but less protection against pulmonary tuberculosis has been reported. On the other hand, the strategy for the control and eradication of tuberculosis in cattle is based on the tuberculin test, followed by the sacrifice of positive carriers. These strategies, when the prevalence of herd infection is very low (less than 1%), are effectively replaced by tracking from slaughterhouses to establishments of origin of the animals in which tuberculosis lesions were detected. This requires the identification of each animal and a high quality in veterinary inspection, which leads to the obtaining of animal products for human consumption free of this microorganism, with the important purpose of preventing its transmission through food.

METHODOLOGY:

DNA extraction protocol from tissue embedded in paraffin

1. Take four slices of 5-micron of tissue embedded in paraffin. Place the 1 and 2 cuttings in a 1.5 ml tube, and in another tube sections 3 and 4. With the tube where the first two slices were placed (1 and 2) a crude extract is obtained.
2. Centrifuge at 10,000 rpm for 2 or 3 min.
3. Add 200 µl of 5% Tween 20 buffer.
4. Boil the tubes for 10 min. Subsequently, place them one minute in liquid nitrogen for freezing.
5. Do again step No. 3 again. Subsequently, allow the tubes to boil for 10 min.
6. Centrifuge at 7,000 rpm for 20 min.
7. Take 7 µl of the supernatant to perform the PCR reaction.

PCR reaction: Include in the PCR reactions a positive control of *M. bovis* strain (AN5) and a negative control with water or negative tissue.

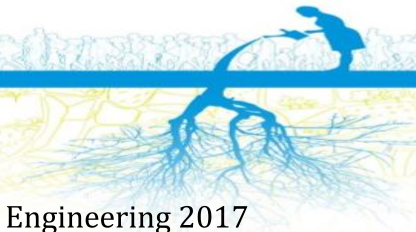

Table No. 1. 1st. Reaction (external initiators)

component	Final concentration	Vol µl for 1 reaction of PCR
PCR buffer	1X	2,5
MgCl2	1 mM	1
dNTPs	0.2 mM	2
primers	25 picomol	1
Enzime Taq DNA pol	2.5 U	0,5
H2O		10
DNA extract		7
	Total vol	25 µl

Table No. 2. 2nd Reaction

component	Final concentration	Vol µl for 1 reaction of PCR
PCR buffer	1X	2,5
MgCl2	1 mM	1
dNTPs	0.2 mM	2
primers	37,5 picomol	1,5
Enzime Taq DNA pol	2.5 U	2,5
H2O		13
DNA product from first PCR		2
	Total vol	26 µl

Table No. 3. Primers

Autor	primers	Sequence	for
Wilson et al 1993	TB294, TB950, TB505 and TB670	IS 6110	Mycobacterium complex
Miller et al 1997	M1 and M2	IS 6110	Mycobacterium complex
Talbot et al 1997	ET2and ET3 for 150 bp	RDI	Mycobacterium complex and BCG strain
Talbot et al 1997	ET1 and ET3 for 200 bp	RDI	Mycobacterium complex and BCG strain
Talbot et al 1997	BCG	RDI	Mycobacterium complex and BCG strain

Table No. 4. Thermocycler program

Temperature ºC	Time	No. cycles
94	10 min	1
94	45 seg	50
72	2 min:15 seg	
72	10 min	1
10	Time indefinite	

Agarose gel electrophoresis: To visualize the results, fractionate the PCR products in 1.5% agarose gel. For a higher resolution of the amplification products, they can be fractionated in 10% polyacrylamide gel. The gel can be stained at the end of the electrophoresis with a 0.5X TBE solution containing 0.5 µg / ml ethidium bromide.

EXPECTED RESULTS: PCR reactions were carried out with primers M1 and M2 (Miller et al., 1997), with which a fragment of 123 pairs of the base (bp) is generated, indicating the presence of the genome of species of the *M. tuberculosis* complex.

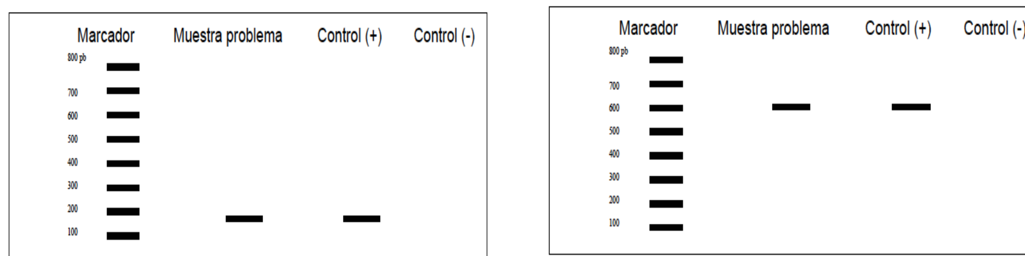

Figure No. 2. A. Graphic representation of expected DNA fragments by PCR with external primers. B. PCR with internal initiators.

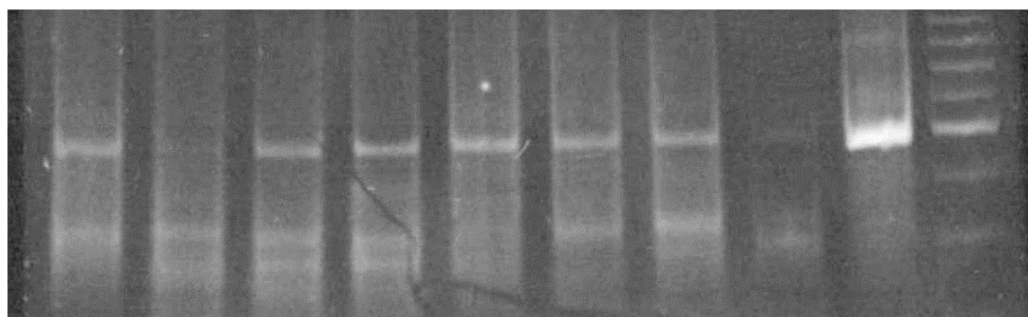

Figure No. 3. Agarose gel electrophoresis of PCR products. Amplifications from paraffin-embedded tissue samples with the primers of Miller et al., 1997. Lanes 1 to 8 = amplifications from paraffin-embedded tissue samples, Lane 9 = amplification from DNA of reference strain (AN5) and M = molecular weight marker Ladder 25.

CONCLUSIONS: PCR showed to be useful to confirm the presence of *Mycobacterium tuberculosis* species from paraffin-embedded tissue samples.

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X Nonthermal Processing	124

Modificación fisicoquímica de la soya por molienda mecánica de alta energía para su posible uso en medios de cultivo

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RESUMEN
La molienda mecánica de alta energía es un método físico que se utiliza para el procesamiento de materia en estado sólido que puede llevar a la modificación fisicoquímica (Wieczorek-Ciurowa and Gamrat., 2007). Es uno de los métodos más empleados en diversas industrias. Por otro lado, la soya es una de las materias primas con mayor uso comercial, particularmente en el área de los alimentos. En la mayoría de estos procesos, la soya es modificada por procedimientos químicos o enzimáticos que son costosos y de difícil recuperación (Cromwell, 2012). Por lo tanto, el objetivo de este trabajo fue modificar fisicoquímicamente la soya empelando molienda mecánica de alta energía como un proceso barato, rápido y que no genera contaminantes.

