Colony Growth of Local Honey Bee (*Apis cerana*) in Teak and Eucalypt Stands

Musyafa[1*]; Shakti Jannada Sukmaseta[2]; Dwi Tyaningsih Adriyanti[3]

Faculty of Forestry Universitas Gadjah Mada Yogyakarta, Jln.Agro No.1 Bulak sumur Yogyakarta 55281
*Corresponding Author

Received:- 07 September 2025/ Revised:- 16 September 2025/ Accepted:- 21 September 2025/ Published: 30-09-2025

Abstract— *There are various species of plants that potentially become a food source of local honey bee (A. cerana) in Wanagama Education Forest. Therefore it is necessary to do research on the development of local honey bee colonies in Wanagama Education Forest. This study was aimed to determine: the development of local honey bee colonies kept in teak and eucalyptus stands, The research was conducted in teak and eucalypt stands of compartment 14, Wanagama Education Forest in September to December 2016. The research was done by measuring the weight of the bee colony, the width of the honeycomb, the length and weight of the individual worker bees once a month. The results showed that the weight increase of bee colony kept in eucalypt stand (102,3%) was higher than that in teak stand (62,6%) in four months. The width of honeycomb increase in eucalypt stand (122.6 %) tended to be higher than that in the teak stand (99.7%). The highest body length (1.20 cm -1.23 cm) and body weight (0.052 g -0.055 g) of worker bee was observed in November. Local honey bee colony in Eucalypt stand developed better than that in teak stand. Eucalypt stand in Wanagama Education Forest seems to have a good carrying capacity for keeping local honey bees.*

Keywords—Apis cerana, colony growth, local honey bee, teak stand, eucalypt stand.

I. INTRODUCTION

Honey is one of the bee products that have high economic value. Bee keeping has not developed well in Indonesia. Production of honey in Indonesia is around 4000 tons per year and most of this honey production is produced from hunting wild in the forest (Kuntadi, 2016). The results of honey in Indonesia is not sufficient for the community because the need for honey is estimated to increase by 7000 tons / year. Indonesia still imports many honey from other countries such as Australia, New Zaeland, Thailand etc. Therefore honey bee keeping needs to get serious attention so that we do not depend on imports of honey from abroad.

In Indonesia there are several species of honey bees cultivated such as local honey bee (*Apis cerana*) and honey bees from Europe (*Apis mellifera*). *A. mellifera* is widely developed and cultivated intensively in Indonesia because it has great honey results. But these bees have the disadvantage of not being able to withstand parasitic attacks of mites that can damage and kill colony *A. mellifera* quickly. Besides that the bees are not easy to adjust to the environment. These bees also need to be transferred to other places following the flowering plant species. However, the transfer of colonies required considerable cost and manpower.

Local honey bees (*A. cerana*) produce less honey than *A. mellifera* but this bee has the advantage of high resistance to the attack of mite parasites known to greatly damage in apiculture. In addition *A.cerana* has a good ability in adaptation to the environment. *A. cerana* also has a greater genetic diversity compared to *A. mellifera.* Therefore, this local honey bee needs to be developed intensively to produce honey with high quality and quantity (Koetz,2013).

During this time *A. cerana* has not been intensively cultivated. Honey bee *A. cerana* usually is obtained from nature or cultivated traditionally without good care. For example in Wanagama Forest the average production of honey bee *A.cerana* is

still low around 1-3 kg / colony / year. Besides the bee *A.cerana* also easily move to another place. With the innovation of honey bee cultivation technique, it is expected to increase the production of honey.

