



EFFECTS OF ANTS ON THE FRUIT SETTING OF *ARTABOTRYS ODORATISSIMUS* R. BR.

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ABSTRACT

Floral volatile compounds exhibit multiple functions such as attracting pollinators, source of food for pollinator and act as defense against herbivore. Thus floral scents may function as allomonones to prevent enemies as well as being synomonones to attract pollinating mutualist. Flowers are morphological and embryological marvels and the sites of sexual reproduction. The yellow coloured flowers of *Artabotrys odoratissimus* R. Br. are very fragrant. The floral volatile of this plant attracts weaver ants. It plays a crucial role in plant- ant interaction. The present study aims to explore the effect of ants on the reproductive success of *A. odoratissimus*. Ants are detrimental to *A. odoratissimus* and disturb the pollinator visits which resulted in reduced fruit set. The nest constructed leaves experience premature death, thus weaver ants show antagonistic effect in the selected species.

Key words: Ant- plant relationship, *Artabotrys odoratissimus*, floral nectaries, foraging, fruit set, leaves, antagonism, nesting, weaver ants, volatile compounds, attraction

In all the ecosystems in the universe from desert to ocean species are interact with each other. All living organisms in a community have important relationship with other living organisms. These interactions may be positive or negative. Ants are one of the most interactive organisms in the world. In interspecific interaction, ants may communicate about the location of food with her sisters, they built and care colonies and young ones (Chomicki and Renner, 2017). In general weaver ants (*Oecophylla smaragdina*) exhibit symbiotic relationship with plant leaf (Bronstein et al., 2006; Rico-Gray and Oliveira, 2007), Leaves provide hollow space specialized for housing ants and provide food for ants (Heil, 2008; Stadler and Dixon, 2008). In return, ants protect the plants from herbivores (Heil, 2008; Heil and McKey, 2003). Ant - plant mutualistic relationship is common in tropics. Ants act as a major biocontrol agent on host plants such as *Mangifera indica*, *Citrus* sp., *Anacardium occid* et al., le and *Swietenia mahagoni*, (Peng et al., 1999; Van Mele et al., 2007; Lim and Kitton, 2003; Van Mela and Cue, 2000). The greater quantity of food resources, the angiosperms increase the opportunity for the interaction of ant – plant. The ants use large number of host species for their shelter (Holldobler, 1983) *Artabotrys odoratissimus* R. Br. is a plant belongs to the family Annonaceae also show myrmecophylic relationship with the Weaver ants, The present study discuss about the ant – plant relationship between *Artabotrys odoratissimus* and Weaver ants.

MATERIALS AND METHODS

Artabotrys odoratissimus is a large woody garden straggler. The inflorescence is axillary, solitary, flowers green colour in young and yellow colour when ripe. It produces strong smell resembling ripened jack fruit. The flowering start during the rainy season or long summer is followed by a heavy rain also initiate flowering. The social insect weaver ants (genus *Oecophylla*) are belongs to the family Formicidae. *Oecophylla* are obligate arboreal insect. The study was conducted in the plant located at Rani Anna Government College for women, Tirunelveli, Tamil Nadu. Ant and *Artabotrys* were found associated in large colonies. The research was conducted in the plant located at Rani Anna Government College for women, Tirunelveli, Tamil Nadu. Ants and *Artabotrys* were found naturally associated in large colonies. Field work was completed between September 2021 and March 2022. Each day, plants were examined to check for ant relationships with the flowers. During the fieldwork, ant nesting and nectar-gathering behaviours are observed. The average length and width of the nests were used to calculate the nest size. In the field, behavioural observations of nest construction, foraging, and nest protection were made. Four times a day, nest-building behaviour was recorded. Real random leaf sample was used to conduct the measurements. The presence or absence of eggs and pupal cocoons were noted.

RESULTS AND DISCUSSION

Interactions between ants and plants may be facultative or obligate, antagonistic or mutualistic (Rico-Gray and Oliveira, 2007). Floral volatiles play a significant role in attracting the weaver ants.

