

Factsheet *Bactrocera dorsalis* (Hendel)

Original name: *Dacus dorsalis* Hendel, 1912: 18.

Vernacular name: Oriental fruit fly

Remark: African populations of this species were formerly referred to as *Bactrocera invadens*, the African Invader fly. When this species was reported for the first time in Africa, it was considered a distinct species and described as such by Drew et al. (2005). An extensive study by Schutze et al. (2014a, b) concluded that there is no scientific evidence to consider this species different from *Bactrocera dorsalis* and thus the names were put in synonymy. The majority of the literature prior to 2015 on the African populations of this species, however, will be published with reference to *Bactrocera invadens*.

Formal redescription (after redescription of *B. invadens* by White, 2006)

Wing length, 5.2-6.9 mm.

Head. Pedicel+first flagellomere not longer than ptilinal suture. Face, antennal furrow with a dark spot. Frons, frontal setae 2, orbital seta 1.

Thorax. Scutum often entirely red-brown or streaked black, but sometimes entirely black; postpronotal lobe yellow; notopleural callus yellow; notopleural xanthine absent; lateral postsutural vitta present; medial postsutural vitta absent. Scutellum without any dark patterning (except for basal dark margin). Anepisternum with a stripe from notopleural callus to (or almost to) katepisternum; extended onto katepisternum. Lateroterga with a single xanthine across both anatergite and katatergite. Thoracic setae. Anterior notopleural seta present; anterior supra-alar seta present; prescutellar acrostichal seta present; basal scutellar seta absent.

Wing. Basal cells bc and c without an almost complete covering of microtrichia; cell bm without microtrichia. Narrow subbasal raised section of cell br with extensive covering of microtrichia. Crossvein R-M beyond middle of cell dm. Costal band complete; shallow, not or only rarely slightly extending below vein R₂₊₃ before wing apex; not expanded into an apical spot. Anal streak present (colour extending beyond cell bcu). Cells bc and c hyaline. Without any crossbanding.

Legs. Femora pale coloured.

Abdomen. Red-brown, patterned black; shape, see image; patterning very variable; tergite III with a transverse black band which often extends broadly along lateral margin so that much of hind margin is black; lateral dark marking on tergites IV and V broad, that in tergite V mesally extended further than outer margin of ceroma. Tergites II-V separate.

Male. Tergite III with pecten, dense microtrichia adjacent end A₁+Cu₂, and hindtibia preapical "pad". Basal costal sections without specialised setae. Aedeagus length (without glans) 2.61-2.96 mm (mean 2.84 mm).

Female. Aculeus pointed; no torsion; length, 1.6 mm.

Remark: differentiation between this species and close allies within the *B. dorsalis* species complex (see Drew & Hancock, 1994) is difficult and needs expert confirmation.

Encyclopedia of Life link: <http://eol.org/pages/726292/overview>

DNA barcoding

Multiple reference DNA barcodes from the species distribution (both under *B. dorsalis* and *B. invadens*) are available on the Barcode of Life Data Systems (BOLD) at :

http://www.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxon=Bactrocera+dorsalis&searchTax=

http://www.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxon=Bactrocera+invadens&searchTax=

The molecular identification of African *B. dorsalis* (formerly *B. invadens*) through DNA barcoding proves to be problematic as *B. dorsalis* s.s. cannot be properly resolved from a number of closely related species belonging to the *B. dorsalis* species complex (see Drew & Hancock 1994; Drew & Romig 2013; Schutze *et al.* 2015). In BOLD (March 2017), *B. dorsalis* is recovered in multispecific BINs (clusters) including other members of the *B. dorsalis* complex (*B. carambolae* , *B. caryeae* , *B. cognata* , *B. kandiensis* , *B. makilingensis* , *B. occipitalis* , *B. paraverbascifoliae* , *B. philippinensis*, *B. thailandica* , *B. verbascifoliae*) as well as a number of (potentially misidentified?) reference vouchers of *B. cacuminata* , *B. opiliae* , *B. ruiiensis*, *B. zonata*.

