

Preservation of *Nepenthes* Pitchers by Freeze Drying

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Dried and pressed herbarium specimens of *Nepenthes* do not clearly exhibit many of the characteristics of the living plant. In particular dried pitchers often lose their original shape and form. However, it is often the shape of the pitcher which has been used to identify the many species and natural hybrids of *Nepenthes*.

Curators of zoological museums have preserved small animals by the method of freeze drying. This method of preservation has a wider application in microbiology and packaging certain foodstuffs.

The method of freeze drying requires leaving the material to be preserved in a vacuum at a temperature of about -50°C . The period of time that material is left in the freeze drier depends upon the nature

of the material. Bacterial cultures are generally freeze dried for 4 hours, whereas a small bird may require a week of freeze drying.

Nepenthes pitchers were freeze dried for 24 hours using the apparatus available at the Zoology Department, National University of Malaysia. The pitchers maintained their original shape and to a certain extent their colour. Pitchers preserved by this method were obtained from plants of *Nepenthes macfarlanei*, *Nepenthes sanguinea*, *Nepenthes albo-marginata* and *Nepenthes ampullaria*. The freeze dried pitchers were only slightly brittle and durability might be obtained by coating the pitchers with a clear varnish paint or spray.

Pollination (from page 61)

er and at the last second avoided it.

The Halictid bees were found inside the pitcher blossoms repeatedly. Several times they were found perched amongst the stamens, with their heads facing the base of the ovary. Most commonly, they were found wandering around inside on the stylar disc which was covered with pollen. Usually they exited a pitcher plant blossom between the petals and the sepals, or between the stylar disc and petal, nearly always making a short flight to the sepals and resting there while combing gathered pollen onto the tibia of their hind legs. On two occasions, bees were observed leaving the flower across the stigmatic surface.

The other bee collected was not seen on any other occasion. It was an *Osmia* sp. and carrying pollen on the underside of the abdomen.

Twenty-eight members of the family Sarcophagidae, probably *Sarcophaga*, were seen on pitcher blossoms. These flies were rarely found in the young flowers. Instead they were noted on flowers of medium and

old ages.

Other insects collected from the flowers included fireflies (Lampyridae) – old flower; click beetle (Elateridae) – medium flower; wasps (Sphecidae) – young flower; midges; ants; cranefly; mosquito. None of these was considered to be involved with pollination.

When Halictid pollen loads were examined, *Sarracenia* pollen was determined to be white in color. Its stephanolcolporate pollen grains were easily identifiable under high-power magnification. Four out of fourteen bees examined had pollen from at least one other species in addition to *Sarracenia* pollen.

Nectar results showed a sugar concentration ranging from 17.2% (wt/wt) in old flowers to 35.2% (wt/wt) in young flowers. The nectar production was also found to decrease with flower age.

Discussion

Since the *Sarracenia* flowers were already opened when the study period began it was not possible to undertake manipula-

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Plate A Lower pitcher of *Nepenthes macfarlanei* prior to freeze drying.

Photos by Roger Shivas



Plate B Freeze dried pitchers of *Nepenthes macfarlanei*.