

Journal of the American

Herbalists Guild

Committed to Excellence in Clinical Botanical Medicine and Herbal Education Since 1989

Volume 15 | Number 1 | Spring 2017

On Digestion

Formulation, Probiotics
Crohn's Disease, Yellowroot

Hippocrates'
Nature Cure Diet

The Spleen in
Traditional Medicine

SPECIAL FEATURE:

Tagetes lucida in
English y en español

Video Interview
with La Abuelita



Journal of the American
Herbalists Guild

Volume 15 | Number 1 | Spring 2017



AMERICAN
HERBALISTS
GUILD

ISSN 1538-7496

Contents

- | | | | |
|-----------|---|-----------|---|
| 05 | PRESIDENT'S MESSAGE
<i>Bevin Clare</i> | 44 | THERAPEUTICS
Flexible Digestive Formulation
<i>Paul Bergner</i> |
| 07 | EDITOR'S NOTE
<i>Susan Marynowski</i> | 49 | Probiotics for Clinical Herbalists
<i>Susan Fidler</i> |
| 08 | AHG NEWS
8th Annual Product Contest Winners
In Memoriam: Tricia McCauley | 58 | MATERIA MEDICA / STUDENT PAPER
Antimicrobial effects of Yellowroot
<i>Irene Payne et al.</i> |
| 13 | CULTURE OF HERBALISM
La Abuelita's Favorite Remedy: Pericón | 63 | CASE STUDY
Crohn's Disease
<i>Katja Swift</i> |
| 19 | El remedio preferido de La Abuelita | 68 | BOOK REVIEW
"Body into Balance"
<i>Reviewed by Jennifer Steinbachs</i> |
| 24 | VIDEO: Interview with La Abuelita
<i>Jaime Trujillo</i> | | |
| 29 | HISTORY / PHILOSOPHY
Hippocrates' Nature Cure Diet
<i>Laurence Layne</i> | | |
| 37 | The Spleen in Traditional Medicine
<i>Janna Weiss</i> | | |

Cover: Doña Maria Evelina Díaz ("La Abuelita") at the door to her healing kitchen in Jocotenango, Guatemala.
 Photo credit: Jaime Trujillo

Invitation to Advertise

For a quarter century, the American Herbalists Guild (AHG) has influenced the way herbalism is understood and practiced throughout North America and beyond. For 14 of those years, the *Journal of the American Herbalists Guild* has presented cutting-edge, peer-reviewed articles documenting the use of herbs in clinical practice. This is your invitation to let our diverse and professional readership know about you, your company, your products, and your events. With an ad in the *JAHG*, news about you and your business will be delivered directly into the hands of 3,000+ potential customers. With our new digital platform, all ads are full color with a clickable link. To learn more about our reasonable advertising rates or to reserve your ad space, please see the *JAHG* Advertising Packet at

www.americanherbalistsguild.com/advertise-journal-american-herbalists-guild
 or contact the AHG at
office@americanherbalistsguild.com.

Benefits of AHG Membership

The American Herbalists Guild was founded in 1989 as a non-profit, educational organization to promote a high level of professionalism and education in the study and practice of therapeutic herbalism. Members at all levels receive a subscription to the biannual *Journal of the American Herbalists Guild*, which delivers issues relevant to those studying or using herbal medicines in the clinical setting, as well as to those manufacturing, marketing, and dispensing botanical medicines. Members receive our monthly member newsletter, discounts to the annual AHG Symposium, access to the Professional Herbalist Training Webinars (live and recorded), unlimited online access to past issues of the *JAHG*, unlimited online access to hundreds of recorded lectures from AHG Symposium, discounts and services from many suppliers and schools, and a number of other benefits. For a complete list of benefits and membership levels, please visit

www.americanherbalistsguild.com/american-herbalists-guild
 or contact the AHG at
office@americanherbalistsguild.com.

Author guidelines

The *Journal of the American Herbalists Guild* invites authors to contribute manuscripts on all aspects of herbalism with an emphasis on the clinical and professional application of botanical medicines. *JAHG* especially encourages herbalists of all persuasions to write. It is vital that our clinical tradition, skills and knowledge of herbal wisdom are broadcast with a strong and effective voice in the current period. Herbalists without prior experience of presenting for publication should request *JAHG* editorial assistance in getting their manuscripts to publishable standards.

For full author guidelines contact:

The American Herbalists Guild
 14 Waverly Court, Asheville, NC 28805
 Phone: 617.520.4372

www.americanherbalistsguild.com/jahg-writers-guidelines
 email: jahgeditor@gmail.com

Editor

Susan Marynowski MS

Editorial Committee

Camille Freeman MS, RH (AHG), LDN
 Bill Schoenbart LAC, RH (AHG)
 James Snow RH (AHG)

Advisory Board

Mark Blumenthal
 Mary Bove ND, RH (AHG)
 Kerry Bone FNIMH, FNHAA, MCPP, RH (AHG)
 Francis Brinker ND
 Chanchal Cabrera MNIMH, RH (AHG)
 Jerry Cott PhD
 Amanda McQuade Crawford MNIMH, RH (AHG)
 Steven Dentali PhD
 Christopher Hedley RH (AHG)
 Christopher Hobbs RH (AHG), L.Ac
 Tieraona LowDog MD, RH (AHG)
 Simon Mills MCPP, FNIMH, MA
 James Reinhart RPH, RH (AHG)
 Kevin Spelman PhD, RH (AHG)
 Jill Stansbury ND
 Michael Tierra OMD, RH (AHG)
 Alan Tillotson PhD, RH (AHG)
 Naixin Tillotson OMD, RH (AHG)
 Roy Upton RH (AHG)
 David Winston RH (AHG)
 Donald Yance RH (AHG)
 Suzie Zick ND, MPH

Executive Director and Operations Manager

Mimi Hernandez RH (AHG)

Assistant Director and Subscriptions/Advertising Coordinator

Heather Compton

Designed by
 Lawrence + Beavan

An Experience with La Abuelita's Favorite Remedy: The Uses of *Tagetes lucida* (pericón)

Jaime Trujillo

In March 2015, I visited Guatemala. There are some negative aspects of international travel. For example, if you have a weak stomach, you may suffer from gastrointestinal issues. As I have lived in Guatemala and visit this beautiful country regularly, gastrointestinal upset is an expected occurrence. This time was no exception – I got sick with gastrointestinal troubles.

A couple of days later, my family and I were invited to dinner at the home of some friends. The table had a spread of Guatemalan cuisine for us to devour. La Abuelita had heard of my gastrointestinal complaints. Doña Maria Evelina Díaz (La Abuelita) is lanky, with snow white hair and raisin skin that has been damaged by the strong altiplano sun. She quickly ordered her grandson, Luis Pedro, to make some pericón tea for me. “Pericón?” I asked. La Abuelita explained that pericón was good for the stomach – that it would reduce my cramps and settle the stomach. As we had dinner, I sipped my tea.

Soon after arriving back at our hotel, I became curious to learn more about pericón. This curiosity led me to perform a basic internet search. The first link was from *Biblioteca Digital de la Medicina Tradicional Mexicana* or *Digital Library of Mexican Traditional Medicine*. This website has a professional monograph on pericón. This information was helpful and insightful as it cemented my belief in the ancient wisdom and practices that La Abuelita was sharing with

me. This is why I wanted to write a monograph on *Tagetes lucida* (pericón). [Editor’s Note: With respect for the tradition of La Abuelita, we will use the regionally appropriate common name “pericón” throughout the article.]