Biology

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). Eggs are laid under the fruit skin and are usually white to creamy yellow in colour. Eggs hatch into larvae which feed on the fruit pulp. There are three larval instars with sizes varying between 2 and 10 mm in length depending on the larval stages (Grout *et al.*, 2011). The larval duration of *B. dorsalis* varies between 7 and 36 days at temperatures ranging between 35°C and 15°C respectively (Rwomushana *et al.*, 2008b). Mature larvae drop to the soil and burrow to pupate. 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).

Host plant list

This pest species utilizes a wide range of hosts. In Africa, it largely displaced the native *Ceratitis cosyra* from mango (Ekesi *et al.*, 2009). Detailed studies on host range can be found for West Africa (Goergen *et al.* , 2011), and Tanzania (Mwatawala *et al.*, 2009). For Asian host records, see Allwood *et al.* (1999). Throughout its African range it is recorded from the hosts listed in the table below.

PlantFamily	PlantLatinName	PlantCommonNameEnglish
Anacardiaceae	Anacardium occidentale	cashew nut
Anacardiaceae	Mangifera indica	mango
Anacardiaceae	Sclerocarya birrea	maroola plum
Anacardiaceae	Sorindeia madagascariensis	
Anacardiaceae	Spondias cytherea	Hog plum
Anacardiaceae	Spondias mombin	tropical plum
Annonaceae	Annona cherimola	cherimoya

Annonaceae	<i>Annona diversifolia</i>	
Annonaceae	<i>Annona montana</i>	
Annonaceae	<i>Annona muricata</i>	soursop
Annonaceae	<i>Annona reticulata</i>	custard apple
Annonaceae	<i>Annona senegalensis</i>	wild custard apple
Annonaceae	<i>Annona squamosa</i>	sugar-apple
Annonaceae	<i>Exalobus monopetalus</i>	
Apocynaceae	<i>Saba senegalensis</i>	Saba nut
Boraginaceae	<i>Cordia</i> sp. cf <i>myxa</i>	
Capparaceae	<i>Maerua duchesnei</i>	
Caricaceae	<i>Carica papaya</i>	papaya, pawpaw
Clusiaceae	<i>Garcinia mannii</i>	chewing stick
Combretaceae	<i>Terminalia catappa</i>	tropical almond
Cucurbitaceae	<i>Citrullus colocynthidis</i>	bitter apple
Cucurbitaceae	<i>Citrullus lanatus</i>	watermelon
Cucurbitaceae	<i>Cucumis sativus</i>	cucumber
Cucurbitaceae	<i>Cucurbita maxima</i>	pumpkin, squash
Cucurbitaceae	<i>Cucurbita pepo</i>	gourd, squash, zucchini
Cucurbitaceae	<i>Lagenaria siceraria</i>	water-bottle
Cucurbitaceae	<i>Luffa</i> sp.	
Cucurbitaceae	<i>Momordica charantia</i>	bitter melon, bitter gourd
Ebenaceae	<i>Diospyros montana</i>	mountain persimmon
Fabaceae	<i>Cordyla pinnata</i>	cayor pear tree
Irvingiaceae	<i>Irvingia gabonensis</i>	african wild mango
Lauraceae	<i>Persea americana</i>	avocado
Liliaceae	<i>Dracaena steudneri</i>	
Loganiaceae	<i>Strychnos mellodora</i>	
Moraceae	<i>Antiaris</i> sp.	
Moraceae	<i>Ficus</i> cf. <i>ottonifolia</i>	
Musaceae	<i>Musa acuminata</i>	cavendish banana
Musaceae	<i>Musa</i> sp.	banana
Musaceae	<i>Musa</i> x <i>paradisiaca</i>	plantain
Myrtaceae	<i>Eugenia uniflora</i>	surinam cherry, pitanga cherry
Myrtaceae	<i>Psidium guajava</i>	common guava
Myrtaceae	<i>Psidium</i> sp.	
Myrtaceae	<i>Syzygium jambos</i>	rose-apple
Myrtaceae	<i>Syzygium malaccense</i>	Malay-apple
Oxalidaceae	<i>Averrhoa carambola</i>	carambola/starfruit
Rhamnaceae	<i>Ziziphus mauritiana</i>	indian jujube
Rosaceae	<i>Eriobotrya japonica</i>	loquat
Rubiaceae	<i>Sarcocephalus latifolius</i>	Guinea peach
Rutaceae	<i>Citrus aurantium</i>	sour orange
Rutaceae	<i>Citrus grandis</i>	
Rutaceae	<i>Citrus limon</i>	lemon
Rutaceae	<i>Citrus reticulata</i>	tangerine

