USDA Forest Service *Research* **Note SE-** 160 **May 1971**

NONLETHAL THRIPS DAMAGE TO SLASH PINE FLOWERS REDUCES SEED YIELDS

Abstract. --Nonlethal damage to female flowers of slash pine (Pinus elliottii Engelm.) by a thrips, Gnophothrips fuscus Morgan, was examined in a north Florida seed orchard. Thrips-damaged flowers developed into crooked mature cones with areas of sunken, deformed cone scales. Damaged cones were significantly shorter, yielded fewer total seed and filled seed per cone, and opened more poorly than undamaged cones.

The destructiveness of a thrips, Gnophothrips fuscus Morgan, to female strobili of slash pine (Pinus elliottii Engelm.) was first brought to the attention of foresters by Ebel.[1] [2] Later, DeBarr[3] illustrated the impact of this insect in a clonal seed orchard, where 45 percent of the female flower crop was destroyed. In addition, more than 25 percent of the surviving flowers sustained damage to scales. This Note reports on effects of the nonlethal thrips damage on subsequent cone development and seed yields in the slash pine orchard.

METHODS

In late February 1967, shortly before natural pollination had ceased, several hundred female flowers on trees in a g-year-old slash pine seed orchard were examined for evidence of thrips-damaged flower scales. The investigations were conducted on the Olustee Experimental Forest, Baker County, Florida. Clusters of thrips-damaged flowers were marked with plastic flagging. In April, after they became pendent, 20 conelets with damaged scales and 20 healthy conelets were marked by loosely tying a short length of colored, plastic-coated wire around the base of each conelet stalk. This procedure was replicated on three trees (blocks) in a randomized block experimental design, with each conelet being an experimental unit.

[1] Ebel, B. H. Thrips injure slash pine flowers. J. Forest. 59: 374-375. 1961.

[2] Ebel, B. H. Control of thrips on slash pine female strobili. J. Forest. 63: 287-288. 1965.

[3] DeBarr, G. L. The damage potential of a flower thrips in slash pine seed orchards. J. Forest. 67: 326-3.27. 1969.

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During mid-September 1968 the mature cones which developed from the tagged conelets were collected, and each was examined, measured for length, and placed in a Kraft-paper bag. Later, the cones were dissected and the seed removed and counted. The proportion of filled seed was determined by radiography, and all filled seed were weighed. Analyses of variance were used to test for significant differences in cone length, yield of seed per cone, number of filled seed per cone, and average weight of seed produced by damaged and healthy cones.

RESULTS AND DISCUSSION

Seventeen months after tagging, 86.9 percent of the undamaged conelets and 63.8 percent of the damaged conelets had matured. Thrips damage reduced weight and overall size of mature cones, which were crooked and gnarled with areas of sunken, deformed scales (fig. 1).

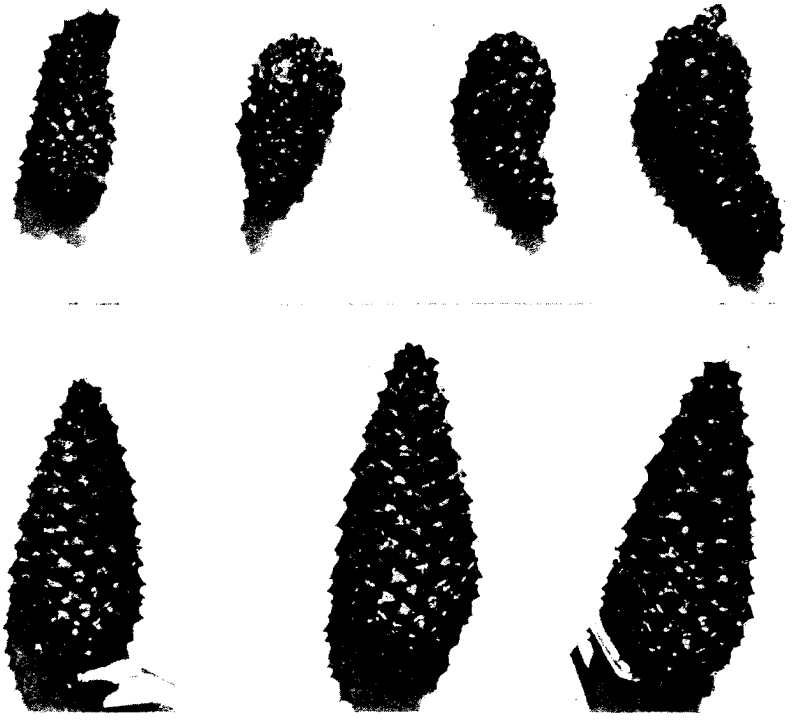

Figure 1. --At , top are mature cones which developed from thrips-damaged flowers. At bottom are cones from healthy flowers produced on the same slash pine tree.

Table 1 and figure 2 show results of the F-tests. Thrips-damaged flowers developed into cones that were significantly shorter and produced fewer total seeds and filled seeds per cone than did those from undamaged flowers. The average length of damaged cones was almost

2 cm. less than healthy cones. More importantly, damaged cones yielded only 1/3 the amount of total, as well as filled, seed per cone. Although the damaged cones usually produced slightly smaller seed, the difference was not statistically significant.

Finally, damage to as few as two or three immature scales on female flowers caused the mature cones to open poorly. Thus, while slash pine cones developing from flowers damaged by thrips produce some filled seed, little, if any, of the seed would be obtainable under conditions imposed by most commercial cone-extraction operations.