Nest-building behaviour: Adult weaver ants have reddish colour body and eyes are large. They have 10-segmented antennae with 2-segmented clubs. Adult ants known for their unique nest building behaviour where workers construct nests by weaving together leaves using larval silk. In *A. odoratissimus*, the present study recorded two types nest builded by the Weaver ants. i) Weaver ants bend the green fresh matured leaves (5-8) together and with whitish mucilaginous substances paste along edges, which held the leaves strongly together. The apex of the leaf glued with the petiole of the same leaf. This nest looks like a pouch hanging on the branches. The size varies in height 10 -13 cm and breadth 8 -10 cm. ii) sometimes, the nest construction is done horizontally (elliptical in shape) instead of pouch. 8 -10 leaves are joined vertically without any bend, margin of leaves are glued with the help of white paper like substance. The length varies from 15-18 cm and breadth 5-7 cm. Occasionally, single leaf is folded to form a nest. Hundreds of ants are actively involved in the construction of nests. During the nest building many ants stand on one another, holding down a leaf with another leaf margin, while other ants are employed to fasten the glue. Gluing is done simultaneously in both ends of the leaves. The ants are pulling the nesting leaves on the edges with their mandibles. With help of potential forces a few ants have successfully bent a leaf onto itself. The workers plan between leaves in a systematic coordinated fashion to bind the leaves together. The size of the nest depends on the size of the group. The whitish mucilaginous glue present in the dried nest is soft and appears as membranous sheet. The entrance of the nest is small and oval. Once nest is constructed, workers retrieve the larvae in such a way that causes them to excrete silk, larvae can produce more silk and pupate without a cocoon. The time required to construct a nest is significantly less the 24 hr. Weaver ant's nests are strong and even heavy wind flow cannot collapse the nest. The nest is impermeable to rain water. New nests were consistently being constructed by workers in large colonies.

The leaves used for the woven the nest experience a premature fall down. The nested leaves dried quickly, this may be due to the exposure of abaxial side to

the direct sunlight. The dried nested leaves remain attached to the plant, even after getting detached from petiole, since they are weaved together during fresh condition. The young or mature flower is more susceptible to the weaver ants. Group of ants enter into the thalamus region of the flower and suck the floral scent continuously for 5-7 days, after that the flower dried up. The fruit formation is absent. Rarely fruit formation may occur and the ants may construct the nest over these fruits. These fruits also resulted in premature fall down.

In *A. odoratissimus*, often the nest constructed by pulling the leaves occur next to the inflorescence axis. Fragrant flowers with well developed nectarines are an adaptation for weaver ants. In many plants ant acts as potential pollinators (Peakall et al., 1991; Schoonhoven et al., 2005), but in *A. odoratissimus* weaver ants produce detrimet all effect. The fruit setting is completely absent or highly reduced due to this interaction. This may be due a poor physical fit to connect androecium and gynoecium of flowers, ants have smooth hairless cuticles which are weakly suitable for pollen adhesion. Furthermore, some ants have metapleural glands that secrete anti-microbial agents, required for nest hygiene (Fernández-Marin et al., 2006), but this secretions damaging to pollen longevity and fertility (Galen and Butchart, 2003). Sometimes plants effective pollinators disturbed by the ant colonies. Many findings suggested that, antagonistic ants may harmful to flower visitors or pollinators (Altshuler, 1999; Galen, 1999; Tsuji et al., 2004; Gaume et al., 2005; Nees, 2006; Junker et al., 2007). Ants may be a nectar thieves. So reduce the addictiveness of flowers to the suitable pollinators. Whenever the nectar is removed from a flower, the nectar pollination is reduced by frequency or duration of pollinator to visit the flower (Galen and Geib, 2007). This resulted in poor fruit setting. Galen and Butchart (2003) reported that, some ants are considered to be typical nectar thieves or even robbers, which can decrease a plant's reproductive success by damaging the anthers and pistils or chasing away other potential pollinators (Gaume et al., 2005).

Many studies are reported on beneficial role of ants in plant reproduction. Very limited studies focused on significance of ant pollination. The ant's role in pollination is underestimated. In *A. odoratissimus* ant relationship is detrimental and reduces fruit setting. The ant infected plants are not produces significant numbers of viable seeds. The chemical constituent in the floral scent acting as attractants of ants awaits further study.

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AUTHOR CONTRIBUTION STATEMENT

Study conception and design: Dr. A. Saravana Ganthi
Data collection: Vellankanni K and Suresh Kumar T
Analysis and interpretation of results: Vellankanni K and Suresh Kumar T
Draft manuscript preparation: Dr. A. Saravana Ganthi. All authors reviewed the results and approved the final version of the manuscript.

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CONFLICT OF INTEREST

No conflict of interest.

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