

Data sheets on quarantine pests
Fiches informatives sur les organismes de quarantaine

Erschoviella musculana

Identity

Name: *Erschoviella musculana* Ershov

Taxonomic position: *Insecta: Lepidoptera: Noctuidae*

Synonyms: *Nycteola musculana* Ershov, *Sarrothripus musculana* Ershov

Common names: walnut moth, Asian walnut moth (English);
ореховая плодожорка, ореховая никтеолина (Russian)

EPPO code: ERSHMU

Phytosanitary categorization: EPPO A2 action list no. 318

Hosts

E. musculana attacks wild and cultivated varieties of *Juglans regia* (Pavlovskii & Shtakelberg, 1955; Degtyareva, 1964).

Geographical distribution

EPPO region: Southern Kazakhstan; Kyrgyzstan

Asia: Southern Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, probably Afghanistan and Iran (Pavlovskii & Shtakelberg, 1955; Degtyareva, 1964; Makhnovskii, 1970)

EU: absent

In Central Asia, outbreaks of *E. musculana* occur in valley and mountain forests and orchards up to an altitude of 1900–2100 m.

Biology

In valleys and on southern slopes of mountains at altitudes of 1100–1300 m, the mass flight of the first generation of *E. musculana* usually occurs from the beginning of April until the end of May. The mass flight of the second generation occurs in June–July. The mass flight of the third generation occurs in August. At higher altitudes (1700–1900 m), the pest develops only two generations per year. In this case, the first generation flies in May and the second at the beginning of August. Above 1900 m, the pest develops only one generation per year and the flight is from the end of May until June. Adults feed on nectar and live for 21 days. The female lays 30–120 eggs, usually 2 or

3 together on young nuts (often where two nuts are touching) or on buds of one-year-old shoots of walnut. Neonate caterpillars usually enter the young nut through the petiole and feed there. After finishing one nut, a caterpillar passes into another and continues to feed. Infested nuts usually contains one caterpillar but it is possible to find nuts with two, and even three, caterpillars. The caterpillar moults four times. Development takes 25–40 days. When leaving the fruit before pupation, the caterpillar makes a round emergence hole, which is much larger than the entrance hole and is not filled with excrement. Caterpillars of the autumn generation cannot enter the nut, and so feed only in the pericarp. Caterpillars also often feed in the centre of young one-year-old shoots and even in leaf axils; this happens more often during years of low harvest of nuts. In this case, the entrance hole (usually at the base of leaf petiole) is also small and filled with excrement (easily seen from outside), whereas the round emergence hole (usually in the terminal bud) is much larger and free from excrement. Caterpillars usually spend all their life inside nuts and shoots, and they leave them only to find a place for pupation. They usually pupate in deep cracks in the bark or under loose bark in the butt part of the trunk up to several metres above the soil. It is possible sometimes to find large aggregations of cocoons (up to 170 specimens) in some refuges (usually under loose bark). Caterpillars of the first two generations may also pupate in the grass or on branches. Pupal development takes about 10 days. The pest overwinters at the larva or pupal stage inside the cocoon (Vassiliev, 1912; Degtyareva, 1964; Makhnovskii, 1955, 1970; Dzhaparov, 1990).

Detection and identification

Symptoms

Damaged fruits are usually easily recognized by brown excrement accumulated at the entry hole of the caterpillar in the fruit or in the shoot. Aggregations of pest pupae are easily detected under loose bark and in other refuges (Fig. 1). Damaged shoots (Fig. 2) often show yellowing and wilting (Vassiliev, 1912; Degtyareva, 1964).

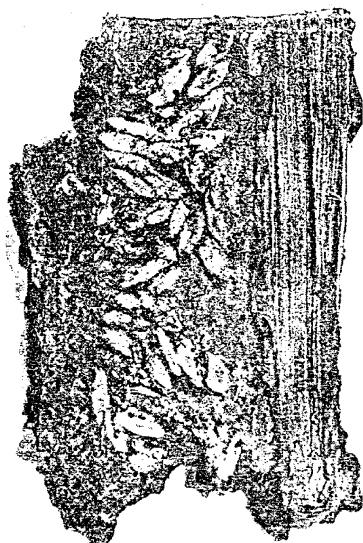


Fig. 1 Aggregations of cocoons of *Erschoviella musculana* under loose bark (all figures from Vassiliev, 1912).

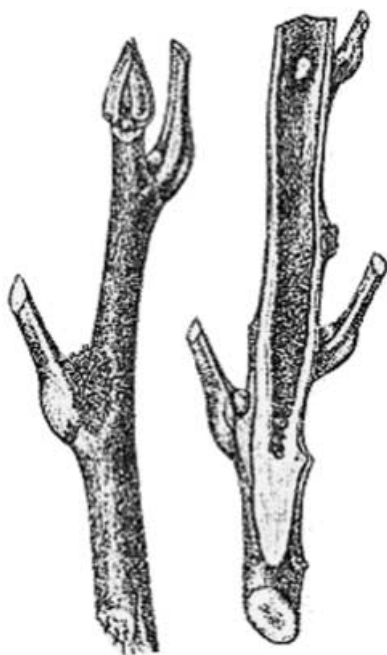


Fig. 2 Walnut shoots damaged by larvae of *Erschoviella musculana*.

