FIG-POLLINATOR MUTUALISM IN *FICUS BENGHALENSIS* IN THE PRESENCE OF NON POLLINATOR WASPS

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Introduction

Figs (*Ficus*: Moracea) are key stone species in many tropical and sub tropical ecosystems with over 900 species in the world (Priyadarsanan, 2000). Fig trees produce a unique form of inflorescence termed "syconium" which contains thousands of tiny flowers (Kerdelhué and Rasplus 1995). Figs are pollinated by species specific wasps of the subfamily Agaoninae that develop inside fig flowers of the syconium.

Development of the wasp pollinator larvae in fig syconia synchronizes with that of the syconium. Pollen bearing female fig wasp enters a receptive syconium through its opening termed "ostiole" and lay eggs within the ovaries of female flowers. During the process the female flowers get pollinated. Thereafter, figs develop seeds and wasp eggs hatch and develop into larvae. Fig wasp larvae feed on the developing seeds. Mature fig wasp males emerge first from the ovaries and mate with females while still inside the syconium. During this stage, anthers of male flowers in the syconium dehisce releasing pollen. Newly emerged female wasps get covered in pollen and then they fly in search of another receptive syconium of the same fig species.

Another group of wasps, the non-pollinator fig wasps also oviposite and develop in fig syconia. Larvae of non-pollinator wasps also feed on the developing fig seeds (Wiebes, 1996) lowering the number of seeds produce by the tree for its propagation. In addition, non-pollinator fig wasps oviposit and develop in the same site as the pollinator wasp, thus lowering the number of pollinator wasps produce by the tree. This relationship may have an adverse effect on the mutualistic relationship in the particular fig pollinator system. The study addresses fig-pollinator mutualism in *Ficus benghalensis* in the presence of its non-pollinator wasps.

Materials and Methods

Ficus benghalensis tree situated in the Peradeniya University Park was selected for the study. Syconia development with time was studied by measuring the size and colour variation of 50 tagged syconia on the tree. Upon maturity the tagged syconia were picked and held in the laboratory in separate plastic cups covered with a fine mesh cloth. On emergence of wasps the syconia were preserved in 70 % alcohol. Undamaged and damaged seeds in each were counted. Wasps that emerged were identified using keys and descriptions of Wiebes (1994) and Priyadarsanan (2000) and count of male and female of each species was made. Data was analyzed to investigate the effect of fig wasps on

seed production and the effect of non-pollinator wasps on fig-pollinator mutualism in *Ficus benghalensis* using Minitab 14.

Results

Of the seven species of wasps that emerged from the 50-tagged syconia, pollinator wasp was identified as *Eupristina masoni* (Agaoninae) and the non-pollinator wasps as *Sycoscapter stabilis, Philotrypesis affinis* (Sycoryctinae), *Walkarella temeraria* (Otitesellinae), *Sycobia* sp. 1 and 2 (Ephicrysomallinae) and an unidentified species in the subfamily Sycoecinae. The tagged syconia on *F. benghalensis* tree at 6 weeks of development were visited by pollinator wasps that lay eggs in the syconia. The emerged pollinator wasps showed a normal distribution among the tagged figs (Figure 1). The number of pollinator wasps that emerged from a single fig ranged from 25 – 444 where over 200 individuals emerged from 60 % of the tagged figs. The emerged non-pollinator wasps showed a skewed distribution among the tagged figs with 0-14 wasps emerged per fig. Non pollinator wasps emerged from only 12 of the tagged figs (Figure 2).

Of the non-pollinator wasps that emerged, majority belonged to *Sycoscapter stabilis* (36), with *Walkarella temeraria* being represented by a single specimen. The analysis revealed that there is no correlation between the number of pollinator wasps and non-pollinator wasps produced per fig (Pearson Correlation Co-efficient r = 0.055, p = 0.076).

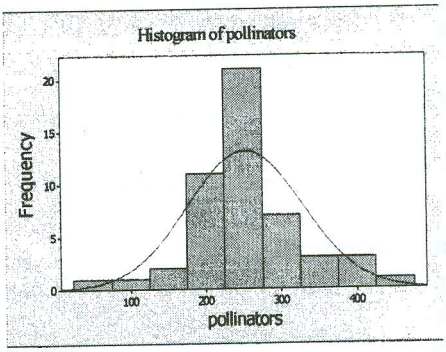

Figure 1. Abundance of pollinator wasps, *E. masoni* among the tagged figs.

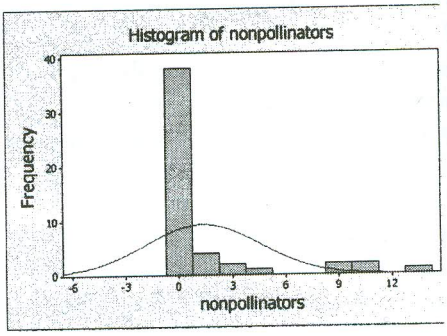

Figure 2. Abundance of non-pollinator wasps among the tagged

The number of wasps that emerged from a fig increased with increasing number of seeds present in a tagged fig (Pearson Correlation Co-efficient r = 0.578, p = 0) while the number of undamaged seeds per fig decreased with the increase in number of wasps that emerged. Though the number of pollinator wasps that emerged decreased with the number of undamaged seeds in a fig, the relationship was not significant (Pearson Correlation Co-efficient r = -0.207, p=0.15).

The highly female biased sex ratio of 0.2796 obtained for pollinator wasps that emerged per fig infer that more

females than males were produced by pollinator wasps.

Discussion

Only a single pollinator wasp species, *Eupristina masoni* of *Ficus benghalensis* was recorded while six other species were non-pollinator wasps. None of the non-pollinator wasps were parasitoids that lay eggs within ovaries already occupied by pollinator wasps. Two of the species of non pollinator wasp, *Sycobia* sp. 1 and sp. 2 (Epichysomallinae) are new records from *F. benghalensis.*

As the number of seeds per fig increased, the number of wasps that emerged per fig also increased due to the increase in ovipositing sites for the fig wasp as reported by Kerdelhué and Rasplus (1995). Furthermore, as the number of wasps developing within a fig increased, the number of undamaged seeds decreased. However, *F. benghalensis* being a monoecious fig tree that produce a large number of figs with large number of seeds per fig, seed production may not be adversely affected by sacrificing a portion of its seeds for developing pollinator wasps as well as non pollinator wasps. However, the low number of non-pollinator wasps produced per fig and their skewed distribution may be due to the greater chance to distribute themselves among the syconia without competing with each other. The female biased sex ratio among the pollinator wasps ensures more egg bearing wasp to produce next generation of pollinators as well as more pollen carriers for pollination of *F. benghalensis* flowers.

Conclusion

The present study adds a new subfamily Epichysomallinae of fig wasps with 2 new species, *Sycobia* sp. 1 and sp. 2 into the world list of fig wasps of *Ficus benghalensis.* The study confirms that fig-pollinator mutualism is not affected by the presence of non-pollinator wasps in the selected monecious *F. benghalensis* tree at peak fig production.

References

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