Pericón is native of the altiplano (highlands) of Mexico and Guatemala, but this herb grows from the United States to Argentina (Lim 2014). The Aztecs and Mayas had multiple uses for pericón, mostly for medicinal, culinary, and ceremonial purposes (Davidow 1999). In 1552, an Aztec doctor recorded the use of pericón in Mexico (Mexicolore 2012). Later, the Spanish commissioned Frair Bernadino de Sahagún to record everything he saw in La Nueva España (New Spain; Kilian 2010). Sahagún began to write *Historia General de las Cosas de la Nueva España* in 1558 (Kilian 2010). In this book, Sahagún first wrote about the use of pericón, where he described and classified it as a medicinal plant used by the indigenous population in Mexico (Mexicolore 2012). Pericón arrived in Europe in 1798 (Bown 2003).

Lim (2014), described pericón as an “aromatic herb” that grows at an altitude of 1,000 to 2,000 meters, describing it as a “half-hardy semi-woody herb to subshrub that grows 46-76 cm high and 48 cm spread...the plant is bushy with many smooth, upright, unbranched stems. The leaves are opposite, linear to oblong, about 7.6 cm long, and shiny.” Pericón blossoms in the summer with a yellow-orange bisexual flower that measures 1.5 cm in diameter (Liam 2014).



Jaime Trujillo's passion for herbalism grew from watching his grandparents use herbs that grew in their yard, where he was raised in Rio Piedras, Puerto Rico. After earning a Master's in Library Information Science from Long Island University, Jaime embarked on a journey that brought him to La Antigua, Guatemala, where he learned about the indigenous culture and healing practices. While later working in the library at Maryland University of Integrative Health, the herbalism seed germinated and Jaime earned the post bachelor certificate in herbal studies. Jaime's passion is centered on medicine making – he often spends weekends making soaps, shaving butter, body butter and lotions, deodorant, and other personal products. Jaime lives in Concord, New Hampshire, where he works for EBSCO Information Services.



.....
La Abeulita at the
entrance to her home
in Jocotenango,
Guatemala.

Jaime Trujillo

The Aztecs had several names for pericón: *yauhtli*, *cuauhiyauhtli*, *iyauhtli*, and *tepepapaloquitl* (Davidow 1999). *Cempoalxochitl* was another name that the Aztecs used to name pericón or closely related *Tagetes* (Mexicolore 2012). The Aztecs used pericón to treat “cold diseases” associated with dampness or excess fluid in the body (Mexicolore 2012). Ortiz de Montellano (cited in Mexicolore 2012) noted that the Aztecs used pericón to treat several general types of illness: those caused by “phlegm” (e.g., intermittent fevers), those with “divine” causes (e.g., gout, stiffness, spitting of blood), and those with “natural” causes (e.g., swellings, blisters, gastrointestinal ailments).

The Mayan civilization used pericón for similar purposes, but the names varied by the different indigenous nations. Living in Guatemala, you quickly learn that there are multiple languages that represent the different Maya nations that are scattered throughout Guatemala and Southern Mexico. The different languages show the diversity, but most importantly, the idiosyncrasies of each nation or tribe. Barillas Aragon (1995) said that the indigenous populations in Guatemala have multiple names for pericón, for instance, in *Liyá* it is called *totonicapán*; in *Iyá* it is called *jolomocox*; in *Ucá* it is called *quetzaltenango*; and in *Ey Yá* it is called

cackchiquel. Casagrande (2000) said that the Tzeltal Mayas in Chiapas called the herb tzitz ak.

The Mayas in Guatemala used pericón for the treatment of various ailments such as malaria and the common cold, but mostly to treat gastrointestinal illness (Barillas Aragon 1995).

Berlin et al. (1996) conducted a survey of the medical ethnobiological uses of medicinal herbs of the Mayas of Chiapas, where they found that the indigenous population used pericón to treat abdominal pain. Clearly, two great civilizations used pericón mainly for gastrointestinal illnesses.

The Aztecs used the energetic properties of pericón to treat diseases. Mexicolore (2012) mentions that the Aztecs classified illness into two categories, hot and cold – when there was an excess of cold and/or dampness, pericón was the herb the Aztecs used to treat these conditions. Mexicolore (2012) describes these symptoms as to be phlegmy, rheumy, and feverish with chills. These illnesses may have also caused the swelling of limbs. The Aztecs classified pericón as a “heat” herb that would remove the excess cold from the body (Mexicolore 2012).

In Mesoamerica, The Aztecs and Mayas used pericón as a flavoring herb. The Aztecs used pericón to flavor *Theobroma cacao* (chocolate) drinks (Wyatt 2002). The Aztecs also added pericón in containers where the dried legumes were stored to flavor them (Wyatt 2002). In Guatemala, the whole herb was used to season the water for boiling corn (Barillas Aragon 1995). Additionally, the indigenous population in Guatemala used pericón as a dye to color different types of fabrics and textiles (Guirola 2010). The yellow-red color comes from the carotenoid lutein that is a constituent of pericón (Dweck 2009).

The Aztecs and the Mayas also used pericón in their religious ceremonies. The Aztecs used pericón as a lucky charm when crossing streams and rivers (Gates 2000). During religious ceremonies, the flowers decorated Aztec temples and burned as incense (Davidow 1999). The Aztecs believed that pericón cleansed the spirit (Davidow 1999). Similarly, the Mayas used pericón for religious purposes. The Mayas believed that it had magical properties and could even save lives. The Mayas also used the flowers

The Aztecs used pericón to treat “cold diseases” associated with dampness or excess fluid in the body.

and leaves cooked in a casserole to make a decoction. This decoction was consumed during the religious ceremonies (Barillas Aragon 1995). The Q'eqchi' (Quiché) people used pericón in the preparation of their incense, among other herbs and barks (Cano 2008). In 1973, Siegel et al. (1977) found that “the Huichols smoke another substance they call tumutsali or yahutli” – the mysterious smoking blend was found to be *Nicotiana rustica* (tobacco) mixed with pericón. This blend was smoked for shamanic rituals, but the authors were unable to prove that it could cause hallucinogenic episodes (Siegel et al. 1977). Schultes (1981) wrote that “Huichol Indians ceremonially smoke a mixture of pericón and *Nicotiana rustica* – a preparation called ye-tumutsali – for introducing visions.” The Huichol smoked these herbs in combination with drinks of *Lophophora williamsii* (peyote) and tesgüino, a beer made from *Zea mays* (corn). It is this mixture of herbal smokes and alcoholic drinks that would cause what the authors called “clearer hallucinations” (Schultes 1981).

Today, in Mesoamerica and other parts of the world, pericón is one of many herbs used to treat multiple conditions and ailments. Cases of harmful side effects of pericón to the general population are undocumented. Pericón extract is proven effective for a number of different health concerns at a dose of 100 mg/kg (where the LD50 is greater than 50,000 mg/kg; Duke 2009). In the United States, pericón is commonly known as sweet-scented marigold, Mexican marigold, Mexican mint marigold, Mexican tarragon, sweet marigold, Texas tarragon, and pericón (Duke 2015).

