

Diagnostics
Diagnostic**PM 7/114 (1) *Bactrocera zonata*****Specific scope**

This standard describes a diagnostic protocol for *Bactrocera zonata*¹.

Specific approval and amendment

Approved in 2013-09.

Introduction

The Peach Fruit fly, *Bactrocera zonata* is one of the most harmful species of Tephritidae. It is a serious pest of peach *Prunus persica* (Rosaceae) and *Annona squamosa* (Annonaceae) in India, as well as *Psidium guajava* (Myrtaceae) and *Mangifera indica* (Anacardiaceae) in Pakistan. It is a polyphagous species attacking about 40 species of fruit and vegetables (Duyck *et al.*, 2004).

Bactrocera zonata is native to India where it was first recorded in Bengal (Kapoor, 1993). It is present in *Asia*: Bangladesh, Bhutan, India, Iran, Laos, Myanmar, Nepal, Oman, Pakistan, Saudi Arabia, Sri Lanka, Thailand, United Arab Emirates, Vietnam and Yemen; *America*; in California, it has been trapped but eradicated (White & Elson-Harris, 1992). *Africa*: this species is present in Egypt (first recorded in 1924) and since 1993 has been causing fruit damage (*Mangifera indica*, *Psidium guajava*, *Prunus armeniaca*, *Prunus persica*, *Prunus domestica* and *Ficus carica*) (Mosleh *et al.*, 2011). It has also been recorded from Libya, Mauritius and Reunion Island. Information on True fruit flies (Diptera, Tephritidae) in Africa is available in (De Meyer & White, 2004). Details on pest distribution is available in PQR (EPPO, 2013). Additional information on the biology of the pest can be found in EPPO/CABI (1997).

Identity

Name: *Bactrocera* (*Bactrocera*) *zonata* (Saunders, 1842).

Synonyms: *The most frequently used synonyms are: Dasyneura zonata* Saunders, *Bactrocera maculigera*

Doleschall, *Rivellia persicae* Bigot, *Dacus ferrugineus* var. *mangiferae* Cotes (Thompson, 1998).

Taxonomic position: Diptera Brachycera Tephritidae (nomenclature and taxonomy suggested by Fauna Europaea are used as the reference).

EPPO code: DACUZO.

Phytosanitary categorization: EPPO A1 No. 302, EU Annex I.A1.

Detection

Fruit flies may be detected as eggs or larvae in fruits or as adults caught in traps. Males of *Bactrocera zonata* can be caught in methyl eugenol baited traps.

If collected larvae are to be preserved, they should be placed in boiling water for a few minutes and then transferred to 70% ethanol (if a molecular test will be carried out subsequently, 95–100% ethanol is recommended). Other procedures can be used.

Identification

Morphological identification with a binocular microscope is the recommended diagnostic method. Magnification ×10 for adult to ×200 for larva and aculeus.

A reliable identification can only be performed on an adult specimen and although larvae are described below, identification based on this stage is not recommended.

Description

Terminology follows White & Elson-Harris (1992).

Larva

(After White & Elson-Harris, 1992; Carroll *et al.*, 2004)

¹Use of brand names of chemicals or equipment in these EPPO Standards implies no approval of them as others may also be suitable.

For identification of larvae of the family Tephritidae see Stehr (1991). Drawings of larvae are available at http://delta-intkey.com/ffl/www.bac_zona.htm

Partial description of 3rd instar larva:

Length 10.0–11.0 mm (Fig. 1).

Head. Antenna 2 segmented. Stomal sensory organ small, rounded. Oral ridges with 10–11 deep, clearly defined rows. Accessory plates present.

Cephalopharyngeal skeleton. Mouthhook without preapical tooth; dental sclerite present; Parastomal bare elongate (Fig. 2).

Anterior spiracles. Elevated, margin concave medially and with 13–15 short tubules (Fig. 2).

Thoracic and abdominal segments. T1 with 6–9 rows of small spinules encircling anterior portion of segment; T2 with fewer rows encircling anterior portion of segment; T3 with a few spinules dorsally but forming rows laterally and ventrally; A1–A8 with rows of spinules ventrally forming creeping welts, with 1 anterior and 1–2 posterior rows of slightly larger spinules.

Anal area. Lobes well developed and surrounded by discontinuous rows of small spinules.

Posterior spiracles. Spiracular slits 3.0–3.5 times as long as they are broad, each with moderately sclerotised rima (Fig. 3); spiracular hairs slightly longer than half the length of a spiracular slit, frequently branched; dorsal and ventral bundles of 3–17 hairs, lateral bundles of 6–8 hairs.

