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THE USE OF MELIPONICULTURE AS AN ENVIRONMENTAL EDUCATION TOOL FOR EARLY CHILDHOOD EDUCATION IN AMAZONAS COUNTRYSIDE

O USO DA MELIPONICULTURA COMO FERRAMENTA DE EDUCAÇÃO AMBIENTAL PARA EDUCAÇÃO INFANTIL NO INTERIOR DO AMAZONAS

EL USO DE LA MELIPONICULTURA COMO HERRAMIENTA DE EDUCACIÓN AMBIENTAL PARA LA EDUCACIÓN INICIAL EN EL INTERIOR DE LA AMAZONIA

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Abstract: Meliponiculture is the breeding of stingless bees (ASF) while promoting the conservation of the environment through the management of their products. The objective of this project was to conduct environmental education activities focused on Meliponiculture, aiming to contribute to the understanding of sustainable development and environmental preservation in the Amazon. The project involved 38 sixth-grade children from a public school in the city of Coari, Amazonas, and consisted of five stages: 1) Theoretical exposition; 2) Ecological trail walk to visit ASF hives in their natural habitat; 3) Visit to a Didactic Meliponary for an introduction to the social organization of bees; 4) Playful workshop on environmental education; 5) Evaluation of the activities. At the end of the visit, a healthy snack including ASF products was provided to the children. The activities were well received, with most of the children expressing their enjoyment of the project. There were moments of interaction and clarification about the importance of ASF for the environment and the preservation of the Amazon ecosystem. When asked if the children would like to have more similar activities in the school, 92% (n = 35) of the children answered yes, while 8% (n = 3) did not respond to the question. The project contributed to clarifying the importance of biodiversity, pollination and conservation of ecosystems. From this project, it is hoped that children can become aware of the need to preserve the Amazon and become multiplying

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agents of sustainable development.

Keywords: Sustainable development. Stingless bees. Coari.

Resumo: A Meliponicultura é a criação racional de abelhas-sem-ferrão (ASF), visando a comercialização de seus produtos e conservação do meio ambiente. O objetivo deste projeto foi realizar atividades de educação ambiental a partir do tema Meliponicultura, visando contribuir com o esclarecimento sobre desenvolvimento sustentável e preservação ambiental da Amazônia. O projeto foi realizado com 38 crianças do sexto ano de uma escola pública municipal na cidade de Coari, Amazonas, e contou com 5 etapas: 1) Exposição teórica; 2) Caminhada em uma trilha ecológica para visitar colmeias de ASF na natureza; 3) Visita a um Meliponário Didático para apresentação da organização social das abelhas; 4) Oficina lúdica sobre educação ambiental; 5) Avaliação das atividades. No encerramento da visita foi oferecido um lanche saudável para as crianças incluindo mel de ASF. Houve uma boa aceitação das atividades realizadas, em que a maioria das crianças declarou ter adorado o projeto. Houve momentos de interação e esclarecimento sobre a importância das ASF para o meio ambiente e para a preservação do ecossistema Amazônico. Quando perguntado se as crianças gostariam que houvesse mais atividades semelhantes a que foi desenvolvida na escola, 92% (n = 35) das crianças responderam que sim e 8% (n = 3) não responderam à questão. O projeto contribuiu para o esclarecimento sobre a importância da biodiversidade, da polinização e da conservação dos ecossistemas. A partir deste projeto espera-se que as crianças possam sensibiliza-se sobre a necessidade da preservação da Amazônia e se tornem agentes multiplicadores do desenvolvimento sustentável.

Palavras Chaves: Desenvolvimento sustentável. Abelhas-sem-ferrão. Coari.

Resumen: La Meliponicultura es la creación racional de abejas sin aguijón (ASF), con el objetivo de la comercialización de sus productos y la conservación del medio ambiente. Este proyecto tuvo como objetivo realizar actividades de educación ambiental a partir de la temática Meliponicultura, con el objetivo de contribuir a la clarificación del desarrollo

sostenible y la preservación ambiental en la Amazonía. El proyecto se realizó con 38 niños del sexto año de una escuela pública municipal de la ciudad de Coari, Amazonas, y contó con 5 etapas: 1) Exposición teórica; 2) Caminata por un sendero ecológico para visitar las

