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Review of *Lansium domesticum* Corrêa and its use in cosmetics

[Revisión de *Lansium domesticum* Corrêa y sus usos en cosmética]

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Abstract

This article focuses on the Indonesian tropical plant, *Lansium domesticum*. Its botany and phytochemistry as well as its medicinal, nutritional and cosmeceutical value, which include antioxidant, moisturizing, whitening and lightening effects, are reviewed. This plant could be of interest for the Latinamerican community as it can grow in several parts of America.

Keywords: *Lansium domesticum*, anti oxidant, moisturizing, cosmetic use.

Resumen

Este artículo trata de la planta tropical Indonesia *Lansium domesticum*. Su botánica y fitoquímica así como sus usos medicinales, nutricionales y cosméticos, que incluyen efectos de antioxidantes, hidratantes, despigmentantes e iluminadores del cutis son revisados. Esta planta puede ser de interés para la comunidad latinoamericana ya que puede adaptarse y crecer en algunas partes de América.

Palabras clave: *Lansium domesticum*, antioxidante, hidratante, uso cosmetico.

INTRODUCTION

Indonesia, a tropical country, is one of the biggest archipelagos in the world, full of plant diversity (Sutarjadi, 1992). Almost 11 percent of 30,000 species of plants have been used in health and beauty care. (Sutarjadi, 1992). As a country rich in natural resources, including medicinal plants and marine resources, the botanists use to say that Indonesia is a mega biodiversity country. While the Dutch complimented Indonesia as *de Smaragd Gordel* which means the green (like emerald) and full of riches islands (Heyne, 1987). Indonesia, with its more than 200 million population, is known for its heritage in the utilization of plant for medicinal as well as cosmetic use.

This article reviews the Indonesian tropical plant, *Lansium domesticum*, that has been used as the source of an extract for natural whitening in cosmetics.

BOTANICAL DATA

Family

Lansium domesticum Corrêa belongs to the Meliaceae family (Heyne, 1987)

Common names

(Heyne, 1987; Verheij, 1992; MMPND, 2007)

Langsat, Duku, Kokosan [Indonesia]; Langsat, Duku, Duku-Langsat Malaysia]; Lansones (Tagalog), Langsat, Duku, Longkong [Thailand]; Bon-bon [Vietnam]; Langsat [Brumese], Lan sa [Chinese]; Lan sa guo [Taiwan]; Langsat, Langsep [Danish]; Kokosan, Langsep [Dutch]; Langsat [English]; Langsep, Langsium [French]; Echter Lansabaum, Langsat, Lansabaum, Lansibaum [German]; Lansio, Lanzone [Italian]; Ransa [Japanese]; Lang sat [Korean]; Arbol-do-lanza [Portuguese]; Arbol de lanza, Lanzon [Spanish].

Synonyms

(Heyne, 1987; Verheij, 1992; Nationalherbarium, 2007)

Aglaia aquea (Jack) Kosterm., *Aglaia domestica* (Correa) Pellegr., *Aglaia dookoo* Griff., *Aglaia intricatoreticulata* Kosterm., *Aglaia merrillii* Elmer, *Aglaia sepalina* (Kosterm.) Kosterm., *Aglaia steenisii* Kosterm., *Lansium aqueum* (Jack) M. Roem., *Lansium domesticum* var. *aqueum* Jack, *Lansium domesticum* var. *pubescens* Koord. & Valet., *Lansium domesticum* var. *typicum* Backer, *Lansium javanicum* Koord. & Valet. ex Moll & Janss., *Lansium javanicum* M. Roem., *Lansium parasiticum* Sahni & Bennet, *Lansium parasiticum* var. *aqueum* (Jack) Sahni & Bennet, *Lansium pedicellatum* Kosterm., *Lansium sepalinum* Kosterm., *Taeniochlaena polyneura* Schellenb.

Description**Bark:**

Tree up to 30 m tall and trunk 75 cm in diameter, in cultivation usually only 5-10 m tall; bole up to 25 m, irregularly fluted, with steep buttresses; bark mottled grey and orange, furrowed, containing milky, sticky resinous sap; twigs glabrous to pilose.

Leaves:

Leaves alternate, odd-pinnate, 30-50 cm long, glabrous to densely pilose, petiole up to 7 cm long; leaflets alternate, 6-9, elliptical to oblong, 9-21 cm x 5-10 cm, glossy, chartaceous-coriaceous, base what some asymmetric, apex short acuminate, lateral veins 10-14 pairs, petiolules 5-12 mm long, thickened at base.

