

HISTORY OF BIXA ORELLANA in Colombia

Upon the arrival of Europeans, the *Bixa orellana* was cultivated from Mexico to Brazil, possibly being the Amazon basin.

Colombian
Caribbean coast

Nocaima
Cundinamarca
Inter-Andean valleys

Colombian
Amazonia

Colombian
Pacific Coast

Our indigenous and ethnic communities in the Amazon, Chocó and even the center of Colombia (Muisca) used the *Bixa orellana* (commonly called in Colombia "Achiote") to paint and tattoo their bodies and especially in their religious rituals, in their harvest parties to attract couples, as insect repellent, as skin protector and even as medicine and condiment.

In Colombia, it is distributed in humid and dry areas: From the Caribbean Coast, Pacific, Amazon and inter-Andean valleys with no less than 520 cultivated hectares and it can benefit more than 300 families of the rural communities of the indicated zones.

Today, achiote cultivation is part of one of the strategies that offers possibilities for the substitution of illicit crops in the country and as an alternative to the social structures in rural communities during the armed conflict since they are potential suppliers of the seed for its collection and subsequent extraction process for the cosmetic, pharmaceutical or food sector.

Bixa orellana today is not only a natural dye, which is extracted from the seed of the tree, but it is also a natural ingredient for cosmetics. It is biodegradable, non-toxic, non-carcinogenic and it is approved by the FDA, COSING and CHINA COMPLICE list for cosmetics.

Annatto (Achiote) is a shrub 2 to 4 m tall, it can live up to 50 years, it is cultivated for harvest up to 30 years and grows in

extreme climatic conditions, abundant rainfall and high temperatures. Achiote shrubs support up to 9,000 mm per year rain, producing 2 or 2.5 harvests a year. The first harvest occurs when the bush is 2 years old. The clusters are ripe 90 days after flowering, and the harvest occurs when 2 or 3 capsules are opened. It can be grown in poor soil, and due to its physiological characteristics, after the crop changes foliage it supplies a large amount of biomass to the soil that acts as fertilizer.

It resists temperatures from 20 ° to 38 °C at altitudes from 30 to 1,200 meters above sea level, although it grows best at relatively low altitudes of no more than 500m.

The very rich carotenoid seed from which a natural reddish orange dye is derived, bixin / norbixin is traditionally and currently used as a body pigment for ritual purposes by indigenous populations of the Amazon basin and the Caribbean, as a pigment and natural ingredient that brings color in lipsticks, facial and body makeup and as a nutrient in cosmetic treatment creams.



