LEAFLET 8

Range of cultivated and wild host plants of the main mango fruit fly species in Benin

Background

Mango production losses in Benin in 2005 and 2006 due to attack by fruit flies (Diptera Tephritidae, classified as quarantine pests), exceeded 50% by the middle of the crop season. Fruits of other cultivated and wild host plants (Photo 1) harbor larvae of Tephritidae all year round as reservoir hosts (Vayssières et al., 2005; Mwatawala et al., 2006; Rwomushana et al., 2008). Such cultivated and wild fruit plant hosts are often found near to our studied orchards. Knowing about these other fruit plants is vital for integrated control methods to be effective (see Leaflet No. 6). Indeed, if these fruit plant hosts are not included in the programme, the control measures in the orchards will merely be partial.

Photo 1: Tephritidae egg laying into *Sarcocephalus latifolius*

Main objectives

1. Provide all people involved in the fruit production sector with identification keys for the different hosts of fruit flies.
2. Highlight the importance of other host plants (especially wild) of mango fruit flies.
3. Gain knowledge of the parasitoid species (= natural enemies) that are present and also their parasitism rate.

DEFINITIONS

We can classify host plants of Tephritidae from high to low importance based on both ecological (abundance of fruit hosts, number of pupae per kg of fresh fruits, rate of larval survival, etc.) and economic (impact on fruit production and export, etc) characteristics.

But the varying status of fruit plant species can be evaluated according to agro-ecological zone. In Benin, this variability is obvious between northern (Table I) and southern (Table II) parts of the country. This classification is relative.

- A primary fruit-host will be the most abundant, leading to the greatest fruit fly damage, and will favor the development of high fruit fly populations (equivalent symbol = ++++).
- A secondary fruit-host will be abundant, causing significant fruit fly damage, and will favor the development of significant populations of fruit flies (equivalent symbol = +++).
- A tertiary fruit-host will be relatively rare, resulting in low fruit fly populations (equivalent symbol = ++) and low levels of associated damage.
- An accidental fruit-host will be rare and cause only sporadic fruit fly damage while causing the lowest populations of fruit flies to develop (equivalent symbol = +).

MATERIAL AND METHODS: Fruit sampling

- Sampled fruits are brought to the laboratory in paper bags or, if possible, in flexible containers covered with fine net or mesh (Photo 2).
- Sample 10 to 20 fruits per batch depending on the fruit size (Photo 2).

Photo 2: Collected fruits are separated for transport to the laboratory

Photo 3: Each fruit sample is weighed separately in the laboratory

➢ Laboratory monitoring of sampled fruits

▪ Fruit batches are numbered and weighed (Photo 3) with individual sheets for each sample

▪ Each sheet should indicate the collection site, date, number of sampled fruits, weight, etc

▪ The different batches are then placed in flexible containers covered with netting and a bottom layer of sand (Photo 4). They are placed on shelves (Photo 5) and protected against ants.

▪ The sand is sieved every four days and pupae are collected with flexible tweezers, placed with a sequence number into small hatchery boxes (Photo 6) and incubated in the dark.

▪ Number of pupae is recorded on the sheet and the fly species identified as adults emerge from the pupae

▪ Fruit sample batches are incubated for at least six weeks. Before being discarded, fruits should be dissected to check for any pupae left inside the dry fruits

Photo 4: Boxes for fruit monitoring

Photo 5: Different fruit batches

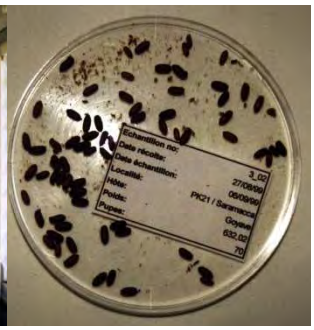

Photo 6: Pupae collection per batch

➢ Calculation of fruit infestation rate and fruit fly parasitism

⇒ Infestation rate **(Ir)** of sampled fruits = total number of pupae adjusted for sample weight. The infestation rate should be evaluated first for each sample, then for all samples and finally for each fruit plant species.

=> Parasitism rate **(Pr) = Pr = [100*p] / [n + o + p]** (WAFFI, IITA-CIRAD project) with
p = total number of parasitoids in the sample,
n = total number of *Ceratitis*, and **o** = total number of *Bactrocera.*

Regional Fruit Fly Control Project in West Africa (WAFFI)

Table I HOST PLANT RANGE OF FRUIT FLIES FROM SUDANIAN AREA (sensu lato) **OF BENIN**

