Factsheet *Ceratitis capitata* (Wiedemann)

Original name: *Tephritis capitata* Wiedemann, 1824: 55.

Vernacular name: Mediterranean fruit fly, medfly

Formal redescription (after De Meyer, 2000)

Body length: 4.00 (3.45-4.60) mm; wing length: 4.12 (3.65-4.55) mm.

Male
Head. Antenna yellow or more orange; first and second segment and base of third segment sometimes darker. Third antennal segment twice as long as second segment. Arista with short hairs, mainly on base and only distinct dorsally. Frons convex to flat; yellow, sometimes with darker orange or orange-brown patches including darker band near antennal implant, occasionally with faint silvery shine; with short scattered hairs which are largely the same colour as frons. Frontal and ocellar bristles black; lower orbital modified, stem pale and shorter than arista with apical end dark and diamond-shaped; upper orbital weakly developed, black. Face yellow-white. Genal bristle pale, genal setulae pale or reddish, weakly developed. Postocellar and outer vertical pale.
Thorax. Postpronotum white, with distinct black spot. Mesonotum: ground colour black, microtrichiae pattern silvery with ashgrey shine, spots black except sutural white spots, prescutellar white markings merged. Scapular setae pale. Scutellum yellow-white, basally with two dark spots, separate or narrowly touching, apically with three merged spots, only slightly incised. Anepisternum pale with lower half darker yellow, pilosity variable but at least partly dark in lower half.
Legs yellow; setation typical for subgenus, mainly pale especially on femora. Fore femur posterodorsally with bush of longer orange-coloured hairs along entire length, basally these hairs darker red or brown but not distinct black; posteriorly hairs much shorter; ventral spines yellow-orange; anteroventral row of hairs short and yellow-orange. Hind femur with longer hairs dorsally and ventrally on apical fourth.
Wing. marginal band usually with clear and complete interruption, occasionally narrowly or partly touching; cubital band free; medial band absent; crossvein r-m at or near middle of discal cell. Vein R1 beyond or equal with crossvein r-m. Orientation crossvein dm-cu variable.
Abdomen. Yellow. Setation and banding typical for subgenus.

Female
As in male except for the following characters: Third antennal segment in general darker than in male. Frons sometimes with darker hairs; darker patches never as outspoken as in male. Orbitals not modified, well developed. Genal setulae darker and strongly developed. Anepisternum without darker pilosity. Legs without feathering; ventral spines on fore femur sometimes partially dark. Oviscape shorter than abdominal terga.

Encyclopedia of Life link: http://eol.org/pages/723951/overview

DNA barcoding

Multiple reference DNA barcodes from the species distribution are available on the Barcode of Life Data Systems (BOLD) at :

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

The molecular identification of *C. capitata* through DNA barcoding proves to be problematic as this species. cannot be properly resolved from *C. caetrata* (Barr et al., 2012). Accordingly, In BOLD, these two species are recovered as part of *a* multispecific BIN. *C. caetrata* has a restricted distribution and host range (only known from Kenya and not recorded from any commercially growns fruits, see De Meyer et al., 2002)

Biology

Ceratitis capitata can complete its life cycle in about 32 days at 25ºC (Vargas et al., 1984). Adults have recorded to live well beyond 19 weeks with a life expectancy for males being at 11 weeks and a life expectancy for females being at 9 weeks (Carey et al. 2008) . Females start laying eggs in fruit between 3-6 days after adult emergence (Manrakhan & Lux, 2006; Vargas et al., 1984). Eggs are laid under the skin of fruit. Eggs are usually white to creamy yellow in colour. The area on the fruit skin where eggs are laid usually becomes discoloured. Eggs hatch into larvae which feed on the fruit pulp. There are three larval instars. The larval duration of *C. capitata* varies from 5 to 21 days at 30ºC-15ºC (Duyck & Quilici, 2002). Fully fed larvae burrow into the soil where they pupate. The pupal stage lasts for 8-35 days at 30ºC-15°C Duyck & Quilici, 2002) after which an adult fly emerges and the cycle continues.