Forest is one of the potential places in the supply of bee feed. The diversity of flowering vegetation in the forest allows the bees to get enough feed each season. One of the forests that the surrounding community serve as the location of honeybee cultivation is Wanagama I Forest Forest, Gunungkidul, Yogyakarta (Adityawan, 2015). The honey bees forage for collecting nectar, pollen and water (Seeley,1989; Abou-Shaara, 2014). Pollen collection increase in the larval stage (Hellmich and Rothenbuhler, 1986). An increase in the uncapped brood in the colonies cause a decrease nectar foraging (Hoopinger and Taber, 1997). The decrease of the pollen in the hive can decrease the brood rearing activity (Barker and Jay, 1974; Antonsenko and Ermoleava, 1979). Changes in the internal environment of the honey bee colony influence its foraging response (Calderone, 1993; Dreller et al.1999). The stronger colony produce more honey than weaker colony (Bhusal et al., 2011; El-Kazafy and Al-Kahtani,2013)

Wanagama Forest is a reforestation forest by converting an area that was once a barren hill that has not been overgrown by vegetation (Al-Mubarrok, 2016). The carrying capacity of Wanagama Forest in providing food sources plays an important role in the development of local honey bee colony (*A. cerana*) which is stationery beekeeping within the forest area. The objectives of the research was to know the development of local honey bee colony kept in teak stand and eucalypt stand.

II. MATERIALS AND METHODS

The research was done in Wanagama Education Forest, Gunung Kidul, Yogyakarta Indonesia. This area is located at an altitude of 150 to 400 meters above sea level, covering an area of 600 ha. Teak stand and eucalypt stands are located on plot 14. Ten local honey bee hives were put in eucalypt stand and teak stand respectively. The development of local honey bee colonies was observed by measuring colony weight, honeycomb size, body length and body weight of worker bee. Colony weight was measured by weighing bee colony on each hive using electrical balance. Honeycomb area was measured by drawing a honey comb on a plastic sheet. Then the image of the the honeycomb on plastic sheet was scanned using a scanner to obtain a honeycomb softcopy in jpeg format. Furthermore, the honeycomb area measurement was done by using Autocad 2010 software. The weight and length of the worker's bees were done by taking 3 individual worker bee samples from each hive. The weight measurement was done using an electrical balance.

III. RESULTS AND DISCUSSION

The colony development of honey bee in Wanagama Forest was showed in Figure 1. At the beginning of observation the weight of honey bee colony in teak stand was 196 g and eucalyptus 229.8 g; while at the end of the observation, the weight of the bee colony was 318.7 g in teak stand and 464,85 g in eucalypt stand. The weight increase of bee colony kept in eucalypt stand (102,3%) tended to be higher than that in teak stand (62,6%) in four months (Figure 3).

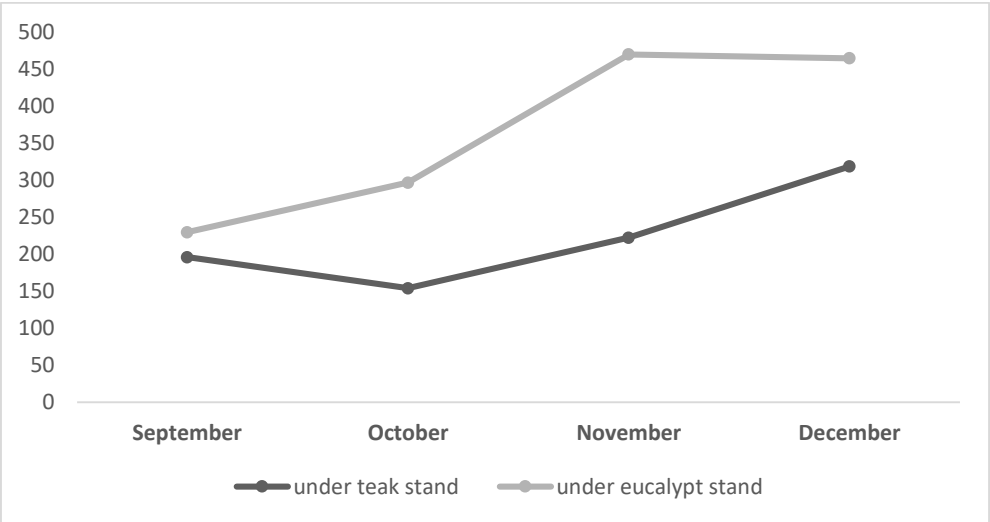

FIGURE 1: Weight of local honey bee colony (g) kept under teak stand and eucalypt stand

