



PEAR THRIPS

Taeniothrips inconsequens (Uzel)

The pear thrips is native to Europe. The exact time and source of introduction to North America are unknown, but it became an economically important orchard pest in California during the early 1900s. In 1912 positive confirmation of the pear thrips in Pennsylvania occurred as a result of the collection of specimens from six different pear orchards in Erie County. From that time until the late 1970s very little had been documented regarding the distribution and economic importance of the pear thrips in Pennsylvania. In the spring of 1980, very small, black insects were observed on expanding sugar maple foliage by a forester working for the Pennsylvania Bureau of Forestry. These insects were collected and identification confirmed them as pear thrips. Studies conducted on sugar maples in Pennsylvania in the early 1980s concluded that the pear thrips was indeed responsible for forest tree damage in Pennsylvania. The pear thrips defoliated 1.3 million acres in Pennsylvania during 1988. In North America the pear thrips is distributed throughout Canada and northern United States, extending south to Virginia and California.

DESCRIPTION

The adult (Fig. 1a) is an extremely small insect, measuring only 1.2-1.7 mm in total length. Adults are perceived as mere black specks when observed on foliage. Features of this pest that are important to its identification are not visible without the aid of a microscope. Adults have two pairs of wings, but are weak fliers. Consequently, dispersal by adults from one infested area to another may be attributed to wind currents. Both larvae and adults gain nourishment by sucking fluids from host plant tissue. To date all adults that have been collected in North America are females. Reproduction by this species is by parthenogenesis (development of an egg without it being fertilized). The two larval instars resemble the adult stage in shape. The larvae (Fig. 1b) have red eyes and are pale cream to translucent green which makes them difficult to observe on host foliage. Larvae sometimes congregate in groups on the foliage which makes them more conspicuous. Prepupae and pupae also resemble the adults in general body shape with wing pads evident. Their color ranges from cream to brown depend-

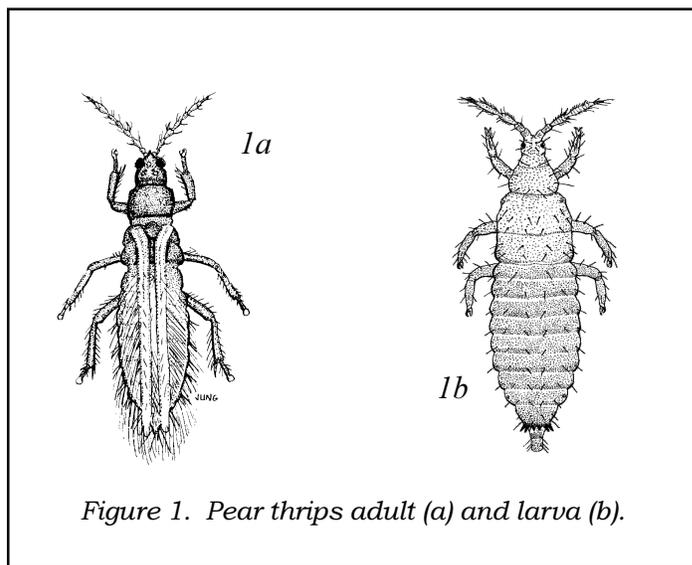
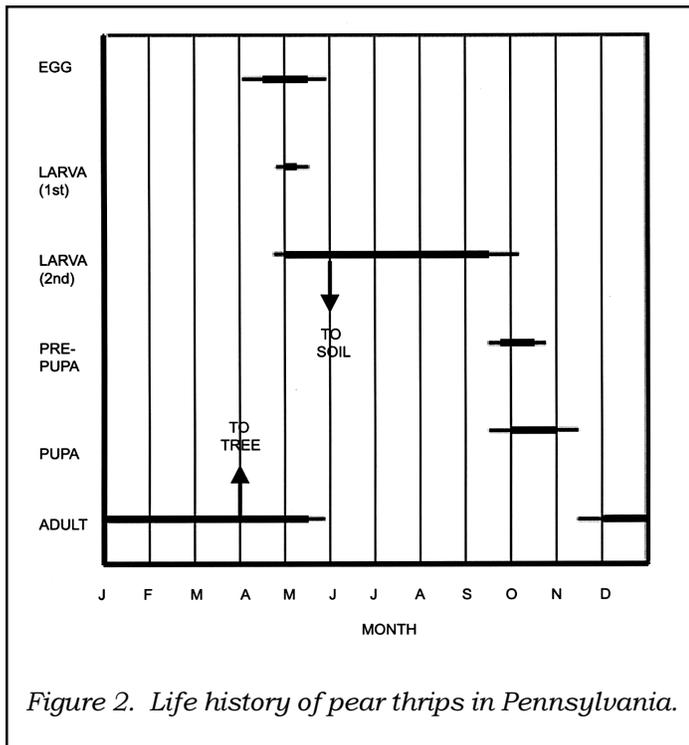


