BERACA

RAIN FOREST 03110
(REFINED ANDIROBA OIL)

RAIN FOREST
SPECIALTIES
BRASIL

BERACA presents a wide portfolio composed of fixed oils, butters, scrubs, clays and actives sustainably sourced from the Brazilian biodiversity. The ingredients come from extractive communities throughout Brazil and are manufactured to connect our biodiversity with thousands of consumers around the world. Through a relationship marked by transparency, traceability and innovation, Beraca contributes directly to regional development and environmental preservation.

GENERAL INFORMATION

Product Code: BR03110B

Related codes: BR03110BA00, BR03110BB46, BR03110BD19, BR03110BX15, BR03110BX18, BR03110BX36, BR03110BX45

Previous code: RF3110

Andiroba (*Carapa guaianensis*) is a native tree from the Amazon region, from the *Meliaceae* family, and it can reach up to 30 meters in height. It has a strong odour and it is visually similar to the chestnut tree (COSTA; MAUAÉS, 2009).

The flowers are small, with petals of a maximum of 8 mm in length, unisex, sessile or sub-sessile (without or almost without supporting stem), with no hair, almost round, white to cream in color, lightly perfumed (RIZZINI; MORS, 1976).

The bark is easily broken and the oil is drained off the pulp. This oil, of yellowish color and extremely bitter, is used to treat skin and muscle inflammations, and it is also a natural insect repellent, its main use. Given its many benefits, the Andiroba oil has been exported to the cosmetic industries in France, Germany and the United States, where it is largely used as a wood protectant, and it is also traded in many regions in Brazil.

COSMETIC USE

The Andiroba oil, extracted from the fruit seed, is largely composed of palmitic, oleic, linoleic and stearic acids, and an unsaponifiable fraction (2 to 5%) mainly formed of terpenoids, specifically limonoids, the agents responsible for the oil's biological activity.

It has high moisturizing activity, and it is indicated to formulate products for dermal renovation. It also has anti-inflammation and healing properties. It may be used in formulas to treat the face and body, sensitive and acneic types of skin.

In addition, the Andiroba oil has an important odorless repellent action against insects.

EFFICACY EVALUATION

INTRODUCTION

The mosquitoes of the genera Aedes albopictus and Aedes aegypti, belonging to the family Culicidae, are vectors of viral diseases such as dengue, zika and chikungunya. The large proliferation and dissemination of the population of these mosquitoes have caused an epidemiological outbreak of these diseases in Brazil and in other countries, and it is of utmost interest to public health that these vectors and the transmission of these diseases are eliminated. One manner to prevent the transmission of the disease is to use repellents, preventing the bite of the vector and the resulting transmission of the virus to the host.

In Brazil, according to ANVISA (2016), there are 122 commercial repellents available. Among these, those that contain DEET (N, N-dietil-meta-toluamide) are the most recommended as a repellent against the genus Aedes. DEET is a synthetic asset that, although it is proved to be effective and safe, also has restrictions of use and a high degree of irritability.

As such, the natural alternatives are of the utmost interest to the cosmetics market. Some plants such as citronella, rosemary and clove are used as natural repellents against mosquitoes in general (black-winged stilt, muriçoca, borrachudo, etc.). However, there are few studies that demonstrate with soundness the efficacy of these natural assets.

Andiroba also has repellent action and its efficacy has already been demonstrated in some scientific studies in whicha2's its repellent power has been justified by the concentration of limonoids. In the Amazon region, where the oil is largely used as a medicinal plant by the population, it is described as having antibacterial, antifungal, antiviral action and repellent action.

Given this scenario, Beraca conducted its own tests to research the efficacy of its RAIN FOREST 03110 (REFINED ANDIROBA OIL) as a mosquito repellent.

OBJECTIVE

The objective of this study was to evaluate repellence against the species Aedes albopictus and the Aedes aegypti when they are treated with REFINED ANDIROBA OIL *(Carapa guianenses).*

METHODS

1. Laboratory

The studies were conducted by two independent labs:.

1.1 Repellence in humans: *Aedes albopictus*

Conducted by Ecolyzer Laboratórios Ltda. Study's reference code: RMQ-1459/01.

1.2 Repellent candle against *Aedes aegypti*

Conducted by the Department of Entomology, Phytopathology and Agricultural Zoology at "Luiz de Queiroz" School of Agriculture.

2. Experimental groups and treatments

The experimental groups and their respective treatments are shown in the table below (Table 1).

Table 1. Products used in the study protocol.

Experimental group	Treatment
PLACEBO	Isopropanol
Refined Andiroba Oil 3.0% - oil	Refined Andiroba Oil (BR03110B) at 3.0%
Refined Andiroba Oil 3.0% - candle	Refined Andiroba Oil (BR03110B) at 3.0%

The products were stored at room temperature during the study.

