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Host Plant Characteristics Influencing Asian Weaver Ant (*Oecophylla smaragdina*) Nest Distribution in Mayiladuthurai and Cuddalore Districts, Tamil Nadu, India

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Abstract: The Asian weaver ant (*Oecophylla smaragdina*) plays a critical role in tropical agroecosystems as a natural predator and biological control agent. This study assessed nest distribution, host plant associations, and structural characteristics of nests across Mayiladuthurai and Cuddalore districts, Tamil Nadu, India. Principal Component Analysis (PCA) confirmed the dataset's suitability (KMO = 0.743; Bartlett's χ^2 = 47.993, df = 10, $p < 0.001$) and extracted two components explaining major variation in host plant and nest traits. PC1 (structural–nest size gradient) was strongly associated with nest length, number of nests, and tree height, whereas PC2 (foliage availability gradient) was primarily driven by leaf abundance. Results indicate that larger, structurally complex, and leaf-rich host plants support higher nest abundance and larger nests, emphasizing the role of plant architecture in weaver ant ecology. These findings have direct implications for the conservation of native ant populations and their integration into sustainable pest management strategies in agroecosystems.

Keywords: *Oecophylla smaragdina*, Weaver ants, Host plant preference, Nest architecture, PCA, Agroecosystem, Conservation, Biological pest management

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Introduction

The Asian weaver ant, *Oecophylla smaragdina*, is a dominant arboreal ant species widely distributed across South and Southeast Asia, Australia, and parts of Africa. It is well known for its remarkable nest-building behaviour, wherein workers weave living leaves together using silk secreted by their larvae to construct aerial nests (Hölldobler and Wilson, 1990). Colonies are typically large, highly territorial, and polydomous, occupying multiple nests across one or more host plants (Peng *et al.*, 1998). Due to their aggressive predatory nature, weaver ants play a significant ecological role in regulating arthropod communities and are widely recognized as effective biological control agents in agroecosystems (Way and Khoo, 1992; Van Mele, 2008).

Host plant selection is a critical determinant of nest establishment, colony expansion, and long-term persistence of *O. smaragdina*. Previous studies have demonstrated that plant architectural features such as tree height, canopy spread, leaf size, leaf flexibility, and foliage density strongly influence nest construction and spatial distribution (Lokkers, 1990). Plants with pliable leaves and well-connected canopies facilitate efficient nest weaving and inter-nest movement, thereby enhancing colony stability. Conversely, sparse foliage or rigid leaves may limit nesting success, even in otherwise suitable habitats.

Several regional studies from India and Southeast Asia have documented host plant diversity and nesting behaviour of *O. smaragdina*. Sangma and Prasad (2021) investigated population structure and nesting behaviour in Meghalaya and reported significant variation in nest number and placement depending on host tree species and microclimatic conditions. Similarly, studies by Lim *et al.* (2008) and Offenberg (2015) emphasized the importance of host plant traits and associated trophobionts in shaping colony organization and foraging efficiency. Recent records continue to expand the known host range of *O. smaragdina*, with new host plant associations reported from different regions, indicating a high degree of ecological plasticity (Gajbe, 2025).

Despite these advances, most existing studies have focused either on forest ecosystems or single-crop agroforestry systems, with limited comparative analyses across heterogeneous landscapes. In Tamil Nadu, particularly in coastal and deltaic regions, vegetation composition includes a mosaic of fruit trees, ornamental plants, avenue trees, and climbers, creating diverse nesting opportunities for weaver ants. However, systematic quantitative assessments linking host plant characteristics such as tree height, leaf abundance, and nest morphometry to nest distribution patterns across different districts remain scarce.

Mayiladuthurai and Cuddalore districts represent ecologically distinct yet comparable regions along the eastern coast of Tamil Nadu, differing in vegetation structure, land-use patterns, and microclimatic conditions. Understanding how *O. smaragdina* responds to these variations through host plant selection and nesting behaviour is essential for elucidating ant plant interaction dynamics at a regional scale. Moreover, such knowledge has practical implications for biodiversity conservation, habitat management, and the promotion of eco-friendly pest control strategies in agroecosystems.

