

***Phyllonorycter apparella*, a New Record and a New Pest of Trembling Aspen (*Populus tremula*) in Turkey**

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Phyllonorycter apparella (Herrich-Schäffer, 1855) (Lepidoptera: Gracillariidae) is a new record for the Turkish fauna and a new trembling aspen (*Populus tremula* L.) pest for Turkey. Its biology, damage and infestation ratio were studied in Sarıkamış (Kars), Turkey, during 1996 and 1997. *P. apparella* has one generation a year. The developmental stages of the pest are described briefly. *P. apparella* hibernates in the adult stage. At the beginning of June, the adults appear. Females deposit their eggs on both leaf surfaces, generally one by one, 7–10 days after emerging. The early instars (sap-feeding larvae) start to mine mostly from the underside of leaves. Each mine has one larva, and each leaf may have up to 26 mines. The last instar (tissue-feeding larva) begins to pupate in the mine after mid August. The adults emerge from mid September to the beginning of October, and move to the trunks of old pine trees, where they hibernate in bark crevices. The infestation level may be as high as 90% of the leaves on some trees.

KEY WORDS: *Phyllonorycter apparella*; Lepidoptera; Gracillariidae; trembling aspen pest; *Populus tremula*.

INTRODUCTION

The poplar species (*Populus* spp.) are very important in Turkey, due to their use in industry as firewood and timber. Seven billion cubic meters of timber are obtained from all kinds of forest trees in Turkey, and approximately half of this production comes from poplar trees (1).

The study was conducted in the town of Sarıkamış (province of Kars) located in the northeastern Anatolia Region of Turkey. Sarıkamış has 30,170 hectares of forested areas at an altitude of 1800–2400 m. This forest is composed of trembling aspen (*Populus tremula* L.) mixed with *Pinus* spp. The climate is very cold and snowy during the winter, and warm and dry during the summer season (Fig. 1).

A few Gracillariidae (Lepidoptera) causing damage to poplar trees have been recorded in Turkey (1,7). *Phyllonorycter apparella* (Herrich-Schäffer, 1855) belongs to this family and is known as a poplar pest in Western Europe (from Scandinavia and Finland to the Balkans), all of the European part of the former USSR, Transcaucasia (Azerbaijan, Armenia and Georgia), Kazakhstan, Ural, Siberia, the Far East (3,6), Poland (2), and Lithuania (4,5). So far, there has not been any study or record of this pest in Turkey, nor is there any information about the biology of this species from other countries.

Phyllonorycter apparella, which causes important damage to the leaves of trembling aspen in the Sarıkamış forest area, has been present at epidemic levels for the last 6–7 years. This study was conducted to determine the nature of this pest and to study its biology.

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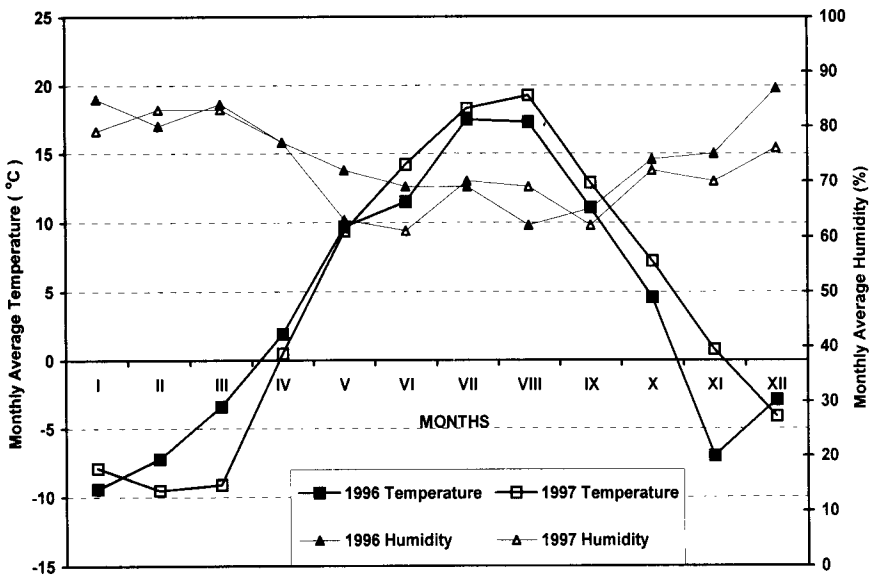


Fig. 1. Monthly average temperature and humidity at Sarkamış (Kars), Turkey, in 1996 and 1997.

MATERIALS AND METHODS

Twice a month from May to October in 1996 and 1997, observations were conducted in the research area and damaged leaves were collected. The leaf samples were examined to determine the infestation ratio by *P. apparella*, the number of eggs and larvae per leaf, and the duration of the developmental stages. The pest is described briefly and some biological information is presented.

