Status of Bactrocera invadens (Diptera: Tephritidae) in Mango-Producing Areas of Arba Minch, Southwestern Ethiopia

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SHORT COMMUNICATION

Status of *Bactrocera invadens* (Diptera: Tephritidae) in Mango-Producing Areas of Arba Minch, Southwestern Ethiopia

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ABSTRACT. *Bactrocera invadens*, the Asian fruit fly, was first reported in Kenya in 2003, and it spread fast to most tropical countries in Africa. To our knowledge, there is no detailed data on the fruit damage and status of fruit flies in Arba Minch and elsewhere in Ethiopia. Hence, information on the species composition and pest status of the fruit fly species is urgent to plan management strategies in the area. Fruit flies were captured using male parapheromone-baited traps. Matured mango (*Mangifera indica*) fruits were collected from randomly selected mango trees and incubated individually in cages (15 by 15 by 15 cm) with sandy soil. *B. invadens* was the predominant (96%; 952 of 992) captured species and the only fruit fly species emerging from mango fruits incubated in the laboratory. The mean number of adult *B. invadens* emerging per mango fruit was 35.25, indicating that the species is the most devastating mango fruit fly in the area. The loss due to this species would be serious if no management strategies are implemented.

Key Words: Arba Minch, *Bactrocera invadens,* fruit fly, mango fruit

Fruit flies have become an increasingly prevalent pest in most of Africa; affecting both export and domestic consumptions (De Meyer et al. 2010). *Bactrocera invadens* was first reported in 2003 in east Africa in Kenya (Lux et al. 2003). Since 2003, the species is rapidly spreading across tropical Africa (Drew et al. 2005) and causing severe damage in Kenya (Ekesi et al. 2006) and Tanzania (Mwatawala et al. 2009) both on cultivated and wild host fruits (Ekesi et al. 2006; Mwatawala et al. 2006, 2009). In Central Africa (Ndzana Abanda et al. 2008) and in West Africa (Vayssières et al. 2009), this pest is also a serious threat for guava and mango value chains. The highly polyphagous nature of the species enables it to attack a wide range of fruits (Goergen et al. 2011).

The damage from *B. invadens* is more serious because it causes loss to export market through quarantine restrictions in addition to the direct damage of fruits. Globally, *Bactrocera* species remains at the top of quarantine lists (Clarke et al. 2005). In Ethiopia, several fruit types including mango, guava, banana, citrus, apple, pineapple, avocado, and papaya are growing for export and domestic markets. Arba Minch is one of the main mango agroecological zones in Ethiopia, and it has been identified as one of the fruit corridors by the Ethiopian government. To our knowledge, there is no comprehensive data on the fruit damage and pest status of fruit flies in the area and elsewhere in Ethiopia. Little data are, however, available regarding the chemical ecology (Alagarmalai et al. 2009) and cytogenetics of the Ethiopian fruit fly *Dacus ciliatus* (Drosopoulou et al. 2011).

Mango fruit is an important crop that contributes to eradicate poverty by providing income to rural smallholders and increasing food security. However, the production of mango is affected by fruit flies, and hence, information on the species composition and pest status is urgent to plan management strategies in the area. This short report discusses on the species composition and pest status of mango fruit flies in Arab Minch, southwestern Ethiopia.

Materials and Methods

Study Site. The study was conducted in Arba Minch, southwestern Ethiopia, in May and June 2014. The area is located at 6° 1.60″N and 37° 32.60″E and at altitude of 1,284 m above sea level. The climate is hot and humid. There are two rainy seasons: March to May with the main rainy season and October to December with smaller rainfall. The total monthly rainfall was 208.4 mm in May 2014 and 73.1 mm in June 2014. The mean minimum temperature was 18.45°C in May and 18.05°C in June, while the mean maximum temperature was 29.48°C in May and 28.9°C in June. The rainfall and temperature data were obtained from Arba Minch University meteorological station.

Fruit Fly Trapping. Fruit flies were captured in May and June 2014 in Arba Minch University orchard (fruit growing site). The total size of the orchard is 1.05 hectare, which contains mixed fruit species such as mango (*Mangifera indica*) (the dominant species), banana, citrus, avocado, guava, and papaya.

Four male parapheromone-baited fly traps (Fig. 1) were used to capture fruit flies. The traps were hanged in four randomly selected mango trees; three traps baited with methyl eugenol (Silvandersson Pheromone Lure), specific for *B. invadens*, and one trap baited with cue lure dispenser, specific for *Bactrocera cucurbitae* and *Dacus* species. The specimens were removed from the traps every 4 days and transported to entomology laboratory for morphological identification using a key for African fruit flies (Billah et al. 2006). Further confirmation was done by expertise in Arba Minch Plant Health Clinic.

