

# EPPO Datasheet: *Bactrocera dorsalis*

Last updated: 2021-04-28

## IDENTITY

**Preferred name:** *Bactrocera dorsalis*

**Authority:** (Hendel)

**Taxonomic position:** Animalia: Arthropoda: Hexapoda: Insecta: Diptera: Tephritidae

**Other scientific names:** *Bactrocera invadens* Drew, Tsuruta & White, *Bactrocera papayae* Drew & Hancock, *Bactrocera philippinensis* Drew & Hancock, *Chaetodacus dorsalis* (Hendel), *Chaetodacus ferrugineus dorsalis* (Hendel), *Chaetodacus ferrugineus okinawanus* Shiraki, *Chaetodacus ferrugineus* (Fabricius), *Dacus dorsalis* Hendel, *Dacus ferrugineus dorsalis* Hendel, *Dacus ferrugineus okinawanus* Shiraki, *Dacus ferrugineus* Fabricius, *Strumeta dorsalis* (Hendel)

**Common names:** oriental fruit fly

[view more common names online...](#)

**EPPO Categorization:** A1 list

[view more categorizations online...](#)

**EU Categorization:** Quarantine pest ((EU) 2019/2072 Annex II A)

**EPPO Code:** DACUDO



[more photos...](#)

## Notes on taxonomy and nomenclature

*B. dorsalis* forms part of a species complex, within which over 50 species have been described in Asia. Many earlier records of *B. dorsalis* from Southern India, Indonesia, Malaysia, the Philippines and Sri Lanka are based on misidentifications of what are now (Drew & Hancock, 1994) known to be other species. However, some of these taxa previously described as distinct taxa, i.e. *B. invadens*, *B. papayae*, and *B. philippinensis* are considered as being synonymous (see Schutze *et al.*, 2014). Part of the literature prior to 2015 will have been published under the junior names in particular with reference to studies in Africa under *B. invadens*. Some researchers (Drew & Romig, 2013; 2016), however, still consider *B. papaya* and *B. invadens* to be valid species, different from *B. dorsalis*.

## HOSTS

*B. dorsalis* is one of the most polyphagous fruit fly species, recorded from close to 450 different hosts worldwide, belonging to 80 plant families. In addition, it is associated with a large number of other plant taxa for which the host status is not certain. The USDA Compendium of Fruit Fly Host Information (CoFFHI) (Liquidó *et al.*, 2019) provides an extensive host list with detailed references. While some fruits (e.g. banana, mangosteen, papaya) are listed as a hosts, it was shown that factors such as ripeness or condition (damaged versus undamaged) can affect the oviposition success of females and the survival of larvae (Cugala *et al.*, 2013, 2017; Unahawutti *et al.*, 2014).

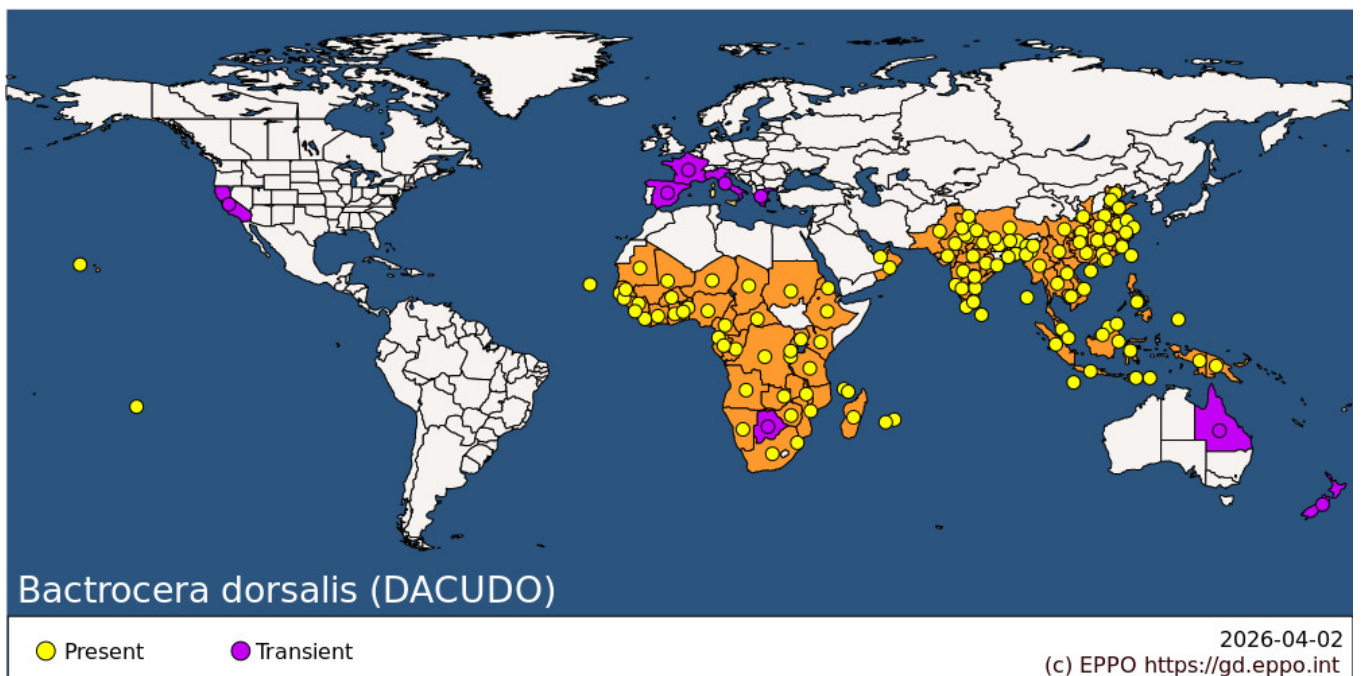
**Host list:** *Abelmoschus esculentus*, *Actinidia fulvicoma*, *Adenanthera pavonina*, *Adenia cissampeloides*, *Adonidia merrillii*, *Aegle marmelos*, *Azalia xylocarpa*, *Alangium chinense*, *Alangium salviifolium*, *Alpinia mutica*, *Anacardium occidentale*, *Ananas comosus*, *Annona cherimola*, *Annona glabra*, *Annona macrophyllata*, *Annona montana*, *Annona muricata*, *Annona reticulata*, *Annona senegalensis*, *Annona squamosa*, *Antiaris toxicaria*, *Antidesma ghaesembilla*, *Aphloia theiformis*, *Aporosa villosa*, *Ardisia crenata*, *Areca catechu*, *Arenga engleri*, *Arenga pinnata*, *Arenga westerhoutii*, *Artabotrys monteiroae*, *Artabotrys siamensis*, *Artocarpus altilis*, *Artocarpus chama*, *Artocarpus elasticus*, *Artocarpus heterophyllus*, *Artocarpus integer*, *Artocarpus lacucha*, *Artocarpus lanceifolius*, *Artocarpus nitidus*, *Artocarpus odoratissimus*, *Artocarpus rigidus*, *Artocarpus sericarpus*, *Averrhoa bilimbi*, *Averrhoa carambola*, *Azadirachta excelsa*, *Baccaurea angulata*, *Baccaurea motleyana*, *Baccaurea racemosa*, *Baccaurea ramiflora*, *Bactris gasipaes*, *Balakata baccata*, *Barringtonia edulis*, *Benincasa hispida*, *Bischofia javanica*, *Blighia sapida*, *Borassus flabellifer*, *Bouea macrophylla*, *Bouea oppositifolia*, *Breynia racemosa*, *Bridelia stipularis*