3. Procedure

3.1 Repellence in humans: *Aedes albopictus*

A solution of REFINED ANDIROBA OIL at 3% in isopropanol was applied to an area of 280 cm² on the arm of a person who has subsequently been exposed to a population of 50 adult mosquitoes in a closed environment for a period of 5 minutes. The treated skin was re-exposed to the same conditions, with no re-application of the product, each 60 minutes, until repellence declined to 50%. The percentage of protection was calculated comparing the number of bites in each treatment. The test was conducted 5 times.

3.2 Repellent candle against *Aedes aegypti*

Two distinct tests were conducted.

Test I: 10 mosquitoes of the species Aedes aegypti and one candle with 3% REFINED ANDIROBA OIL or placebo were placed in a specific environment of 2.0 x 1.5 x 2.7 m in dimension, with holes, to evaluate repellence. The candle was lit during 2 hours to liberate the odour. After this period, the environment was inspected to count the number of mosquitoes that escaped. This test was conducted three times.

Test II: 05 female mosquitoes, one candle with 3% REFINED ANDIROBA OIL or placebo and a person were placed in a specific environment of 4.0 x 5.0 x 2.7 m in dimension, with no holes, for 2 hours. After this period, the number of bites received was counted. This test was conducted for three days, and the bites were counted twice in alternate days.

RESULTS

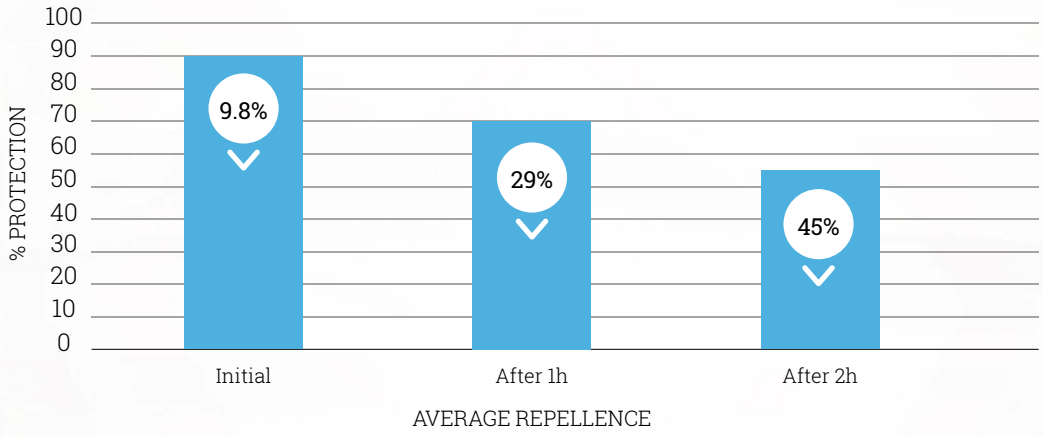
1. Repellence in humans: *Aedes albopictus*

Under the test conditions, the 3% REFINED ANDIROBA OIL caused, on average, repellence of 71% after 1 hour, as shown in the following table (Table 2).

Table 2. % of repellence in the test's first 2 hours.

	% PROTECTION		
	Initial	**After 1 hour**	**After 2 hours**
R1	100.0	100.0	100.0
R2	91.0	25.0	50.0
R3	100.0	80.0	50.0
R4	80.0	100.0	50.0
R5	80.0	50.0	25.0
Average	**90.2**	**71.0**	**55.0**

Graph 1 outlines the average percentage of repellence of the REFINED ANDIROBA OIL at 3% in isopropanol.



Graph 1. Average percentage of repellence of the REFINED ANDIROBA OIL at 3% compared to placebo.

2. Repellent candle against *Aedes aegypti*

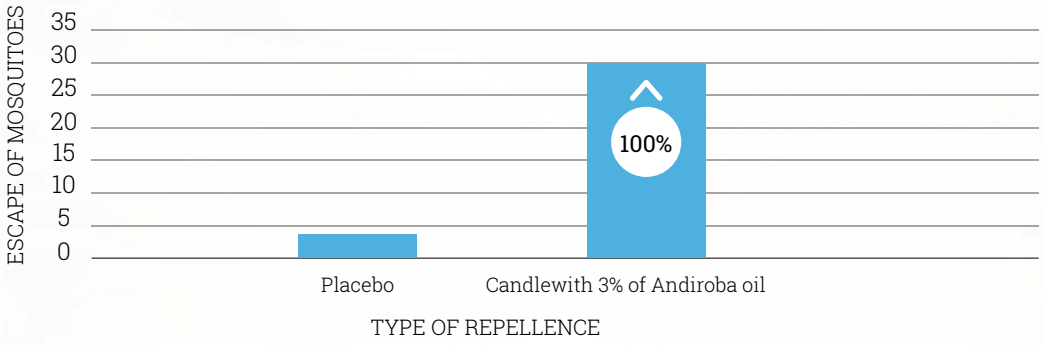
a. Test I – Repellence test regarding the environment contaminated with the odour

After two hours of liberating the odour produced by the lit candle with REFINED ANDIROBA OIL, no mosquitoes have remained in the assessed environment (Table 3).

