Name	Counterpart	Title
Windra Priawandiputra, Damayanti Buchori	**B09**	Development of a method to capture stingless bees for increasing human livelihood and improving biodiversity assessment

Background and Objectives

Global decline of bees has been reported in some countries, particularly in countries where honey bees are widely used for industrial purpose (Biesmeijer *et al.* 2006; VanEngeldorp *et al.* 2008). Although these drivers have also become a concern in Indonesia, data on the decline of bees and their populations in Indonesia are not available. Gratzer *et al.* (2019) shared that beekeepers in Indonesia are mainly managing local species (*Apis cerana*) and some stingless bees, although there are also a few beekeepers, which manage *Apis mellifera*. The number of beekeepers has recently increased in Indonesia, especially for stingless bee species (Buchori *et al.* unpublished). Stingless bees beekeeping could improve economic and human livelihood in Indonesia, especially in suburban areas (Cortopassi-Laurino *et al.* 2006; Pratiwi *et al.* 2020; Priawandiputra *et al.* 2020).

Some hunters of stingless bees in Indonesia usually find the wild nests on trees in natural habitats and cut them down. This method can be successfully used to collect stingless bees in the wild, although it has many consequences, such as the death of tree, loss of plants, loss of stingless bee habitat, costly in time and labor (Oliviera *et al.* 2013). Another method, nest traps, has been commonly applied in Brazil to collect stingless bee colonies in the wild (Oliviera *et al.* 2013). Although nest traps are a good potential alternative to the method used so far, they have not yet been not studied, tested and applied in Indonesia. Stingless bees are commonly found in forest area (Sakagami *et al.* 1990), while some species can also be found in various agricultural and urban habitats. We can utilize nest traps to monitor the existence and population status of various stingless bee species in natural and human-modified land uses. However, if nest traps could be successfully applied for stingless bee keeping in Indonesia, they would be a good solution for sustainable collection of wild stingless bees, improving human livelihoods, and a tool for monitoring bee population biodiversity. We also applied the grafting technique to propagate the stingless bees colonies, so the method could be applied in the wild. Therefore, this study aims to: (1) confirm the effectiveness of trapping and grafting methods in Indonesia; (2) investigate the effect of different land use composition on the success of trapping methods; (3) discover the most suitable material for capturing stingless bees; (4) assess stingless bees diversity using different trapping methods. In addition, the prospects for using trapping and grafting methods for human livelihood advantages, biodiversity assessments and conservation of stingless bees were investigated.

Methods

The study was conducted at IPB University, Dramaga Campus, Bogor, Indonesia. The area on Dramaga Campus designated as green campus was randomly selected for 21 plots (Fig. 1). A total 126 traps (63 made of bamboo and 63 made of plastic) were placed on the Dramaga Campus.

We used two local common materials to construct traps such as plastic containers and bamboos (Picture 1). We choose 1.5 L plastic containers traps since they are easy to find and abundant in number. Internode of bamboo 30-40 cm long were selected for the traps. Each internode was perforated for the entry of stingless bees. Raw propolis and honey from stingless bees

Figure 1. Traps location in Dramaga Campus IPB University.

were used as attractants. Both attractants were sprayed into the entrance of the traps.

We also prepared the grafting techniques using different component of grafting boxes such as acrilic, wood, bamboo, and plastic (Picture 2). Three replicates were prepared for all grafting boxes. Each grafting box was connected to the hives of stingless bees. The weight and occupancy of the hives when moved to the new grafting box were measured. ImageJ was used to measure the cerumen, brood cell, honey and pollen pot, and occupation percentages. The grafting techniques were not installed until late August 2021. The grafting box served as a corridor between the colony in the sources box and the outside of the box. It takes 4 months for them to move their nest into the grafting box.

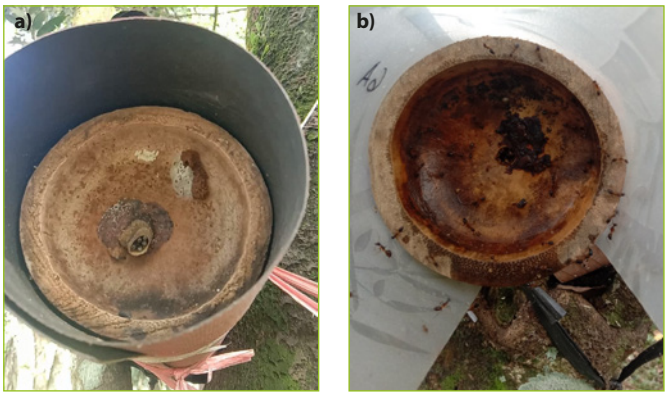
Mining data was also collected from youtube videos related to trapping and grafting techniques for stingless bee colonies. We analyzed the percentages of video that already used grafting and trapping techniques to collect the stingless bees.

Results and Conclusion

Although the traps had been in place for 6 months, only two bamboo traps were occupied by colony of stingless bees (Picture 3). Meanwhile, 15 bamboo and 7 plastic traps were occupied by ants. In this case, this technique was not really effective to collect stingless bees in natural habitats. Some trap treatment need to be modified based on other video literatures, such as adding burning bamboo and propolis.

Picture 1. Traps that were made from bamboo (a) and plastic were placed nearby.