METODOLOGIA:
La molienda se realizó en dos molinos planetarios de bolas el Pulverisette 7 y PM400/2, tomando como estándar soya entera (SE), soya triturada (ST) y harina de soya (HS) con y sin hidrólisis ácida. Las condiciones de molienda fueron para el Pulverisette 7: 4 y 15 bolas de 20 y 10 mm de diámetro respectivamente, 2 tazones de 80 mL a 600 rpm en tiempos de 5, 10, 20 y 40 min. Para el PM400/2 se utilizaron 9 bolas de 20 mm de diámetro, 2 tazones de 250 mL a 400 rpm a 2, 3, 4, 5, 10 y 20 min y para ambos molinos se empleó como material de molienda acero inoxidable. La concentración de azúcares reductores se hizo empleando el método descrito por Wood et al., (2012). El análisis estructural se realizó por microscopia electrónica de barrido (Jeol JSM-6390 LV) y difracción de rayos X (Bruker AXS D8 Advance).

RESULTADOS:
Los resultados indicaron que la HS fue la que obtuvo la concentración más alta antes y después de la hidrólisis (Figura 1 línea punteada).La comparación de azúcares reductores para los dos molinos planetarios de bolas Pulverisette 7 (fondo azul) y PM 400/2 (fondo rojo) se muestran en la Figura 1. En el molino Pulverisette 7 se observó mayor concentración de azúcares en los tiempos más cortos y con bolas de menor tamaño a diferencia del PM 400/2. Este efecto puede ser atribuido a que el molino Pulverisette 7 genera mayor energía provocando mayores cambios

en las concentraciones (Gotor et al., 2013). El análisis morfológico para el Pulverisette 7 (Figura 2 a) mostró que hubo reducción del tamaño de partícula, aglomeración y fracturas en la superficie, así como también formación de estructuras tipo cristal. Mientras que en el PM 400/2 (Figura 2 b) hay una continua reducción de tamaño de partícula, asociado con la concentración de azúcares reductores de estas muestras. El análisis estructural por difracción de rayos X de la soya, indicó que tienen patrones de difracción característico de un material amorfo (Martino *et al.,* 2011). A los 5 minutos de molienda en Pulverisette 7 hay un incremento de la intensidad del pico observado alrededor de 21°. Esta reflexión está asociada al ordenamiento de los polisacáridos solubles de la soya y ha sido reportada por muchos autores (Loh *et al.*, 2015; Salarbashi *et al.*, 2016) (Figura 3 a). Por el contrario, en PM 400/2 no hay cambios significativos en la cristalinidad de las muestras (Figura 3 b). La molienda mecánica de alta energía incrementa la concentración de azúcares reductores en la soya, además de generar cambios estructurales como la formación de aglomerados y el incremento en la cristalinidad. Dichas concentraciones varían en función del modelo del molino que está directamente relacionada con las energías que estos liberan. Haciendo a la soya tratada con molienda mecánica candidata para su posible uso como sustrato no convencional, por ejemplo su empleo en medios de cultivo.

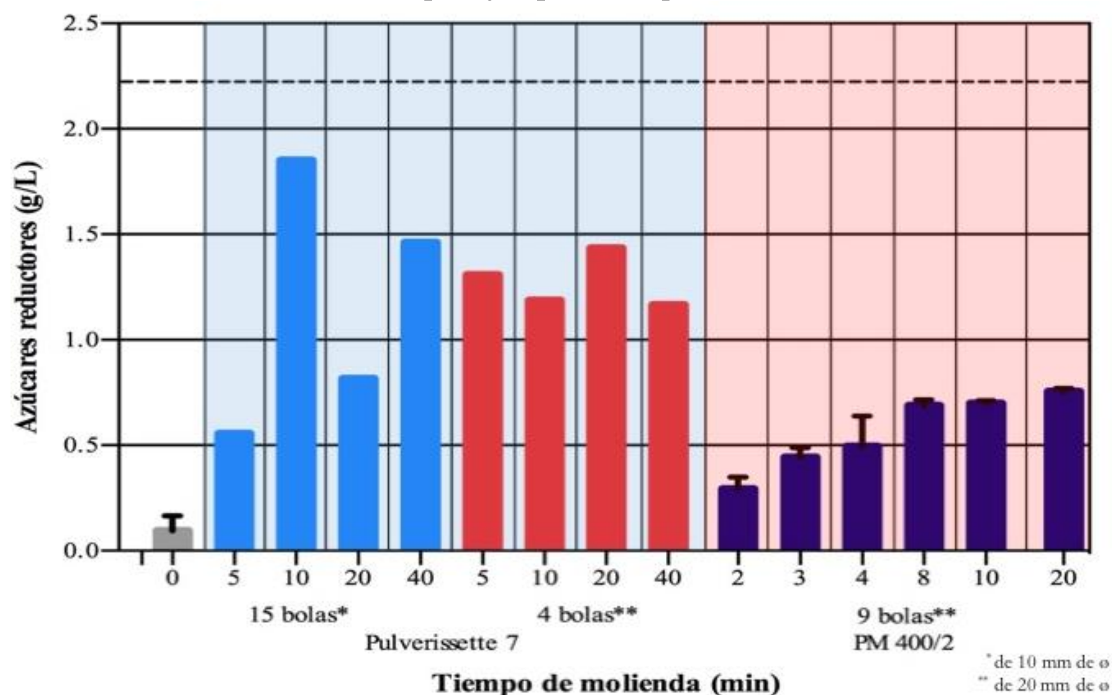

Figura 1. Concentración de azúcares reductores en soya entera con diferentes tiempos.

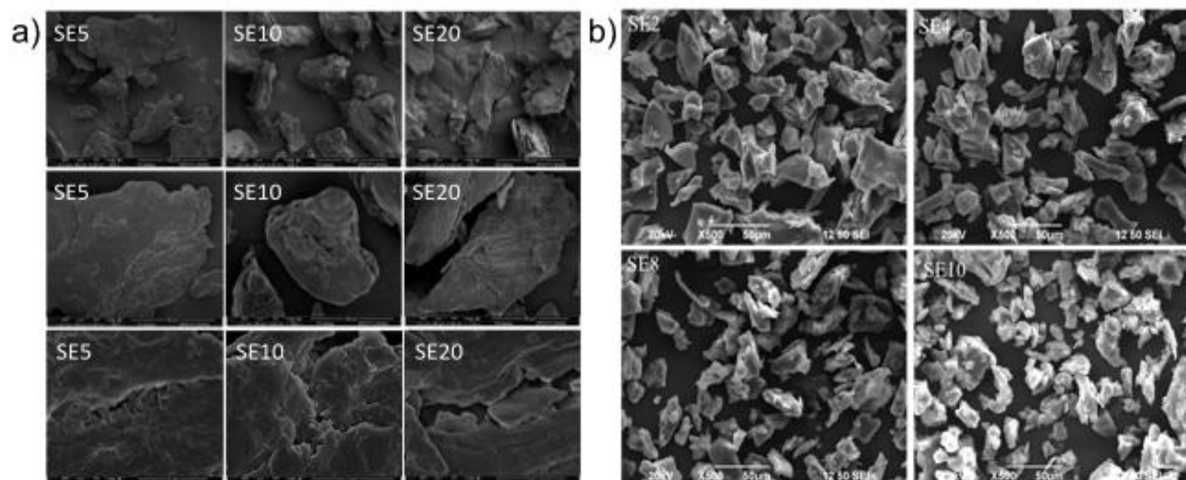

Figura 2. Microscopia electrónica de barrido de muestras de soya en el molino a) Pulverisette 7 y b) PM 400/2.