colmenas de ASF en la naturaleza; 3) Visita a un Meliponario Didáctico para presentar la organización social de las abejas; 4) Formación lúdica de educación ambiental; 5) Evaluación de actividades. Al final de la visita, se ofreció a los niños una merienda saludable que incluía miel de ASF. Hubo una buena aceptación de las actividades realizadas, en la que la mayoría de los niños manifestaron que les encantó el proyecto. Hubo momentos de interacción y aclaración sobre la importancia de la ASF para el medio ambiente y para la preservación del ecosistema amazónico. Ante la pregunta de si a los niños les gustarían más actividades similares a las que se desarrollan en la escuela, el 92% (n=35) de los niños respondió que sí y el 8% (n=3) no contestó la pregunta. El proyecto contribuyó a esclarecer la importancia de la biodiversidad, la polinización y la conservación de los ecosistemas. A partir de este proyecto se espera que los niños puedan comprender la necesidad de preservar la Amazonía y convertirse en agentes multiplicadores del desarrollo sostenible.

Palabras Clave: Desarrollo sostenible. Abejas sin aguijón. Coarí.

INTRODUCTION

Meliponiculture is the rational rearing of stingless bees (Meliponini) and constitutes an economic activity that aims to combine the management of stingless bees and the commercialization of their products with environmental conservation (KERR et al., 1996, BUSTAMANTE et al., 2008, ZAPECHOUKA; SILVA, 2022). Stingless bees are known as such because they have their stinger apparatus atrophied (Kerr et al., 2001), which is one of the factors that facilitates the management of these species, compared to that of the species Apis mellifera Linnaeus, 1758, which has a stinger.

Meliponini species are found, for the most part, in tropical forests (more than 60%), and the Amazon rainforest, with its rich biodiversity, is known as "the natural and world cradle of stingless bees" (KERR, 1998). The creation of these bees presents quite attractive aspects of sustainability: it has a low cost with the management of colonies (FRAZÃO; SILVEIRA, 2003); it does not require large spaces or much work, compared to those of agriculture, fishing and cattle raising; and it represents a very profitable activity, in the medium and long term (VIEIRA et al., 2008).

When collecting their food in nature, stingless bees provide the service of pollination. The pollination process occurs when pollen grains from a flower (male gametes) pass to the

stigma (receptor of the female apparatus) of another flower of the same species. In this way, bees provide fertilization of plants, which results in the production of fruits and seeds. Bees can be responsible for the pollination of 40 to 90% of the native flora according to the ecosystem, in addition to the dispersion of seeds of species of timber importance (KERR et al., 1996).

Despite the importance of stingless bees, many nests of various species have been destroyed by human actions, such as: deforestation and burning that destroy vegetation, since most stingless bees nest in hollows of medium-sized trees (FRAZÃO; SILVEIRA, 2003). The queens of the Meliponini, once fertilized, are much heavier than the workers. However, their wings are the same size, making it impossible for them to fly. Thus, the entire colony is subject to death in fires, since unfortunately the forest is being transformed into charcoal on the roadsides of the Amazon (KERR et al., 2001).

The action of honey hunters who destroy the nests of stingless bees to remove honey is also worrying, and often waste the other products that could be used, in addition to killing the colony (FRAZÃO; SILVEIRA, 2003). Another problem found is the use of insecticides near some crops (soybeans, cotton, tobacco, oranges, tomatoes) that harms meliponaries and colonies of nearby forests (KERR et al., 2001).

The promotion of Meliponiculture may be able to prevent the extinction of these species and the depredation of natural nests, in addition to generating income in a sustainable way and contributing to the maintenance of biological diversity (VENTURIERI, 2006). With the disappearance of stingless bees, there may be a decrease in plants whose flowers are pollinated by bees, since these will have their seed production reduced. Therefore, the decline in bee populations can lead to a drop in agricultural productivity (WITTER et al., 2009).

Associating beekeeping with sustainable development is a valuable tool for environmental education, providing enriching experiences and inspiring a deeper connection with the environment. Through the use of didactic strategies that bring theoretical knowledge closer to application in the environment, a stronger environmental awareness is created, promoting positive actions in favor of conservation and sustainability of the environment (SILVA, LAGES, 2001; CONCEIÇÃO, 2022).

Studies on environmental education with the use of meliponaries have shown that awareness of the importance of bees contributes to clarifying the importance of pollinators and sustainable practices. Educating communities, especially from childhood, can contribute to raising awareness of people about the importance of these insects, promotes an emotional connection with stingless bees and encourages the adoption of sustainable practices that open

the perspective for maintaining the balance of ecosystems (FRAZÃO; SILVEIRA, 2003; QUEIROZ et al., 2017).

