J. Agric. Technol., 2(1&2): 13-16 (2015)
ISSN: 2348-4721

New Record of Pigeon Pea as a Roosting Crop for *Bactrocera cucurbitae* (Diptera: Tephritidae): Implications for an Attract-and-Kill Approach

Chandra Shekhar Prabhakar

Department of Entomology, Bihar Agricultural University, Sabour–813210, Bhagalpur, Bihar, India
E-mail: csprabhakar.ento@gmail.com

The melon fly, *Bactrocera cucurbitae* (Coquillett) is an economic pest of cucurbits and has a wide distribution in tropical and subtropical countries of the world. It is difficult to manage under field conditions and causes significant economic damage to the cucurbits crops. Integrated pest management approach with male annihilation and bait application techniques (MAT and BAT) are the most widely used techniques for management of the melon fly. In the present study, pigeon pea was recorded as a roosting crop for the melon fly and could be used as a trap crop for its management. The maximum adult fly activity was found during evening time on pigeon pea and varied from 16.66 to 18.04 adult fly/ plant from 8 AM to 5 PM, respectively. Pigeon pea as trap crop for the melon fly could help in the improvement of bait application techniques and reduce the load of insecticides on main crop i.e. cucurbits. Whereas, pigeon pea as a bordering crop will also help in the enhancement of soil fertility and nutritional security of poor and marginal farmers who cultivated cucurbits for their daily livelihood.

Keywords: Melon Fly; *Cajanus Cajan*; Fruit Fly; Trap Crop; Roosting Vegetation

INTRODUCTION

The melon fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae) is a multivoltine, polyphagous and destructive insect pest of cucurbits and has more than 125 host plant species (Dhillon *et al.,* 2005; *Pinero et al.,* 2006; Prabhakar *et al.,* 2012a). Presently, it has wide distribution in different countries of Asia, Africa, and several islands in the Pacific Ocean regions (Dhillon *et al.,* 2005; Virgilio *et al.,* 2010; Prabhakar *et al.,* 2012a). It causes significant damage to cucurbit vegetables ranging between 30-100% in tropical and subtropical regions of the world (Dhillon *et al.,* 2005; Prabhakar *et al.,* 2012a).

An effective control method was developed based on behavioral observations on fruit fly in which bait with an added toxicant has been sprayed along bordering attractive vegetation known as roosting vegetation. If plants bordering *B. cucurbitae* host cropping areas are not attractive to adult flies they are not a good site for application of bait sprays. Both male and female fruit flies seek shelter ("roost") in vegetation bordering host areas during noon hours and at night. Many reports are available in the literature on roosting plants for *B. cucurbitae* such as corn (*Zea mays* L.), guava (*Psidium guajava* L.), cassava (*Manihot esculenta* Crantz), tiger's claw (*Erythrina tahitensis* Nadeaud), castor bean (*Ricinus communis* L.), spiny amaranth (*Amaranthus spinosus* L.), fuzzy rattlepod, (*Crotalaria incana* L.), and citrus varieties (Nishida and Bess, 1957; Kazi, 1976; Stark, 1995; McQuate *et al.,* 2003; McQuate, 2011).

Most of the cucurbits cultivation in developing countries is by the small and marginal farmers for their essential dietary components and daily livelihood by marketing small amount of surplus produce. If a roosting plant bordering host crop area is also a crop plant that will help to uplift the socio economic condition of the farmers along with the better management of melon fly. Therefore, the present study reports pigeon pea (*Cajanus cajan* (L.) Millsp) as a roosting plant for the melon fly and their implication in melon fly management.

MATERIALS AND METHODS

Experimental Site

The experimental site was situated at Bisai Bigha (Latitude 25.18° N, Longitude 85.30° E and Altitude 62 m amsl), Nalanda, Bihar in the eastern part of India. The activity of melon flies were observed during September 15 to October 30, 2014. Minimum and maximum temperatures were recorded with the help of The Weather Channel (Real time weather

information provider by The Weather Company, Atlanta, USA installed in Nokia Lumia 820) between 20-28°C (Min. Temp.) and 26-36°C (Max. Temp.) with 60-80% RH (Relative Humidity) during the period of observations on melon fly. The sun rise and sun set time varied from 5:20 to 5:45 AM and 5:15 to 5:40 PM during period of experiment.