Although in September the weight bee colony kept in eucalypt stand was higher than that in teak stand, but statistically this was not significantly different (P> 0.05). The development of honey bee colony kept in eucalypt stand was better than in teak stand. The food source for honey bee in eucalypt stand seemed to be better than in teak stand. According Sihombing (1997), pollen eaten by honeybees primarily as a source of protein and fat, little carbohydrates and minerals. Protein is a major determinant of the growth and proliferation of honeybees, as well as in general insect. The development of bee colonies is strongly influenced by dietary factors. Honeybees require various nutrients for growth, development, reproduction, and production (Sihombing, 1997).

Significant increase of honey bee colony in November may be due to the abundance of *Acacia auriculiformis* pollen in nature so that pollen deposits in nest cells are also abundant. Djam'an., et al. (2016) in the study of flowering patterns of *Acacia auriculiformis* in Banyumas, West Java, suggested that *Acacia auriculiformis* experienced flowering peaks in April-May and ready-to-harvest fruits in July-August. The abundance of *Acacia auriculiformis* pollen in November in Wanagama is the late flowering phase

Development of honeycomb area becomes one of the indications of whether the number of bees in a colony increases or not. Honeycomb development was affected by the availability of the nectar and pollen. According to Pratt (1999) bees build new nests during flowering seasons where nectar sources are abundant, so the colonies need new cell to store honey. Bee colonies in the educational forest of Wanagama obtain the supply of nectar from the shoots and buds of mangium leaves (extrafloral nectar).

The increase of honeycomb area was observed in teak stand and eucalypt stand (figure 2). Honey comb area in the bee colony in teak stand increased from 541.18 cm2 in September to 1080.65 cm2 in December.. The honeycomb area in eucalypt stand increased from 680.69 cm2 in September to 1515.17 cm2 in December. The width of honeycomb increase in eucalypt stand (122.6 %) tended to be higher than that in the teak stand (99.7%). A more rapid increase of honeycomb area of the local honey bee colony kept under eucalypt stand indicated that eucalypt stand is more favorable for beekeeping than teak stand. Food factors certainly provide a significant influence in spurring the development of the colony. The species of pollen obtained by bee colonies kept under the eucalyptus stand may be greater than the colony under the teak stands.

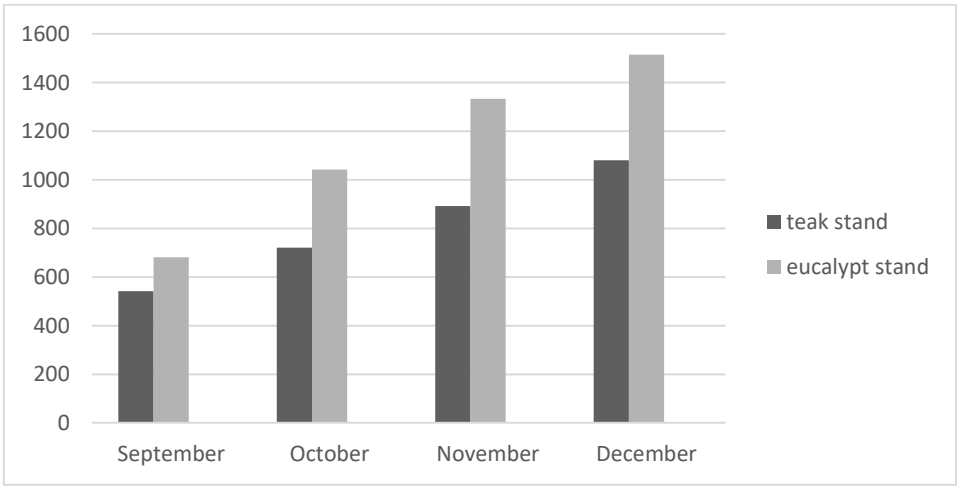

FIGURE 2: Honeycomb area (cm^2) of honeybee colony kept under teak and eucalypt stand

