INDIAN JOURNAL OF ARID HORTICULTURE
Vol.9 (1-2): 112-114

SHORT COMMUNICATION

Impact of intercrop on incidence of *ber* fruit fly, *Carpomyia vesuviana* Costa (Diptera: Tephritidae) under hot arid eco-system

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(Received: 30.11.2014; Accepted : 12.01.2015)

Ber (*Ziziphus mauritiana* Lamk.) is an important fruit tree grown under the arid and semi-arid region of India. Among the various insect pests infesting *ber*, fruit fly (*Carpomyia vesuviana* Costa) is most destructive and it destroys on an average of 24 persent of fruits (Lakra and Singh, 1984). The existing management strategies are solely relies upon the chemical pesticides and usage of bio-pesticides is also very limited. Use of synthetic chemicals is not economical and less attractive, while considering associated health hazards and environment. Summer ploughing, is an ecologically sound alternative to chemical control, which destroy the residual pupa and it is a recommended cultural practice against tephritid flies. However, often it fails to avoid the migrating population due to lack in synchronized soil cultivation among the growers. In this context, the intercropping of non host or pest repelling plants may be promising cultural method to check the pest intensity, for achieving more monetary return from a unit area per time. Growing annual crops like cluster bean and green gram between the *ber* rows as intercrops is a common and suggested practice under arid ecosystem as it increased on an average of 10 persent higher monetary returns over sole *ber* crop system (Patel *et al*. 2003). Intercrop also manipulates confusing environment and acts as repellents to arthropods to find its host. This could be an alternative method to curb the pests and boost the natural enemy populations in organic agriculture as it needs to avoid the use of synthetic pesticides (Lal *et al*., 2002). The possible alteration in microclimate and site-specific allelopathic interaction surrounding vegetation led the changes in incidence of insect pests and natural enemies. Though ample work has been done on *ber* fruit fly management, a meagre work is carried out in intercropping based management strategies. Hence, the present study was conducted to investigate the influence of intercropping on fruit fly incidence under hot arid ecosystem.

The experiment was conducted in existing ten year old *ber* cv. Gola tree plantation in the Experimental Block of Central Institute for Arid Horticulture, Bikaner, Rajasthan. Six treatments *viz*., *ber* + radish, *ber* + mustard, *ber* + coriander, *ber* + marigold, *ber* + barley and *ber* (sole crop as control) were imposed in the randomized block design with three replications. Sowing of annual crops was done during *rabi* 2008-09. Treatments were also imposed in three different spacing environments *viz*., 16 m x 12 m, 8 m x 8 m and 6 m x 6 m in the *ber* block, specially, developed to conduct the *ber* based farming system for hot arid environment. The recommended agronomic practices were carried out for both main crop (*ber*) and intercrops. The data on incidence of fruit fly were recorded from the first fortnight of October to till harvest. The observation was taken from randomly selected three branches/ treatment at fortnight interval. The per cent incidence was computed by subtracting total infested fruits with total number of fruits per branch. The data were analyzed with standard statistical package.

Among the six treatments, all the five intercrop combinations (Table 1) showed less incidence of fruit fly over sole *ber* (control), which was statistically significant. The trend was similar in all three different environments (spacing). At 16 m x 12 m spacing, the least damage of fruit fly was recorded in the combinations, *ber* + marigold (0.25 %) followed by *ber* + radish (0.51%) and *ber* + mustard (0.88%). The treatment consists of *ber* + coriander showed minimum fly attack (1.18%) followed by *ber* + mustard (1.56%) in 8 m x 8m planted rows. Under 6 m x 6 m spacing *ber* + marigold combination recorded least incidence (1.47%) followed by *ber* + radish (1.70 %), *ber* + mustard (2.27%) and *ber* + coriander (2.78%). *Ber* + mustard combination was comparatively better against fruit fly in all three different environments (Table 2.). The fruit

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fly attack was low (1.10%) in the wider row spaced (16 m x 12 m) combinations and it was inverse in closer planted rows of *ber* trees (Figure 1). The shade and slight alteration in microclimate around the canopies could be the reason for more fruit fly activity. Intercropping affects the pests by changing microclimate through change in canopies and physical factors (Goel and Tiwari, 2004); diverted orientation due to alteration in crop architecture (Elanchezhyan and Baskarom, 2008) and poly-culture create plant diversity, which affects the population dynamics of insect pests (Sinha *et al*., 2007). The results revealed that, the intercropping of non host plants could be unfavorable for fruit fly to finds its host and the reason might be due to either repellent action of annual intercrops or due to diversified environment. The marigold was found promising at 16 m x 12 m and 6 m x 6 m row spacing, while coriander gave encouraging results at 8 m x 8 m. The present result confirm the earlier findings marigold repelled Mexican bean beetle in bean, coriander repelled aphids in rose (Kianmatee and Ranamukharachchi, 2007) and low stem gall incidence on cotton in combination of cotton with marigold (Vaiyapuri *et al*., 2007). The study concludes

Table 1. Mean damage (%) of *ber* fruit fly (*Carpomyia vesuviana*) on *ber* based intercropping system

