EVALUATION OF CRIMSON CLOVER SEED DAMAGE BY THE CLOVER HEAD WEEVIL[1 2]

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ABSTRACT

A plastic chamber containing excised crimson clover, *Trifolium incarnatum* (L.), seed heads was used in measuring clover head weevil, *Hypera meles* (F.), larval feeding damage on 35 inbred lines. Percent seed damage was based on number of florets with corollas removed. Seed was not damaged when the corollas were not disturbed. Significant differences existed between the least and most fed on lines among both early and late-season inbreds.

The clover head weevil, *Hypera meles* (F.), greatly reduces the reseeding ability of crimson clover, *Trifolium incarnatum* (L.), because of larval damage to floral parts and developing seeds. The total crimson clover acreage in the Southeastern United States has declined from an estimated 6 million acres grown in 1951 to 600,000 acres currently under management. The majority of this decline has been attributed to *H. meles*, with reported reductions in seed yield ranging from 80 to 87% (Knight and Hollowell 1973).

This paper reports: (1) a method of screening selected inbred lines of crimson clover for resistance to damage to the seed head by larvae of *H. meles* and (2) differences in feeding damage to these lines.

METHODS AND MATERIALS

The feeding chamber (Fig. 1) consisted of a plastic cylinder, 6.5 cm long and 8.5 cm diam with 1 end glued to the top of a 9-cm plastic petri dish and the other end resting on the bottom of the dish. Ventilation was provided by cutting a 5 cm diam hole in the dish top and covering it with 52-mesh nylon screen. Also, three 1.5 cm holes were cut in the dish bottom to hold rubber-capped plastic vials filled with water. Each vial contained an excised crimson clover seed head with stem collected from a spaced-plot field nursery. The stems were inserted into the water through the hole in the rubber cap. Filter paper with 3 appropriately cut holes was placed in the chamber bottom and moistened every 12 hr. The chamber was supported by placing it in the shell of a 1-pt paper carton with the top and bottom removed.

Three field-collected *H. meles* 4th stage larvae were placed on each clover head with a damp camel's hair brush. Each of the 35 early and late-season lines was represented by 4 chambers or replications. The prepared feeding chambers were arranged in a randomized complete block design on trays in an environmental chamber and held for 85 hr at 21°C 12-hr day, 18°C 12-hr night, and 60% RH.

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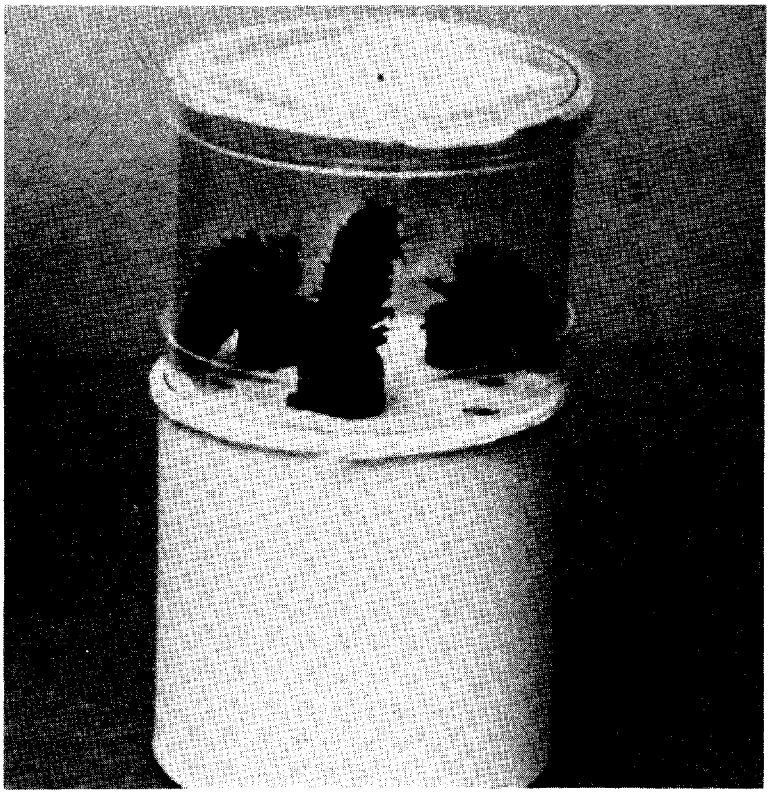

Fig. 1.—Feeding chamber for evaluating *H. meles* larval feeding on crimson clover seed heads.

After the feeding period, larvae were removed from the chambers and seed heads were evaluated for feeding damage.