Morphology

Eggs

The egg (Fig. 3) is yellowish-grey to reddish-grey, spherical, 0.5 mm in diameter, strongly flattened from below and slightly flattened from the top, covered by small ribs. Both poles are covered by the net of hexagonal cells forming a star at the top (Vassiliev, 1912).

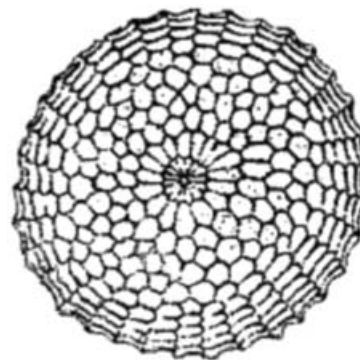


Fig. 3 Egg of *Erschoviella musculana*.

Larva

The neonate larva is cream-white to yellowish-white, 2–3 mm long with dark-brown head (0.5 mm in diameter) and with pronotum covered by a few long light hairs. The fully grown caterpillar before pupation (Fig. 4) is 15–20 mm long and approximately 5 mm wide at the first abdominal segment, light greenish-cream to greenish-brown or reddish-brown with pattern formed by small brown spots and specks. A light brownish pulsing dorsal vessel is visible through the middle of the dorsal part of the body. The body is covered by a few light brownish-cream hairs based on small dark-brown round scutella. These hairs are short on the head and rather long on the dorsal and lateral sides of the body. The anal plate is dark-brown. The pronotum is brown to greenish-brown. Thoracic legs are dark-brown and matt. Abdominal legs are of the same colour as the rest of the body. The head is brown and bright, 3–4 mm in diameter. The stigmata are very small (Vassiliev, 1912; Degtyareva, 1964; Dzhaparov, 1990).

Pupa

The pupa (Fig. 5) is 11–12 mm long and 3.5–3.6 mm wide. The head, antennae, legs and wings are light brownish-ochre. A wide, darker brown to black-brown longitudinal stripe runs along the dorsal side. The abdomen is mat, light greenish-brownish-ochre. The last two tergites have transverse wrinkles. The top of the abdomen is rounded and has no cremaster. The pupa is in a snow-white dense cocoon, which is 12–14 mm long and 4.5–5.2 mm wide (in the middle), and which is narrowed at both ends (Vassiliev, 1912; Degtyareva, 1964).

Adult

The adult wingspan is 18–23 mm (Fig. 6). The length of the body is 8–9 mm. The fore wings are, in general, leaden-grey with transverse brown, white and black bands and lines. The wing fringe is grey with black points. The hind wings are monochrome grey. The thorax is grey or brownish-grey with dark transverse stripe. The antennae are thin, light brown to dark brown, covered by rare small hairs. The palpi are long and thin, grey with dark tops. The underside of wings and of the body is monochrome light grey (Vassiliev, 1912).

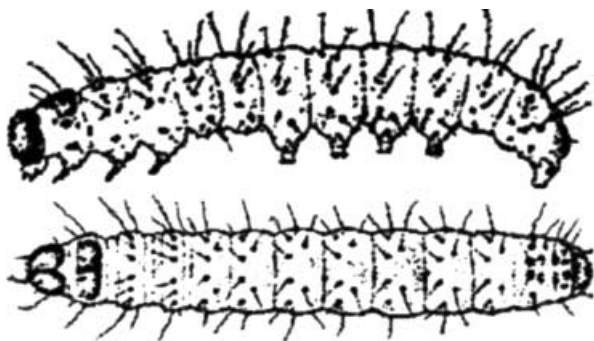


Fig. 4 Caterpillars of *Erschoviella musculana*.

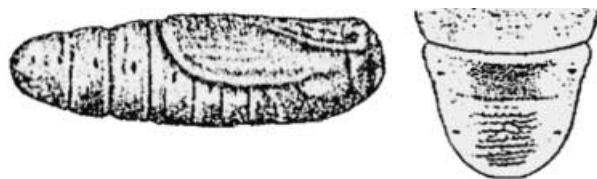


Fig. 5 Pupa (left) and the top of the pupa abdomen (right) of *Erschoviella musculana*.

Pathways for movement

E. musculana can spread by flight of the adult moths. All stages of the life cycle can be transported with walnut fruits (inside nuts) and on walnut plants moving in trade (inside shoots), particularly plants for planting and cut branches. Eggs, larvae and pupae (cocoon) may be associated with wood containing bark and may be present as contaminating pests on other products.

