Ficha Cartográfica de Producción Académico - Científico

Docente: Oliverio Favián Vargas Maza
Nombre del artículo: Melinopini biodiversity and medicinal uses of the honey from El Oro province in Ecuador
Nombre de la revista: Emirates Journal of Food and Agriculture
ISSN de la revista: 2079-0538
DOI del artículo: 9755/ejfa.2015.04.079
Volumen, número, páginas del artículo: Volumen 27, número 6, páginas 502-506
Fecha de publicación: 13 de abril de 2015

- Artículos académico-científicos publicados y/o aceptados para publicación. Archivo digital conforme a las exigencias de las revistas indexadas.

Melinopini biodiversity and medicinal uses of the honey from El Oro province in Ecuador
http://www.scopemed.org/?mno=184920

- Notificación de aceptación del artículo para ser publicado en una revista de la base SCIMAGO (Scopus) o ISI Web.

- Certificado de aceptación del trabajo. Puede ser un correo electrónico del editor de la revista.
Meliponini biodiversity and medicinal uses of pot-honey from El Oro province in Ecuador

Vit Patricia1,2,*, Vargas Oliverio4, López Triny4, Maza Favián4

1Currently: Prometeo Researcher, Faculty of Agricultural and Livestock Sciences, Universidad Técnica de Machala, Machala, El Oro, Ecuador; 2Food Science Department, Faculty of Pharmacy and Bioanalysis, Universidad de Los Andes, Mérida 5101, Venezuela; *Honorary Associate Biomedical Sciences, School of Medical Sciences, The University of Sydney, 75 East Street, Lidcombe, NSW 1825, Australia; 4Faculty of Agricultural and Livestock Sciences, Universidad Técnica de Machala, Machala, El Oro, Ecuador; 4Planning Department, Universidad Técnica de Machala/Av. Panamericana Km 5 ½ Via Pasaje, Machala, El Oro, Ecuador

ABSTRACT

Ecuadorian stingless bees (Apiidae, Meliponini) have ethnomedicinal interest because their products are used in healing. Diverse remedies consist on pot-honey alone or mixed with infusions. This set of medicinal uses were informed in El Oro province by Ecuadorian stingless bee keepers -known as meliponicultor- in Latin America: Bruises, tumors, ocular cataracts, pterygium, inflammation, infections, varicoses veins, cleaning blood after childbirth, kidney diseases, tumor, wound healing, and soothing balm before sleeping. Scaptotrigona ederi named “catiana” or “catana” is the most frequent bee in the visited cantons Las Lajas, Balsas, Piñas, and Zaruma. Other important stingless bees are Melipona indecisa “canamambo”, Melipona mimetica “bermejo”, Nanotrigona cf. perilampoides “pítón”, and Paratrigona att. eutaeniata “pirunga”. A bioprospective research will follow to value this ancient tradition and the honey processed in cerumen pots, with sound inclusion in the Ecuadorian honey regulation NTE INEN 1572, currently under revision.

Keywords: Ecuador; Geotrigona; Medicinal uses; Melipona; Meliponini; Pot-honey; Scaptotrigona

INTRODUCTION

Ecuador has a surface of almost 300,000 km² divided into 24 provinces with the highest biodiversity in the planet. El Oro province is divided into 14 cantones, and belongs to the region 7 of Ecuador, located in the South West of the country, besides Loja and Zamora Chinchipe provinces (Fig. 1). El Oro’s population is 559,846 inhabitants living in 5,850 km²—roughly 1/50 the country surface; the capital city Machala is internationally known as the banana capital of the world. Besides the ecologically controversial exploitation of shrimp farming and intensive banana plantations, El Oro province has protected areas. Arenillas Ecological Reserve, Buenaventura National Park and Isla Santa Clara Wildlife Sanctuary. This coastal province is home to the Mulpupango, Chilla and Tioloma foothills, Hummingbird Sanctuary, and stingless bees.

Las Lajas is a 300 Km² Southern West canton of El Oro province, capital La Victoria, known for the production of cocoa, corn, and livestock. The temperature of 19 to 30°C, and altitudes between 80 and 900 m.a.s.l. are good for stingless bee life, indeed few species are currently kept.

Stingless bees (Hymenoptera; Apidae: Meliponini) are a tropical group with more than 500 known species, and perhaps 100 more to be named (Michener, 2013). This great biodiversity is mostly represented by Neotropical Meliponini with almost 400 species group (Camargo and Pedro, 2007; Camargo, 2013). Different species of stingless bees thrive in El Oro province, and some of them are used in traditional meliponiculture. The following species of stingless bees were previously reported in this province (Ramirez et al., 2012): Cephalotrigona capitata Smith, 1854; Geotrigona fusipes, Camargo & Moure, 2066; Ozotrigona melicolor, Packard, 1869; Scaptotrigona sp. cf. postica, Scaptotrigona sp., Trigona fulviventris, Trigona matura, Trigona sp. 1 and sp. 2.