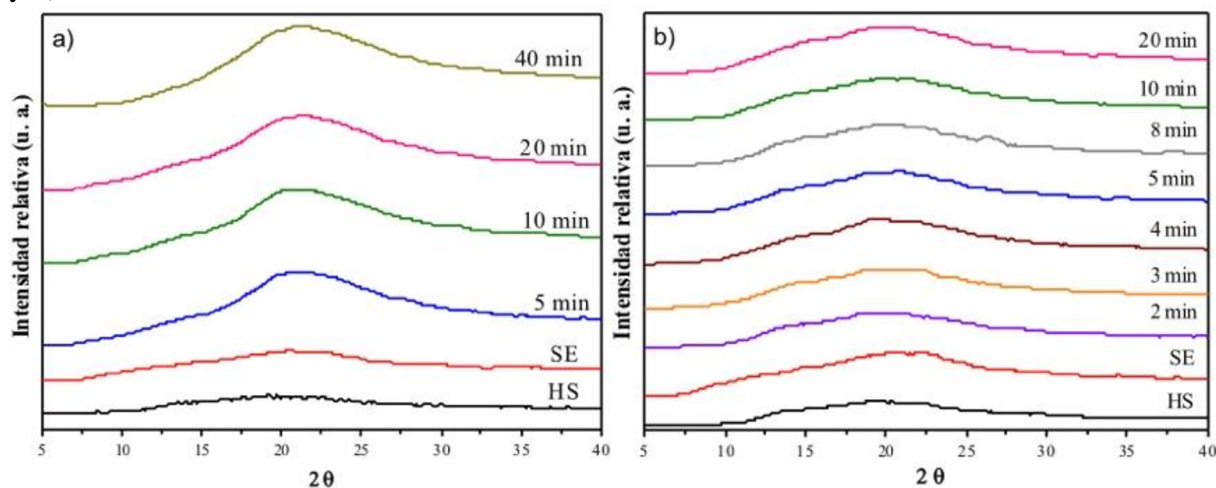

Figura 3. Difractogramas de muestras de soya en a) Pulverisette 7y b) PM 400/2.

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Elaboration of gummies from honey bee (*apis mellifera*)

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ABSTRACT
The honey is a sweet substance produced by bees from the nectar of the plants. Two samples of bee honey (Apis Mellifera) harvested in February and May of 2017 in Amatlán de los Reyes were collected, physicochemical parameters were determined, gummy formulation was established, color and texture were measured (Brookfield CT3 using TA39 Cylinder geometry) applying a standard test. The honey presented dark brown color due to the origin, ºBrix shows an unadulterated honey and the low pH values help to avoid deterioration as far as the flavor and texture, for the gummies a higher maximum load was required for the honey test harvested in February and this was related to the peak of deformation of 11.6 mm, likewise for the one of May it required greater amount of energy to deform the sample and the force of adhesion.

KEYWORDS: Honey ● gummy ● *Apis mellifera* ● texture.

INTRODUCTION

The production of honey in Mexico is a relevant activity of the livestock subsector, due to the generation of jobs and income in the agricultural sector, as well as its contribution of foreign currency. In the period from 2005 to 2015 the average annual production was 58 thousand tons, which fluctuated between 55 and 62 thousand tons, while exports stood at 42.1 thousand tons by 2015. This has placed Mexico as the eighth largest producer in the world and the third exporting country. (Martínez-González E. et al., 2017).

Apiculture is an alternative source of livelihood for many resource poor farmers, but despite the favorable natural environment and the potential for sustainable livelihoods in rural areas, often lacks the financial and technological support needed to fully exploit their large conservation potential of forests and natural ecosystems and reduce poverty. (Affognon H.D. et al., 2015).

Compared to other agricultural companies, apiculture is a low-cost enterprise with the potential to have a tremendous impact on improving the livelihoods of households and the national economy. There are opportunities in both the domestic and export markets. However, inefficient technologies, poor knowledge, environmental degradation and low production are some of the key challenges facing the subsector (Affognon H.D. et al 2015).

With respect to the internal marketing of honey, the beekeeper sells little to the final consumer, and the price he receives usually depends on the number and market power of the agents involved in the process. The most extensive commercial channel is the one that includes the industry, which uses honey as an ingredient for the elaboration of foods such as cereals, yogurts, sweets and breads; or as a raw material for the tobacco industry and cosmetology, which increasingly occupies more products such as pollen, propolis and royal jelly. (Magaña, M.A., et al., 2012). Honey is understood as the natural sweet substance produced by Apis mellifera bees from the nectar of the plants or secretions of living parts thereof or excretions of plant-sucking insects which remain on living parts thereof and which the bees collect, transform and combine with specific substances of their own, and deposit, dehydrate, store and leave in the honeycomb so that it matures and ages. (Moguel Ordóñez, Y. B., et al., 2005). The chemical composition of honey depends mainly on the plant sources from which it is derived, but also on the influence of external factors such as climate, extraction and storage management. (Moguel Ordóñez, Y. B., et al 2005).

Gummies are consumed comfits spread among people of different ages but mainly by children. The formulation of this product requires sugar that contributes to its flavor and consistency, although with the undesirable effect of increasing its glycemic index and calories from simple sugars; it is known that the consumption of products with the last two characteristics are related to childhood obesity, which is a growing disease worldwide. (Aranda-Gonzalez et al., 2015).

That is why the objective is to make honey bee gummy (Apis Mellifera) that is produced in the municipality of Amatlán de los Reyes projecting a product with added value and trying to diversify the local products derived from honey.

MATERIALS AND METHODS

Two bee honey samples (Apis Mellifera) harvested in the months of February and May of 2017 were collected in the municipality of Amatlán de los Reyes, belonging to the State of Veracruz. These raw materials were measured physicochemical properties as pH using a Hanna Instruments Marker potentiometer and for soluble solids a digital atago refractometer. Color measurements were performed and a Konica Minolta CR-400 meter was used. To measure the apparent viscosity of honey samples, the Brookfield viscometer model DV-II + Pro was used and the selected spindle was No. 6, since all the values were in a torque range of 10 - 100% for a time of two minutes at room temperature.The hydration of 80 g grenetine is carried out with 238 g of water for 30 minutes. 250 g of water are heated and dissolved in 50 g of glucose and 194 g of honey, this syrup is kept under heating until the temperature of 112-125 ° C is reached for 10 min. Reached temperature is removed from the fire and added hydrated grenetine and mix perfectly. The mixture is poured into the molds and allowed to cool for about 60 minutes under refrigeration at 10 ° C. It was planned to obtain a rectangular gummy with a weight of 28 g and a height of 3 cm. Color measurements were performed and a Konica Minolta CR-400 colorimetry meter was used as well as texture tests on the two formulations of gummies using a Brookfield CT3 Texturometer, with a TA39 Cylinder geometry type and with normal test (a test normal

starts a single cycle of understanding when the operator presses the start button. Starting in the opposition where the firing charge is measured, the probe descends in the programmed position), start force 6 g, deformation of 15 mm and speed of penetration 1.5 mm/ s.

