EPPO Datasheet: *Anthonomus quadrigibbus*

Last updated: 2022-07-19

IDENTITY

Preferred name: *Anthonomus quadrigibbus*
Authority: Say
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Curculioninae
Other scientific names: *Tachypterellus consors cerasi* (List), *Tachypterellus quadrigibbus magnus* List, *Tachypterellus quadrigibbus* (Say), *Tachypterus quadrigibbus* (Say)
Common names: apple curculio, large apple curculio, western curculio
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EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: TACYQU

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HOSTS

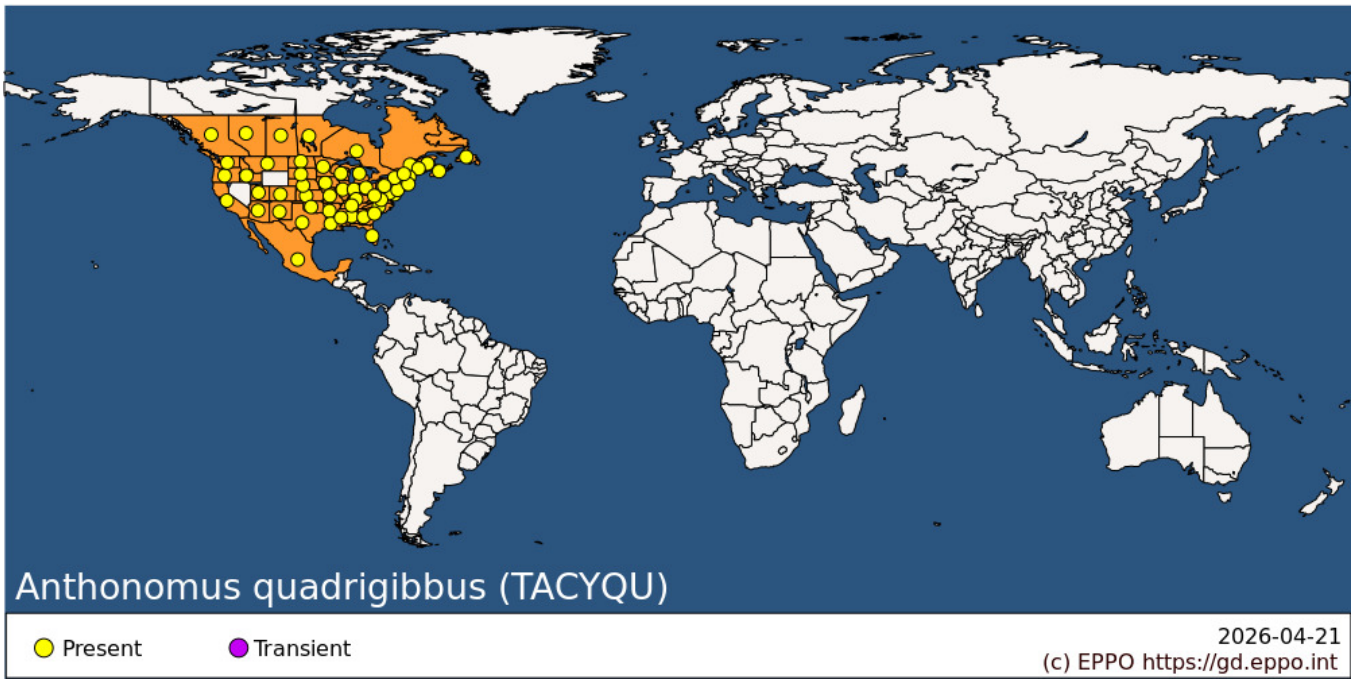
Anthonomus quadrigibbus is associated with a wide range of plants in the Rosaceae family and, with *Cornus stolonifera* (Cornaceae) (Burke & Anderson, 1989). In addition, Burke (1976) mentioned that this species may also develop in the fruit of *Melia azedarach*. Apples and *Crataegus* spp. are the main host plants. Burke & Anderson (1989) gave the following list of Rosaceae from which the adults have been reared or collected: *Crataegus mollis*, *C. holmesiana*, *C. crus-galli*, *C. punctata*, *C. macrosperma*; apples and sweet crab apple (*Malus coronaria)*; *Prunus serotina*, *P. virginiana* var. *demissa*, *P. emarginata*, *P. virginiana*, *P. cerasus*; pears; *Amelanchier alnifolia*; *Sorbus* sp. Maier (1990) noted other *Amelanchier* species (*A. arborea*; *A. canadensis*; *A. obovalis*) that can serve as host plants for *A. quadrigibbus*. A small number of larvae were also observed on *P. pensylvanica* (Maier, 1990). *Crataegus* is a common host in eastern but not in western North America. While apples serve as hosts in the eastern and midwestern portions of the range, cultivated cherries are a significant host only in Colorado. Wild *Prunus* species represent potential hosts throughout the range of the species. *Amelanchier* spp. appear to be suitable hosts only in eastern and central North America; in western regions, only *Anthonomus consors* is associated with this plant genus (Burke & Anderson, 1989).

