DIAPAUSE OF THE NANTUCKET PINE TIP MOTH,
RHYACIONIA FRUSTRANA (COMSTOCK), IN ARKANSAS

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ABSTRACT

Overwintering samples of pine tips containing tip moth pupae were collected over a three year period from Arkansas plantations. These were held at ca. 25 C until adult moths emerged. Moths did not emerge in the usual generation time, indicating a diapause mechanism that is independent of temperature.

Key Words: Lepidoptera, Olethreutidae, biology, pine insects

Seasonal populations of the Nantucket pine tip moth, Rhyacionia frustrana (Comstock), in Arkansas have been studied for three years, beginning in the fall of 1974. We have observed three complete generations/year with peak adult emergence in April, June and August. A few moths do emerge from pupae in late September, but the majority remain in this stage and emerge in the early spring. Yates (1960) suggested, that in general, this tip moth spends the winter in the pupal stage and may begin adult emergence as early as January in the southern part of the U.S. Fenton and Afanasiev (1946) recorded four generations in Oklahoma with adults in late March, early June, July and September.

Powell and Miller (1978) indicated that a strong, obligate diapause has not been clearly demonstrated for any species of Rhyacionia. They specifically stated "In several, like pasadenana and frustrana, little if any diapause seems to occur; pupae brought indoors in fall or winter complete development and emerge." Richmond and Thomas (1976) stated, that in North Carolina, a facultative diapause occurs in the pupal stage of progeny in each year's third generation. In that area the third generation eggs hatch about mid-August and larvae enter the pupal stage during September. Adults from these pupae emerge the following March and April. The overwintering generations in Arkansas in the three years observed, have not emerged in the normal generation development time for non-overwintering generations. Pupae collected from the field in November 1974 did not emerge until the following January. These pupae were held in the laboratory at about 25 C for ca. 2.5 months before emergence occurred. Total time as pupae was approximately 6

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months. Non-diapause generation time is about 60 days. Similar developmental times were observed for the overwintering generation of 1975-76. Samples were collected from the overwintering population on 25 August 1975 when most of the individuals were in the late larval and pupal stage and again in January 1976 when they were all pupae. Both samples were held under conditions similar to 1974-75. A few moths did emerge initially (<5%) from both samples; however, adult emergence continued until March 25, even though both samples were held at a temperature suitable for development.

In the spring of 1976, tip moth population densities in south central Arkansas were very low and continued to decline until the fall when densities were the lowest observed since 1973. The overwintering 1976-77 population was sampled on 16 September and 3 February. Both samples were composed of all the infested tips from 120 trees located in four different plantations 2-5 years old. A Faxitrion Model 43805® soft tissue, x-ray machine was used to determine that only 19 of the 46 tips of the September collection were actually infested with tip moth immatures and 31 of the 73 tips of the February collection were actually infested. The tips were held at about 25 C until emergence ceased and then the tips were dissected. Some moths did emerge soon after bringing them into the laboratory, however, last emergence occurred 21 April. These moths had been pupae for about 7 months. The September collection had finished emergence and the tips were dissected on 10 February. These tips had been held under the same conditions as the February collection but adult emergence preceded the February collection by only 7-14 days.

Moderate population densities occurred during the 1977 season in our sampling areas. A total of 821 tips showing infestation symptoms were collected from the overwintering generation on 30 August and radiographed to determine the number of immatures. X-rays indicated that only 413 of these tips were actually infested. On 8 November, 475 live pupae and 45 dead immatures were dissected from these tips. Emergence of adults from these pupae was completed by the end of February. Five percent of this population turned out to be the pitch pine tip moth, _Rhyacionia rigidana_ (Fernald) which did not emerge until the middle of March.

From these observations, it appears that _R. frustrana_ does have a diapause mechanism and that temperature above the development threshold does not interrupt diapause.

**LITERATURE CITED**