RESULTS AND DISCUSSION

Physicochemical characteristics of honey bee Apis Mellifera harvested.
The first sample harvested in February 2017 was obtained from xochitl trees with white flowers, the honey presented a dark brown color and presented a homogeneous liquid consistency. The second sample harvested in May 2017, the nearby crops were coffee and sugar cane, had a homogeneous semisolid consistency. The physicochemical results obtained in the different honey samples are described in Table 1.

Table 1. Results of Brix degrees and pH º of each one of the samples of honey.

Determination / Sample	February	May
°Brix	78.8	80.3
pH	4.76	4.39
Viscosity	13570	48200

Habib et al., 2014 in his work presents the values of ° Brix can be a reliable index of adulteration. The analyzed samples presented ° Brix without significant differences, that oscillated between 79.0 to 84.10 (average = 80.95 ± 1.60). The results obtained in the present study suggest that the honey samples used in the present study are most likely unadulterated, similarly. The pH of the honey should be low to avoid microbiological contamination. The pH values of the honey samples studied averaged 4.76 ± 0.55, and the range was 3.99 ± 0.02 to 6.33 ± 0.02, values acceptable and comparable with those obtained in other works.

In this work the information is presented in table 1 and show values of 78.8 and 80.3 very similar which shows that there is no adulteration of honey. With respect to the honey the values are low between 4.39 and 4.76 reason why they are ratifying results. Feás et al., 2010 mention with respect to pH that it is a parameter who correlates with the storage of honey and with the growth of microorganisms that could change the texture and stability of honey.

Color and texture characteristics of honey bee-gummy
The results obtained of color and texture in the samples and of gummies are described and the information is presented in table 2 and 3, respectively.

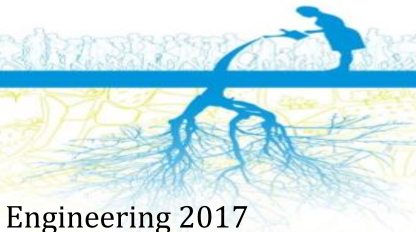

Table 2. Color results of each of the honey samples and the product obtained.

Units of color	February Honey	February Product	Units of color	May Honey	May Product
L*	21.05	22.99	L*	18.53	21.85
a*	1.87	2.57	a*	2.00	1.7
b*	6.16	5.78	b*	2.61	2.37

The color characteristics are presented in Table 2, which summarizes the means, standard deviations and ranges of the parameters L /, a / and b /, obtained with the Hunter colorimeter for honey samples. The color of the honeys was amber light to dark, with reddish or green tint. Habib et al., 2014 in their study showed that samples H16 and H6 had the highest average values of the L / parameter indicating lightness, 35.49 ± 0.17 and 13.77 ± 0.24, respectively, whereas H7 and H15 had the lowest mean values of the parameter L /, 5.03 ± 0.04 and 5.74 ± 0.17 respectively. The honey samples analyzed had red, yellow and green components: green components (values / negative values) for H9, H7, H2, H3, H14. On the other hand, H16 and H6 also had the highest mean values of parameter b / value at 36.54 ± 0.17 and 16.02 ± 0.13, respectively. In general, the parameters L /, a / and b / of the honey samples analyzed showed significant variations between the color parameter.

Table 3. Results of texture tests of the two products

	Product February	Unit	Product May	Unit
Maximum load	135	G	122.5	g
Peak deformation	11.6	mm	8.7	mm
Work	10.49	mJ	11.26	mJ
Final load	101.5	G	107	g
Grip strenghth	37	G	82	g
Adherence	2647.82	mJ	7924.53	mJ

For the products a maximum load was required for the test of the gummy of harvested honey in the month of february and this was related to the peak of deformation of 11.6 mm the information is presented in table 3, also the second product required more energy to deform the sample and the adhesion strength, which is related to the viscosity shown in Table 1.

CONCLUSIONS

The results demonstrate the need for a diversification of local bee products, establishing quality parameters through color and texture tests. The results show that the honey with a better sweetness is the honey harvested from cane based on its origin, being the one less consumed

locally by its perished with molasses, obtaining an alternative to the commercialization of the local honey.

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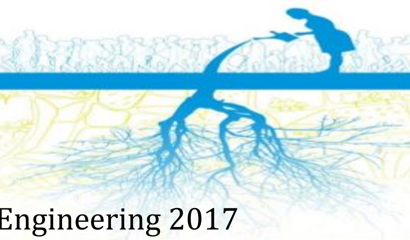

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Diseño de una bebida fermentada de suero lácteo, cáscaras de piña y panela

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RESUMEN
Se diseñó una bebida fermentada a partir de suero lácteo, cáscaras de piña y panela, con el objetivo de aprovechar los nutrientes que contienen, de manera que se agregue valor a estos subproductos que son considerados pérdidas económicas y factores de contaminación. Los experimentos se basaron en técnicas artesanales para la elaboración del tepache en conjunto con antecedentes de productos derivados del suero lácteo. En cada etapa de la elaboración se consideraron los controles de calidad e inocuidad necesarios y con base a esto se obtuvo un diagrama de proceso, se realizó un diseño de experimental completamente al azar de cuatro tratamientos, en los que cada formulación estuvo compuesta por 3 L de suero, 1 kg de cáscaras de piña, 5 g de levadura tomando como variable la concentración de panela en 0%, 3.75%, 6.25%, 15%. Con la finalidad de medir la aceptación, se realizó una prueba hedónica, a cien consumidores, con una escala de nueve puntos concluyéndose que la concentración del endulzante es un factor que influye sobre la preferencia del consumidor. Se estandarizó el diagrama de proceso y se realizó un análisis financiero, concluyendo que la bebida puede aportar beneficios al sector agroindustrial así como al mercado de las bebidas alcohólicas fermentadas.

PALABRAS CLAVE: •Fermentación alcohólica, •subproducto, •suero lácteo, •contaminación, •sustentabilidad.

