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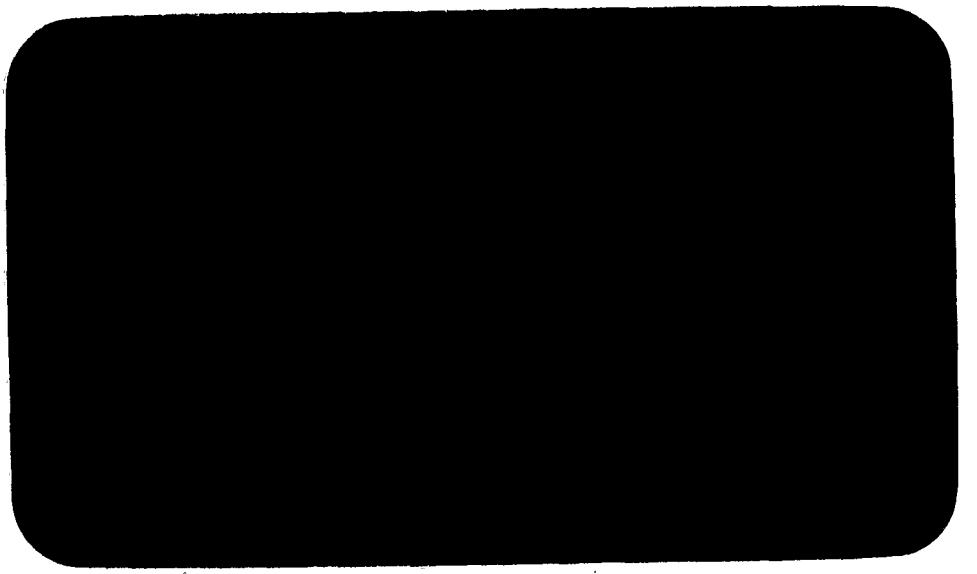

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NOCTURNAL REST AND DISPLACEMENT PATTERNS OF *BRUCHUS AFFINIS* (COL., BRUCHIDAE) ON SPECIFIC *LATHYRUS* SSP. (LEGUMINOSAE) POPULATIONS

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ABSTRACT

Exact observations of the behaviour of *Bruchus affinis* Frölich (Col., Bruchidae) in *Lathyrus* fields, confirmed by diurnal and nocturnal experiments, showed that the adults of the bruchid systematically spent the night in the flowers of *L. sylvestris* and *L. pratensis* L. (Leguminosae). In daytime the movements of the adults within the same *Lathyrus* population (studied by capture, marking and recapture method) was relatively limited in space (high percentage of adults recaptured in the area of their release) and was more important in *L. sylvestris* than in *L. pratensis*. *B. affinis* adults use *L. pratensis* for pollen feeding only and *L. sylvestris* for pollen feeding and laying eggs on pods. The possibility of a territorialism playing a role in the pollen dispersion and specifically influenced by the host-plant flowers is discussed.

Key words: *Bruchus affinis*, *Lathyrus*, behaviour, displacement, pollination.

INTRODUCTION

Regarding the biology of bruchids and their behaviour, very little is known on their night and day activities (Southgate, 1979). Among monovoltine species, data are available on the colonization of the host population (Korab, 1927) and the distribution according to the hibernation sites (Wakeland, 1934), but nothing is known on the displacement patterns in relation to the complex relations between the bruchid adults and the specific plant populations.

Bruchus affinis Frölich is a monovoltine bruchid. In Southwest France (Bearn), the adults develop on both *Lathyrus latifolius* L. and *L. sylvestris* L. which are semi-herbaceous vines flowering and producting pods from July to September. In most of the locations studied, *L. latifolius* or *L. sylvestris* are associated with *Lathyrus pratensis* which flowers earlier.

The adults emerge from the *Lathyrus* seeds at the beginning of fall and hibernate throughout the winter. The colonization of *Lathyrus* populations takes place in the middle of May and the adults are first seen on *L. pratensis*. On this species, the beetles are found feeding on pollen but they do not terminate their reproductive diapause. Sexual activities and vitellogenesis start after contact with *L. latifolius* or

Table 1 Number of *B. affinis* caught at different times of the night of June 26-June 27 (9 pm local time = 7 pm GMT)

lot N°	time of exposition from ...	to	number of inflorescences examined	number of bags used	number of adults caught
1	9 pm	5 am	82	40	20
2	9.30	5	83	40	8
3	10.30	5	82	40	0
4	11.20	5	83	40	0

L. sylvestris and the females lay eggs on the green pods of the 2 species (Bashar et al., 1985).

The study of the colonization movements and the displacements of the adult from *L. pratensis* to *L. sylvestris*, or within the same *Lathyrus* population led to interesting observations on the behaviour of the adults and to the hypothesis of territorialism which is the object of the present contribution.

RESULTS

(I) Daytime activity: are the adults attracted to the flower or to the pods?