, *Broussonetia kaempferi*, *Broussonetia papyrifera*, *Callicarpa longifolia*, *Calophyllum inophyllum*, *Calotropis* sp., *Camonea vitifolia*, *Cananga odorata*, *Canarium album*, *Canarium indicum*, *Capparis duchesnei*, *Capparis sepiaria*, *Capparis tomentosa*, *Capsicum annuum*, *Capsicum frutescens*, *Carallia brachiata*, *Careya arborea*, *Carica papaya*, *Carissa carandas*, *Carissa spinarum*, *Caryota mitis*, *Cascabela thevetia*, *Casimiroa edulis*, *Castanopsis* sp., *Cayratia japonica*, *Celtis tetrandra*, *Chionanthus parkinsonii*, *Choerospondias axillaris*, *Chrysobalanus icaco*, *Chrysophyllum cainito*, *Chukrasia tabularis*, *Cinnamomum yabunikkei*, *Cissus repens*, *Citrullus colocynthis*, *Citrullus lanatus*, *Citrus depressa*, *Citrus maxima*, *Citrus natsudaidai*, *Citrus reticulata*, *Citrus swinglei*, *Citrus trifoliata*, *Citrus x amblycarpa*, *Citrus x aurantiifolia*, *Citrus x aurantium* var. *clementina*, *Citrus x aurantium* var. *deliciosa*, *Citrus x aurantium* var. *paradisi*, *Citrus x aurantium* var. *sinensis*, *Citrus x aurantium* var. *unshiu*, *Citrus x aurantium*, *Citrus x latifolia*, *Citrus x limon* var. *meyerii*, *Citrus x limon*, *Citrus x limonia* var. *jambhiri*, *Citrus x nobilis*, *Citrus x tangelo*, *Clausena lansium*, *Clusia rosea*, *Coccinia grandis*, *Coccoloba uvifera*, *Coffea arabica*, *Coffea canephora*, *Cordia alba*, *Cordia* sp., *Cordyla pinnata*, *Crescentia cujete*, *Crinum asiaticum*, *Cucumis melo*, *Cucumis prophetarum*, *Cucumis sativus*, *Cucurbita argyrosperma*, *Cucurbita maxima*, *Cucurbita moschata*, *Cucurbita pepo*, *Cydonia oblonga*, *Dacryodes edulis*, *Desmos chinensis*, *Dillenia obovata*, *Dimocarpus longan*, *Diospyros abyssinica*, *Diospyros areolata*, *Diospyros castanea*, *Diospyros dasyphylla*, *Diospyros diepenhorstii*, *Diospyros discolor*, *Diospyros glandulosa*, *Diospyros japonica*, *Diospyros kaki*, *Diospyros malabarica*, *Diospyros maritima*, *Diospyros mespiliformis*, *Diospyros mollis*, *Diospyros montana*, *Diospyros morrisiana*, *Diospyros nigra*, *Diospyros sandwicensis*, *Diospyros tutcheri*, *Diplocyclos palmatus*, *Donella lanceolata*, *Dovyalis hebecarpa*, *Dracaena reflexa*, *Dracaena steudneri*, *Drypetes floribunda*, *Durio zibethinus*, *Dysoxylum parasiticum*, *Ehretia microphylla*, *Elaeocarpus hygrophilus*, *Elaeocarpus serratus*, *Eriobotrya japonica*, *Erycibe subspicata*, *Eugenia dombeyi*, *Eugenia palumbis*, *Eugenia uniflora*, *Excoecaria agallocha*, *Fagraea berteriana*, *Fagraea ceilanica*, *Feijoa sellowiana*, *Fibraurea tinctoria*, *Ficus auriculata*, *Ficus benjamina*, *Ficus carica*, *Ficus chartacea*, *Ficus erecta*, *Ficus fistulosa*, *Ficus hirta*, *Ficus hispida*, *Ficus lepicarpa*, *Ficus microcarpa*, *Ficus obpyramidata*, *Ficus polita*, *Ficus pumila*, *Ficus racemosa*, *Ficus religiosa*, *Ficus sagittata*, *Ficus septica*, *Ficus* sp., *Ficus sycomorus*, *Ficus virgata*, *Flacourtia indica*, *Flacourtia rukam*, *Flueggea virosa*, *Fortunella hindsii*, *Fortunella japonica*, *Fortunella margarita*, *Fragaria chiloensis*, *Gambeya albida*, *Garcinia atroviridis*, *Garcinia celebica*, *Garcinia costata*, *Garcinia cowa*, *Garcinia dulcis*, *Garcinia griffithii*, *Garcinia intermedia*, *Garcinia mangostana*, *Garcinia mannii*, *Garcinia parvifolia*, *Garcinia prainiana*, *Garcinia subelliptica*, *Garcinia venulosa*, *Garcinia xanthochymus*, *Garuga floribunda*, *Glycosmis pentaphylla*, *Gmelina elliptica*, *Gmelina