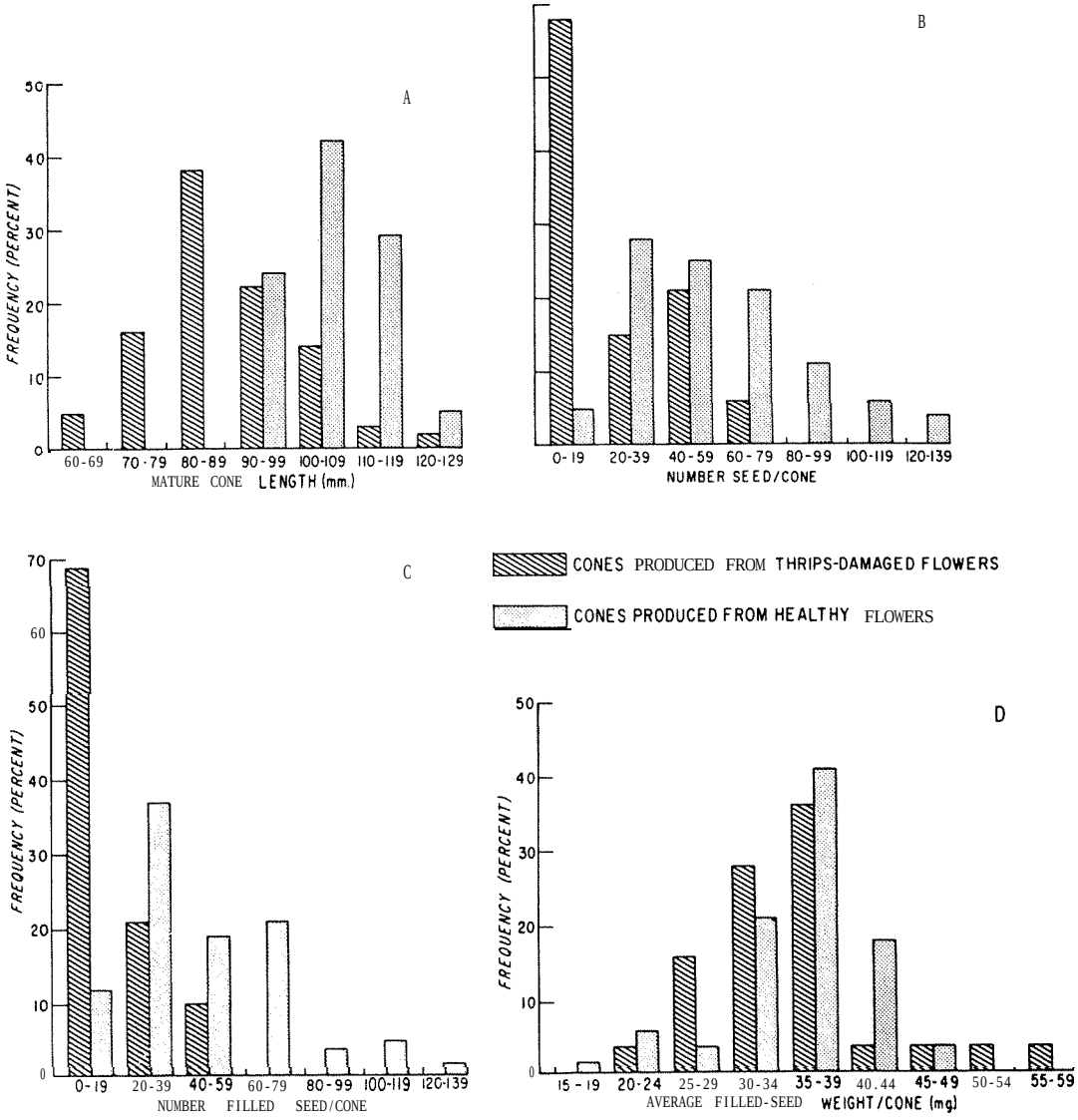

Figure 2. --Effect of nonlethal damage by thrips on cone length (A), total yield of seed (B), yield of filled seed (C), and average filled-seed weight per cone (D) from slash pine.

Table 1. --Comparison of survival, cone length, and seed yield of mature cones produced from healthy and thrips-damaged flowers of slash pine

Factor observed	Condition of female flowers		Value "F-test"
	Damaged by thrips	Undamaged	
Percentage survival (flowers maturing to 2nd-year cones)	63.8	86.9	--
Mean length of mature cones (cm.)	8.78 ± 1.36	10.61 ± 0.90	$4
Mean number seed/cone	19.7 ± 21.5	57.1 ± 29.8	**
Mean number filled seed/cone[1]	18.1 ± 15.3	48.4 ± 28.3	**
Mean filled-seed weight/cone (mg.)	36.4 ± 7.7	38.1 ± 13.0	NS

**Significant at P = 0.01.

[1] Corrected for the number of filled seed damaged by seedbugs and Laspeyresia sp., as determined on radiographs.

Earlier published accounts brought to light the damage potential of flower thrips infestations in slash pine seed orchards. But, in addition to mortality of female buds and flowers, cones produced from flowers with nonlethal damage can also account for a substantial amount of seed loss. Thus, the effects of thrips infestations in slash pine seed orchards are even more devastating than previously known.

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