C : cultivated W : wild E : exotic A : african				Principal mango fruit fly species					
Family / species	Local name	Mode	Origin	*B. invadens*	*C. cosyra*	*C. quinaria*	*C. silvestrii*	*C. fasciventris*	*C. capitata*
Anacardiaceae									
Anacardium occidentale	Cashew nut	C	E	++	+++	+++	+++		
Mangifera indica	Mango	C	E	++++	++++	+++	+++	++	+
Sclerocarya birrea (Ph. 7)	Marula plum	W	A	++	++++				
Spondias mombin	Tropical plum	C	E	+++	+			+	
Anonaceae									
Annona muricata	Sour sop	C	E	++	+			++	
Annona senegalensis (Ph. 8)	Wild custard apple	W	A	+	++++			+	
Caesalpiniaceae									
Cordyla pinnata	Cayor pear tree	W	A	+	++++				
Irvingiaceae									
Irvingia gabonensis (Ph. 9)	African wild mango	C	A	+++					
Loganiaceae									
Strychnos spinosa	Monkey ball tree	W	A		+			+++	
Myrtaceae									
Psidium guajava	Common guava	C	E	++++	++			+++	+
Oxalidaceae									
Averrhoa carambola	Starfruit	C	E	+					
Rubiaceae									
Sarcocephalus latifolius	African peach	W	A	+	++++				
Rutaceae									
Citrus reticulata	Tangerine	C	E	+				+	
Citrus sinensis	Sweet orange	C	E	++				+	
Citrus x paradisi	Grapefruit	C	E	+					
Sapotaceae									
Chrysophyllum albidum	African star-apple	C	A	+++				+	
Vitellaria paradoxa (Ph. 10)	Sheanut	W	A	++++	++	++++	++++	+	
Solanaceae									
Capsicum frutescens	Chili	C	E	+					++++
Lycopersicum esculentum	Tomato	C	E	+					

Photo 7: *S. birrea*

Photo 8: *A. senegalensis*

Photo 9: *I. gabonensis*

Photo 10 : *V. paradoxa*

RESULTS

- In the Sudanian zone (Table I), *B. invadens* has three main primary hosts (mango, guava and shea), three main secondary hosts (*S. mombin, I. gabonensis* and *C. albidum*) and four main tertiary hosts (*A. occidentale, S. birrea, A. muricata* and *C. sinensis*).
- In this Sudanian zone (Table I), *C. cosyra* has five main primary hosts (*M. indica, S. birrea, A. senegalensis, C. pinnata* and *S. latifolius*), one main secondary host (*A. occidentale*) and two main tertiary hosts (*P. guajava* and *V. paradoxa*).
- Parasitoids belonging to six species of Braconidae have been recorded since 2005 emerging from *C. cosyra*. These are: *Fopius caudatus* (Szépligeti), *Fopius* cf. *silvestrii*, *Psyttalia cosyrae* (Wilkinson), *Psytallia concolor* (Szépligeti), *Psyttalia* spp., *Diachasmimorpha fullawayi* (Silvestri), one specie of Eulophidae *Tetrastichus giffardianus* Silvestri and a specie of Pteromalidae *Pachycrepoîdeus vindemniae* (Rondani). These are all African species with a low rate of global parasitism on mango fruit flies.

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Table II HOST PLANT RANGE OF FRUIT FLIES FROM GUINEAN AREA OF BENIN

C : cultivated W : wild E : exotic A : african				Principal mango fruit fly species					
Family / species	Local name	Mode	Origin	*B. invadens*	*C. cosyra*	*C. quinaria*	*C. silvestrii*	*C. fasciventris*	*C. capitata*
Anacardiaceae									
Mangifera indica	Mango	C	E	++++	+			++	
Anonaceae									
Annona muricata (Ph. 11)	Sour sop	C	E	+++				++	
Caricaceae									
Carica papaya	Papaya	C	C	+++					
Combretaceae									
Terminalia catappa	Tropical almond	C	E	++++					
Ebenaceae									
Diospyros montana	Mountain persimmon	C	E	+++				+	
Irvingiaceae									
Irvingia gabonensis	African wild mango	C	A	++++					
Lauraceae									
Persea americana	Avocado	C	E	+				+	
Musaceae									
Musa sp	Banana	C	E	+					
Myrtaceae									
Psidium guajava	Common guava	C	E	++++				++	
Sizygium malaccense	Malay apple	C	E	+					
Oxalidaceae									
Averrhoa carambola	Starfruit	C	E	++					
Rutaceae									
Citrus reticulata	Tangerine	C	E	+++				+	
Citrus sinensis	Sweet orange	C	E	+++				+	+
Citrus x tangelo	Tangelo	C	E	++++				+	
Sapotaceae									
Chrysophyllum albidum	African star-apple	C	A	+++				++	
Manilkara zapota	Bully tree	C	A	++				+	

RESULTS…

- In the Guinean zone (Table II) , *B. invadens* has five main primary hosts (*M. indica*, *T. catapa*, *I. gabonensis*, *P. guajava*, and Tangelo); six main secondary hosts (*A. muricata*, *C. papaya*, *D. montana*, *C. reticulata*, *C. sinensis* and *C. albidum*); and two main tertiary hosts (*A. carambola* and *M. zapota*).
- *C. cosyra* is infrequently found in this zone (Table II) because it is a species of the Sudano-Sahelian zone.
- For these Tephritidae species, the host plants vary depending on the country and agro-ecological zone. For instance, *Capparis* spp., are not included here because they are species of the Sahelian zone. Since this list is not intended to be exhaustive, only the main mango fruit fly hosts in Benin are included. An article on this topic will be completed soon with G. Goergen.

Photo 11: Corossol (*A. muricata*)

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