Rutaceae	Citrus reticulata x paradisi	tangelo cv Orlando
Rutaceae	Citrus sinensis	sweet orange
Rutaceae	Citrus sinensis x reticulata	Tangor cv Ortanique
Rutaceae	Citrus x paradisi	grapefruit
Rutaceae	Citrus x tangelo	tangelo
Sapindaceae	Blighia sapida	Ackee
Sapotaceae	Achra sapota	
Sapotaceae	Chrysophyllum albidum	white star-apple
Sapotaceae	Chrysophyllum cainito	common star-apple
Sapotaceae	Manilkara zapota	sapodilla, chicle
Sapotaceae	Richardella campechiana	ties, egg fruit
Sapotaceae	Vitellaria paradoxa	shea butter
Solanaceae	Capsicum frutescens	tabasco pepper
Solanaceae	Solanum aethiopicum	
Solanaceae	Solanum anguivi	
Solanaceae	Solanum incanum	
Solanaceae	Solanum lycopersicum	tomato
Solanaceae	Solanum nigrum	black nightshade
Solanaceae	Solanum sodomaeum	Sodom apple

Additional information on African host records and associated specimens can be found on : <http://projects.bebif.be/fruitfly/taxoninfo.html?id=161>

Information on host range worldwide can be found on the USDA Compendium of Fruit Fly Host Information (see Liquido et al., 2016).

Impact & management

Losses incurred by *Bactrocera dorsalis* can be substantial, especially on mango (Ekesi et al., 2006; Goergen et al., 2011; Rwomushana et al., 2008a; Vayssières et al., 2009). Significant damage by the pest has also been recorded on guava and citrus in East and West Africa (Goergen et al., 2011; Rwomushana et al., 2008a). Seasonal studies in western Africa show that *B. dorsalis* is predominant in the rainy season, compared to *C. cosyra* which occurs predominantly in the dry season (Vayssières et al., 2015).

Management for this species is, as for most fruit fly pests, most efficient using an IPM (Integrated Pest Management) program, including aspects such as orchard sanitation, bait sprays, male annihilation technique, mass trapping among others. Specific IPM methodologies against *B. dorsalis* in Africa are presented by Mwatawala et al. (2015). General reviews on the current IPM components applied in Africa can be found in chapters 13 to 20 of Ekesi et al. (2016).

No SIT (Sterile Insect Technique) application specifically for this species has been developed in Africa. SIT has been used in eradication and suppression programmes elsewhere (see Enkerlin, 2005 for a review).

Attractants & trapping

Both sexes can be attracted by liquid protein baits (Torula yeast), protein bait capsules (Questlure), three component Biolure, two component Biolure (Ammonium Acetate and Trimethylamine).

Male flies are attracted efficiently by methyl eugenol.

General information on trapping, types of traps, lures and required density of trapping stations can be found in IAEA (2013), Shelly et al. (2014), and Manrakhan (2016).

Distribution

Bactrocera dorsalis is found throughout most of Sub-Saharan Africa. (De Villiers et al., 2016). In Indian Ocean only reported from Madagascar. Introduced into Mauritius but eradicated (Sookar & Deguine, 2016).

Distribution map for Africa, based upon specimen records with georeferences, is available at:

<http://projects.bebif.be/fruitfly/taxoninfo.html?id=161>

For worldwide distribution, see GBIF: <http://www.gbif.org/species/7930834>

Also data under *B. invadens*, *B. papayae* and *B. philippinensis*, see respectively:

<http://www.gbif.org/species/8137983>

<http://www.gbif.org/species/5087263>

<http://www.gbif.org/species/5087241>

Quarantine regulations

Bactrocera dorsalis is on the A1 quarantine pest list of the EPPO and is a quarantine pest for the USA, Jordan and New Zealand (<https://gd.eppo.int/taxon/DACUDO/categorization>).

Others

CABI Plantwise factsheet on *B. dorsalis* can be found at:

<http://www.plantwise.org/knowledgebank/datasheet.aspx?dsid=17685>

CABI invasive species compendium on *B. dorsalis* can be found at:

<http://www.cabi.org/isc/datasheet/17685>

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