NOTE

Species complex of fruit flies at Abu-naama area and detection of the species, *Dacus punctatifrons* (Karsch)

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True fruit flies (Diptera:Tephritidae) are the major constraint in commercial horticulture in many African developing countries. The family Tephritidae includes about 4257 species arranged in 500 genera, among these 1400 species are known to develop in fruits. Equatorial Africa is the original home of 915 species belonging to 148 genera, out of which 299 species develop in either wild or cultivated fruits. Their cosmopolitan distribution, broad larval host range and substantial economic impacts have placed tephritids among the world's most notorious agricultural pests (McPheron and Steck 1996).

Profitable fruit production in Africa is greatly hampered by fruit flies. Both producers and exporters suffer significant direct and indirect economic losses resulting from their damage. Annual production of mangoes was estimated to be 1.9 million tons, about 40% of which was lost due to fruit flies (Lux *et al.,* 2003). In Sudan, the production and export of fruits and vegetables is seriously affected by fruit flies (FF). Infestation and damage in mango crop exceeded 80% (Gubara and Abu-Elgasim, 2004). Moreover, the Ministry of Agriculture and Forestry (MAF) has declared in 2008 the FFs as a "national pest" similar to rats, birds and locusts. The main *Dacus* species in Sudan are; *Dacus ciliatus*, *D. vertebrates* and *Dacus longistylus*. The former is the most dominant species attacking cucurbits in Sudan (Gesmallah, 2000).

The genus *Dacus* Fabricius contains economically important fruit fly species distributed in the Afrotropical and Indo-Australian regions (Virgilio *et al.,* 2009). *Dacus punctatifrons* Karsch (subfamily: Dacinae Tribe: Dacini) (Caroll *et al.,* 2002) is a major pest of many cultivated and wild cucurbits as well as tomato (*Lycopersicon esculentum*) (Elfekih *et al.,* 2009; Okoll and Ntonifor, 2005). It is widely distributed in sub-Saharan Africa (Benin, Cameroon, Democratic Republic of Congo and Equatorial Guinea), Angola, Ghana, Nigeria, Kenya, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, Zimbabwe and Mauritius (White and Elson-Harris, 1992). In Cameron, *B. invadens* was the most abundant fruit fly species (66.6%) while *Dacus punctatifrons* was the second most economically important species (30%) (Leonard, 2010).

The term ‘para pheromone’ covers a broad category of highly attractive chemicals that are not components of true pheromones, but have similar activity. They include Methyl eugenol (attracting several *Bactrocera* species), Trimedlure (attracting *C. capitata*, *C. rosa*, *C. fasciventris*), Cuelure (attracting *B. cucurbitae* (Coquillet), and a few other species), VertLure (attracting *D. vetebratus* (Bezzi), Terpinyl acetate (attracting a range of *Ceratitis* spp.) These materials attract males, sometimes with great efficacy, as in the case of Methyl eugenol (ME). Despite their obscure biological significance, parapheromones constitute exceptionally powerful IPM tools that are widely used in fruit fly detection, monitoring and control.

The presence of some species of the family Tephritidae have a negative impact on the economies of infested countries, since they have negative implications on their international trade of fruits and

vegetables. The objectives of this research were to moinitor and detect fruit fly species prevailing at Abu-naama area, Sennar State.

Field surveys which involved trapping and collection of adult fruit flies were conducted during September-December 2009 at Abu-naama, Sennar State (Longitude 330 56', latitude 130 10') located on Western Bank of the Blue Nile. This work is part of a program carried out by the National Institute for the Promotion of Horticultural Exports, University of Gezira in collaboration with The Royal Museum for Central Africa in Belgium. This program aims at identifying fruit fly species infesting vegetables and fruits in Sudan and determining the population density and seasonality of these species using different types of male lures.