Flowers:

Inflorescence many flowered, solitary or in fascicles of 2-10 on the trunk or largest branches; racemes simple or branched at the base, 10-30 cm long; flowers bisexual, sessile to pedicelled, solitary, small; calyx fleshy, cup-shaped, 5-lobed, greenish-yellow; petals fleshy, erect, ovate, 2-3 mm x 4-5 mm, white to pale yellow; staminal tube subglobose, up to 2 mm high, anthers in one whorl; ovary globose, appressed pilose, 4-5-celled; style short, thick, stigma broad.

Fruits:

Fruit an ellipsoid or globose berry, up to 2-4(-7) cm x 1.5-5 cm, yellowish pubescent, calyx persistent with reflexed lobes; fruit-wall thin (1-1.5 mm) or thick (up to 6 mm).

Seeds:

Seeds 1-3, enveloped by a closely adhering, thick, fleshy, translucent white aril; cells without developed seed are also filled with aril tissue (Heyne, 1987; Morton, 1987).

Figure 1. *Lansium domesticum*, tree and fruit

**Origin and Geographic Distribution**

Langsat originates in western South-East Asia, from Peninsular Thailand in the west to Borneo in the east (Indonesia). It still occurs wild or naturalized in this area and is one of the major cultivated fruits. In Borneo it is found throughout the island. On a small scale, langsat is also cultivated in Vietnam, Burma, India, Sri Lanka, Hawaii, Australia, Surinam and Puerto Rico.

In Indonesia, langsat can also be found in Banyuwangi, Palembang, Bangka, West of Kalimantan, and in some areas of Sulawesi (Celebes) (Heyne, 1987; Verheij, 1992).

Langsat was introduced into Hawaii before 1930, and is frequently grown at low elevations. An occasional tree may be found on other Pacific islands. The species is little known in the American tropics, except in Surinam. Seeds were sent from Java to the Lancetilla Experimental Garden at Tela, Honduras, in 1926 and plants arrived from the same source in 1927. The trees have grown well and there are bearing trees in Trinidad, where the langsat was established in 1938, and a few around Mayaguez, Puerto Rico, that have been bearing well for about 60 years. There were young specimens growing on St. Croix in 1930. Southern Florida does not have the climatic and soil conditions favorable to the langsat. There have been attempts to maintain langsat at the University of Florida's Agricultural Research and Education Center in Homestead, but the trees have

succumbed either to the limestone terrain or low temperatures.

Varieties

There are two distinct botanical varieties: *Lansium domesticum* var. *pubescens*, the typical wild langsat, which is a rather slender, open tree with hairy branchlets and nearly round, thick-skinned fruits having much milky latex;

Lansium domesticum var. *domesticum*, called the duku, doekoe, or dookoo, which is a more robust tree, broad-topped and densely foliated with conspicuously-veined leaflets; the fruits, borne few to a cluster, are oblong-ovoid or ellipsoid, with thin, brownish skin, only faintly aromatic and containing little or no milky latex. The former is often referred to as the “wild” type, but both varieties are cultivated and show considerable range of form, size and quality. (Heyne, 1987; Morton, 1987; Verheij, 1992; MSC, 2002)

Climate

The langsat grows in ultra-tropical climate. Even in its native territory it cannot be grown at an altitude over 2,100 to 2,500 ft (650-750 m). It needs a humid atmosphere, plenty of moisture, and will not tolerate long, dry seasons. Some shade is beneficial, especially during the early years (Morton, 1987).