Host plant list

This the most polyphagous African fruit fly species, recorded from more than 100 commercial and wild fruits in Africa, belonging to more than 30 plant families. Worldwide it is recorded from more than 350 different hosts. A dedicated website on the host plants is maintained by USDA (Liquido et al., 2016). Detailed studies on host range can be found for Kenya (Copeland et al., 2002). Throughout its range in Africa it is recorded from the hosts listed in the table below.

PlantFamily	PlantLatinName	PlantCommonNameEnglish
Anacardiaceae	Anacardium occidentale	cashew nut
Anacardiaceae	Harpephyllum caffrum	kaffir plum, wild plum
Anacardiaceae	Mangifera indica	mango
Annonaceae	Annona cherimola	cherimoya
Annonaceae	Annona reticulata	custard apple
Annonaceae	Artabotrys monteiroae	
Annonaceae	Cananga odorata	ylang-ylang
Annonaceae	Monodora grandidieri	
Apocynaceae	Acokanthera cf oppositifolia	
Apocynaceae	Acokanthera friesiorum	
Apocynaceae	Acokanthera oppositifolia	

Apocynaceae	Acokanthera schimperi	round-leaved poison bush
Apocynaceae	Acokanthera sp.	poison bush
Apocynaceae	Carissa carandas	
Apocynaceae	Carissa edulis	egyptian carissa
Apocynaceae	Carissa grandiflora	natal plum
Apocynaceae	Carissa longiflora	
Apocynaceae	Carissa sp.	
Apocynaceae	Carissa tetramera	
Apocynaceae	Thevetia peruviana	lucky nut, yellow oleander
Berberidaceae	Berberis holstii	
Boraginaceae	Bourreria petiolaris	
Boraginaceae	Ehretia cymosa	
Cactaceae	Opuntia sp.	prickly pear
Cactaceae	Pereskia aculeata	Barbados gooseberry
Capparaceae	Capparis sepiaria	wild caper-bush
Capparaceae	Capparis sepiaria var. citrifolia	
Capparaceae	Capparis sp.	
Capparaceae	Maerua duchesnei	
Cecropiaceae	Myrianthus arboreus	bugtree?
Celastraceae	Elaeodendron schweinfurthianum	
Celastraceae	Mystroxylon aethiopicum	
Celastraceae	Salacia elegans	
Chrysobalanaceae	Chrysobalanus icaco	coco plum, fat-pork
Clusiaceae	Calophyllum tacamahaca	
Combretaceae	Terminalia catappa	tropical almond
Cucurbitaceae	Coccinia microphylla	
Cucurbitaceae	Corallocarpus ellipticus	
Cucurbitaceae	Cucumis dipsaceus	teasel gourd
Cucurbitaceae	Peponium mackenii	
Ebenaceae	Diospyros abyssinica	
Ebenaceae	Diospyros kaki	japanese persimmon
Ebenaceae	Diospyros mespiliformis	
Ebenaceae	Diospyros pallens	
Ebenaceae	Diospyros pubescens	
Ebenaceae	Euclea divinorum	
Ebenaceae	Euclea racemosa schimperi	
Ericaceae	Arbutus unedo	strawberry tree
Euphorbiaceae	Antidesma venosum	
Euphorbiaceae	Drypetes gerrardii	
Euphorbiaceae	Drypetes natalensis	
Euphorbiaceae	Drypetes natalensis var. leiogyna	
Euphorbiaceae	Drypetes sp.	
Euphorbiaceae	Flueggea virosa	
Fabaceae	Pithecellobium dulce	
Flacourtiaceae	Dovyalis caffra	kei apple