Some of the conditions for which pericón is potentially effective are: anemia, asthma, bacterial infection, bleeding, cardiomyopathy, cholera, colds, colic, dermatosis, diarrhea, dysmenorrhea, fever, fungus, gastrosis, influenza, gonorrhea, malaria, nausea, neurosis,

pain, pneumonia, rheumatism, salmonella, and stomachache (Duke 2009). Pericón also is used as a substitute for the spice *Artemisia dracunculus* (tarragon; Bown 2003).

Depression and anxiety are two major mental health conditions that affect large portions of our population. In 2012, a group of scientists found positive effects of pericón tea on depression and the serotonergic system at a dose of 50 mg/kg in an animal model (Guadarrama-Cruz et al. 2012) [Editor's Note: We will not further elaborate on animal research.]

Pericón has had positive results in treating gastrointestinal disorders. Caceres et al. (1993) found that pericón was effective in treating cholera. A study conducted by Ortiz (1989) concluded that an n-hexane extract of pericón has good antispasmodic action. Caceres et al. (1993) confirmed these findings, showing

that an n-hexane extract of pericón had the strongest antispasmodic action, thus helpful in treating spasmodic (crampy) diarrhea.

Tellez-Lopez et al. (2013) looked at the effectiveness of pericón in increasing testicular function and quality of sperm in an animal model. This was the first study to find that pericón improved sperm quality and testicular structure and helped in the release of the gonadotropin hormone that signals for the production of testosterone (Tellez-Lopez et al. 2013).

Despite the understanding of pericón's benefits and pharmacology and the long record of safe traditional use, some commercial preparations have been banned from the United States. On July 20, 1998, the U.S. Food and Drug Administration (FDA 1998) sent a memorandum to the Malabar Productos Naturales LLC

.....
Tagetes lucida (pericón)

Dick Culbert CC BY 2.0 flickr



denying the sale and distribution of five of their products, including “Jointaid,” which contained the essential oils of pericón. In response, Malabar submitted new literature to support their claims and the recommended dosage for their product. As with many herbal products, at issue were the medicinal claims made by the manufacturer that were not supported by evidence-based research. In 1998, the FDA denied the claim and banned the product from the United States.

...the pericón tea was spicy, sweet, earthy, and smooth...it had an anise-like flavor that gave it a warming sensation as it went down...

Tasting the pericón tea that La Abuelita made for me was an adventure. As we sat at the table, the kettle started to scream. Luis Pedro poured boiling water in a cup with dried shoots of

The Phytopharmacology of Pericón Essential Oil

Dr. Duke’s Phytochemical and Ethnobotanical Database (2015) finds that pericón has 30 different constituents in the leaf or shoot of the plant, with three main compounds in high concentration: estragole (2,035 ppm), methyl-eugenol (1,460 ppm), and (anethole 1,425 ppm). Regalado et al. (2011) found 40 different constituents in pericón, with the two main aromatic constituents being methyl-eugenol and estragole. The overall concentration of essential oils in pericón is 6,000 ppm. In Italy, Marotti et al. (2004) conducted a study where they extracted the essential oils from different plants of the *Tagetes* genus; they found that pericón’s flower has a high concentration of essential oils at 2.5%, even though the flower is much smaller than those of the rest in the *Tagetes* genus. Contrary to previous research, Marotti et al.’s (2004) research found that pericón had methylchavicol as a main compound. All of these phytochemicals are found in the above-ground shoots of the plant.

In Latin America and India, the essential oil of pericón has been extensively researched. Most of the research finds that the essential oil of pericón can be used to combat bacterial and fungal overgrowth. Céspedes et al. (2006) arrived at the conclusion that the essential oil of pericón has antifungal and antibacterial properties. Regalado et al. (2011) found that “*T. lucida* essential oil exhibited a moderate antimalarial activity.”

To understand the actions and potential side effects of the essential oil of pericón, it was necessary to broaden the search to the entire *Tagetes* genus. According to Cropwatch (2006), there have been claims that said that the essential oils of *Tagetes* may cause dermatitis if used in aromatherapy, and that the essential oil can be toxic in large quantities, yet the watchdog group concludes that the *Tagetes* genus essential oils are safe for human use.

Pericón has three main essential oil constituents: methyl-eugenol, anethole, and estragole. Methyl-eugenol is effective in treating inflammation in the respiratory system caused by allergies (Tang et al. 2015). Manufacturers use methyl-eugenol as a flavoring substance in the United States (WHO 1991). Methyl-eugenol is also used for cosmetic products like perfumes, lotions, and soaps (NTP 2000). While pericón whole herb has not been shown to cause cancer, the NTP (2000) found that the use of methyl-eugenol has the potential to cause cancer in excessive doses.

Anethole exhibits anti-inflammatory and chemopreventive properties (Choo et al. 2011). Zahid et al. (2015) conducted research on the effectiveness of anethole as an antibacterial, finding that “anethole did not show significant growth inhibitory effect...but anethole showed potent antibacterial activity against all of the tested strains.”

Like methyl-eugenol, estragole is a flavoring agent commonly used in the United States (WHO 1991). According to WHO (1991), estragole has the potential to cause cancer at very high doses of over 10mg/kg, but not at lower doses. Silva-Comar et al. (2014) concluded that estragole “showed anti-inflammatory activity as demonstrated by the inhibition in the leukocyte recruitment and stimulation of phagocytic activity in macrophages.”

Pericón essential oil can also be used as an insect repellent or larvicide. Narayanaswamy et al. (2014) concluded that pericón essential oil can be used eradicate larvae of *Aedes aegypti*, the mosquito species that is commonly known to carry dengue fever and the zika virus. Caballero-Gallardo et al. (2011) found that the essential oil of pericón was effective in repelling insects, but when the components of the essential oil were isolated, the insects were partially attracted. This finding correlates to the results of another study, where components of pericón were used to attract male fruit flies for research purposes (Haq et al. 2014).



.....
La Abuelita shows the author the pericón in her healing kitchen.

Jaime Trujillo

pericón. Luis Pedro placed the steamy cup right in front of me and I wondered if it was going to taste horrible. Could this tea relieve my symptoms or would it make matters worse? As I allowed the tea to cool down a bit, La Abuelita encouraged me to take the first sip. I brought the cup to my lips, and with a bit of courage, I took the first sip of tea. It was tasty! I dislike bitter tastes, so this possibly was part of my hesitation. I was happily wrong – the pericón tea was spicy, sweet, earthy, and smooth. The pericón tea had an anise- or licorice-like flavor that gave it a warming

.....
Pericón is readily available from the herb vendors in the local markets of Guatemala.

Jaime Trujillo



sensation as it went down to my stomach. I sipped this tea for the entire evening, much to the benefit of my gastrointestinal system.

In conclusion, I am grateful to La Abuelita for sharing her herbal knowledge with me. I have learned that the wisdom of pericón has been passed down through the generations for centuries, and I am so lucky to now be part of this lineage. After drinking the pericón tea, I was able to eat my dinner without further negative effect. The stomach cramping ceased and I was able to have some normalcy for several hours. I think that if I had used pericón at the early stages of the condition, it would have helped me by stopping the stomach cramps and killing the pathogens that were causing the diarrhea.

