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Short Note

Incidence and distribution of fruit flies (Diptera: Tephritidae) infesting cucurbits in Himachal Pradesh

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Abstract

A survey was conducted during 2009-10 in commercial cucurbits growing areas of Himachal Pradesh to estimate the damage and distribution of tephritid fruit flies. The studies revealed that *Bactrocera cucurbitae* and *Bactrocera tau* were the major and serious pests of cucurbits causing 44.44 to 80.00 per cent fruit infestation at different locations with an average fruit infestation of 65.88 per cent in Himachal Pradesh. *Bactrocera scutellaris* was the only species, which infested flowers and tender stems of cucurbits in the state. Owing to large scale infestation and severe economic losses, need for the large scale management programme is advocated for the pest fruit flies for sustainable cucurbits production and farmers livelihood in the Himachal Pradesh.

Key words: Fruit fly, *Bactrocera*, cucurbits.

Cucurbits comprising of cucumber, bottle gourd and bitter gourd are the important crops grown in Himachal Pradesh in an area of 2443 ha with production of 54237 tonnes (Anonymous, 2010). Tephritid fruit flies (Diptera: Tephritidae) are one of the most diverse group of insects, and cause annual economic loss of about Rs 6,958.20 crore in India (Sardana *et al.*, 2005). Fruit flies of genus *Bactrocera* are one of the most severe pest problems of orchard and vegetable crops in the country in general and hill state in particular. They occupy a predominantly important place in the list of enemies of plants and among the world's most notorious agricultural pests, both because of their widespread presence and broad host range, the enormous direct and indirect damage by the major species of the fruit fly complex and thus have a grave effect on agricultural economy (Michaux & White, 1999; Agarwal & Sueyoshi, 2005 and De Meyer *et al.*, 2010).

In Himachal Pradesh, *Bactrocera cucurbitae* (Coquillett) and *Bactrocera tau* (Walker) are the most serious pests on cucurbits (Gupta & Verma, 1992; Sood & Nath, 1999 and Prabhakar *et al.*, 2009). *B. tau* in particular has been reported on many fruit and vegetable crops by Narayanan and Batra (1960) in India and Huque (2006) in Bangladesh. This species was reported as a serious pest of cucurbitaceous vegetables (Bhalla & Pawar, 1977; Sood & Nath, 1999 and Prabhakar *et al.*, 2009) and also of solanaceous vegetables in Himachal Pradesh and plains of Punjab (Kapoor & Agarwal, 1983). Recently, *Bactrocera scutellaris* (Bezzi) was reported as pest of many cucurbit crops in Himachal Pradesh (Prabhakar *et al.*, 2007; Sunandita & Gupta, 2007 and Prabhakar *et al.* 2009).

These few reports on the fruit fly species infesting cucurbits in the state are, however based on selective locations. Therefore, the present investigation

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was undertaken to estimate the damage and distribution of fruit flies infesting cucurbits in Himachal Pradesh with a view to plan a management programme for fruit fly in the state. An extensive survey was undertaken during 2009-10 to know the incidence and distribution pattern of fruit fly species damaging cucurbits at 18 locations spread in eight districts of Himachal Pradesh where the cucurbits are commercially grown. Fruit fly damage in cucurbits field was identified with the presence of oviposition mark/s on the fruit. Whereas, presence of maggot/s in the flower samples and tender fruits was considered as infestation of fruit fly. Per cent damage in cucurbits were calculated in the field as per following formula

$$\text{Per cent fruit fly damage} = \frac{\text{Number of fruit fly damage fruits}}{\text{Total number of fruits observed}} \times 100$$

For identification of fruit fly species infesting cucurbits, infested fruit and flower samples comprising minimum of ten infested fruits/ flowers were collected during the peak activity of fruit flies in the area. The samples from each location were kept in separate rearing cages (20 × 15 × 18 cm^3) under laboratory conditions at Palampur for adult fruit fly emergence. The emerging fruit fly adults were identified on the basis of morphological descriptions given by White and Elson-Harris (1992) and Drew and Raghu (2002).

Fruit fly infestation in cucurbits: After an extensive survey of commercial cucurbits growing areas of Himachal Pradesh during 2009-2010 across eight districts *viz.* Bilaspur, Chamba, Hamirpur, Kangra, Kullu, Mandi, Solan and Una, the fruit flies infestation was encountered (ranging from 44.44 to 80.00 per cent) mostly in lower and middle altitude areas of Himachal Pradesh.