Given the above, Meliponiculture can play a valuable role in environmental education, arousing interest and awareness of people for the conservation of nature, the importance of biodiversity and the impacts of their actions on the environment. The objective of this project was to carry out environmental education activities based on the theme of Meliponiculture, aiming to contribute to the clarification of elementary school students about sustainable development and environmental preservation of the Amazon.

METHODOLOGICAL APPROACH

This project was carried out in partnership with faculty and students from the Federal University of Amazonas (UFAM) and the Federal Institute of Amazonas (IFAM). The student extensionists participated in theoretical activities on Meliponiculture and sustainable development, taught by the participating faculty. For the execution of the project, a visit was made to a municipal public school located in the urban area of the municipality of Coari-AM to present the activities and schedule of the project. The target audience was 38 elementary school children, from the sixth grade of elementary school, who had prior authorization from their parents and the administrative and teaching staff of the school to participate in the project.

The activities were divided into 5 stages:

1-Expository Activity

The children were transported to the IFAM, Coari campus, in the Institute's auditorium, an environmental education activity was held, which consisted of a theoretical exposition on the importance of preserving the environment. This was a participatory activity in which the extensionists asked questions about the children's prior knowledge and presented the activities that would take place. Subsequently, there was a brief explanation about the relationship between Meliponiculture and environmental preservation.

2-Walk on an Ecological Trail to Visit Stingless Bee Hives in Nature.

The children were led to the IFAM ecological trail, where they took a walk to visit a hive in nature. At this moment it was possible to present the natural habitat of the bees and there

was an explanation about the relationship of stingless bees to the sustainability of the ecosystem.

3-Visit to a Didactic Meliponary

The Meliponary is located on the IFAM Ecological Trail, organized in boxes (meliponary), simulating the conditions of natural nests and has species of Melipona sp. The visit to the didactic Meliponary aimed to present the castes and social organization of bees in hives. The visit to the meliponary was concluded with a tasting of honey produced by stingless bees.

4-Playful Activity on Environmental Education.

Then the student extensionists presented a playful activity on the importance of stingless bees for the environment through a playful dramatization and questions about the theme.

5-Evaluation of Activities.

The last stage consisted of the evaluation of the activity. Initially, the children went to the IFAM cafeteria where they were offered a healthy snack, which consisted of passion fruit juice and acerola juice sweetened with honey; sliced bread with chicken pâté; cut fruits (watermelon, papaya and melon) and added with stingless bee honey. At the end of the activity, the children evaluated the activities developed, describing what they had learned and their perspective in relation to the project. In the end, they were taken back to their school of origin.

RESULTS AND DISCUSSION

A total of 38 children, of both sexes, enrolled in two sixth-grade classes participated in the activities. In the initial theoretical presentation of the project, it was possible to observe an interaction of the extensionists with the participating public. What Meliponiculture was and the organization of bees was presented. At this moment there was active participation of the children who reported what they knew about bees and about their importance to the environment. It was verified the little knowledge of the children related to the fact that there are stingless bees and the importance of these insects to the environment.

The field practice in the trail visits and in the meliponary was carried out in a very successful way. Many students stated, informally, that they had never seen hives, neither in their natural habitat, nor in meliponaries.

This scenario reinforces the need to provide more activities of this nature, to propagate the importance of stingless bees to the environment, their role in maintaining nature and in food production, in favor of nature and thus

Environmental education actions aimed at children and adolescents generate positive impacts, because the children and adolescents who understand environmental issues today will be sustainable adults tomorrow, sharpening critical thinking and motivating other people to environmental preservation (BORGES, PAULA, 2022).