Fruit Fly Identification

Adults of fruit fly were first counted in male and female on the basis of absence and presence of ovipositor, photographed and collected for identification. A total of 10 adults were collected for identification and were identified on the basis of morphological descriptions given by White and Elson-Harris (1992), Prabhakar *et al.* (2012b) and author's personal experience with the species.

Observations Recorded

The observations on number of fruit fly (male and female) were recorded three times in a day at 8 AM, 2 PM and 5 PM on three randomly selected pigeon pea plants for 15 minutes. Selection of time to record the activity of flies was based on behavioral observations of fruit flies Bactrocera cucurbitae as these flies have been more active during the morning hours and evening hours and less active during high day temperature.

RESULTS AND DISCUSSION

Adults male and female of melon fly were found resting on both surfaces of leaf of pigeon pea plant (Fig. 1). A total (maximum) 21 adult flies/ plant were counted in a day at evening 5 pm (15 min before sunset) on 25th of Oct. 2014. Whereas, average number of adult flies/plant/day resting on pigeon pea were varied from 16.66 to 18.04 adult flies/ plant from 8 AM to 5 PM, respectively (Fig. 2). There were no significant observed differences in number of male and female melon fly during morning hours on pigeon pea. Whereas, adult female melon fly activity was significantly higher as compare to adult male during evening hours on pigeon pea. In this study, fly's mating was also observed on pigeon pea during dusk hour and after sunset (Fig. 1G & H). It has shown that pigeon pea as roosting crop for melon fly. This is the first report on pigeon pea as roost plant for melon fly. Earlier corn, cassava and guava have been reported as trap crop (roost plant) for the melon fly management (McQuate and Vargas 2007; McQuate 2011). The increased number of adult female melon fly on pigeon pea during noon hours suggests that female fly back for rest during high temperature at noon hours and for rest and mating after foraging on main crop during night hours. This kind of activity in melon fly has already been observed by Nishida and Bess (1957). Pigeon pea is a legume and important pulse crop in many tropical and developing countries grown by poor and marginal farmers and could be used as trap crop for management of melon fly. This will have additional advantages as the trap crop be a crop its own and among other reported crops pigeon pea is a hardy and required less water and has bushy foliage. It can be planted as bordering crop around cucurbits field and the bait sprays (mixed insecticide and attractant) recommended for the management of melon fly could be applied on the pigeon pea. The bait insecticidal spray on pigeon pea plant will help in two ways; a) it will kill more male and female melon flies as dual attraction system works on pigeon pea plant i.e. bait material and pigeon pea plant as attractant, and b) bait spray or insecticidal spray on pigeon pea for the management of melon fly will reduce the load of insecticides on cucurbit crop (main crop). Other advantages of pigeon pea as a trap crop for melon fly management are a) produce of pigeon pea grown on border will help in the nutritional security of the growers family as it is a good source of protein (Bressani *et al.*, 1986); b) pigeon pea is a legume plant and it helps in the improvement of soil fertility by fixing nitrogen to the soil (Rao and Dart 1987); and c) It also works as hedge and wind break plant for the farm. However, further study is needed to address the relative attractiveness of different phenological stages, density of border planting, patches and varieties of pigeon pea as roosting sites for melon fly and other species of tephritid fruit flies for better management and farmer's livelihood with nutritional security.

