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Carbon Steel as a Media for the Stringless Bee *Tetragonula sp.* Nest at Indralaya Area in South Sumatra, Indonesia

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Abstract: An investigation to observation the potential of stingless bee on building their nest at the high temperature material had been done to *Tetragonula (Tetragona) sp.* nest at Indralaya area, South Sumatra. Here we describe the *Tetragonula sp.* nest that uses streetlight pole made by carbon steel as the nest media. Purposive sampling is used to select the target nest. Two streetlight poles found be used by *Tetragonula sp.* as their home. The coordinate of location, height from ground surface, diameter of streetlight pole, air temperature and humidity, and floral species around nest, were noted. The spot coordinate of the area is between S 30 14' 19.2498" and E 1040 39' 15,3288" at 1,5 m above the ground surface with 12 cm diameter of pole and the highest air temperature was 35^0C at daylight during the months of sampling with about 80 – 90 % humidity. Some floral species are planted around the research area in order to attract the bees, they are including: *Switenia macrophyla, Hevea brasiliensis, Zea mays*, and *Citrullus lanatus*. It is founded that during the daylight, the air temperature in area was around 40^0C, and the bee's nest give minor effect on corrosion and degradation to the metallic materials during the test.

Keywords: *tetragonula sp.*, insects' nest, streetlight pole, metal medium

1. Introduction

Stingless bees are a monophyletic group principally found in tropical and subtropical areas of America, Africa, Australia, and parts of Asia [1]. The stingless bee species are taxonomically organized into two major genera *viz., Trigona,* the largest group and *Melipona,* a genera consisting exclusively of the genus *Melipona.* All area in Asian and African, the stingless bee species belong to the genus *Trigona.* According to other reference, Trigona is the other name of *Tetragonula sp.* [2]. It has published, various species have their preferred habitats and climatic conditions. Some species are present in the rain forest, savanna and also transitions between forest and savanna vegetation zones. Furthermore, they reported that many stingless bee species nests in cavities. These cavities could be found in the following stem and branches of living trees including bamboo.

Cavities in unused panel doors of buildings may give accessed to insect to the cracks and holes. It is as the other finding that one species of stingless bee (*Dactylurina staudingeri*) builds its own nest in the form of a ball attached to a stem or branch of a tree as presented by other [3]. In the normal condition, the stingless bees built their nest on trunk of trees, logs, wall crevices and under the roof of dwellings [4]. This kind of bees mix the plant resin with wax to construct the entrance of the nest and also coat the resins over the hive to protect it from their enemies like ants and wasps. Majority of

these bees prefer teak trees for building their hives. Teak tree maintains temperature and humidity at the optimum level, so that it prefers teak tree (*Tectona grandis*) [3,4]. There is limited reference that study the insects' nest in metal medium. This research aimed to publish that stingless bee, nested in Carbon steel medium, specifically in the light street pole, at Indralaya, South Sumatra, Indonesia.

2. Materials and Methods

Purposive sampling is used to select the target nest. Two streetlight poles found be used by Tetragonula sp as their home. The coordinate of location measured by android cellular phone program, height from ground surface measured by plastic ruler, diameter of streetlight pole size too, air temperature and humidity noted by thermometer and seconder data from national weather website, and floral species around nest, were noted. The research procedure for data collection are presented on Fig. 1 and Fig. 2 below.

Figure 1. Pole measurement

Figure 2. Temperature measurement

3. Results and Discussions

From the investigation, the spot coordinate is S 30 14' 19.2498'' and E 1040 39' 15,3288''; 1,5 m above the ground surface. This location of the nest is in tropical region, south east Asia, that also founded by others [4,5], where the heightest level of nest from ground level is middle elevation around 11 to 15 ft, or about 3.35 m - 4.57 m high [5].

Medium for nesting, in this case is streetlight pole made by Carbon steel. It founded that the Carbon steel mediums found to be available nesting of stingless bees, as also presented in other paper [5]. Regarding the temperature, it is founded that the highest was 40 degrees of Celsius at surrounding area of the pole during mid-day. Other researcher founded that the stingless bees would live well at around 18 to 24 degrees Celsius temperature and still could live at 32 degrees. Its mean that the higher temperature or up to 40^0C, stingless bee still have a potential for building their nest on the surface of metallic medium, which also suggested by other [6]. The representation of the nest is shown on Fig. 3 and Fig. 4 below.

Figure 3. Other colony of *Trigonula sp.*, some meters around the investigation spot

Figure 4. *Tetragonula sp.* nest in metal iron pole

Stingless bees are mainly categorized as a highly social bees, as they are living in the colony. They are working together to maintain the colony, keeping almost constant the temperature throughout the time. The mechanisms of thermoregulation of this animal are called passive thermoregulation, it is due solely to the construction of involucre and nesting and not the motor activities of individuals [7].

Therefore, in most species of stingless bees, of course with rare exceptions, are the only mechanisms that they have to thermoregulate. Maintaining a constant temperature is critical for normal growth and development of the larval and pupal stages. It should explain why *Trigonula sp.*, in this case, could maintain and survive in the hole of streetlight iron pole. It was reported elsewhere that body size and coloration were involved in thermoregulation [5,8].

Insects are very sensitive to temperature condition. That is the reason, why the bees are flying out of their nest during daylight. They are select the soil and logs for build the hole nest or make leaves ball, like the big red ants. But, in this case, it is newly published, the stingless bee insect, could do their life in the iron metal body, even the temperature was higher than others [7-8].

4. Conclusions

It is founded that Tetragonua sp could build their nest at high temperature material, on the spot coordinate: S 30 14′ 19.2498′′ and E 1040 39′ 15,3288′′ and about 1,5 m above the ground surface, 12 cm diameter pole, highest air temperature was 350C at daylight during the whole year of the test; with the humidity around 80 – 90 %. Some floral species have a potential for attracting bees for building their nest, they are including *Switenia macrophyla*, *Hevea brasiliensis*, *Zea mays*, and *Citrullus lanatus* that are planted around the Carbon metal streetlight pole. The air temperature in the pole is very high or around 40 0C during daylight.

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