“Stingless bees process honey and pollen in cerumen pots” is the title of an e-book, to reflect on differences from and similarities to honey and pollen processed in beeswax...
Knowledgeable medicinal properties of honey produced by stingless bees from Guatemala, Mexico, and Venezuela were informed (Vit et al., 2004). Achuaras from the Amazonian forest of Ecuador treat throat inflammation with pot-honey (Guerrini et al., 2009). Honey—as an effective curative product with religious and mythical powers—was pinpointed in a retrospective review on the medicinal uses of Melipona beecheii pot-honey by the ancient Maya to restore balance of all patients (Ocampo Rosales, 2013). Pot-honey was a name suggested to group honey produced by Meliponini because stinglessness—intellectual term used by Michener (2013)—possibly gives no input to think on the process by which honey is made inside cerumen containers, a component that may explain bioactive properties (Vit et al., 2013).

Natives from South America, such as the Kayapós, from southern Pará, Brazil, use the products of stingless bees in food and medicine, and also as a model for social organization for their own communities (Posey and Camargo, 1985; Camargo and Posey, 1990). Local knowledge on medicinal use, management, and ecological aspects were studied in a contribution of ethnoentomology for eight stingless bee species from Michoacan, Mexico (Reyes-González et al., 2014).

In this work we studied Ecuadorian meliponines from Las Lajas, Balsas, Piñas, and Zaruma cantons from El Oro province and the different medicinal uses of their honey produced in cerumen pots, to retrieve the relation man-bee-environment-health.

**MATERIALS AND METHODS**

Stingless bee keepers—named meliponicultors in Latin America—were visited in four cantons (Las Lajas, Balsas, Piñas, and Zaruma) from Provincia El Oro in Ecuador. Questionnaires were used with seventeen meliponicultors, six female and eleven male, to inform medicinal uses of pot-honey by themselves and pot-honey consumers. The questionnaire consisted in 15 structured questions on Personal Identification (1. Name, 2. Surname, 3. Age, 4. Location, 5. Phone, 6. Email); Meliponiculture (7. Years of experience, 8. Ethnic names of species kept, 9. Origin of the Nests, 10. Rational or traditional meliponary, 11. Number of hives, 12. Products extracted, 13. Method of honey extraction, 14. Conservation of the honey); 15. Medicinal uses of pot-honey were elicited by...
 enumeration and listening cases. Data on medicinal uses of pot-honey were analyzed and summarized by using Microsoft Excel to determine relative frequencies (%) of citations so as to identify the most common and popularly uses in the studied area.

The behavior of the bees was observed, and information on type of meliponary and shape of the nest entrance was recorded. Ethnic names of the stingless bees were taken in each sampling, and used for preliminary identification (Ramírez et al., 2013). Stingless bees were collected in isopropyl alcohol, kept in boxes, and sent to Dr. S.R.M. Pedro, Camargo’s Collection, Biology Department, Universidade de São Paulo, Ribeirão Preto, Brazil, for entomological identification. Another set was sent to Prof. J. Ramírez for subsequent mounting to be deposited in entomological boxes at Universidad Nacional de Loja, Loja, Ecuador. Further duplicates were sent to Professor Charles D. Michener at the University of Kansas, Lawrence, USA; to Dr. Clifford Keil, Director of the Invertebrates Museum, Pontificia Universidad Católica de Ecuador, Quito, Ecuador; and Dr. David W. Roubik, Smithsonian Tropical Research Institute, Panama.

RESULTS AND DISCUSSION

Stingless bees kept by seventeen visited Ecuadorian meliponicultors, aged 12 to 76-y-o in El Oro province are “bermeja” Melipona mimetica Cockerell, 1914; “cananambo” Melipona indecisa Cockerel, 1919; “catiana” or “catana” Scaptotrigona ederi Schwarz, unpublished; “pirunga” Paratrigona aff. eutaniiata Camargo & Moure, 1994, “piton” Nannotrigona cf. perilampoides (Cresson, 1878). All of them commented on decrease of “bermeja” and “cananambo” nectar as a more sensitive bee in frank decrease.