I find it fascinating how Guatemalans have used herbal medicine to treat common maladies like gastrointestinal diseases, coughs, nervous system to mention just a few, and how faith still such an integral part of their herbal wisdom. Listening to La Abuelita, it is evident to me that herbal medicine is very important in Guatemalan culture and traditions. Because of the lack of resources and access to medical treatment, the people have used herbal medicine for centuries to heal their ailments. It is through these hardships that herbal medicine has survived and been passed down to the younger generations. ■

Un encuentro con el remedio preferido de La Abuelita: Usos de *Tagetes lucida* (pericón)

Jaime Trujillo

En marzo de 2015, visité Guatemala. Hay algunos aspectos negativos de los viajes internacionales. Por ejemplo, si uno ya padece de síntomas digestivos, puede aumentar los problemas gastrointestinales como resultado de los cambios dietéticos que acompañan a los viajes. Como he vivido en Guatemala y visito a este hermoso país con frecuencia, los trastornos gastrointestinales es una ocurrencia esperada. Esta vez no fue la excepción – me enfermé con problemas gastrointestinales.

Unos días después, mi familia y yo fuimos invitados a cenar en la casa de unos amigos. La mesa estaba repleta de varios platos típicos de la cocina guatemalteca para devorar. La Abuelita sabía de mis quejas gastrointestinales. Doña María Evelina Díaz (La Abuelita) es larguirucha, con pelo blanco como la nieve y piel como las pasas que ha sido dañada por el fuerte sol del altiplano. Rápidamente ordenó a su nieto, Luis Pedro, que me hiciera un té de pericón. ¿Pericón? pregunté. La Abuelita explicó que el pericón era bueno para el estómago, que reduciría mis calambres y tranquilizaría el estómago. Cuando cenamos, tomé sorbos de mi té.

Poco después de regresar a nuestro hotel, estuve curioso por aprender más sobre el pericón. Esta curiosidad me llevó a realizar una búsqueda básica en el Internet. El primer enlace fue de *Biblioteca Digital de Medicina*

Tradicional Mexicana. Este sitio Web cuenta con una monografía profesional sobre el pericón. Esta información fue útil y perspicaz, ya que cimentó mi creencia en la antigua sabiduría y prácticas que La Abuelita estaba compartiendo conmigo. Por eso quería escribir una monografía sobre *Tagetes lucida* (pericón).

Pericón es nativa del altiplano de México y Guatemala, pero esta hierba crece desde los Estados Unidos hasta Argentina (Lim 2014). Los aztecas y mayas tenían usos múltiples para el pericón, principalmente para propósitos medicinales, culinarios, y ceremoniales (Davidow 1999). En 1552, un médico azteca registró el uso del pericón en México (Mexicolore 2012). Posteriormente, los españoles encargaron a Fraile Bernardino de Sahagún que registrara todo lo que vio en La Nueva España (Kilian 2010). Sahagún comenzó a escribir *Historia General de las Cosas de la Nueva España* en 1558 (Kilian 2010). En este libro, Sahagún escribió primero sobre el uso del pericón, donde lo describió y clasificó como una planta medicinal utilizada por la población indígena en México (Mexicolore 2012). Pericón llegó a Europa en 1798 (Bown 2001).

Lim (2014) describió el pericón como una “hierba aromática” que crece a una altitud de 1.000 a 2.000 metros, describiéndola como algo entre una “hierba semi-arbolada (y) semi-arbustiva (y) un arbusto enano que crece entre 46 y 76 cm de altura y 48 cm extendido...la planta es espesa con muchos tallos lisos, verticales, no ramificados.

Los aztecas utilizaron el pericón para tratar “enfermedades frías” asociadas con humedad o exceso de líquido en el cuerpo.

Las hojas son opuestas, lineales, a oblongas, de unos 7.6 cm de largo y brillantes.” Pericón florece en el verano con una flor bisexual amarillo-naranja que mide 1,5 cm de diámetro (Lim 2014).

Los aztecas tenían varios nombres para el pericón: yauhtli, cuaubiyauhtli, iyauhtli y tepepapaloquilitl entre otros (Davidow 1999). Cempoalxochitl era otro nombre que los aztecas usaban para nombrar el pericón o *Tagetes*, estrechamente relacionados (Mexicolore 2012). Los aztecas utilizaron el pericón para tratar “enfermedades frías” asociadas con humedad o exceso de líquido en el cuerpo (Mexicolore 2012). Ortiz de Montellano (citado en Mexicolore 2012) señaló que los aztecas usaban el pericón para tratar varios tipos de enfermedades generales: las causadas por “flema” (por ejemplo, las fiebres intermitentes), aquellas con causas “divinas” (gota, rigidez en el cuerpo, escupir sangre) y aquellos con causas “naturales” (por ejemplo, hinchazones, ampollas, dolencias gastrointestinales).

La civilización maya usaba el pericón para propósitos similares, pero los nombres variaban según las diferentes naciones indígenas. Viviendo en Guatemala, uno se da cuenta rápidamente que hay múltiples lenguas que representan a las

diversas naciones mayas que están esparcidas por Guatemala y el sur de México. Las distintas lenguas muestran no solo la diversidad, pero aun más importante, las idiosincrasias de cada nación o tribu. Barillas-Aragón (1995) dice que las poblaciones indígenas en Guatemala tienen múltiples nombres para el pericón. Por ejemplo, en Liyá se llama totonicapán; en Iyá se llama jolomocox; en Ucí se llama quetzaltenango; y en Ey Yá se llama cachiquel. CasaGrande (2000) dijo que los mayas Tzeltal en Chiapas llamaban la hierba tzitz ak.

Los mayas en Guatemala usaron pericón para el tratamiento de diversas enfermedades como la malaria y el resfriado común, pero sobretodo para tratar enfermedades gastrointestinales (Barillas-Aragón 1995). Berlin et al. (1996) realizaron un estudio de los usos etnobiológicos médicos de las hierbas medicinales de los mayas de Chiapas, donde encontraron que la población indígena usaba pericón para tratar el dolor abdominal. Es claro que dos grandes civilizaciones usaban pericón principalmente para tratar enfermedades gastrointestinales.

Los aztecas utilizaron las propiedades energéticas del pericón para tratar enfermedades. Mexicolore (2012) menciona que los aztecas clasificaron la enfermedad en dos categorías,

La fitofarmacología del aceite esencial de pericón

La Base de Datos Fitoquímicos y Etnobotánicas del Dr. Duke (2015) encuentra que el pericón tiene 30 componentes diferentes en la hoja o brote de la planta, con tres compuestos principales en alta concentración: estragole (2.035 ppm), metil-eugenol (1.460 ppm) y anetol (1.425 ppm). Regalado et al. (2011) encontró 40 constituyentes diferentes en pericón, siendo los dos principales constituyentes aromáticos metil-eugenol y estragole. La concentración total de aceites esenciales en el pericón es de 6.000 ppm. En Italia, Marotti et al. (2004) realizaron un estudio donde extrajeron los aceites esenciales de diferentes plantas del género *Tagetes*; encontraron que la flor del pericón tiene una alta concentración de aceites esenciales en el 2.5%, aunque la flor es mucho más pequeña que el resto del género *Tagetes*. Al contrario a la investigación anterior de Regalado, la investigación de Marotti et al. (2004) encontró que el pericón tenía metilchavicol como

componente principal. Todos estos fitoquímicos se encuentran en los brotes sobre el suelo de la planta.