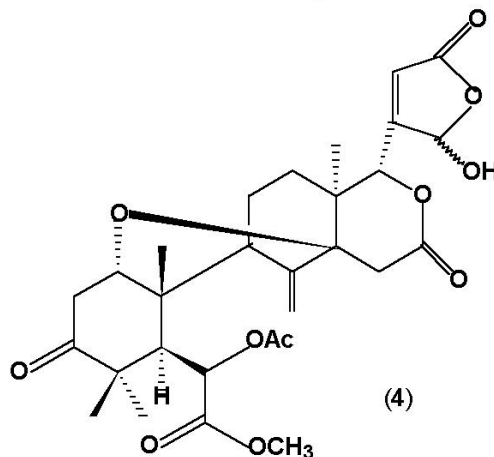
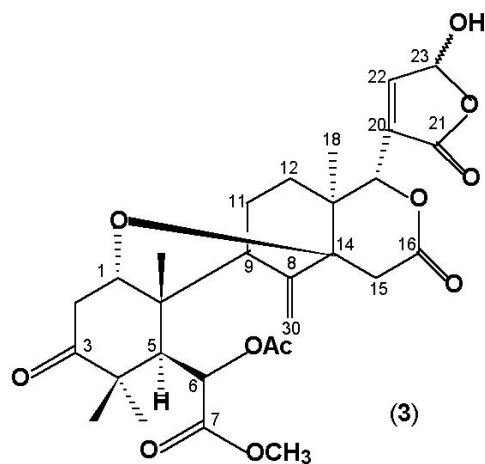
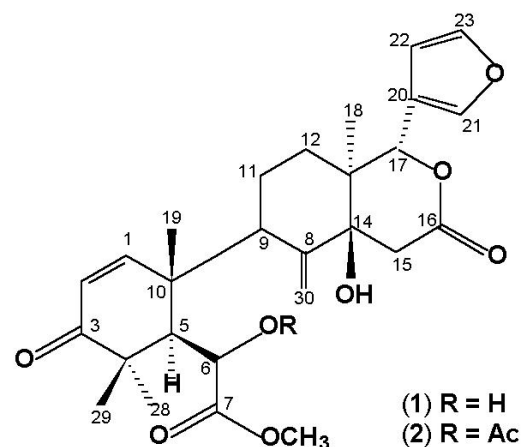
CHEMICAL COMPOSITION

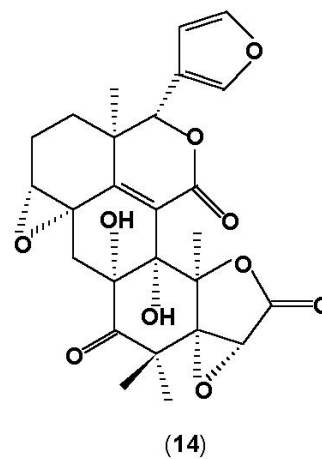
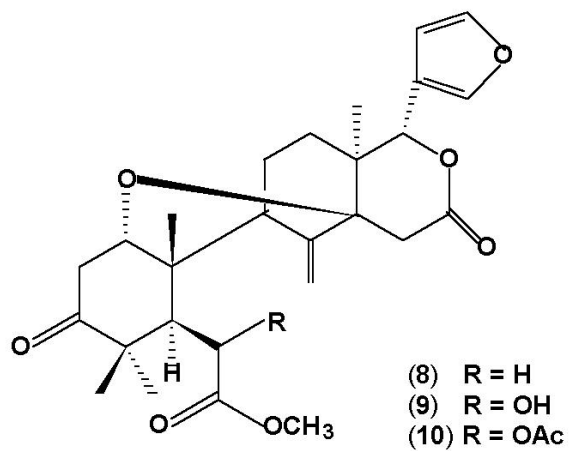
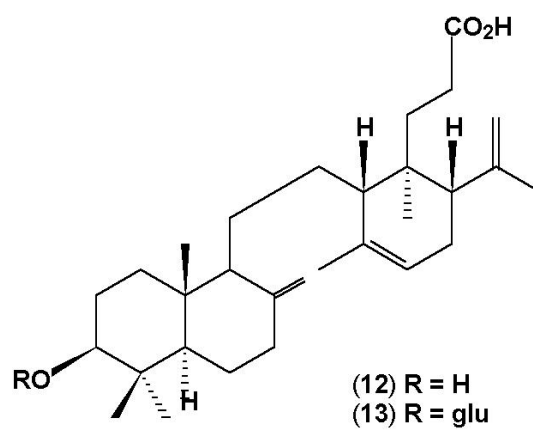
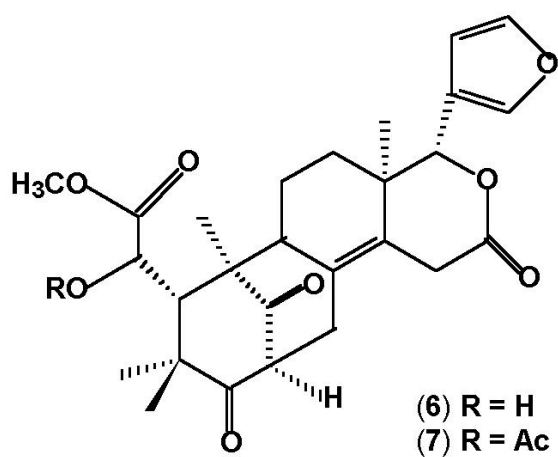
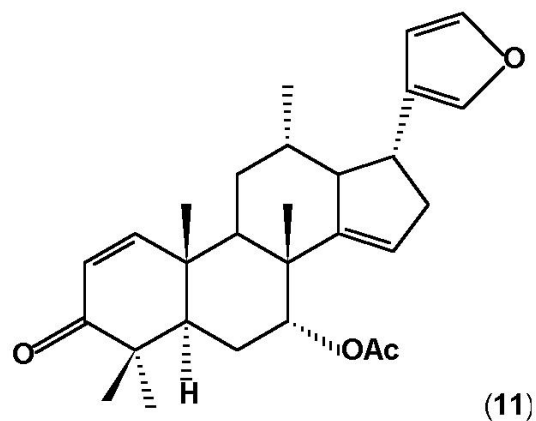
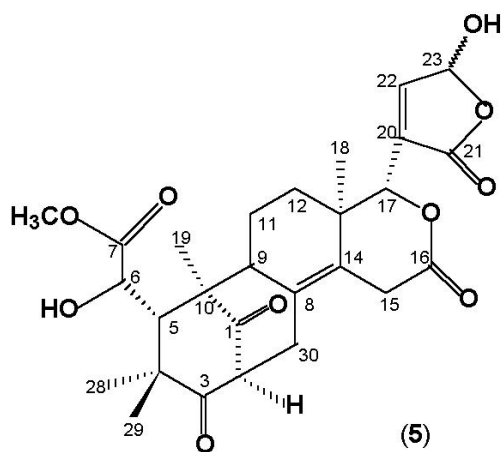
The edible portion is 68% of the fruit weight. Per 100 g it contains: water 84 g, a little protein and fat, carbohydrates 14.2 g, mainly reducing sugars, predominantly glucose, fibre 0.8 g, ash 0.6 g, Ca 19 mg, K 275 mg, some vitamin B1 and B2 but little vitamin C. The energy value is 238 kJ/100g.