The body length of worker bee ranged 1.11 to 1.15 cm in teak stand and 1.14 -1.23 cm in eucalypt stand (Figure 3). The weight of worker bee was 0.049 – 0.054 g in teak stand and 0.049-0.052 g in eucalypt stand (Figure 4). The length and the weight of worker bee in eucalypt stand and teak stand was similar. The length and the weight of worker bee either in teak stand and eucalypt stand in November was higher than in other month. It may due to the fact that in November the availability of the food was higher than that in the other month.

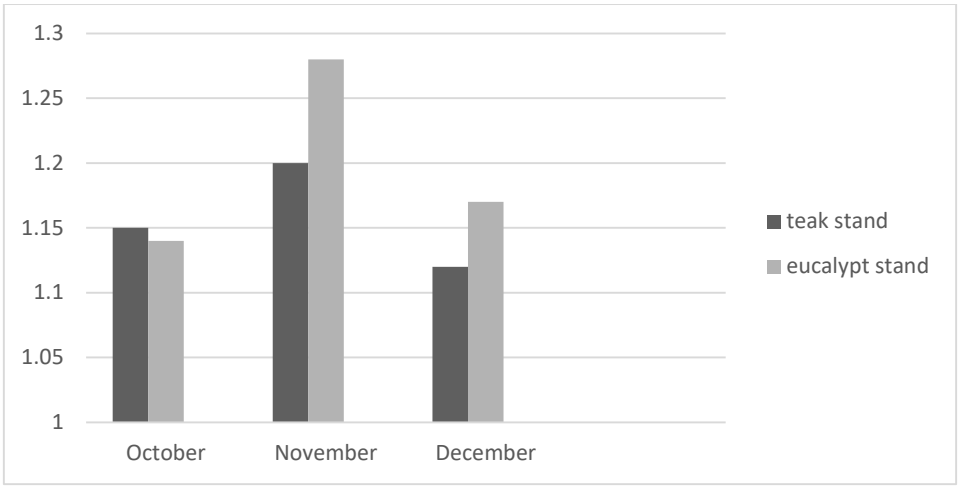

FIGURE 3: Body length of worker (cm) bee kept under teak stand and eucalypt stand

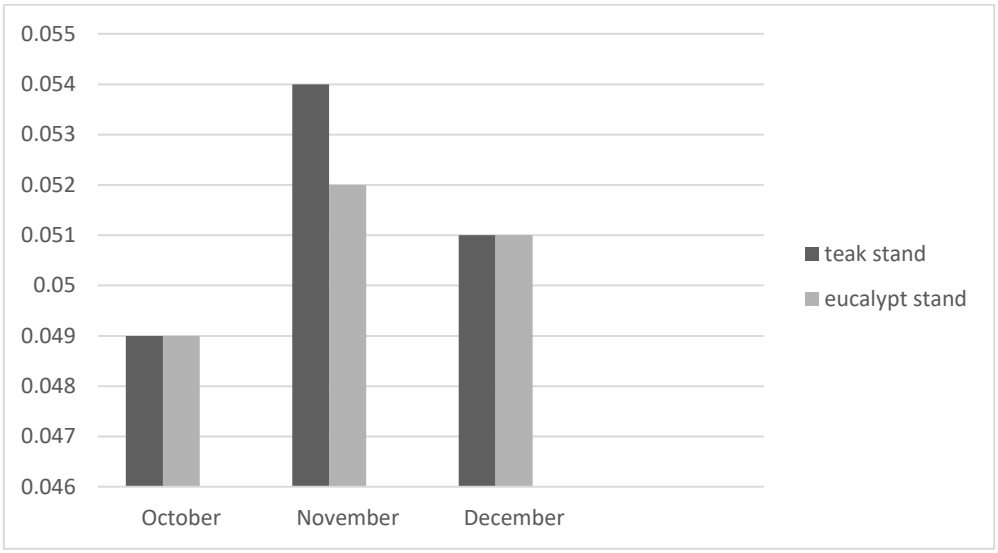

FIGURE 4: Body weight of worker bee (g) kept under teak stand and eucalypt stand

IV. CONCLUSION

Honey bee colony growth in eucalypt stand is better than in teak stand. It may due to the availability of nectar and pollen in eucalypt stand is better than in teak stand.