Adult

(After Carroll *et al.*, 2002).

For identification of the Family Tephritidae see Papp & Darvas (2000). An interactive key for Dacine fruit flies Diptera has also been published (White & Hancock, 2004).

Predominantly pale orange-brown to red-brown (Fig. 4).

Head. Head higher than long. Chaetotaxy reduced: Ocellar and postocellar bristles absent; Frontal bristles: two pairs; Orbital bristles one pair; Posterior orbital bristles reclinate (Fig. 5). Dark round spots in each antennal furrow (Fig. 5).



Fig. 1 Larva.

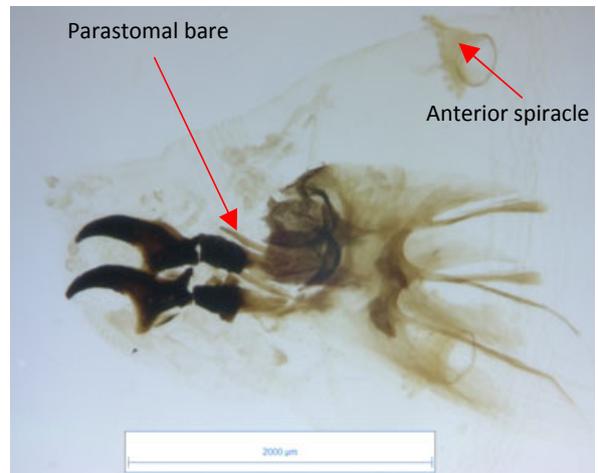


Fig. 2 Head of larva, Cephalopharyngeal skeleton.



Fig. 3 Posterior spiracles.

First flagellomere elongate (at least three times as long as broad); rounded apically. Arista longer than flagellomere.

Thorax. Anterior supra-alar bristles present. Presutural supra-alar bristles absent. Postsutural supra-alar bristle present. Intra-alar bristles present well developed, similar to post-alar bristles. Prescutellar acrostichal setae present. Anterior notopleural bristles present. Transverse suture with the lateral branches wide apart. Scutum orange-brown, or red-brown; without a large dark central stripe which broadens basally. Postpronotal lobe entirely pale whitish or yellowish; concolourous with lateral postsutural stripe. Posterior half of anepisternum pale whitish or yellowish. Two pale whitish to yellow lateral postsutural stripes (vittae). Lateral postsutural stripes of scutum extending to intra-alar bristles or beyond. Scutum without blackish dorsoventral stripe. Katepisternite, katatergite and anatergite all with pale yellowish or whitish spot present and distinct. Mediotergite uniformly brown or yellowish to orange-brown medially, with distinct dark spot present (Fig. 6).

One pair of scutellar setae; pale and acuminate. Scutellum densely setulose; without a dark and pale pattern (at



Fig. 4 Habitus.

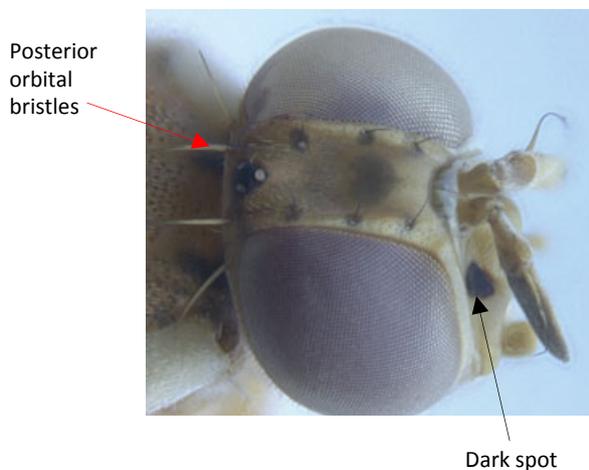


Fig. 5 Head.

most a narrow dark basal line); without mark. Setulae on scutellum short, decumbent; unicolorous, acuminate (Fig. 7).

Abdomen. Abdomen ovate or parallel sided. Abdominal tergites separate. Abdomen in lateral view arched, dome-like, rather rigid. Abdominal tergite 1 broader at apex than at base; without a prominent hump laterally. Male: pecten with dark bristles on tergite 3 (Fig. 8). Abdominal tergites 3–5 predominantly yellow to orange brown. Abdominal tergites with medial dark stripe usually on T3–T5, or with medial dark stripe on T5 only; not brown with medial T-shaped yellow mark; with separate dark areas on anterolateral margins of T3–T5 (T3 only), or without isolated dark areas on lateral margins of T3–T5; without dark brown transverse bands. Aculeus pointed; length 1.0–1.2 mm (Fig. 9).

