EFFECT OF ADULT BOLL WEEVIL FEEDING ON COTTON SQUARES

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Abstract

Adult boll weevil feeding on large cotton squares does not cause abscission, unlike boll weevil oviposition, and the squares become bolls. Thirty-five percent of the bolls developed from feeding-punctured squares had an injured carpal. Of the total number of carpals developed from feeding-punctured squares monitored in this study, only 25% were damaged, but the loss of lint in the injured carpal never exceeded 50%, so some lint was still harvestable. Feeding by adult boll weevils results in limited yield loss, unlike oviposition which is more destructive.

Introduction

Boll weevil, *Anthonomus grandis grandis* Boheman, oviposition on cotton, *Gossypium hirsutum* L., squares is known to cause abscission (Hunter and Pierce 1912, Davich et al. 1965, Coakley et al. 1969, Bacheler et al. 1975, Showler and Cantú 2005), but the effect of feeding on squares has not been reported. Under field conditions, boll weevils prefer to feed on large (5.5-8-mm-diameter) squares than smaller squares (Showler 2005). The purpose of this study was to determine the fate of large feeding-punctured cotton squares under field conditions.

Materials and Methods

Cotton, *Gossypium hirsutum* L. (var. DPL-50), was planted on 9 March 2005 on five 15.2-m-long rows spaced 1 m apart at the USDA-ARS Kika de la Garza Subtropical Agricultural Research Center's South Farm, Hidalgo County, TX. When squares began to form, seventeen 1 × 1 × 0.5 (w × h × l) m cages, each covering 8-10 plants, were placed onto a row of cotton to avert uncontrolled infestations of boll weevils on the study plants. Soil was shoveled around the lower edges of each cage to prevent immigration or emigration of weevils. The plants were irrigated at first bloom.

A hundred newly-emerged boll weevils collected from abscised cotton squares in commercial fields were kept in a 1 × 1 × 1 m cage in the laboratory (26 °C, 35% RH, 12:12 h L:D photoperiod) with 20 fresh squares for 2 d (eggs were not yet sufficiently developed for oviposition). Five of the weevils were released for two days in each field cage. A paper tag was fastened to one bract of each feeding-punctured square, and the date was written on the tag, until 17 squares, all large, were tagged, one from each cage. Seventeen non-damaged large squares (controls), one from each cage, were also tagged. On 15 June, each cage was sprayed with cyfluthrin using a hand-held Greenlawn (Gilmour, Somerset, PA) 2.8-liter capacity pump sprayer to kill all boll weevils present in the cages.

The squares developed into mature speckled bolls that were removed from the growing plant and dissected. Damage to individual carpals inside each boll was recorded. The two sample *t*-test (Analytical Software 1998) was used to detect significant differences between feeding-punctured and control bolls. Percentages were arcsine-square root-transformed before conducting the *t*-test, but nontransformed data is presented.

Results and Discussion

No feeding-punctured squares abscised, each developed into a boll. Unlike oviposition-punctured squares, feeding-punctured squares are not completely lost. Feeding on large squares, as compared to smaller squares and bolls, results in accelerated egg development and oviposition (Showler 2004) which is associated with surges in adult boll weevil populations observed in cotton fields when large squares are the predominant fruiting stage (Showler et al. 2005, Showler and Robinson 2005).

There were significantly more feeding punctures on the damaged squares ($t=\infty$, df=1, 17, $P<0.0001$) and the percentage of damaged carpals was greater ($t=\infty$, df=1, 17, $P<0.0001$) than on the controls (Table 1). Carpal damage, however, was observed in only 35% of the bolls that developed from feeding-punctured squares ($t = 4.39$, df = 1, 17, $P < 0.0001$). Where a square feeding puncture was not associated with a damaged boll carpal, either the developing lint inside the square was not damaged when feeding occurred there, or the weevil's rostrum did not move beyond the square's outer rind. Newly-emerged adult female boll weevils maintained on a steady diet of large square rinds produced eggs as well as weevils fed only on the inner contents of large squares (A.T.S., unpublished data). Of the squares fed on by boll weevils in our study, only 25% of the carpals in resulting bolls had feeding damage.

Table 1. Mean (±SE) numbers of cotton square feeding punctures caused by boll weevils and resulting damaged carpals per boll, and percentages of carpals damaged, Hidalgo County, Texas, 2005 (*n* = 17 fruiting bodies).

Feeding punctures	Punctures per square	Damaged carpals per boll	% damaged carpals per boll
Yes	1.7 ± 0.2 a	0.6 ± 0.2 a	25 ± 7 a
No	0 b	0 b	0 b

Different letters in the same column are significantly different ($P<0.05$), two-sample *t* test.

Feeding on a square can cause a brownish stained area on the lint developing within a boll carpal which eventually withers without discoloration and the injured carpal produces less than its full complement of lint. In our study, the stained areas were always <50% of the carpal so that at least half of each feeding-damaged carpal could be harvested.

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