INTRODUCCIÓN

Durante mucho tiempo en la rama de industrias alimentarias, se ha buscado diferentes maneras de aprovechar la totalidad de las materias primas del proceso, las mermas en la producción siempre son un punto a controlar y con la reutilización de estos desechos alimentarios se busca la creación de nuevos productos, el suero de leche es una fuente de proteína de alta calidad ya que contiene en promedio: 25 % de las proteínas de la leche, 8 % de la materia grasa y alrededor 95 % de la lactosa; por lo menos el 50 % en peso de los nutrimentos de la leche se quedan en el suero lácteo (Inda , 2000). En México desde que las fábricas comenzaron el procesado del queso aproximadamente en el año 1870, el suero lácteo producido es cerca de 1 millón de toneladas y contiene 50 mil toneladas de lactosa y 5 mil toneladas de proteína verdadera. (Saddoud *et al.,* 2007). Una industria quesera media que produzca diariamente 40,000 litros de suero sin depurar genera una contaminación diaria similar a una población de 1,250,000 habitantes (Leticia *et al.*, 2009). Este foco de contaminación aunado con la innovación de productos agregando un valor

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nutricional demandado por las distintas necesidades de los consumidores, ha motivado a los ingenieros en alimentos a competir por la elaboración de estos productos con valor agregado. Es de suma importancia destacar las grandes cantidades de cáscara de piña que se generan en la agroindustria tomando en cuenta que por pieza de piña el 45 % es cáscara (Chabela, 2009), debido a que esta porción no es considerada en elaboración de productos como: jaleas, mermeladas y jugos. La utilización de la cáscara se reduce solo a elaboración de bebidas fermentadas de forma artesanal como el tepache, sin valorar las aportaciones de fibra dietaria y antioxidantes (Larrauri *et al*., 1995). La panela se adiciona como dulcificante y sustrato, ya que es un producto alternativo en el sector cañero. Esta se obtiene del jugo de caña de azúcar, el cual es evaporado para obtener un líquido viscoso denominado melaza y sometido a un proceso de solidificación, convirtiéndose en un tipo de azúcar que es muy consumido en América Latina, Filipinas y Asia (Micaela, 2014). Considerando las propiedades anteriormente descritas se elaboraron pruebas para adaptar el proceso del tepache tradicional utilizando principalmente el suero lácteo como fuente de agua y nutrientes, para realizar la fermentación.

MATERIALES Y MÉTODOS

Se recolectó el suero lácteo de la localidad de Cuitláhuac, Veracruz, para este fin se utilizaron garrafones estériles de 20 litros, y se consideró con una frescura de no mayor de 12 horas, posteriormente se realizaron pruebas fisicoquímicas de °Brix con un refractómetro digital ATAGO® modelo PAL-3; pH con potenciómetro marca Conductronic® modelo PC45; acidez titulable total mediante el método volumétrico como lo indica la NOM-155-SCFI-2003 esto para asegurar la viabilidad tecnológica y tratar térmicamente a 75°C por 1 minuto. La cáscara de piña se recolectó en bolsas plásticas estériles con una frescura de no más 12 horas, se observó que estuviera libre de materia extraña y se desinfectó con hipoclorito de sodio (NaOCI) a una concentración de 50 a 100 mgL^{-1}. La panela se adquirió en tiendas de abarrotes de la región, envasada herméticamente en plástico. Se utilizó levadura *Saccharomyces cerevisiae* en presentación de 11 g de la marca Tradi Pan®.

Se planteó un diseño de experimentos completamente al azar en donde se plantearon 4 formulaciones tomando con variable la concentración de panela. La hipótesis establecida fue que el nivel del edulcorante afectaba la aceptabilidad de los consumidores. Las formulaciones se conformaron por 3 L de suero, 1 kg de cáscaras de piña, 5 g de levadura y las distintas concentraciones de panela como se muestran en la Tabla 1.

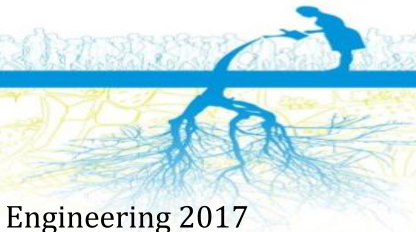


Tabla 1. Porcentaje de panela añadida a la fórmula.

Formulaciones	**Concentración de panela (m/m)**
F0	0%
F1	3.75%
F2	6.25%
F3	15%

Las formulaciones se fermentaron en recipientes estériles de 5 L de capacidad cerrados herméticamente con trampa de agua para permitir emisiones de CO_2 a través de una manguera transparente de medio metro de longitud con diámetro interior de 0.5 centímetros y 0.7 de diámetro exterior. La fermentación alcohólica se realizó durante 24 horas a 25±1°C, pasado este tiempo las formulaciones fueron clarificadas con un cedazo filtrante. El producto fue envasado en recipientes estériles de 450 mL y pasteurizados por inmersión a 75°C durante un minuto. Al producto terminado se le realizaron los mismos análisis fisicoquímicos que al suero lácteo en la recepción así también se determinó el contenido de proteínas (NOM-155-SCFI-2012), la concentración de lactosa (NOM-155-SCFI-2012), densidad (NMX-F-737-COFOCALEC-2010) y el índice de insolubilidad (NMX-F-183-1986). Se realizaron determinaciones microbiológicas de contenido de hongos y levaduras (NOM-111-SSA1-1994), coliformes totales (NOM-113-SSA1-1994) y mesófilos aerobios (NOM-092-SSA1-1994). Las formulaciones fueron evaluadas por cien catadores no entrenados de acuerdo a un formato de prueba hedónica en escala de 9 puntos que va desde me disgusta muchísimo, pasando por ni me gusta ni me disgusta hasta llegar a me gusta muchísimo. La estimación del precio de venta de los productos se realizó a partir de los costos fijos, variables y de producción; considerando factores como la capacidad de producción de la maquinaria, la cual es de 1000 L. Asimismo se tomaron como referencia los precios de venta de productos competencia como la cerveza, malteadas y bebidas proteicas a fin de evaluar la brecha entre estos y los de suero lácteo.

RESULTADOS Y DISCUSIÓN

A continuación, se presenta los resultados de los análisis físicos químicos al suero lácteo en la recepción:

Tabla 2. Especificaciones fisicoquímicas del suero lácteo.

ANÁLISIS	ESPECIFICACIÓN FISICOQUÍMICA
Acidez Titulable (%)	0.07 a 0.12
pH	6.4 a 6.7
°Brix	8.8 a 9.0

En la Tabla 3, se presentan los resultados de los análisis fisicoquímicos al producto terminado:

Tabla 3. Análisis fisicoquímicos del producto terminado.

ANÁLISIS	**F0**	**F1**	**F2**	**F3**
° BRIX	8.1	8.7	9.1	9.8
pH	4.30	4.37	4.57	4.80
ACIDEZ (gL^{-1} de Ácido Láctico)	0.60	0.6075	0.6145	0.630
PROTEÌNA (%)	0.845	0.859	0.864	0.870
LACTOSA (gL^{-1})	4.33	4.34	4.32	4.33
DENSIDAD (gmL^{-1})	1.0240	1.0260	1.0240	1.0250
ÍNDICE DE INSOLUBILIDAD	0.3	0.3	0.4	0.4

En la Tabla 4 se presentan los resultados de los análisis microbiológicos al producto terminado:

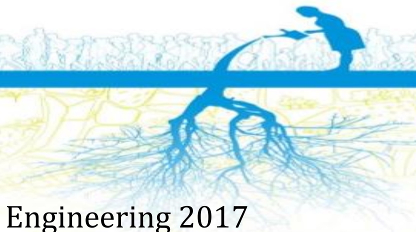
Tabla 4. Análisis microbiológicos de producto terminado.