Samples were collected from an orchard having different types of fruits (mango, guava, grapefruit, orange and lemon) at Abu-naama. Four types of male lures (parapheromones), Trimedlure, Terpinylacetate, Cuelure and Methyl eugenol, in the form of plugs, were used to collect adult fruit flies. One plug of each lure was placed in a McPhail trap (Fig. 1) with one strip of Dichlorvos® insecticide to kill the attracted adults. This mixture can remain effective for up to six weeks at field conditions. Four McPhail traps baited with the different lures were suspended on the mango trees on branches at 1-1.5 meter above the ground in the shaded parts of the tree. Positions of the traps were fixed throughout the study period. Traps were labeled according to the lure used, location and date of placement. One trap was used for one lure and was only re-used for that lure. Lures were replaced periodically based on the recommended expected longevity. The traps were visited every two weeks, when captured flies (Fig. 2) in each trap were collected using a fine hairbrush and placed in plastic vials containing propylene glycol; each plastic vial was labeled with the details of the location, date of collection and type of lure. The vials containing the fruit flies were then taken to the laboratory for preliminary identification and counting. Representative samples of the collection was sent to the Royal Museum for Central Africa, Tervuren, Belgium for identification.

Fig. 1. McPhail trap.

Fig. 2. Captured fruit fly adults.

Morphological identification of the collected specimens revealed the presence of *Dacus punctatifrons* (Karsch) as a first record of the species in the Sudan where 104 specimens of this species were caught using Cuelure. This result is in agreement with that of White and Elson-Harris (1992) who mentioned that males of *D. punctatifrons* were attracted to the Cuelure. For many species including the Tephritid species, definite identifications are made by morphological criteria. Adult size of *D. punctatifrons* is medium with a wing length of 6.3-7.0 mm. Postpronotal lobe is yellow to bicoloured. Scutum is predominantly red-brown with lateral and medial postsutural vittae, the lateral one is extending anteriorly as far as the suture. Scutellum is entirely pale yellow at most with narrow basal dark border; scutum is without prescutellar acrostichal seta (Plate 1). Lateroltergite has single xanthine across both one tergite and katatergite (Plate 2). Wing cell bc and c are hyaline. Wing anal streak is present (colour expanded beyond cell bcu) (Plate 3). Fore fermur is usually

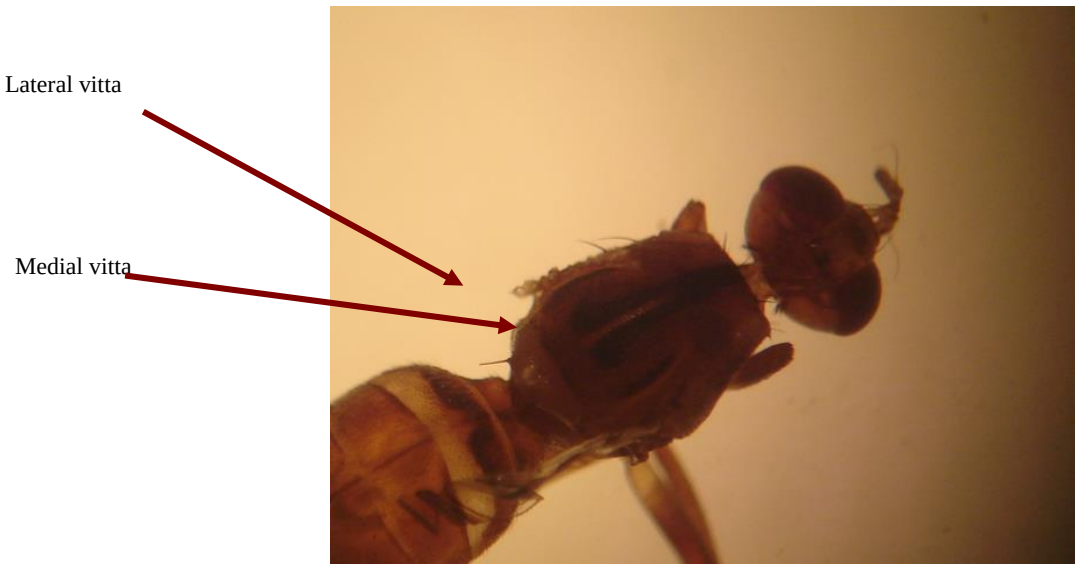

Plate 1. Adult of *D. punctatifrons*.