philippensis*, *Gnetum* sp., *Grewia asiatica*, *Gynochthodes umbellata*, *Haematostaphis barberi*, *Hanguana malayana*, *Hexalobus monopetalus*, *Heynea trijuga*, *Holigarna kurzii*, *Horsfieldia irya*, *Icacina oliviformis*, *Inga laurina*, *Inocarpus fagifer*, *Iringia gabonensis*, *Iringia malayana*, *Ixora javanica*, *Ixora macrothyrsa*, *Juglans hindsii*, *Juglans nigra*, *Juglans regia*, *Kaempferia* sp., *Kedrostis leloja*, *Knema globularia*, *Lagenaria siceraria*, *Landolphia heudelotii*, *Lansium domesticum*, *Lepisanthes alata*, *Lepisanthes fruticosa*, *Lepisanthes rubiginosa*, *Lepisanthes tetraphylla*, *Lindera oxyphylla*, *Litchi chinensis*, *Litsea glutinosa*, *Litsea salicifolia*, *Luffa acutangula*, *Luffa aegyptiaca*, *Lycianthes biflora*, *Machilus thunbergii*, *Maclura cochinchinensis*, *Malpighia emarginata*, *Malpighia glabra*, *Malus domestica*, *Malus sylvestris*, *Mammea siamensis*, *Mangifera caesia*, *Mangifera caloneura*, *Mangifera casturi*, *Mangifera foetida*, *Mangifera griffithii*, *Mangifera indica*, *Mangifera lalijiwa*, *Mangifera laurina*, *Mangifera odorata*, *Mangifera pajang*, *Mangifera quadrifida*, *Manilkara jaimiqui*, *Manilkara zapota*, *Melastoma dodecandrum*, *Melicope pteleifolia*, *Microcos tomentosa*, *Mimusops coriacea*, *Mimusops elengi*, *Mitrephora maingayi*, *Momordica balsamina*, *Momordica charantia*, *Momordica cochinchinensis*, *Monoon longifolium*, *Monoon simiarum*, *Morinda citrifolia*, *Morinda coreia*, *Morus alba*, *Morus nigra*, *Muntingia calabura*, *Murraya paniculata*, *Musa acuminata*, *Musa balbisiana*, *Musa basjoo*, *Musa troglodytarum*, *Musa x paradisiaca*, *Myrianthus arboreus*, *Myrica rubra*, *Myxopyrum smilacifolium*, *Nauclea latifolia*, *Nauclea orientalis*, *Neolamarckia cadamba*, *Neolitsea sericea*, *Nephelium cuspidatum*, *Nephelium lappaceum*, *Noronhia emarginata*, *Notelaea sandwicensis*, *Ochreinauclea maingayi*, *Ochrosia mariannensis*, *Olox scandens*, *Opilia amentacea*, *Opuntia ficus-indica*, *Palaquium maingayi*, *Pandanus odorifer*, *Pandanus tectorius*, *Parinari anamensis*, *Parkia biglobosa*, *Parkia speciosa*, *Passiflora caerulea*, *Passiflora edulis*, *Passiflora foetida*, *Passiflora incarnata*, *Passiflora laurifolia*, *Passiflora ligularis*, *Passiflora quadrangularis*, *Passiflora suberosa*, *Passiflora tripartita*, *Persea americana*, *Phaleria macrocarpa*, *Phaseolus vulgaris*, *Phoenix dactylifera*, *Phyllanthus acidus*, *Phyllanthus emblica*, *Phyllanthus littoralis*, *Physalis minima*, *Physalis peruviana*, *Pimenta dioica*, *Piper nigrum*, *Planchonella duclitan*, *Pometia pinnata*, *Potentilla indica*, *Pouteria caimito*, *Pouteria campechiana*, *Pouteria sapota*, *Pouteria viridis*, *Premna serratifolia*, *Prunus armeniaca*, *Prunus avium*, *Prunus campanulata*, *Prunus cerasifera*, *Prunus cerasoides*, *Prunus cerasus*, *Prunus davidiana*, *Prunus domestica*, *Prunus mume*, *Prunus persica*, *Prunus phaeosticta*, *Prunus salicina*, *Pseudocydonia sinensis*, *Psidium cattleianum*, *Psidium guajava*, *Punica granatum*, *Pyrus calleryana*, *Pyrus communis*, *Pyrus pyrifolia*, *Rhaphiolepis williamtelliana*, *Rhizophora* sp., *Rhodocactus grandifolius*, *Rhodomyrtus tomentosa*, *Rollinia mucosa*, *Rubus leucanthus*, *Rubus reflexus*, *Rubus rosifolius*, *Rubus sumatranus*, *Saba comorensis*, *Saba senegalensis*, *Salacca zalacca*, *Salacia verrucosa*, *Sambucus javanica*, *Sandoricum koetjape*, *Santalum paniculatum*, *Sauropus androgynus*

