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DEVELOPMENT OF HANDMADE, NATURAL AND ECOLOGICAL COSMETICS BASED ON HONEY AND GEOPROPOLIS FROM STINGLESS BEES

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Abstract: This work's main objective was the production of natural cosmetics prepared by hand, in an ecological way, based on honey and geopropoly from stingless bees, the meliponines. In the first phase, what has already been published in terms of cosmetics based on stingless bee honey was researched, to support the development of a safe and innovative product. This research also considered the traditional knowledge of ancestral communities, which use honey, in addition to small properties that live off family farming and also employ agroecology in the production of honey. In the second phase, the methodologies for preparing the cosmetics were defined, which was carried out at home and eventually in laboratories at IF Baiano, Campus Governador Mangabeira. Practices were recorded and the implementing team held virtual meetings whenever necessary. In the third phase, a booklet was created, in addition to the Instagram account, where awareness was raised about the preservation of stingless bees, as well as the appreciation of traditional and ecological knowledge in artisanal production and the bioeconomy, which can replace with many advantages the rampant consumption of synthetic substances, such as petroleum derivatives, widely used in cosmetics.
Keywords: Hygiene; Meliponines; Sustainability.

INTRODUCTION

An important group for the maintenance and conservation of ecosystems are bees (MICHENER, 2000). In tropical natural environments, native honey bees stand out, which group numerous species of social organisms, with complex behaviors (NOGUEIRA-NETO, 1997). They are known as stingless bees or meliponines (Apidae, Meliponini) and their ecology arouses enormous interest also because they stand out among flower-visiting insects in tropical ecosystems (ROUBIK 1989, MICHENER 2000), such as the Atlantic Forest (RAMALHO, 2004; SILVA et al., 2013).

Of the products provided by bees, honey is the best known. It was one of man's first foods, and practically all ancient civilizations used it as food and medicinal resource (ABREU, 2003; MOREIRA & MARIA, 2001). This is demonstrated by the use of honey and bee pollen in pre-Hispanic periods and the role they played in the diet of Native American communities. Until the 19th century, honey and wax were used in food by Indians and whites, and candles were made by Jesuits from stingless bees (NOGUEIRA-NETO, 1997; CORTOPASSI-LAURINO, 2002). Honey comes from bees and some wasps, however due to its ancient domestication, and because it originates from the main consuming countries, the bee Apis mellifera (Linnaeus, 1758) is considered the main producer, despite the great diversity of existing bee species. and that produce good quality honey, like stingless bees (CARVALHO et al. 2005). Although they produce honey in smaller quantities, meliponines are important for providing a product that differs from A. mellifera honey, mainly in its unparalleled sweetness, differentiated, more aromatic flavor and differentiated medicinal properties, which allows it to reach high prices in the market (NOGUEIRA- NETO, 1997; CARVALHO et al., 2005).

With the COVID-19 pandemic, there has been greater emphasis on the importance of healthy eating and the correct use of cleaning and personal hygiene products in preventing diseases. It is recognized that one of the main measures to prevent the new coronavirus, recommended by the World Health Organization, is to wash your hands with soap and water. Soap, as it is a substance that breaks down fat, can destroy the viral

envelope (external part of the virus, composed precisely of fat), killing these organisms. 70% alcohol gel has been sold as a solution to combat the new coronavirus, but excessive use can generate other problems. Experts explain that alcohol dries out your hands and reduces the body's natural protection, which can cause allergies, leave the area susceptible to burns and create a gateway for infections.

The product is, indeed, the best alternative for hygiene as long as it is not possible to use soap and water (FUNDEP, 2020). A soap has the general formula RCO-ONa, where R is usually a carbon chain containing 12 to 18 carbon atoms. Water alone does not remove certain types of dirt, such as grease residue. This happens because water molecules are polar and fat molecules are nonpolar. Soap plays an important role in cleaning because the molecule has two natures, with regard to polarity: it has a charged end (which is attracted to water) and the other is not solubilized in water, and dissolves fats as it is non-polar. Currently, soap is obtained from fats (beef, pork, lamb, or oils (cotton, various types of palm trees). The alkaline hydrolysis of glycerides is generically called a saponification reaction because, in a reaction of this type, when an ester from a fatty acid is used, the salt formed is called soap (BARBOSA et al, 1995).

In traditional communities, especially rural ones, the practice of artisanal soap production is still carried out, primarily, by women, using vegetable oils and animal fats, mixed with caustic soda and aromatic herbs. Like soaps, detergents contain an organic moiety with a charged group at the end of the chain. When detergents have positively charged chains, they are called cationic; when the charge is negative, they are anionic; when they have no charge they are non-ionic, and when they have a negative and a positive charge they are called amphoteric detergents. Shampoos are materials used to clean hair and contain in their formulations one or more types of synthetic detergents (in addition to other substances, such as perfumes, preservatives, thickeners) whose function is to remove grease from the hair.

