Prepared by CABI and EPPO for the EU under Contract 90/399003

Data Sheets on Quarantine Pests

Blitopertha orientalis

IDENTITY

Name: *Blitopertha orientalis* (Waterhouse)
Synonyms: *Anomala orientalis* (Waterhouse)
Taxonomic position: Insecta: Coleoptera: Scarabaeidae
Common names: Oriental beetle (English)
Bayer computer code: ANMLOR
EPPO A1 list: No. 33
EU Annex designation: I/A1 - as *Anomala orientalis*

HOSTS

B. orientalis is a polyphagous pest, whose larvae feed on the roots of grass and many vegetable crops, and have been recorded in particular damaging maize, pineapples and sugarcane. The adults feed on flowers (e.g. *Alcea rosea*, *Dahlia* spp., *Iris* spp., *Phlox* spp. and roses). For the EPPO region, grass, vegetables and maize would be the most significant host plants.

GEOGRAPHICAL DISTRIBUTION

EPPO region: Absent.
Asia: China, Japan, Korea Democratic People's Republic, Korea Republic, Taiwan.
North America: USA (north-eastern states, North Carolina and Hawaii).
EU: Absent.
Distribution map: See CIE (1959, No. 108).

BIOLOGY

At the latitude of New York, *B. orientalis* usually completes its life cycle in 1 year, although individuals may spend two winters as larvae. Adults emerge towards the end of June and are present for about 2 months. Swift, low, short flights (only 1 m) are characteristic during the day from 08:00 to 16:00. From early July until early September, females burrow into the soil where they deposit eggs, singly, at a depth of 2.5-23 cm (average 12 cm) beneath the surface. Although single females are known to lay up to 63 eggs, the probable field average is around 25. Eggs hatch in a few days and the larvae, which prefer unshaded, frequently mown lawns, burrow to 10-20 cm from the soil surface and continue feeding on tender young grass roots and humus until temperatures drop to freezing. Their depth in the soil depends on the moisture content, the larvae burrowing deeper into the soil as the surface layer dries out during the summer. They can attain relatively high densities, far exceeding 100-150 larvae per m^2. Growth is rapid and there are three larval instars. From mid-October, larvae descend in the soil to a depth of 20-42 cm, where they overwinter in a comparatively inactive state - a few in the first instar, about 40% in the second and the rest in the last instar. Towards the end of April, they return to the surface and feed until early June, when each larva prepares a cell by packing the soil at

a depth of 12 cm below the surface. Larvae become prepupae in this cell; all feeding ceases, the legs lose their function and become shrivelled and the colour changes to a yellowish-white. After about 7 days, the insect enters the pupal stage, during which it lies in the cast skin of the third instar larva and remains in the cell for 10-15 days. Pupae have been found in the field from early June to mid-August. The adult emerges by splitting the pupal cell, but it remains in the cell for a few days until it has hardened.

From laboratory studies in Hawaii (Bianchi, 1935; Van Zwaluwenburg, 1937), *B. orientalis* was reported to have an average pre-oviposition period of 7.1 days and to lay eggs for 8.3 days; eggs hatched in 14.8-18 days at 25.5°C and 100-96% RH. Exposure to a constant temperature of 37.5°C for 144 h killed all eggs; 38% of eggs kept submerged for 10 days after laying hatched. The average number of eggs laid per female was 32.1. At temperatures of 21 and 26°C, pupal development in males took 11.4-9.1 days, and in females 11.1-8.7 days (the reverse relationship to that commonly found in Coleoptera). In optimum conditions, total development from egg to adult took 164.5 days. For additional information see Hallock (1930), Bianchi (1935), Van Zwaluwenburg (1937), Tashiro (1987).

DETECTION AND IDENTIFICATION

Symptoms

Symptoms of *B. orientalis* in grass are normally not easily seen during the first year of infestation. Grubs cut the roots just beneath the soil surface. In dry and hot summers these plants die relatively quickly and in cases of high grub density dead and black patches appear.

Adults of *B. orientalis* prefer the soft plant tissue between the veins of leaves for feeding. The rougher tissue of the veins is not consumed by the beetle which leaves the skeleton of the leaf. Severely affected leaves turn brown and fall off (USDA, 1963).

Morphology

Eggs

White, about 1 mm in diameter and found in soil.