The dark Scaptotrigona ederi has variable defensive behavior, generally entangles in the hair and bites, therefore the use of the veil is advised for harvesting. The other species mentioned here are gentle bees, Nannotrigona sp. hides easily inside the nest. Two of the interviewed meliponicultors kept more than one type of stingless bee species, namely Melipona indecisa and Scaptotrigona ederi; whereas a female meliponicultor kept Nannotrigona cf. perilampoides, Paratrigona aff. eutaniiata and Scaptotrigona ederi. In Table 1 we show the ethnomedicinal uses of pot-honey produced by these five species of stingless bees, with healing properties known by producers and consumers in the locality. In this work the simple expressions were chosen to group the way honey is used, instead of systematic categorizations of medicinal interventions. The use of mixtures with plants would deserve another work by its own, therefore only the pot-honey is considered here.

Pot-honey is widely used alone or mixed with medicinal plants to treat tumors, eyes (ocular cataracts, pterygium), inflammation, sour throat infections, blood (bruises, varicose veins, purifying blood, cleaning blood after childbirth), kidney diseases, wound healing, and soothing balm before sleeping. The most frequent medicinal use was related to blood in 27% of the reported uses.

Their sensory qualities are appreciated by meliponicultors, who perceive floral smell and enticing sour flavor. In Table 1, the ethnic and scientific names of five stingless bee species from El Oro province are given with the medicinal uses of the pot-honey attributed by meliponicultors investigated here. Eight healing effects were registered, and besides being the most frequent, “catiana” or “catana” pot-honey has all these putative medicinal properties. Generally meliponicultors do not keep Apis mellifera, but the uses of honey are similar as a sweetener in plant infusions with antiinflammatory, emollient, against colds, and invigorative properties, as reported in the Granada study (Benítez, 2011). In the review on edible insects of Ecuador (Onore, 2005) and in our study, medicinal uses of stingless bee bodies were not informed by stingless bee keepers. However, whole body extracts of bees are used as anticancer and antibacterial agents, namely for their antimicrobial peptides (AMPs) (Ratcliffe et al., 2011).

Insects represented the major animal group (23%) of folk medicinal bio-resources in the study of Bahia, Brazil (Costa-Neto, 2004). Therefore entomotherapy has implications for public health and biological conservation...

Table 1: Ethnomedicinal uses of pot-honey produced by five types of stingless bees in El Oro province

<table>
<thead>
<tr>
<th>Stingeless bee names</th>
<th>Canton location</th>
<th>Balm</th>
<th>Blood</th>
<th>Kidney</th>
<th>Eyes</th>
<th>Inflammation</th>
<th>Sour throat</th>
<th>Tumor</th>
<th>Wound healing</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;bermeja&quot; Melipona mimetica</td>
<td>Las Lajas</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&quot;cananambo&quot; Melipona indecisa</td>
<td>Piñas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&quot;catiana&quot; Scaptotrigona ederi</td>
<td>Balsas, Las Lajas, Piñas, Zaruma</td>
<td>5.4</td>
<td>27.1</td>
<td>5.4</td>
<td>8.1</td>
<td>13.5</td>
<td>10.8</td>
<td>5.4</td>
<td>2.7</td>
</tr>
<tr>
<td>&quot;pirunga&quot; Paratrigona aff. eutaniiata</td>
<td>Las Lajas</td>
<td>-</td>
<td>-</td>
<td>2.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&quot;piton&quot; Nannotrigona cf. perilampoides</td>
<td>Las Lajas</td>
<td>-</td>
<td>-</td>
<td>2.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

504

Emir. J. Food Agric • Vol 27 • Issue 6 • 2015
Further ongoing studies are of interest to identify the megabiodiversity of stingless bees in Ecuador, the traditional meliponiculture, and medicinal uses of pot-honey as ancestral knowledge. Although these pot-honeys were produced and used before Columbus, they are not yet considered in the honey regulations (Vit, 2008). This joint effort besides the characterization of pot-honeys, and its inclusion in the honey standards of the INEN 1572 regulation (Vit et al., unpublished), using the Melipona favosa pot-honey model (Vit, 2013), would increase its current value in the market up to USD 27/kg, promote the study of its medicinal properties and praise the activity of meliponicultors. The role of honey is perceived therapeutic in 90% of multispecies medicinal recipes.

Traditional medicine (TM) remains a simple therapy for health care in low income countries because it is the most available and affordable form of healing, as well as for the naturism philosophy, and combined with alopatic medicine as complementary alternative medicine (CAM) (WHIO, 2000). It is readily available in ethnic groups such as Pankararé from Brazil who use Triesomellita sp., Cephalotrigona cf capitata, Melipona sp., Melipona scutellaris, Paratamona cf. cupina, Tetragonisca sp., Trigona (Trigona) sp, Plesiita sp., pot-honey or pollen eaten or mixed with plants (Costa-Neto, 2002). The fact that pot-honey has cultural value connecting with ancient curative skills, does not exclude its use as raw material in the preparation of industrial drugs.

