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A Non-gall Forming *Eurosta solidaginis* (Diptera: Tephritidae)

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ABSTRACT *Eurosta solidaginis* (Fitch) can parasitize *Solidago canadensis* without forming a gall. This non-gall former apparently escapes most of the parasitism and predation of the gall forming fly. Levels of host-plant infestation by non-gall formers may approach the frequency of gall formation.

INDEX DESCRIPTORS: *Eurosta*, Tephritidae, gall, goldenrod gall fly.

During collection of *Eurosta solidaginis* (Fitch) gall forming larvae, I slit the stem a few millimeters below the gall and found another larva in a small cavity. No enlargement of the stem or other host symptoms betrayed the larva's presence.

Numerous articles have appeared which deal with gall formation of this ubiquitous species. Weis & Abrahamson (1986) discussed the genetics of gall formation and suggested that due to continuous variation many genes are influenced by two selective factors: 1) birds tend to selectively feed on large galls and 2) a hymenopterous parasite selects smaller galls.

Mills (1969) studied various hormones for their gall forming ability. He stated that probably one or more compounds were released from the insect, which in turn caused the secretion of several plant substances that form galls.

The purpose of this paper is to report the occurrence of the non-gall forming fly, its frequency of infestation of *Solidago* spp., and its taxonomic status.

MATERIALS AND METHOD

Stems of *Solidago gigantea* Ait. and *S. canadensis* L. were collected between March 15 and April 7, 1987 and 1989 five miles east of Oskaloosa, Iowa and one mile north of Eddyville, Iowa. An area was chosen for its large number of galls; then all stems in the area were removed including the ones with galled stems. Stems with any visible enlargement were collected. This ensured that the smallest possible galls were also collected. Stems of *S. canadensis* collected near Wadsworth, Ohio in March of 1967 were all four mm in diameter or larger.

After removing all galls the stems were placed in 15 to 30 gallon aquaria with window screen on top and an inch of moist peat moss on the bottom. The plants were kept at room temperature and the emerging flies were collected each day before noon. Stems of *S. canadensis* were divided into those larger than four mm and those smaller.

The host plants could not be positively identified because the stems were collected in the winter condition. *Solidago* plants from the same area were collected as voucher specimens and placed in Iowa State University's museum.

RESULTS AND CONCLUSIONS

Adult *E. solidaginis* from non-galled stems were smaller. Wings average 5.6 mm (4.3-6.2 mm for 11 specimens), compared to 6.4 mm (5.7-7 mm) for gall formers. Their body was generally darker but the wings had less darkening of the costal cells. No other consistent differences were noticed. In a cross between five non-gall forming males and 3 gall forming females set up in a 15 gallon aquarium with suitable young shoots of *S. canadensis*, two galls started to form. No adults were reared from this cross, however. These observations suggest that the two forms are only genetic differences occurring within populations from the three localities tested.

The non-gall formers produced a small cavity in the stem pith about twice the size of the larva in the six cavities found. No tunneling in the stem was noted. The third instar prepared an exit area, leaving only a thin layer of plant tissue similar to gall formers (Uhler, 1951).

No hymenopterous parasites have as yet been found and no bird predation observed in the stems collected. Two small cavities were found that appeared to be larvae attacked by fungus.

From 2,335 non-galled stems collected (Table 1) 16 adults emerged, nine males and seven females. All but one of these emerged from *S. canadensis*. Since the stems were collected in the winter condition, the one record from *S. gigantea* could be another species of goldenrod. The success rate of *E. solidaginis* utilizing its host plant in this study was greater for non-gall formers than for those producing galls. Of 791 non-galled *S. canadensis* stems, 11 adults emerged but only seven flies emerged from the 47 galls on these same stems (Table 1). This gives a success rate of 1.3% for non-gall formers and 0.9% for gall forming flies. Cane and Kurczewski (1976) reported gall forming adults emerging from 0.5% of stems surveyed. Hartnett and Abrahamson (1979, Table 1) indicate a similar level of emergence.

S. gigantea serves as a host plant for gall formers but apparently is not an important host for non-gall formers. Of the 16 specimens reared from stems, only one came from a stem smaller than four mm diameter. Since *S. gigantea* is usually smaller than this in the area studied this alone could account for its not being used by non-gall formers.

Table 1. Emergence of *Eurosta solidaginis* from stems and galls of *Solidago* spp.

Stems	Emerged from stems	Galls	Emerged from galls	Plant
791	11	47	7	<i>S. canadensis</i> *
400	4			<i>S. canadensis</i> **
1,528	1?	25	4	<i>S. gigantea</i> (@)
		227	23	<i>S. canadensis</i> *
		159	24	<i>S. gigantea</i> (@)

*Collected one mile north of Eddyville, Iowa, March 1987 & April 7, 1989.

**Collected during winter of 1967, Wadsworth, Ohio. A record of galls was not kept.

@ Collected five miles east of Oskaloosa, Iowa, March 28, 1987 & April 7, 1989.

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