In the EPPO region, the cultivated hosts are grown throughout the region, and the genera *Crataegus*, *Prunus* and *Sorbus* are well represented in the wild flora.

Host list: *Amelanchier alnifolia, Amelanchier arborea, Amelanchier canadensis, Cornus sericea, Crataegus crus-galli, Crataegus holmesiana, Crataegus macrosperma, Crataegus mollis, Crataegus punctata, Cydonia oblonga, Malus coronaria, Malus domestica, Prunus cerasus, Prunus emarginata, Prunus pensylvanica, Prunus serotina, Prunus virginiana var. demissa, Prunus virginiana, Pyrus communis, Sorbus sp.*

GEOGRAPHICAL DISTRIBUTION

The species is endemic in North America and widely distributed across Canada, the United States of America and Central Mexico (Burke & Anderson, 1989).



North America: Canada (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Québec, Saskatchewan), Mexico, United States of America (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin)

BIOLOGY

Adult weevils overwinter on the ground beneath the trees. They begin to emerge when the ground surface temperature is about 16°C or above for at least 24 h and fly strongly when the temperature is much higher. In the Champlain Valley, New York State (USA), emergence usually starts in early May. Adults disperse actively in the spring, seeking the most suitable hosts. At first, they feed on leaf petioles, flower buds, and then on blossoms and finally on small fruits as soon as they have set.

There is considerable migration in the spring from one host to another as fruit is set, the weevil showing a preference for smaller fruit (Hammer, 1936). Ritcher (1936) showed that weevils reared from *Crataegus* and apple both preferred to oviposit on the host from which they were reared. However, if the preferred host is not available, the weevils will readily disperse to, and oviposit on, the same or a different host some distance away (List, 1932; Hammer, 1936).

Mating takes place soon thereafter and then egg laying which may be prolonged up to 60 days or more; the mean period is 34.6 days, during which a mean of 65.8 eggs can be laid per female (Crandall, 1905). The eggs are deposited in cavities made in maturing fruits, only one egg per large apple. On cherries, the eggs may be deposited either directly in the seeds or in the flesh of the fruit; most females apparently do the latter (List, 1932). Eggs may be deposited in both ovaries and flesh of apples (Crandall, 1905).

Incubation requires about 7 days and the larvae feed by enlarging the oviposition cavity. According to Burke & Anderson (1989), the larvae feed primarily upon the seed(s), although they may also be found in the flesh of the fruit. Apparently, they do not tunnel through the fruit like *Conotrachelus nenuphar*, but feed within a cavity (Hammer, 1936).

The majority of larvae in apples that fall, as well as those in apples remaining on the trees, develop successfully. There are three larval instars and pupation usually occurs in the fruit while it is still on the tree. The adult must dig an

exit hole to emerge from its host.

Data on development rates in different types of apples are given by Hammer (1936). In Maine (USA), 80% of adults had emerged by mid-August (Lathrop, 1955) and the latest emergence occurs in mid-September in New York state (Hammer, 1936). This species is univoltine. Aspects of the biology of *A. quadrigibbus* were given by Fulton (1928), Hammer (1933; 1936), Ritcher (1936) and Lathrop (1955).