, *Schoepfia fragrans*, *Sclerocarya birrea*, *Selenicereus undatus*, *Sesbania grandiflora*, *Shirakiopsis indica*, *Sicyos edulis*, *Simarouba glauca*, *Siphonodon celastrineus*, *Solanum aculeatissimum*, *Solanum aethiopicum*, *Solanum americanum*, *Solanum anguivi*, *Solanum betaceum*, *Solanum capsicoides*, *Solanum donianum*, *Solanum erianthum*, *Solanum granuloso-leprosum*, *Solanum incanum*, *Solanum lasiocarpum*, *Solanum linnaeanum*, *Solanum lycopersicum*, *Solanum mauritianum*, *Solanum melongena*, *Solanum muricatum*, *Solanum nigrum*, *Solanum pimpinellifolium*, *Solanum pseudocapsicum*, *Solanum seaforthianum*, *Solanum sessiliflorum*, *Solanum stramonifolium*, *Solanum torvum*, *Solanum trilobatum*, *Sorindeia madagascariensis*, *Spondias dulcis*, *Spondias mombin*, *Spondias pinnata*, *Spondias purpurea*, *Staphylea ternata*, *Streblus asper*, *Strychnos mellodora*, *Strychnos nux-vomica*, *Syzygium acuminatissimum*, *Syzygium aqueum*, *Syzygium aromaticum*, *Syzygium borneense*, *Syzygium coarctatum*, *Syzygium cumini*, *Syzygium formosanum*, *Syzygium grande*, *Syzygium jambos*, *Syzygium levinei*, *Syzygium lineatum*, *Syzygium malaccense*, *Syzygium nervosum*, *Syzygium samarangense*, *Terminalia bellirica*, *Terminalia catappa*, *Terminalia chebula*, *Terminalia citrina*, *Theobroma cacao*, *Trichosanthes costata*, *Trichosanthes pilosa*, *Trichosanthes scabra*, *Triphasia trifolia*, *Uvaria grandiflora*, *Uvaria littoralis*, *Vaccinium reticulatum*, *Vangueria infausta*, *Viburnum japonicum*, *Vitellaria paradoxa*, *Vitis amurensis*, *Vitis vinifera*, *Voacanga africana*, *Wikstroemia phillyreifolia*, *Wikstroemia uva-ursi*, *Willughbeia coriacea*, *Willughbeia edulis*, *Xanthophyllum flavescens*, *Ximenia americana*, *Xylothea kraussiana*, *Zanthoxylum asiaticum*, *Zehneria mucronata*, *Zehneria wallichii*, *Ziziphus jujuba*, *Ziziphus mauritiana*, *Ziziphus mucronata*, *Ziziphus nummularia*, *Ziziphus oenopolia*, *x Citrofortunella floridana*, *x Citrofortunella microcarpa*