En América Latina y en la India, el aceite esencial de pericón ha sido ampliamente investigado. La mayor parte de la investigación encuentra que el aceite esencial del pericón se puede utilizar para combatir el crecimiento excesivo bacteriano y fúngico. Céspedes et al. (2006) llegaron a la conclusión de que el aceite esencial de pericón tiene propiedades antifúngicas y antibacterianas. Regalado et al. (2011) encontraron que el aceite esencial de “*T. lucida*” presentó una actividad antipalúdica moderada.”

Para comprender las acciones y efectos secundarios potenciales del aceite esencial de pericón, fue necesario ampliar la búsqueda a todo el género *Tagetes*. Según Cropwatch (2006), se han afirmado que los aceites esenciales de *Tagetes* pueden causar dermatitis si se utilizan en aromaterapia, y que el aceite esencial puede ser tóxico en grandes cantidades, sin embargo, el grupo de control concluye que los aceites esenciales del género *Tagetes* son seguros para el uso humano.

caliente y fría – cuando había un exceso de frío y / o humedad, el pericón era la hierba que usaban los aztecas para tratar estas condiciones. Mexicolore (2012) describe estos síntomas como flema, legañoso, y fiebre con escalofríos. Estas enfermedades pueden también haber causado la hinchazón de las extremidades. Los aztecas clasificaron el pericón como una hierba “de calor” que eliminaría el exceso de frío del cuerpo (Mexicolore 2012).

En Mesoamérica, los aztecas y mayas utilizaron el pericón como hierba saborizante. Los aztecas utilizaron pericón para dar sabor a las bebidas de *Theobroma cacao* (chocolate, Wyatt 2002). Los aztecas también agregaron pericón en envases donde se almacenaron las legumbres secas para darles sabor (Wyatt 2002). En Guatemala, la hierba entera se utilizó para sazonar el agua para hervir maíz (Barillas-Aragón 1995). Adicionalmente, la población indígena en Guatemala utilizó el pericón como un tinte para colorear diferentes tipos de tejidos y textiles (Guirola 2010). El color amarillo-rojo proviene de la luteína carotenóide que es un componente del pericón (Dweck 2009).

Los aztecas y los mayas también usaban el pericón en sus ceremonias religiosas. Los Aztecas usaban el pericón como un encanto afortunado al cruzar arroyos y ríos (Gates 2000). Durante



las ceremonias religiosas, las flores decoraron templos aztecas y se quemaron como incienso (Davidow 1999). Los aztecas creían que el pericón limpiaba el espíritu (Davidow 1999). Del mismo modo, los mayas usaban el pericón con fines religiosos. Los mayas creían que tenía propiedades mágicas e incluso podría salvar vidas. Los mayas también utilizaron las flores y las hojas cocinadas en una cazuela para hacer una decocción. Esta

.....
Tagetes lucida (pericón).

Krzysztof Ziarnik CC BY-SA 4.0

Wikimedia Commons

Pericón tiene tres componentes principales del aceite esencial: metil-eugenol, anetol, y estragole. Metil-eugenol es eficaz en el tratamiento de la inflamación en el sistema respiratorio causada por alergias (Tang et al. 2015). Los fabricantes utilizan metil-eugenol como sustancia saborizante en los Estados Unidos (OMS 1991). Metil-eugenol también se utiliza para productos cosméticos como perfumes, lociones y jabones (NTP 2000). Mientras que la hierba entera de pericón no ha demostrado causar cáncer, el NTP (2000) encontró que el uso de metil-eugenol tiene el potencial de causar cáncer en dosis excesivas.

Anethole exhibe propiedades antiinflamatorias y quimio-preventivas (Choo et al. 2011). Zahid et al. (2015) realizó una investigación sobre la eficacia del anetol como antibacteriano, encontrando que “el anetol no mostró un efecto inhibitorio significativo del crecimiento...pero el anetol si mostró una potente actividad antibacteriana contra todas las cepas sometidas a prueba.”

Al igual que el metil-eugenol, el estragole es un agente saborizante comúnmente utilizado en los Estados Unidos (Organización Mundial de la

Salud 1991). Según la OMS (1991), el estragole tiene el potencial de causar cáncer a dosis muy altas de más de 10 mg/kg, pero no a dosis más bajas. Silva-Comar et al. (2014) concluyeron que el estragole “mostró actividad antiinflamatoria como lo demuestra la inhibición en el reclutamiento de leucocitos y la estimulación de la actividad fagocítica en los macrófagos.”

El aceite esencial de pericón también se puede usar como repelente de insectos o larvicida. Narayanaswamy et al. (2014) concluyeron que el aceite esencial de pericón puede ser usado para erradicar las larvas de *Aedes aegypti*, la especie de mosquito que comúnmente se conoce como portador del dengue y el virus zika. Caballero-Gallardo et al. (2011) encontraron que el aceite esencial de pericón era efectivo para repeler insectos, pero cuando los componentes del aceite esencial fueron aislados, los insectos fueron atraídos parcialmente. Este hallazgo se correlaciona con los resultados de otro estudio, en el que se utilizaron componentes del pericón para atraer machos de la especie moscas de la fruta con fines de investigación (Haq et al. 2014).

decocción fue consumida durante las ceremonias religiosas (Barillas-Aragón 1995). Los q'eqchí (Quiché) usaron pericón en la preparación de su incienso, entre otras hierbas y cortezas (Cano 2008). En 1973, Siegel et al. (1977) encontraron que “los huicholes fuman otra sustancia que llaman tumutsali o yahutli” – se encontró que la misteriosa mezcla de tabaco era *Nicotiana rustica* (tabaco) mezclado con pericón. Esta mezcla se fumaron en rituales chamánicos, pero los autores no pudieron probar que pudiera causar episodios alucinógenos (Siegel et al. 1977). Schultes (1981) escribió que “los huicholes fuman ceremonialmente una mezcla de pericón y *Nicotiana rustica* – una preparación llamada yatumutsali – para introducir visiones.” El huichol fumaba estas hierbas en combinación con bebidas de *Lophophora williamsii* (peyote) y tesgüino, una cerveza hecha de *Zea mays* (maíz). Es esta mezcla de fumar hierbas y bebidas alcohólicas lo que causaría lo que los autores llamaron “alucinaciones más claras” (Schultes 1981).

Hoy en día, en Mesoamérica y otras partes del mundo, el pericón es una de las muchas hierbas utilizadas para tratar múltiples enfermedades y condiciones. Los casos de efectos perjudiciales del pericón para la población general no se han documentado. El extracto de pericón se ha demostrado eficaz para tratar a varias problemas de salud a una dosis de 100 mg/kg (donde la DL₅₀ es superior a 50.000 mg/kg, Duke 2009). En los Estados Unidos, el pericón se conoce comúnmente como caléndula mexicana de la menta, estragón-mexicano, caléndula dulce, caléndula del dulce-olor, caléndula mexicana del dulce-olor, estragón de Tejas y pericón (Duke 2015).