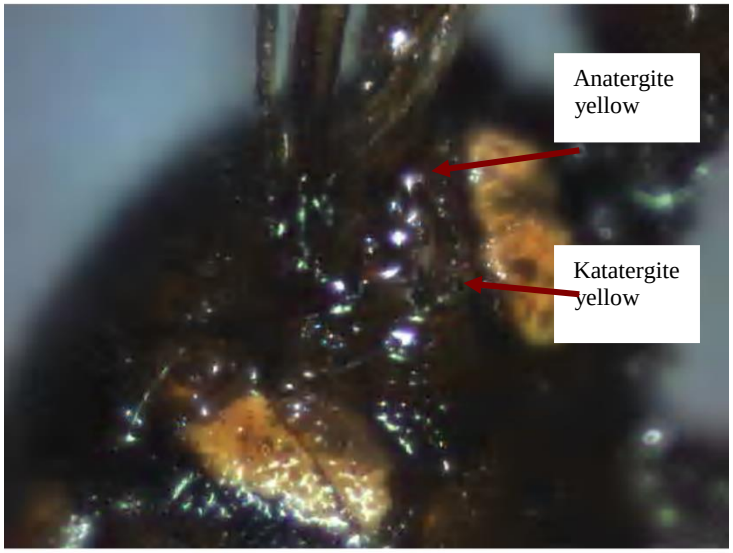

Plate 2. Lateral view of *D. punctatifrons.*

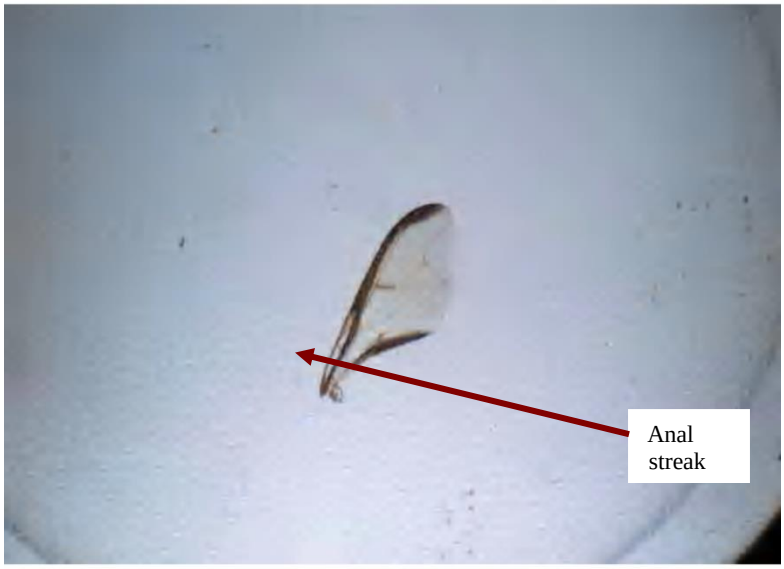

Plate 3. Wing of *D. punctatifrons.*

entirely of one colour which is yellow to almost black (Plate 4). Abdomen has all terga fused into a single sclerite (Plate 5).

Plate 4. Legs of *D. punctatifrons*.

Plate 5. Abdomen terga of *D. punctatifrons*.