Cationic synthetic detergents are used as hair conditioners and their function is to reduce friction between strands and, consequently, static electrification, leaving hair softer and easier to comb (BARBOSA et al, 1995). Synthetic detergents and soaps involve a strong base in their manufacture (sodium or potassium hydroxide), and this causes their formulations to have a pH (measure of the acidity and basicity of a material) above 7 (alkaline). Furthermore, soaps can react with water, causing the medium to become alkaline. Most modern shampoos, called acid-balanced shampoos, contain acidic ingredients in their formulations whose function is to maintain the pH of washed hair close to its natural pH. This effect is obtained, for example, by adding citric acid to the shampoo formulation, whose function is to neutralize the temporary effects of alkaline shampoos.

Conditioners have a low pH (around 3) to neutralize the aggressive effects of shampoo on the scalp (DRAELOS, Z. K., 1991). The constant use of these materials can cause skin allergy problems and damage the hair (BARBOSA et al, 1995), in addition to causing ecological imbalances and pollution of water sources, as when rinsed they go into the sewage system, which does not always carry out the adequate treatment of this waste. Plastic packaging, which also causes a great negative impact on ecosystems, when discarded inappropriately, (MARQUES, 2018) can be avoided when using solid shampoo and conditioner, a trend that has been followed by consumers concerned about the preservation of planet Earth, following the principles of bioeconomy and circular economy (LUZ, 2020).

Therefore, it is important to produce surface-active agents (soaps and detergents) that are less polluting and aggressive to the human body and nature. Natural soap, made by hand using vegetable oils with antioxidant properties such as olive and palm oil and coconut oil, can advantageously replace common soaps, shampoos and conditioners sold commercially on a large scale. To this basic formulation, extracts and essential oils from medicinal herbs such as aloe, rosemary, basil, fennel, as well as stingless bee honey extract and geopropolis will be added, depending on the appropriate purpose. Instead of synthetic dyes, it is proposed to add plant derivatives, with a high content of flavonoids, which are natural antioxidants already recognized in the prevention of various diseases by combating free radicals (SAUTHIER et al., 2019) such as anthocyanins, red pigments existing in hibiscus and pitanga, for example. In addition to these, you can also use bixin, extracted from annatto, already used by indigenous people as paint and sunscreen, and turmeric from saffron, rich in flavonols. As a natural preservative, rosemary components can be added, such as carnosic acid and other antioxidants such as Vitamin E and citric acid. The soap, manufactured by hand, also has the advantage of keeping the glycerin that is produced together with the soap, incorporated into the formula. Industries generally remove this glycerin due to its high commercial value. Glycerin is used in industries as diverse as cosmetics, food, mattresses and explosives. It has great power as a humectant, being able to retain water, thus being moisturizing for both the skin and hair. The objective of this work was to develop a line of cosmetics and hygiene materials such as soaps, deodorants and creams based on honey and geopropolis from stingless bees (Apidae; Meliponini) in addition to raising awareness among the internal and external community of the IF Campus. Baiano Governador Mangabeira, on the need for prevention and health care, with the appreciation of hygiene materials and artisanal practices.

MATERIAL AND METHODS

In the first phase of the project, what has already been published in terms of honey-based cosmetics was evaluated to support the development of a safe and innovative product. This research also considered the traditional knowledge of ancestral communities such as indigenous people and quilombolas, who know and use honey, in addition to small properties that live off family farming and also use agroecology in the production of honey from stingless bees.

In the second phase, methodologies for preparing cosmetics were defined and adapted to the reality of the pandemic, which required distancing and extra care, not only with the use of personal protective equipment (PPE) common in laboratories, but also with those necessary for prevention. of COVID-19, such as masks and alcohol gel. This production was carried out at the residence of each of the participants and eventually in laboratories at IFBAIANO Governador Mangabeira, or at partner institutions such as UFBA and UNEB. Practices were recorded and the implementing team held virtual meetings whenever necessary.

To prepare the cosmetics, honey samples were collected from species of stingless bees, such as *Melipona scutellaris*, popularly known as uruçu, in the meliponary on the IFBaiano campus in Governador Mangabeira and in other previously selected points. The honeys were collected directly from the food jars present inside the colonies, using syringes, so that no harm would occur to the bees and the food jars themselves. The samples were placed in sterilized glass bottles and kept refrigerated for subsequent use.

The next step involved the process of extracting the active ingredients from honey and other constituents that were added such as medicinal herbs and seeds. Extraction will be carried out with solvents considered safer such as grain alcohol and natural oils. Next, there was the formulation and elaboration of: various extracts; liquid and solid soap; and deodorants. The packaging followed ecological principles, avoiding as much as possible the use of materials that could cause damage to nature. The labeling meets the criteria established by regulatory bodies.

