INCIDENCES OF THE LACK OF PETALS ON THE POLLINATION OF RAPESEED BY HONEYBEES.

J.PIERRE

Laboratoire de Zoologie, INRA, BP 29, 35650 Le Rheu, FRANCE

M.RENARD

Station d'Amélioration des Plantes, INRA, BP 29, 35650 Le Rheu, FRANCE

ABSTRACT

Observations were made to compare some aspects of the foraging behaviour of honeybees on two different lines of rapeseed (apetalous and a petalous) with reference to their attractiveness to bees. There was no difference between the lines for the number of flowers/m2 and the volume of nectar secretion which are considered as important factors of attractivity. Nevertheless, the apetalous line was visited, sometimes, even more than the normal one and the bees showed a considerable constancy to each type of flowers : passages between the two types were not frequent. The nectar foraging behaviour, observed under cages, differed with the floral morphology. On the petalous flowers, the honeybees visited generally the two inner nectaries by scrabbling over the anthers. On the apetalous flowers the honey bees inserted their tong between the sepals to reach the nectaries, the number of nectaries visited per flower was less important and the time spent to obtain nectar was shorter.

INTRODUCTION

Mutant rapeseed lines without petals were recently selected because of their advantage in reducing the transmission of the Sclerotinia desease by these organs. Observations were made to know the incidences of that important modification of the floral morphology on the foraging behaviour of honey bees with regards to their role in cross-pollination.

Two experiments were conducted with the same spring rapeseed lines (Apetalous = A and Petalous = P) : one in the field and the other in cage plots. In the field , the plots A or P (1.5m.*7.5m.) were contiguous (three replicates), and one colony was placed at 200 m. Under cages (3m.*3m.and 2m high), the experiment was carried on under three treatements with small colonies : 2 cages sown with A, 2 cages sown with P, 1 cage sown with a mixture (50%-50%) of A and P (MA+MP).

Different parameters of the attractivity of the genotypes and of the foraging behaviour were considered.
In the field :

- the nectar secretions of the two lines (modified method from Mesquida J.et al.1988)
- the number of flowers in full bloom / m2
- the number of bees / m2
- the number of bees passing from A to P or P to A was observed during 5 mn. at

the frontier between the two genotypes (0.5m each side *4 m long). The passing ratio was calculated as : Number of honeybees passing from A to P and P to A / Total number of honeybees foraging on A and P

- the flow of honeybees, considering the direction of the passage. A software, calculated on the basis of a Markovian flow, was written to estimate the significance of the directional movements.(Pierre J-S. unpublished).

Under cage :

- the posture of the honeybee on the flower as it was gathering nectar.
- the duration of the nectar gathering in relation with the posture.
- the number of nectaries visited in relation with the flower type and the posture.

EXPERIMENTAL

In the field

Nectar secretions

The quantity of nectar secreted was the same for the two genotypes and fluctuated in the same way from day to day depending on the weather conditions.

Foraging behaviour

There was a good synchronisation in the flowering of the two genotypes and the number of flowers per m2 was not significantly different, but the number of honey bees foraging / 1000 flowers was higher on the apetalous line at a given date.

TABLE 1 Number of Honey bees / 1000 flowers

	A	P	Significance
20.06.94	1.6	1.8	N.S.
23.06.94	3.2	2.2	S**

The passage ratio between A and P was 0.25 instead of 25 for the reference P to P. No directional flow was detected.

Under Cages

Postures during nectar gathering

Different postures have been previously classified into three groups with reference to video recorded observations (Pierre J. et al. unpublished) and to the litterature (Free J.B.and Williams I.H. 1973 ; Delbrassine S. and Rasmont P.1988) :

S - (scrabbling). The insect visits an inner nectary and scrabbles over the stigmate and the anthers to reach a second or third nectary.

C - (circumventing). The insect, entering the flower, circumvent the base of the style to reach the nectaries

I - (inserting). The insect, not entering the flower, inserts its tong between the bases of the petals and sepals to reach the nectaries.
There was an adaptation of the posture of the insect to the morphology of the flower (table 2). The I foraging was more often observed on the apetalous flowers. The C posture appeared to be an intermediate behaviour expressed in the two cases.

TABLE2. Pourcentage of the differents posture on the two flower types

Posture	A	P	MA	MP
S	18.8%	79.5%	17.5%	81.8%
C	30.6%	14.8%	20%	13.5%
I	50.6%	6.4%	62.5%	5%

Nectar gathering duration and number of nectaries visited

The time spent in nectar gathering was significantly shorter with the I posture on the apetalous flowers (2.69 seconds.).There was no difference between S and C (3.76 to 4.10 seconds.).That can bee related to the results of the table 3 showing that on the petalous flowers, the two nectaries were very often exploited by scrabbling over the stigmate and the duration was longer. Nectar was not frequently obtained from a third nectary (10.2% on the petalous flowers). When the honeybees foraged by inserting their tong, the number of nectaries visited was less important and that concerned the two types of flowers.

TABLE 3. Distribution of the number of nectaries visited in relation to the postures

	1 nectary	2 nectaries	3 nectaries
S	6.5%	83.3%	10.2%
C	17.8%	53.8%	31.4%
I	72.8%	24.8%	2.4%

ACKNOWLEDGEMENTS

The authors thank PIERRE Jean-Sébastien for writing a program to analyse the flow of the insects.

REFERENCES

Delbrassinne S., Rasmont P. (1988). Contribution à l'étude de la pollinisation du Colza *Brassica napus* L. var. *oleifera* (Moench) Delile, en Belgique. Bulletin de la Recherche Agronomique Gembloux, 23 (2), 123-152.

Free J.B., Williams I.H. (1973). The foraging behaviour of honeybees (*Apis mellifera* L.) on Brussels sprout (*Brassica oleracea* L.).Journal of Applied Ecology, vol 10, 489-499.

Mesquida J., Marilleau R., Pham-Delegue M-H., Renard M. (1988). A study of rapeseed *Brassica napus* L. var *oleifera* Metzger) flower nectar secretions. Apidologie, 19, 307-318.