Pest significance

Economic Impact

E. musculana is the most important pest of walnuts in the countries of its present distribution. It is first of all an important pest of walnut fruits. Young fruits damaged by the pest caterpillars fall. One caterpillar may destroy several fruits. Even in the case when caterpillars feed in the pericarp, fruits are deformed and do not usually produce normal nuts. In this way the pest considerably reduces the yield of nuts (by as much as 70–80%). This causes direct economic damage in commercial walnut orchards, and interferes with natural regeneration of walnut forests in mountains (causing erosion). In the years of low yield of nuts, the pest caterpillars feed inside young shoots causing them to wilt. In this case, the most important damage is observed on young trees. The pest may damage mountain walnut forests up to 1900–2100 m (Vassiliev, 1912; Degtyareva, 1964; Makhnovskii, 1970; Dzhaparov, 1990).

Assessment of the economic impact of the pest in 1986/1988 in Kyrgyzstan showed high losses of the walnut growing enterprise 'Arslanbob' due to *E. musculana* (Dzhaparov, 1990).

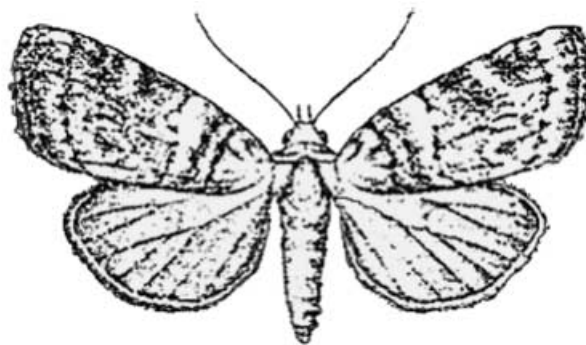


Fig. 6 Adult of *Erschoviella musculana*.

Control

Possibilities for control of the pest are very limited. During almost all its life cycle, it is well protected against chemical and bacterial treatments. On young trees, trapping bands are used against pest caterpillars. Removing and destruction of fallen fruits may give good results. It is also possible to destroy aggregations of pest pupae under loose bark (Degtyareva, 1964; Makhnovskii, 1970; Dzhaparov, 1990).

The natural enemies of *E. musculana* may play an important role in regulation of its populations. 16 species belonging to *Ichneumonidae*, *Braconidae*, *Pteromalidae*, *Torymidae*, *Trichogrammatidae*, *Carabidae*, *Raphidiidae* and *Formicidae* are recorded as parasitoids and predators of the pest. The most frequent of these are *Trichogramma* sp. and *Pimpla instigator*. Sometimes, caterpillars are infected by the bacterium *Bacillus thuringiensis* or the fungus *Beauveria bassiana* (Degtyareva, 1964; Dzhaparov, 1990).

Phytosanitary risk

E. musculana is considered as a serious walnut pest in many southern countries of the former USSR. It is very likely to be able to establish in the many EPPO countries of the south and east of the European part of the EPPO region where its host plants are important nut trees.

Phytosanitary measures

E. musculana was added in 2003 to the EPPO A2 action list, and endangered EPPO countries are thus recommended to regulate it as a quarantine pest. Since the risk of introduction of *E. musculana* with fruits, cut branches or wood appears low enough to be acceptable, phytosanitary measures need concern only plants for planting of *Juglans* spp. Freedom from the pest can be ensured by a pre-export inspection.

References

- Degtyareva VI (1964) [The main lepidopterous pests of trees and shrubs of the central part of Gissar mountain ridge and Gissar valley.] Izdatel'stvo Akademii Nauk Tadzhikskoi SSR, Dushanbe (TJ) (in Russian).

- Dzhaparov EB (1990) [Biology and ecology of *Erschoviella musculana* in walnut forests of Southern Kirgizia.] Doctoral Thesis, Leningrad Forest Technical Academy, Sankt-Peterburg (RU) (in Russian).
- Makhnovskii IK (1955) [*Pests of Shelter Plantations in Central Asia and their Control.*] State Editing Office of Uzbek SSR, Tashkent (UZ) (in Russian).
- Makhnovskii IK (1970) [The walnut moth.] *Zashchita Rastenii* no. 15, 30–32 (in Russian).
- Pavlovskii EN & Shtakelberg AA (1955) [*Guide to Forest Pests.*] Izdatel'stvo Akademii Nauk SSSR, Moscow–Leningrad (RU) (in Russian).
- Vassiliev IV (1912) [Oriental leaf beetle *Agelastica orientalis* Baly and walnut moth *Sarothripus musculana* Ersch. – two pests of Turkestan horticulture.] *Proceedings of the Bureau of Entomology* v, IX, 7. Merkushev, Sankt-Peterburg (RU) (in Russian).