In district Bilaspur, fruit flies infestation at different locations varied from 55.55 to 60.00 per cent with maximum infestation at Ghumarwin (60.00 %) followed by Chandpur (55.55 %). In Chamba, only one location was surveyed i.e. Banikhet and the fruit fly infestation was 44.44 per cent. The fruit flies infestation ranged between 50-60 per cent in district Hamirpur, while it varied from 60-80 per cent at different locations in district Kangra. In district Mandi, Solan, Kullu and Una, the fruit fly infestation varied from 66.66 to 77.00 per cent, 70.00 to 77.77 per cent, 77.77 per cent, (at Naggar) and 66.66 per cent (at Haroli), respectively. The state average fruit flies infestation was 65.88 per cent, highest being in Kangra at Palampur (80.00%) and lowest in Chamba at Banikhet (44.44%).

The variations in fruit fly infestation in cucurbits at different locations might be due to the variations in the local environmental conditions and relative susceptibility of the crop varieties. For example, highest fruit fly infestation was recorded at Palampur (80.00%) in Kangra district, where Sood *et al.* (2010) also reported 79.56 per cent fruit damage by fruit flies in cucumber var. Pusa Sanyog (susceptible to fruit flies). High fruit flies activity in Himachal Pradesh might have been facilitated by congenial climatic conditions like high rain fall (1251.90 mm annual rainfall) and humidity, with majority rains being received during active cucurbits growing season (May-Sept). This is also supported by faulty insect-pest control practices adopted by the farmers, as they are not using IPM (Integrated Pest Management) approach like field sanitation, MAT (Male Annihilation Technique) and BAT (Bait Application Technique) techniques as observed during the survey. On the other hand, most of the agricultural land have bushy hedges and is surrounded by forest and pastures consisting of many wild cucurbits which could facilitate the fruit flies to rest and pick the resources during and after insecticide application. High fruit fly infestation in cucurbits recorded during the present study in Himachal Pradesh is in accordance with Gupta *et al.* (1992) who had observed 60.00-80.00 per cent infestation on different cucurbits in Himachal Pradesh.

Fruit fly species associated with cucurbits: In the infested cucurbit samples collected from different locations, two species viz. *B. tau* and *B. cucurbitae* were the predominant infesting all the cucurbits at majority of locations surveyed. These two species

were observed as the most damaging fruit fly species on different cucurbits at Ghumarwin (Bilaspur), Nadaun (Hamirpur), Jawalamukhi, Kangra, Palampur & Shahpur (Kangra) and Mandi, Nagwain & Sundernagar (Mandi) in Himachal Pradesh. However, cucurbit samples collected from Chandpur (Bilaspur), Banikhet (Chamba), Naggar (Kullu) and Nauni (Solan) indicated infestation of *B. tau* only, whereas samples from Bhota (Hamirpur), Indora (Kangra), Saproon (Solan) and Haroli (Una) indicated infestation of *B. cucurbitae* only. *B. scutellaris* was the lone species reared from the infested samples of flowers and tender fruits collected from three locations namely, Kangra & Palampur in district Kangra and Barot in district Mandi during the survey.

B. cucurbitae was earlier considered to be the major fruit fly species infesting cucurbits in Himachal Pradesh, however, in the present survey, *B. tau* and *B. cucurbitae* both were recorded as the predominant species infesting cucurbits in Himachal Pradesh. The fruit fly damage to cucurbits was observed to be confined mostly to the low and mid hills of the State.

These species have earlier been reported to be the major species infesting cucurbits (Kapoor *et al.*, 1980 and Gupta *et al.*, 1992) in Himachal Pradesh. However, Sood and Nath (1999) and Prabhakar *et al.* (2009) reported *B. tau* as a major fruit fly species infesting cucurbits in the State. *B. tau* has also been reported from north-eastern region of India (Borah & Dutta, 1996), China (Yang *et al.*, 1994) and Bangladesh (Huque, 2006). The reports pertaining to cucurbit infestation by *B. tau* from across the places indicate a wider geographical distribution of the species. During recent past, *B. scutellaris* has also been reported as one of the most destructive fruit fly species infesting tender fruits and growing vegetative parts from Himachal Pradesh, damaging not only the fruits but also retarding the plant vigour and growth (Prabhakar *et al.*, 2007; Sunandita & Gupta, 2007 and Prabhakar *et al.*, 2009). The reports of different workers on infestation of cucurbits by fruit flies in the Himachal Pradesh substantially support the present findings, that cucurbits are not damaged by a single fruit fly species but by a complex of species viz. *B. cucurbitae, B. tau and B. scutellaris.*

Higher infestation rate (fruit damage) of fruit flies in cucurbit crops in Himachal Pradesh necessitates large scale adoption of integrated pest management programme with wide-area management programme as an essential component of IPM for fruit fly management with firm cohesion between farmers-agriculture departments and educational & research institutions like SAUs (State Agricultural Universities).

