

Short communication: Organoleptic and physical characteristics of propolis from northeastern Argentina

A. Sosa López^{*1}, M. J. Subosky¹, J. F. Maidana² and A. Castillo¹

¹ *Cátedra de Química Orgánica y Biológica. Departamento de Física y Química. Facultad de Ciencias Agrarias. Sargento Cabral, 2131. 3400 Corrientes. Argentina*

² *Centro de Investigaciones Apícolas. Facultad de Agronomía y Agroindustrias. Universidad Nacional de Santiago del Estero. Avda. Belgrano (Sud), 1912. 4200 Santiago del Estero. Argentina*

Abstract

Propolis is a combination of resinous, gummy, and balsamic substances of slimy consistency, which is collected by bees from different botanical sources and then transported to hives, where their physical and chemical properties are modified. Propolis contains active pharmacological substances and its demand as a natural drug is increasing in international markets. The objective of this work was to determine the organoleptic characteristics and physical parameters of propolis samples taken from 14 beehives in northeastern Argentina. In general, propolis came in irregular, opaque and shiny fragments with a hard consistency and contained external impurities. In most cases, the aroma was aromatic-resinous, attributed to the predominant flora in the geographical zone studied. This could be a positive factor for its commercialisation. Its flavour was predominantly insipid and it was a chestnut-brown colour. The water and ash contents found in different samples were very variable, indicating the presence of mineral elements from additional substances that bees introduce to make the propolis a more solid consistency. This preliminary study with no precedents in northeastern Argentina suggests that, in spite of the variability found, this natural product meets basic requirements for its commercialisation, and can be competitive on international markets.

Key words: mineral elements, physical and chemical properties, beehives.

Resumen

Nota corta: Características organolépticas y físicas de propóleos del nordeste argentino

El propóleos es un conjunto de sustancias resinosas, gomosas y balsámicas, de consistencia viscosa, que son recolectadas por las abejas de distintas fuentes botánicas y luego transportadas a la colmena, donde son modificadas física y químicamente. El propóleos contiene sustancias farmacológicas activas, por lo que es requerido cada vez más en los mercados internacionales en calidad de fármaco natural. El objetivo del presente trabajo fue determinar las características organolépticas y parámetros físicos de los propóleos procedentes de 14 apiarios del nordeste argentino. En general, los propóleos se presentaron en forma de trozos irregulares opacos y con brillo, de consistencia predominantemente dura, y con impurezas de otro origen. El olor fue mayoritariamente resinoso aromático, atribuido a la flora predominante en el área de estudio, lo que podría ser un factor positivo en su comercialización. El sabor predominante fue insípido y el color marrón con tintes castaños. El contenido de humedad y de cenizas en las diferentes muestras fue muy variable, debido fundamentalmente a su distinto origen geográfico. La variabilidad en el contenido de elementos minerales procede de las sustancias adicionadas por la abeja para otorgar mayor consistencia al propóleos. Este estudio preliminar y sin antecedentes en el nordeste argentino permite inferir, a pesar de las variabilidades encontradas, que este producto natural presenta los requerimientos básicos para su comercialización y estaría en condiciones de competir en los mercados internacionales.

Palabras clave: elementos minerales, propiedades físico-químicas, apiarios.

Propolis is a combination of resinous, gummy and balsamic substances of slimy consistency, which is collected by the bees from the buds and barks of trees

and transported to the inside of the hive where it is modified by adding waxes, mechanical impurities and salivary secretions. Owing to the variability of factors involved in propolis production, it would be expected to have variable physical and chemical properties. Bees use this product in the hive for several purposes,

* Corresponding author: avallejos@agr.unne.edu.ar
Received: 09-07-02; Accepted: 18-12-02.

to varnish the inside of the hive (including the panels) for disinfecting purposes, to fill in crevices, to reduce the size of entrances and to consolidate structural components. It is also used to cover the corpses of predators that enter the hive (beetles, rodents, small lizards), that become embalmed preventing their decomposition.

Active pharmacological substances found in propolis are of plant origin (Asis, 1989; Bianchi, 1996). Its composition is, therefore, highly variable owing to the diversity of the botanical sources used to produce it (Maidana, 1998).

The synergism between propolis and antibiotics make it an useful therapeutic resource, although in some cases local application of propolis can cause allergic reactions (Apimondia, 1976; Stangaci, 1998).

Since it contains drugs of plant origin, national production is insufficient since it is exported in increasing amounts to international markets, mainly Germany, Italy, Japan and the US (Bedascarrabure, 1999a). With the aim of transforming commercial opportunities into real competitive advantages in the MERCOSUR region, quality standards for this product must be established. The aim of this work was to determine the organoleptic characteristics and the physical parameters of propolis from northeastern Argentina (NEA).