ANÁLISIS	**F0**	**F1**	**F2**	**F3**
HONGOS ($UFCmL^{1}$)	<1	<1	<1	<1
LEVADURAS ($UFCmL^{-1}$)	<1	<1	<1	<1
COLIFORMES TOTALES ($UFCmL^{-1}$)	0	0	0	0
MESÓFILOS AEROBIOS ($UFCmL^{-1}$)	80	80	90	70

Los resultados de la prueba hedónica fueron comparados en la Figura 1.

Figura 1. Gráfica circular de resultados de la prueba hedónica.

En la Figura 1, se observa que la formulación 3 fue la más aceptada por los consumidores. Posteriormente se presenta la diferencia de medias con un nivel de significancia de 0.05 para



evaluar las hipótesis. H_o: Los evaluadores no perciben diferencia del contenido de panela entre las formulaciones. H_i: Más de uno nota la diferencia del contenido de panela entre las formulaciones. La comparación se presenta en la Tabla 5 donde los promedios de aceptación de las formulaciones fueron: F0= 6.15±1.58, F1= 5.91±1.61, F2= 6.47±1.78, F3= 7.18±1.66.

Tabla 5. Comparación de medias.

F0 vs F1	6.15 ± 1.58^a	5.91 ± 1.61^a
F0 vs F2	6.15 ± 1.58^a	6.47 ± 1.78^a
F0 vs F3	6.15 ± 1.58^a	7.18 ± 1.66^b
F1 vs F2	5.91 ± 1.61^a	6.47 ± 1.78^b
F1 vs F3	5.91 ± 1.61^a	7.18 ± 1.66^b
F2 vs F3	6.47 ± 1.78^a	7.18 ± 1.66^b

El análisis estadístico de los resultados de la prueba sensorial mostró preferencia por las bebidas en donde se empleó una mayor concentración de endulzante. Debido a esto se descartaron las formulaciones F0, F1 y F2 debido a la predilección de la formulación F3. Contemplando los resultados se diseñó un diagrama de flujo de proceso como se muestra en la Figura 2.

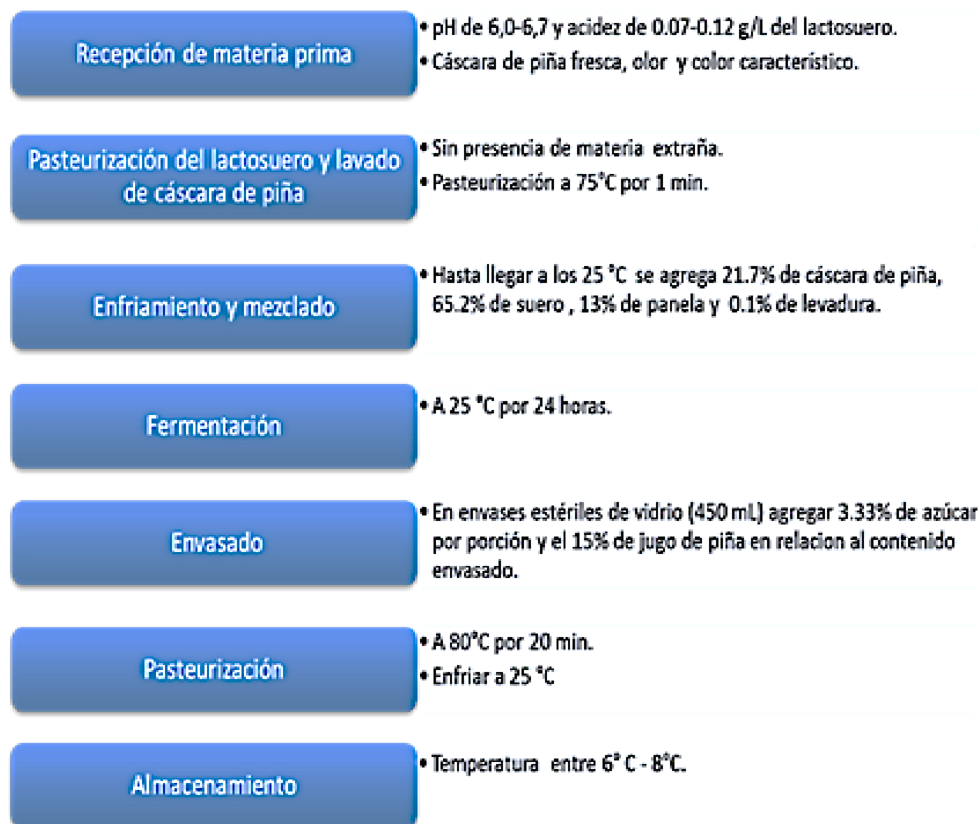


Figura 2. Diagrama de flujo del proceso estandarizado.

Los resultados del análisis financiero indican que la bebida es rentable con un precio de 17 pesos por pieza. Se estimó el punto de equilibrio a los 5 meses de producción del primer año.

CONCLUSIONES

La bebida es aceptada por las personas que participaron en la prueba hedónica, la formulación F3 con un 15 % de panela influye en el agrado del consumidor, además de que las materias primas utilizadas agregan valor nutrimental al producto fermentado que al mismo tiempo reduce la contaminación al no ser desechados, convirtiendo a la bebida en un alimento funcional, sustentable que puede traer beneficios al medio ambiente, al consumidor y la economía del país.

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Abstract

III	Food Engineering	140

Sintonización de controladores óptimos PI y evaluación mediante herramientas de decisión multi-criterio para un sistema inestable

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Palabras Clave: PI, optimización multi-objetivo, algoritmos evolutivos

INTRODUCCION: A pesar del desarrollo de una amplia gama de estrategias de control, el controlador Proporcional-Integral-Derivativo (PID) sigue siendo una de las estructuras de control más populares y ampliamente utilizadas en la industria. La tarea de sintonización (ajuste) de controladores puede ser abordada mediante un proceso de optimización. Es decir, se sintonizan sus parámetros a partir de una función de coste, de manera que se pueda obtener la respuesta deseada de un sistema en lazo cerrado. Los controladores PI(D) pueden ser aplicados en el área de la industria química, por ejemplo, en el control de (bio)reactores. Los (bio) reactores, generalmente son sistemas con un comportamiento no-lineal y en algunos casos presentan multiplicidad de estados estacionarios con comportamiento inestable. Un ejemplo de este tipo de sistemas inestables es el bioreactor de Cholette que ha tenido gran interés por la comunidad de control (trabajos sobre este tema son los desarrollados por M. Chidambaram). **OBJETIVO:** Sintonizar y evaluar controladores óptimos PI para un sistema inestable utilizando optimización multi-objetivo y herramientas de decisión multi-criterio. **METODOLOGÍA:** La sintonización de controladores PI en un estado estacionario inestable se lleva a cabo en tres etapas principales. 1) La definición del problema como multi-objetivo: En esta investigación se define de la siguiente forma:

$$\min J(k_p, k_i) = [ITSE_{servo}\ ITSE_{regulatorio}\ TVU_{servo}\ TVU_{regulatorio}] \qquad (1)$$

2) Proceso de optimización multi-objetivo. 3) Etapa de toma de decisiones y posteriormente evaluación numérica de las soluciones potenciales. **RESULTADOS:** Se hizo el comparativo en dominio del tiempo con el controlador PI propuesto por *Shariati y cols.,* (2014). Los valores de $ITSE_{servo,regulatorio}$, $TVU_{regulatorio}$ para controladores propuestos dominan al control que sirvió de comparativo. **CONCLUSIONES:** Los controladores PI obtenidos mediante optimización multi-objetivo muestran un mejor desempeño que el control que sirvió de comparativo en diferentes regiones del frente de Pareto y por simulación numérica.