Therefore, the present study aims to examine host plant characteristics influencing nest distribution and nest structural parameters of *Oecophylla smaragdina* in Mayiladuthurai and Cuddalore districts. By comparing nest abundance, nest dimensions, and associated plant traits across multiple host species, this research seeks to fill existing knowledge gaps and contribute to a more comprehensive understanding of weaver ant ecology in coastal Tamil Nadu.

Materials and Methods

Study area

The present study was conducted in Mayiladuthurai and Cuddalore districts, East coastal region of Tamil Nadu, India (Fig. 1), representing tropical coastal agroecosystems with mixed vegetation comprising fruit trees, ornamental plants, and climbers. The region experiences a tropical climate, characterized by high temperatures, moderate to high humidity, and seasonal rainfall influenced by the northeast monsoon. Such climatic conditions are favourable for arboreal ant species, particularly *Oecophylla smaragdina*.

Field surveys were carried out on tree and climber species commonly occurring in agricultural fields, home gardens, institutional campuses, roadside plantations, and semi-natural

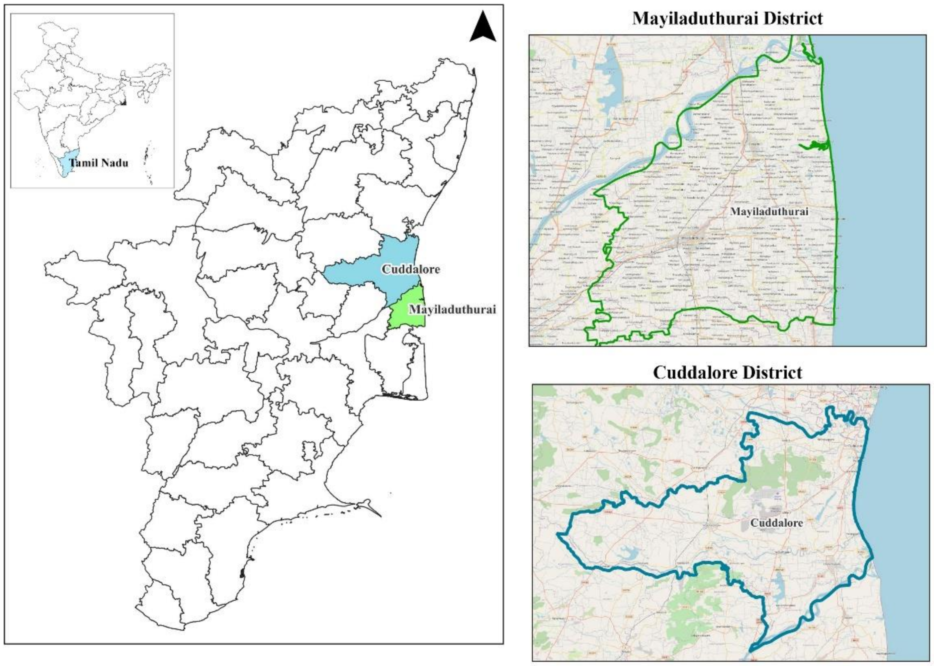

Fig. 1: Map showed the study area.

vegetation during period from March 2023 to February 2025. Plant species hosting weaver ant nests were identified using standard regional floras and verified with botanical keys. Both native and cultivated plant species were included to assess host preference and diversity.

A systematic visual survey method was adopted following standard protocols used in arboreal ant studies as described by Blüthgen and Fiedler (2002). Selected sampling sites in each district were visited monthly during the study period. Each host plant was examined thoroughly for the presence or absence of *O. smaragdina* nests. For each plant species, the number of nests per plant, nest located height from the ground, number of leaves used for the nest construction, length and width of the nest were recorded month wise. Only active nests (with visible worker movement) were considered to avoid overestimation of colony presence. Comparative analysis between districts was performed to understand spatiotemporal patterns in host plant association. Data were analysed using descriptive statistics, and Principal Component Analysis done by using IBM SPSS version 26 and illustrated graphically where necessary.