Figure 1. Pear thrips adult (a) and larva (b).

ing on their maturity. The egg is slightly bean-shaped, whitish, and measures 0.75 mm in length by 0.25 mm wide.

LIFE HISTORY

The life history of this species in Pennsylvania is illustrated in Figure 2. This pest spends most of the winter as an adult female in the soil. Emergence of the adults usually occurs when the soil and air temperatures warm in early spring. These conditions normally occur during a period from early to mid-April in Pennsylvania. Adults disperse to a suitable host and crawl beneath a swollen bud scale to gain access to the delicate, immature tissue. Extensive damage to the tender, developing foliage can occur at this time as the result of feeding and, possibly, oviposition by the adults. Eggs are laid soon after a suitable host is located. Each female may lay as many as 150 eggs individually beneath the epidermal cells on the petioles and lower leaf veins. The incubation period may last from a few days to a week. Normally, in Pennsylvania most first instar larvae have emerged from the eggs by mid-May. During this period both adults, and first and second instar larvae may be observed on the lower leaf surface near the juncture of larger veins. By the end of May most adults have died. The development of the two larval instars occurs in a rather short period of time.



Second instar larvae feed until the first week of June. At this time they drop to the leaf litter, burrow to a depth of several inches, and construct a cell in the soil with the aid of spines located near the end of their abdomen. This larval stage remains in the soil until pupation occurs during the fall. The prepupal and pupal stages last a relatively short period of time in the soil. By the end of December most pupae in the soil have transformed to adults. One generation is completed each year in Pennsylvania.

DAMAGE

This pest has been observed on expanding sugar maple foliage in Pennsylvania every year since 1980. Larval and adult life stages of this insect have been observed on a variety of trees including sugar, Norway, and red maple, black cherry, and white ash. Sugar maple is attacked most frequently and severely. In some instances black cherry has been defoliated by this insect in the early spring. Injury to the host plant usually varies with population density. Most damage to sugar maple and other suitable host trees is the result of feeding by adults on delicate tissue inside swelling buds in early spring. Oviposition by adults on this tender tissue may also affect tree health. Additionally, seed production may also be adversely affected by this pest. Damage that is categorized as light usually is expressed in the form of a slight crinkling of the foliage with some darkened areas (egg laying sites) associated with larger veins on the lower leaf surface. Heavy damage is apparent when leaves are dwarfed, expanding approximately one-fourth as large as normal size. The host leaf surface is distinctly crinkled, and its color is mottled with interveinal areas that may be yellow, reddish, or brown. The leaf margin may have a

ragged appearance with a substantial amount of the leaf surface missing. On the lower leaf surface, the larger veins will show an abundance of egg laying sites. The tree crown will appear to be thinly foliated and obviously yellow when viewed from a distance. Damage may vary considerably among individual sugar maple trees. This may indicate that this species has a preference for individual trees within a species.

