

POLLINATION OF 'RYAN' AVOCADO DURING THE 1993 FLOWERING SEASON AT POLITSI: SECOND REPORT

A P du Toit and D Swart

Apicultural Unit, Agricultural Research Council Plant Protection Research Institute, Private Bag X134, Pretoria 0001, RSA

1. INTRODUCTION

The objective of this study is to improve avocado fruit production in South Africa through better pollination practices. Eardley and Mansell (1993) reported that many different insects visited avocado blossoms in South Africa. Of these, only honeybees were present in sufficiently high numbers to ensure adequate pollination. In our investigation on honeybee foraging activity it was noted in the first report year that no one foraging activity dominated during any time of the day or during the entire flowering period (du Toit & Swart, 1993). This indicates that no mass quantities of pollen are released nor large volumes of nectar secreted at any specific time during the flowering period. Because of this, honeybee foragers remain active on avocado blossoms throughout the day for the entire flowering period and this enhances cross-pollination.

This second report summarizes the observations made during the avocado bloom of 1993 and is a continuation of the investigation on honeybee foraging activity in a flowering avocado orchard.

2. METHODS

The study was conducted at Vergelegen Estate, Politsi, in a 50+ ha irrigated avocado orchard. Ten bee-hives were placed in the centre of the orchard, while a second permanent apiary with 20 hives was located at the eastern end of the orchard. Returning honeybee foragers that visited the flowering avocado orchard were sampled at the hive entrance. Samples of +60 foragers per hive were taken from two hives at 2-hourly intervals (08:00, 10:00, 12:00, 14:00 and 16:00) on six days during September 1993 (Figs. 1 & 2). The hive entrance was closed and returning foragers scooped into a 500 ml glass killing bottle containing ethyl acetate.

Foraging loads were then investigated. Pollen and propolis (bee-glue) are carried in pollen baskets on the hind legs. Honey stomachs were removed with forceps and their contents identified as either nectar or water using an Atago 500 refractometer. Dissolved sugars in nectar gave readings of 8% or higher, while water gave readings 0-7%.

3. RESULTS AND DISCUSSION

Daily activity of foragers

The average number of pollen collectors increased from an early morning low of 12% to

a distinct peak of 33% at 10:00 and then steadily decreased to 7% in the late afternoon (Fig. 1). This corresponded with pollen dehiscence in a type B cultivar such as 'Ryan'. The percentage avocado pollen brought in was determined on 20-9-93 in relation to all pollen types collected. At 08:00 it consisted of 20% (n = 35), 78% at 10:00 (n = 65), 54% at 12:00 (n = 46), 14% at 14:00 (n = 50) and 40% at 16:00 (n = 10). Pollen pellets were on average of medium size, size 3 on the arbitrary scale (n = 91, S.D. = 1.4 and S.E. = 1.3), with the largest pellets being collected around 10:00 when avocado pollen is most abundant. Other pollen types identified during the study were *Wahlenbergia* (*Campanulaceae*), *Celtis* and *Trema* (*Ulmaceae*), *Pinus* (*Pinaceae*), *Prunus* type (*Rosaceae*), and *Litchi* (*Sapindaceae*). Two different types of fungal spores were also collected.