## GEOGRAPHICAL DISTRIBUTION

*Bactrocera dorsalis* is an Asian species distributed from the Indian Subcontinent eastwards towards Southeast Asia. It has been introduced into different parts of Oceania, and while it has been eradicated in some of these areas it became established in others. Vargas *et al.* (2015) gives an overview of the distribution and invasion history. The species has also been introduced in Africa where it was detected for the first time in 2003 in Kenya. It subsequently spread throughout the whole continent below the Sahara (De Villiers *et al.*, 2016) as well as several islands in the western part of the Indian Ocean. It has been recently detected in the EPPO region (France: Mouttet & Balmès, 2020; Italy: Nugnes *et al.*, 2018) although there is currently no evidence that it has become established there.



**EPPO Region:** France (mainland), Greece (mainland), Italy (mainland), Spain (mainland)

**Africa:** Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Congo, The Democratic Republic of the, Cote d'Ivoire, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, Senegal, Sierra Leone, South Africa,

Sudan, Tanzania, United Republic of, Togo, Uganda, Zambia, Zimbabwe

**Asia:** Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China (Anhui, Aomen (Macau), Beijing, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanghai, Sichuan, Xianggang (Hong Kong), Xizhang, Yunnan, Zhejiang), Christmas Island, East Timor, India (Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttarakhand, Uttar Pradesh, West Bengal), Indonesia (Irian Jaya, Java, Kalimantan, Nusa Tenggara, Sulawesi, Sumatra), Lao People's Democratic Republic, Malaysia (Sabah, Sarawak, West), Myanmar, Nepal, Oman, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, United Arab Emirates, Vietnam

**North America:** United States of America (California, Hawaii)

**Oceania:** Australia (Queensland), French Polynesia, New Zealand, Palau, Papua New Guinea

## BIOLOGY

The general life cycle is similar to those of other *Bactrocera* species infesting fruits: eggs are laid below the skin of the host fruit. Three larval stages develop inside the fruit, feeding on the plant tissue. Once mature the third instar larva will leave the fruit, dig down into the soil and turn into a pupa enclosed in a puparium. The adult fly will emerge from the puparium. *Bactrocera dorsalis* can complete its life cycle in about 37 days at 25°C (Vargas *et al.*, 1984). Adults can live up to 11 weeks (Vargas *et al.*, 1984). Females start laying eggs between 18 and 48 days after adult emergence depending on prevailing temperatures (Vargas *et al.*, 2000). The larval duration of *B. dorsalis* varies from 7 to 36 days at 35°C and 15°C respectively (Rwomushana *et al.*, 2008b). An adult fly emerges from the pupa after 9 to 34 days at temperatures ranging from 30°C to 15°C (Ekesi *et al.*, 2006; Rwomushana *et al.*, 2008b). In places where *Bactrocera dorsalis* has been invasive, it is known to outcompete native or previously introduced fruit flies (Vargas *et al.*, 2007; Ekesi *et al.*, 2009).

## DETECTION AND IDENTIFICATION

### Symptoms

Attacked fruit have tiny oviposition punctures, but these and other symptoms of damage are often difficult to detect in the early stages of infestation. Considerable damage may occur inside the fruit before symptoms are visible externally, often as networks of tunnels accompanied by rotting.

### Morphology

#### *Larva*

Fruit fly larvae in general have a typical shape, i.e., cylindrical maggot-shape, elongate, anterior end narrowed and somewhat recurved ventrally, with anterior mouth hooks, and flattened caudal end. Their length varies from 5 to 15 mm. Identification to species level is not possible based on larvae. The 3rd-instar larvae have been described by White & Elson-Harris (1992) in detail. The same work provides a key to 3rd-instar larvae which is useful for an identification to genus level.

**Adult** (after diagnostic description given by Drew & Romig, 2013. Additional character states of the female after Drew & Hancock, 1994. Also included are variable states as listed under *B. invadens* and *B. papayae* as they are considered synonymous in this datasheet)

#### Male

Face fulvous with a pair of medium-sized to large circular to oval black spots; postpronotal lobes and notopleura yellow; scutum black with extensive areas of red-brown to brown below and behind lateral postsutural vittae, around notopleural suture, between postpronotal lobes and notopleura, and inside postpronotal lobes; broad parallel-sided lateral postsutural yellow vittae ending at or behind intra-alar seta; medial postsutural yellow vitta absent; mesopleural stripe reaching midway between anterior margin of notopleuron and anterior notopleural seta dorsally;

scutellum yellow; legs with femora entirely fulvous; fore tibiae pale fuscous and hind tibiae fuscous, mid tibiae fulvous with a small area of dark fuscous basally; wing with cells bc and c colourless, microtrichia in outer corner of cell c only; a narrow fuscous costal band confluent with R2+3 and remaining very narrow around apex of wing (occasionally there can be a very slight swelling around apex of R4+5); a narrow pale fuscous anal streak; supernumerary lobe of medium development; abdominal terga III-V orange-brown with variable pattern but normally with the basic 'T' shaped pattern consisting of a narrow to broad transverse black band across anterior margin of tergum III, a narrow to medium-width medial longitudinal black band over all three terga, narrow anterolateral fuscous to dark fuscous corners on terga IV and V; a pair of oval orange-brown to pale fuscous shiny spots on tergum V; abdominal sterna dark coloured.

### Female

As for male in the general body colour patterns. Pecten absent from abdominal tergum III. Ovipositor basal segment orange-brown, dorsoventrally compressed and tapering posteriorly in dorsal view; ratio of length of oviscape to length of tergum V varies from 0.7:1 to 1.2:1; aculeus apex needle shaped.

Remark: differentiation between this species and closely related species within the *B. dorsalis* species complex (see Drew & Hancock, 1994) is difficult and needs expert confirmation. See ISPM 27 DP 29 (IPPC, 2019) for details on how to differentiate between the main species of commercial importance belonging to the species complex. Aculeus length has been used to differentiate between *B. dorsalis* and *B. papayae* but see Schutze *et al.* (2014) for review on the intra-specific variability of this aspect.

