BUZZ POLLINATION OF *SOLANUM MELONGENA* BY BEES

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Introduction

Buzzing is a technique used by certain species of bees to collect pollen from flowers that have poricidal anthers as found in 357 genera of plants in 54 families. Concealed pollen grains in the anthers of such flowers need natural or artificial vibrations to release pollen. Buzzing bees cling on to the anthers and vibrate their body using indirect flight muscles (Buchmann, 2000). The vibrations produce a buzzing noise and hence the pollination mechanism is termed "buzz pollination". Anthers on vibration release pollen grains through terminal pores and this pollen drop coats the under side of the bee. Once in the nest the pollen forms food for the developing larvae.

Pollinating bees show specialized behavior patterns at flowers, depending on the structure, type and the amount of resources flowers produce. Buchmann and Cane (1989) reported a positive relationship between handling time (time spent at a flower during a single visit) of bees and availability of pollen in buzz pollinated flowers. Shelly and Villalobos (2000) reported that the handling time also varies with the size of the bee.

During the present study, diurnal activity and handling time of bees visiting *Solanum melongena* (brinjal) flowers was studied in relation to size of bees and availability of pollen at two sites in the Kandy District.

Materials and Methods

The study was conducted in 2 plots at Meewatura and Gelioya in the Kandy District. The plot in Meewatura had 50 brinjal plants and the one in Gelioya had 80 plants. At flowering, detailed morphology of flowers, anthers and stigma was recorded. Pollen was studied using the Wodehouse (1935) method. Pollen in flowers at different ages (newly opened, 01 day, 02 days and over two days old flowers) was counted to determine the relationship between buzzing time and availability of pollen grains. Stigma receptivity was determined by checking its stickiness. Bees visiting and buzzing at flowers of *S. melongena* grown in the two plots were collected and identified using standard keys. This behaviour was observed at 30 minute intervals from 07.00 - 04.00 pm. Handling time at flowers of different ages was recorded for two common buzzing bee species in Gelioya on four sunny days. Weather data was obtained from the Natural Resources Management Center, Peradeniya. Data was analyzed using Minitab 14.

Results

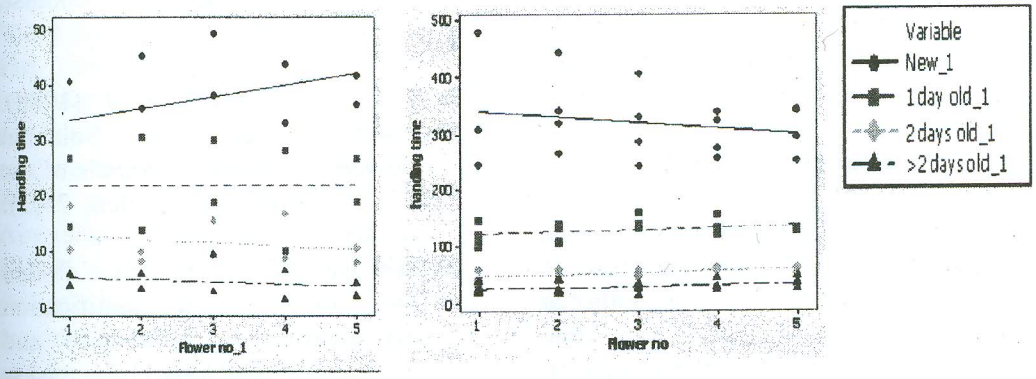
Six species of buzzing bees and two species of non-buzzing bees visited *S. melongena* flowers at the two sites over a period of 10 months (Table 1). Species composition of buzzing bees

differed in the 2 sites while the 2 species of non-buzzing bees were common to both sites.

Buzzing bees were the first to arrive at brinjal flowers and were followed by non-buzzing bees. The peak abundance and activity of bees at the two sites were from 8.00 – 11.00 am. and correlate with the stigma receptivity period of the flowers. The buzzing bees, *Hoplonomia westwoodi* was the most common in Meewature while in Gelioya it was *Pachynomia* sp. The handling time at flowers of buzzing bees was higher for larger bees than for smaller bees. The larger bees as *H. westwoodi* spent less handling time than smaller bees as *Pachynomia* sp. at flowers of different ages. Furthermore, bees buzzed longer at new flowers than at older flowers (Figure 1).

Table 1. Buzzing and non- buzzing bees recorded from the two plots.

	Buzzing bees	Non- buzzing bees
Plot in Meewatura	*Hoplonomia westwoodii* *Amegilla comberi* *Austronomia* sp.	*Trigona* sp. *Apis cerana*
Plot in Gelioya	*Hoplonomia westwoodi* *Amegilla comberi* *Leuconomia* sp. *Pachynomia* sp. *Xylocopa tenuiscapa*	*Trigona* sp. *Apis cerana*



A B

Figure 1. Handling time of (A) *Hoplonomia westwoodi* and (B) *Pachynomia* sp. at five flowers of *S. melongena* of different ages.

Study of pollen grains revealed that the number of grains per anther decreased with the age of flower. Over 200,000 pollen gains were found in the anther of a new flower and 40,000 pollen grains in anthers of >2 day old flowers.

Discussion

The species composition and abundance of buzzing bees at the two sites may differ depending on the surrounding vegetation that provides suitable nesting grounds and food sources for bees during the off season. It is noteworthy that *Austranomia* sp., *Hoplonomia westwoodi* and *Leconomia* sp. were recorded for the first time from *Solanum melongena.* Furthermore, according to Karunaratne *et al.*, 2005, this is the first record of *Pachnomia* sp. from the Kandy District.

Following a visit by buzzing bees pollen concealed in poricidal anthers get released and become available for non-buzzing bees. Hence non-buzzing bees followed buzzing bees at *Solanum melongena* flowers to gather pollen as reported by Shelly and Villalobos (2000). As stated by Buchmann (2000) handling time is shorter at new flowers than at older flowers as even short buzzes provide sufficient amount of pollen from unharvested anthers.

The increase in handling time at a particular flower by smaller bees is because they buzz at a single anther at a time, thereby spending more time collecting pollen from all the anthers. The larger bees buzz once at the entire anther cone spending less time. Similar observations were made by Symon and Anderson (1988).

Conclusion

Hoplonomia westwoodi was the most common buzzing bee in Meewatura and in Gelioya it was *Pachynomia* sp. The peak activity period of bees was from 08.00 – 11.00 am. Handling time of buzzing bees at new flowers was higher than that at old flowers. Different handling times were shown by different bee species according to their size. *Pachynomia* sp. showed higher handling time than *Hoplonomia westwoodi* at flowers of different ages.

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