Flacourtiaceae	Dovyalis hebecarpa	ceylon gooseberry
Flacourtiaceae	Flacourtia indica	governor's plum
Flacourtiaceae	Ludia mauritiana	
Flacourtiaceae	Rawsonia sp.	
Flagellariaceae	Flagellaria guineensis	
Goodeniaceae	Scaevola plumieri	
Goodeniaceae	Scaevola sericea	
Goodeniaceae	Scaevola taccada	
Lauraceae	Cinnamomum verum	cinnamon
Lauraceae	Persea americana	avocado
Liliaceae	Asparagus sp.	asparagus
Loganiaceae	Strychnos decussata	Cape teak
Loganiaceae	Strychnos henningsii	
Loganiaceae	Strychnos potatorum	
Loganiaceae	Strychnos pungens	wild orange, monkey orange
Loganiaceae	Strychnos sp.	
Meliaceae	Ekebergia capensis	dog plum, Cape ash
Meliaceae	Sandoricum koetjape	
Moraceae	Antiaris toxicaria	antiaris, false iroko, false mvule
Moraceae	Ficus carica	common fig
Moraceae	Ficus sp.	fig
Myrtaceae	Acca sellowiana	pineapple guava
Myrtaceae	Eugenia paniculata	
Myrtaceae	Eugenia uniflora	surinam cherry, pitanga cherry
Myrtaceae	Psidium cattleyanum	strawberry guava, cherry guava
Myrtaceae	Psidium friedrichsthalianum	coronilla
Myrtaceae	Psidium guajava	common guava
Myrtaceae	Syzygium cumini	Java plum
Myrtaceae	Syzygium malaccense	Malay-apple
Myrtaceae	Syzygium samarangense	java apple
Olacaceae	Ximenia americana var. caffra	
Oleaceae	Olea europaea cuspidata	
Oleaceae	Olea woodiana	
Opiliaceae	Opilia amentacea	
Opiliaceae	Pentarhopalopilia umbellulata	
Oxalidaceae	Averrhoa bilimbi	cucumber tree, pickle fruit
Oxalidaceae	Averrhoa carambola	carambola/starfruit
Passifloraceae	Passiflora caerulea	blue passion fruit
Passifloraceae	Passiflora edulis	granadilla
Passifloraceae	Passiflora sp.	
Passifloraceae	Passiflora suberosa	
Podocarpaceae	Podocarpus elongatus	yellow-wood
Polygonaceae	Coccoloba uvifera	seagrape
Rhamnaceae	Ziziphus mauritiana	indian jujube
Rosaceae	Cydonia oblonga	quince

Rosaceae	Eriobotrya japonica	loquat
Rosaceae	Malus domestica	apple
Rosaceae	Prunus africana	
Rosaceae	Prunus armeniaca	apricot
Rosaceae	Prunus domestica	plum
Rosaceae	Prunus persica	peach
Rosaceae	Prunus sp. cf capuli	
Rosaceae	Pyrus communis	pear
Rubiaceae	Coffea arabica	arabica coffee
Rubiaceae	Coffea canephora	robusta coffee
Rubiaceae	Coffea sp.	coffee
Rubiaceae	Guettarda speciosa	
Rubiaceae	Lamprothamnus zanguebaricus	
Rubiaceae	Oxyanthus zanguebaricus	
Rubiaceae	Polysphaeria parvifolia	
Rubiaceae	Vangueria infausta	mispel, wild medlar
Rubiaceae	Vangueria sp.	
Rutaceae	Atalantia sp.	
Rutaceae	Casimiroa edulis	white sapote
Rutaceae	Citrus aurantium	sour orange
Rutaceae	Citrus japonica	Kumquat
Rutaceae	Citrus limon	lemon
Rutaceae	Citrus reticulata	tangerine
Rutaceae	Citrus sinensis	sweet orange
Rutaceae	Citrus sp.	
Rutaceae	Citrus x nobilis	tangor
Rutaceae	Clausena anisata	
Rutaceae	Murraya exotica	Chinese box
Rutaceae	Murraya paniculata	orange jessamine
Rutaceae	Triphasia sp.	
Rutaceae	Vepris lanceolata	
Rutaceae	Vepris nobilis	
Rutaceae	Vepris simplicifolia	
Rutaceae	Vepris trichocarpa	
Salvadoraceae	Azima tetracantha	
Santalaceae	Santalum album	Indian Sandalwood
Sapindaceae	Filicium decipiens	fernleaf
Sapotaceae	Argania spinosa	argan
Sapotaceae	Chrysophyllum argyrophyllum	
Sapotaceae	Chrysophyllum cainito	common star-apple
Sapotaceae	Chrysophyllum carpussum	
Sapotaceae	Chrysophyllum magalismontanum	
Sapotaceae	Chrysophyllum sp.	
Sapotaceae	Chrysophyllum viridifolium	
Sapotaceae	Manilkara butugi	

