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NOTE

OBSERVATIONS ON THE BIOLOGY OF TWO SPECIES OF FRUIT FLIES (DIPTERA: TEPHRITIDAE), AND THEIR COMPETITION WITH A MOTH LARVA

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In the course of a survey of Cretan tephritids, three species were reared from flower heads of the composite, *Ptilostemongnaphaloides* (Cyr.) Sojak (Neuenschwander and Freidberg, 1984). Two of these tephritids, *Terellia sabroskyi* and *Urophora neuenschwanderi*, were rather commonly found in this plant, and although described as new (Freidberg, 1982), almost no biological data were ascribed to them. *P. gnaphaloides* is a shrub growing on steep, hardly accessible ledges, most often in deep gorges. The present note describes some aspects of the biology of both tephritids, and in particular their competition with larvae of a moth, *Phycitodes* sp., possibly *binaevella* Hubner (Lepidoptera: Phycitidae)†. The accurate sites, sampling dates and characters to distinguish between the larvae of the two studied tephritids were given in the papers cited above.

Of the two tephritids, *T. sabroskyi* was the dominant species, occurring in 9 out of 10 collecting localities and in 14 out of 19 samples. *U. neuenschwanderi* was found alone in 5 samples from one locality. Five localities and 5 samples yielded both flies, with either one species constituting a small minority of the reared insects. None of many dissected flower heads contained both fly species together.

On 14.V.1981, when most individuals of both species were present as fully grown, diapausing larvae, a total of 177 flower heads from Therisso were dissected, 100 of which were infested by tephritids. The identity, position and condition of all tephritid larvae were registered, and the past activity of the moth caterpillars, which at that time had mostly left the flower heads, was assessed. The number and condition of all seeds were established, and gall formation was noted. Undamaged fly larvae and their parasitoids were reared to adults.

Of the 177 dissected flower heads only 8 were uninfested by insects, 7 of which had no seeds. The remaining heads were infested by the following agents or contained their parasitoids:
69 heads — by moth larvae.
50 heads — by living *T. sabroskyi* plus signs of presence of moth larvae.

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26 heads – by dead *T. sabroskyi.*
12 heads – by living *T. sabroskyi* (without signs of presence of moth larvae).
12 heads – by larvae of *U. neuenschwanderi.*

Some moth larvae were parasitised by *Apanteles* sp. (Braconidae), and some larvae of *T. sabroskyi* were parasitised by species of *Tetrastichus, Syntomosphyrum* and *Ormyrus* (Chalcidoidea).

Up to 5 living *T. sabroskyi* larvae were found in one flower head. The certain cause of mortality in 15 flower heads, in which dead larvae were found, was the mining activity of the moth caterpillar.

Up to 7 larvae of *U. neuenschwanderi* were found in one flower head. One larva was found dead, but the cause of mortality was unknown. In samples from other localities larvae of this species were observed to have been killed by moth caterpillars, and some fly larvae had been parasitised.

Flower heads infested only by living larvae of *T. sabroskyi* (N = 12) contained on the average 2.0 mature seeds, one of which was destroyed. On the other hand, flower heads infested only by moth larvae or moth larvae together with fly larvae yielded many more mature seeds, *i.e.* 8.5 (N = 69) and 8.7 (N = 50) respectively, although 83.5% and 73.6% respectively of the seeds were destroyed. These findings suggest that moth larvae destroy mainly mature seeds, whereas fly larvae attack also young seeds.

T. sabroskyi larvae were found in three different positions within the flower heads: A – free between the bracts, enclosed in a loose case of bracts; B – in vertical or horizontal position in a small and flat gall-like structure; C – in a hollowed-out seed, with a bushel of bracts protruding from the opening. The distribution of the fly larvae in the various positions and their mortality were influenced by the presence or absence of moth larvae (Table 1). Flower heads with caterpillars had less fly larvae. Moreover, fly larvae inhabited significantly more frequently the protected sites when found together with moth larvae (positions B & C: 92.6% of all larvae), than when found without them (positions B & C: 38.5%; X^2 with correction for continuity = 28.9). It is concluded that moth larvae destroyed unprotected fly larvae. In addition, it seems that seeds gave some protection against parasitisation to the fly larvae enclosed in them. Parasitisation rates in A were 8.3%, in B 10.2%, and in C 2.7%, but the differences were not significant.

TABLE 1. SURVIVAL OF LARVAE OF *TERELLIA SABROSKYI* (L_3) IN DIFFERENT POSITIONS WITHIN THE FLOWER HEADS (f.h.) OF *PTILOSTEMON GNAPHALOIDES* IN THE PRESENCE OR ABSENCE OF MOTH LARVAE, *PHYCITODES* SP.[1]

	Number of f.h.	Number of L_3		Percent living L_3 in different positions		
	N	N	mean	A %	B %	C %
Moth absent	12	26	2.2	61.5	15.4	23.1
Moth present	50	68	1.4	7.4	50.0	42.6

1. Sample taken at Therisso, Crete, on 14.V.1981; for explanation see text.

U. neuenschwanderi larvae on *P. gnaphaloides,* were found mostly in vertical position in galls, and often inside hollowed-out seeds which were firmly embedded in the hard gall. On *Staehelina arborea* Schreber (Compositae), from which this fly was only once collected, no galls were observed. Larvae developed entirely inside one of the narrow seeds, where teneral adults were also observed stuck and dead.

The observed variation in the pupation site, especially as seen in *T. sabroskyi,* is unusual for flower head inhabiting tephritids. Moth caterpillars have been observed to be important mortality agents of immatures of the knapweed gall-fly (Varley, 1947). However, this is, to my knowledge, the first time that variations in pupation position of fruit flies have been related to the presence of caterpillars.

REFERENCES

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