4.6 POLLINATION EXPERIMENTS

4.6.1 Pollen ovule ratio

The mean number of pollen grains per flower in the red and green leaf forms of *A. sessilis* was 519.42 ± 133.00 and 547.10 ± 207.77 respectively. As only one ovule was observed in all the flowers studied, the pollen to ovule ratio of the red and green leaf forms was 519.42 (±133.00): 1 and 547.10 (±207.77): 1 respectively. Thus, the breeding system of *A. sessilis* is facultative xenogamy according to Cruden (1977).

4.6.2 Pollination experiments (Appendix 4.6.4)

In *A. sessilis* (both leaf forms), open pollination experiment significantly produced the highest fruit set followed by self pollination experiment ($p < 0.05$) (Appendices 4.6.2.1 & 4.6.2.2). In *A. sessilis* red, geitonogamous experiment and cross pollination experiment showed an even lower fruit set whereas the emasculated and bagged flowers experiment showed the lowest fruit set. However, the difference was not significant among these three experiments ($p > 0.05$) (Appendix 4.6.2.1). In *A. sessilis* 'Green', the fruit set obtained from emasculated and bagged flowers experiment was the lowest.

The average fruit set of the open pollination experiment was 80.21 ± 13.78% in *A. sessilis* 'Red'; 95.01 ± 6.30% in *A. sessilis* 'Green' (Figure 100). The bagging experiment indicated that *A. sessilis* is self pollinated. The average fruit set of the bagged individual flowers and bagged inflorescences was 42.00 ± 12.30% and 58.74 ± 24.33% in *A. sessilis* 'Red' respectively; 59.00 ± 20.25% and 63.76 ± 21.01% in *A. sessilis* 'Green' respectively. Although the untreated and bagged inflorescences

produced more fruits than the untreated and bagged individual flowers, the difference was not significant in both ($p > 0.05$) (Appendices 4.6.2.1 & 4.6.2.2).

Fruit set from the treated and bagged individual flowers (the individual flowers were pollinated by pollen grains from different flowers in the same plant) showed that *A. sessilis* also exhibits geitonogamous pollination. The average fruit set of the geitonogamous pollination experiment was 15.92 ± 7.85% in *A. sessilis* 'Red'.

For the cross pollination experiment, the average fruit set was 15.00 ± 11.79%. The result indicated that the two leaf forms could be genetically similar and compatible as fruits were produced. The colour of the fruit was red which is similar to the colour of the ovary.

The average fruit set of emasculated and bagged flowers experiment was 14.72 ± 5.41% in the red leaf form and 40.00 ± 16.33% in the green leaf form. Probably, the plants could also reproduce by apomixis since the emasculated and bagged flowers are able to produce fruits without any pollination.

When comparing between the two leaf forms, *A. sessilis* 'Green' produced a significantly higher fruit set in the open pollination and self pollination experiment ($p < 0.05$) (Appendices 4.6.3.1 & 4.6.3.2).

In the parent plants of *A. brasiliana*, the open pollination experiment showed a higher average fruit set as compared with self pollination experiment (bagged inflorescences), which is 55.09 ± 23.03% and 29.51 ± 11.42% respectively. In the seedling, the average fruit set obtained from the self pollination experiment is higher than the parent plant, which is 40.21 ± 9.79%. As *A. brasiliana* did not produce any pollen grains in the parent plants and offsprings, the presence of fruits in both the open

pollination and self pollination experiment indicated that *A. brasiliana* is an apomict plant.

4.6.3 Flower visitors

Preliminary study showed that Formicidae (ants), *Apis florea* (dwarf honeybees) and Syrphidae (hover flies) were the visitors for both varieties of *A. sessilis*. They visit the flowers throughout the anthesis period, from 0730–1700 hours. These insects are probably attracted by the scent of freshly opened flowers (presence of osmophores were detected by staining the flower with 0.01% neutral red solution) and nectar which is a source of food (presence of nectar secretory glands were detected by staining the flowers with 1% Sudan III solution) (Figures 101 & 102).

During peak flowering, most of the ants visit the individual flowers at the reclining stems of the plant whereas the honeybees and hoverflies visit the flowers at the top of the plant. The insects generally move in three ways. They move between flowers of the same inflorescence; between flowers of different inflorescences in the same plant or between flowers of different plants. These movements may facilitate xenogamy or geitonogamy.

As the floral nectaries are located at the base of the stamens, ants crawling into the short and cup-shaped corolla to collect nectar will come into contact with the dehisced anthers and receptive stigma. The ants are able to visit individual flowers from different plants without having to return to the ground as *A. sessilis* is matted (Figure 103A & B; Figure 104A–F). Their visits peaked at 1000–1500 hours in both varieties and the highest number was recorded on a day which had very little rainfall.

Dwarf honeybees are the other frequent flower visitors after the ants. They grip other parts of the inflorescences with their hind legs when collecting nectar and possibly pollen grains also (Figure 104G & H). Similar to the ants, mouth parts of the dwarf honeybees touch the anthers or stigma as they collect nectar. Their visits peaked at 1100–1500 hours in both varieties. Hoverflies are the least seen visitors at the site. They also cling to the inflorescences and insert their mouthparts into the corolla to suck nectar (Figure 103C–H). Their visits peaked at 1000–1500 hours in both varieties.

Preliminary study also showed that insect visitors are absent in *A. brasiliana*. This is because the flowers of *A. brasiliana* are unattractive to insect as they do not produce any nectar or pollen grains. In *A. bettzickiana*, Formicidae (ants) is occasionally observed. Similar to *A. sessilis*, ants craw into the short and cup-shaped corolla to nectar. Their visit peaked at 1000–1400 hours.