OVIPOSITION PREFERENCES OF THE NANTUCKET PINE TIP MOTH (LEPIDOPTERA: TORTRICIDAE) ON LOBLOLLY AND SLASH PINE

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ABSTRACT

The Nantucket pine tip moth, *Rhyacionia frustrana* (Comstock), oviposited preferentially on loblolly pine in plantings of adjacent blocks of 4-year-old loblolly and slash pines. Ninety-three percent of 719 eggs found were on loblolly pine. More eggs were deposited on the needles than on shoots. Fifty-six and 64 percent of the eggs were deposited on needles of loblolly pine during the first and fourth generations, respectively. Sixty-one and 100 percent of the eggs were deposted on needles of slash pine during the first and fourth generations, respectively.

Key Words: Tip moth, *Rhyacionia,* resistance, oviposition preference, host preference.

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INTRODUCTION

The Nantucket pine tip moth, *Rhyacionia frustrana* (Comstock) is a persistent and sometimes serious pest in young pine plantations, particularly loblolly pine, *Pinus taeda* L., and shortleaf pine, *P. echinata* Mill., in the Southeastern United States. *Rhyacionia frustrana* has 3 generations per year in the Georgia Piedmont and has 4 generations per year in the Georgia Coastal Plain (Berisford, unpublished data). Tip moth larvae feed inside of buds and growing shoots. Attacks on small trees may cause reduced height growth and loss of form (Yates 1960).

Loblolly pine is planted extensively in the South where it is highly susceptible to *R. frustrana* attack. Slash pine, *P. elliottii* var. *elliottii* shows a high degree of resistance to *R. frustrana* once trees are well established in the field which apparently takes about 2 years (Hood, unpublished data).

Some mechanisms for the resistance of slash pine to *R. frustrana* have been identified. Yates (1966) reported similar numbers of eggs deposited by *R. frustrana* on branches of loblolly and slash pine in laboratory cages, but samples in a mixed 4-year-old loblolly and slash pine plantation showed 5.6 times more 1st instar larvae on loblolly than on slash pine. Yates (1962) concluded that resistance of slash pine was due to differential survival of the larvae because they developed more slowly on slash pine. Slash pine resin did not crystallize as readily as did loblolly pine resin. In 1983, we initiated studies to further examine the relative susceptibility of slash and loblolly pines to tip moth attack.

Our objectives were to: 1) determine if *R. frustrana* females exhibit oviposition preferences between loblolly and slash pine in the field; 2) define quantitatively the preferred oviposition sites of the moth; and 3) determine if the preferred oviposition sites are different on the two pine species.

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MATERIALS AND METHODS

Twelve 0.04-ha plots located within a 160-km radius of Savannah, GA, were selected for this study in 3 and 4-year-old pine plantations owned by Union Camp Corp. Each site had adjacent blocks of 6 trees per tree species which had been planted in 1979. The surrounding plantations consisted of loblolly and slash pine of various ages. The sites had been intensively prepared prior to planting to minimize competing vegetation.

The periods during which maximum oviposition would occur were estimated by the method of Gargiullo et al. (1984). On 14 and 15 March 1983, 4 trees of each species were randomly selected at each of the 12 sites. Two shoots were selected from the top one-third of each tree by a modified version of the procedure reported by Gargiullo and Berisford (1981). Shoots were collected from the top portions of trees because highest tip moth densities occur there (Berisford and Kulman 1967, Gargiullo et al. 1983). The terminal 15-cm of each selected shoot was clipped and placed in 30 × 30-cm plastic bags with closure. Bags were placed in portable ice chests containing "blue ice" and transported to the laboratory where they were stored at 5°C. Egg counts and oviposition sites were recorded using a microscope at 15 ×. Shoot collections were made again on 27 and 28 August, (4th generation) and eggs were counted by the same method. The data were summarized and an ANOVA was conducted on egg counts for both generations.

RESULTS AND DISCUSSION

Table 1 shows the numbers and locations of *R. frustrana* eggs laid on loblolly and slash pines for the 1st and 4th genrations. Most of the eggs (93%) were found on loblolly pine. The ANOVA showed significant differences ($P \leq 0.01$) in egg counts for both generations.

Table 1. Numbers and (percentages) of Nantucket pine tip moth eggs deposited by oviposition site in loblolly and slash pine planted in adjacent blocks on 12 sites near Savannah, GA, in 1983.

Oviposition Site	Pine species and tip moth generation			
	Loblolly 1	Loblolly 4	Slash 1	Slash 4
Needle	311 (56.4)	75 (64.7)	28 (60.9)	6 (100)
Needle base, fascicle and sheath	126 (22.9)	34 (29.3)	15 (32.6)	0 (0.0)
Candles (new shoots)	113 (20.5)	7 (6.0)	1 (2.2)	0 (0.0)
Bark	1 (0.2)	0 (0.0)	2 (4.3)	0 (0.0)

The preferred oviposition site on both pine species was the inner surface of the needle above the needle fascicle (Table 1). The secondary oviposition site was at the base of the needle fascicle and sheath. Both of these sites are sheltered and may provide some degree of protection from parasites, predators, and adverse weather conditions. The candle (new growth of the pine shoot) and bark were least preferred for oviposition. There were no differences in oviposition sites between the 1st and 4th generations on loblolly pine. However, the only eggs found (six) were on slash pine needles during the fourth generation.

Female *R. frustrana* demonstrated the ability to select a susceptible host (loblolly pine) over a resistant host (slash pine) for oviposition when both host species were simultaneously available. The mechanism of this host selection is unknown, but could be a response to chemical, tactile or visual cues, or a combination thereof. Determination of this selection mechanism may yield information that can be used in the future to reduce tip moth attacks on loblolly pine. Breeding for resistance or utilizing chemicals involved in host selection which attract or repel the moths may become a part of future tip moth management.

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