RESULTS

The following information about this species is presented to augment that already published on *P. apparella*, such as by Kuznetsov (6). That paper, which is in Russian, presents only some morphological characteristics of adults. We added some more information (including egg, larva and pupa) in this paper.

Adult (Fig. 2a): General appearance bright silvery white; head tuft; frontoclypeus and labial palpi whitish with pale yellow scales; antennae long and scape white, filiform, pale yellowish annulated, brownish on apical parts of most segments; thorax light brownish, tegulae pale yellow; wings dark gray; fore wing narrow and long with whitish indistinct markings and rough scales, cilia whitish on anal side, longer than on apical side; hind wing gray with whitish cilia; wingspan 8.32–9.76 mm. Male genitalia are shown in Fig. 2b.

Egg (Fig. 2c): White and rounded; immediately after oviposition slightly cloudy, subsequently turning transparent; 0.21–0.31 mm in diameter.

Larva: Early (sap-feeding) instars bright white; head flat, head capsule 0.112–0.125 mm in diameter; mouth parts distinct, brownish; thoracic segments distinctly larger than abdominal segments; each body segment with a pair of long bristles laterally and dorsally

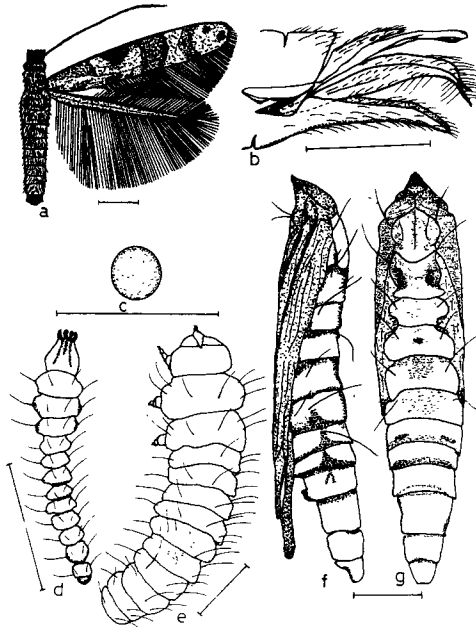


Fig. 2. Biological stages of *Phyllonorycter apparella*: (a) adult; (b) male genitalia; (c) egg; (d) sap-feeding larva; (e) mature larva (tissue-feeding); (f) pupa (lateral view); (g) pupa (dorsal view). Scale line = 1 mm.

(Fig. 2d). Fifth (mature, tissue-feeding) instar pale yellow; head capsule and thorax concolorous; head capsule 0.435–0.475 mm in diameter; body with sparse long bristles; mouth parts light brown; thoracic legs well developed; abdomen with prolegs on segments 3–5 and 10 (Fig. 2e). Diameter of head capsule of the other instars: second instar 0.162–0.175 mm; third instar 0.225–0.237 mm; fourth instar 0.337–0.362 mm.

Pupa (Fig. 2f,g): Pupa semilibera type; light brown, later turning dark brown; extremities visible; 3.82–4.83 mm long.

Biology *Phyllonorycter apparella* hibernates in the adult stage under the bark of mature pine trees adjacent to trembling aspen. The adults were first observed on June 5, 1996, and June 2, 1997. They remain on the host plants ~ 3 weeks (Fig. 3). The females deposit their eggs on both surfaces of leaves, generally one by one, rarely in groups of two or more (up to seven). The number of eggs per 2 cm² was 27–85 (47) on upper surfaces and 8–38 (22) on lower surfaces.

The earliest eggs were laid on June 15 in 1996, and on June 10 in 1997; almost all of them hatched by July 10 and July 8, respectively. The duration of eclosion was approximately 10–12 days. The sap-feeding larvae generally fed in the mines located on the underside of the leaves. They enlarge mines in all directions and the leaves become blotchy. After 2 or 3 days of feeding, a mine was 1–2 mm in diameter; toward the end of July it had grown to ~ 7 mm in diameter (Fig. 4). Each mine contained only one larva, and a single leaf had up to 26 mines. However, some larvae died due to parasitoid activity as well as adverse ecological conditions. Therefore, fewer than 17 mature larvae remained alive in the mines at the end of the season. The feeding larvae and/or pupae, with a water-soaked appearance, were clearly seen at the side of a mine under transmitted light. The

