EPPO DATA SHEETS ON QUARANTINE PESTS

Naupactus leucoloma

IDENTITY

Name: *Naupactus leucoloma* Boheman
Synonyms: *Graphognathus leucoloma* Buchanan
Pantomorus leucoloma Boheman
A full list of synonyms is given by Lanteri & Marvaldi (1995).
Taxonomic position: Insecta: Coleoptera: *Curculionidae*
Common names: white-fringed weevil (English)
white-fringed beetle (English)
Notes on taxonomy and nomenclature: before 1995, the name *Graphognathus leucoloma* was widely used and much of the literature concerning this pest refers to it as *G. leucoloma.*. Warner (1975) synonymized four earlier described subspecies of *G. leucoloma* (*G. l. leucoloma, G. l. pilosus, G. l. striatus, G. l. dubius*) and established that there are four valid species of *Graphognathus* in North America (*G. leucoloma, G. minor, G. peregrinus* and *G. fecundus*). These are now transferred to the genus *Naupactus*.
Bayer computer code: GRAGLE
EPPO A1 list: No. 293

HOSTS

Naupactus leucoloma is a highly polyphagous pest (CSL, 1999), able to feed on a very wide range of plant species (with more or less damage). On crops of interest for the EPPO region, it causes most severe damage in the following: *Brassica* spp., *Daucus carota, Fragaria* x *ananassa, Medicago sativa, Pisum sativum, Rubus* spp., *Solanum tuberosum, Trifolium* spp. and *Zea mays*. Pastures can be seriously damaged, with the legumes and not the grasses being attacked. *N. leucoloma* has been recorded on 385 species in the USA alone (Young *et al*., 1950), including, besides the above-mentioned, various herbaceous crops such as *Arachis hypogaea, Ipomoea batatas* and *Vigna unguiculata*, weeds, grapevine and trees such as *Prunus persica* (peach) and *Salix* (willow) (Metcalf & Metcalf, 1993).

GEOGRAPHICAL DISTRIBUTION

The centre of origin of *Naupactus* species is South America, with *N. leucoloma* ranging from 12°S to 42°S, west of the Andes and from 15°S to 38°S, east of the Andes.
EPPO region: Absent.
Africa: South Africa (Northern Cape Province)
North America: USA [first recorded in Florida in 1936, it has since spread to Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, New Mexico (Sites & Thorvilson, 1988), North Carolina, South Carolina, Tennessee and Texas (Eggert *et al*., 1990; Metcalf & Metcalf, 1993) and Virginia].
South America: Argentina (Buenos Aires, Catamarca, Chaco, Córdoba, Corrientes, Entre Rios, Formosa, Jujuy, La Pampa, La Rioja, Mendoza, Rio Negro, San Juan, San Luis, Santa Fe, Santiago del Estero, Salta and Tucumán), southern Brazil (Rio Grande do Sul) and Uruguay. It is considered as introduced in Chile and Peru (Lanteri & Marvaldi, 1995).
Oceania: Australia (first reported in New South Wales in 1932, it is now quite widespread within the state; it is also in Victoria, Western Australia and Queensland.) New Zealand (first discovered in the Auckland area in 1944, now well established in several parts of North Island; also occurs in South Island; Perrot, 1964).
EU: Absent.
Distribution map: See CIE (1964; no. 179).

BIOLOGY

Males are rare and have only been found in South America (Lanteri & Marvaldi, 1995). Outside South America, only parthenogenic females are found. Five to 25 days after emerging, mature females begin to lay up to 1500 eggs in groups of 20-60 over a two-month period. Eggs hatch in 11-30 days, and developmental threshold temperatures and thermal constants have been determined by Masaki (1998). There are 11 larval instars, the first of which does not feed (Gough & Brown, 1991). The larval stage usually overwinters, although eggs can also overwinter. It is the damage caused by larval feeding that makes *N. leucoloma* a pest. Larvae pupate in oval chambers in the soil during early

summer. Adults emerge in the summer. The elytra are fused and adults cannot fly, so high densities can build up locally. Up to 200 or 300 individuals can be found per plant.

DETECTION AND IDENTIFICATION

Symptoms

Adults feed at the bases of leaf margins, leaving characteristic "notching" but this seldom injures plants seriously except when adults are very numerous (Zehnder, 1997). Larvae mostly gnaw at tap roots and the basal parts of stems, although they also feed on small lateral roots. Root feeding extends from the soil surface to a depth of about 12 cm. When feeding is severe, plants turn yellow, wilt and die. Plants on which only a small amount of the cambium layer is eaten usually survive, but produce little or no crop. In lucerne, the larvae chew well into the taproot and, though rarely severing it, they usually work for some distance along it making a furrow, resulting in the death of young plants.

Morphology

Egg

The egg is oval, approximately 0.9 mm long and 0.6 mm wide. When freshly laid it is milky white, but after 4-5 days, it changes to a dull light yellow. The number of eggs laid can be affected by the host plant (Ottens & Todd, 1979). Eggs are laid in clusters of 12-60 in the soil or on the roots, in ground litter beneath plants or on stems and lower leaves of plants. They are fixed together with a sticky, gelatinous mass, which hardens into a protective film, allowing them to withstand drought. Soil also sticks to egg masses making detection of the eggs difficult. In midsummer in the USA, eggs hatch within 14 days, but cooler weather slows egg development, which can take up to 3 months (Metcalf & Metcalf, 1993).