Sapotaceae	Manilkara sansibarensis	
Sapotaceae	Manilkara sulcata	
Sapotaceae	Manilkara zapota	sapodilla, chicle
Sapotaceae	Mimusops bagshawei	
Sapotaceae	Mimusops caffra	coast red-milkwood
Sapotaceae	Mimusops elengi	spanish cherry
Sapotaceae	Mimusops kirkii	
Sapotaceae	Mimusops kummel	
Sapotaceae	Mimusops obtusifolia	round-fruited red-milkwood
Sapotaceae	Mimusops sp.	milkwood
Sapotaceae	Mimusops zeyheri	
Sapotaceae	Richardella campechiana	ties, egg fruit
Sapotaceae	Sideroxylon inerme	white milkwood
Sapotaceae	Synsepalum dulcificum	miraculous fruit
Simaroubaceae	Brucea antidysenterica	
Simaroubaceae	Brucea sp.	
Simaroubaceae	Harrisonia abyssinica	
Solanaceae	Capsicum annuum	bell pepper, capsicum
Solanaceae	Capsicum cardenasii	
Solanaceae	Capsicum chinense	Habanero pepper
Solanaceae	Capsicum frutescens	tabasco pepper
Solanaceae	Capsicum sp.	
Solanaceae	Lycium campanulatum	
Solanaceae	Lycium sp.	
Solanaceae	Solanum aethiopicum	
Solanaceae	Solanum auriculatum	
Solanaceae	Solanum capsicastrum	
Solanaceae	Solanum macrocarpon	
Solanaceae	Solanum mauritianum	bugtree
Solanaceae	Solanum nigrum	black nightshade
Solanaceae	Solanum scabrum	
Solanaceae	Solanum seaforthianum	
Solanaceae	Solanum sp.	
Sterculiaceae	Cola natalensis	
Tiliaceae	Grewia tembensis	
Tiliaceae	Grewia trichocarpa	
Vitaceae	Vitis vinifera	grapes

Additional information on African host records and associated specimens can be found on : http://projects.bebif.be/fruitfly/taxoninfo.html?id=3

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 *Ceratitis capitata* can be substantial, especially in regions where the species has been introduced. However, in most African countries, it seems to be in competition with other native and exotic fruit flies and its impact is more limited (see Mwatawala et al., 2009), and Vayssières et al., 2015 for detailed studies in respectively Tanzania and Benin). Exception is South Africa where medfly is the major pest in several region (in particular Cape Provinces) where it causes considerable damage in deciduous fruit (Manrakhan & Addison, 2014). Medfly is also an important pest of argan and citrus in Morocco (Debouzie & Mazih, 1999).

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, mass trapping among others. General reviews on the current IPM components applied in Africa can be found in chapters 13 to 20 of Ekesi et al. (2016).

SIT (Sterile Insect Technique) application specifically for this species has been developed and applied in South Africa (Barnes, 2016). SIT has also been used in prevention, containment, eradication and suppression programmes elsewhere (see Enkerlin, 2005 for a review).

Attractants & trapping

Both sexes can be attracted by protein bait products such as liquid protein baits (Torula yeast), protein bait capsules (Questlure) Three component Biolure and two component Biolure (Ammonium acetate and trimethylamine).

Male flies can be attracted by the following lures: trimedlure and enhanced ginger oil (EGO) lure.

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). More specific information on efficacy of trapping and lures for *Ceratitis capitata* in Africa is given in Mwatawala et al. (2006) and Manrakhan et al. (2017).

Distribution

Ceratitis capitata is found throughout Sub-Saharan Africa. It appears to be less abundant in wetter, and colder conditions but prevalent in dry, hot environments. It is found on all islands in the western Indian Ocean. It is established in several continents and regions outside Africa.

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

For worldwide distribution, see GBIF: http://www.gbif.org/species/1626096

Quarantine regulations

Ceratitis capitata is a quarantine pest in the USA, China and New Zealand (https://gd.eppo.int/taxon/CERTCA/categorization). It is also a pest of quarantine concern in Japan {Grout, 2011 #593}.

Others

CABI Plantwise factsheet on *C. capitata* can be found at:

http://www.plantwise.org/knowledgebank/datasheet.aspx?dsid=12367

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

http://www.cabi.org/isc/datasheet/12367

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