### **DNA barcoding**

The molecular identification of *B. dorsalis* through DNA barcoding proves to be problematic as this species cannot be properly distinguished from a number of closely related species, including species from the *B. dorsalis* species complex (see Drew & Hancock 1994; Drew & Romig 2013; Schutze *et al.* 2014). Additionally, the presence of unidentified / possibly misidentified reference sequence in the Barcoding Index Number Systems (BINs) in which this species is represented, might also bias its molecular identification.

Sequences (both under [Bactrocera dorsalis](#) and [Bactrocera invadens](#)) are available in the Barcode of Life Data Systems (BOLD). Sequences for *Bactrocera dorsalis* are available in [EPPO-Q-Bank](#).

### **Detection and inspection methods**

Males are efficiently attracted to methyl eugenol. Both sexes can be monitored by traps baited with protein-based attractants. Detection is also possible by examination of fruit for oviposition punctures and then rearing the larvae through to the adult stage.

## **PATHWAYS FOR MOVEMENT**

Transport of infested fruits is the main means of movement and dispersal to previously uninfested areas. Adult flight can also result in dispersal but previous citations of long (50-100 km) dispersal movements for *Bactrocera* spp. are unsubstantiated according to a recent review by Hicks *et al.* (2019). Dispersal up to 2 km is considered more typical.

## **PEST SIGNIFICANCE**

### **Economic impact**

Losses incurred by *Bactrocera dorsalis* can be substantial, especially on mango. Significant damage can also be caused on guava and citrus (Ekesi *et al.*, 2006; Goergen *et al.*, 2011; Rwomushana *et al.*, 2008a; Vayssieres *et al.*, 2009).

### **Control**

Management for this species includes the general control measures for *Bactrocera* spp. (see Vargas *et al.* 2015 for an overview of management options). These include sanitation (to gather all fallen and infested host fruits and destroy them). Insecticidal protection is possible by using a cover spray or a bait spray. 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 and other beneficials. Male annihilation technique (MAT) using methyl-eugenol as main attractant, has been used in several eradication programs against *B. dorsalis* (for an overview, see Vargas *et al.* 2014). Sterile Insect Technique (SIT) has been used as a component in an area-wide integrated pest management (IPM) program to suppress the species in Thailand (Chinvinijkul *et al.*, 2016). See Enkerlin (2005) for a review on SIT programs worldwide against this and other tephritid pest species.

### Phytosanitary risk

*Bactrocera dorsalis* is a known pest of several commercial fruit crops in the area where it is present. It can be moved in trade with infested fruit. Several studies have been made on climatic suitability of different regions in the world for this species (see Stephens *et al.* 2007; De Meyer *et al.*, 2010; Liu *et al.*, 2011; De Villiers *et al.*, 2016). For the EPPO region EFSA (2020) made a projection of potential establishment within the EPPO region, concluding that the species can potentially become established in the Mediterranean coastal areas, as well as the whole of Spain and Portugal, and the Atlantic coast in France. The EFSA Panel on Plant Health, in their Pest Categorization of non-EU Tephritidae (EFSA, 2020) placed *B. dorsalis* on the list of fruit flies that satisfy the criteria to be regarded as a potential Union quarantine pest for the EU.

## PHYTOSANITARY MEASURES

Consignments of fruits from countries or regions where *B. dorsalis* occurs should be inspected for symptoms of infestation and those suspected should be cut open in order to look for larvae. Possible measures include that such fruits should come from an area where *B. dorsalis* does not occur, or from a place of production found free from the pest by regular inspection in the 3 months before harvest. Plants transported with roots from countries or regions where *B. dorsalis* occurs should be free from soil, or the soil should be treated against puparia. The plants should not carry fruits. Cold treatment, hot water immersion, high temperature forced air, vapour heat treatment and fumigation can be performed on fruit commodities. Detailed information on these treatments and possible combinations of treatments for different species of fruits is available in USDA treatment manual (USDA, 2021). Annex 32 of ISPM 28 Phytosanitary treatments for regulated pests (FAO, 2018) describes a vapour heat treatment for *Bactrocera dorsalis* on *Carica papaya*.

## REFERENCES

- EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Di Serio F, Gonthier P, Jacques MA, Jaques Miret JA, Justesen AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke HH, Van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Bali EM, Papadopoulos N, Papanastassiou S, Czwieneczek E & MacLeod (2020) A Pest categorization of non-EU Tephritidae. *EFSA Journal* **18**, 5931, 62 pp. <https://doi.org/10.2903/j.efsa.2020.5931>
- Chinvinijkul S, Limohpasmanee W, Chanket T, Uthaitanakit A, Phopanit P, Sukamnouyporn W, Maneerat C, Kimjong W, Kumjing P & Boonwee N (2016) Use of the sterile insect technique in an area-wide approach to establish a fruit fly-low prevalence area in Thailand. In: Perez-Staples D, Diaz-Fleischer F, Montoya P & Vera MT (Eds) Area-wide Management of Fruit Flies. CRC Press, Boca Raton, pp. 325-332.
- Cugala D, Ekesi S, Ambasse D, Adamu RS & Mohamed SA (2013) Assessment of ripening stages of Cavendish dwarf bananas as host or non-host to *Bactrocera invadens*. *Journal of Applied Entomology* **138**, 449-457.
- Cugala D, Jordane JJ & Ekesi S (2017) Non-host status of papaya cultivars to the Oriental fruit fly, *Bactrocera dorsalis* (Diptera: Tephritidae), in relation to the degree of fruit ripeness. *International Journal of Tropical Insect Science* **37**, 19-29.