Results

A total of 208 nests were recorded in Mayiladuthurai district, and 143 nests were recorded in Cuddalore district. All nests were systematically examined, and the parameters outlined in the methodology were measured for each nest. A total of 33 host plant species belonging to trees, shrubs, climbers, and palms were recorded as nesting substrates for the Asian weaver ant (*Oecophylla smaragdina*). Considerable variation was observed in host plant structural characteristics and nest attributes (Table 1). Mean tree height ranged from 3.00 ± 1.43 ft in *Tinospora cordifolia* to 15.00 ± 5.00 ft in *Mangifera indica* and *Swietenia macrophylla*. The number of nests per host plant varied markedly, with the highest nest abundance recorded on mango (*Mangifera indica*) (22.33 ± 9.29), followed by ylang-ylang vine (*Artabotrys hexapetalus*) (16.00 ± 4.50) and false ashoka (*Polyalthia longifolia*) (5.66 ± 1.15), indicating strong host preference. In contrast, minimal nesting was observed on *Jasminum officinale* (1.00 ± 1.00) and *Ficus carica*.

Leaf availability also differed among host plants, ranging from 3.00 ± 1.41 leaves in *Tinospora cordifolia* to 14.00 ± 1.73 leaves in *Terminalia arjuna* and 15.12 ± 3.12 leaves in *Phyllanthus acidus*. Nest dimensions showed substantial interspecific variation, with nest length varying between 8.50 ± 2.91 cm in *Jasminum officinale* and 20.66 ± 1.15 cm in *Terminalia arjuna*, while nest width ranged from 5.40 ± 0.69 cm in *Hibiscus rosa-sinensis* to 23.33 ± 2.88 cm in *Caryota urens*. Overall, host plants with greater height, higher leaf density, and broader foliage tended to support larger and more numerous nests, suggesting that plant architectural complexity plays a key role in influencing nest distribution and nesting intensity of *O. smaragdina* (Table 1).

In the Cuddalore district, 143 nests recoded and descriptive statistical analysis revealed considerable variation in host plant characteristics and weaver ant nest parameters across the twenty recorded plant species (Table 2). Tree height ranged from 4.12 ± 0.82 ft in *Coccinia indica* to 21.51 ± 5.31 ft in *Polyalthia longifolia*, indicating a wide structural diversity of nesting substrates. The number of nests per host plant varied markedly, with the highest mean nest abundance observed on *Mangifera indica* (30.12 ± 2.35) followed by *Polyalthia longifolia* (15.16 ± 5.20) and *Pongamia pinnata* (12.33 ± 2.51), suggesting strong host preference for larger or more structurally complex plants.

The number of leaves, an important factor influencing nest construction, showed substantial variation, ranging from 3.12 ± 0.89 in *Ficus carica* to 15.26 ± 4.62 in *Coccinia indica* and 15.12 ± 3.12 in *Phyllanthus acidus*. Nest dimensions also varied among host species, with nest length ranging from 6.15 ± 1.31 cm (*Ficus carica*) to 20.89 ± 5.21 cm (*Polyalthia longifolia*), while nest width ranged between 4.12 ± 1.21 cm (*Ixora coccinea*) and 11.66 ± 11.90 cm (*Psidium guajava*).

Overall, the results indicate that in Cuddalore district, taller trees with greater canopy complexity and higher leaf availability supported increased nest abundance and larger nest dimensions. As the same statistical approach and parameters were applied uniformly across districts, these patterns are directly comparable with observations from other study areas.