Mango Fruits Sampling and Laboratory Rearing. We randomly selected five mango trees. Five matured fruits of variable weight were collected per mango tree and incubated individually in cages (15 by 15 by 15 cm) with sandy soil. The moisture content of the sandy soil was maintained by adding water. The adults emerged from each mango fruit were counted and identified using a morphological key (Billah et al. 2006).

Results

In total, 21 methyl eugenol and seven cue lure dispenser-baited traps were used to collect 992 fruit flies in May and June 2014. *B. invadens* was the predominant fruit fly species (96%; 952 of 992). Of the 952 *B. invadens*, 16 (1.7%) were captured in cue lure dispenser-baited catches, whereas 98.3% were from methyl eugenol-baited traps.

Fig. 1. Locally made fruit flies traps (donated by Arba Minch Plant Health Clinic).

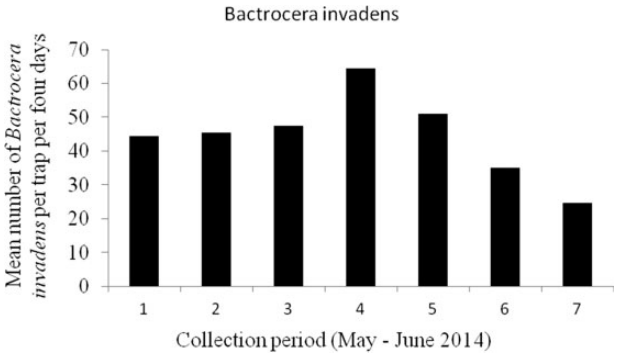

Fig. 2. The number of *B. invadens* per trap per 4 d (May to June 2014).

B. cucurbitae and unidentified *Dacus* species accounted for, respectively, 3.5% (35 of 992) and 0.5% (5 of 992). No *B. cucurbitae* or *Dacus* species were captured in methyl eugenol-baited traps.

Figure 2 shows the mean number of *B. invadens* per trap per 4 d. Here, we considered only methyl eugenol-baited traps to calculate the mean number of *B. invadens* per trap per 4 d. The overall mean number of *B. invadens* per trap per 4 d was 44.57 (ranged between 24.7 and 64.3) flies, whereas *B. cucurbitae* was 5 flies per trap per 4 d (minimum 1 and maximum 10). *Dacus* species was found only rarely.

In total, 25 mango (*M. indica*) fruits were incubated in the laboratory. Nineteen mango fruits were positive for *B. invadens;* the only species emerging in the laboratory. The mean number of adult *B. invadens* emerging was 35.25 flies per mango fruit (minimum of 15 and maximum of 49 *B. invadens* per mango fruit). No adults of *B. cucurbitae*, *Ceratitis*, and *Dacus* emerged from mango fruits incubated in the laboratory.

Discussion

B. invadens was the predominant and the most damaging mango fruit fly species in the area. A recent study from Eastern Central Tanzania showed a wide distribution and predominance of *B. invadens* (Geurts et al. 2014). Another study from Tanzania revealed that the highest damage of mango fruits was by *B. invadens* (Mwatawala et al. 2006). Severe damage of fruits due to *B. invadens* was reported in Kenya (Ekesi et al. 2006) and Tanzania (Mwatawala et al. 2006, 2009). Many hosts were recorded for *B. invadens*, which enables the species to attack a wide range of wild and cultivated fruits in Benin and Cameroon (Goergen et al. 2011).

Only *B. invadens* adults emerged from mango fruits incubated in the laboratory, indicating that the species is the most devastating mango fruit fly in the area. In Central and West Africa, *B. invadens* showed the highest infestation index in mango (Vayssières et al. 2009) and other fruits (Goergen et al. 2011). In central Tanzania, 30–80% of damage has been reported (Mwatawala et al. 2006). However, the situation is different in South Africa as *B. invadens* found only rarely and even eradicated from several provinces (Manrakhan and Hattingh 2013). Hence, the success of fruit production whether for local markets or for export will mostly depend on the quality and quantity of the fruits, which in turn depend on the sound management of fruit flies. The loss due to *B. invadens* would be severe in our study area unless an integrated management strategy is implemented. Moreover, our study is brief and limited to mango, the future research studies are recommended to focus on hosts range, damage level, and management strategies.

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