Legs. Femora slender. Fore femur with regular bristles; without ventral spines; with 1–3 posterodorsal and 1 posteroventral rows of bristles only, or without major bristles. Mid femur and hind femur without spine bristles. Middle

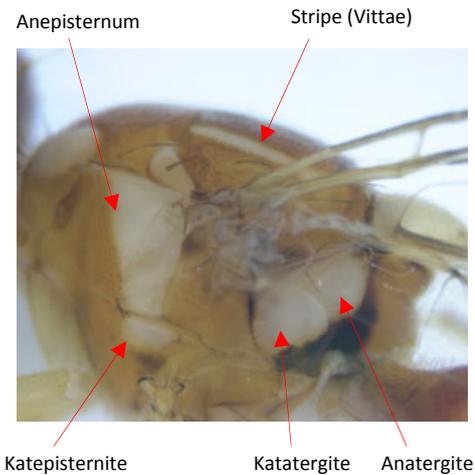


Fig. 6 Thorax – lateral view.



Fig. 7 Part of scutum and scutellum.

leg of male without feathering. Femora all entirely yellow without dark mark.

Wings. Length: 5.2–6.1 mm (Fig. 10). Wing pattern reduced and mostly yellowish, or mostly brownish. Costal band with only cell sc and apex of vein R4 + 5 coloured. Apex of costal band distinctly expanded into a brown elongate spot. Cell bm broad, parallel-sided; ratio of length to width 2; ratio of width to cell cup width 2. Vein M distally curved anteriad. Cell dm widens apically gradually from base. Posterodistal corner of cell dm approximately a right angle. Cell cup extension present and coloured, vein CuA2 abruptly bent; longer than vein A1 + CuA2; with parallel margin.

Reference material

Not applicable.

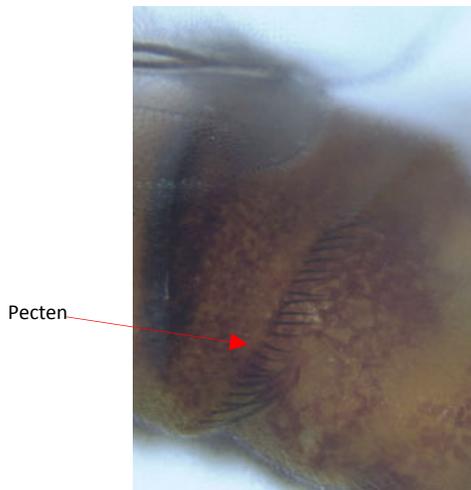


Fig. 8 Part of abdomen of male - pecten on tergite 3.

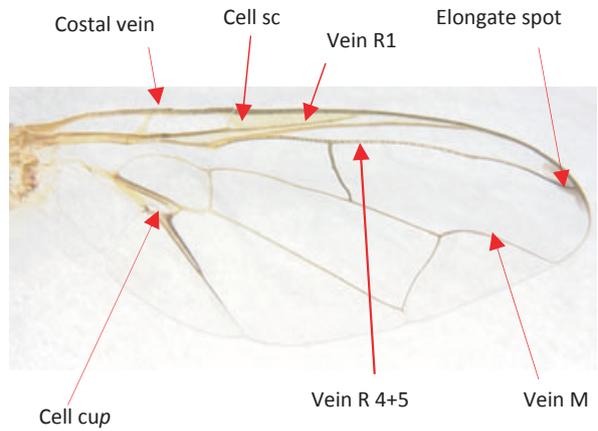


Fig. 10 Wing.

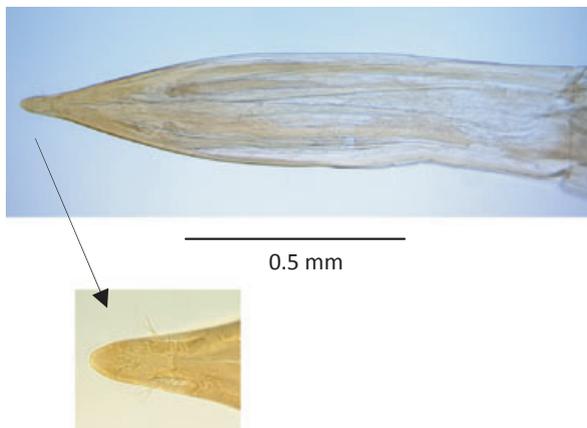


Fig. 9 Aculeus.