In the "St. Suzanne" location in a *L. sylvestris* population, 2 isolated tillers, and 5 inflorescencens for each were selected for observations. Two observers looked at the movements of *B. affinis* adults to the flowers and to the pods, from 8.30 am to 8.30 pm. During observations the following were recorded:

(1) The adults were found inside the flowers in the early morning. They leave the flowers at sunrise and start visiting activities when the air temperatures exceeds 20°C. At sunset, when the air temperature is below 20°C, they were found again reaching the flowers and resting in them.

(2) The adults seem to be attracted mainly to the flowers (inflorescences,) into which they penetrate immediately, for pollen consumption (Bashar et al., 1987). The pods are suspected not to attract the bruchids. The adults seem to encounter them when walking at random along the leaves and stems of the *Lathyrus* plants.

II) Nocturnal activity: do the adults spend the night in the flowers?

In the location of "Cadillon" a total of 330 inflorescencens were selected. They were grouped into 4 lots and were hidden into muslin bags or exposed to the visiting bruchids at different time of sunset and the night (Table 1). Before the flowers were exposed, the bruchids found on or in them were eliminated. After 5 hours of exposion, all the inflorescences were closed within the respective bags and the presence of bruchids was checked the next day.

The examination of the flowers revealed that the inflorescences exposed during sunset have given shelter to adults. No adults were found in the flowers exposed after sunset. This confirms that the *B. affinis* adults spend the night inside the flowers, they get into them at sunset, and they do not move during night.

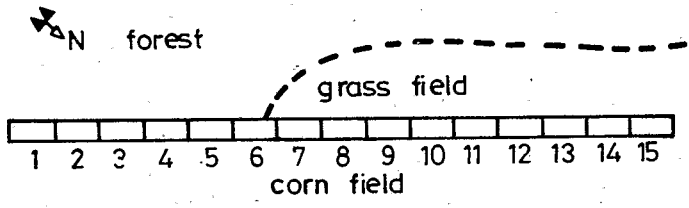

Fig. 1. Experimental plots at St. Suzanne and the surrounding vegetation.

The two previous experiments lead to 2 hypotheses: (1) Flowers give shelter for adults during the night and this could be the origin of a territorialism restricting the area of pollen transportation. (2) Flowers are the exclusive organs capable of attracting the bruchids to the host plant. Therefore, the distribution of adults and eggs in the population is strictly dependant on the distribution of flowers.

To answer these questions, the following experiments were conducted.

(III) Displacement patterns: do *B. affinis* adults move?

The experimental field at "St. Suzanne" is a plain (50 m altitude). *L. sylvestris* mixed with *L. pratensis* were distributed along a line between the edge of a forest and a corn field (Fig. 1). This "population" is not isolated from others in the vicinity. The whole area, estimated 300 m long and 4-5 m wide is divided into 15 plots (20 m x 4 m). From plot 1 to 6, the population is countinously attached to the edge of the forest and from 7 to 15, it is separated from the forest by a grass field (Fig. 1). The study was conducted on the same plots both on *L. sylvestris* and *L. pratensis*.

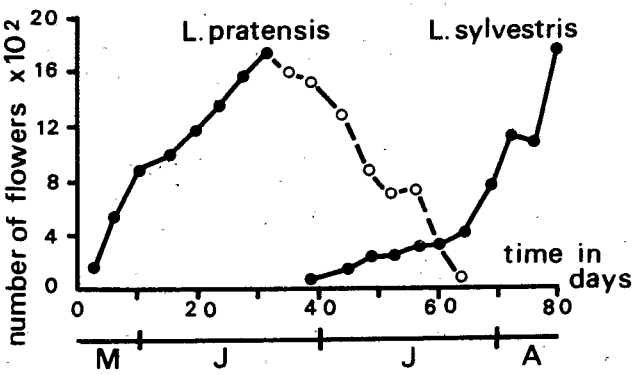

Fig. 2. Abundance of *L. pratensis* and *L. sylvestris* flowers from May 20 to August 13 in the field of St. Suzanne.

From the beginning of May to the end of August, each plot was visited on 3 to 4 days intervals to count the inflorescencens and to perform a "capture-recapture" experiment. The adults were collected in or on the flowers of the different plots from 10 am (plot 1) to about 7 pm (plot 15) on the same day. They were brought into the laboratory and marked according to the plot and flowers of origin. Then they were released in the same plot. The same operation was performed 3 to 4 days later. The data obtained were: 1) the number of inflorescencens, 2) the number of adults captured, 3) the number of adults captured in the same or in a different plot.

L. pratensis flowers are present from the middle of May to the end of June to mid-September (Fig. 2). The displacement of *B. affinis* adults on *L. pratensis* were studied from May 25 to July 2, and from July 6 to August 13 for *B. affinis* on *L. sylvestris*.

The abundance of the beetles on the flowers of both species fluctuated according to the number of the inflorescencens recorded in each plot (Fig. 3). The same observation can be made for the recaptured bruchids: For absolute numbers, the more abundant were the flowers, the more numerous the captured and recaptured beetles were.