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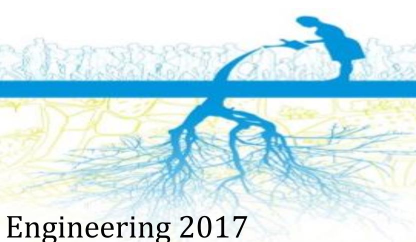

IV	Food Health & Nutrition	141

Temas de la FAO abordados mediante la optimización multi-objetivo: Descripción de funciones objetivo

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PALABRAS CLAVE: Optimización multi-objetivo, FAO, funciones objetivo, algoritmos de optimización.

INTRODUCCIÓN La Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO, por sus siglas en inglés) tiene como objetivos principales la erradicación del hambre, la inseguridad alimentaria y la malnutrición a nivel mundial. Incluso muchos de los temas son complementarios a los cinco principios de la Alimentación y Agricultura Sustentables. Las prioridades de la FAO pueden abordarse en diferentes áreas del conocimiento: social, ciencias exactas, económico, biológico y multidisciplinario. Específicamente, en el ámbito de las ciencias exactas están la ingeniería y la tecnología donde se encuentra el área de investigación operacional. Algunos temas de la FAO se han abordado desde un punto de vista de optimización multi-objetivo.

OBJETIVO El objetivo principal de esta investigación es realizar una revisión bibliográfica crítica sobre los temas de la FAO que han sido abordados mediante la optimización multi-objetivo, específicamente sobre las funciones de costo.

METODOLOGÍA Para esta revisión bibliográfica se consultaron trabajos de investigación recientes del 2014 a 2017 sobre optimización multi-objetivo y los temas de la FAO enfocándose principalmente a *qué* problemática están resolviendo mediante una función de costo.

RESULTADOS Se ha observado que la optimización multi-objetivo ha abordado los siguientes temas de la FAO: Agricultura /Desarrollo sostenible, Agricultura/Suelos, Agricultura/Cadena de suministros y Agricultura/Semillas considerando en algunos casos restricciones, modelos determinísticos y diferentes algoritmos de optimización. Se ha encontrado del análisis efectuado que son pocos los trabajos que utilizan herramientas de visualización y decisión y falta abordar algunos temas específicos como el de mecanización.

CONCLUSIÓN El enfoque de problemas específicos en el contexto de la optimización multi-objetivo es una forma útil y eficaz de tener soluciones potenciales que resuelvan un problema.

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Consumo de alcohol etílico como factor de riesgo en el desarrollo de Cáncer oral. Meta-análisis

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PALABRAS CLAVE: Cáncer, Carcinogénesis**,** Alcohol, Nutrición

INTRODUCCIÓN: El consumo de alcohol en México se ha convertido en problema de salud pública, forma parte de las enfermedades crónico-degenerativas y perjudica al 13.1 % de la población. El hábito del consumo excesivo de alcohol está ligado a un desconocimiento en la nutrición personal y no proporciona ningún aporte a la salud individual. El etanol (CH3-CH2OH), es el componente activo de las bebidas alcohólicas y su consumo tiene repercusiones en el organismo, principalmente en los sistemas nervioso, cardiovascular y digestivo. En la cavidad oral se manifiestan signos clínicos, que van desde un mayor índice de caries, y sialosis hasta desarrollo de leucoplasia y eritroplasia; por tanto el consumo crónico de etanol está asociado epidemiológicamente con un riesgo elevado de cáncer oral y tracto gastrointestinal superior[1], ya que la enzima alcohol deshidrogenasa-3 (ADH-3) la cual está presente en la microflora oral y en la mucosa, convierte el etanol en acetaldehído, que posee potencial carcinogénico[2]. La Organización Mundial de la Salud estima que el cáncer oral es uno de los más prevalentes a nivel mundial y con una presentación elevada en personas jóvenes (menos de 45 años); tan solo en el Instituto Mexicano del Seguro Social entre los años 2010 y 2012, se evaluaron 410 pacientes con cáncer oral, lo cual representó el 10% de todos los tumores de cabeza y cuello. El incremento en el consumo de tabaco y alcohol en la población mexicana, especialmente en individuos jóvenes según reportes del INEGI, hace prever que el diagnóstico de ésta enfermedad será más frecuente, alertando sobre el problema de salud que implicará para la población mexicana en los próximos años[3].

OBJETIVO: Describir los efectos del consumo de alcohol con el riesgo de desarrollo de cáncer oral.

METODOLOGÍA: Para evaluar la asociación entre el consumo de alcohol y el desarrollo de cáncer oral, se realizó una revisión de artículos epidemiológico-clínicos del año 2010 al año 2017. Un total de 3 estudios fueron consultados con un total de 10 casos, encontrando una elevada relación del consumo de alcohol y el desarrollo de cáncer en cavidad oral, faringe, esófago y laringe; encontrándose riesgo severo de desarrollo en pacientes que conjuntamente consumen tabaco. La búsqueda de los artículos través de plataformas como EBSCO, OVID, MEDIGRAPHIC. Las publicaciones fueron agrupadas de la siguiente manera i) casos y controles ii) cohorte iii) casos clínicos.

RESULTADOS: Se encuentra un mayor riesgo de presentación de cáncer oral en aquellos pacientes con ingesta de alcohol a razón de 25g por día; así mismo las bebidas como la cerveza que contiene nitrosodimetilamina (C2H6N20); el vino y destilados que contienen diferentes tipos de Taninos (C14H14011) cuando se compara el tipo de alcohol con la cantidad de carcinógenos, se observa que los «licores oscuros» como el whisky, el ron añejo y el coñac, contienen mayor

proporción de carcinógenos éster y acetaldehído que los licores ligeros (vodka, ginebra, ron claro); la proporción de cáncer hipofaríngeo y de laringe supraglótica es mayor en los consumidores de alcoholes oscuros; los consumidores de vino y cerveza tienen mayor proporción de cáncer de la cavidad oral

DISCUSIÓN: El acetaldehído, primer metabolito del etanol, ha sido identificado como carcinogénico en animales, por lo que cualquier aumento en su concentración puede repercutir sobre la mucosa oral debido a atrofia epitelial y aumento de la permeabilidad lo que predispone el tejido a efectos carcinogénicos. Cabe destacar que la mayor parte de los autores coinciden en afirmar que la asociación del consumo de alcohol y tabaco aumenta el riesgo de desarrollo de cáncer oral en una cuantía mayor que lo que supondría la suma de sus efectos.

CONCLUSIÓN: La promoción de salud desempeña un papel muy importante para contrarrestar la fase inespecífica de la enfermedad, es decir, anteponerse al desarrollo de los factores de riesgo (como el consumo de alcohol) que favorecen su aparición, y debe precisarse sobre los conocimientos de utilizar al máximo la epidemiología del riesgo para mejorar la eficiencia de la promoción y la prevención de padecer lesiones premalignas y malignas en la cavidad oral.