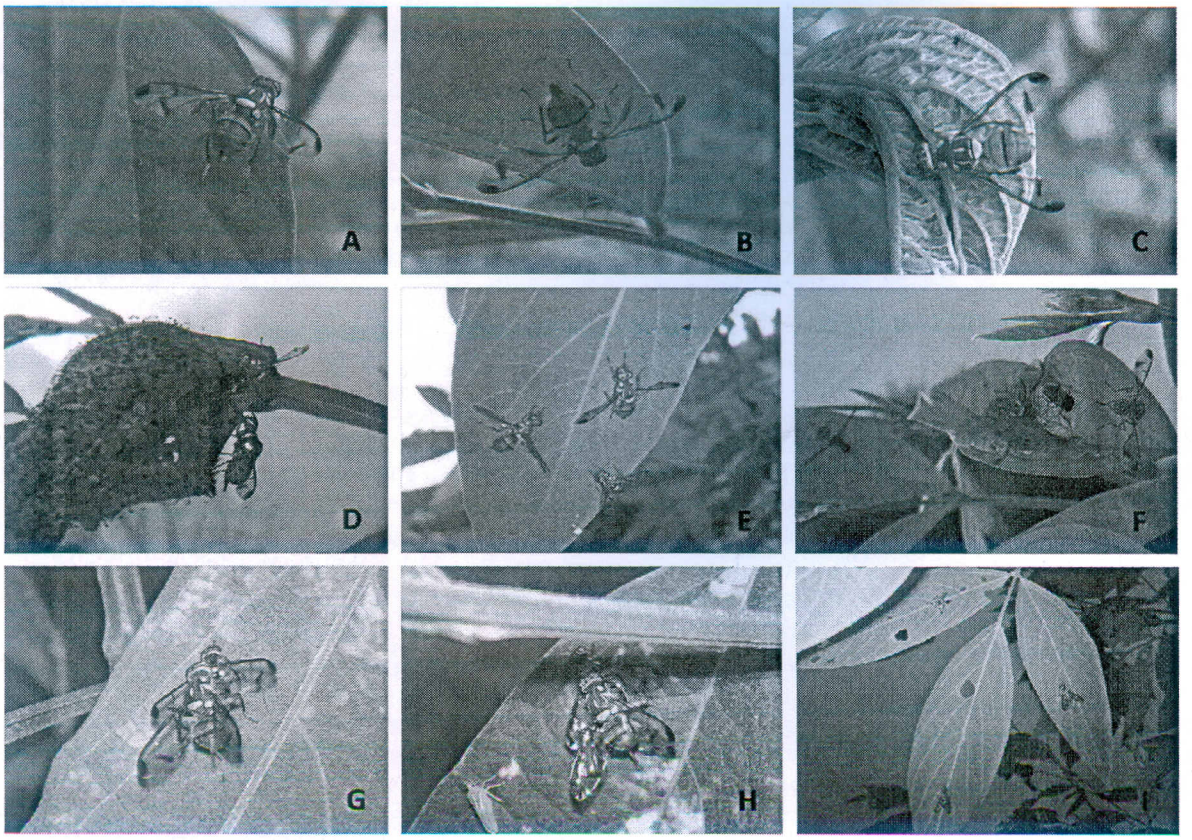

Fig. 1: Different Postures of Adult Melon Flies Roosting on Pigeon Pea. A & B: An Adult Female Melon Fly on the Upper and Undersurface of A Leaflet; C: An Adult Male Melon Fly on a Pigeon Pea Leaflet; D, E &F: A Group of Adult Melon Fly Adults on the Upper and Undersurface of a Leaflet; G & H: Melon Fly Adults Mating on the Under and Upper Surface of A Leaflet; and I: Adult Melon Flies Resting Singly on the Undersurface of Each Leaflet of a Pigeon Pea Leaf

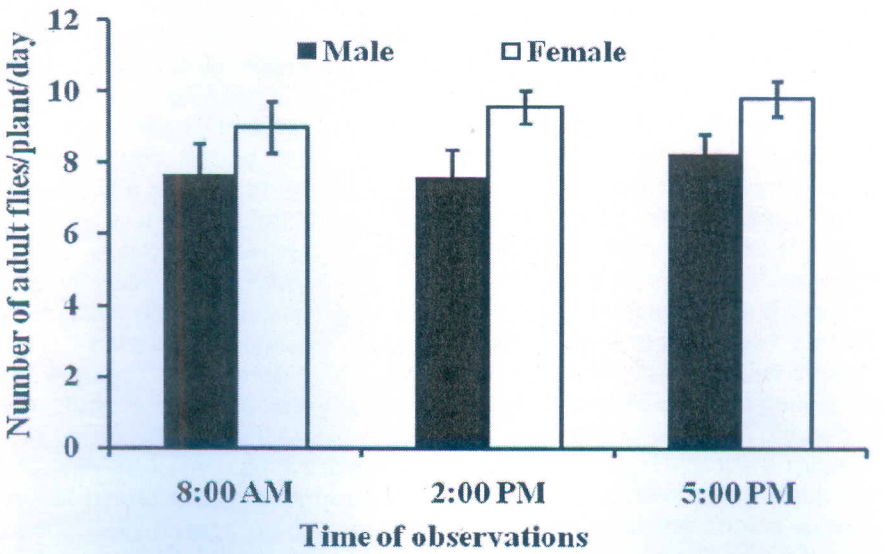

Fig. 2: Number of Adult Male and Female Melon Fly Resting at Different Time Period on Pigeon Pea Plant

ACKNOWLEDGMENT

Thanks for the constructive comments by two anonymous reviewers on the earlier version of the manuscript.