Principal Component Analysis

The suitability of the dataset for principal component analysis was confirmed using Kaiser–Meyer–Olkin (KMO) and Bartlett's Test of Sphericity. The KMO measure of sampling adequacy was 0.743, indicating a good level of shared variance among the variables and confirming that the data were appropriate for factor extraction. Bartlett's Test of Sphericity was highly significant (χ^2 = 47.993, df = 10, p < 0.001), rejecting the null hypothesis that the correlation matrix is an identity matrix and further validating the application of PCA.

Principal Component Analysis (PCA) extracted two principal components, together explaining the major variation in host plant characteristics and nest attributes of *Oecophylla smaragdina* across the two study districts (Mayiladuthurai and Cuddalore). It was identified that two components, with PC1 strongly associated with nest length, number of nests, and tree height, while PC2 was primarily driven by number of leaves (Table 3, Fig. 2).

Component 1 (PC1) showed strong positive loadings for nest length (0.892), number of nests (0.800), tree height (0.643), and nest width (0.527) (Table 3). This component represents a structural–nest size gradient, indicating that taller host plants tend to support larger nests and higher nest abundance. The clustering of nest size parameters with tree height suggests that plant stature plays a critical role in determining nesting intensity and nest architecture of weaver ants.

Component 2 (PC2) was primarily influenced by number of leaves (0.870), with a moderate negative loading for nest width (−0.591). This

Table 1: Host plant characteristics and Asian weaver ant nest parameters recorded from Mayiladuthurai District (Mean ± SD) N=208