In Figure 1 it is possible to observe the two activities carried out:

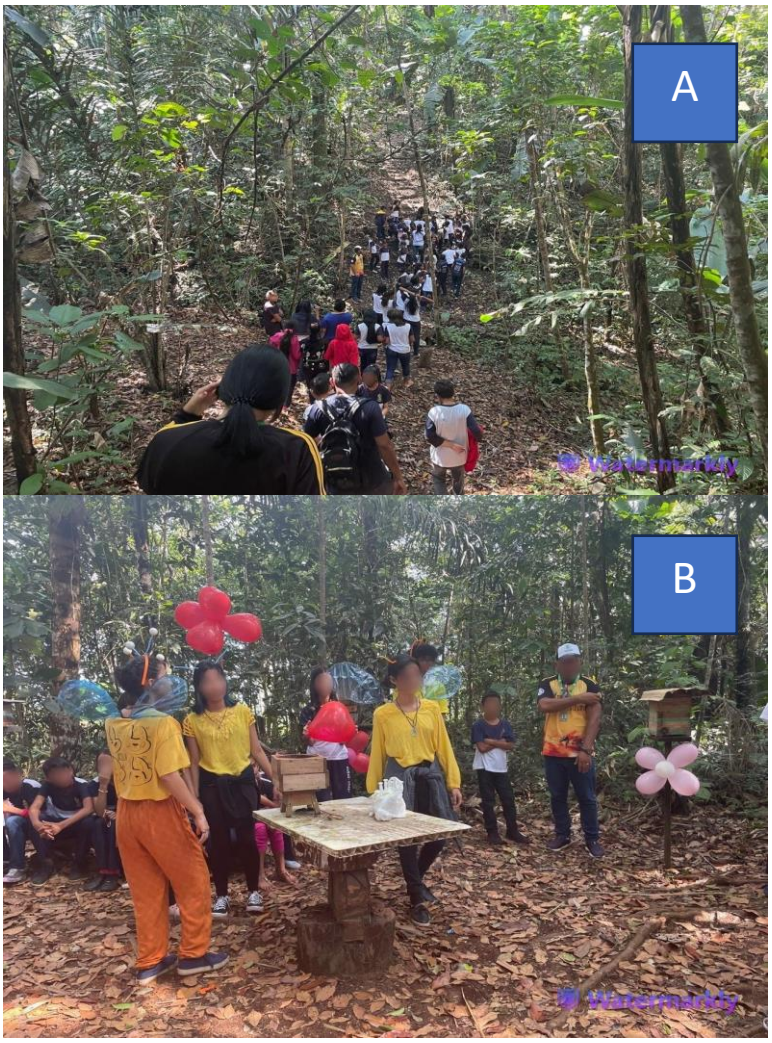


Figure 1. Field Practices. A) Walk on the trail. B) Meliponary
Source: Primary Data, 2022

Stingless bees live in less populous colonies than bees with stingers, and each species has its own particularities regarding the shape and size of the nest, food preferences, and behavior. Among the best-known stingless bees are the bees of the genus Melipona, popularly known as “jandaíras” (SILVA et al., 2018).

In meliponaries, the presence of boxes is verified, which project a simulation of the natural habitat of bees in the environment. The management of colonies requires knowledge of the needs of each species of stingless bees, as well as the offer of bee pasture that offers raw material for the construction of the hive structure, in addition to nectar and pollen.

It was explained to the children that in addition to the production of honey, which is the most well-known product, stingless bees also produce propolis, “samburá” (fermented pollen), and cerumen, with potential medicinal properties and are highly valued both in the Amazon region, as in other states and countries (MELLO, 2000).

The children were able to learn about the creation of stingless bees and had the opportunity to get to know the life of these insects up close. The student extensionists explained about the interactions of bees with plants and the ecosystem. It was possible to unite in practice what had been commented on in a theoretical way about the importance in pollination in the maintenance of biodiversity.

It was verified that the practical activity aroused the interest and curiosity of the children, encouraging the search for knowledge about the processes involved in the preservation of the environment.

Ratifying the findings that "stingless bees arouse interest in different age groups, levels of education" (QUEIROZ et al. 2017, p.118), and that it is of crucial importance, to create a critical awareness to citizens, dialoguing about everyday themes, articulated to the themes of "environmental conservation [based on our local reality], which, most of the time, are left aside, by a model of environmental education ready and stereotyped" (ZAPECHOUKA; SILVA, 2022, p.12).

The playful activity was carried out with a dramatization about the organizational structure of bees and after, there were questions about the contents that were approached in the theoretical and practical activities. For Menegazzo (2018), the teaching methodologies that use playfulness as a tool, promote a better understanding of the children of the subject approached, because this form of teaching, uses the interaction and association of the content worked for a better understanding of the topic approached.

It is verified that playful activities play a fundamental role in the development and learning of children. They promote several benefits, both in the cognitive and socio-emotional aspects. The children were organized in teams and united in a collaborative way to answer the questions about stingless bees, environment and environmental preservation.