Pericón es potencialmente eficaz para algunas de las siguientes condiciones: anemia, asma, infección bacteriana, sangrado, cardiomiopatía, el cólera, resfriados, cólicos, dermatosis, diarrea, dismenorrea, fiebre, hongos, gastritis, la gripe, la gonorrea, la malaria, las náuseas, la neurosis, el dolor, la neumonía, el reumatismo, la salmonella, y el dolor de estómago (Duke 2009). También pericón se utiliza como un sustituto para el especia *Artemisia dracuncululus* (estragón, Bown 2001).

La depresión y la ansiedad son dos de los

principales problemas de salud mental que afectan a grandes segmentos de nuestra población. En 2012, un grupo de científicos encontró efectos positivos del té de pericón sobre la depresión y el sistema serotoninérgico con una dosis de 50 mg/kg en un modelo animal (Guadarrama-Cross et al. 2012). [Nota del editor: No vamos a elaborar más sobre la investigación animal].

Pericón ha tenido resultados positivos en el tratamiento de trastornos gastrointestinales. Cáceres et al. (1993) encontraron que pericón fue eficaz en el tratamiento del cólera. Un estudio realizado por Ortiz (1989) concluyó que un extracto de n-hexano de pericón tiene buena acción antiespasmódica. Cáceres et al. (1993) confirmaron estos resultados, mostrando que un extracto de n-hexano de pericón tenía la acción antiespasmódica más fuerte, lo que es útil en el tratamiento de la diarrea espasmódica (calambres).

Téllez-López et al. (2013) estudiaron la eficacia de aumento de pericón en la función testicular y la calidad de los espermatozoides en un modelo animal. Este fue el primer estudio para encontrar que el pericón mejoró la calidad del esperma y la estructura testicular y ayudó en la liberación de las señales de la hormona gonadotropina que facilita la producción de testosterona (Téllez-López et al. 2013).

A pesar de la comprensión de los beneficios del pericón y la farmacología y su larga historia de uso seguro tradicional, el uso de algunas preparaciones comerciales han sido prohibidos en los Estados Unidos. El 20 de julio de 1998, la Administración de Alimentos y Medicamentos (Food and Drug Administration/FDA) de los Estados Unidos se mandó un memorándum al Malabar Natural Products, LLC, negando el permiso para la venta y distribución de cinco de sus productos, incluyendo “Jointaid,” que contenía los aceites esenciales de pericón. Malabar respondió con la presentación de nueva literatura para apoyar su posición y la dosis recomendada de su producto. Como es el caso con muchas hierbas medicinales, en cuestión eran las afirmaciones hechas por el fabricante que no fueron apoyadas por la investigación científica. En 1998, la FDA negó la petición de la compañía y prohibió la

entrada del producto a los Estados Unidos.

Era una aventura a probar el té de pericón que La Abuelita hizo para mí. Cuando nos sentamos a la mesa, la tetera empezó a silbar. Luis Pedro vertió agua hirviendo en una taza con brotes secos de pericón. Luis Pedro colocó la taza humeante justo a mi frente y yo me pregunté si iba a tener un sabor horrible. ¿Podría este té aliviar mis síntomas o sería empeorar las cosas? Dejé que el té se enfriara un poco, y La Abuelita me animó a tomar el primer sorbo. Llevé la copa a mis labios, y sintiendo un poco valiente, tomé el primer sorbo de té. Estaba sabroso! No me gusta los sabores amargos, así que posiblemente eso era parte de la razón por mi vacilación. Estaba felizmente equivocado – el té de pericón era picante, dulce, terroso, y suave. El té de pericón tenía un sabor de anís o regaliz que le dio una sensación de calor, ya que bajó a mi estómago. Tomé sorbos de este té durante toda la noche, para el beneficio de mi sistema gastrointestinal.

En conclusión, estoy agradecido a La Abuelita por compartir sus conocimientos sobre las hierbas conmigo. He aprendido la sabiduría de pericón que se ha transmitido de generación a generación durante siglos, y por suerte ahora

soy parte de este linaje. Después de beber el té de pericón, pude comer mi cena sin ningún efecto negativo. Los calambres de estómago dejó de suceder y yo era capaz de tener algo de normalidad durante varias horas. Yo si creo que si hubiese utilizado el pericón en las primeras etapas de la enfermedad, me hubiese ayudado a parar los calambres en el estómago y matar los patógenos que estaban causando la diarrea.

Me resulta fascinante como los guatemaltecos han utilizado la medicina herbal para tratar enfermedades gastrointestinales comunes, más otras enfermedades como la tos, y el malestar del sistema nervioso, por mencionar sólo unos pocos, y como la fe sigue siendo una parte integral de su sabiduría a base de hierbas. Escuchando a La Abuelita, es evidente para mí que la medicina herbal es muy importante en la cultura y las tradiciones de Guatemala. Debido a la falta de recursos y el acceso a tratamiento médico, las personas han utilizado la medicina herbal durante siglos para curar sus dolencias. Es a través de las penurias que estas hierbas medicinales han sobrevivido y ha sido transmitido a las generaciones más jóvenes. ■

Un pórtico de hotel está decorado con franjas de *Tagetes lucida* (pericón).

K M CC BY 2.0 flickr





Jaime Trujillo



Click on the photo

to view the January 2016 interview with Doña Maria Evelina Díaz (La Abuelita), recorded at her home in Jocotenango, Guatemala, where she lives with her daughter and three grandchildren. The young man conducting the interview is her grandson, Luis Pedro Díaz. Luis Pedro works for the municipality of La Antigua and is an architecture student at Universidad Mariano Galvez.

La Abuelita Speaks: Video Interview and English Summary

La Abuelita's grandson, Luis Pedro Díaz, opens the conversation by asking what medicinal plants she remembers. La Abuelita first mentions manzanilla (*Matricaria chamomilla*, chamomile). She says that manzanilla is like pericón because it helps with an upset stomach. [EDITOR'S NOTE: We have used the local common names for the plants discussed in the video out of respect for La Abuelita's healing tradition.]

Luis Pedro asks her how she was treated when she was young and got sick. La Abuelita responds that she was given pericón (*Tagetes lucida*, sweet-scented marigold or Mexican marigold). She explains that the most common herbs used were pericón and manzanilla and that they had similar properties. Pericón is also used as a flavor enhancer for instance, when making "atol blanco" (white atole), which is a creamy drink made with corn flour. La Abuelita explains that the atol is heavy to the stomach and it gives you a stomachache, so by adding the pericón to the atol you will not get that stomachache. La Abuelita begins to describe that making the pericón tea is very simple, just grab some of the leaves and stems, put them in water, and bring the concoction to a boil. Once it comes to a boil, the water is going to turn yellow - turn off the stove, strain the tea, and drink. You have to drink it warm.

Luis Pedro asks what they used instead of Alka-Seltzer® or aspirin when she was growing up. La Abuelita says that they used sal de uvas (literally "salt of grapes," an over-the-counter bicarbonate antacid). La Abuelita mentions that they also used mejorana (*Origanum majorana*, sweet marjoram). People walked into the "monte" or mountain forest to harvest mejorana to eradicate stomach worms. She recalls when she had some worms as a girl and her father went into the forest and harvested mejorana. When he returned, he cooked the herb and used the water for her bath. Another application was as a poultice. La Abuelita's father would mash the mejorana leaves while adding some alcohol, and then wrap the poultice around the belly with a cloth. This would eliminate the stomach worms and discomfort.