Treatments	Environments (spacing)			CD (0.05) bt/w spacing environments
	16 m x 12 m	8 m x 8 m	6 m x 6 m	
T1- *Ber* + radish	0.51 (0.74)^{a}	3.35 (1.82)^{ab}	1.70 (1.29)^{ab}	0.62
T2- *Ber* + coriander	1.10 (1.05)^{a}	1.18 (1.06)^{a}	2.78 (1.66)^{b}	0.38
T3- *Ber* + marigold	0.25 (0.62)^{a}	2.99 (1.72)^{ab}	1.47 (1.21)^{a}	0.33
T4- *Ber* + mustard	0.88 (0.93)^{a}	1.56 (1.24)^{b}	2.27 (1.50)^{ab}	0.31
T5- *Ber* +barley	1.27 (1.09)^{a}	2.81 (1.65)^{ab}	3.03 (1.74)^{bc}	NS
T6- *Ber* (sole)	2.61 (1.61)^{b}	4.51 (2.12)^{c}	4.87 (2.21)^{c}	0.23
SEd	0.21	0.19	0.12	
CD (0.05) *bt/w intercrop combinations	0.47	0.42	0.27	

Figure in parenthesis are *sqrt* transformed values

Table 2. Mean damage (%) of fruit fly (*Carpomyia vesuviana*) in intercrops combinations with different spacing environments

Spacing (meter)	*Ber* + radish	*Ber* + coriander	*Ber* + marigold	*Ber* + mustard	*Ber* + barley	*Ber* (sole)
16 x 12	0.51 (0.74)^{a}	1.10 (1.05)^{a}	0.25 (0.62)^{a}	0.88 (0.93)^{a}	1.27 (1.09)	2.61 (1.61)$_{a}$
8 x 8	3.35 (1.82)^{b}	1.18 (1.06)^{a}	2.99 (1.72)^{c}	1.56 (1.24)^{ab}	2.81 (1.65)	4.51 (2.12)$_{b}$
6 x 6	1.70 (1.29)^{ab}	2.78 (1.66)^{b}	1.47 (1.21)^{b}	2.27 (1.56)^{b}	3.03 (1.74)	4.87 (2.21)$_{b}$
Row means	1.84	1.69	1.57	1.54	2.37	3.99

Figure in parenthesis are *sqrt* transformed values

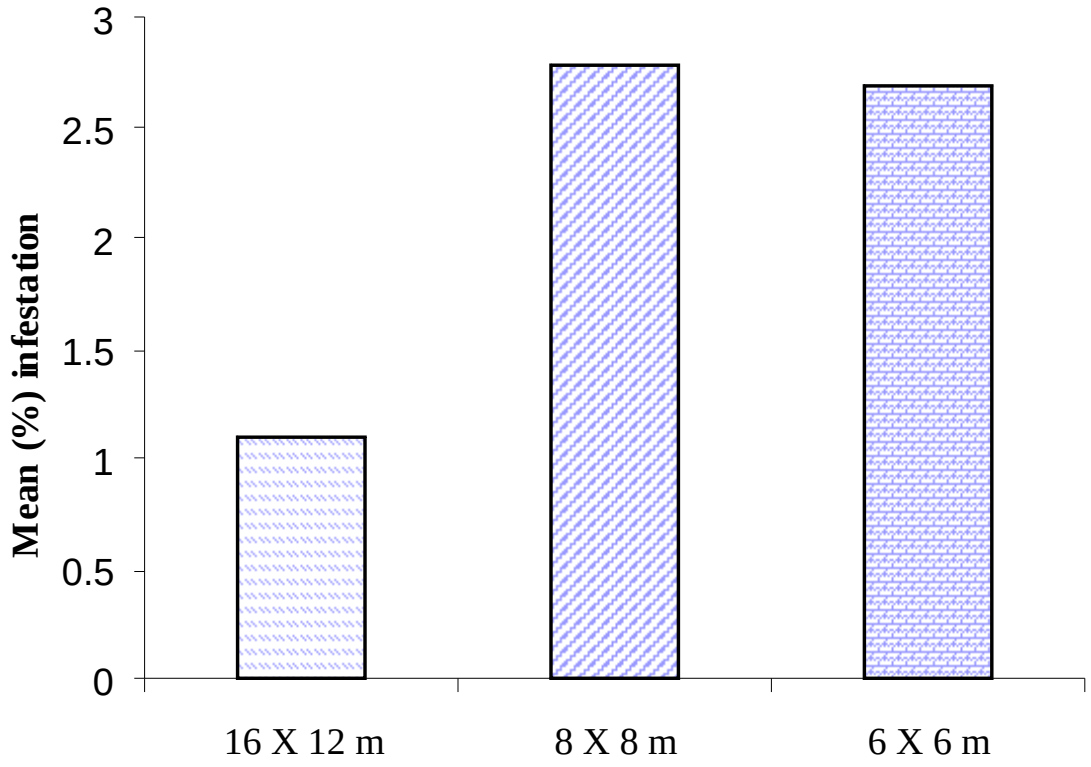

Figure 1. Damage level of fruit fly *Carpomyia vesuviana* Costa in different spacing environment

that, intercropping of pest repellent crops like mustard and marigold could be a viable option to curb the fruit fly incidence; thereby reducing the expenses on pesticide application. Further, such intercropping practices also brings additional monetary return in the *ber* based diversified farming through harvest of the intercrops.

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