S. No.	Name of the Host plant	Tree height (ft)	No. of nests	No. of leaves	Nest length (cm)	Nest width (cm)
1	Arjuna tree (*Terminalia arjuna*)	10.00 ± 3.32	3.00 ± 1.73	14.00 ± 1.73	20.66 ± 1.15	13.33 ± 2.88
2	Black murdah (*Terminalia elliptica*)	10.00 ± 3.16	5.00 ± 2.23	11.66 ± 2.88	18.33 ± 2.88	13.33 ± 4.16
3	Broom creeper (*Cocculus hirsutus*)	5.66 ± 0.57	4.33 ± 1.15	6.11 ± 5.20	10.75 ± 5.62	7.73 ± 1.56
4	Cannonball tree (*Couroupita guianensis*)	10.00 ± 3.16	10.00 ± 3.16	10.33 ± 4.50	16.66 ± 2.88	10.50 ± 2.29
5	Citron tree (*Citrus medica*)	6.33 ± 1.15	11.66 ± 2.88	9.66 ± 2.87	16.55 ± 3.67	9.83 ± 1.58
6	Custard apple (*Annona squamosa*)	5.00 ± 2.64	3.00 ± 2.78	6.66 ± 1.15	12.60 ± 2.45	9.50 ± 1.44
7	False ashoka (*Polyalthia longifolia*)	13.33 ± 2.88	5.66 ± 1.15	10.77 ± 2.94	20.38 ± 3.27	11.33 ± 2.69
8	Fish tail palm (*Caryota urens*)	15.00 ± 1.00	10.00 ± 1.17	13.33 ± 2.88	19.33 ± 1.15	23.33 ± 2.88
9	Guava tree (*Psidium guajava*)	15.00 ± 3.87	3.00 ± 1.73	6.66 ± 2.88	13.00 ± 1.73	11.66 ± 11.90
10	Heart-leaved moonseed (*Tinospora cordifolia*)	3.00 ± 1.43	2.00 ± 2.88	3.00 ± 1.41	11.00 ± 1.41	9.10 ± 1.27
11	Hibiscus (*Hibiscus rosa-sinensis*)	6.00 ± 2.65	4.00 ± 2.13	4.66 ± 0.57	9.50 ± 0.86	5.40 ± 0.69
12	Honey suckle mistletoe (*Dendrophthoe falcata*)	10.00 ± 3.16	3.00 ± 2.45	8.66 ± 2.30	13.50 ± 2.59	8.76 ± 1.78
13	Indian almond (*Terminalia catappa*)	15.00 ± 3.87	10.00 ± 3.16	11.00 ± 3.60	17.90 ± 2.26	20.66 ± 1.15
14	Indian ash tree (*Lannea coromandelica*)	8.00 ± 1.73	6.66 ± 2.88	8.77 ± 2.38	14.61 ± 3.78	9.96 ± 3.52
15	Indian bat tree (*Ficus tsjahela*)	10.00 ± 1.07	5.00 ± 1.43	11.66 ± 3.51	17.66 ± 2.51	12.33 ± 2.51
16	Indian kino (*Pterocarpus marsupium*)	15.00 ± 3.87	2.00 ± 1.41	8.00 ± 2.82	12.00 ± 3.46	10.00 ± 3.16
17	Indian laburnum (*Cassia fistula*)	6.00 ± 2.48	5.00 ± 2.23	7.33 ± 2.51	14.16 ± 1.44	10.66 ± 1.15
18	Indian laurel (*Calophyllum inophyllum*)	7.00 ± 2.64	5.00 ± 2.23	14.00 ± 1.73	19.00 ± 6.55	13.33 ± 5.77
19	Indian mulberry (*Morinda tinctoria*)	6.00 ± 3.60	11.66 ± 2.88	9.00 ± 3.84	15.61 ± 4.06	8.84 ± 4.92
20	Ivy gourd (*Coccinia indica*)	3.00 ± 3.76	3.00 ± 2.87	12.33 ± 2.30	10.00 ± 1.90	7.00 ± 2.59
21	Jackal jujube (*Ziziphus oenopolia*)	10.00 ± 1.83	3.00 ± 1.37	7.66 ± 2.51	11.66 ± 2.88	11.33 ± 1.15
22	Jackfruit (*Artocarpus heterophyllus*)	9.00 ± 1.73	4.66 ± 1.52	7.66 ± 3.16	14.13 ± 3.12	9.24 ± 1.18
23	Jamun (*Syzygium hemispericum*)	7.33 ± 2.30	6.00 ± 1.73	5.00 ± 1.65	13.44 ± 3.04	8.47 ± 2.73
24	Jasmine (*Jasminum officinale*)	7.00 ± 2.64	1.00 ± 1.00	6.00 ± 2.44	8.50 ± 2.91	8.00 ± 2.82
25	Lemon (*Citrus limon*)	5.66 ± 1.15	7.33 ± 2.51	9.44 ± 3.97	14.33 ± 4.38	7.71 ± 2.35
26	Mahogany (*Swietenia macrophylla*)	15.00 ± 3.87	2.00 ± 1.41	6.00 ± 2.44	10.00 ± 3.16	8.00 ± 2.82
27	Mango (*Mangifera indica*)	15.00 ± 5.00	22.33 ± 9.29	11.88 ± 2.61	19.64 ± 4.30	10.27 ± 2.41

28	Neem (*Azadirachta indica*)	7.00 ± 2.64	6.33 ± 3.21	8.88 ± 3.10	1.03 ± 2.29	5.66 ± 2.22
29	Pacific rosewood (*Thespesia populnea*)	5.33 ± 2.88	9.33 ± 1.15	3.44 ± 1.50	15.05 ± 2.18	10.61 ± 2.24
30	Pongam oil tree (*Pongamia pinnata*)	6.00 ± 2.44	7.33 ± 2.51	8.33 ± 3.20	13.44 ± 2.54	9.88 ± 2.14
31	Spanish lime (*Melicoccus bijugatus*)	10.00 ± 3.16	5.00 ± 2.23	10.66 ± 1.15	16.66 ± 2.88	8.66 ± 1.15
32	Yellow elder (*Tecoma stans*)	7.00 ± 1.41	4.00 ± 1.41	4.50 ± 3.33	10.41 ± 4.82	8.20 ± 1.54
33	Ylang-ylang vine (*Artabotrys hexapetalus*)	6.00 ± 2.44	16.00 ± 4.50	10.66 ± 4.04	18.50 ± 2.59	10.66 ± 1.15

