

Colony inhibition and abundance of *Oecophylla smaragdina* in Krishnagiri districts of Tamil Nadu

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Introduction

Ants have a major influence in many habitats in view of their abundance, their stability as populations and their feeding habits. Ant species make use of circadian clocks to occupy specific territories at different times. Weaver ants (Hymenoptera: Formicidae) are predatory insects that are widely used as bioagents for the control of insect pests in various crops (Materu, Seguni, & Ngereza, 2014; Olotu, du Plessis, Seguni, & Maniania, 2013; Peng & Christian, 2007; Seguni, 1997; Way, 1953; Way & Khoo, 1992). The Asian weaver ant *Oecophylla smaragdina* (Fabricius) has been successfully used to control pests of various crops including cashew (*Anacardium occidentale* Linn.). In Africa, habitat such as tree crop plantations is occupied by 'territorially dominant' arboreal ant species (Hölldobler, 1983; Parr and Gibb, 2010) like *Oecophylla longinoda* (Hymenoptera: Formicidae). *Oecophylla* spp are characterized by populous colonies, the ability to build large and/or polydomous nests and a highly developed intra- as well as interspecific territoriality (Crozier et al., 2009) that causes their territories to be distributed in a mosaic pattern in tree canopies (Majer, 1972; Dejean et al., 1994; Blüthgen and Stork, 2007).

The ability of ants to protect plants against pests is related to their activity pattern (foraging to prey and foraging/patrolling to leave cues on fruits). Dejean (1990) noted several different conclusions from studies which investigated the activity pattern of *Oecophylla* species. Weaver ants exhibit a unique strategy of nest building on the tree using the leaves for nest construction. The mated *O. smaragdina* queen starts its colony by laying the first batch of about 35 eggs underneath tree leaves and taking care of the eggs until they hatch into worker ants (Lokkers, 1990). The worker ants exhibit a bimodal size distribution in which the major workers are approximately 8-10 mm in length, and the minors are roughly half the length of the majors (Weber, 1946; Wilson & Taylor, 1964). The function of the minor workers is mostly to feed the queen and

primary workers in attending the broods, rearing, and milking honeydew from the scale insects. The significant workers function as soldiers, hunters, and nest builders (Holldobler, 1983).

The existence of nocturnal peak of readiness to display nest-building behaviour is controversial in the case of *O. smaragdina*, and in the case of *O. Longinoda* the daily pattern of readiness to display nest-building and nest-repairing activities is so far almost totally unknown (Hemmings, 1973).

In this experiment, we were going to identify the different hosts of *Oecophylla smaragdina* in particular locality where the ant colony's population and abundance are regarded biotic factors and how the short-term weather factors will influence the population was our main objectives of this study.

Regarding the abiotic factors, climate change associated with greenhouse gas emissions is altering temperature and precipitation as well as the magnitude and pattern of climate variation (IPCC, 2007). Under diverent climate conditions, locations currently unfavorable to a particular invasive species may become more favorable (Kriticos *et al.* 2003; Peterson, 2003; Roura-Pascual *et al.* 2004), and species coexistence and resource use may change (Levine and Rees, 2004; Sanders and Gordon 2004), thus altering the susceptibility of communities to invasion (Chesson, 2000; Davis *et al.* 2000; Cleland *et al.* 2004). The rate of spread of *Linepithema humile* populations can vary considerably across habitats, seasons, and years (Way *et al.* 1997; Sanders *et al.* 2001; Suarez *et al.* 2001; Krushelnycky *et al.* 2004; Digirolamo and Fox 2006).

Robertson (1988) hypothesized that levels of ant predation on insect pests can be altered by seasonal changes. The reported study is a regional study to identify the host and abundance of *O. smaragdina*. Yet, factors influencing the activity patterns of *O. smaragdina* species remain almost undocumented, especially for the environmental conditions of Tamil Nadu. Study of the

circadian activity pattern of the weaver ant *O. smaragdina* and the influence of certain factors is of great ecological interest because it affords an opportunity to clarify some elements of the spatio-temporal distribution of weaver ant species at the scale of both the tree and the orchard. This research offers information on the host quantity, number, and impact of weather on *Oecophylla smaragdina* nest in selected areas of Krishnagiri district.

Methodology:

Colony inhabitation of *Oecophylla smaragdina* in different plant hosts

This study took place in the Krishnagiri district's Burgur, Mookandapalli, Kaveripattinam, and Marandahalli taluks, which were located between the latitudes of 12°32'44" and 78°13'36" in Tamil Nadu. The all-out search approach was used to determine the colony inhabitation of *O. smaragdina* in various plant hosts.

Each of the trees/plants in the study site was surveyed for the presence of ants, in the following sequence. Firstly, the trunk and lower branches (in case of trees) and whole plant (in case of shrubs) were examined for ant trails. If no ants were found, binoculars were used to scan the canopy for trails and nests. The presence of nests alone was never accepted as proof of ant presence, as nests were often abandoned in seemingly healthy condition during colony contraction periods. Some large trees had dense foliage that obstructed during the observation period. For these an unskilled labour climbed into the canopy to look for ants. Using this combination of techniques, quite small populations could be detected, trees/plants with ant nests were noted (Lokkers, 1990). Identification of plant hosts were done at species level. Surveys were conducted from December 2019 - May 2020 at monthly intervals.

Abundance of *Oecophylla smaragdina* in different plant hosts

Weaver ant abundances were assessed by counting the number of weaver ant nests in each of the seven plant hosts viz, *Citrus acids*, *Pongamia pinnata*, *Mangifera indica*, *Azadirachta indica*, *Morinda citrifolia*, *Manilkara zopota* and *Hibiscus rosa sinensis* at Burgur, Mookandapalli, Kaveripattinam and Marandahalli of Krishnagiri district once at fortnightly intervals during December 2019 - May 2020. Counting the number of weaver ant nests takes approximately five minutes per tree.

Weather factors

Abiotic weather factors *i.e.*, Temperature, Relative Humidity, Rainfall, Rainy days, Wind speed, Gust, Average wind speed, Cloud, UV Index were collected from the website <https://www.worldweatheronline.com/krishnagiri-weather-averages/tamil nadu/in.aspx>.

Pearson's correlation two tailed test were carried out between abiotic and biotic factors (Total number of nest in each month). All the statistical analysis were carried out in SPSS 16.0 software.