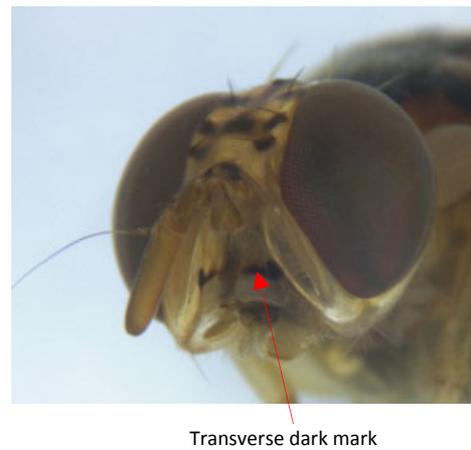


Fig. 11 Head of *Bactrocera correcta*.

Reporting and documentation

Guidelines on reporting and documentation are given in EPPO Standard PM7/77 (1) *Documentation and reporting on a diagnosis*.

Performance criteria

When performance criteria are available, these are provided with the description of the test. Validation data are also available in the EPPO Database on Diagnostic Expertise (<http://dc.eppo.int>), and it is recommended to consult this database as additional information may be available there (e.g. more detailed information on analytical specificity, full validation reports, etc.).

Further information

Further information on this organism can be obtained from:

Feedback on this diagnostic protocol

If you have any feedback concerning this Diagnostic Protocol, or any of the tests included, or if you can provide additional validation data for tests included in this protocol that you wish to share please contact diagnostics@eppo.int.

Protocol revision

An annual review process is in place to identify the need for revision of diagnostic protocols. Protocols identified as needing revision are marked as such on the EPPO website.

When errata and corrigenda are in press, this will also be marked on the website.

Acknowledgements

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Appendix 1 – Key for identification of adult *B. zonata*

For identification of the Family Tephritidae see Papp & Darvas (2000). An interactive key for Dacine fruit flies (Diptera) has also been published (White & Hancock, 2004).

Identification of the adult of *Bactrocera zonata* (after White & Elson-Harris, 1992; Kapoor, 1993 and Carroll *et al.*, 2002).

1	Subcostal vein abruptly bent and dorsal side of vein R1 with setulae (Fig. 10)	Tephritidae 2
1*	Subcostal vein not abruptly bent or dorsal side of vein R1 lacks setulae	Other families

(continued)

2	Abdominal segments not fused	3
2*	Abdominal segments fused	<i>Dacus</i>
3	Scutellum not bilobed and with 2 marginal setae (Fig. 7)	4
3*	Scutellum bilobed	Other species
4	Scutum with prescutellar acrostichal and anterior supra-alar setae and without medial orange vitta (Fig. 7). Male with pecten on tergite 3 (Fig. 8). <i>Bactrocera</i> (<i>Bactrocera</i>) group of subgenera	5
4*	Scutum different	Other subgenera
5	Mesonotum with two postsutural yellow vittae. Head with black markings	6
5*	Mesonotum with three postsutural yellow vittae	Other species
6	Face with a black spot in each antennal furrow (Fig. 5)	7
6*	Face with transverse dark markings (Fig. 11)	<i>B. correcta</i>
7	Wing without any cross band. Area of cell br immediately above cell bm without microtrichia. Costal band with only cell sc and apex of vein R4 + 5 coloured. Apex of costal band expanded into an elongate (Fig. 10).	8
7*	Wing different	Other species
8	Scutellum entirely pale coloured, except sometimes for a narrow black line across the base (Fig. 7)	9
8*	Dorsal surface of scutellum with a large black triangular mark, lateral and apical areas yellow	<i>B. psidii</i>
9	Thorax and abdomen pale orange-brown to red-brown (Fig. 4). Apex of costal band distinctly expanded into a spot. Aculeus length 1.0–1.2 mm (Fig. 9)	<i>Bactrocera zonata</i>
9*	Thorax and abdomen black (if dark orange-brown then the wing without marking). Aculeus length 1.6 mm	<i>B. tuberculata</i>

Appendix 2 – Preparation of aculeus for observation under a binocular microscope with ×200 or 400 magnification

Break off the abdomen of the female and place it in a 10% potassium solution, 1 h at room temperature or 20–30 min at warming temperature.

When the abdominal sclerites are smooth enough, remove them leaving only the aculeus. Use a pin to separate aculeus and take care to not damage the tip of the aculeus.

Transfer the aculeus in distilled water during several minutes and mount on a glass in a drop of glycerol with a cover slip.