Table 2: Host plant characteristics and Asian weaver ant nest parameters recorded from Cuddalore District (Mean ± SD) N=143

S. No.	Name of the Host plant	Tree height (ft)	No. of nests	No. of leaves	Nest length (cm)	Nest width (cm)
1	Almond (*Prunus dulcis*)	13.12 ± 2.41	5.32 ± 1.21	5.12 ± 1.21	15.12 ± 3.12	5.23 ± 1.21
2	Cannonball tree (*Couroupita guianensis*)	11.24 ± 2.15	9.24 ± 2.14	10.33 ± 4.50	16.66 ± 2.88	10.50 ± 2.29
3	Common fig (*Ficus carica*)	14.12 ± 3.15	1.12 ± 0.89	3.12 ± 0.89	6.15 ± 1.31	6.78 ± 2.13
4	False ashoka (*Polyalthia longifolia*)	21.51 ± 5.31	15.16 ± 5.20	13.41 ± 6.11	20.89 ± 5.21	6.25 ± 1.32
5	Guava (*Psidium guajava*)	16.00 ± 3.87	3.00 ± 1.73	6.66 ± 2.88	13.00 ± 1.73	11.66 ± 11.90
6	Hibiscus (*Hibiscus rosa-sinensis*)	7.00 ± 2.75	5.00 ± 1.13	7.66 ± 0.87	7.50 ± 0.86	4.40 ± 0.71
7	Indian laburnum (*Cassia fistula*)	7.00 ± 2.48	6.21 ± 2.23	8.24 ± 2.51	13.15 ± 2.15	10.25 ± 2.14
8	Indian mulberry / Noni (*Morinda citrifolia*)	5.00 ± 2.60	9.66 ± 3.88	10.00 ± 3.64	12.61 ± 3.06	7.84 ± 2.92
9	Ivy gourd (*Coccinia indica*)	4.12 ± 0.82	2.15 ± 0.81	15.26 ± 4.62	9.25 ± 2.89	5.81 ± 1.45
10	Jackfruit (*Artocarpus heterophyllus*)	11.00 ± 2.73	2.66 ± 0.52	7.75 ± 2.16	12.13 ± 3.12	7.24 ± 2.18
11	Jungle geranium (*Ixora coccinea*)	6.00 ± 1.21	3.12 ± 0.89	8.12 ± 10.01	9.12 ± 1.23	4.12 ± 1.21
12	Lemon (*Citrus limon*)	7.66 ± 1.25	6.33 ± 1.51	8.44 ± 3.67	12.33 ± 3.38	5.23 ± 1.35
13	Mango (*Mangifera indica*)	18.25 ± 3.26	30.12 ± 2.35	10.28 ± 3.55	15.63 ± 3.61	8.12 ± 1.62
14	Neem (*Azadirachta indica*)	6.00 ± 1.64	5.21 ± 1.21	7.88 ± 2.10	7.31 ± 1.29	4.67 ± 1.22
15	Pacific rosewood (*Thespesia populnea*)	6.33 ± 1.88	8.33 ± 2.15	4.44 ± 1.50	13.05 ± 2.18	9.61 ± 1.24
16	Pongam oil tree (*Pongamia pinnata*)	5.54 ± 2.44	12.33 ± 2.51	10.33 ± 3.22	12.44 ± 1.54	8.88 ± 3.14
17	Spanish lime tree (*Melicoccus bijugatus*)	8.00 ± 2.16	4.00 ± 1.23	8.66 ± 1.25	12.66 ± 3.88	7.66 ± 1.15
18	Sapodilla / Chikoo (*Manilkara zapota*)	15.12 ± 1.23	3.12 ± 1.21	10.12 ± 2.13	8.25 ± 2.24	6.12 ± 2.11
19	Star gooseberry (*Phyllanthus acidus*)	12.42 ± 2.56	2.56 ± 1.21	15.12 ± 3.12	8.15 ± 1.36	4.23 ± 1.51
20	Teak (*Tectona grandis*)	18.12 ± 2.12	8.45 ± 2.31	5.12 ± 1.21	14.23 ± 1.23	6.12 ± 1.21