In the third phase, an informative booklet was created, in addition to the Instagram account (GEMAS_IFBAIANO). In these media it was possible to highlight the importance of preserving stingless bees, as well as the valorization of traditional and ecological knowledge in artisanal production and bioeconomy, which can replace with many advantages the unrestrained consumption of synthetic substances, such as petroleum derivatives, which are widely used. in cosmetics. Future goals are maintained, if the product is tested and approved, following existing laws and rules, we can think about applying for patents, in addition to participating in fairs and conferences and publishing in scientific journals. Recipes for making shampoos and conditioners have been tested, but these require resources such as mixers and pH meters. Given the limitations of the project's budget, worsened by the Pandemic, these products could not be finalized and may also be included in a possible development of the work.

RESULTS AND DISCUSSION

The production of cosmetics was implemented with a test phase, starting in May 2021 with the production of extracts. Dry portions of fractions of various plants were used: fennel; rosemary; mint; barbatimão; chamomile; calendula, among others and 98% grain alcohol (v/v), as solvent.

Around 20 g of dry and crushed material was weighed and made up to 200 g with grain alcohol. The mixture was stored in a dark glass bottle for around 10 days, shaking the bottle several times during these days. The mixture was filtered through a common plastic funnel using a paper filter as the filtering medium. The filtrate was stored in a dark bottle and labeled as 10% (m/m) alcoholic extract.

Alcoholic extracts of honey and stingless bee propolis were also prepared using the same procedure. Annatto extracts with coconut oil and chamomile with aloe vera oil were also produced, replacing grain alcohol with the respective oils. At the end of May until November 2021, production of solid shampoos begins. In the first test of solid shampoos, aloe vera and honey were used as the main ingredients. The aloe pulp, aloe oil and honey were ground in a blender. The base was heated in a bain-marie or microwave, and the aloe vera was added, once it was off the heat. Then the essential oils were added.

In this first phase of testing, the products became very oily and some did not solidify efficiently. The material that did not remain solid was heated again with 100g of grated coconut soap and placed in the molds. This time, the product was better, it solidified, but the texture of those produced with a glycerin base was firmer. The smell was considered pleasant. These shampoos must be recommended for dry hair. In November 2021, the production of liquid and solid soaps began. 4 different recipes were created, all with the common base for liquid soaps, differing

only in the types of extracts and essential oils. To 100 mL of the base, 80 mL of filtered water was added. 5 mL of plant extracts were added; 5 mL of propolis extract; 5 mL of stingless bee honey and 5 mL of essential oils. The resulting materials were shaken vigorously and stored in plastic bottles. Various combinations of extracts and oils were tested. It was observed that the addition of propolis makes the liquid soap milkier, there is a loss of transparency, but the other properties are maintained. Recipes with a liquid base free of sodium lauryl sulfate were also tested, the result was similar and the final product can be considered more natural, as the base does not use petroleum derivatives but rather renewable sources, such as vegetable oils.

For the production of solid soaps (Fig.1), the common glycerin base was used: transparent, pearly and white. Also, a base made only with vegetable sources was tested, which although more expensive, has the advantage of being more natural. These bases were heated in a water bath and microwave, and the following were added: previously prepared plant extracts, including honey and propolis; essential oils and vitamin E as a preservative. Different combinations were tested according to the therapeutic properties already studied in different medicinal plants and essential oils.

Fig. 1: Solid soaps made with propolis, honey and essential oils.

Next, tests were carried out to prepare natural deodorants (Fig. 2), from November 2021 and January 2022. The process begins with the addition of grated beeswax and the selected oil, which are brought to the fire, in a water bath, until the mixture is completely melted. The other ingredients are added and mixed until a homogeneous material result. Finally, add the essential oils and mix well (off heat). Place in jars, preferably glass. It was approved by several people who used the deodorant produced in the tests. Using a mixer makes the final product more uniform. There was a record of lightening of armpit hair during the use of deodorant. The deodorant produced with aloe vera oil has a darker final color than when coconut oil is used, although the other properties remain similar.

Fig. 2: Natural deodorants made with beeswax and essential oil.

After preparing the cosmetics, labels were created and printed and added to the packaging. With this material, in addition to all the bibliographical research carried out, a booklet (Fig. 3) on natural and ecological cosmetics was written, edited and published, as set out in one of the objectives of the project. In this booklet you can see images of the different products and recipes in greater detail. Booklet Link: https://drive.google.com/file/d/1-3dfwYMp00eW0CkitjbAZB3wNFRrEzNm/view.

Fig.3. Cover of the booklet on natural and ecological cosmetics.

FINAL CONSIDERATIONS

Meliponines have widely recognized environmental importance, mainly due to the indispensable service they provide with pollination, in the maintenance of natural and agricultural ecosystems, and consequently, in food production. Despite this, they have been decimated by the use of pesticides in monocultures and the destruction of their natural habitats, among other factors. The project proposed the development of natural cosmetics produced manually based on honey and geopropolis from stingless bees, and other materials known by traditional communities such as herbs, seeds and natural oils, developing hygiene materials such as soaps, deodorants and creams. The proposal is that these materials can be developed safely and with few resources, using as raw material honey from stinging bees and other inputs already known by traditional communities such as herbs, seeds and natural oils, taking care to follow the principles of Green chemistry and giving preference to ecologically suitable materials in all stages of manufacturing.

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