DETECTION AND IDENTIFICATION

Symptoms

The first signs of injury are usually tiny punctures through the skin of the fruitlets. Beneath the punctures, the weevils dig out cavities for feeding or oviposition. If for the latter, they are closed with a pellet of frass. As the fruit grows these punctures are left at the bottom of funnel-shaped pits and the apple becomes misshapen. The egg puncture is wider toward the bottom, whereas the feeding puncture is somewhat parallel-sided; however, the two types of punctures are virtually indistinguishable on the surface of the fruit (Burke, 1976). Larvae, pupae and adults can be found in mature apples. Feeding on maturing fruit by the new generation of adults produces collapsed brown spots that can coalesce to form areas up to 2.5 cm in diameter (Hammer, 1932). Damage is well illustrated by Fulton (1928) and Hammer (1932; 1936). Pathogens and other pests may enter through punctures (Hammer, 1936). Adult and larval damage on berries and seed of saskatoons (*Amelanchier alnifolia*) have been described by Steeves *et al*. (1979).

Morphology

Eggs

White, ovoid, laid in cavity in the fruit whose opening is sealed with frass, one egg per cavity (Hammer, 1936).

Larva

Final instar: 7.5-9.0 mm body length; body white or cream, legless, robust, curved, asperities very small, tubercle-like, generally distributed over entire surface; head light yellowish-brown, sides rather strongly rounded, width 0.77-0.88 mm (mean 0.82 mm), mandibles brown or black. For a key to the known larvae of the tribe Anthonomini, a detailed description of the larva of *A. quadrigibbus* and a good habitus figure, see Ahmad & Burke (1972).

Pupa

Length 4.7-5.5 mm (Burke, 1968), whitish, darkening as development progresses; elytra each with a large, conical tubercle at about the middle; four pairs of discotergal setae on most abdominal terga; abdominal segment 9 bearing one posterior process; in a cavity in the fruit (Hammer, 1936). For a key to the known pupae of the tribe Anthonomini, a detailed description of the pupa of *A. quadrigibbus*, and a good habitus figure, see Burke (1968).

Adult

Body length including rostrum 5.0-11.0 mm (Hammer, 1936), excluding rostrum 2.5-5.5 mm (Burke & Anderson, 1989); brown, lacking the whitish elytral markings of *Conotrachelus nenuphar* (EPPO, 2022); antennal club elongate, as long as, or longer than, six preceding segments of funicle combined (as compared with the related *A. consors* in which the club is stout, distinctly shorter than the six preceding segments of the funicle combined); rostrum long, slender, curved, one third to one half of overall body length (Hammer, 1936); scutellum narrow, convex dorsally; pronotum and elytra with dorsal pubescence dense and coarse; pronotum distinctly narrower than elytra at base; elytra with distinct, small to large tubercle on interval 3 at declivity, transverse, sub-basal depression poorly to moderately strongly developed; alternate elytral intervals slightly more convex, irregular in width; humeri strongly rounded (Burke & Anderson, 1989).

Size is very variable and host-dependent (Burke & Anderson, 1989); sexual dimorphism is slight with the females

usually slightly larger than males and females having a slightly greater length of the rostrum relative to body length; elytral tubercle development is variable and is possibly related to body size but allometry has not been proved (Burke & Anderson, 1989).

Detection and inspection methods

Trees and other host plants should be inspected just before and during fruit set for the presence of adult weevils. Fruit can be inspected for the presence of punctures caused by egg laying. Since the insect has a thanatosis behavior (death feigning), it is easy to collect adults on trees in the spring by using a beat sheet (Hammer, 1936). This method will work efficiently only if the temperature is higher than 21°C, when adults are active. Yellow sticky traps can be installed prior to blossom to detect the presence of adults. A sweep net can also be used to collect adults on smaller host plants such as *Amelanchier* and *Prunus*, as the weevil can be difficult to observe on the plant.

PATHWAYS FOR MOVEMENT

The adults are strong fliers and can disperse the species locally. Larvae, pupae or newly emerged adults could be transported in apples, but there are no records of their interception. Adults could occur as contaminants of fresh fruit and in soil and debris around trees that have fruited, but such pre-diapause individuals are unlikely to have mated.