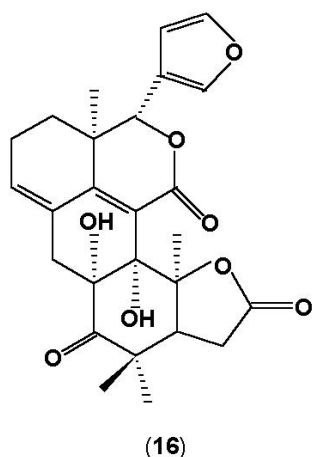
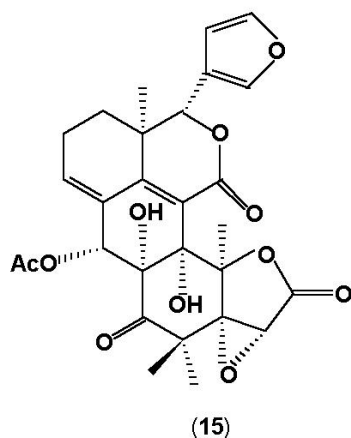
The fresh peel contains 0.2% of a light-yellow volatile oil, a brown resin and reducing acids. From the dried peel, there is obtained a dark, semi-liquid oleoresin composed of 0.17% volatile oil and 22% resin. (Heyne, 1987; Verheij, 1992).

Five tetranorterpenoid, domesticulide A-E (**1-5**), were isolated from seed of *Lansium domesticum* Corr. together with 11 known triterpenoids (**6-16**). It is worth noting that the seed extract of *L. domesticum* are a rich source of limonoids. Six classes of the limonoids have been isolated, including andirobin derivatives (**1-2**), methyl angolensates (**3, 4, 8, 9** and **10**), mexicanolides (**5-7**), an azadiradione (**11**), onoceranoids (**12-13**) and dukunolides (**14-16**). Compounds **2, 3, 4, 7, 8, 10, 11**, and **15** showed

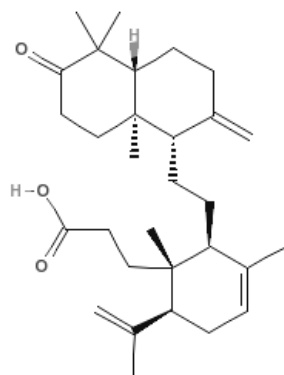
antimalarial activity against *Plasmodium falciparum* with IC₅₀'s of 2.4-9.7 µg/ml (Saewan, 2006).