Results and discussion

Survey results on the colony inhabitation of *O. smaragdina* in different plant hosts are listed in Table 1. Twenty-seven under seventeen families viz., *Rutaceae*, *Apocynaceae*, *Cucurbitaceae*, *Rubiaceae*, *Fabaceae*, *Anacardiaceae*, *Annonaceae*, *Ulmaceae*, *Meliaceae*, *Lecythidaceae*, *Moraceae*, *Myrtaceae*, *Malvaceae*, *Fabaceae*, *Caricaceae*, *Arecaceae*, *Sapotaceae* were recorded for the presence of *O. smaragdina*. Colony inhabitation of *O. smaragdina* occurred in *Nerium oleander*, *Coccinia indica*, *Ixora coccinea*, *Mangifera indica*, *Haldina cordifolia*, *Polyalthia longifolia*, *Thespesia populnea*, *Cocos nucifera*, *Couroupita guianensis*, *Ficus*

religiosa, *Psidium guajava*, *Hibiscus rosa sinensis*, *Ficus benghalensis*, *Prosopis juliflora*, *Acacia nilotica*, *Ficus carica*, *Annona squamosa*, *Carica papaya*, *Madhuca longifolia*, *Tamarindus indica* for six months. In *Pongamia pinnata* (March, April), *Citrus limon* (March to May); *Holoptelea integrifolia* (December to February); *Azadirachta indica* (March to May) and *Manilkara zapota* (January to April); *Borassus flabellifer* (December to March) the months of occupancy of *O. smaragdina* were only for two, three and four months respectively and in *Morinda citrifolia* months of occupancy of *O. smaragdina* was only five months (January to May).

Abundance of *Oecophylla smaragdina* in different plant hosts

Studies conducted to assess the abundance of *O. smaragdina* in different plant hosts are presented in Table 2. Numbers of nests were more in *Mangifera indica* (42.67), *Citrus limon* (29.17), *Azadirachta indica* (23.50) and less number of nests were found in *Pongamia pinnata* (15.50), *Manilkara zapota* (15.33), *Hibiscus rosa sinensis* (12.83) and *Morinda citrifolia* (8.00).

The nest numbers increased from March (48) to May (74) in *Citrus limon*, March (44) to April (49) in *Pongamia pinnata*, December (18) to May (84) in *Mangifera indica*, March (35) to May (61) in *Azadirachta indica*, January (5) to May (16) in *Morinda citrifolia*, January (15) to April (35) in *Manilkara zapota*. The nest numbers followed fluctuating pattern from December (10) to May (16) in *Hibiscus rosa sinensis*. Numbers of nests were nil during December to February in *Citrus limon*; *Pongamia pinnata* (also during May); *Azadirachta indica*, *Morinda citrifolia* during December and *Manilkara zapota* during December and May.

Relationship between the ant nest mean number and meteorological data

Total number of nests were positively correlated with meteorological factors like Maximum Temperature ($r=0.95$), Minimum Temperature ($r=0.95$), Average Temperature ($r=0.96$), Maximum wind speed (kmph) ($r=0.77$), Average gust (kmph) ($r=0.54$), Average wind speed

(kmph) ($r=0.66$) and UV Index ($r=0.80$). whether Rainfall (mm) ($r= -0.10$), Cloud (%) ($r=-0.73$), Humidity (%) ($r=- 0.92$) were negatively correlated.

Twenty seven under seventeen families were recorded for the presence of *O. smaragdina*. Colony inhabitation of *O. smaragdina* occurred in 20 plant hosts for all the six months (December to May) viz., *Nerium oleander*, *Coccinia indica*, *Ixora coccinea*, *Mangifera indica*, *Haldina cordifolia*, *Polyalthia longifolia*, *Thespesia populnea*, *Cocos nucifera*, *Couroupita guianensis*, *Ficus religiosa*, *Psidium guajava*, *Hibiscus rosa sinensis*, *Ficus benghalensis*, *Prosopis juliflora*, *Acacia nilotica*, *Ficus carica*, *Annona squamosa*, *Carica papaya*, *Madhuca longifolia*, *Tamarindus indica*. Next highest occupancy was by *Morinda citrifolia* for five months during January to May. *Manilkara zapota* and *Borassus flabellifer* were occupied for four months. *Citrus limon*, *Holoptelea integrifolia*, *Azadirachta indica* were occupied for three months. In *Pongamia pinnata*, *O. smaragdina* occupied only for the lowest number of period as two months during March and April (Table 1). *O. smaragdina* was present in twenty host plants for six months because of favorable climatic conditions, flowering and fruiting period.

Similar studies were conducted by Lim (2007) who reported that the habitat surveys found a total of 29 host plant species (21 families) for *O. smaragdina*, *Bambusa sp.* (Poaceae), *Cocos nucifera* L. (Arecaceae), *Mimusops elengi* L. (Sapotaceae), *Samanea saman* (Jacq.) Merr. (Fabaceae), *Hevea brasiliensis* (Willd. Ex A.H.L. Jussieu) Müll. Arg. (Euphorbiaceae), *Khaya ivorensis* A. Chev. (Meliaceae), *Acacia auriculiformis* A. Cunn. Ex Benth. (Fabaceae), *Bruguiera gymnorhiza* (L.) Savigny (Rhizophoraceae), *Bruguiera parviflora* (Roxb.) Wight & Arn. Ex Griff. (Rhizophoraceae), *Bruguiera sp.* (Rhizophoraceae), *Canthium foetidum* Hiern. (Rubiaceae), *Derris trifoliata* Lour. (Fabaceae), *Morinda citrifolia* L. (Rubiaceae), *Sonneratia alba* Sm. (Lythraceae), *Talipariti tiliaceum* (L.) Fryxell (Malvaceae), *Vitex pinnata* L. (Lamiaceae), *Artocarpus heterophyllus* Lam. (Moraceae), *Averrhoa bilimbi* L. (Oxalidaceae), *Averrhoa*

carambola L. (Oxalidaceae), *Barringtonia* sp. (Lecythidaceae), *Canarium megalanthum* Merr. (Burseraceae), *Citrus aurantifolia* (Christm.) Swingle (Rutaceae), *Cocos nucifera* L. (Arecaceae), *Garcinia mangostana* L. (Clusiaceae), *Lansium domesticum* Corrêa (Meliaceae), *Mangifera indica* L. (Anacardiaceae), *Nephellium lappaceum* L. (Sapindaceae), *Solanum torvum* Sw. (Solanaceae), *Syzygium samarangense* (Blume) Merr. and L. M. Perry (Myrtaceae).

