

VARIABLE SUSCEPTIBILITY TO Dioryctria  
amatella (HULST) (Lepidoptera: Phycitidae)

AMONG PINES IN CLONAL SEED ORCHARDS

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Concern over seed losses due to cone insect damage in pine seed orchards is increasing annually. The coneworm, Dioryctria amatella (Hulst) (Lepidoptera: Phycitidae), is one of the primary pests of pine cones in the southeastern United States. A recent study by Sartor and Neel (1971) has shown that the coneworm does cause significant losses in seed yields in 2 Mississippi pine seed orchards.

Clonal seed orchards offer an excellent opportunity to screen phenotypes for possible sources of host plant resistance to insect infestation. Merkel et al. (1965) provided data that suggest there are inherent differences among slash pines in resistance to Dioryctria attack of cones and stems.

This study was intended as a preliminary step in screening genetic clones of slash and loblolly pines for inherent differences in coneworm infestation rates.

METHODS

Three clonal pine seed orchards in Mississippi were available for study; the McNair Orchard (International Paper Company) in Jefferson County, the Erambert Orchard (United States Forest Service) **in Perry** County, and the Scott Paper Company Orchard in Greene County.

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Entire 2nd-year cone crops were collected from sample trees in each orchard during the harvest seasons. Loblolly cones were collected by hand and slash cones were collected by hand and with a tree shaker. Coneworm infestation rates were recorded for individual trees.

In the 2 loblolly orchards studied (McNair and Erambert Orchards), only those clones with 5 or more trees with adequate 2nd-year cone crops (10 or more cones/tree) were used as sample units. Every clone in the slash orchard that had 2 or more trees with adequate cone crops were used. Not all clones in any of the orchards met these specifications, and not all the genetic sources were sampled. Selection of sample trees within each clone was not made by a completely random method and unequal numbers of sample trees per clone were used so that as many clones as possible could be screened.

### RESULTS

Rates at which the coneworm infested cones in pine seed orchards were recorded for 1969 and 1970 (Table 1). These data show that 2nd-year slash cones were more heavily infested than 2nd-year loblolly cones. However, no insecticides had been applied in the Scott Paper Company orchard or in the Erambert Orchard. These 2 orchards had the highest infestation rates which could be considered as indicative of coneworm control in the McNair Orchard where insecticides had been applied. Data in Table 1 also show there was considerable variation between the 1969 and 1970 **infestation** rates within 2 of the orchards.

Table 1.--Infestation rates of 2nd-year loblolly and slash cones by *D. amatella* at harvest time in 3 pine seed orchards.

Orchard	Number of units sampled			Mean % cones infested
	Clones	Trees	Cones	
McNair (loblolly pine)				
1969 <u>1/</u>	20	--	--	9.48
1970 <u>  </u>	20	245	21,477	11.66
Erambert (loblolly pine)				
1969 <u>2/</u>	--	--	--	--
1970 <u>  </u>	8	80	2,111	23.78

Table 2.--Continued

Orchard	Number of units sampled			Mean % cones infested
	Clones	Trees	Cones	
Scott Paper Company (slash pine)				
1969	32	60	--	17.82
1970	44	249	--	33.69

1/Data were taken from International Paper Company's records which contained information on clones only and represented cones infested by any insect species.

2/This orchard did not produce enough cones in 1969 to obtain an adequate sample.

Mean coneworm infestation rates of 2nd-year cones collected from 20 clones (245 trees) of loblolly pine in the McNair Orchard were analyzed with a completely random design (CRD). An F test showed that the variance in infestation rates among the 20 clones was significant at the  $p < .01$ . When the mean infestation rates were compared with Kramer's extension of Duncan's new multiple range test (DNMRT), it was shown that a group of 9 clones showed signs of resistance, and a group of 2 clones showed signs of susceptibility to coneworm infestation when compared to all clones screened in the orchard (Table 2).

Differences in the mean coneworm infestation rates of the 2nd-year cones of 8 clones (80 trees) of loblolly pine in the Erambert Orchard were analyzed with a CRD. Variance among the means was shown to have a significant F value at the  $p < .01$ . When all the means were compared with Kramer's extension of DNMRT, a group of 5 clones appeared resistant and a group of 3 clones appeared susceptible to coneworm infestation (Table 2).

Differences in the mean coneworm infestation rates of 2nd-year cones collected from 44 clones (249 trees) in the Scott Paper Company Orchard in 1970 were analyzed with a CRD. These differences were also analyzed with a CRD from 2nd-year cones collected from 19 of the same clones (45 trees) in 1969. F tests showed that variance among the clones in each set of data were significant at the  $p < .01$ . When Kramer's extension of DNMRT was used to test for homogeneity among the means in the 1969 and the 1970 data, it was shown that 5 clones appeared consistently resistant and 2

clones appeared consistently susceptible to coneworm infestation when compared to all clones screened in the orchard (Table 2).

Table 2.--Results of preliminary screening for variable susceptibility to coneworm attack in 3 clonal pine seed orchards.

Orchard	Number of clones	
	Susceptible	Resistant
McNair (loblolly pine)	2	9
Erambert (loblolly pine)	3	5
Scott Paper Company (slash pine)	2	5

It is apparent from data obtained on the infestation rates of cones by the coneworm that differences in susceptibility do exist among the clones in each orchard. Within each orchard some clones appear resistant, and some susceptible.

Trees in each of the clones that appear to possess resistance should now be screened more intensively under controlled population densities of the coneworm. If inheritable resistance is definitely established among the clones in the orchards, the agencies involved will have to decide if these characteristics are worth further incorporation into the genetic stock.

#### LITERATURE CITED

- Merkel, E. P., A. E. Squillace and W. G. Bengtson. 1965. Evidence of inherent resistance to Diorycytria infestation in slash pine. Proc. 8th S. Conf. Forest Tree Impr. 96-99.
- Sartor, C. F. and W. W. Neel. 1971. Impact of Diorycytria amatella on seed yields of maturing slash and loblolly pine cones in Mississippi seed orchards. J. Econ. Entomol. 64(1): 28-30.