

### Morphology

Generally speaking, *Ceratitis* species are small, carry blotches or stripes on their wings and have a rounded scutellum which has yellow and black patches. The combination of at least black patches on the scutellum and the presence of the sub-apical band, outlined in black (**Photo 1–5**), are the main distinguishing characteristics of the *Ceratitis* genus compared to other Tephritidae genera.

### Taxonomy

Descriptions follow of the five main species of the *Ceratitis* genus that have infested West Africa and that are economically important. These are:

#### 1. *Ceratitis cosyra* (Walker)



**Photo 1:** *Ceratitis cosyra* female

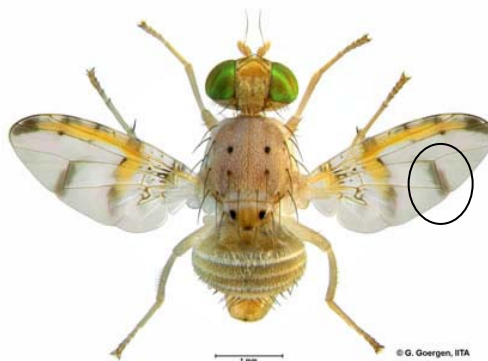
**Name:** *Ceratitis* (*Ceratalaspis*) *cosyra* (Walker)

**Family / tribe:** Tephritidae / Ceratitidini.

**Common name:** marula fruit fly.

**Description:** The adult varies in size (3–6 mm long) with wide yellow stripes on its wings. (**Photo 1**). The mesonotum is pale, slightly tinted with orange, and carries patches of various size and colours. The scutellum has two small brown patches at its base, and three black patches near the thorax (White et Elson Harris, 1992). This is the dominant *Ceratitis* species in West African mango orchards.

#### 2. *Ceratitis quinaria* (Bezzi)



**Photo 2:** *Ceratitis quinaria*

**Name:** *Ceratitis* (*Ceratalaspis*) *quinaria* (Bezzi)

**Family / tribe:** Tephritidae / Ceratitidini.

**Description:** The adult is smaller (3.6–4.5 mm long) (**Photo 2**). The mesonotum is pale pink, and has 4 black patches, two of which are usually visible. The scutellum is white at its base and yellow near the thorax. It carries little 5 black patches, three of which are visible from above (De Meyer, 1998).

### 3. *Ceratitis silvestrii* Bezzi



Photo 2: *Ceratitis silvestrii*

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**Name:** *Ceratitis* (*Ceratalaspis*) *silvestrii* Bezzi

**Family / tribe:** Tephritidae / Ceratitidini.

**Description:** The adult is usually smaller (3.7–4.0 mm long) (**Photo 3**). The scutellum is white at its base and yellow near the thorax. Three very distinct black patches can be seen near the thorax, with no brown small patches at the base. The mesonotum is white with two characteristic black patches on the sides, radiating from the transverse suture (De Meyer, 1998).

### 4. *Ceratitis fasciventris* (Bezzi)



Photo 4: *Ceratitis fasciventris*

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**Name:** *Ceratitis* (*Pterandrus*) *fasciventris* (Bezzi)

**Family / tribe:** Tephritidae/Ceratitidini.

**Description:** The adult varies in size (4.5–6 mm long) with large brown stripes on the wings. It has also a black transverse band on the abdomen. The scutellum is divided into three black areas by characteristic white or yellow stripes (**Photo 4**). Males differ from *Ceratitis rosa* in that hairs on the middle tibiae are shorter (De Meyer, 2001).

### 5. *Ceratitis capitata* (Wiedemann)



Photo 4: *Ceratitis capitata*

**Name:** *Ceratitis* (*Ceratitis*) *capitata* (Wiedemann)

**Family / tribe:** Tephritidae / Ceratitidini.

**Common name:** Mediterranean fruit fly.

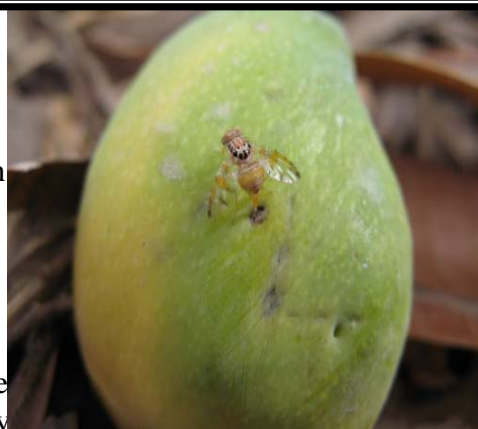
**Description:** the adult varies in size (4–5 mm long). Yellowish head, yellowish-grey thorax and abdomen; the wings have three yellowish-orange stripes, one lengthwise, two transversal (**Photo 5**). Males can be easily differentiated because they have small black diamond-shaped nodules at the apex of their orbital setae. Females have a characteristic yellow marking on their wings, and the mean apical half of their scutellum is completely black (De Meyer, 2000).

## Regional Control Fruit Fly Project in West Africa



### Biological description and damage caused

- Females pierce the fruit skin, using their ovipositor to lay their eggs just below the surface (**Photo 6**). As soon as they hatch, the larvae feed on the pulp for several days before leaving the fruit and burying themselves in the ground, transforming into pupae. An adult will emerge from each pupa.



**Photo 6** : Egg-laying by *Ceratit*s spp.

- The biological features and development time of these insects depend on the relative temperature and humidity in the environment. Life cycle is similar for most *Ceratit*s species (Vayssières et al., unpubl.) and, given a 25° C ~ 75% RH, adopts the following pattern : eggs (2–3 days), larvae (5–15 days), pupae (8–12 days), adults (40–90 days). *Ceratit*s species are multivoltine (i.e. several generations / year).