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XI	Product Development	**143**

Desarrollo y grado de aceptación de una bebida fermentada probiótica funcional mediante el uso de residuos de cascarilla de café de la región nororiental del Estado de Puebla

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Área: Product Development ; Categoría: Licenciatura.

En los países productores de café, los residuos y sub-productos del café constituyen una fuente de grave contaminación y problemas ambientales. Por ese motivo se ha tratado de inventar métodos de utilizarlos como materia prima para la producción de productos de interés humano (alimentos, etc.). El objetivo de este trabajo fue formular una bebida fermentada a base del producto de lixiviación de la cascara de pulpa de café y piloncillo. Se realizaron diferentes formulaciones denominadas como C910, C851, C820 y C752, partiendo de las formulaciones A (panela:agua) y B (lixiviado de café) y microorganismos fermentadores en una relación 1:4. Todas las bebidas fueron sometidas a un análisis sensorial, donde se evaluaron las propiedades sensoriales sabor, aroma, color, entre otros parámetros en tres escalas: agradable, moderadamente agradable y desagradable. La lixiviación de Rosas y Ríos (2015) fue realizada bajo algunas modificaciones de temperatura y extrayente en una concentración 1:1 (cascara de pulpa de café: agua), esto para garantizar la extracción de ácido cafeico contenido en la cascara de pulpa de café. Las evaluaciones sensoriales realizadas se basaron en la selección de 20 individuos (panelistas) entrenados con una etapa teórico-práctica previa a la selección, a cada juez se le presento una bandeja con las 4 soluciones ordenadas en forma aleatoria con códigos numéricos escogidos al azar, un vaso de agua potable para neutralizar y la hoja de respuestas. Los resultados en el desarrollo y estandarización de la bebida fermentada demostraron que la formulación de la bebida C820 alcanzó un 85% de aceptación por los jueces, por encima de las demás (C910 (1.5%), C851 (9.5%) y C752 (4%)). Los aspectos más notados por los panelistas fueron el dulzor, tipicidad, acidez, consistencia y color. Las consideraciones sensoriales se identificaron partir de un ANOVA obteniendo diferencias significativas entre cada formulación ($p>0.05$) mediante el paquete estadístico *Statgraphics*.

PALABRAS CLAVE: bebida fermentada, piloncillo, lixiviación, evaluación sensorial, panelista.

Caracterización funcional de una bebida probiótica con compuestos nutraceuticos y propiedades antioxidantes

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Área: Product Development; Categoría: Posgrado.

La oferta mundial de bebidas funcionales y-o nutracéuticos es un sector alimentario con un gran auge en los últimos años. Las bacterias probióticas y los frutos proporcionan metabolitos biofuncionales, fomentando las bebidas fermentadas, como el tepache (bebida fermentada mexicana) al cual se le atribuyen beneficios a la salud. El objetivo del trabajo fue caracterizar funcionalmente una bebida con beneficios probióticos a partir de la cuantificación de compuestos nutraceuticos (polifenoles, flavonoides y capacidad antioxidante). El estudio se realizó en una bebida preparada de pulpa de cascara de café, piloncillo y *kéfir* de agua. Para efectuar la apreciación objetiva de la caracterización funcional de la bebida, fue necesario realizar las determinaciones analíticas pertinentes. Se tomó la muestra y se sometió a extracción metanólica, para estos ser analizados mediante Cromatografía de Capa Fina (CCF) para establecer las diferencias en la composición de los extractos. Adicionalmente a la CCF se evaluaron algunos parámetros químicos mediante métodos espectrofotométricos y se analizó la actividad antioxidante *in vitro* (Radical DPPH). Se determinó el contenido de polifenoles y flavonoides totales en la muestra. La CCF demostró la presencia de ácido gálico, catequina y resveratrol en la bebida, esto de acuerdo a los controles colocados en la placa, cada uno de ellos muestra tiempo de retención significativo con respecto a los controles ($p \leq 0.05$), comprobado con los parámetros químicos. El contenido de compuestos fenólicos en la bebida fue de 113.16±3.55 mg AG.; este valor fue representativo a equivalentes con el ácido gálico (AG) y correspondiente al contenido de capacidad antioxidante, el cual arrojo un valor de 4.28 µMol ET/ g muestra. Los datos obtenidos en los ensayos de actividad antioxidante y contenido fenólico mostraron un coeficiente de correlación r^2; sobre 0.99. El análisis estadístico y las gráficas se efectuaron en el paquete estadístico MINITAB 14.

PALABRAS CLAVE: Funcionales, probióticos, tepache, fenoles, capacidad antioxidante, kéfir de agua, cromatografía, espectrofotométricos.

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Caracterización físico-química y microbiológica de una bebida probiótica funcional obtenida por la transformación de azucares a partir de zoogleas (*tibicos o kéfir* de agua)

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Área: Product Development; Categoría: Licenciatura.

Se denomina Kéfir de agua o tibicos (*Zoogleas*) al cultivo simbiótico benigno de bacterias y levaduras adaptadas al agua que consume azucares para su desarrollo. Tradicionalmente los granos kéfir han sido usados por cientos de culturas en la antigüedad, en el Tíbet, China, sin embargo el efecto de la adición de estos microorganismos en bebidas no fermentadas no se ha estudiado ampliamente, y por ello el objetivo del presente estudio fue reportar la caracterización físico-química y microbiológica de la bebida fermentada terminada. La bebida se preparó siguiendo la metodología y los estándares de buenas prácticas de manufactura (Lobato, M.-Chuzeville, C., 2017). Los ensayos consistieron en el control y medición de los ºBrix sólidos solubles totales (SST), acidez titulable (AT) y pH, durante un tiempo de almacenamiento de 51 días. Las pruebas microbiológicas consistieron en la identificación de microorganismos *probióticos* además de indicadores sanitarios de calidad (*Coliformes totales y fecales*). Los SST se mantuvieron estables durante el tiempo de almacenamiento (4°C), ya que a dicha temperatura no se permite la fermentación enzimática y los azucares no fueron transformados por los microorganismos (12-11.5°Brix). Los valores de pH y AT mostraron un comportamiento no proporcional (inverso), sin embargo no fueron significativos ($p \leq 0.05$); el valor de pH mostro una variación (pH 4.17), pero fue menor a 0.1 unidades (no representativa). Las pruebas microbiológicas demostraron presencia de lactobacilos y levaduras con aplicación probiótica (medio semi selectivo MRS) con una formación de $1x10^8$ UFC/mL en cada una de las bebidas fermentadas. Los indicadores de higiene permitieron garantizar un diagnostico positivo mediante el análisis de correlación entre los microrganismos, mostrando un 87% fuera del límite permitido para mesofilos coliformes, por lo que ninguna muestra analizada contiene la cantidad necesaria para producir una intoxicación. Se empleó el *Statgraphics* con dos replicas ($p \leq 0.05$).

PALABRAS CLAVE: Kéfir (tibicos, zoogleas), físico-química, probióticos, fermentación enzimática, ºBrix, UFC (Unidades formadoras de colonias).

We thank you all for coming!

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