- De Meyer M, Robertson MP, Mansel MW, Ekesi S, Tsuruta K, Mwaiko W, Vayssières JF & Peterson AT (2010) Ecological niche and potential geographic distribution of the invasive fruit fly *Bactrocera invadens* (Diptera, Tephritidae). *Bulletin of Entomological Research* **100**, 35-48.
- De Villiers M, Hattingh V, Kriticos DJ, Brunel S, Vayssières JF, Sinzogan A, Billah MK, Mohamed MA, Mwatawala M, Abdelgader H, Salah FEE & De Meyer M (2016) The potential distribution of *Bactrocera dorsalis*: considering phenology and irrigation patterns. *Bulletin of Entomological Research* **106**, 19-33
- Drew RAI & Hancock DL (1994) The *Bactrocera dorsalis* complex of fruit flies (Diptera: Tephritidae: Dacinae) in Asia. *Bulletin of Entomological Research suppl. Series 2*, 1-68.
- Drew RAI & Romig MC (2013) Tropical Fruit Flies of South-East Asia. CABI, Wallingford (UK), vii+653 pp.
- Drew RAI & Romig MC (2016) Keys to the Tropical Fruit flies of South-East Asia. CABI, Wallingford (UK), 487 pp.
- Ekesi S, Nderitu PW & Rwomushana I (2006) Field infestation, life history and demographic parameters of the fruit fly *Bactrocera invadens* (Diptera: Tephritidae) in Africa. *Bulletin of Entomological Research* **96**, 379-386.
- Ekesi S, Billah MK, Nderitu PW, Lux SA & Rwomushana I (2009) Evidence for competitive displacement of *Ceratitis cosyra* by the invasive fruit fly *Bactrocera invadens* (Diptera : Tephritidae) on mango and mechanisms contributing to the displacement. *Journal of Economic Entomology* **102**, 981-991.
- Enkerlin WR (2005) Impact of fruit fly control programmes using the sterile insect technique. In: Dyck VA, Hendrichs J & Robinson AS (Eds) Sterile Insect Technique. Principles and Practice in Area-Wide Integrated Pest Management. Springer Verlag, Dordrecht, 651-676.
- FAO (2018) ISPM 28. Annex 32. Vapour heat treatment for *Bactrocera dorsalis* on *Carica papaya*. Rome, IPPC, FAO. [https://assets.ippc.int/static/media/files/publication/en/2019/02/PT\\_32\\_2018\\_En\\_VHT\\_Bactr\\_papaya\\_2018-04-21\\_WithCover.pdf](https://assets.ippc.int/static/media/files/publication/en/2019/02/PT_32_2018_En_VHT_Bactr_papaya_2018-04-21_WithCover.pdf)
- Goergen G, Vayssières JF, Gnanvossou D & Tindo M (2011) *Bactrocera invadens* (Diptera: Tephritidae), a new invasive fruit fly pest for the Afrotropical region: host plant range and distribution in west and central Africa. *Environmental Entomology* **40**, 844-854.
- Hicks CB, Bloem K, Pallipparambil GR & Hartzog HM (2019) Reported long-distance flight of the invasive Oriental fruit fly and its trade implications. In *Area-Wide Management of Fruit Flies* (eds Pérez-Staples D, Diaz-Fleischer F, Montoya P. & Vera MT), pp. 9-26. CRC Press, Boca Raton (US)
- IPPC (2019) ISPM 27 Diagnostic protocols for regulated pests DP 29: *Bactrocera dorsalis*. International Plant Protection Convention, FAO, Rome (Italy), 39 pp.
- Liquido NJ, McQuate GT, Birnbaum AL, Hanlin MA, Nakamichi KA, Inskeep JR, Ching AJF, Marnell SA & Kurashima RS (2019) A review of recorded host plants of oriental fruit fly, *Bactrocera (Bactrocera) dorsalis* (Hendel) (Diptera: Tephritidae), Version 3.1. Available online at: *USDA Compendium of Fruit Fly Host Information* (CoFFHI), Edition 4.0, <https://coffhi.cphst.org/> [accessed on 2021-04-23]
- Liu JH, Xiong X, Pan Y, Xiong Z, Deng Z & Yang L (2011) Predicting potential distribution of oriental fruit fly, *Bactrocera dorsalis* in Jiangxi Province, South China based on maximum entropy model. *Scientific Research and Essays* **6**, 2888-2894.
- Moultet R & Balmès V (2020) Multiple trappings of *Bactrocera dorsalis* complex in France during the 2019 national surveillance survey. Book of Abstracts 4th TEAM meeting, La Grande Motte, France, 81.
- Nugnes F, Russo E, Viggiani G & Bernardo U (2018) First record of an invasive fruit fly belonging to *Bactrocera dorsalis* complex (Diptera: Tephritidae) in Europe. *Insects* **9**, 182.