Larva

The fully grown legless larva is about 13 mm long and 6 mm wide. It has a small, round pale-brown head, which is tucked back into the prothorax with only the black mandibles protruding. The body is yellowish-white, fleshy, curved and sparsely covered with hair. It consists of 12 segments interrupted by 2 sublateral longitudinal grooves extending the length of the body. The entire larval stage is spent in the soil at a depth of 1-15 cm, but some may burrow deeper. Lanteri & Marvaldi (1995) provide a key to the first-instar larvae of three species within the *N. leucoloma* group.

Pupa

The pupa is about 10-12 mm long and changes colour from white to brown as the body appendages darken before transformation to the adult. Larvae pupate in oval chambers 5-15 cm deep in the soil during early summer.

Adult

Only females of this species are found outside South America (Lanteri & Marvaldi, 1995). The adult female is 8-12 mm in length and 4 mm wide across the abdomen. It has a short snout and is oval in general shape. It is dark grey, with a lighter band along the outer margin of its wing covers and two paler longitudinal lines on each side of the head and thorax one above and one below the eye. The abdomen is densely covered with short pale hairs which become longer towards the tips of the elytra. The inner margins of the elytra are fused together, and the adults cannot fly. Males are shorter, about 8.5 mm long, and narrower with longer antennae and legs. Lanteri & Marvaldi (1995) provided a key to adults within the *N. leucoloma* group.

MEANS OF MOVEMENT AND DISPERSAL

Adults cannot fly but they actively crawl and climb. Females can crawl 0.4-1.2 km during their 2-5-month adult life (Metcalf & Metcalf, 1993). Adults cling to hay and other crops and to vehicles and agricultural equipment being transported, and can thus be carried in trade. Since eggs are laid on many parts of host plants and remain viable for more than 7 months, they can also be transported in trade (Chadwick, 1978). Eggs, larvae and pupae may also be transported with soil attached to plants for planting or turf. As females are parthenogenetic, the chance of small populations colonizing new regions is increased.

PEST SIGNIFICANCE

Economic impact

Very low population densities of *N. leucoloma* can cause economic damage. A density of only one larva m^{-1} row of potatoes (equivalent to about 1 larva 1.5 m^{-2}) resulted in a loss of 9% of average gross return (Learmouth, 1993). As larvae feed on roots, the damage they cause is noticed when plants begin to show stress by becoming yellow or stunted. Larvae often sever a plant's main root while feeding. In potatoes, damage is more spectacular, as larvae tunnel inside the tubers. In New Zealand, the nitrogen fixation rate of *Trifolium repens* was reduced by 92% by *N. leucoloma* larval feeding (Hardwick & Prestidge, 1996). Larvae hatching from eggs in early or late summer reach sufficient size to damage sweet potato roots before the autumn harvest (Zehnder, 1997). Adults feed on leaves, but the resulting damage is very minor except at high population densities. Metcalf & Metcalf (1993) stated that "entomologists who have studied the insect feel that it may become a serious pest in many regions of the United States" and hence, the USA has internal phytosanitary regulations to limit its spread.

Control

Once established on outdoor crops, little can be done to control infestations except to grow oats and small grain cereals on infested land as these crops are not attacked to any great extent by *N. leucoloma*. Adult *N. leucoloma* cannot fly, so ditches about 25 cm deep and 25 cm wide, with steep, well-packed sides can be used to prevent populations from spreading. Holes in the ditches can trap the adults which can then be destroyed with kerosene (Metcalf & Metcalf, 1993). Unfavourable weather, soil conditions, parasites, predators and diseases are important factors in keeping *N. leucoloma* in check. Carabid beetle larvae, horsefly larvae, wireworms and ants feed on *N. leucoloma* in the field and vertebrates such as toads, mice, snakes and birds feed voraciously on adult beetles (Young *et al*., 1950). Adult beetles are susceptible to a wide variety of insecticides, but it is the larvae that need to be targeted as they cause the most damage. However, the soil-dwelling larvae are difficult to control; chlorpyrifos and metam-sodium are the best products to use, but they do not give entirely satisfactory results (Ralph, 1992). Crop rotation is probably the best form of control. Matthiesen *et al*. (1997) reported research suggesting that rotation with high-glucosinolate *Brassica* spp. will lead to the release, during their decomposition of their residues, of methyl isothiocyanate (the active decomposition product of metam-sodium), thus providing a means of "biofumigation" against larvae of *N. leucoloma*. Methyl isothiocyanate was found to be the most active of several fumigants against *N. leucoloma* (Matthiessen *et al*., 1996).

Phytosanitary risk

N. leucoloma has spread from its native South America to South Africa, Australia, New Zealand and the USA. Despite phytosanitary measures in the USA, it has spread from Florida to states further north and west. *N. leucoloma* damages many important crop plants, particularly potato and forage plants, and can survive on a great variety of other hosts. In countries where it has been introduced, it usually becomes a pest (Lanteri & Marvaldi, 1995). Given the current distribution of *N. leucoloma* (south-eastern USA and South America), most of the southern part of the EPPO region would be climatically suitable for establishment of this pest.

PHYTOSANITARY MEASURES

No specific measures have yet been recommended at the European level, but the general measures recommended for soil-borne pests should apply. Plants of host species with roots from countries in which *N. leucoloma* occurs should be grown following EPPO Standard PM 3/54 (OEPP/EPPO, 1994).

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