Table 3. Escape of mosquitoes by repetition and total. Efficacy % (%E) of repellence of the odour of the 3% REFINED ANDIROBA OIL candle compared to placebo.

TREATMENTS	REPETITIONS			TOTAL	% E
	R1	R2	R3		
3% Refined Andiroba Oil	10	10	10	30	100.0
Placebo	00	02	01	03	-

The number of mosquitoes that escaped is shown in Graph 2.



Graph 2. Total number of mosquitoes that escaped from an environment with the odour of the 3% REFINED ANDIROBA OIL candle compared to placebo.

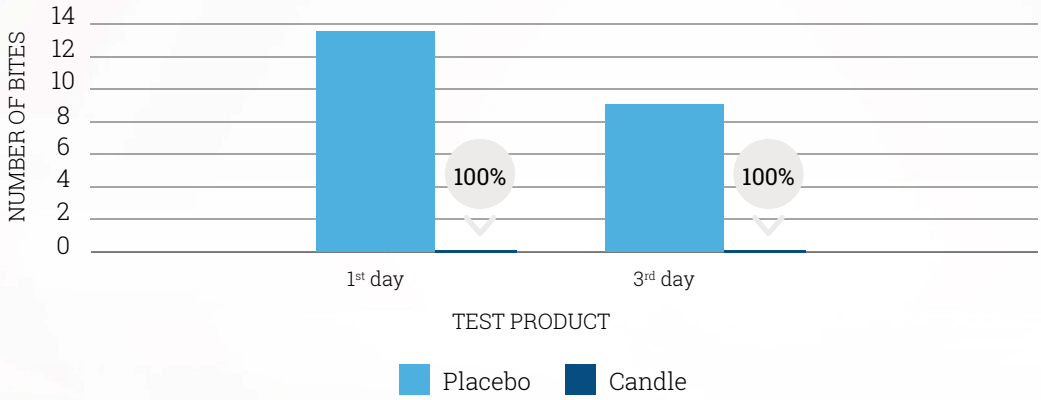
b. Test II – Repellence test regarding number of bites

The REFINED ANDIROBA OIL candle has promoted significant repellence against the mosquito if compared to the control test (isopropanol solution). The normal activity of the mosquito was prevented, avoiding bites (Table 4).

Table 4. Number of bites during 2 hours in the 1st and 3rd days. By repetition and total. Efficacy % of the odour of the 3% REFINED ANDIROBA OIL candle compared to placebo.

TREATMENTS	REPETITIONS				TOTAL		% E
	R1		R2				
	1st DAY	3RD DAY	1st DAY	3RD DAY	1st DAY	3RD DAY	
3% Refined Andiroba Oil	00	00	00	00	00	00	100.0
Placebo	06	04	07	05	13	09	-

Graph 3 shows the number of bites during the test.



Graph 3. Number of total bites during 2 hours in the 1st and 3rd days in an environment with the odour of the 3% REFINED ANDIROBA OIL candle compared to placebo.

CONCLUSION

1. Repellence in humans: *Aedes albopictus*

The 3% REFINED ANDIROBA OIL, when applied on human skin, promotes approximately 71.0% of repellence against the *Aedes albopictus* mosquito one hour after the application, and 55.0% after two hours.

2. Repellent candle against *Aedes aegypti*

a. Test I – Repellence test regarding the environment contaminated with odour

The 3% REFINED ANDIROBA OIL candle has promoted 100% of repellence against the *Aedes aegypti* mosquitoes in a treated environment.

b. Test II – Repellence test regarding bites

The 3% REFINED ANDIROBA OIL candle has promoted 100% of repellence against the bite of the *Aedes aegypti* mosquito in a treated environment.

As such, we can conclude that the REFINED ANDIROBA OIL (BR03110B) is an efficient asset to be used in repellent formulas against the *Aedes* mosquitoes.