Picture 2. Grafting box were made from acrylic (a), wood (b), bamboo (c) and plastic (d).



Picture 3. Bamboo traps were occupied by stingless bees (a) and ants (b)

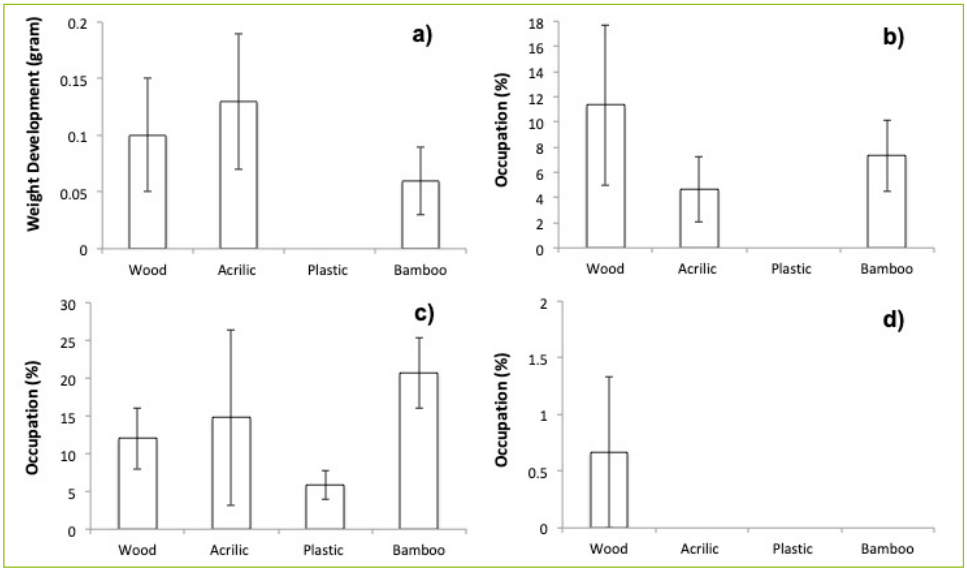


Figure 2. The weight development and percentages occupation of grafting boxes in different types: a) weight, b) honey and pollen pot, c) the cerumen, and d) brood cell.

The grafting techniques using different box materials showed different weight developments and occupation percentages (Fig. 2). The colony of stingless bees can occupy the new boxes made from wood, acrilic, and bamboo material (0.1, 0.13, 0.06 gr, respectively). Honey and pollen pot were established in wood, acrilic, and bamboo materials. Plastic materials were hardly colonized by stingless bees. Some batumen and cerumen were constructed in all type of boxes. The brood cell was only made in wooden box.

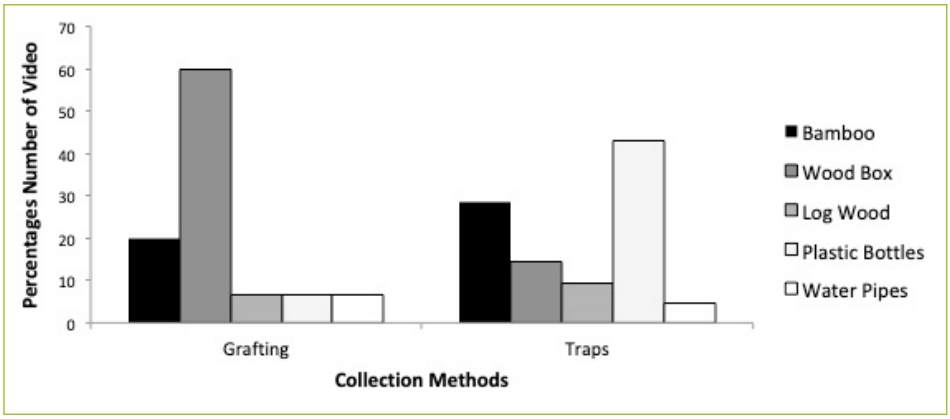


Figure 3. The percentages number of video (N=31) related with different collection method of stingless bees colonies.

Based on youtube video, many Indonesians have already tried the techniques of grafting and nesting trap techniques. We have seen 31 videos related to the grafting and trapping techniques for collecting stingless bees colonies in natural habitats. Some videos showed the different materials used to collect the stingless bees colony. Most Indonesians used wooden boxes and plastic bottles for grafting and trapping techniques, respectively (Fig. 3).
The nesting traps and grafting techniques were used to collect the colony of stingless bees in Indonesia based on youtube video. These grafting and trapping techniques could be effective and efficient to capture wild stingless bees for beekeeping. However, only grafting may be succesful in relocating the stingless bees colony, while the effectiveness of trapping needs to be re-evaluated. The different land use composition had no clear effect on the collection of stingless bee colony. Based on grafting result, wood box, acrilic and bamboo can be effectively used to collect stingless bees colonies. Plastic bottles can be used to collect stingless bee colonies in natural habitats based on video analysis, but our results shows that bamboo is more effective than plastic to collect the colony of stingless bees. Ants can be also trapped in the nesting traps. Collecting stingless bees can be more sustainable and environmentally friendly using these two techniques, althought it takes more time to reap the benefits. It can be implemented in Hutan Harapan, Jambi, as a follow-up project.

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Major Outcomes:

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