According to Rodriguez-Giron et al. (2013) *O. smaragdina* ants were found visiting plants of 48 species in 32 families that were in bloom and attracting pollinators at the time of the observations. They saw ants monitoring blooms in 31 of the 48 plant species. Kenne et al. (2003) recorded that red weaver ants roost on a variety of plant species, including cultivated fruit trees like *Citrus maxima*, *Mangifera indica*, *Theobroma cacao*, *Garcinia mangostana*, *Lansium domesticum*, and *Syzygium aqueum*. These previous observations are similar to the present study. The red weaver ants erected their nests on 23 plant species in both rural and urban settings, with thirteen plant species (number of nests 2 - 10) in urban areas and twenty-two species (number of nests 5 - 15) in rural regions. The most nesting was observed on *Mangifera indica*, whereas the least number of nesting was observed on *Nerium odorum*, *Cocos nucifera* L., *Tamarindus indica*, and other host plants (Rajagopal et al., 2019).

Nalini and Ambika (2019) reported that the colony inhabitation of *O. smaragdina* in different plant hosts during March 2017- February 2018 at Annamalainagar. Seventeen hosts under fourteen families viz., Annonaceae, Meliaceae, Myrtaceae, Fabaceae, Rubiaceae, Moraceae, Rosaceae, Anacardiaceae, Sapotaceae, Poaceae, Malvaceae, Rutaceae, Lecythidaceae, *Cucurbitaceae* and one unidentified hosts were recorded for the presence of *O. smaragdina*. Fifty-four plants devoid of *O. smaragdina* were also identified and listed. Colony inhabitation of *O. smaragdina* occurred in *Mangifera indica* as highest for all the twelve months. In *Morinda*

citrifolia, *Manilkora zapota*, *Prunus dulcis*, *Citrus limon* months of occupancy of *O. smaragdina* were ten, nine, eight and six respectively.

Numbers of nests were highest in *Mangifera indica*, followed by *Citrus limon*, *Azadirachta indica*. Less number of nests were found in *Pongamia pinnata* and *Manilkara zapota*. Lowest number of nests were in *Morinda citrifolia* and *Hibiscus rosa sinensis*. The nest numbers increased from March to May in *Citrus limon*, March to April in *Pongamia pinnata*, December to May in *Mangifera indica*, March to May in *Azadirachta indica*, January to May in *Morinda citrifolia* and January to April in *Manilkara zapota*. The nest numbers followed fluctuating pattern from December to May in *Hibiscus rosa sinensis* due to homopteran population. Numbers of nests were nil during December to February in *Citrus limon* and *Pongamia pinnata* (also during May); *Azadirachta indica*, *Morinda citrifolia* during December and *Manilkara zapota* during December and May (Table 2) (Fig. 1). The nest number dynamics clearly shown the lean trend during the dormant season of plant hosts. Similar observations were made by Lokkers (1990) who stated that the number of weaver ant nests (*O. smaragdina*) peaked during seasons of maximum physiological activity of the ant's host plants, i.e., during leaf and flower flush. The result is a high number of small nests during the flush and fruiting of host tree.

Nest numbers were more during March to May in all the plant hosts due to new flush of leaves, flowers and less rain. This is confirmed by Mahapatro and Mathew (2016) whom stated that the nest number suffered during the plant host's lean period. Also, it is similar to the observations of Nalini *et al.* (2020) whom reported that the total number of *O. smaragdina* nests in eighteen plant hosts at Annamalainagar during twelve months were 609.50. The highest percentage of nests were recorded in March, April of 2017 and February 2018 were 20.67, 13.28 and 11.23 respectively. During September 2017, January 2018 and May 2017 percentage of nests

recorded were 10.58, 8.44 and 7.46 respectively. Least percentage of nests found during July, November and December 2017 were 3.93, 3.36 and 2.29 respectively.

Several studies supported the present findings which reported that, the number of weaver ant nests per tree has often been used as a measure of ant abundance in plantation crops (Rapp and Salurn, 1995; Peng et al., 1997; Ayenor et al., 2007; Dwomoh et al., 2009; Olotu et al., 2013). Nest numbers increased from October to December on cashew and from November to January on mango. These periods are the time when cashew and mango trees, respectively, produce leaf and flower flush in Benin. During this developmental stage of the host trees, ants produced numerous new small nests not necessarily because of increased ants numbers, but because they prefer to build new nests on young shoots with flexible leaves (Offenberg et al., 2006) and since flushing shoots are often infested with honeydew producing homopterans which the ants shelter by building nests around their colonies (Lokkers, 1986; Joachim Offenberg, unpublished data).

Bharti and Silla (2011) stated that for five months, nests were seen on five citrus trees. It was discovered that there were a total of 20 nests at the beginning of the season and 40 nests at the conclusion. Per tree/season, an average of 5-6 nests were constructed. Each nest was occupied for an average of eighty-five days before being abandoned when the majority of the leaves from which it was constructed perished. This is in accordance to the present study results.

Way (1954) and Vanderplank (1960), in Zanzibar abandoning of nests by *O. Longinoda* and their choice of sites for building new ones is also highly influenced by seasonal factors. Limited knowledge exists on the abundances of *O. Smaragdina* in relation to cashew tree growth phases and weather conditions such as temperature, RH and rainfall etc. For *O. longinoda* that hunts by sight (Dejean, 1986), light intensity is a crucial factor, although other physical factors such as temperature and humidity play an important role in *Oecophylla* activities.

At the same time, daily patterns of nest-building and nest-repairing activities of these ants remain so far relatively little known [for reviews see Hemmingsen (1973) and Holldobler and Wilson (1990). Such knowledge is crucial in maintaining high and stable populations of *O. Smaragdina* in the field (Rwegasira, Mwatawala, Rwegasira, and Offenberg, 2014). Techniques for boosting ants' populations such as feeding (Nassor, Rwegasira, Jensen, Mwatawala, and Offenberg, 2015) can be applied based on the knowledge of temporal abundances.

Ants, on the other hand, are great subjects for habitat and host selection research because they are very mobile, frequently travelling across micro-environments while foraging, and yet return to very distinct habitats each time. This is especially true for weaver ants, who travel through diverse ecosystems to reach their nests. Ants, on the other hand, are great subjects for habitat and host selection research because they are very mobile, frequently travelling across micro-environments while foraging, and yet return to very distinct habitats each time. This is especially true for weaver ants, who travel through diverse ecosystems to reach their nests. The crucial characteristics in determining the definite link were whether abiotic variables influence ant colony makeup and abundance.