Luis Pedro asks if she remembers any other herbs that she used. La Abuelita mentions that they made a relaxation bath using chilca (*Baccharis salicifolia*, mulefat or seepwillow) and white rose petals (*Rosa* spp.). La Abuelita also recalls using hollos de naranjo, the young, tender leaves and flowers of orange trees (*Citrus* spp.). They made a tea of orange flowers and young leaves to calm the nerves. (The author notes that his Puerto Rican grandmother made the same herbal tea for similar purposes.)

La Abuelita says that yerba buena (*Mentha* spp., Bergamot mint, peppermint, or spearmint)

is good for coughs. She says she knows this because her daughter gave it to her grandson. “He had a bad case of asthma and she was told to grab a large amount of yerba buena, add as much sugar she could, and boil it until she had a syrup.” She also reminds Pedro that you can use yerba buena for cooking.

Pedro asked La Abuelita how she learned to use herbs. She responds that she learned from her own grandmother. La Abuelita remembers, “My grandmother always had pericón in the house. She would divide the pericón and keep some in the kitchen inside a brown bag. We also had manzanilla. Manzanilla was all over our yard. As soon as the manzanilla was ready to be harvested, my grandmother would cut them and put them to dry. Once dry, the manzanilla was kept inside a tusa (corn husk) in order to maintain the aroma of the manzanilla.”

Luis Pedro asks his grandmother if these herbs are easy to find today. She replies, “Yes, in the market.” The conversation shifts. La Abuelita mentions llantén (*Plantago major*, broadleaf plantain). Llantén is good for the kidneys and as a bath for your feet, La Abuelita says. She adds that malva (*Malva sylvestris*, common mallow) was also use in baths. La Abuelita also mentions apazote (*Dysphania ambrosioides*, wormseed). She recalls, “When we had lice, my dad would go and get some apazote and cook it. He will take the apazote tea and he would bath us with it to kill the lice.” She continues, “They would make a compress of apazote and place it in the stomach area to eliminate the stomach worms.” She says that apazote also is good for treating and healing wounds. Another herb that La Abuelita mentions is chicha fuerte (*Oxalis stricta*, common yellow woodsorrel). This herb is available throughout the area and is used for treating gum problems, for example, for babies when they are teething or for any other gum discomfort in adults. To apply, you mash the chicha fuerte and smear it on the affected gum area.

After this conversation ends, Luis Pedro brings out the manzanita fruit (*Crataegus mexicana*, Mexican hawthorn, sometimes also called manzanilla or tejocote). These round and colorful fruits are traditionally strung as

Christmas wreaths. Pedro explains that most families keep the wreath after the holiday because the fruits have the same medicinal properties and uses as the manzanilla flower. La Abuelita remembers an anecdote of a neighbor who came to their home one Christmas Eve and asked her father if they had “manzanilla in fruit.” She recollects that her father took the wreath from the nacimiento (Christmas nativity scene) and gave it to the neighbor for tea.

La Abuelita and Luis Pedro then talk about the medicinal and culinary uses of fig leaves. They explain that we know the sweet and delicious fig fruit, but that the leaves can be used to make a cough syrup. In addition, you can use fig leaves as a flavoring in fruit marmalades, like mango (*Mangifera indica*) or jocote (*Spondias purpurea*, red mombin or hog plum), and it is delicious.

Then La Abuelita shows us the dried manzanilla and pericón herbs. She explains that if you shake the dried manzanilla, the seeds will fall out and you can plant the seeds. La Abuelita explains that chamomile is sweeter than pericón. During the conversation, she remembers that you can boil young avocado leaves and use it as a footbath. She then talks about the hibiscus calyx or “la Rosa de Jamaica” (*Hibiscus sabdarifa*, roselle). La Rosa de Jamaica is dried and made into a “fresco” (refreshing cooler) during Christmas and Easter.

La Abuelita remembers that when she was working as a nanny and the family’s toddler was crying and unable to fall asleep, the mother usually placed some chipilín (*Crotalaria longirostrata*, longbeak rattlebox) under the child’s pillow so he could fall asleep. “If you cannot sleep, you can put chipilín under your pillow and you will have a good night’s sleep.” She adds that chipilín is delicious and high in iron. [Editor’s Note: The edible portions of the plant are the leaves and shoots, which are cooked and served as a leafy green vegetable or dried as an herb. *Crotalaria* seeds and roots are considerably toxic.]

The conversation shifts because La Abuelita wants to share about “el árbol del Hermano Pedro.” Hermano Pedro (Brother Peter) was a Franciscan Friar in La Antigua in the 17th century. John Paul II beatified “Hermano Pedro” in the



Dried manzanilla (chamomile, on left) and pericón in La Abuelita's kitchen.

Luis Pedro Díaz

1980s. If you lived or have visited La Antigua, Guatemala, especially during Lent and Easter, you have learned of el árbol del Hermano Pedro. The tree is in the courtyard of the Church of Calvario in La Antigua, Guatemala. The people of La Antigua believe that the tree has healing properties. La Abuelita reports, "After mass, many of the parishioners will walk under the tree to take the fallen flowers and make tea. The faithful will drink the tea because they feel that the tree has miraculous properties and, if they have faith, their pain or disease will vanish." The tree is esquisúchil (*Bourreria huanita*, jazmín de palo or popcorn flower), a tree native to Central America in the Boraginaceae family. La Abuelita shows us the dried flowers of "el árbol del Hermano Pedro" and mentions that the tree is respected and no one harms the tree.

Luis Pedro and La Abuelita then demonstrate how to finish making the pericón tea. La Abuelita says that there are vendors in the local market that sell many dried herbs, including pericón. The market days are Thursday and Saturday. A bunch of dried pericón costs 3 to 5 Quetzals (less than US\$1). Luis Pedro then pours and tastes the pericón tea. ■

REFERENCES

- Barillas-Aragon CL. 1995. Determinación de la concentración y rendimiento de 7-metoxicumarina y aceite esencial, en cinco estados de desarrollo del Pericón (*Tagetes lucida* Cav.) en la Alameda. Universidad de San Carlos de Guatemala (Chimaltenango): Tesis Ingeniería Agrónoma, Facultad de Agronomía.
- Berlin EA, Lozoya X, Meckes M, Tortoriello J, Villareal ML. 1996. The scientific basis of gastrointestinal herbal medicine among the highland Maya of Chiapas, Mexico. Chapter 2 In L Nader, Editor, *Naked science: anthropological inquiry into boundaries, power, and knowledge*. New York (NY): Routledge.
- Bown D. 2003. *Herbal: the essential guide to herbs for living*. London (UK): Pavilion Books.
- Caballero-Gallardo K, Olivero-Verbel J, Stashenko E. 2011. Repellent activity of essential oils and some of their individual constituents against *Tribolium castaneum* herbs. *Journal of Agricultural and Food Chemistry* 59:1690-1696.
- Cáceres A, Torres M, Ortiz S, Cano F, Jauregui, E. 1993. Plants used in Guatemala for the treatment of gastrointestinal disorders. IV. Vibriocidal activity of five American plants used to treat infections. *Journal of Ethnopharmacology* 39:73-75.
- Cano M. 2008. *Processing Maya incense*. Asociación FLAAR Mesoamerica. Guatemala City (Guatemala): FLAAR (Foundation for Latin American Anthropological Research). Available at: http://www.wide-format-printers.org/FLAAR_report_covers/705193_Prossessing_incense.pdf
- Casagrande DG. 2000. Human taste and cognition in Tzeltal Maya medicinal plant use. *Journal of Ecological Anthropology* 4:57-68.

