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STUDIES ON POPULATION DYNAMICS OF WEAVER ANT, *OECOPHYLLA SMARAGDINA* FABRICIUS (HYMENOPTERA: FORMICIDAE) NESTS IN *PRUNUS DULCIS* AND *MORINDA CITRIFOLIA*

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Abstract

Weaver ants are effective biocontrol agents and will prey on many of the arthropods entering their territory. A study was conducted to assess the population dynamics of *Oecophylla smaragdina* nests from the trees with ant nests in *Prunus dulcis* and *Morinda citrifolia* in Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu at fortnightly intervals. In *Prunus dulcis* highest number of green nest, dry nest, leaf pavilion were found in April, May and March respectively. Total number of nests were more during April, March and May. In *Morinda citrifolia* highest number of green nest and dry nest were found in July and October respectively. Leaf pavilion was highest in January. Total number of nests were more during October, April and August.

Key Words : *Oecophylla smaragdina*, population dynamics, *Prunus dulcis*, *Morinda citrifolia.*

Introduction

As predators of pests, some species of ants are useful in integrated pest management (IPM) programmes. A total of 24 species of ants from 10 genera are recognized by farmers and researchers in tropical locations as beneficial for about 16 agricultural crops and some timber tree species (CAB Abstracts 1910–2007). *Oecophylla* ants are the earliest recorded biological control agent (Huang and Yang 1987), and they are able to control more than 50 pest species in more than 12 different tropical tree crops (Way and Khoo 1992; Peng and Christian 2004; Peng *et al*., 2004).

Oecophylla smaragdina can benefit agriculture in two distinctly different ways. As insect predators, they are effective biological control agents able to control more than 50 different pest species in at least 12 different tropical fruit crops (Way and Khoo, 1992; Pierre and Idris, 2013). Further, they can increase fruit yields and/or fruit quality compared to conventional synthetic insecticide control measures (Way and Khoo, 1989; Barzman *et al*., 1996; Peng *et al*., 2004; Peng and Chiristian, 2005; Van Mele, 2008). A second way of utilizing *Oecophylla* ants is as a food source, which has been practiced in Southeast Asia for centuries (Defoliart, 1999; Offenberg and Wiwatwitaya, 2010).

Several studies have shown significant role of *O. smaragdina* in pest control in mango, citrus and cashew plantations in Vietnam, Australia and other south-east Asian regions. Unfortunately, in India, little research has been carried out till-date (Sreekumar *et al*., 2011; Mahapatro, 2008). Keeping in mind the importance of management of major pests of fruit crops and the successful use of *O. smaragdina* as a potential biocontrol agent worldwide, present investigation was initiated with the objective to study the population dynamics of *O. smaragdina* in *Prunus dulcis* and *Morinda citrifolia*.

Materials and Methods

Dynamics of *O. smaragdina* nests were recorded from the trees with ant nests from January 2017–December 2017 in *Prunus dulcis* (three numbers) and *Morinda citrifolia* (four numbers) in Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu which is located at an altitude of + 5.79 m MSL, 11°24' N latitude and 79°44' E longitude, at fortnightly intervals. Those ant nests were categorized and recorded as two types of nests, simple and composite and their numbers were noted. Simple nests are

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composed of 1-2 leaves, termed as leaf or ant-pavilions. Composite nests are green (active) nests with a few dried leaves. Nest with all dried leaves are taken as abandoned ant-nests (dry nests) and their number too were noted as mentioned by Mahapatro and Mathew (2014).

Results and Discussion

In *Prunus dulcis* highest number of green nest, dry nest, leaf pavilion were found in April, May and March as 6.66, 9.16 and 1.50 respectively. The number of green nest, dry nest, leaf pavilion noted in June; December as 2.33, 1.16, 0.50; 1.50, 1.00, 0.00 respectively. The lowest number of green nest, dry nest and leaf pavilion were found in January, August and July as 1.00, 0.66 and 0.16 respectively (Table 1). Green nest; dry nest; leaf pavilion were absent during August-October; September to November; August to December respectively. Total number of nests were more during April, March and May.

In *Morinda citrifolia* highest number of green nest and dry nest were found in July and October as 5.87 and 6.00 respectively. Number of green nest, dry nest noticed in February; October as 2.25, 1.30; 2.62, 6.00 respectively. Lowest number of green nest, dry nest and leaf pavilion were found in January, December and November were as 0.75, 0.12 and 0.25 respectively. Leaf pavilion was highest in January (0.37) and absent from February to October. Total number of nests were more during October, April and August table 2.