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PRODUCT NAME	INCI NAME	ACTIVES / MARKERS	MAIN CLAIMS	STUDY		SAFETY																																													
				EFFICACY	RESULTS																																														
BIXA ORELLANA SEED EXTRACT- S. (SUNFLOWER OIL) Concentration: 1,0% - 10,0%	Bixa orellana seed extract / Helianthus annuus (sunflower) oil	Quercetin, Galic acid (Phenol), glycosides, Tannins, Carotenoides (around 0,8% bixin / and 0,6% norbixin). Lysine, histidine, threonine, valine, methionine+ cysteine, isoleucine, leucine, phenylalanine+ tyrosine. Mn, Ca, Cu, I, Mg. Riboflavin, niacin, thiamine, and ascorbic Acid.[1][2]	Antioxidant, healing, emollient, calmative, and astringent. Also, it can be used as coloring agent in creams, lotions. [3]	Antimicrobial activity of ethanolic extracts of the leaves and seed of B. orellana		Skin irritation and sensitization: GOOD. Skin tolerability could be used after conducting studies of primary acute irritation accumulated irritation, skin sensitization and phototoxicity after 21 days application: It is not a primary dermal irritation [6]. Regarding sunflower oil: The results obtained from the Ames test (Salmonella/microsome test), which was used to indicate the carcinogenic potential, suggest that the sunflower oil does not have a mutagenic or genotoxic effect being dose-independent [7]. On the other hand, the sunflower oil was tested for genotoxic activity in the Drosophila somatic mutation and recombination test, in both first-class extravirgin and low-grade (refined) oil. Larvae of the standard (STD) and highly bioactive (NORR) crosses of Drosophila melanogaster were fed medium containing 6% and 12% of each of the oils. The results showed that the sunflower oil has minimal biological significance (nongenotoxic), which could be explained by its lower concentrations of polyunsaturated fatty acids, and this may have contributed to the inconclusive or negative biological diagnoses [8].																																													
				<table><tr><th>Micro-organisms</th><th colspan="4">Zone of inhibition (mm)*</th></tr><tr><th></th><th>EBO_l</th><th>EBO_s</th><th>GENT</th><th>NYST</th></tr><tr><td><i>Bacillus subtilis</i></td><td>21.50</td><td>20.00</td><td>34.00</td><td>NT</td></tr><tr><td><i>Staphylococcus aureus</i></td><td>20.00</td><td>17.00</td><td>30.00</td><td>NT</td></tr><tr><td><i>Streptococcus pyogenes</i></td><td>19.50</td><td>19.00</td><td>24.00</td><td>NT</td></tr><tr><td><i>Salmonella typhi</i></td><td>17.00</td><td>14.50</td><td>19.50</td><td>NT</td></tr><tr><td><i>Pseudomonas aeruginosa</i></td><td>19.00</td><td>19.00</td><td>33.00</td><td>NT</td></tr><tr><td><i>Escherichia coli</i></td><td>22.50</td><td>18.00</td><td>31.00</td><td>NT</td></tr><tr><td><i>Candida albicans</i></td><td>22.00</td><td>20.00</td><td>NT</td><td>24.50</td></tr></table> EBO_l = ethanolic extract of the dried leaves; EBO_s =ethanolic extract of the dried seeds; GENT = gentamycin; NYST = nystatin (100 IU/ml); values (mean of three replicates) indicate zone of inhibition in mm; diameter of well =10 mm; NT=not tested; * =test materials were analysed at 10-mg/ml concentration. [4] Pesticide Residual Analysis (Pyrethroids, Organosphosphates, Carbamates and Organochlorines) Method: GS-MS/MS Result: No Detected [5]			Micro-organisms	Zone of inhibition (mm)*					EBO _l	EBO _s	GENT	NYST	<i>Bacillus subtilis</i>	21.50	20.00	34.00	NT	<i>Staphylococcus aureus</i>	20.00	17.00	30.00	NT	<i>Streptococcus pyogenes</i>	19.50	19.00	24.00	NT	<i>Salmonella typhi</i>	17.00	14.50	19.50	NT	<i>Pseudomonas aeruginosa</i>	19.00	19.00	33.00	NT	<i>Escherichia coli</i>	22.50	18.00	31.00	NT	<i>Candida albicans</i>	22.00	20.00	NT	24.50
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BIXA ORELLANA SEED POWDER Concentration: 0,1% - 10,0%	Bixa orellana seed Powder			Oxidative stability: The oxidative stability of the sample "BIXA ORELLANA SEED EXTRACT-S (SUNFLOWER OIL) NEYBER" at room temperature (25 ° C) is 382.5 days, by ISO 6886: 2016 method.		Eye irritation: According to the defined scale, the Bixa orellana Extract - S test classification of eye irritant or severe eye damage is not required.																																													