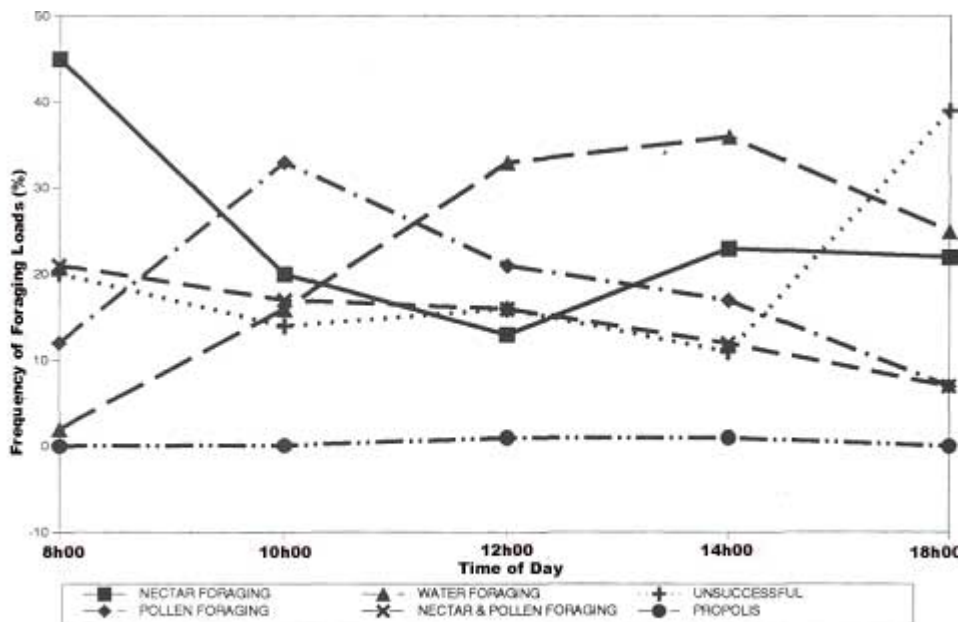


FIG 1. Honey-bee foraging activity in avocado orchards

Nectar foraging declined rapidly from a morning high of 45% to a mid noon low of 13%, after which it increased to 22% at 16:00. The availability of nectar is indicated by the nectar foraging activity. Foraging for both nectar and pollen showed a stepped decline from 21% at 8:00 to 7% at 16:00. Water foraging frequency increased rapidly from 2% at 08:00 to 36% at 14:00 and then dropped to 25% at 16:00 (Fig. 1). Extremely high temperatures were recorded during the avocado bloom period. Temperatures of above 30°C were often recorded as early as 10:00, with the maximum recorded temperature of 38°C in the shade, during the period of investigation. It is known that honeybees will increase water collection in order to cool down the hive which is maintained at an internal hive temperature of 32-34°C (Lindauer, 1955.) Such high temperatures were not recorded in the previous year when the maximum frequency of water foragers was 16%. Collection of propolis was insignificant, the highest frequency being 1% between 12:00 and 14:00.

Unsuccessful foragers with no loads declined steadily from 20% at 08:00 to 11% at 14:00, but then showed a sharp increase to 39% at 16:00 (Fig. 1). This sharp increase in their number illustrated the exhaustion of the available nectar and pollen supplies.

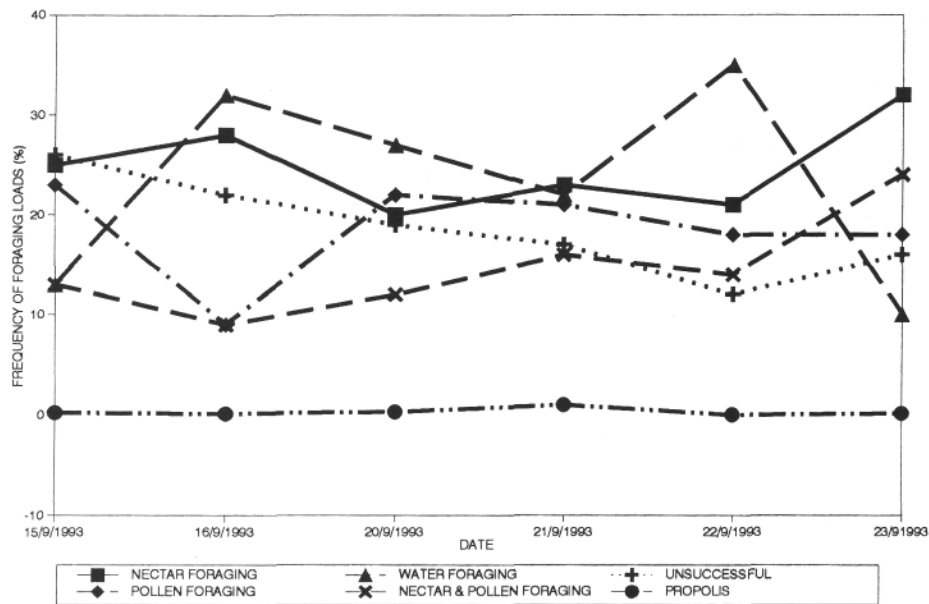


FIG.2 Honey-bee foraging activity in avocado orchards.

Seasonal activity of foragers

Water foraging dominated through the entire flowering period and reached a high of 35% (Fig. 2). This is ascribed to the high recorded temperatures. Nectar foraging varied between 20-32%.

4. CONCLUSION

The investigation confirmed that honeybees visited avocado florets throughout the flowering period where colonies of bee-hives were introduced to enhance cross-pollination. Both nectar and pollen were collected. This season's work illustrated the influence of high ambient temperature on other foraging activities, as more foragers become involved in water collection to cool down the in-hive temperature.

If the conclusion of this report as well as the report on the occurrence of pollinators in an avocado orchard (Eardley & Mansell, elsewhere in this publication) is taken in consideration, it is recommended that pollination should be supplemented by introducing bee-hives into avocado orchards.

5. REFERENCES

- DU TOIT, A.P. & SWART, D. 1993. Notes on foraging activity of honeybees in an avocado orchard. *South African Avocado Growers' Association Yearbook 16*: 17 - 38.
- EARDLEY, C.D. & MANSELL, M.W. 1993. Preliminary report on the natural occurrence of insect pollinators in an avocado orchard. *South African Avocado Growers' Association Yearbook 76*: 127 - 128.

LINDAUER, M. 1955. The water economy and temperature regulation of the honeybee colony. *Bee World*, 36: 62-72, 81-92, 105 - 111.