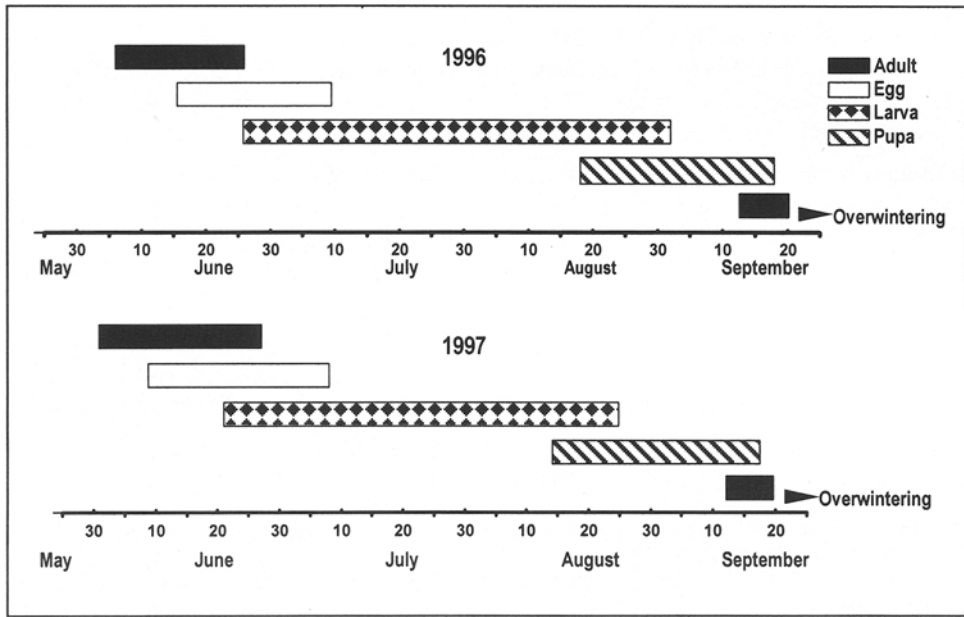


Fig. 3. Duration of biological stages of *Phyllonorycter apparella* in Sarıkamış (Kars), Turkey, in 1996 and 1997.

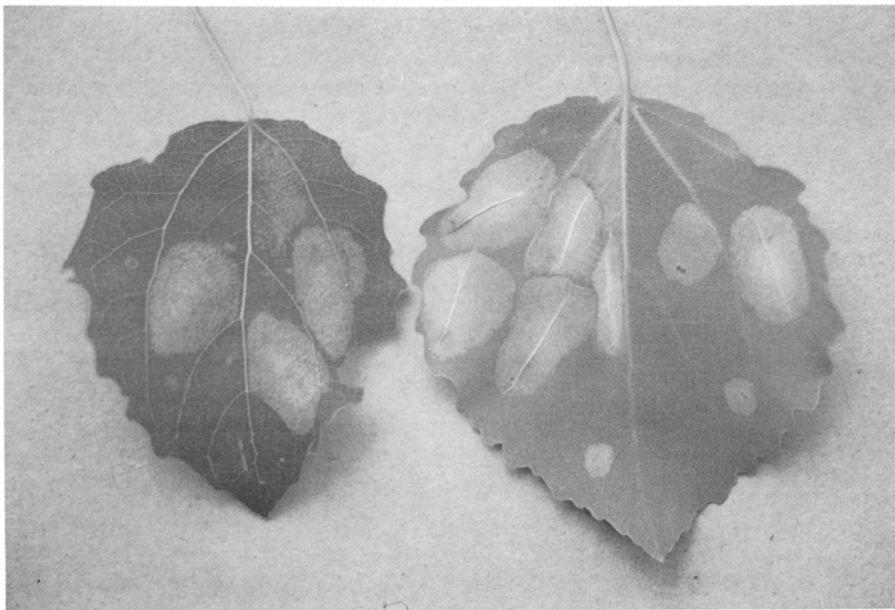


Fig. 4. Mines of *Phyllonorycter apparella*: upperside (left) and underside (right) of leaf.

full-grown fifth instar spins a loose cocoon of silken threads and attaches it to the edge of the mine with its cremaster; the first pupated on August 18 in 1996, and August 14 in 1997. The total larval stage lasts ~ 2 months. Pupation was completed on September 20

in 1996 and September 16 in 1997. In mid September adults start to emerge, and continue to do so until the beginning of October. The adults move to the trunks of mature pine trees for hibernation. Consequently, *P. apparella* had only one generation a year under the ecological conditions at Sarıkamuş in 1996 and 1997 (Fig. 3).

Damage and infestation When a tree is heavily infested, the entire parenchyma tissue of some leaves may have been ingested by the time the larvae reached maturity. Depending on the number of mines, a whole leaf might be destroyed. The infestation level may reach up to 90% of the leaves on one tree, and the infested trees appear brown in color.

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