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

Data Sheets on Quarantine Pests

Bactrocera tryoni

IDENTITY

Name: *Bactrocera tryoni* (Froggatt)
Synonyms: *Chaetodacus tryoni* (Froggatt)
Dacus ferrugineus tryoni (Froggatt)
Dacus tryoni (Froggatt)
Strumeta tryoni (Froggatt)
Tephritis tryoni Froggatt
Taxonomic position: Insecta: Diptera: Tephritidae
Common names: Queensland fruit fly (English)
Mouche des fruits de Queensland (French)
Bayer computer code: DACUTR
EPPO A1 list: No. 235
EU Annex designation: I/A1 - as *Dacus tryoni*

HOSTS

B. tryoni has a very wide host range on both cultivated and wild species (in 25 families). As shown by Fitt (1986), adults of *B. tryoni* exhibit no particular preference in the species of fruits on which they will lay. The main hosts are in practice mostly tree fruits: *Annona*, *Averrhoa carambola*, avocados (*Persea americana*), *Citrus*, *Fortunella*, guavas (*Psidium guajava*), *Malus*, mangoes (*Mangifera indica*), passion fruits (*Passiflora edulis*), pawpaws (*Carica papaya*), peaches (*Prunus persica*), plums (*Prunus domestica*) and *Pyrus*. However, vegetables such as tomatoes (*Lycopersicon esculentum*) are also infested. Many tree fruit crops of the EPPO region are potential hosts.

GEOGRAPHICAL DISTRIBUTION

EPPO region: Absent.
North America: USA (found but not established in California).
South America: Chile (twice adventive in Easter Island, but eradicated; Bateman, 1982).
Oceania: Australia (throughout eastern half of Queensland, eastern New South Wales, and extreme east of Victoria; recently found in Tasmania, where it is now under eradication; outbreaks repeatedly occur in South Australia, but are regularly eradicated (Maelzer, 1990); established in the Perth area of Western Australia in 1989 but now believed eradicated). A few males have been trapped in Papua New Guinea but *B. tryoni* is unlikely to be established there (Drew, 1989). Adventive in New Caledonia and French Polynesia (Austral Islands and many of the Society Islands). New Zealand (intercepted only). Doubtful records in Northern Mariana Islands, Vanuatu.
EU: Absent.
Distribution map: See IIE (1991, No. 110).

BIOLOGY

Eggs are laid below the skin of the host fruit. These hatch within 1-3 days and the larvae feed for 10-31 days. Pupariation is in the soil under the host plant and adults emerge after 1-2 weeks (longer in cool conditions) and adults occur throughout the year (Christenson & Foote, 1960). *B. tryoni* would be unable to survive the winter in the EPPO region, except in the south. The adults are best able to survive low temperatures, *Bactrocera* spp. generally having a normal torpor threshold of 7°C, dropping as low as 2°C in winter. The ability of *B. tryoni* to survive repeated frosts has been studied by Meats & Fitt (1987). Sutherst & Maywald (1991) have used the CLIMEX model to describe the potential for population growth of *B. tryoni* in Australia, together with the climatic factors which limit its geographical distribution and abundance. A projection was also made of the behaviour of *B. tryoni* in North America following hypothetical introduction into Los Angeles county, California (USA).

DETECTION AND IDENTIFICATION

Symptoms

Attacked fruit will usually show signs of oviposition punctures. Fruit with a high sugar content, such as peaches, will exude a sugary liquid, which usually solidifies adjacent to the oviposition site.

Morphology

Larva

Described by Exley (1955), Elson-Harris (1988), White & Elson-Harris (1992). Electrophoretic methods have been tried out to distinguish larvae of *B. tryoni* from those of *Ceratitis capitata* (Dadour *et al.*, 1992).

Adult

Colour: Face marked with a dark spot in each antennal furrow; scutum with lateral yellow vittae; scutum and abdomen predominantly red-brown, except for postpronotal lobe, notopleurae and lateral vittae which are yellow; scutellum entirely pale-coloured, except sometimes for a narrow black line across the base; postpronotal lobe yellow, the same colour as the lateral vittae; costal margin of wing with a distinct coloured band extending from wing base to near wing apex; costal band narrow, usually not extending below vein R2+3; crossveins r-m and dm-cu not covered by any markings; abdomen varying from predominantly red-brown with a black 'T'-shaped mark on tergites two to five, to predominantly black.

Head: With reduced chaetotaxy, lacking ocellar and postocellar setae; first flagellomere at least three times as long as broad.

Thorax: With reduced chaetotaxy, lacking dorsocentral and katepisternal setae. Postpronotal lobes without any setae (sometimes with some small setulae or hairs); scutum with prescutellar acrostichal setae and anterior supra-alar setae; scutellum not bilobed, with only two marginal setae (the apical pair).

Wing: Vein Sc abruptly bent forward at nearly 90°, weakened beyond this bend and ending at subcostal break; vein R1 with dorsal setulae; cell cup very narrow, about half depth of cell bm; cup extension very long, equal or longer than length of vein A1+CuA2. At least apical half of cell bc and whole of cell c covered in microtrichia, only the base of cell bc without microtrichia. 5-7 mm long.

Abdomen: All tergites separate (view from side to see overlapping sclerites); tergite five with a pair of slightly depressed areas (ceromata). Male with a row of setae (the pecten) on each side of tergite three.