References

Agarwal ML and Sueyoshi M 2005. Catalogue of Indian fruit flies (Diptera: Tephritidae). Oriental Insects **39**: 371-433.

Anonymous 2010. Package of practices for vegetable crops. Directorate of Extension Education, CSK HPKV Palampur, p 203.

Bhalla OP and Pawar AD 1977. A survey study of insect and non-insect pests of economic importance in Himachal Pradesh. *Tiku* and *Tiku*, Kitab Mahal. Bombay, p 80.

Borah SR and Dutta SK 1996. Comparative biology of *Dacus tau* (Walker) on cucurbitaceous vegetables. J. Agric. Sci. Soc. North-East India **9** (2): 159-65.

De Meyer M, Robertson MP, Mansell MW, Ekesi S, Tsuruta K, Mwaiko W, Vayssie'res JF and Peterson AT 2010. Ecological niche and potential geographic distribution of the invasive fruit fly *Bactrocera invadens* (Diptera: Tephritidae). Bull.Entomol. Res. **100** (1): 35-48.

Drew RAI and Raghu S 2002. The fruit fly fauna (Diptera: Tephritidae: Dacinae) of the rainforest habitat of the Western Ghats, India. The Raffles Bull. Zool. **50** (2): 327-52.

Gupta D and Verma AK 1992. Population fluctuations of the maggots of fruit flies (*Dacus cucurbitae* Coquillett and *D. tau* Walker) infesting cucurbitaceous crops. Adv. Plant Sci. **5**: 518-23.

Huque R 2006. Comparative studies on the susceptibility of various vegetables to *Bactrocera tau* (Diptera: Tephritidae). Pakistan J. Biol. Sci. **9** (1): 93-95.

Kapoor VC and Agarwal ML 1983. Fruit flies and their natural enemies in India. In: *Fruit flies of economic importance* (R Cavalloro ed). Balkema, Rotterdam, 252-57 pp.

Kapoor VC, Hardy DE, Agarwal ML and Grewal JS 1980. *Fruit Fly (Diptera: Tephritidae) Systematics of Indian Subcontinent.* Export Indian Publishers, Jalandhar, 113 p.

Michaux B and White IM 1999. Systematics and biogeography of southwest Pacific *Bactrocera* (Diptera: Tephritadae: Dacini). Palaeogeography, Palaeoclimatology and Palaeoecol. **153** (1-4): 337-51.

Narayanan ES and Batra HN 1960. *Fruit flies and their Control.* ICAR, New Delhi, 68 p.

Prabhakar CS, Sood P, Mehta PK and Choudhary A 2007. Fruit fly, *Bactrocera scutellaris* (Bezzi): a potential threat to cucurbit cultivation under low and mid hills of Himachal Pradesh. Pest Mgmt. Econ. Zool. **15** (2): 181-85.

Prabhakar CS, Sood P, Mehta PK and Choudhary A 2009. Distribution and developmental biology of fruit flies infesting cucurbits in North-western Himalaya. J. Insect Sci. **22** (3): 300-08.

Sardana HR, Tyagi A and Singh A 2005. *Knowledge Resources on Fruit Flies (Tephritidae: Diptera) in India.* National Centre for Integrated Pest Management, New Delhi, 174 p.

Sood P and Nath A 1999. Fruit flies associated with cucurbits in Himachal Pradesh. J. Hill Res. **12** (1): 52-54.

Sood P, Prabhakar CS and Mehta PK 2010. Eco-friendly management of fruit flies through their gut bacteria. J. Insect Sci. **23** (3): 275-83.

Sunandita and Gupta D 2007. A note on host range of fruit fly species infesting summer vegetable crops in mid hills of Himachal Pradesh. J. Insect Sci. **20** (1): 106-07.

White IM and Elson-Harris MM 1992. *Fruit flies of Economic Significance: Their Identification and Bionomics.* Centre for Agriculture and Biosciences International, Wallingford, UK, 601 p.

Yang PJ, Carey JR and Dowell RV 1994. Host specific demographic studies of wild *Bactrocera tau* (Walker) (Diptera: Tephritidae). Pan-Pacific Ent. **70** (3): 253-58.

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