PEST SIGNIFICANCE

Economic impact

Riley (1871) noted *A. quadrigibbus* as destructive to cultivated apples and pears. It has since been reported as a pest of cultivated apples in several northeastern and mid-western states of the USA as well as in Eastern Canada (Crandall, 1905; Fulton, 1928; List, 1932; Hammer, 1936). According to Metcalf & Flint (1962) it can cause very severe damage to apples, locally inflicting more than 50% crop losses. In Maine, injury to apples may occasionally be severe in heavily infested orchards (Lathrop, 1955). List (1932) mentioned that *A. quadrigibbus* was first recorded damaging cultivated cherries in Colorado (USA) in 1914 and later became a serious pest. Hoerner & List (1952) reported it causing serious damage to cherries in Northern Colorado in 1945. Buckell (1930) described damage to cultivated pears by *A. quadrigibbus* in the Salmon Arm area of British Columbia (Canada) during the growing seasons of 1927-1929. Considerable damage occurred to pears, but apples and cherries in the same orchard showed no sign of injury. It may be noted that most of the references cited here are quite old. The species is currently considered as a secondary pest in apple in Eastern Canada and the US, rarely causing damage of economic significance (Bloem *et al.*, 2002; Morin *et al.*, 2020). However, *A. quadrigibbus* injury on pears has been identified in a limited number of orchards in Ontario and British Columbia (Agriculture and Agri-Food Canada, 2020), and research would be needed to reassess the frequency and distribution of this pest species.

Control

Apparently, there is no recently published literature on the control of this weevil. Buckell (1930) recommended that thickets of wild crab apple and hawthorn in the vicinity of orchards should be destroyed to decrease population buildup on alternative plants. The weevils often attack the foliage or tender twigs just before or during the blossoming period, and therefore the pink-bud application should be delayed for as long as possible. As soon as the fruits begin to form, the weevils start to injure them. This occurs before nearly all the petals have fallen and therefore the calyx application should be made sooner than is usually the case or when 60% of the petals have fallen. According to Hammer (1932), insecticide sprays applied during the adult feeding and oviposition period in the spring appeared to give measurable control. Hammer (1933) suggested that fruit drops should be picked up at least twice, but even where this is done, many of the weevils will emerge from apples on the trees and thus lower the efficiency of this method of control.

Hammer (1936) listed seven species of parasite of *A. quadrigibbus* in New York State and mentioned the occurrence of parasitic fungi. It was also mentioned that the larvae are killed by larvae of *Cydia pomonella* and *Conotrachelus nenuphar* when these occur in the same small fruits. Bugbee (1967) reported *Eurytoma fusca* and *E. mali*

(Hymenoptera: Eurytomidae) as parasites of this weevil. Burke (1976) summarized in table form the reported hymenopterous parasites of *Anthonomus* species.

Phytosanitary risk

A. quadrigibbus is not currently listed as a quarantine pest by EPPO. Considering the potential risk it may present to economically important fruit crops in the European Union territory (EFSA, 2018), it is currently regulated by the European Union. Within EPPO, it was considered that measures already recommended for other North American fruit pests would adequately protect against its introduction. Thus, it was considered as a quarantine pest against which it was not necessary to take specific measures (including listing). Conditions in the EPPO region seem suitable for the survival and multiplication of the species including the presence of wild *Crataegus* spp. to support reservoir populations. The fact that there is little recent information about it from North America suggests strongly that modern insecticide treatment regimes reduce it to a non-economically significant level (as has happened with other fruit tree pests throughout the world). The same would very probably be true in the EPPO region.

PHYTOSANITARY MEASURES

It could be recommended that host fruit should come from an area where *A. quadrigibbus* does not occur and/or where routine intensive control measures are being applied. Plants of host species transported with roots should be free from soil, or the soil should be treated against the pest, and they should not carry fruit.

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Datasheet history

This datasheet was first published in 1992 in 'Quarantine Pests for Europe'. It was revised in the second edition of the book in 1997, and in 2022. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

CABI/EPPO (1992/1997) Quarantine Pests for Europe (1st and 2nd edition). CABI, Wallingford (GB).

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