Species complex at Abu-naama area

In addition to *D. punctatifrons*, four fruit fly species were recorded at Abu-naama area, *Bactrocera cucurbitae*, *B. invadens*, *Ceratitis cosyra* and *Ceratitis quinaria* with a total number of 9965,4684, 2 and 1 fly/trap. These constitute 79%, 19.7/%, 0.2% and 0.1%, respectively (Table 1 and Fig.3). This result indicates that *B. cucurbitae* and *B. invadens* were the most prevalent species at Abu-naama area. Although *C.capitata* can be attracted to the male lure Trimedlure, no specimens of this species were captured, indicating that the surveyed area was almost free of this species at least during the period of the study. Generally, the population of *B.cucrbitae* and *B. invadens* was very high compared to that of *D.punctatifrons* (Fig.4). The highest population of *B. cucurbitae* (2636 adult/trap) was observed during September and that was due to the availability of wild and cultivated host plants during the rainy months. The highest population of *D. punctatifrons* (32 adults/trap) was observed during September and October (Fig.4). The relative abundance of *C.cosyra* and *C. quinaria* (Table 1) seems to be affected by the recently introduced alien *B. invadens.* It appears that this species is out competing and replacing the indigenous species, a phenomenon that has been observed repeatedly in fruit fly invasion (Duyck *et al.,* 2004).

Table 1. Fruit fly species and number of their specimens caught during 15 September-15 December 2009(14 weeks) using different male lures at Abu-naama, Sennar State.

Parapheromones	Species caught	Total number of specimens
Methyl eugenol	*Bactrocera invadens*	4684
Cuelure	*Bactrocera cucurbitae*	9965
	Dacus punctatifrons	104
Terpinyl acetate	*Ceratitis cosyra*	2
Trimedlure	*Ceratitis quinaria*	1

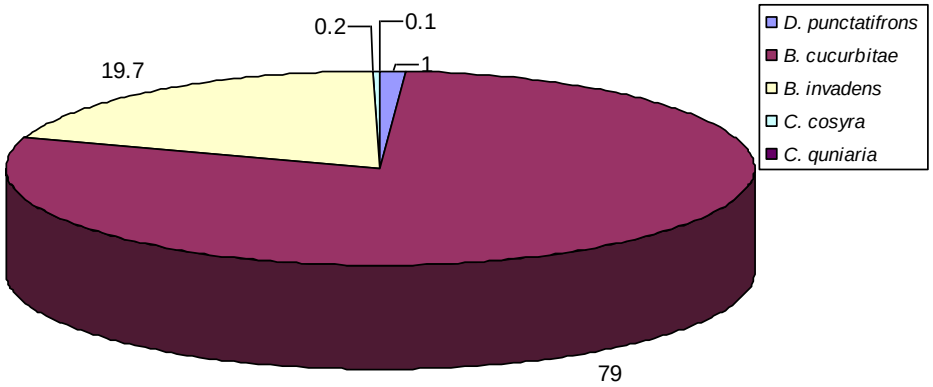

Fig. 3. Composition of fruit fly population at Abu-naama during the period September-December, 2009.