Results and Discussion

Preliminary microscopic observations to determine the relationship between larval feeding damage and corolla drop from the seed head showed that seed damage was closely related to corolla drop on seed heads of check lines. Under the binocular microscope, 85.4% of the florets with corollas removed sustained seed damage. When corollas were not disturbed by the larvae, seed was not damaged. Larvae apparently either disturb or excise the drying corolla when entering the floret to feed on the developing embryo; as a result, it falls from the seed head. Thus, the number of corollas on the chamber floor was used as an index of seed damage.

Larval feeding on 'Dixie 68-152' and 'Frontier 68-53', the least damaged lines among the early season group, was similar to that on 'Chief O. P.', the open pollinated check and on 12 of the other 14 inbred lines tested (Table 1). However, 1 line, 'Chief 68-77', suffered significantly greater feeding damage (2-fold increase). Among the late season lines, 3 inbreds, 'Dixie 149-5-S_7', 'Dixie 71', and 'Chief 68-108' although not significantly different in feeding damage from the 'Frontier O. P.' check, were all damaged substantially less than either 'Chief 68-1' or 'Dixie 68-111-S_2'. Damage to the other 17 lines did not differ significantly.

TABLE 1.—FEEDING DAMAGE BY 4TH STAGE *H. meles* LARVAE TO SEED HEADS OF EARLY- AND LATE-SEASON INBRED LINES OF CRIMSON CLOVER. STANDARDS WERE CHIEF AND FRONTIER OPEN-POLLINATED (O.P.).

Early-season group		Late-season group	
Inbred line	Mean % damage*†	Inbred line	Mean % damage
Dixie 68-152	24.00 a	Chief 68-108	15.00 a
Frontier 68-53	24.00 a	Dixie 71	15.00 ab
Chief 68-129	26.00 a	Dixie 149-5-S_7	15.00 abc
Chief O. P.	28.00 ab	Dixie 68-113-S_2	16.00 abcd
Dixie 68-151-S_2	29.00 ab	Chief 68-94	21.00 abcd
Dixie 68-128	33.00 ab	Frontier O. P.	21.00 abcd
Dixie 68-96	34.00 ab	Chief 68-17	22.00 abcd
Frontier 68-46	36.00 ab	Dixie 124-S_{10}	23.00 abcd
Dixie 68-129	36.00 ab	Chief 68-99	25.00 abcde
Dixie 68-46	36.00 ab	Chief 68-22	25.00 abcde
Dixie 68-68	36.00 ab	Chief 68-2	26.00 abcde
Chief 68-141	37.00 ab	Chief 118	27.00 abcde
Frontier 68-67	38.00 ab	Chief 48-S_{10}	30.00 abcde
Frontier 68-59	38.00 ab	Dixie 68-70	30.00 abcde
Chief 68-77	42.00 b	Chief 68-109	31.00 abcde
		Chief 68-64	31.00 abcde
		Chief 68-123	32.00 abde
		Dixie 68-92	34.00 cde
		Chief 81-S_{10}	34.00 de
		Dixie 68-111-S_2	42.00 e
		Chief 68-1	43.00 e

*Corolla drop from the floret used as indicator of larval feeding and seed damage.
† Means not followed by the same letter differ significantly at the .05 level of probability by Duncan's new multiple range test.

Results of the present study indicate that laboratory tests with 4th stage larvae can be used to determine relative differences in seed damage to crimson clover by *H. meles*. This test procedure allows the evaluation of damage to seed heads at predetermined larval infestation levels under controlled environmental conditions. This technique, developed to specifically measure crimson clover seed damage by *H. meles* larvae, can now be incorporated as a component in a series of related host plant resistance evaluations. The least and most damaged lines screened in these initial tests can now be used for comparison as 'resistant' and 'susceptible' check lines in future seed damage determinations.

The differences in seed damage among inbred lines are difficult to explain. Little information has been generated on inbred line chemical composition; however, Sullivan et al. (1972) demonstrated the dependence of flower color on glycoside anthocyanin pigments. Several insect-plant relationships are known where glycosides affect insect feeding behavior (Hedin et al. 1974), thus comparisons of seed head glycoside content from lines with highly different *H. meles* larval feeding responses may provide an explanation for differences in inbred line seed damage.

Development of resistant crimson clover varieties through plant breeding programs utilizing the technique reported here could greatly improve the reseeding ability of this important forage legume, and reduce or eliminate the requirement for chemical control of the clover head weevil.

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Pale tree-cricket with his bell
Ringing ceaselessly and well,
Sounding silver to the brass
Of his cousin in the grass.

William Bliss Carman