Detection and inspection methods

B. tryoni can be monitored by traps baited with male lures. Cue lure (4-(p-acetoxyphenyl)-2-butanone) attracts flies at very low concentrations and is believed to attract over a range of up to 1 km. The lure is usually placed on a cotton-wool wick suspended in the middle of a plastic trap that has small openings at both ends; Drew (1982) describes the Steiner trap. Cowley *et al*. (1990) found that Lynfield traps were cheaper than but as effective as Jackson traps in quarantine surveillance for *B. tryoni*. Lure can either be mixed with an insecticide (malathion or dichlorvos) or a piece of paper dipped in dichlorvos can be placed in the trap. Traps are usually placed in fruit trees at a height of about 2 m above ground and should be emptied regularly as it is possible to catch hundreds of flies in a single trap left for just a few days, although the lure may remain effective for at least 2 weeks. A review of the biological aspects of male lures was presented by Cunningham (1989) and the use of lures is described more fully by Drew (1982). The trapping system used to monitor for possible introductions of *B. tryoni* into New Zealand has been described by Cowley (1990).

MEANS OF MOVEMENT AND DISPERSAL

Adult flight and the transport of infested fruits are the main means of movement and dispersal to previously uninfested areas. Many *Bactrocera* spp. can fly 50-100 km (Fletcher, 1989).

PEST SIGNIFICANCE

Economic impact

In Australia, *B. tryoni* is a serious pest of a wide variety of unrelated fruit crops (e.g. *Annona*, *Averrhoa carambola*, *Carica papaya*, *Citrus*, *Fortunella*, *Malus*, *Mangifera indica*, *Passiflora edulis*, *Persea americana*, *Prunus domestica*, *Prunus persica*, *Psidium guajava* and *Pyrus),* but seldom cucurbits.

Control

When detected, it is important to gather all fallen and infested host fruits, and destroy them. *B. tryoni* should be continually monitored using bait traps (Bateman, 1982). Insecticidal protection is possible by using a cover spray or a bait spray. Malathion is the usual choice of insecticide for fruit fly control and this is usually combined with protein hydrolysate to form a bait spray (Roessler, 1989); practical details are given by Bateman (1982). Bait sprays work on the principle that both male and female tephritids are strongly attracted to a protein source from which ammonia emanates. Bait sprays have the advantage over cover sprays in that they can be applied as a spot treatment so that the flies are attracted to the insecticide and there is minimal impact on natural enemies. Biological control has been tried against *B. tryoni*, but introduced parasitoids have had little impact (Wharton, 1989).

Phytosanitary risk

EPPO lists *B. tryoni* as an A1 quarantine pest (OEPP/EPPO, 1983) within the broad category "non-European Trypetidae"; it is also of quarantine significance to APPPC, CPPC, COSAVE, JUNAC and OIRSA. *B. tryoni* is indigenous only to Australia, but like other *Bactrocera* spp. is known by experience to have the potential to establish adventive populations in various other tropical areas. The direct risk of establishment of *B. tryoni* in most of the EPPO region is minimal, though populations might enter and multiply during the summer months. In southern areas, such populations might survive one or several winters. In view of the range of the species in Australia (extending to Victoria and even now Tasmania), *B. tryoni* probably presents the greatest risk among the pest species of *Bactrocera* of establishing and causing direct losses in southern areas. A further important risk for EPPO countries arises from the probable imposition of much stricter phytosanitary restrictions on exported fruits (particularly to America) if *B. tryoni* enters and multiplies, even temporarily.

PHYTOSANITARY MEASURES

Consignments of fruits of *Annona*, *Averrhoa carambola*, *Carica papaya*, *Citrus*, *Fortunella*, *Malus*, *Mangifera indica*, *Passiflora edulis*, *Persea americana*, *Prunus domestica*, *Prunus persica*, *Psidium guajava* and *Pyrus* from countries where *B. tryoni* occurs should be inspected for symptoms of infestation and those suspected should be cut open in order to look for larvae. EPPO recommends that such fruits should come from an area where *B. tryoni* does not occur, or from a place of production found free from the pest by regular inspection for 3 months before harvest. Fruits may also be treated in transit by cold treatment (e.g. 14, 18 or 20 days at 0.5, 1 or 1.5°C, respectively; USDA, 1994), by hot-water dip (Heard *et al.*, 1991; Jessup, 1991) or, for certain types of fruits, by vapour heat (e.g. keeping at 43°C for 4-6 h) (Heard *et al*., 1992; USDA, 1994). Ethylene dibromide was previously widely used as a fumigant but is now generally withdrawn because of its carcinogenicity; methyl bromide is less satisfactory, damaging many fruits and reducing their shelf life, but treatment schedules are available (e.g. 32 g/m^3 for 2 h at 21-26°C; USDA, 1994). Insecticides such as fenthion, dimethoate and omethoate can be applied as sprays during grading and packing of tomatoes and mangoes (Heather *et al*., 1987). Irradiation is now being investigated as a treatment against *B. tryoni* (Jessup, 1990; Heather *et al.*, 1991; Lescano *et al*., 1994).

Plants of host species transported with roots from countries where *B. tryoni* occurs should be free from soil, or the soil should be treated against puparia. The plants should not carry fruits. Such plants may indeed be prohibited importation.

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