Table 3: Principal component loadings of host plant and nest variables

Variables	PC1	PC2
Tree height	0.643[a]	0.061
Number of nests	0.800[a]	0.223
Number of leaves	0.111	0.870[a]
Nest length	0.892[a]	−0.003
Nest width	0.527[a]	−0.591

[a] values indicate high factor loadings (≥ 0.50). Extraction method: Principal Component Analysis (PCA). Two components were extracted

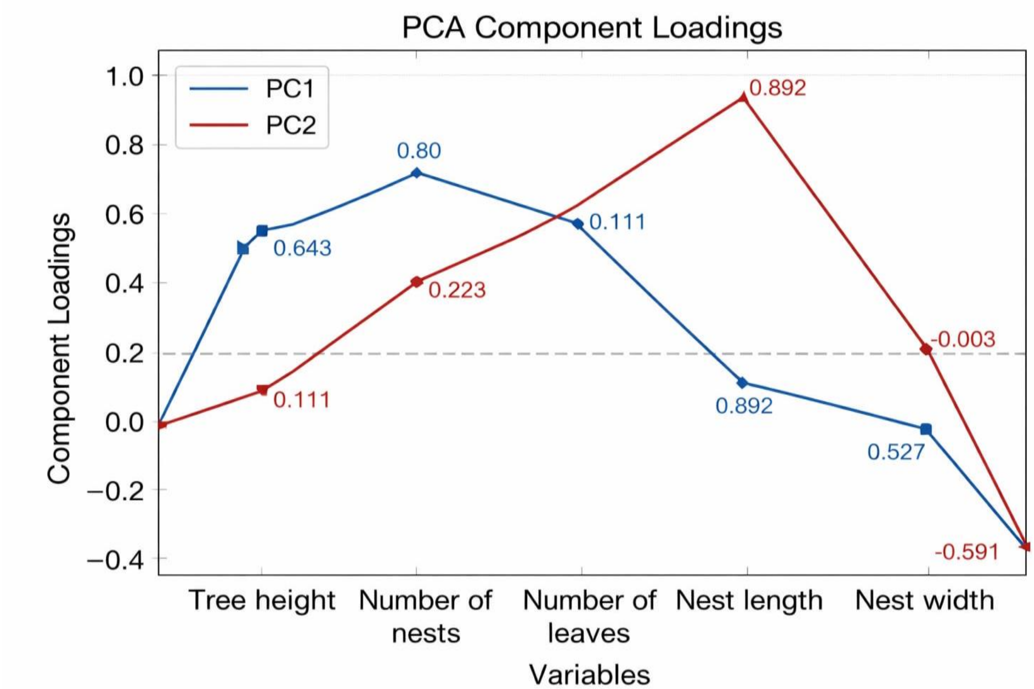

Fig. 2: Principal component loadings of host plant and nest variables.

component reflects a foliage availability gradient, where increased leaf abundance contributes independently to nesting suitability, particularly influencing nest construction potential rather than nest number.

The separation of nest size variables (PC1) and foliage traits (PC2) indicates that nest abundance and nest dimensions are more strongly driven by host plant structural characteristics, while leaf availability contributes as an auxiliary factor in nest formation.

Discussion

The present study provides a comprehensive assessment of host plant characteristics influencing the nest distribution and nesting intensity of the Asian weaver ant *Oecophylla smaragdina* across two ecologically comparable districts of Tamil Nadu. The recording of 208 nests in Mayiladuthurai and 143 nests in Cuddalore highlights the widespread occurrence of this species and its strong association with a diverse range of host plants, including trees, shrubs, climbers, and palms. Despite differences in total nest counts between Mayiladuthurai and Cuddalore, consistent ecological patterns were observed, indicating that host plant selection by *O. smaragdina* is governed by generalizable habitat attributes rather than site-specific factors. The use of uniform sampling protocols and identical statistical approaches across districts allows for robust spatial comparison and strengthens the ecological interpretation of the observed patterns.