- Just after their emergence, the adults are not sexually mature. Males become sexually active about 3–4 days after emerging from pupae, and females about 6–8 days after emerging from pupae.

- Monitoring is achieved using a trap with sexual baits for males (Terpinyl acetate, Trimedlure).

- The first four species cause extensive damage to mangos (**Photo 7**). The fifth one mainly attacks *Citrus* fruits.



**Photo 7**: Damage caused by *Ceratit*s spp.

### Ecology and behaviour

- Upon emergence, the adults can fly short distances, but the wind can carry them much further.

- Females of the *Ceratit*s spp are attracted to the fruit both by its smell (C.S.) and its colour (P.S.) (preferably yellow, orange and red).

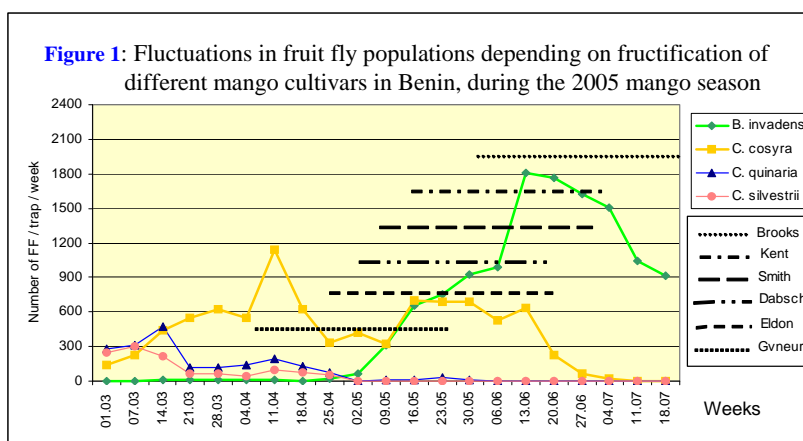
Thus green fruits are not often attacked, but their attractiveness increases as soon as physiological ripening is advanced.

- *Ceratit*s species prefer warm dry climates.

These species are more abundant during the dry season (Vayssières et al., 2005).

Populations start gradually decreasing at the beginning of the rainy season (**Figure 1**).

- Wild host plants allow them to maintain residual populations almost all the year round.





## Regional Control Fruit Fly Project in West Africa



### Host plants

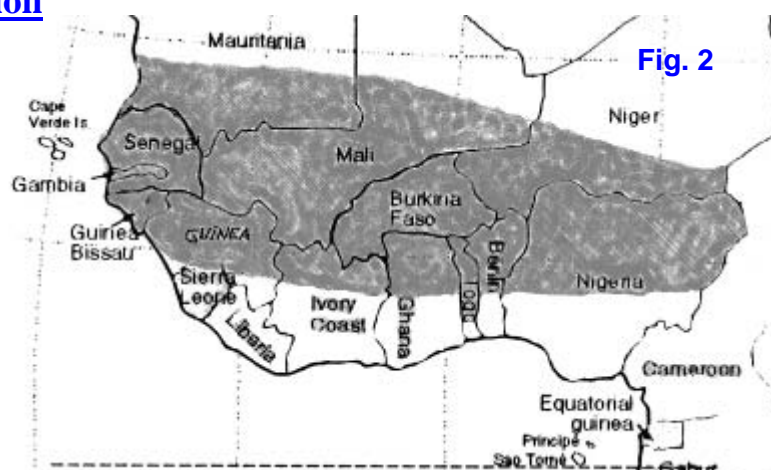
- *Ceratitis* species are usually polyphagous. In addition to the mango tree, they also attack the cashew nut tree (*Anacardium occidentale*), the guava tree (*Psidium guajava*), citrus fruit trees (*Citrus* spp : sweet orange, mandarin), cultivated annona trees (*Annona* spp : soursop, scaly annona).

- They also attack wild fruits such as : Annona (*Annona senegalensis*), shea-butter tree (*Vitellaria paradoxa*), the African peach (*Sarcocephalus latifolius*), etc. These wild host plants can be found in the vegetation neighbouring the mango, cashew and citrus orchards.

### Geographical distribution

- *C. cosyra* is the dominant *Ceratitis* species in West Africa : it can be found most frequently in dry savannah regions.

- Host countries in West Africa for *C. cosyra* : Benin, Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Nigeria, Mali, RIM, Guinea-Bissau, Niger, Senegal, Togo (**Figure 2**).



### Pest control methods

#### **Preliminary steps**

Early detection is extremely important in order to prevent and control these pests. A detection programme using bait (sexual and food bait) plus regular monitoring is thus required. Pest control methods should start early on, as soon as the young fruit starts to form.

#### **Prophylactic control**

This consists of gathering up the fallen or infested fruit and putting it into a plastic bag, then placing the bag in the sun for at least 48h after having closed it hermetically.

#### **Biological control**

Recent research has shown that an abundance of *Oecophylla longinoda* weaver ants in an orchard considerably reduces the damage caused by fruit flies (results obtained by IITA-WARDA-CIRAD Benin). Awareness campaigns aiming to encourage introduction and retention of these ants in orchards infested by the flies should be undertaken. Identification of the complex combination of natural enemies associated with the above mentioned species should be planned. Measures for managing the habitats of these natural enemies should be planned in order to encourage establishment and predatory activity.

#### **Integrated pest control**

As for all fruit fly species, control of *Ceratitis* species should call on a whole range of complementary pest control methods. Efficiency goes hand in hand with area-wide management on a large scale and over a long period. Integrated pest control covers the methods described above, plus other specific methods such as bait stations, entomopathogens, and localised treatment with Success Appat (GF-120). While the GF-120 has achieved positive results in Benin, the bait stations and entomopathogen methods need to be further tested and developed before integrating them into an IPM package for use in West Africa.

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