REFERENCES

[1] Abou-Shara, HF. 2014. The foraging behavior of honey bees, *Apis mellifera*: A review. Veterinarni Medicina (1):1-10
[2] Al-Mubarrok, F. 2016. Studi Kelayakan Hutan Wanagama I sebagai Kawasan Restorasi Rusa Jawa (*Rusa timorensis*).Laboratorium Satwa Liar Fakultas Kehutanan UGM. Penelitian.
[3] Adityawan, MR. 2015. Identifikasi Pola Pemanfaatan Lahan oleh Masyarakat di Hutan Pendidikan Wanagama I Kabupaten Gunungkidul Yogyakarta. Fakultas Kehutanan UGM. Skripsi
[4] Antonsenko, AD, Ermoleava,GF.1979. Effect of feeding on colony life and the pollinating activity of honeybees. Trudy SverdlovskogoSel'skokhozyaistvennogo Instituta 55:69-75.
[5] Barker RG, Jay SC (1974). A comparison of foraging activity of honeybee colonies with large and small populations. Manitoba Entomologist 8:48-54.
[6] Bhusal, SJ, Kafle, L, Thapa, RB, Shih, CJ. 2011. Effect of colony strength on the performance of honey bees (*Apis mellifera*) in Nepal (Hymenoptera: Apidae). Sociobiology 58(2):435448.
[7] Calderone, NW. 1993. Genotypic effects on the response of workerhoney bees, *Apis mellifera*, to the colony environment. Animal Behavior 46:403-404.
[8] Djam'an, DF, Syamsuwida, G, Aminah, A. 2016. Pola pembungaan dan Pembuahan Akor (*Acacia auriculiformis*) di Parungpanjang, Bogor. Balai penelitian dan Pengembangan Teknologi Perbenihan Tanaman Hutan.Bogor.
[9] Dreller, C, Page, RE. 1999. Genetic, developmental and environmental determinants of honey bee foraging behavior. In: Detrain C, Deneubourg JL, Pasteels, JM, eds. Information processing in social insects. Basel: Birkha Verlag pp.187-202.

[10] EL-Kazafy, AT, Al-Kahtani, SN. 2013. Relationship between population size and productivity of honey bee colonies. Journal of Entomology 10:163-169.
[11] Hellmich ,RL II, Rothenbuhler, WC.1986. Relationship between different amounts of brood and the collection and use of pollen by honeybee (*Apis mellifera*). Apidologie 17(1):13-20.
[12] Hoopinger, R, Taber, S.1979. The effect of available nectar on pollen gathering by honeybees. Proceedings of IVth International Symposium on Pollination, Maryland pp.375-379.
[13] Koetz, A. 2013. The Asian Honey bee (*Apis cerana*) and its strains with special focus on *Apis cerana* Java genotype. Department of Agriculture, Fisheries and Forestry Queensland.Literature review.
[14] Kuntadi. 2016. Pengembangan Budidaya Lebah Madu dan Permasalahannya. Pusat Peneltian dan Pengembangan Konservasi dan Rehabiltasi Badan Penelitian dan Pengembangan Kehutanan. Bogor
[15] Seeley, TD.1989. Social foraging in honey bees: how nectar foragers assess their colony's nutritional status. Behavioral Ecology and Sociobiology 24(3): 181-199.
[16] Sihombing, DTH. 1997. Ilmu Ternak Lebah Madu. Gadjah Mada University Press.Yogyakarta.