- Rwomushana I, Ekesi S, Gordon I & Ogot CKPO (2008a) Host plants and host plant preference studies for *Bactrocera invadens* (Diptera: Tephritidae) in Kenya, a new invasive fruit fly species in Africa. *Annals of the Entomological Society of America* **101**, 331-340.
- Rwomushana I, Ekesi S, Ogot CKPO & Gordon I (2008b) Effect of temperature on development and survival of immature stages of *Bactrocera invadens* (Diptera: Tephritidae). *Journal of Applied Entomology* **132**, 832-839.
- Schutze MK, Aketarawong N, Amornsak W, Armstrong KF, Augustinos A, Barr N, Bo W, Bourtzis K, Boykin LM, Caceres C, Cameron SL, Chapman TA, Chinvinijkul S, Chomic A, De Meyer M, Drosopoulou ED, Englezou A, Ekesi S, Gariou-Papalexiou A, Hailstones D, Haymer D, Hee AKW, Hendrichs J, Hasanuzzaman M, Jessup A, Khamis FM, Krosch MN, Leblanc L, Mahmood K, Malacrida AR, Mavragani-Tsipidou P, McInnis DO, Mwatawala M, Nishida R, Ono H, Reyes J, Rubinoff DR, San Jose M, Shelly TE, Srikachar S, Tan KH, Thanaphum S, Ul Haq I, Vijaysegaran S, Wee SL, Yesmin F, Zacharopoulou A & Clarke AR (2014) Synonymization of key pest species within the *Bactrocera dorsalis* species complex (Diptera : Tephritidae): taxonomic changes based on a review of 20 years of integrative morphological, molecular, cytogenetic, behavioural, and chemoecological data. *Systematic Entomology* **40**(2), 456-471. <https://doi.org/10.1111/syen.12113>
- Stephens AEA, Kriticos DJ & Leriche A (2007) The current and future potential geographical distribution of the oriental fruit fly, *Bactrocera dorsalis* (Diptera: Tephritidae). *Bulletin of Entomological Research* **97**, 369-378.
- Unahawutti U, Intarakumheng R, Oonthonglang P, Phankum S & Follett PA (2014) Nonhost status of mangosteen to *Bactrocera dorsalis* and *Bactrocera carambolae* (Diptera: Tephritidae) in Thailand. *Journal of Economic Entomology* **107**, 1355-1361.
- USDA (2021) United States Department of Agriculture Treatment Manual. [https://www.aphis.usda.gov/import\\_export/plants/manuals/ports/downloads/treatment.pdf](https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf) [accessed on 2021-04-23]
- Vargas RI, Miyashita D & Nishida T (1984) Life-history and demographic parameters of three laboratory-reared Tephritids (Diptera: Tephritidae). *Annals of the Entomological Society of America* **77**, 651-656.
- Vargas RI, Walsh WA, Kanehisa D, Stark JD & Nishida T (2000) Comparative demography of three Hawaiian fruit flies (Diptera: Tephritidae) at alternating temperatures. *Annals of the Entomological Society of America* **93**, 75-81.
- Vargas RI, Leblanc L, Putoa R & Eitam A (2007) Impact of introduction of *Bactrocera dorsalis* (Diptera: Tephritidae) and classical biological control releases of *Fopius arisanus* (Hymenoptera: Braconidae) on economically important fruit flies in French Polynesia. *Journal of Economic Entomology* **100**, 670-679.
- Vargas RI, Leblanc L, Pinero JC & Hoffman KM (2014) Male annihilation, past, present, and future. In *Trapping and the detection, control, and regulation of tephritid fruit flies*. (Eds Shelly TE, Epsky N, Jang EB, Reyes-Flores J & Vargas R), pp 493-511. Springer Verlag, Dordrecht (the Netherlands)
- Vargas RI, Pinero JC & Leblanc L (2015) An overview of pest species of *Bactrocera* fruit flies (Diptera: Tephritidae) and the integration of biopesticides with other biological approaches for their management with a focus on the Pacific region. *Insects* **6**, 297-318.
- Vayssières JF, Korie S & Ayegnon D (2009) Correlation of fruit fly (Diptera: Tephritidae) infestation of major mango cultivars in Borgou (Benin) with abiotic and biotic factors and assessment of damage. *Crop Protection* **28**, 477-488.
- White IM & Elson-Harris MM (1992) *Fruit flies of economic significance: their identification and bionomics*. CAB International, Wallingford (UK), xii+601 pp

#### **CABI resources used when preparing this datasheet**

CABI Datasheet on Pest <http://www.cabi.org/isc/datasheet/17685>

#### **ACKNOWLEDGEMENTS**

This datasheet was extensively revised in 2021 by Dr M. De Meyer. His valuable contribution is gratefully acknowledged.

### How to cite this datasheet?

EPPO (2026) *Bactrocera dorsalis*. EPPO datasheets on pests recommended for regulation. Available online. <https://gd.eppo.int>

### Datasheet history

This datasheet was first published in the EPPO Bulletin in 1983 and revised in the two editions of 'Quarantine Pests for Europe' in 1992 and 1997, as well as in 2021. 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 (1<sup>st</sup> and 2<sup>nd</sup> edition)*. CABI, Wallingford (GB).

EPPO (1983) Data sheets on quarantine organisms No. 41, Trypetidae (non-European). *EPPO Bulletin* **13**(1). <https://doi.org/10.1111/j.1365-2338.1983.tb01715.x>



Co-funded by the  
European Union