In the last part of the activity, the children were able to eat snacks that contained stingless bee honey (Figure 2). Furthermore, it was possible to present the nutritional aspects referring to honey in comparison with processed foods. There was interaction and fraternization of all participants of the project (teachers, extensionists and children).

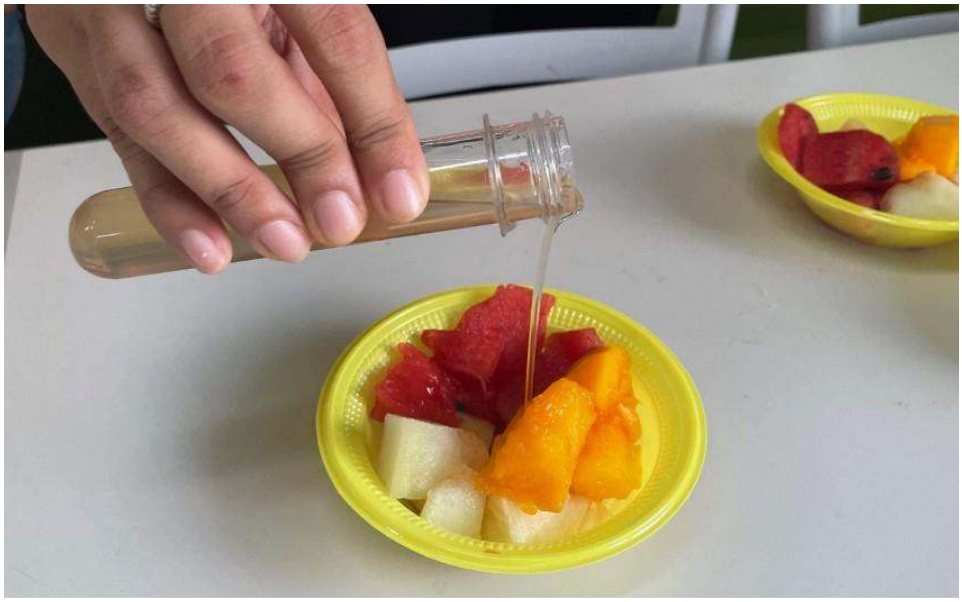


Figure 2. Fruit Salad Drizzled with Stingless Bee Honey.
Source: Primary Data, 2022

In the evaluation, most of the children declared that they loved the activities carried out (50%, n = 19), 42% (n = 16) declared that they liked the activities and 8% (n = 3) did not answer the question. When asked if the children would like more activities similar to the one developed in the school, 92% (n = 35) of the children answered yes and 8% (n = 3) did not answer the question.

With this, it was verified that the project achieved the objectives, involving the children in the learning about environmental education, enabling them to become defenders of the environment through the appreciation of nature, the initial knowledge about sustainable practices and sensitizing them about what consequently generates a citizen awareness, based on the feeling of protection to the environment and the responsibility of preserving pollinators and ecosystems (GONÇALVES, 2020).

The extension work with stingless bees has been carried out successfully in different states in Brazil, demonstrating that these educational actions promoted are effective and necessary strategies for the constitution of a sustainable relationship with bees (BENDINI et al., 2020; SILVA et al., 2022). However, it is commonly described for the capitals, this report being the first that describes the activity in the municipality of Coari, Amazonas.

From the execution of this project, the continuation of activities that aim to awaken the interest of children, adolescents, young people and adults for the understanding of the role of bees in the pollination process and for the importance in the production of food and preservation of plant species is encouraged. It is also expected that the participating subjects can become multiplying agents of the need for conservation and preservation of the Amazon.

CONCLUSIONS

The use of Meliponiculture as a tool for environmental awareness was an opportunity for children to solidify information about environmental education and the need for environmental preservation. During the theoretical and practical activities, it was possible to arouse interest in the preservation of stingless bees and make associations about the importance of this Meliponiculture for the environment in general.

Through these activities, the children were able to learn about the organization of bees, their natural habitat, understand their social organization and their interactions with the environment, visited the meliponary, had an understanding of the importance of biodiversity, pollination and conservation of ecosystems.

In this way, the project carried out provided an opportunity for children to develop practical, theoretical and cognitive skills, acquiring valuable knowledge about stingless bees and their role in the Amazon biome, their products and a sensitization on environmental education, contributing to the formation of critical and reflective citizens about their role in the environment.

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