A record was made of all the apiaries in the region. A total of 14 apicultural producers were randomly selected from most of the provinces that make up this region (Corrientes, Chaco, Misiones and Formosa).

The predominant flora in the apiaries of Corrientes, Chaco and Formosa (Cabrera, 1976) corresponds to the climax community and is mainly comprised of woods of *Schinopsis balansae* Engl. (*Anacardiaceae*, common name: red quebracho) and *Aspidosperma white quebracho* Schltdl. (*Apocynaceae*, white quebracho). Other important tree species in this community are: *Caesalpinia paraguariensis* (Parodi) Burkart (*Fabaceae*, guayacán); *Gleditsia amorphoide* (Griseb) Taub. (*Fabaceae*, espina corona); *Astronium balansae* Engl. (*Anacardiaceae*, urunday); *Ruprechtia laxiflora* Meisn. (*Polygonaceae*, viraro); *Diplokeleba floribunda* N.E.Br. (*Sapindaceae*, stonewood); *Eugenia nuciflora* L. (*Myrtaceae*, ñangapiri); *Patagonula americana* L. (*Boraginaceae*, guava); *Tabebuia heptaphylla* (Vell.) Toledo (*Bignoniaceae*, lapacho); *Prosopis* spp (*Fabaceae*, carob tree); *Acacia caven* (Molina) Molina (*Fabaceae*, aromito), *A. praecox* Griseb. (*Fabaceae*, garabato); *Geoffrea dicorticans* (Gillies ex Hook & Arn.) Burkart (*Fabaceae*, chañar). In the herbaceous condi-

tion at Spring, predominate *Eupatorium* spp. (*Asteraceae*) and *Vernonia* spp. (*Asteraceae*).

In contrast, in the Misiones province the predominant vegetation type corresponds to forests and savannah. The climax community (Cabrera, 1976; Zuloaga and Morrone, 1999 a, b) is the forest of *Nectandra megapotamica* (Spreng.) Mez (*Lauraceae*, laurel), *Ocotea puberula* (Ness & Mart.) Ness. (*Lauraceae*, ayuí-morotí), *Inga verna* Willd. Subsp. *afinis* (DC.) T.D.Penn. (*Fabaceae*, ingá), *Schefflera morotoni* (Aubl.) Maguire, Steyer. & Frodin (*Araliaceae*, ambay-guazú), *Erythrina falcata* Bent. (*Fabaceae*, seibo), *Picrasma crenata* (Vell.) Engl. (*Simaroubaceae*, bitterwood); *Patagonula americana* L. (*Boraginaceae*, guayaibí); *Sapium haemospermum* Mill. Ag. (*Euphorbiaceae*, curupí or lecherón); *Enterolobium contortisiliquum* (Vell.) Morong. (*Fabaceae*, timbó), *Choricia speciosa* A. St.-Hil. (*Bombacaceae*, samohú); *Euterpe edulis* Mart. (*Arecaceae*, palm); *Syagrus romanzoffiana* (Cham.) Glassman (*Arecaceae*, pindó), *Ilex paraguariensis* A. St.-Hil. (*Aquifoliaceae*, yerba mate); *Astronium balansae* Engl. (*Anacardiaceae*, urunday), several different species of *Celtis* spp. (*Ulmaceae*, tala). In the marginal forests the following species predominate: *Cecropia pachystachya* Trecul (*Cecropiaceae*, ambay), *Salix humboldtiana* Will. (*Salicaceae*, willow), *Erythrina crista-galli* L. (*Fabaceae*, seibo), *Inga verna* Will. subsp. *afinis* (DC.) T.D.Penn. (*Fabaceae*, ingá), *Ocotea acutifolia* (Ness) Mez (*Lauraceae*, river laurel).

Three samples were randomly collected from each apiary, and a total of 42 were studied. These were collected by scraping the quadrants, covers and partitions of the hives using stainless steel knives. The samples were treated following the protocol designed by the Universidad de Santiago del Estero (UNSE) and the Instituto Nacional de Tecnología Agropecuaria (INTA) of Faimallá (Maldonado, 2000). The samples were placed in transparent polyethylene packets and afterwards in dark bags to protect them from the sun.

The organoleptic characteristics determined were consistency, appearance, visible impurities, aroma, flavour, colour, according to the UNSE-INTA-Famailla protocol (Maldonado, 2000). The physical characteristics studied were percent water content and ash contents according to the gravimetric method (Maidana, 1997; Bedascarrabure, 1999c).