Larva

After hatching, the larva is 1.5 mm long but when fully grown after 2 months, it reaches approximately 25 mm. It possesses two longitudinal rows of pointed spines (11-15 in each row) on the underside of the last segment, and can be distinguished from other white grubs (Melolonthinae) by the smaller size and transverse, rather than V- or Y-shaped anal opening.

Pupa

Found in the cast, yellowish skin of the third instar larva. A typical coleopteran pupa.

Adult

8-11 x 4.5-6 mm, typically straw-coloured with dark markings, but may be entirely straw-coloured or entirely black. A light, median line may divide the thorax into two black areas. The wing covers usually have one or two U-shaped bands and a black spot at the inner basal angle of each.

MEANS OF MOVEMENT AND DISPERSAL

Natural spread of the beetle has been slow because it rarely makes long flights. Mechanical agencies, however, are of considerable importance in long-distance spread. Adults may remain hidden in flowers, while larvae may be present in soil accompanying consignments.

PEST SIGNIFICANCE

Economic impact

Losses mainly arise from larvae of *B. orientalis* feeding on roots, which may be severely damaged, with crops turning brown and dying. In lawns, feeding by the overwintering larvae may kill the grass in June, but more often in August and September, with areas from a few cm^2 to 1-2 ha turning brown. In 1928, about 6 ha of lawn were injured in New York State alone. The infested area at New Haven, Connecticut, in 1928, covered about 2.5 km^2 (Hallock, 1930). Damage is usually greatest on unshaded lawns where the grass is kept short by frequent mowing. Damage may vary with soil type; soils high in iron and aluminium colloids, and which dry to light fluffy masses with the subsoil remaining very humid, are the most readily colonized. Adult feeding on flowers is of trivial importance.

Control

In the 1920s, biological control using the parasitic wasps *Scolia manilae*, *Tiphia vernalis* and *T. popilliavora*, was quite successful, especially in Hawaii.

Several insecticides are reported to be effective against *B. orientalis* (Villani *et al.*, 1988). Bendiocarb, chlorpyrifos, ethoprop, diazinon and isofenphos are the main active ingredients used in the USA. For additional information see Hallock (1930), Tashiro (1973).

Phytosanitary risk

B. orientalis has the status of an A1 quarantine pest in EPPO (OEPP/EPPO, 1979) and is also of quarantine significance for OIRSA. If introduced into the EPPO region, *B. orientalis* could cause considerable losses in horticulture, and especially to grass.

PHYTOSANITARY MEASURES

Plants with roots from countries where *B. orientalis* occurs must have been planted in an inorganic growing medium or in a growing medium tested or treated by an EPPO-approved procedure. These plants should either be kept under conditions which prevent reinfestation or should be freed from the original growing medium and kept bare-rooted or be replanted in an EPPO-approved tested or treated growing medium (OEPP/EPPO, 1990).

BIBLIOGRAPHY

Bianchi, F.A. (1935) Investigations on *Anomala orientalis* Waterhouse at Oahu Sugar Co. Ltd. *Hawaiian Planters' Record* **39**, 234-255.

CIE (1959) *Distribution Maps of Pests, Series A* No. 108. CAB International, Wallingford, UK.

Hallock, H.C. (1930) The Asiatic beetle, a serious pest in lawns. *Circular, US Department of Agriculture* No. 117.

OEPP/EPPO (1979) Data sheets on quarantine organisms No. 33, *Anomala orientalis*. *Bulletin OEPP/EPPO Bulletin* **9** (2).

OEPP/EPPO (1990) Specific quarantine requirements. *EPPO Technical Documents* No. 1008.

Tashiro, H. (1973) Bionomics and control of root feeding insect pest: grubs and billbugs. *Bulletin of the Entomological Society of America* **19**, 92-94.

Tashiro, H. (1987) *Turfgrass insects of the United States and Canada*, xiv + 391 pp. Comstock Publishing Associates, Ithaca, NY, USA.

USDA (1963) *The Japanese beetle in the United States. Agricultural Handbook, USDA*, 30 pp. US Department of Agriculture, Washington DC, USA.

Van Zwaluwenburg, R.H. (1937) Summary of laboratory studies of *Anomala* 1933-35. *Hawaiian Planters' Record* **41**, 25-32.

Villani, M.G.; Wright, R.J.; Baker, P.B. (1988) Differential susceptibility of Japanese beetle, oriental beetle, and European chafer (Coleoptera: Scarabaeidae) larvae to five soil insecticides. *Journal of Economic Entomology* **81**, 785-788.