APPLICATION

SUGGESTION OF FORMULATION

1. REPELLENT LOTION WITH REFINED ANDIROBA OIL

Formulation:	REPELLENT LOTION WITH REFINED ANDIROBA OIL

INGREDIENTS	INCI	%w/w	SUPPLIER
PHASE A			
WATER	*Aqua*	86.85	-
DERMOFEEL PA-3	*Sodium Phytate, Aqua, Alcohol*	0.10	-
VERSTATIL PC	*Phenoxyethanol, Caprylyl Glycol*	1.00	-
PHASE A1			
ARISTOFLEX AVC	*Ammonium Acryloyldimethyltaurate/VP Copolymer*	1.55	-
PHASE B			
BR03110B RAIN FOREST 03110 (REFINED ANDIROBA OIL)	***Carapa guaianensis seed oil, Tocopherol***	**3.00**	**BERACA**
DERMOFEEL SENSOLV	*Isoamyl Laurate*	5.00	-
DERMOFEEL PS	*Polyglyceryl-3 Stearate*	2.00	-
PHASE C			
FRAGRANCE	*Fragrance*	0.50	-

Procedure:
Weigh all ingredients of phase A. Pulverize the phase A1 into phase A, wait for 5 minutes to hydrate the polymer.
Lead to heating without homogenization of ARISTOFLEX AVC. Upon reaching 75°C - 80°C stir to form the gel.
Weight all ingredients of phase B, heat until 75°C - 80°C.
Add phase B in A/A1 and stirring until room temperature.
Add phase C below 30°C.

2. REPELLENT CANDLE WITH REFINED ANDIROBA OIL

Formulation:	**REPELLENT CANDLE WITH REFINED ANDIROBA OIL**

INGREDIENTS	**INCI**	**%w/w**	**SUPPLIER**
PHASE A			
CARNAUBA WAX	*Copernicia Cerifera (Carnauba) Wax*	27.40	-
CANDELILLA WAX	*Euphorbia Cerifera (Candelilla) Wax*	26.40	-
BR03710B RAIN FOREST 03710 (REFINED MURUMURU BUTTER)	***Astrocaryum murumuru butter, Tocopherol***	**5.00**	**BERACA**
BR03110B RAIN FOREST 03110 (REFINED ANDIROBA OIL)	***Carapa guaianensis seed oil, Tocopherol***	**7.20**	**BERACA**
BEESWAX	*Beeswax*	20.00	-
BR03692B RAIN FOREST 03692 (ST GRADE UCUUBA BUTTER)	***Virola surinamensis seed butter,Tocopherol***	**12.00**	**BERACA**
PHASE B			
CLOVE RESIN OIL	-	2.00	-

Procedure:
Mix ingredients of phase A one after the other and heat until all the ingredients are melted.
Start to cool down under medium stirring.
Add phase B and mix until complete homogenization.
Fill the mixture and the wick into a suitable container.

PHYSICAL AND CHEMICAL PROPERTIES

ANALYSIS	UNITS	SPECIFICATIONS
Appearance (above 25ºC)	Visual	Viscous liquid with characteristic precipitated fraction
Appearance (below 25ºC)	Visual	Waxy
Color	Visual	Light yellow to light brown
Odour	-	Characteristic
Acid value (as oleic acid)	%	≤ 2.0
Peroxide value	meqO_2/Kg	≤ 10.0
Iodine value	gI_2/100g	40 – 100
Saponification value	mgKOH/g	150 – 210

FATTY ACID COMPOSITION

Palmitic acid	(C16:0)	20.0 – 35.0%
Stearic acid	(C18:0)	5.0 – 12.0%
Oleic acid	(C18:1)	35.0 – 60.0%
Linoleic acid	(C18:2)	5.0 – 20.0%

MICROBIOLOGICAL ANALYSIS

Total bacteria h. m.	cfu/g	< 100
Fungus and yeasts	cfu/g	< 100

STORAGE INFORMATION

- **Shelf Life** → 18 months
- **Conditions** → Dry, cool, airy place away from light and heat and in an environment with constant temperature not exceeding 25°C
- **Container** → Nitrogen blanketed

IMPORTANT OBSERVATIONS

• After opening the product to be consumed as soon as possible. Contact with oxygen generates an oxidative process decreasing the shelf-life of the product.

• Due to the particularity of each butter, it is not possible to establish an oxidative parameter for the period of exposure.

• Natural oil substances and waxes could settle during storage and develop a slight sedimentation at the bottom of the container. Please have this in mind when emptying the container.

• The above information has been developed with the methods and practices set out in AOCS (American Oil Chemists' Society).

REGULATORY INFORMATION

INCI Name (PCPC / COSING)	CAS number
CARAPA GUAIANENSIS SEED OIL	352458-32-3
TOCOPHEROL	59-02-9, 16698-35-4, 54-28-4, 119-13-1

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