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DEVELOPMENT OF FRANKLINIELLA OCCIDENTALIS (WESTERN FLOWER THRIPS) ON SUSCEPTIBLE AND RESISTANT COTTON GENOTYPES

M.W. Fairbanks, D.R. Johnson and T.J. Kring
Department of Entomology
University of Arkansas
Fayetteville, AR

Abstract

Reproduction and development of western flower thrips were evaluated on cotton genotypes. Asiatic cotton (Gossypium arboreum L.), accession A2-154 and upland cotton (Gossypium hirsutum L.), cultivar Deltapine 458 BGRR were used as resistant and susceptible genotypes, respectively. No thrips pre-adult developmental differences were found between the two cotton genotypes. Adult longevity of thrips reared on Deltapine 458 BGRR was significantly greater than those reared on A2-154 with 18.64 and 15.14 days, respectively. Also, the average number of thrips larvae produced per day was significantly greater on Deltapine 458 BGRR.

Introduction

The western flower thrips, Frankliniella occidentalis (Pergande) is one of 13 species of thrips known to feed on seedling cotton, Gossypium hirsutum L. (Watts 1937). Given its wide host range and resistance to many insecticides, it is important to look for alternate methods of control in cotton. Thrips resistant cotton cultivars could be particularly helpful in reducing early season populations of western flower thrips. The goal of this research was to determine if F. occidentalis development was significantly altered when reared on susceptible and resistant cotton genotypes and to evaluate their reproductive success on these hosts.

Methods and Materials

Mass Rearing

Deltapine 33B was used for mass rearing. Two species of cotton were used for the developmental and reproduction tests, Deltapine 458 BGRR (Gossypium hirsutum L.) and Asiatic A2-154 (Gossypium arboreum L.)

Thrips Development

Fifty newly emerged thrips were placed into small cages (Fig. 1) and clipped onto cotton cotyledons of either Deltapine 458 BGRR or Asiatic A2-154. The length of time and mortality were recorded for each of the following developmental stages: egg, first instar, second instar, prepupa, pupa and adult. Larval thrips were observed daily to determine mortality and / or molting. Determination of instar was based on exuvia present in the cage. Adults were relocated on the same leaf every three days to evaluate longevity and to assure a fresh feeding surface until death.

Thrips Reproduction

Twenty-five virgin females were caged with males for 24 hrs to allow mating and egg deposition. After each male had been removed, the female was caged on a living cotton cotyledon for 24 hrs. After this time, the location of the cage was marked on the cotton leaf and the female and the cage were relocated to another cotyledon of the same genotype. An empty cage was placed on the previous location to contain any emerging larvae and left in place for nine days to ensure that all viable larvae have emerged. Because egg detection is difficult, the number of emerged larvae was used to evaluate reproductive rates.

Results

Thrips Development

The mean duration of each pre-adult developmental stage was not significantly different ($P>0.05$) between the two cotton genotypes (Table 1). Only adult duration and longevity show significant genotypic effects ($P<0.05$). Thrips adult duration was markedly increased on DP 458 BGRR with an average of 6.83 days as compared to 4.48 days for A2-154. Longevity was greater on DP 458 BGRR that it was for A2-154 with 18.64 and 15.14 days, respectively.

Thrips Reproduction

The number of viable thrips larvae produced per female reared on DP 458 BGRR was almost three times greater ($P<0.05$) than the number produced on A2-154 with 10.28 and 3.48, respectively (Table 2). Likewise, the average number of larvae produced per female per day was significantly greater on DP 458 BGRR (1.45) than on A2-154 (0.80). Because eggs were not easily discernable within the cotyledons, we are unable to determine if egg production was lower on the resistant

genotype. Adult longevity measured in the thrips reproduction test was similar to that in the thrips development test. The average adult longevity of F. occidentalis reared on A2-154 was 4.48 d in the development test. Similarly, thrips adult longevity when reared on DP 458 BGRR was ca. 7 d in both tests.

Conclusion

Cotton probably has more pesticides applied to it during its production than any non-vegetable crop grown today. This makes cotton a good candidate for the incorporation of host-plant resistance for two reasons. First, cotton can be grown more efficiently and at a reduced cost by incorporating insect resistance into existing and new cultivars. Secondly, the use of host-plant resistance will reduce the pesticide load on the crop throughout the growing season, thus reducing the environmental impact of pesticide use (Stewart 1997). A better understanding of the interaction between cotton and thrips biology, particularly during the adult stage of thrips development, is critical to better understand the reasons for increased resistance to thrips.

Literature Cited

Stewart, J. W. 1997. Pest control by host plant resistance, pp 51-61. *In*: G. J. Weidemann & W. C. Yearian [eds.] Alternatives: Accomplishments of the University of Arkansas Alternative Pest Control Center 1989-1995. Ark. Ag. Exper. Sta. Fayetteville, Ar.

Watts, J. G. 1937. Species of thrips found on cotton in South Carolina. J. Econ. Entomol. 30: 857-860.

Table 1. Mean (SE) developmental time (days) of F. occidentalis for susceptible and resistant genotypes.

	Genotype	
Developmental Stage	**Asiatic A2-154**	**DP 458BGRR**
Egg	4.54 (0.12) a	4.42 (0.10) a
Larva 1	2.82 (0.09) a	2.72 (0.09) a
Larva 2	4.64 (0.23) a	5.00 (0.16) a
Prepupa	1.34 (0.09) a	1.35 (0.08) a
Pupa	1.31 (0.09) a	1.05 (0.04) a
Egg to Adult	15.56 (0.36) a	14.77 (0.28) a
Adult	4.48 (0.43)a	6.83 (0.41) b
Longevity	15.14 (0.77) a	18.64 (0.80) b

Means in a row followed by the same letter are not significantly different (LSD<0.05).

Table 2. Mean (SE) reproductive parameters of F. occidentalis for susceptible and resistant genotypes.

	Genotype	
Reproductive Parameter	**Asiatic A2-154**	**DP 458BGRR**
No. viable larvae	3.48 (0.36) a	10.28 (0.78) b
Avg. larvae / day	0.80 (0.07) a	1.45 (0.09) b
Adult longevity	4.24 (0.26) a	7.28 (0.43) b

Means in a row followed by the same letter are not significantly different (LSD<0.05).

Figure 1. Thrips cage on cotton cotyledon.