Most of the propolis was irregular opaque shiny fragments (Fig. 1A). The consistency was mainly hard (Fig. 1B), since the bees add soil and plant remains to

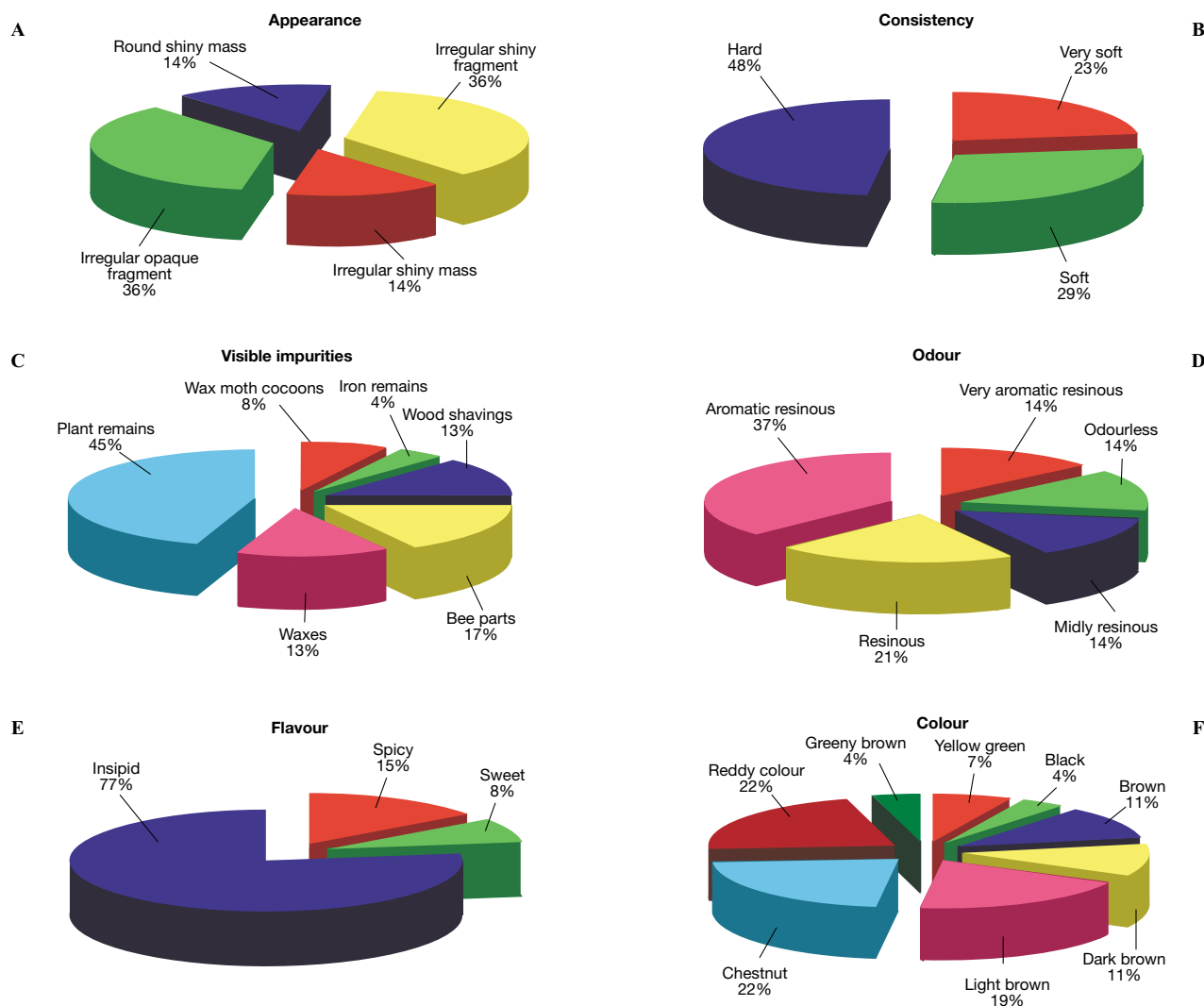


Figure 1. Organoleptic properties of propolis.

make them harder, because of the softening effect of the high temperatures of the region, confirming the findings of Maidana (1998). Visible impurities were found in all the samples, with the remains of plants and other materials (Fig. 1C). Remains of paint, paper or cardboard were not found.

The aroma of all the samples studied, which is one of the most important characteristics for propolis consumers, mainly corresponded to resinous aromatic (37%) (Fig. 1D), attributed to the predominant flora in the apiary region, and can be a positive attribute for its commercialisation. In 77% of the samples the flavour was insipid (Fig. 1E). The predominant colour was brown with chestnut tones (Fig. 1F).

The water and ash contents of the samples ranged from 4 to 7 and between 2.5 and 4.54%, respectively

(Fig. 2). This ash contents is indicative of the presence of mineral elements, which proceed from substances added by the bee (mechanical impurities such as clays, sands, etc) in order to solidify the propolis. The minerals found, of both organic and inorganic origin, are associated with the therapeutic properties of this product (Sosa López *et al*, 2000). Knowledge of the water contents of the propolis is useful to improve its conservation and storage by preventing the growth of moulds such as *Mucor* and *Penicillium* on its surface, that reduce the quality of this product.