Three new onoceranoid triterpenes, lansionic acid (17), 3 β -hydroxyonocera-8(26),14-dien-21-one, and 21 α -hydroxyonocera-8(26), and 14-dien-3-one, were isolated from the fruit peel of *Lansium domesticum* var *domesticum*. These triterpenoids exhibited mild toxicity against brine shrimp (*Artemia salina*) (Tanaka, 2002).



17. Lansionic acid
(1-16 from the authors, 17 from PubChem Substance Database)

USAGE OF LANSIUM

Food Uses

The peel of the langsat can be easily removed and the flesh is practically eaten fresh out of hand, or served as a dessert, and may be cooked in various ways. Seedless fruit may be bottled in syrup or sometimes candied (Morton, 1987).

Table 1. Food value of *L. domesticum*
Food value per 100 g of edible portion*

Moisture	86.5 g
Protein	0.8 g
Carbohydrates	9.5 g
Fiber	2.3 g
Calcium	20.0 mg
Phosphorus	30.0 mg
Carotene (Vit.A)	13.0 I.U.
Thiamine	89 mcg
Riboflavin	124 mcg
Ascorbic Acid	1.0 mg
Phytin	mg (dry weight)

*According to analysis made in India. The edible flesh may constitute 60% of the fruit. (Morton, 1987)

Medicinal Uses

The peel, rich in oleoresin, is used against diarrhea. This resin is non-toxic and is administered to halt diarrhea and intestinal spasms; However, Morton (1987) shown that it can contracts rabbit intestine *in vitro*. Other parts of the plant employed medicinally include the crushed seeds used to treat fevers and the astringent bark which is administered (p.o) against dysentery and malaria. The powdered bark is used in poultices against scorpion stings. (Verheij, 1992)

Other Uses

The dried peel is burned in Java, the aromatic smoke serving as a mosquito repellent and as incense in the rooms of sick people. The light-brown wood is tough and durable and used for house pots, tools, handles, etc (Heyne, 1987).

Cosmetic Uses

The dried Hydroethanol extract of *Lansium domesticum* fruit can be used as cosmetic. The dry extract is re-dissolved in propylene glycol to obtain the final product. It is used as a skin care product for skin depigmentation and moisturizing. The

recommended dose of the liquid extract is 2 – 5% (Tilaar, 2007b).

STUDIES ON BIOLOGICAL ACTIVITIES

In Vitro Studies on Biological Activities

From an *in vitro* studies it was shown that the extract of *Lansium domesticum* has antioxidant activity against DPPH free radical and anti tyrosinase activity (Vanni, 1990; Shimada, 1992; Tilaar, 2007a; Tilaar, 2007b).

Clinical Study on Skin moisturizing and lightening effect

This was performed according to Good Clinical Practice on a panel of 30 female volunteers aged 32 - 52 years old during 4 weeks. Skin moisture content was measured using Corneometer CM 820. Lightening effect was measured using a Mexameter MX 16 and data was statistically evaluated. The result showed that *Lansium* extract can significantly increase skin moisture content and decrease the skin melanin index (Serup, 1995; Anonymous, 1998a; Anonymous, 1998b; Tilaar, 2007a).

Dosage and Safety

Dermatological safety evaluation was performed using Repeated Opened Patch Test (ROPT) and SCPT. ROPT showed that *L. domesticum* extract did not cause any irritation or allergic skin reaction. Single Closed Patch Test (SCPT), showed that concentration of 1% and 3% of extracts did not cause any irritation or allergic skin reaction in all volunteers, while concentration of 5% caused irritation in 1.9% of all subjects. According to the method of HET-CAM (Hen's Egg Testing of Chorioallantoic Membrane). Fifty milligrams (50mg) of *Lansium* extract in a lotion base was applied onto the chorioallantoic membrane and left in contact for 20 seconds. The membrane was then evaluated for 5 minutes for any appearance of hyperemia, hemorrhage, and opacity (Curry, 1991; Serup, 1995; SCCNFP, 2000; Ranti, 2007; Luepke, 1985).

CONCLUSION

Lansium domesticum is an Indonesian plant species that has been successfully grown in certain parts of Latin-America. Several parts of the plant are used in popular medicine but it is more important as an economic crop as the edible fruit is widely eaten fresh as dessert. However it can also be used in cosmetics as we found that its extract has antioxidant

property as well as moisturizing and lightening effects with a good safety profile.

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