From the monthly data, if average mean temperatures (minimum 18⁰ C, average 27⁰ C, maximum 32⁰ C) where the key points to construct the nest in between these temperatures the (December 25⁰ C to May 37⁰ C) the nest number also gets increased from 28 to 251 (December to May). In most cases, a single married queen (haplometrosis) from the nest is responsible for colony reproduction in ants as well as the establishment of new nests; nevertheless, numerous cooperative queens may be engaged on rare occasions (pleometrosis). Pleometrosis is a condition that makes it easier for colonies to thrive under adverse conditions, although it is not always present

(Peeters and Andersen, 1998). They are more common in the summer when the temperature exceeds 39°C.

As a result, we discovered that the temperature range of 25⁰ C to 36⁰ C was the optimal significant range for nest building and ant abundance establishment in our study (Table 3). (Fig. 2). Similarly, Devarajan (2016) indicated that temperature around the nest and wind intensity revealed as critical environmental variables for influencing *Oecophylla smaragdina* nest configuration.

Outside the nest, ant activity remained unbroken throughout the day (24 hours), with substantial variation across day time intervals. Activity was lowest at night (11:30 PM to 4:30 AM), then increased significantly in the early morning (5:30 AM to 8:30 AM), then increased again (9:30 AM to 11:30 AM) to reach a noon high. Early in the afternoon, the day's activity reaches saturation (12:30 PM to 2:30 PM). Activity was reasonably continuous from midday to late afternoon (9:30 AM to 6:30 PM time period), with foraging, nest production, egg, larva, and pupa transfer movements by worker ants participating in active movements, followed by a quick nighttime decline (7:30 PM to 10:30 PM). Temperature and relative humidity are important abiotic elements that influence the feeding behaviours of various ant species. Ants can be classified as diurnal (active during the day), nocturnal (active at night), or crepuscular (active at both dusk and dawn) based on their daily foraging routines (Pimid et al., 1989)

Temperature has been correlated to activity by many ant species (e.g. *Veromessor pergandei* Meyr and *Pogonomyrmex californicus* (Buckley): Bernstein, 1979; *O. smaragdina*: Lokkers, 1990). Similarly, Jean-François vayssieres (2011) reported that *O. Longinoda* are more abundant in the mid-day, early and late afternoon periods – when temperature is higher and relative humidity (RH) lower. They are less abundant in the evening, night and early morning. RH is also

higher at these times and temperature is also lower. Correlation analysis supports the finding that temperature is a very important abiotic factor for weaver ants. Ant activity outside the nest was positively correlated with temperature ($r = 0.50$, $n = 896$, $P < 0.0001$) and negatively with RH ($r = -0.18$, $n = 896$, $P < 0.0001$).

Sangma and Prasad's (2021) investigation in the Ri-Bhoi area of Meghalaya found similar results that the weaver ants, *Oecophylla smaragdina* are prevalent great numbers in hot and humid environment with 22 -30°C. Weaver ants generally thrive in warm and humid climatic conditions with an average temperature of 20-30 °C (Crozier, 2010; Bharti and Silla, 2011). They are found in almost all kinds of trees with moderate to large-sized leaves, which are easier to pull and provide good shelter for nesting. In the Ri-Bhoi district of Meghalaya, the temperature range of 18-32 °C.

From table 3, other factors like rainfall (mm) ($r = -0.10$), rainy days ($r = -0.22$), cloud (percent) ($r = -0.73$), and humidity (percent) ($r = -0.92$) were all negatively correlated with nest formation, implying that nest formation should be completed before the monsoon changes or during the active forage season, when the circadian rhythm plays an important role in nest formation prior to monsoonal rainfall (Fig. 2). The daily foraging pattern is the daily routine of ants within 24 hours, such as foragers finding foods outside their nests and returning the food to their colonies, whereas the seasonal foraging pattern indicates the reaction to seasonal change, such as winter, summer and rainy. Different biotic and abiotic variables influence both daily and seasonal foraging activity in ants (Patel and Bhatt, 2020).

In fact, there is a negative association with these four factors. With these factors in mind, and despite the low temperature on rainy days and low cloudy days, as well as the high humidity at night during periods of lunar presence, ant densities were not significantly different from sunny days, whereas the abundance level and all activity of workers prior to maintaining the nest

optimum condition inside and outside the nest, if any one factor is not applicable, the nest queen absconds to a suitable location and the abundance transfers. As a result, a variety of elements interact to influence the weaver ant's internal clock.

Abiotic factors such as temperature, rainfall and relative humidity (RH) can also affect weaver ant abundances; similarly, weaver ant's queen might die under heavy rainfall (Peng *et al.*, 2008). Weaver ant, *O. smaragdina*, prefers temperatures between 26°C and 34°C and an RH between 62% and 92% (Van Mele and Cuc, 2007), the extremes of which are detrimental. Peng *et al.* (2008) observed reduced populations of weaver ants under harsh conditions including high rainfall. Lokkers (1990) reported a negative brood development of below 21°C and above 34°C. In the current study, RH ranged from 45% to 84%, which was lower than that from 62% to 92%, which was reported to be optimal for *O. smaragdina* (Van Mele and Cuc, 2007).

Average gust (kmph) ($r=0.54$), Maximum wind speed (kmph) ($r=0.77$), Average wind speed (kmph) ($r=0.66$), In field observations, all of these wind parameters were positively connected with nest construction (Fig. 2) Wind characteristics had no impact on ant activity and nest formation because workers of *O. smaragdina* have well-developed aralia on their feet.

Our survey records that the part of the host selected for nest-building varied according to the months, and that the variation seemed to be correlated with the wind direction. That there is a tendency to construct nests on slopes facing the sun. I have noted that the change from one side of the tree to the other takes place before the change in the monsoon (wind). The sun is overhead in the middle of April.

The monsoons do not change direction until late in September and June each year, yet *Oecophylla* move from one side of the tree to the other in late October and early November each year, before the change in direction of the monsoon. This would indicate that the deciding factor

is the position of the sun and not the prevailing wind, unless the ants move in anticipation of the change in wind direction. Nests are usually constructed in positions well exposed to the sun and not in the shade. As stated above, the complete colony will suddenly move to a new location before the rainy days.

Likewise, intolerable and unsuitable abiotic factors, Way (1954) also states that the complete colony will suddenly move to a new location if heavily infested with predators. Of 165 colonies observed for 3 years nesting in a block of 500 palms, eleven (6.6%) died out and seven (40%) moved to other palms. application of some insecticides caused increased movement.