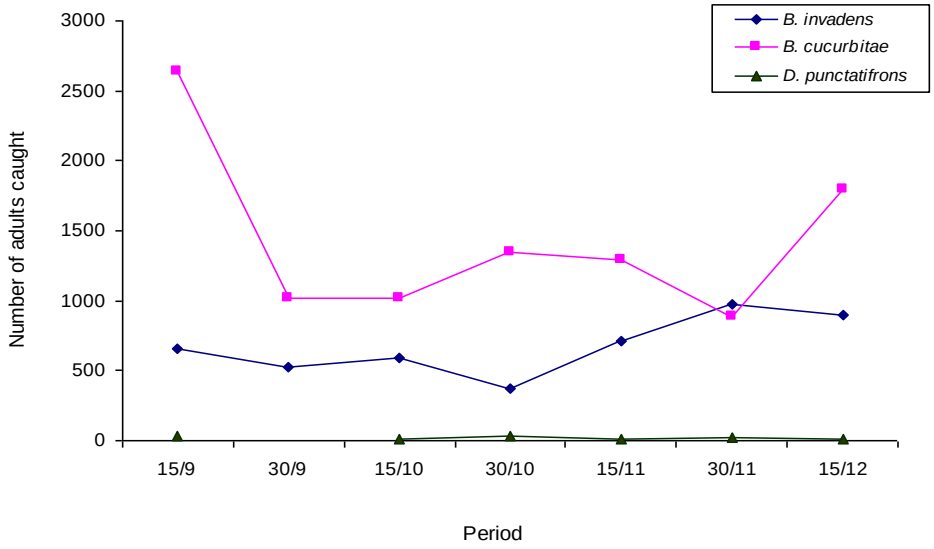

Fig. 4. Population dersities of ftuit flies atAbu-naama during the period September-December, 2009.

It could be concluded from this study that *B. cucurbitae* and *B. invadns* are prevailing fruit fly species at Abu-naama area. The study also revealed the presence of *D. punctatifrons* in this area as a first record of the species in the Sudan, so care should be taken to avoid outbreaks of this species.

Future research

1- Efforts should be directed to explore host range, damage, population seasonality and the biology of *D.punctatifrons* in Sudan.

2- Intensive surveys should be carried out in all parts of Sudan to investigate other new fruit fly species.

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أنواع ذبابة الفاكهة بمنطقة أبو نعامة والتعرف على النوع الجديد (*Dacus punctatifrons* (Karsch)

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الخلاصة

تلفاً فادحاً في محاصيل الخضر والفاكهة عالمياً وبالسودان. لقد أصبحت هذه (Diptera : Tephritidae) سببت ذبابة الفاكهة الآفة من المخاطر الإقتصادية الأساسية لكونها من آفات المحاجر وللفاقد الكبير الذي تحدثه في المحاصيل في أفريقيا. تستخدم المصائد الحشرية لإكتشاف الأنواع الموجودة من ذبابة الفاكهة في البساتين وتعتبر طريقة عملية وفعالة. أجري هذا البحث في الفترة من سبتمبر – ديسمبر 2009م في منطقة أبو نعامة بولاية سنار بغرض التعرف على الأنواع الجديدة من ذبابة الفاكهة ورصد أعدادها. إضافة إلى أربعة McPhailتم إختيار بستان مزروع بعدد من أنواع الفاكهة لإجراء هذا البحث. إستخدام في هذا البحث مصيدة أنواع من الجاذبات الجنسية هي Methyl eugenol (ME), Terpinyl acetate (TA), Cuelure (CL) Trimedlure ومبيد الدايكلورفوس الذي أستخدم لقتل الحشرات المنجذبة للمصيدة. علقت المصائد على أشجار المانجو. أجريت عملية جمع (TR), الحشرات كل أسبوعين. عينات ذبابة الفاكهة التي جمعت حفظت داخل أنابيب بلاستيكية بها مادة بروبايلين جلايكول ثم بعد ذلك تم التعرف على أنواع ذبابة الفاكهة وعدّها. تصنيف الحشرات عن طريق الشكل الظاهري أوضح وجود النوع *D. punctatifrons* وهذا يعتبر أول تسجيل لهذا النوع بالسودان. تم رصد عدد 104 من الحشرات الكاملة المذكرة من هذا النوع بإستخدام مصيدة McPhail والجاذب الجنسي Cuelure . أيضاً تم رصد أربعة أنواع من ذبابة الفاكهة وهذه قد تم رصدها من قبل بالسودان. هذه الأنواع هي *B. cucurbitae, B. invadens, C. cosyra* و *C. quninaria* حشرة 1 و2، 4684، 9965 حيث تم رصد عدد *B. cucurbitae* و *B. invadens* كاملة/مصيدة على التوالي. من هنا يتضح أن النوعين هما النوعان السائدان في منطقة أبو نعامة.