				Eye irritation: According to the defined scale, the BIXA ORELLANA SEED EXTRACT-S (SUNFLOWER OIL) test item does not require classification as an eye irritant or a serious eye injury factor.			Phototoxicity: Under the experimental conditions adopted, the product Bixa orellana seed extract S (Sunflower Oil), did not exhibit any phototoxic potential.																																												
				Residual analysis of pesticides (Pyrethroids, Organophosphates, Organochlorines and Carbamates): There was no detection of any of the pesticides defined as a parameter to be evaluated and specification based on the REGULATION (EU) 2017/626 (maximum allowed limit of pesticides in foods of vegetable origin).																																															
				Biodegradability: It is considered easily biodegradable, according to OECD method challenge 301 B. Degradation of 81% at 28 days. It is carried out according to OECD 301B, because the substance has low solubility in water and is not considered volatile.		Ecotoxicity: In the experimental conditions of the test, the sample "Bixa orellana seed extract-S (Sunflower oil)", does not present any toxicity on the mobility of <i>Daphnia magna</i> in the nominal test concentration of 100 mg / L, the EC50-48 h, is greater than 100 mg / L.																																													
<table><tr><th colspan="2">GENERAL CHEMICAL COMPOSITION OF BIXA ORELLANA</th></tr><tr><th>Compound</th><th>Presence</th></tr><tr><td>Moisture</td><td>4.89 - 13.00%</td></tr><tr><td>Ash</td><td>4.50 - 7.97%</td></tr><tr><td>Mineral residue</td><td>5.22%</td></tr><tr><td>Fiber</td><td>18.48 - 53.31%</td></tr><tr><td>Protein</td><td>9.7 - 14.24%</td></tr><tr><td>Lipids</td><td>2.2 - 6.3%</td></tr><tr><td>Carbohydrate</td><td>16.26 - 68.9%</td></tr><tr><td>Flavonoids</td><td>Present</td></tr><tr><td></td><td>5.19 ± 1.52 mg quercetin equivalent/g</td></tr><tr><td></td><td>8.86 ± 0.06 g/seed</td></tr><tr><td>Saponins</td><td>Present</td></tr><tr><td>Phenols</td><td>Present</td></tr><tr><td></td><td>62.08 ± 2.21 mg galic acid equivalent/g</td></tr><tr><td></td><td>82.99 ± 0.03 g/seed</td></tr><tr><td>Reducing sugars</td><td>Present</td></tr><tr><td>Fixed oils</td><td>Present</td></tr><tr><td>Glycosides</td><td>93.22 ± 0.05 g/seed</td></tr><tr><td>Tannins</td><td>44.79 ± 0.03 g/seed</td></tr><tr><td>Carotenoids</td><td>40.33 ± 0.32 mg bixin/g</td></tr><tr><td></td><td>31.61 ± 3.88 mg norbixin/g</td></tr></table> [4]				GENERAL CHEMICAL COMPOSITION OF BIXA ORELLANA			Compound	Presence	Moisture	4.89 - 13.00%	Ash	4.50 - 7.97%	Mineral residue	5.22%	Fiber	18.48 - 53.31%	Protein	9.7 - 14.24%	Lipids	2.2 - 6.3%	Carbohydrate	16.26 - 68.9%	Flavonoids	Present		5.19 ± 1.52 mg quercetin equivalent/g		8.86 ± 0.06 g/seed	Saponins	Present	Phenols	Present		62.08 ± 2.21 mg galic acid equivalent/g		82.99 ± 0.03 g/seed	Reducing sugars	Present	Fixed oils	Present	Glycosides	93.22 ± 0.05 g/seed	Tannins	44.79 ± 0.03 g/seed	Carotenoids	40.33 ± 0.32 mg bixin/g		31.61 ± 3.88 mg norbixin/g	Skin irritation and sensitization: GOOD. Skin tolerability could be used after conducting studies of primary acute irritation accumulated irritation, skin sensitization and phototoxicity after 21 days application : It is not a primary dermal irritation [5] . The topical application with Bixa orellana dye showed a higher degree of safety compared with oral ingestion of foods dyes with Bixa which in some cases produces hypersensitivity phenomena. Moreover histochemical studies showed a low grade of penetration on the skin, so the use of Bixa dye may be encouraged in COSMETIC PRODUCTS[6].		
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References:

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