The elements studied by absorption spectrophotometry were iron, copper, manganese, zinc and potassium, the concentrations of which vary depending on the origin of the propolis (Table 1). A highly significant difference was found in the iron contents of

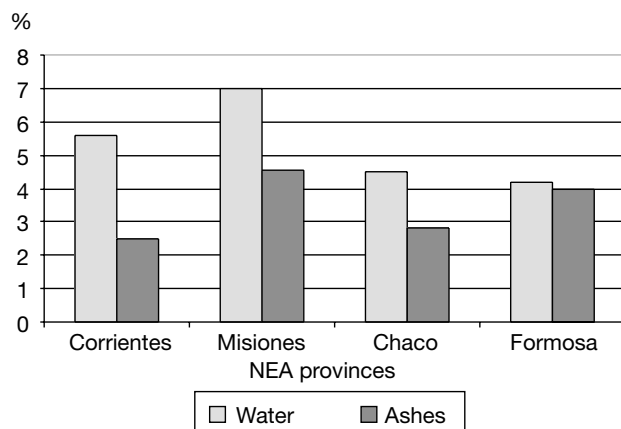


Figure 2. Water and ash contents of propolis.

Table 1. Mean contents of mineral elements in propolis of NEA (mg kg^{-1}). The values correspond to the mean values of three repeats for 14 producers

Provinces	Potassium	Copper	Manganese	Iron
Corrientes	24.1	16.1	35.7	1,056.7
Misiones	41.1	26.1	33.5	413.8
Chaco	31.2	16.9	12.1	135.5

the samples from the Corrientes province, $1,056.7 \text{ mg kg}^{-1}$ compared to that of samples from Chaco, 135.5 mg kg^{-1} . Physical parameters (water and ash contents) are in agreement with those reported by several authors for different regions of Argentina (Maldonado, 2000).

References

APIMONDIA, 1976. Apiterapia hoy. Instituto Internacional de Tecnología y Economía Apícolas. Sector Médico

- de Terapia. Editorial Apimondia. Bucarest, Rumania. 108 pp.
- ASIS M., 1989. Propóleos: el oro púrpura de las abejas. Ed. CIDA, La Habana, Cuba. 218 pp.
- BEDASCARRASBURE E., MALDONADO L., FIERRO MORALES W., BRACHO J., MAIDANA J.F., 1999a. El propóleos: un valioso producto apícola. Serie actualización PROAPI. I, pp.1-8.
- BEDASCARRASBURE E., MALDONADO L., FIERRO MORALES W., BRACHO J., MAIDANA J.F., 1999b. El propóleos: un valioso producto apícola. Serie actualización PROAPI. II, pp. 1-8.
- BEDASCARRASBURE E., MALDONADO L., FIERRO MORALES W., BRACHO J., MAIDANA J.F., 1999c. El propóleos: un valioso producto apícola. Serie actualización PROAPI. III, pp. 1-8.
- BIANCHI E., 1996. Calidad de propóleos. CEDIA - Santiago del Estero, Argentina. 10 pp.
- CABRERA A.L., 1976. Regiones fitogeográficas argentinas. Ed. Acme SACI Bs.As. 2nd. ed, Part II, 85 pp.
- MAIDANA J., 1997. Características físicas del propóleos, en relación a su procedencia y origen vegetal. CEDIA-Santiago del Estero, Argentina. Ciencias y Abejas. Rev. 23, 16-20.
- MALDONADO L., 2000. Perfil de los propóleos argentinos. Abstracts of the International Congress on Propolis, Buenos Aires, Argentina. pp. 11-17.
- SOSA LÓPEZ A.A., SUBOSVSKY M.J., CASTILLO A.E., RAMÍREZ S.S., PEIRETTI H.A., DÍAZ I., 2000. Determinación de elementos minerales en propóleos. Abstracts of the XXIII Congreso Argentino de Química. Corrientes-Argentina. p. 20
- STANGACIU S., 1998. L. Propiedades curativas de los productos de la colmena. Propiedades médico-farmacológicas de los productos de la colmena. I Jornadas Internacionales sobre propóleos, Buenos Aires, May 14, pp.1-20.
- ZULOAGA F., MORRONE O. (Eds.), 1999a. Catálogo de las plantas vasculares de la República Argentina II. Missouri Botanical Garden, USA. Part 1, 621 pp.
- ZULOAGA F., MORRONE O. (Eds.), 1999b. Catálogo de las plantas vasculares de la República Argentina II. Missouri Botanical Garden, USA. Part 2, 647 pp.