Descriptive statistics revealed marked interspecific variation in nest abundance and nest dimensions, supporting the hypothesis that taller plants with complex architecture and adequate foliage provide superior nesting substrates. Host plants such as *Mangifera indica*, *Polyalthia longifolia*, and *Pongamia pinnata* consistently supported higher nest densities and larger nests, corroborating earlier findings that plant stature and branching complexity enhance nesting opportunities, colony expansion, and microclimatic stability for arboreal ants (Hölldobler and Wilson, 1990; Offenberg, 2015). In contrast, climbers and shrubs with limited structural support exhibited lower nest abundance, despite occasional high leaf availability (Sangma and Prasad, 2021).

The application of Principal Component Analysis strengthened these observations by clearly partitioning the influence of host plant traits. The adequacy of the dataset for PCA was confirmed by a satisfactory KMO value and a highly significant Bartlett's Test of Sphericity, validating the multivariate approach. The first principal component (PC1), dominated by nest length, number of nests, tree height, and nest width, represents a structural–nest size gradient. This component highlights the dominant role of host plant architecture in shaping both nesting intensity and nest morphology, directly supporting the conceptual framework proposed in the Introduction.

The second principal component (PC2), driven primarily by number of leaves, reflects a foliage availability gradient. While leaf abundance is essential for nest construction—given that *O. smaragdina* uses leaves as primary building material bound with larval silk—it acts as a complementary factor rather than the primary determinant of nest abundance. This separation of structural and foliage effects indicates that optimal nesting conditions arise from the interaction of plant height, canopy stability, and leaf availability, rather than any single trait in isolation (Peng *et al.*, 1998; Blüthgen and Feldhaar, 2009).

Management and Conservation Implications

From a management perspective, the results have direct implications for agroforestry and conservation planning. The strong association of *O. smaragdina* with taller, structurally complex trees suggests that retaining or promoting such species particularly mango, ashoka, pongam, and other native canopy forming plants can enhance natural populations of weaver ants. Given the well documented role of *O. smaragdina* as an effective biological control agent in orchards and plantation systems, conserving suitable host plants can contribute to sustainable pest management while reducing reliance on chemical pesticides (Way and Khoo, 1992; Offenberg and Wiwatwitaya, 2010; Exélis *et al.*, 2023).

From a conservation standpoint, maintaining plant structural diversity within agricultural and semi-natural landscapes is essential for sustaining arboreal ant communities and their associated ecosystem services. The consistency of patterns across districts underscores the broader applicability of these findings and supports the inclusion of habitat complexity as a key consideration in biodiversity-friendly land-use strategies.

Conclusion

The present study demonstrates that host plant structural characteristics, particularly tree height and leaf abundance, strongly influence the nest distribution, size, and abundance of *Oecophylla* *smaragdina* in Mayiladuthurai and Cuddalore districts. Taller trees with dense foliage support larger and more numerous nests, highlighting the importance of plant architectural complexity in weaver ant ecology. Principal Component Analysis further confirmed that nest size parameters are primarily driven by plant stature, while leaf availability serves as an auxiliary factor in nest construction. These findings underscore the role of native tree diversity and canopy complexity in sustaining healthy weaver ant populations, which can be leveraged for biological pest control in agroforestry systems. Conservation and management strategies should prioritize the preservation and planting of structurally diverse native trees to maintain functional ant communities and enhance ecosystem services.

Ethical Statement

The authors confirm that all ethical issues have been dealt with the research ethics guidelines provided by the Department of Zoology, Faculty of Science, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Author Contributions

Uma Maheswari D.: designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript; *Ronald Ross P.*: managed the analyses of the study. All authors have read and agreed to the published version of the manuscript.

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Conflict of Interest

The authors declare no conflicts of interest.

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