The long-term effect of this pest feeding on the physiology, growth, and health of sugar maple and other host trees is unknown. However, we may assume that the host tree's production of materials necessary for growth and maintenance is adversely affected. A reduction in sugar maple seed production, the direct result of injury, may have a serious affect on the regeneration of northern hardwood stands and sugar bushes in Pennsylvania. Defoliation stress may cause a reduction in tree health. This injury will often cause the affected host to be more susceptible to invasion by secondary organisms.

MANAGEMENT (in the forest)

The determination of the density and distribution of populations in a forest is critical to any successful management strategy aimed at reducing the impact of this species. Since this pest spends approximately ten months of its life cycle in the soil, monitoring of populations may be best accomplished through the use of soil sampling techniques. Individual tree and stand phenology should be monitored in order to better predict when a management tactic should be initiated. Foliar sampling techniques may prove useful in determining when an appropriate control measure should be initiated. The minute size of this species presents a tremendous challenge to researchers involved in developing effective and reliable population estimates. Quantitative sampling methods that predict population levels have not been developed, therefore, an economic threshold level has not been established for this pest in the forest.

When economically damaging populations are present, an application of a registered insecticide should be directed at the lower leaf surface of host trees during mid-May in southern Pennsylvania. Applications in northern counties should follow about one week later. This is the period of time when most larvae would be exposed on the foliage. Application at this time will not provide foliage protection for the current growing season, but it may reduce the potential for reinfestation during the next season. Currently, there are no registered insecticides for use against adults when they are beneath bud scales.

This pest has a number of natural enemies in the United States. Predators include three species of lacewings, two species of minute pirate bugs, two species of lady beetles, a species of rove beetle, and a species of predaceous thrips. One tiny wasp is also known to parasitize this pest. The effectiveness of these natural

enemies has not been evaluated in the northeastern United States. Additional biological control agents may be discovered through exploration both in the soil and on the host plants in this species' native habitat. In addition to these biological control agents, factors such as soil temperature and soil moisture may also play important roles in regulating populations in the forest.

MANAGEMENT (in the sugar bush)

In addition to the suggestions mentioned above for the monitoring and control of this pest in the forest, managers of a sugar bush may elect not to tap their trees at all the year following injury that has been severe enough to cause refoliation of trees in the same growing season. Another choice would be to monitor individual trees within the sugar bush. A decision to tap only those trees that have not refoliated as a result of stress from the previous year may also be an appropriate management strategy designed to maintain tree health in the stand. When populations are high, application of the registered insecticide should be timed to coincide with the presence of the larval stages on the lower leaf surface. This will usually be during mid-May in southern Pennsylvania. Applications in northern counties should follow about one week later.

MANAGEMENT (on woody ornamentals)

During the past few years, sugar and Norway maples planted as ornamentals have been attacked in many areas of Pennsylvania. Trees most often injured are those that are growing in close proximity to northern hardwood stands. Additional consideration should be given to trees that are growing near fruit orchards where the potential for pear thrips dispersal is a real possibility. Not all maples begin to expand foliage at the same time. Many factors influence leaf expansion which may explain why certain trees are more heavily attacked than others. To reduce the potential impact by this pest the following growing season, application of a registered insecticide should be made against larvae on the lower leaf surface during mid-May in southern Pennsylvania. In northern Pennsylvania applications should follow about one week later. However, this strategy does not provide foliage protection for the current season. Maintaining the health of trees planted as ornamentals that have been subjected to defoliation stress by this pest can be accomplished by broadcasting a low nitrogen fertilizer around the dripline of the tree in the fall after leaf drop. Watering of stressed trees during drought conditions will also assist the tree in maintaining its health.

WARNING

Pesticides are poisonous. Read and follow directions and safety precautions on labels. Handle carefully and store in original labeled containers out of the reach of children, pets, and livestock. Dispose of empty containers right away, in a safe manner and place. Do not contaminate forage, streams, or ponds.

Gregory A Hoover
Sr. Extension Associate
Dept. of Entomology
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