How they withstand the strong wind effects or gust means which slightly hinders host position and movements means because of their huge aralia and their adhesive characteristics, a single worker from *O. Smargdina* grasp the usual surface in any poor weather or other variables described above. Aralia are crucial not just for retaining the substrate, but also for capturing and transporting huge prey (Wojtusiak et al.,1995)

This occurrence of the aralia on ant feet has been surveyed in a large number of ant species by Freeland *et al.* (1982). In the subfamily Formicinae, the aralia have been found by these authors in all three surveyed species: *Camponotus discors* (Forel 1902), *Paratrechina* sp. and *Melophorus* sp. As far as we know, until now the presence of aralia has not been documented in ants of the genus *Oecophylla*.

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Figures

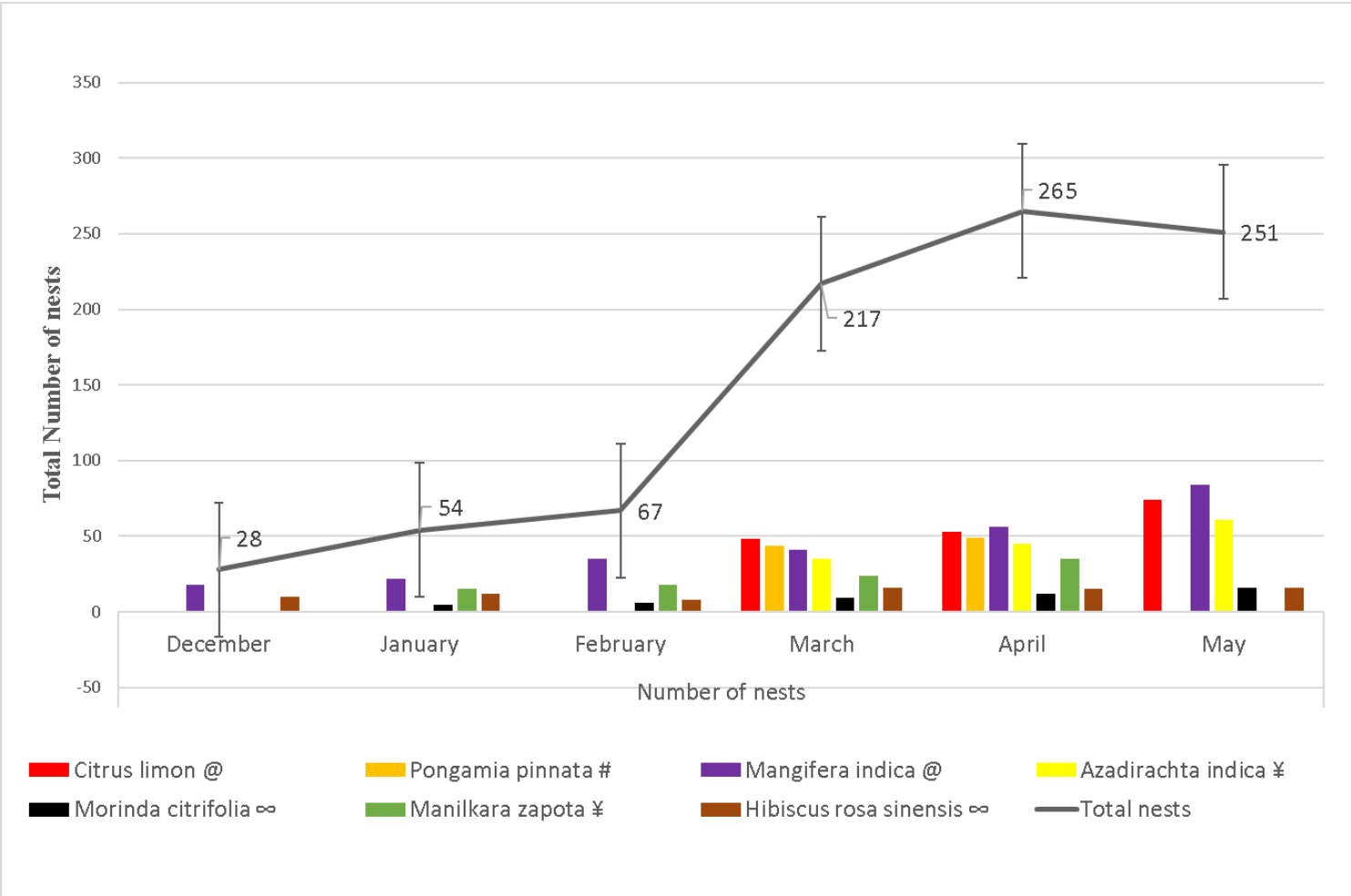


Figure 1

Figure 1. Abundance of *Oecophylla smaragdina* in different plant hosts

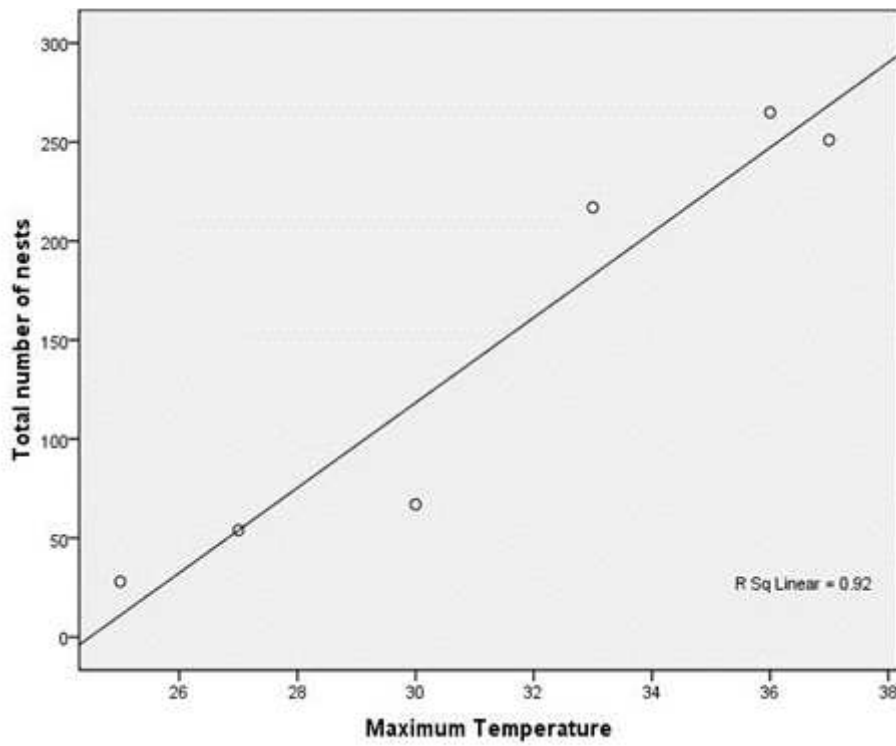


Figure 2

Weak positive correlation

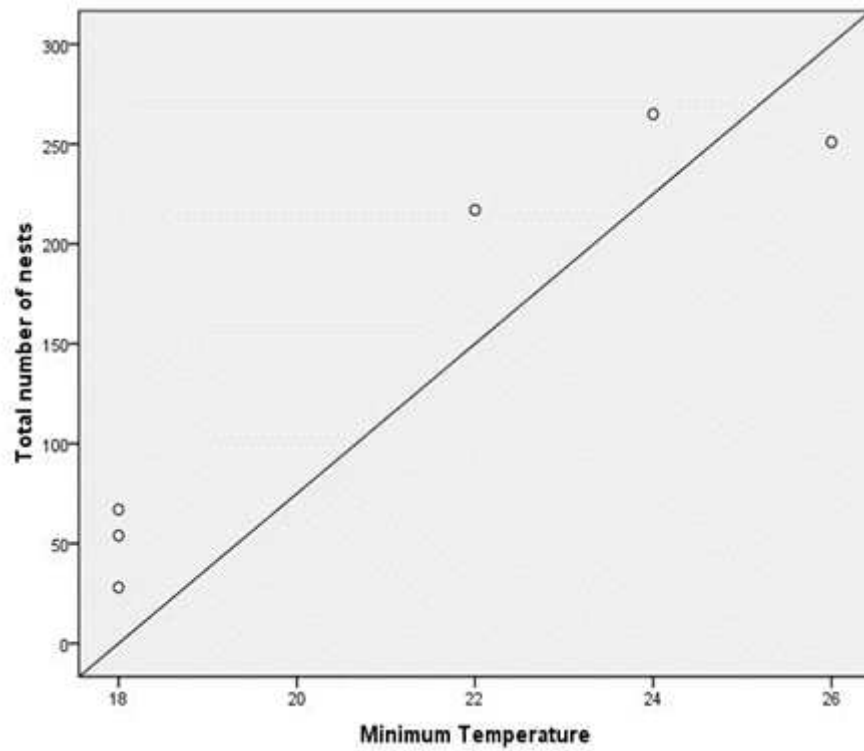


Figure 3

Weak positive correlation

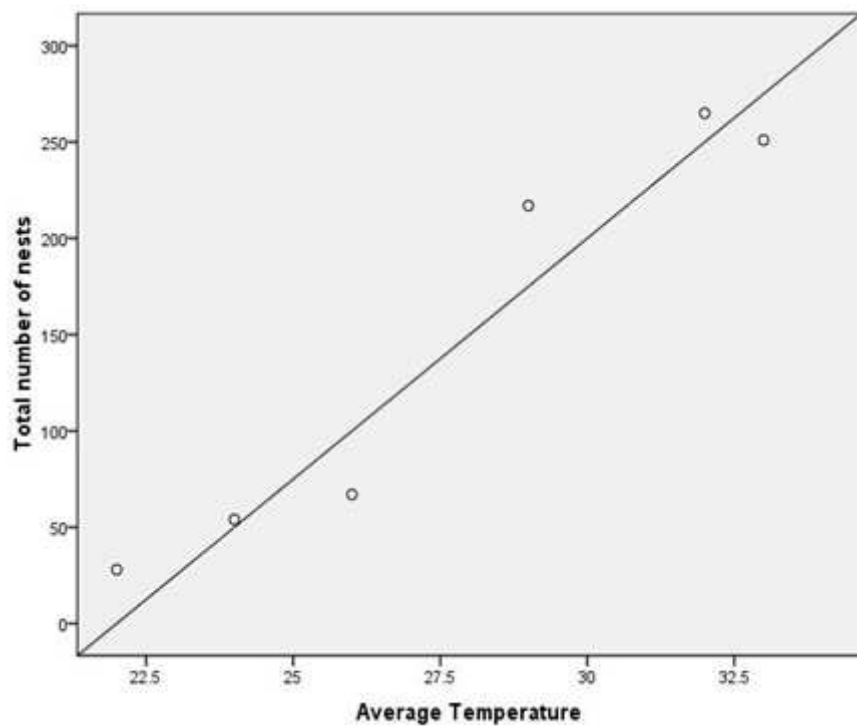


Figure 4

Weak positive Correlation

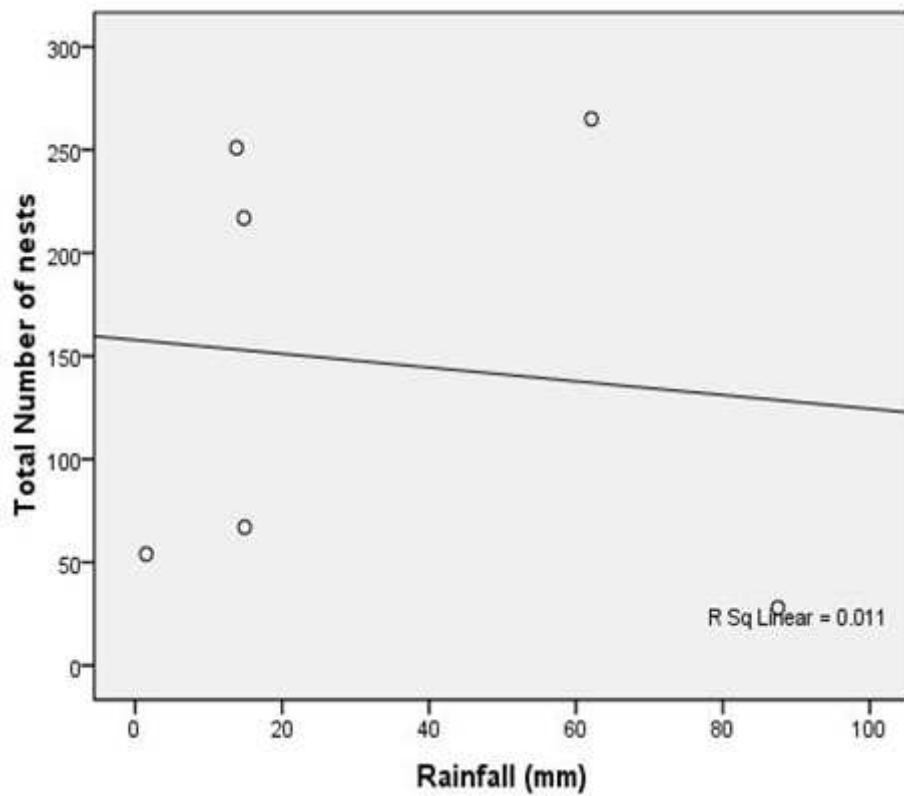


Figure 5

Weak negative correlation