Table 1: Dynamics of *Oecophylla smaragdina* nests in *Prunus dulcis* (January 2017- December 2017).

Observation periods #	Number of green nest (G)*	Number of dry nest(D)*	Number of leaf pavilion(L)*	Green+Dry nests (G+D)*	Total nests (G+D+L)*
January	1.00	2.00	0.83	3.00	3.83
February	3.33	1.33	0.50	4.66	5.16
March	5.50	3.66	1.50	9.16	10.66
April	6.66	8.50	1.00	15.16	16.16
May	4.33	9.16	0.83	13.50	14.33
June	2.33	1.16	0.50	3.50	4.00
July	1.16	2.33	0.16	3.50	3.66
August	0.00	0.66	0.00	0.66	0.66
September	0.00	0.00	0.00	0.00	0.00
October	0.00	0.00	0.00	0.00	0.00
November	1.33	0.00	0.00	1.33	1.33
December	1.50	1.00	0.00	2.50	2.50

Mean of two counts.

*Mean of three trees.

Table 2: Dynamics of *Oecophylla smaragdina* nests in *Morinda citrifolia* (January 2017- December 2017).

Observation periods #	Number of green nest (G)*	Number of dry nest(D)*	Number of leaf pavilion(L)*	Green+Dry nests (G+D)*	Total nests (G+D+L)*
January	0.75	0.25	0.37	1.00	1.37
February	2.25	1.30	0.00	3.55	3.55
March	4.25	1.62	0.00	5.87	5.87
April	3.00	5.00	0.00	8.00	8.00
May	1.62	2.50	0.00	4.12	4.12
June	3.62	2.12	0.00	5.75	5.75
July	5.87	1.00	0.00	6.87	6.87
August	4.00	3.75	0.00	7.75	7.75
September	4.25	2.25	0.00	6.50	6.50
October	2.62	6.00	0.00	8.62	8.62
November	0.00	3.25	0.25	3.25	3.50
December	0.00	0.12	0.37	0.12	0.50

Mean of two counts.

* Mean of four trees.

In agreement with the present observations Way (1953) stated that weaver ants get their name from their peculiar habit of binding leaves with larval silk to form communal nests in tree canopy. A single leaf or two may be used to form the simple nests often called leaf- or ant pavilions, where ants and trophobionts are sheltered, but no brood is raised. Mahapatro and Mathew (2016) suggested that sites of ant- homopteran aggregations were regularly replaced by new locations on fresh growth as evident from the ant- pavilion number fluctuations. This is in supportive to the present findings.

Oecophylla smaragdina colony is monogynous, polydomous (many-nests) spreading over several trees. Naked nests (with webbings only), simple leaf-nest (ant pavilions) and composite (multiple) leaf nests are observed in the field. Alternate hosts near the cashew orchards found were, mango, jackfruit, guava, black pepper and rubber, the most common tropical trees in Kerala state. The ant-nests are of different types and size named as simple nests, complelx/composite nests, green and dry nests. As the harbouring any population depends obviously on this factor, observations were segregated accordingly and traced out the fluctuation pattern of varied nest-types at regular intervals. This approach was followed unlike taken by earlier workers (Peng *et al*., 1997; Peng *et al*., 2004). This is in confirmation with present study results.

According to Coley and Barone (1996) the fluctuation of the dynamic nests also gives the ecological value toward the oil palm. In facultative associations, a plant offer nectar,

food bodies and other rewards to lure ants that nest else, where to patrol its leaves and remove any herbivores they encounter in palm oil. Similarly Altieri (1999) reported that the bigger the nest the more *O. smaragdina* populations that can become the pest's control of the palm. The nest's changes can also indicate that the environment is being contaminated or not that can be seen from the number of populations and the forming nests on the palm. Besides contributing to economy, the ants also contribute to ecological value and natural balance.

In the present study the nest number also suffered during the plant host's lean period. This is supported by Mahapatro and Mathew (2016) whom stated that the nest number dynamics clearly demonstrated a downfall (lean) trend during the dormant season of plant host. From the present study results it is obvious that green and dry nests were more during rainy and winter seasons. Green nest and ant pavilion were more during nectar rich and reproductive periods of the plant hosts.

Conservation biological control with predatory ants such as *Oecophylla* in high-value tree crops has great potential for African and Asian farmers (Van *et al*., 2007). The present study also has proven this for *O. smaragdina* in Tamil Nadu. As organic produces are of great demand and *O. smaragdina* will guarantee this effectively.

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