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Red Wood (Pterocarpus Indicus Wild) and Bread Fruit (Artocarpus Communis) Bark Sap as Attractant of Stingless Bee (Trigona Spp)

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ABSTRACT

An investigation about the power of redwood bark sap to invite stingless bee arrival had been done at Biology campus area, The University of Sriwijaya, Indralaya, South Sumatera, Indonesia; during Nopember 2010. Redwood breadfruit bark have been hurt for outcoming the red sap, and duration time for stingless bee arrival be measured then. Meanly, in 17 minutes, stingless bee had came for red sap; and in 5 minutes for breadfruit. Chemical test of redwood sap after soluted in methanol and put on gelsilicon chromatography with ethil-acetate and methanol (1:1), and sprayed by sulphic acid indicate that the compounds is terpenid (tannin) for red wood sap, and tannin and alcaloid for bread fruit sap.

| Pterocarpus indicus | Artocarpus communis | *Trigona spp* | bark sap | gum |

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1. INTRODUCTION

At an afternoon, one year ago, a neighbor cut the red wood trunks in front of the house. Many red elastic sap/gum came out from the bark and lot of insects, stingless bee, hold the gum and keep it i n their leg baskets. These phenomena were interested. What were the chemical compounds in the red sap? And what for sting-less bee to keep it? The study on *Trigona* and *Pterocarpus* begin at that day. Even, *Trigona sp*, also be found at bread fruit sap too, many months later.

At least there are 100.000 chemical compounds produced by 200.000 species of flowering plants in their growth and development. Most of them were not essential for physiological process of that plant.

The structure of more than 6000 alkaloids, 3000 terpenoids, some thousands of phenylpropaniod , 1000 flavonoid, 500 qu inons, 650 pol yacetylene and 400 of amino acidshad been known. Most of chemical compounds of plant identified, were functioned as volatile attractant for insects. Attaction of those compounds processed by diffusion in the air (Metcalf, 1992).

In Philippines, stinsgless bees are mass produced for pollination and honey production. During the swarming season (February-March) strong colonies are divided. Broad chambers containing queen cells are removed al ong with same adult bees, and placed 1-2 metres away from the original colony. These so called 'starter' colonies are then allowed to rear their own queen (Fajardo and Cervancia, 2011).

Heard (1999) find that stingless bee are common visitors to flowering plants in tropics, but evidence for their importance and effectiveness as crop pollinators is lacking for most plant species. They are known to visit the flowers of 90 crop species. They were confirmed to be effective and important pollinator of 9 species. They make a contribution to the pollination of 60 other species, but there is insufficient information to determine their overall effectiveness or importance. They have been recorded from another 20 c rops, but other evidence suggests that they do not have an important role because these plants are pollinated by other means.

The nest of stingless bees usually consist of an external tube, internal tunnel, resin dumps, wax dumps, foot pots for storing pollen and honey, brood and nest envelopes like involucrum and batumen. B rood cells, honey pots and pollen pots are arranged in separate clusters. Brood cells and food pots made of cerumen which is a mixture of wax and resin.(Pooley and Michener, 1969 in Danaraddi, 2007). Eltz *et al.* (2002) in Danaraddi (2007) reported the nest density of *Trigona collina* Smith, was generally high in sites located in the Sipilok forest fragment (mean 8.4 nest/ha). Nest densities in continuous forest were all low (between 0 and 2.1 nest/ha, mean 0.5 nest / ha).

Boogert *et al.* (2006) found that spesies *Trigona corvina*, scent marked a high quality food source and that they used their own scent marks to relocate it in choice experiment. Boogert studied for some species ;were bumblesbees, honey bees and stingless bees.

Stingless bees need flower nectar and pollen for their food. Stingless bees could find the food untill 500 metres (Baconawa 1999 c it. Abdillah 2008). Nectar of rubber plant and Cassava even were got by Trigona from their stem (Abdillah, 2008). Compared with Apis, population of *Trigona* colony were larger (Anonymous 2001 cit. Abdillah 208).

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MacArthur and Pianka argued that to obtain food, any predator (herbivor) must expend time and energy, first in searching for its object, and then in handling it (i. e. Pursuing, subduing and consuming it). Searching is bound to be directed, to some extent, toward particular food/prey type, but while searching, a predator/herbivor is neverthless likely to encounter a wide variety of food items. (Begon, M., Harper, J.L. and Colin R Towsend, 1986).