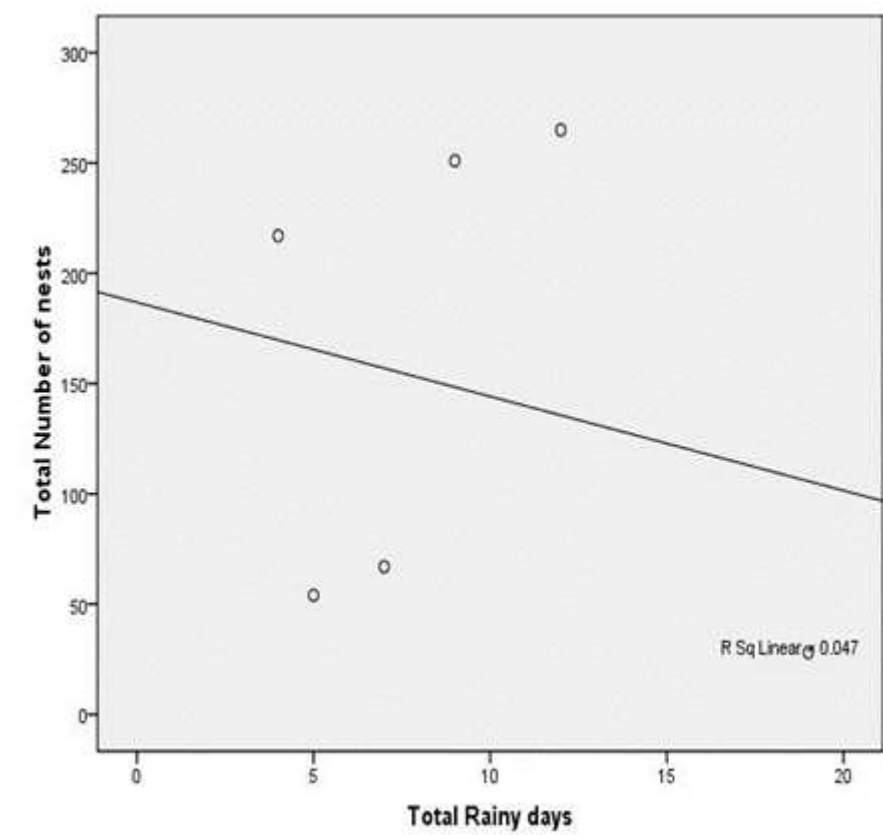


Figure 6

Weak negative correlation

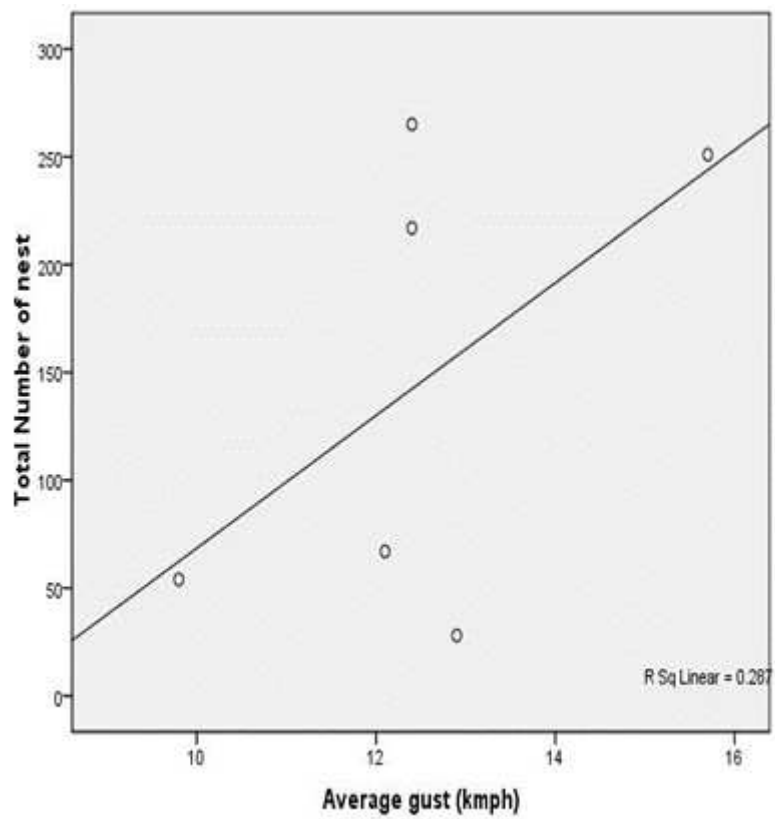


Figure 7

Weak positive correlation

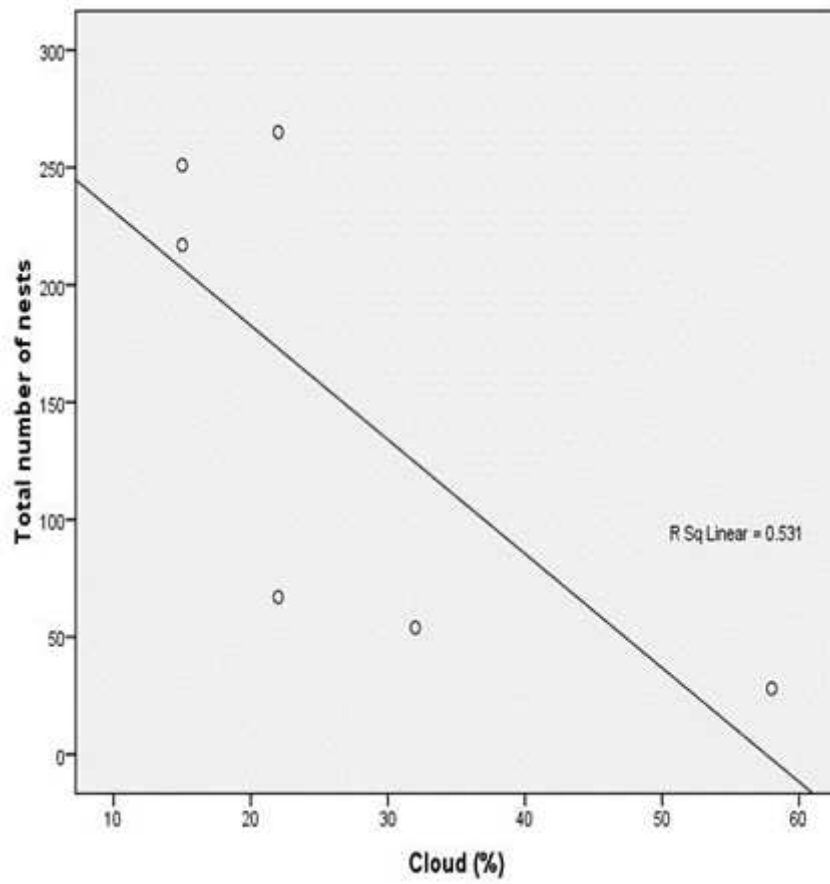


Figure 8

Weak negative Correlation

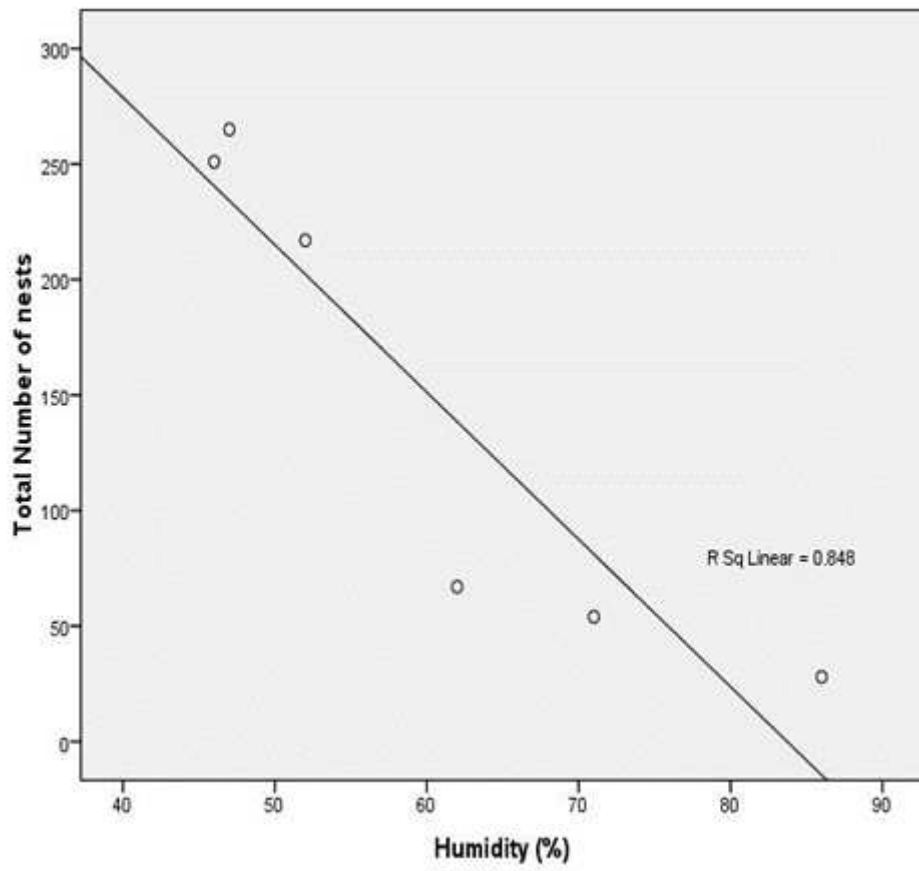


Figure 9

Weak negative Correlation

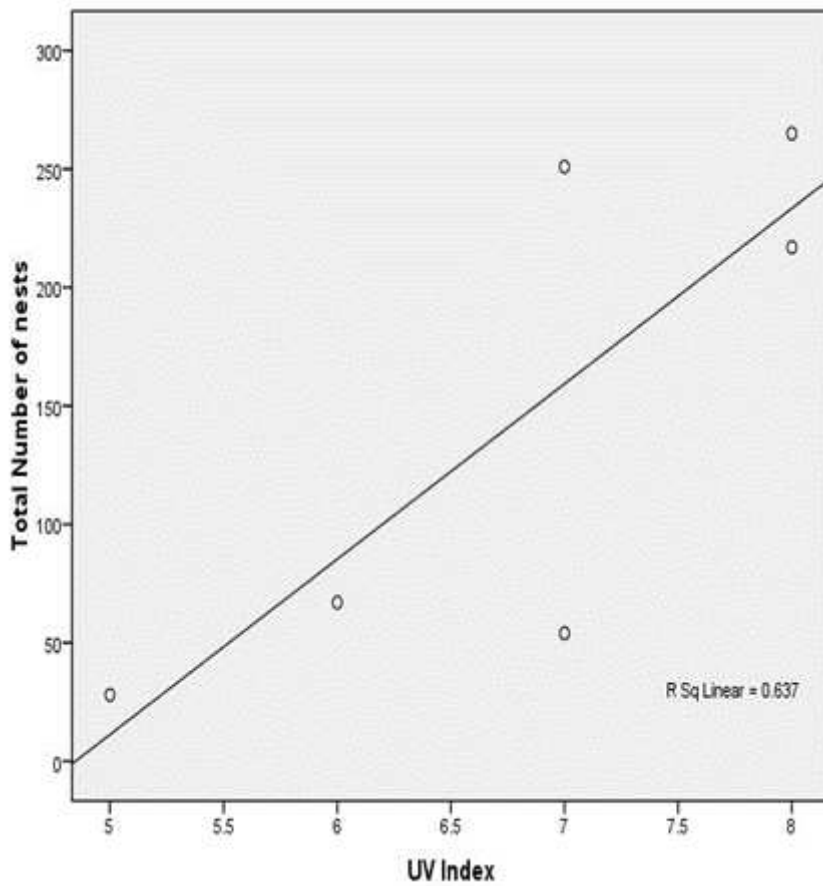


Figure 10

Weak positive Correlation

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