The percentage of adults recaptured at 3/4 days intervals was different with the two species: (a) for the number of adults recaptured in the plot of release compared to the number of adults marked and released, we got from 10.8 to 55.4 (June 3) for *L. pratensis* and from 6.8 to 16.5 (August 9) for *L. sylvestris* (Fig. 4); (b) If we compared the number of adults recaptured in the plot of release to the total number of adults recaptured we got higher values: 79.5% on June 3 in *L. pratensis*, and 51.5%

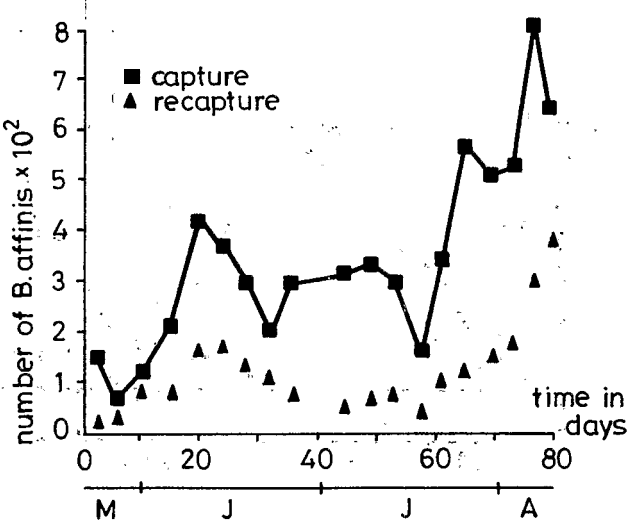

Fig. 3 B. affinis capture and recapture data at the time of *L. pratensis – L. sylvestris* flowering at St. Suzanne.

on July 5 in *L. sylvestris*. In both cases, the percentages of recapture are higher in *L. pratensis* than in *L. sylvestris* (Fig. 4).

Although the displacements were limited in space, some individuals were found far away from the plot of origin. For the whole period of study on *L. pratensis*, the maximum distance covered by an adult displacement during the 3/4 days interval was 80 m (June 15 from plot 6 to plot 2). It was 280 m (July 30 from plot 1 to plot 15) on *L. sylvestris*.

CONCLUSION

When they visit the flowers of *L. pratensis* or *L. sylvestris*, the adults of *B. affinis* can have an impact on pollination at three different levels: stigmatic receptivity, transfer of autopollen from the bottom of the keel to the stigma and transport of allopollen (Bashar et al., 1987). Because they spend the night in the flowers, it was suggested that the bruchid adults could live in a small territory and carry pollen to the flowers in the immediate vicinity of the inflorescence used as a dormitory. We now can state that although the displacements are reduced, the adults are capable

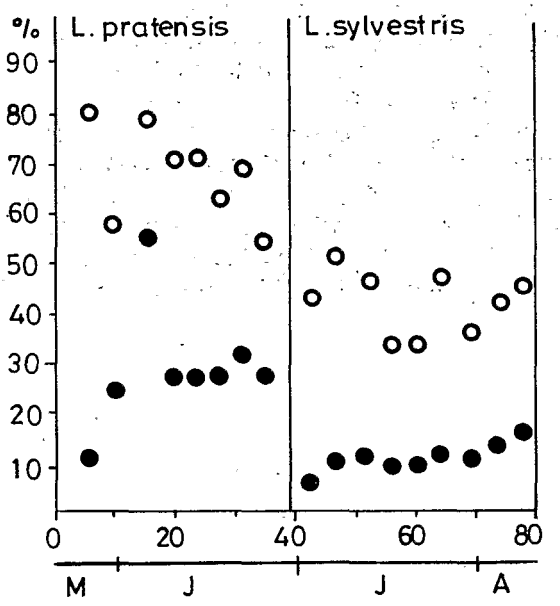

Fig. 4 Number of adults recaptured in the same plot compared to the total number of adults marked and released (solid circles) and to the total number of recaptured adults (empty circles).

of visiting the whole *Lathyrus* population and, eventually, other populations of the area.

The present study showed that the rate of recapture in the same plot was rather high. The adults of *B. affinis* usually stayed several days in the plot where they had been caught. This behaviour must be in relation to the abundance of flowers as we have seen a correlation between inflorescence density and the number of adults. But this moving behaviour is different in *L. pratensis* and in *L. sylvestris*. In the first case *B. affinis* visits the flowers only for pollen feeding. In the second case, pods are also visited for egg-laying. This observation shows that the behaviour of *B. affinis* adults changed after passing from the *L. pratensis* population to *L. sylvestris*. Two hypotheses can be proposed: 1) When the females are sexually mature, their foraging behaviour is different: they are still exclusively attracted to flowers but spend less time on them, passing from one inflorescence to the other more rapidly. Pods are found at random. 2) They are attracted to both flowers and pods. The search for pods of a certain quality, leads to longer displacement and a higher rate of dispersion on the *Lathyrus* population.

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