Table 1 Time that were needed by *Trigona sp1* to find and arrived at bark hurt of *P indicus.*

Number of replication	REDWOOD	BREADFRUIT
1	19	3
2	15	4
3	18	5
4	16	4
5	17	9

2. EXPERIMENTAL

Redwood and breadfruit bark have been hurt for outcoming the red sap, and duration time for stingless bee arrival be measured then by watch (searching time). Five hurt done, and mean of data were measured. . Chemical test of redwood sap after soluted in methanol and put on gelsilicon chromatography with ethil-acetate and methanol (1:1) for redwood sap; and *n*-hexan for breadfruit, and sprayed by sulphic acid 10 % after dried. The colour of spot were watched then (Thin Layer Chromatography) as published by Fransworth (1966)

3. RESULT AND DISCUSSON

As Begon *et al.* (1986) explained, it is needed a certain time for insect to find the foot object (searching time). Trigona sp1 (smaller) need about 17 minutes to find the red wood gum. Furthermore, *Trigona sp2* (bigger) need about 5 minutes to find the object. Because the sap of those trees were not nectar and pollen organ; it must be used of *Trigona spp* for nest built (see Baconawa 1999 cit. Abdillah 208). But, Roubik and Patino (2009) reported, that *Trigona* nest were built from pollen too. Seventy two plants species pollen were found in *Trigona corvine* nest scutellum. Lemberg *et al.* (2008) reported that *Trigon*a used resin-like substances as glue against intruders to their nest.

Body size, as could saw at **Figure 4**, inferences of flight range and possible ecological implications included the finding of food of course. Data suggested that maximum flight distance in Meliponini, -stingless bee group- is a function of body size, especially generalized wing size, which can be estimated through principal component analysis, as had been done by Araujo *et al*. (2004).

Worker bee size reflects an adaptation to environmental conditions; a major part of the morphological variation in Meliponini occurs independently of phylogeny due to the fact that, for social bees, worker body size has been generally considered as an adaptation to foraging activity and floral resource exploitation (Pignata and Dimiz-Filho, 1996 cit. Arraujo et al. 2004).

Table 2 Result of chemical compound test by sulpic acid reagent

NO	SAMPLE (SAP)	COLOUR AFTER REAGENT TEST
1	RED WOOD	BROWN (TERPENOID)
2	BREAD FRUIT	VIOLET-BROWN (TANNIN) AND YELLOW (ALCALOID)

Furthermore, it is known that stingless bee is social insect that have specific framework in activity of foraging. The foraging is a complex process involving large numbers of individuals collecting food from many different sources. The state of foraging behavioral were included 5 points; waiting at the nest and available to start foraging, searching the food source, exploiting food source, recruiting nest mates to food source and follow recruiters to food source. By those mechanisms, time of finding food source be influenced (Sumpter and Pratt, 2003).

Fig. 1 (from above to below): Red wood bark hurt and red gum/sap came out

Syah (2005) has isolated the chemical compounds of *Artocarpus communis* and found 50 ph enolic compounds those were calcon, flavanon, 3-phrenylflavon and stilbene. Most of those chemical compounds were characterized as cytotoxic, anti-imflamation, anti-malariae, anti-microbe and inhibitor for some enzymes. Specific for tree bark, the chemical compounds that were isolated are: 3-phenylflavon, Dihydrobenzoxanton, Xuinonodihydrobenzoxanton, furanodihydrobenzoxanton and tetrahydroxanton. Other compounds were found at flower, root and root epiderm. *Trigona sp* nest flavonoid (propolis) reported had the antibacterial activity against *Streptococcus mutans* (in vitro) (Sabir, 2005). Luttrell (2010) wrote, plants resin added for honey and pollen pots where the antifungal, antibacterial and other biological activity of the plants resins aid in the preservation of honey and pollen.

Fig. 2 Thin Layer Chromatography test of Redwood gum by H_2SO_4 reagent

Fig. 3 Spot of gum drop of red wood

Fig. 4 Two species of *Trigona* spp, the bigger (*left*) attracted to bread fuit sap and the smaller (*right*) attracted to red wood gum

Fig. 5 *Trigona* crowded at Red wood gum. Many *Trigona* sp are taking the gum

It could be seen, that the species of *Trigona spp* show difference in liking the sap of tree bark. The smaller, came to red wood gum and the bigger came to bread fruit sap. In niche concept of organism, every species has own specific status of life, where tend to different to the other. If two or more species have the same niche, they should compete each other, and one of them should change their life niche.

At other hand, some facts may influence the time to find out the trees sap. Distance to the nest, air flow condition and capability of catch the smell of gum could do the main role in this situation. Even, carbon dioxide, as a content of air, may influence the attraction of insect to object. In bed bug (*Cimex lettularius L*), for example, carbon dioxide, heat and chemical lure, influence the attraction to pitfall trap (Wang *et al*., 2009). In bats species, ultrasound emissions of wind turbines show the potential attractant for them (Szewczak, 2006).

Fig. 6 *Trigona sp* (big size body), attacking the tip of arm that closed to their nest, a hundred meter from bread fruit gum. The nest made at an *Acacia sp* tree (left above corner at picture)

4. CONCLUSION

Red wood and bread fruit bark sap attract *Trigona spp* for nest material. It taked time about 17 minutes to find red wood gum by *Trigona sp1* and 5 minutes to find breadfruit sap by *Trigona* sp2. Differentiation of time to finding the gum may be because of the different species niche, included body size and air condition.

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