

INSECT INVESTIGATIONS

Late Season Boll Weevil Infestations and Survival in Cotton Bolls in Arizona^{1,2}

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ABSTRACT

Studies were conducted in Phoenix, AZ, to determine the development of boll weevil, Anthonomus grandis Boheman, infestations in late-season cotton bolls, the pattern of boll weevil emergence, and survival/mortality in the bolls.

Boll weevils emerged from bolls buried in moist vermiculite over a period of 232 to 239 days, from 29 January to 2 August. Higher percentages of emergence and lowest mortality in bolls occurred in bolls collected in November as compared to bolls collected in December.

Few boll weevils emerged from bolls held under dry conditions in an outdoor insectary for 174 days. However, an average of 16% of the weevils were found alive in the dry bolls in late May.

INTRODUCTION

The boll weevil, Anthonomus grandis Boheman, has been of increasing concern in Arizona since 1978 (Bergman et al. 1982). Currently the Arizona Commission of Agriculture and Horticulture, the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture, the California Department of Food and Agriculture, and the Arizona Cotton Growers Association are cooperating in an effort to eradicate the insect from Arizona and southern California.

Major population-suppression strategies associated with the eradication effort involve early detection of overwintering weevils with grandlure-baited traps, timely application of insecticide treatments at or about the pinhead square stage of plant development, and early crop termination and plowdown (APHIS, personal communication). Successful application of those strategies demands a thorough and complete understanding of overwintering boll weevil survival and emergence.

We conducted studies at Phoenix during 1987 and 1988 to determine the pattern of infestation levels in cotton bolls remaining on plants in the field from mid-November until late December. We also investigated emergence patterns and the survival/mortality of boll weevils in the bolls.

PROCEDURES AND RESULTS

Small undeveloped green and dry boll weevil-infested cotton bolls were collected from 10 to 13 cotton fields in the Phoenix area. Collections were made the weeks of 15, 22, and 29 November and 6 and 13 December 1987; the numbers of bolls collected each week were 1,563, 1,779, 1,279, 3,188 and 4,939, respectively. Samples each

week were randomly subdivided into subsample groups of 27 to 254 bolls. Boll subsamples were placed in screen-ventilated 26-cm wide x 35-cm long x 9-cm high plastic boxes. The boxes with bolls were held in an outdoor screen insectary. On 22 January 1988, moist vermiculite was placed to a level covering the bolls in 10 to 13 boxes from each sampling date. The vermiculite was moistened at periodic intervals thereafter until mid-August 1988. All boxes with bolls buried in moist vermiculite were checked weekly from 22 January to 22 August for boll weevil emergence when the bolls were dissected and examined for living and dead boll weevils. The remaining 20 to 26 boxes for each sampling date with bolls and no moist vermiculite were subdivided into two groups for each sampling date and held for an average of 141 (April 15-29) or 174 (May 16 to June 6) days when bolls were dissected and all stages of boll weevils living and dead were recorded. All boxes were checked weekly for boll weevil emergence from 22 January until bolls were dissected.

Numbers of boll weevils in bolls collected weekly from 15 November to 13 December and buried in moist vermiculite ranged from 0.19 to 0.35/boll. Percentages of samples infested ranged from 62% on 15 November to 100% on 13 December, suggesting that boll weevils continued to oviposit and reproduce in immature green bolls on cotton plants at least through early December. No weevils emerged from the collected bolls prior to 22 January 1988. However, boll weevil emergence was initiated within 1.1 to 3.0 weeks following burial of the bolls in moist vermiculite. Most emergence for all collections occurred between 29 January and 22 April, although small percentages of weevils (1 to 2%) emerged as late as 2 August (232 to 239 days in bolls). Average numbers of weeks to last emergence increased from 8.0 for bolls collected 15 November to 13.0 and 12.5 for bolls collected 6 and 13 December, respectively. That may reflect continued oviposition and boll weevil development in bolls collected as dates of collection progressed. Most of the weevils (94 to 100%) in bolls collected from 15 to 29 November emerged and mortality in the bolls was only 0 to 6%. In contrast, 72 and 42% of the boll weevils in bolls collected 6 and 13 December, respectively, emerged and mortalities of adults and pupae in the bolls was 30 and 58%, respectively. The total number of weevils emerged from all bolls buried in moist vermiculite was 521 or 47% of the total number in the bolls.

Only 3 boll weevils emerged from more than 500 collected bolls held for 141 to 174 days under dry conditions in the outdoor insectary. Percentages of samples infested increased from 61 in bolls collected on 15 November to 100% for bolls collected 13 December. The results for increasing levels of percentages of samples infested as the length of time in the field increased were similar to those discussed for other collected bolls. Numbers of boll weevils/boll ranged from 0.31 to 0.98. Percentages of boll weevil survival in bolls held under dry conditions for 141 days ranged from 15 to 43.6%. Survival of boll weevils held in dry bolls for 174 days was greatly reduced and ranged from 1.1 to 16.2%. Higher mortality of boll weevils held for 174 days as compared to mortality in bolls held 141 days may have occurred as a result of exposure to increasingly high temperatures during late May and June.

Boll weevils remain reproductive and oviposit in cotton bolls in Arizona long after cotton harvest. The results of our study show increasing percentages of bolls infested from samples taken in mid-November to mid-December. Boll weevils in bolls exposed to moist conditions may emerge from January to August, whereas adult weevils in dry bolls may live at least to late May. The results of our study show the necessity for stalk shredding, disking, and crop plowdown as soon as possible after cotton harvest. Burial of boll weevil-infested cotton bolls in the soil increases mortality and decreased boll weevil emergence dramatically (Fye et al. 1970, Bergman et al. 1983, Bariola et al. 1984), but maximum benefits can be realized only if the crop is destroyed and plowed down soon after harvest, since continuing development and emergence of boll weevil populations in late-season bolls contribute to the numbers that have the opportunity to overwinter in desert and/or cultivated crop plant trash habitats (Fye et al. 1970, Leggett, unpublished data).

NOTES

¹ Coleoptera: Curculionidae

² Mention of a proprietary product does not constitute an endorsement by the U. S. Department of Agriculture.

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