- Céspedes C, Ávila G, Martínez A, Serrato B, Calderón-Múgica J, Salgado-Garciglia R. 2006. Antifungal and antibacterial activities of Mexican tarragon (*Tagetes lucida*). *Journal of Agricultural and Food Chemistry* 54:3521-3527.
- Choo EJ, Rhee Y, Jeong S, Lee H, Kim HS, Ko HS, Kim J, Kwon T, Jung JH, Kim JH, Lee H, Lee E, Kim DK, Chen C, Kim S. 2011. Anethole exerts antimetastatic activity via inhibition of matrix metalloproteinase 2/9 and AKT/ mitogen-activated kinase/nuclear factor kappa B signaling pathways. *Pharmaceutical Society of Japan Biological and Pharmaceutical Bulletin* 34(1):41-46.
- Cropwatch. 2006. Proposed *Tagetes* oil restrictions: The precautionary principle gone mad? Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln (NE): The Cropwatch Series.
- Davidow J. 1999. *Infusions of healing: A treasury of Mexican-American herbal remedies*. New York (NY): Fireside Books.
- Duke JA. 2009. *Duke's handbook of medicinal plants of Latin America*. Boca Raton (FL): CRC Press.
- Duke JA. 2015. *Tagetes lucida* Cav. – Asteraceae. Dr. Duke's Phytochemical and Ethnobotanical Databases. Retrieved from <https://phytochem.nal.usda.gov/phytochem/plants/show/2371?et=>
- Dweck AC. 2009. *Natural colour 2: Comprehensive focus on natural dyes*. Personal Care: 2009. Retrieved from www.dweckdata.com/Published_papers/NaturalColour2.pdf
- Food and Drug Administration (FDA). 1998. 75-day premarket notification for new dietary ingredient. Retrieved from http://fda.gov/ohrms/.../rpt0030_01.pdf
- Gates W. 2000. *An Aztec herbal: The classic codex of 1552*. Mineola (NY): Dover Publications.
- Guadarrama-Cruz G, Alarcon-Aguilar FJ, Vega-Avila E, Vazquez-Palacios G, Bonilla-Jaime H. 2012. Antidepressant-like effect of *Tagetes lucida* Cav. extract in rats: involvement of the serotonergic system. *The American Journal of Chinese Medicine* 40(4):753-768.
- Guirola C. 2010. Natural dyes used in Mesoamerica since pre-Hispanic age. *Asociación FLAAR Mesoamerica*: 1-14. Retrieved from www.maya-archaeology.org
- Haq I, Vreysen M, Cacéres C, Shelly T, Hendrichs J. 2014. Methyl eugenol aromatherapy enhances the mating competitiveness of male *Bactrocera carambolae* Drew & Hancock (Diptera: Tephritidae). *Journal of Insect Physiology* 68:1-6.
- Kilian LE. 2010. Missionaries' beasts in New Spain: The utilization of the European bestiary tradition in Sahagún's Florentine codex. Retrieved from Scholarsbank University of Oregon at: https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/10828/Kilian_Laura_Elizabeth_ma2010su.pdf?sequence=1
- Lim TK. 2014. *Edible medicinal and non-medicinal plants: Volume 7, Flowers*. New York (NY): Springer.
- Marotti M, Piccaglia R, Biavati B, Marotti I. 2004. Characterization and yield of essential oils from different *Tagetes* species. *Journal of Essential Oils* 16:440-444.
- Mexicolore. 2012. *Four hundred flowers: The Aztec herbal pharmacopoeia, Part 1: Yauhtli and Cempoalxochitl*. London (UK): Mexicolore. Available at <http://www.mexicolore.co.uk/aztecs/health/aztec-herbal-pharmacopoeia-part-1>
- Narayanaswamy VK, Gleiser RM, Kasumbwe K, Aldhubiab BE, Attimarad MV, Odhav B. 2014. Evaluation of halogenated coumarins for antimosquito properties. *The Scientific World Journal* 2014:1-6.
- National Toxicology Program (NTP). 2000. Toxicology and carcinogenesis studies of methyl-eugenol (CAS No. 93-15-2) in F344/N rats and B6C3F1 mice. Research Triangle Park (NC): NTP Technical Report 491.
- Ortiz SD. 1989. Elucidación del principio activo antiespasmódico en el extracto n-hexano del pericón (*Tagetes lucida* Cav.). *Revista Científica de la Facultad de Ciencias Químicas y Farmacia* 7(1): 9-10.
- Regalado EL, Fernández MD, Pino JA, Mendiola J, Echemendia OA. 2011. Chemical composition and biological properties of the leaf essential oil of *Tagetes lucida* Cav. from Cuba. *Journal of Essential Oil Research* 23(5):63-68.
- Schultes RE. 1981. Iconography of New World plant hallucinogens. *Arnoldia* 41(3):80-125.
- Siegel RK, Collings PR, Diaz JL. 1977. On the use of *Tagetes lucida* and *Nicotiana rustica* as a Huichol smoking mixture: The Aztec "Yauhtli" with suggestive hallucinogenic effects. *Economic Botany* 31(1):16-23.
- Silva-Comar FM, Marques-Wiirzler LA, Silva-Filho SE, Kummer R, Bocchi-Pedroso R, Spironello RA, Silva EL, Bersani-Amado CA, Nakamura-Cuman RK. 2014. Effect of estragole on leukocyte behavior and phagocytic activity of macrophages. *Evidence-Based Complementary and Alternative Medicine* 2014:784689.
- Tang F, Chen F, Ling X, Huang Y, Zheng X, Tang Q, Tan X. 2015. Inhibitory effect of methyl-eugenol on IgE-mediated allergic inflammation in RBL-2H3 cells. *Mediators of Inflammation* 2015:463530.
- Téllez-López MA, Treviño-Neávez JF, Verde-Star MJ, Rivas-Morales C, Oranday-Cárdenas A, Moran-Martínez J, Serrano-Gallardo LB, Morales-Rubio ME. 2013. Evaluación del efecto del extracto metanólico de *Tagetes lucida* sobre la función testicular y calidad espermática en ratas macho Wistar. *Revista Mexicana de Ciencias Farmacéuticas* 44(4):43-52.
- World Health Organization/WHO (1991). Evaluation of certain food additives. Geneva (Switzerland): WHO Technical Report Series 806.
- Wyatt AR. 2002. *The food and cuisine of Pre-Columbian Mesoamerica*. In HK Solomon and WW Weaver, Editors. *The Encyclopedia of Food and Culture*. New York (NY): Charles Scribner and Sons.
- Zahid SH, Awasthi SP, Hinenoya A, Yamasaki S. 2015. Anethole inhibits growth of recently emerged multidrug resistant toxigenic *Vibrio cholerae* O1 El Tor variant strains in vitro. *The Journal of Veterinary Medical Science* 77(5):535-540.