REFERENCES

Bressani, R., Gómez-Brenes, R.A. and Elías, L.G. (1986), "Nutritional Quality of Pigeon Pea Protein, Immature and Ripe, and its Supplementary Value for Cereals", *Arch Latinoam Nutr.*, Vol. 36, pp. 108–116.

Dhillon, M.K., Singh, R., Naresh, J.S. and Sharma, H.C. (2005), "The Melon Fruit Fly, *Bactrocera cucurbitae*: A Review of its Biology and Management", *J. Insect Sci.* Vol. 5, p. 1.

Kazi, A.S. (1976), "Studies on the Field Habits of Adult Melon Fruit Fly *Dacus* (Strumeta) *Cucurbitae*, Coquillet", *Pakistan J. Sci. Ind. Res.* Vol. 19, pp. 71–76.

McQuate, G.T., Jones, G.D. and Sylva, C.D. (2003), "Assessment of Corn Pollen as a Food Source for Two Tephritid Fruit Fly Species", *Environ Entomol.*, Vol. 32, pp. 141–150.

McQuate, G.T. and Vargas, R.I. (2007), "Assessment of Attractiveness of Plants as Roosting Sites for the Melon Fly, *Bactrocera Cucurbitae,* and Oriental Fruit Fly, *Bactrocera Dorsalis*", *J. Insect Sci.*, Vol. 7, p. 57.

McQuate, G.T. (2011), "Assessment of Attractiveness of Cassava as a Roosting Plant for the Melon Fly, *Bactrocera Cucurbitae*, and the Oriental Fruit Fly, *B. Dorsalis*", *J. Insect Sci.*, Vol. 11, p. 30.

Nishida, T. and Bess, H.A. (1957), "Studies on the Ecology and Control of the Melon Fly *Dacus (Strumeta) Cucurbitae* Coquillett (Diptera: Tephritidae)", *Hawaii Agri. Exp. Station Tech Bul.*, No. 34, University of Hawaii, Honolulu, Hawaii

Pinero, J.C., Jacome, I., Vargas, R. and Prokopy, R.J. (2006), "Response of Female Melon Fly, *Bactrocera Cucurbitae*, to Host-associated Visual and Olfactory Stimuli", *Entomol Exp. Appl.*, Vol. 12, pp. 261–269.

Prabhakar, C.S., Mehta, P.K., Sood, P., Singh, S.K., Sharma, P. and Sharma, P.N. (2012a), "Population Genetic Structure of the Melon Fly, *Bactrocera Cucurbitae* (Coquillett) (Diptera: Tephritidae) based on *Mitochondrial Cytochrome Oxidase (COI)* Gene Sequences", *Genetica,* Vol. 140, pp. 83–91.

Prabhakar, C.S., Sood, P. and Mehta, P.K. (2012b), "Pictorial Keys for Predominant *Bactrocera* and *Dacus* Fruit Flies (Diptera: Tephritidae) of North Western Himalaya", *Arthropods,* Vol. 1, pp. 101–111.

Rao, J.V.D.K.K. and Dart, P.J. (1987), "Nodulation, Nitrogen Fixation and Nitrogen Uptake in Pigeonpea (*Cajanus cajan* (L.) Millsp) of Different Maturity Groups", *Plant Soil,* Vol. 99, pp. 255–266.

Stark, J.D. (1995), "Nocturnal Behavior of Oriental Fruit Flies and Melon Flies (Diptera: Tephritidae) and Associated Parasitoids in a Commercial Papaya Growing Region on Kauai", *Hawaii Proc Hawaiian Entomol Soc.*, Vol. 32, pp. 149–151.

Virgilio, M., Delatte, H., Backeljau, T. and DeMeyer, M. (2010), "Macrogeographic Population Structuring in the Cosmopolitan Agricultural Pest *Bactrocera Cucurbitae* (Diptera: Tephritidae)", *Mol Ecol.*,} Vol. 19, pp. 2713–2724.

White, I.M. and Elson-Harris, M.M. (1992), *Fruit Flies of Economic Significance: Their Identification and Bionomics*, Centre for Agriculture and Biosciences International, Wallingford, p. 601.