The ecological contribution of stingless bees as organisms is encapsulated in their pollinating service to about 50% of flowering plant species in the Neotropics (Bicskei, 1997) and Australia (I Heard, 1999). The role of honey is perceived as therapeutic in 90% of multispecies medicinal recipes from Misiones, Argentina (Kujawscsa, 2012).

Stingless bee keepers from Zona Maya in Mexico experienced colony losses of Melipona beecheii due to competition for food (Villanueva-Gutiérrez et al., 2013), especially in meliponaries with more than 100 nests. Besides the rescue of tradition, environmental protection is needed to achieve sustainable meliponiculture. To protect wild populations of stingless bees, the Ecuadorian Ministry of Environment started to fine extractions of nests from wild logs five years ago in Las Lajas canton from El Oro province, as informed by a meliponicultur from Amarillos, parish La Libertad (M. Estrada, personal communication). Besides the nutritional, organoleptic and sanitary values of a medicinal food like honey, an enterprising concept on the quality of the agri-food systems—as reviewed by Monastera and Crisponi (2013), considers animal welfare and defence of the ecosystem, as practiced by stingless bee keepers in modern days.

CONCLUSIONS

Honey is a medicinal food product of plant-animal-based pharmacopeia used in entomotherapy. Seventeen meliponicultors provided information on the honey produced in cerumen pots by five types of stingless bees from el Oro province from Ecuador. Pot-honey is mostly harvested from “catana” or “catiana” because the other bees—“bermeja”, “cananambo”, “pirungu” and “piton”—are less frequent. This described knowledge has ecological and sanitary implications, and deserves careful considerations.

ACKNOWLEDGEMENTS

To Prometeo, Senescyt, Ecuador for the grant to Patricia Vit at Universidad Técnica de Machala UTMACH, Provincia El Oro. To Dr. Silvia R.M. Pedro, Biology Department, Universidade de São Paulo, Ribeirão Preto, Brazil, for the entomological identifications. To Gobierno Autónomo Descentralizado Provincial El Oro GADPEQ, for the map with the cantons studied here. To Mrs. Elizabeth Brito Administrative Assistant from the Planning Department, and Mrs. Esperanza Poma Busto, Director of Public Relations, for the efficient logistics, the Principal of UTMACH Eng. César Quezada Abad for the facilities provided for field work, and the drivers Mr. Jairo Riofrío, Mr. Wilson Ríos, and Mr. Francisco Saavedra. To Prof. José Quevedo from UTMACH for the initial contact with pot-honey producers from Piñas. To El Oro province Ecuadorian meliponicultors Eviña María Guairacoche Pereira, Ubertino Matamoro, María Torres, Andrés Torres, Graciela Pacheco, Segundo Peijó, Arturo Balaresco, Osvaldo Ajila, Guillermo Peijó, César and Nayeli Jaramillo, Segundo Lapo, Abelardo Román, Rosa and Marina Estrada, Daniel and José Zúñiga from Ecuador to keep the tradition beyond ancient times. Professor Genoveva Ocampo Rosales from the Faculty of Phylosophy and Letters, Universidad Nacional Autónoma de México, and Professor Maurizio Paolletti from the Department of Biology, Università di Padova, Italy, kindly
revised our manuscript. To Productos Schullo for the support to present a poster of this research in the 23rd SILAE congress, Marsala, Sicily, Italy, 2014.

Author contributions
V. P. made a major contribution to design the research and collect the data. L.T. contributed with field work in Las Lajas V.O and M. V.F. were involved in overall supervision as Prometco Counterparts. All authors read and approved the final manuscript.

REFERENCES
The "Emirates Journal of Food and Agriculture" (EJFA) is a unique, peer-reviewed Journal of Food and Agriculture publishing basic and applied research articles in the field of agricultural sciences by the College of Food and Agriculture, United Arab Emirates University, United Arab Emirates.

Current Issue

Warning: mysql_connect(): Too many connections in /home/scopemed/depo/db.php on line 2
I cannot connect to the database because: Too many connections.

pISSN : 2079-052X
eISSN : 2079-0538
ISSUES : 12 per year

PUBLISHER: College of Food and Agriculture, United Arab Emirates University

Published by the College of Food and Agriculture, United Arab Emirates University, United Arab Emirates.

Indexed & Abstracted

- JCR, Journal Citation Reports (Thomson Reuters)
- Journal Master List (Thomson Reuters)
- SCIE, Science Citation Index Expanded (Thomson Reuters)
- SCOPUS
- CAB Abstracts (CABI Publishing)

See the full Indexing

Emirates Journal of Food and Agriculture

Indicator 2006-2012 Value
SJR ★★★★★ 0.31
Cites per doc ★★★★★ 0.94
Total cites ★★★★★ 156

http://www.ejfa.me/