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SHORT COMMUNICATION

Scenario of *ber* fruit weevil *Aubeus himalayanus* Voss (Coleoptera: Curculionidae) incidence in *ber*-based cropping system

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The *ber* fruit weevil, *Aubeus himalayanus* is an emerging pest of *ber* in arid and semi-arid region of India. It was recorded as a new pest of *ber* for the first time from Andhra Pradesh (Gour and Sriramulu, 1994). Later, from Rahuri, Maharashtra and Jobner, Rajasthan Anonymous 2003) Karnataka (Balikai *et al*., 1998) and lately in Bikaner (Karuppaiah *et al*., 2010). The pest infestation occurs in all the fruit stages; however, it is prevalent in pea to pebble size fruits. Pest feeds only on the seed of developing fruit and arrests further fruit development. In severe cases it could causes damage up to 23.63% to 43.28% (Karuppaiah *et al*., 2014). Currently fruit weevil is managed mainly using synthetic insecticides and usage of bio-pesticides is very limited. Summer ploughing, is an ecologically sound cultural method in minimizing the fruit weevil, which destroy the residual pupa and it is also a recommended cultural practice against tephritid fruit flies of *ber*.

The intercropping of annual crops in between perennial fruit crops is a regular farming practice in arid region to achieve more monetary return in 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% higher monetary returns over sole *ber* system (Patel *et al*.2003). Moreover, in the context of ecological pest management growing of non-host or pest repelling plants could be promising intervention to check the pest intensity in main crop. Intercrop also manipulates confusing environment and acts as repellents to arthropods to find its host. This could supplement to curb the pests menace and also boost the natural enemy populations (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 production aspects of *ber* based intercropping model/system but no work is carried out to document the status of insect pests' of *ber*. Since, *ber* fruit weevil is an emerging pest to this region; the present study was conducted to study the status of fruit weevil incidence in *ber* based intercropping model under hot arid ecosystem.

The observations were made on 10 year old trees of *ber* cv. Gola 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 with randomized block design in 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 weevil were recorded from 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.

The incidence of fruit weevil in five different intercrop combinations was presented in the Table 1. The significant different was observed among the different set of combination. The least incidence of stone weevil was observed in *ber* where no intercrop was done and per cent damage was 7.42, 7.23, and 7.21 in 16 x 12, 8 x 8 and 6 x 6 m spacing environment, respectively. Apart from sole *ber*, in the plantation with 16 x 12 m spacing, *ber* + radish combination registered low fruit weevil incidence (7.52%) followed by *ber* + coriander (7.79%), *ber* + mustard (10.50%), *ber* + barley (10.51%) and *ber* + marigold (11.73%). At 8 x 8 m plantation least damage of weevil

recorded in *ber* + barley (10.46%) combination followed by *ber* + coriander (13.22%), *ber* + marigold (14.80%), *ber* + radish (18.39 %) and maximum with *ber* + mustard (20.37%). At 6 x 6 m spacing the least damage of fruit weevil noticed in *ber* + barley (10.33%) followed by *ber* + marigold (12.83%), *ber* + coriander (19.67%), *ber* + mustard (26.96%) and *ber* + radish (32.82%). Irrespective of different planting space, the maximum infestation of 19.58% damage was recorded in *ber* + radish combination. The infestation trend was *ber* + radish > *ber* + mustard > *ber* + coriander> *ber* + marigold > *ber* + barley > *ber* (sole). Overall among the intercrop combinations *ber* + barley combination found to be promising in reducing the weevil incidence with both of the models *viz*, 8 x 8 and 6 x 6 m (Fig 1). Irrespective of intercrop combination, the greater incidence of stone weevil recorded with the closer planting model i.e. 6 x 6 m followed by 8 x 8 m and 16 x 12 m and mean damage was 13.03, 13.74 and 14.80 per cent, respectively (Fig 2). However statistically no significant in damage level was observed between the planting system.

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 Baskaran*et al*., 2008) and poly-culture create plant diversity, which affects the population dynamics of insect pests (Sinha *et al*., 2007). However, in the present study, the fruit weevil damage was significantly low in sole *ber* (control) where no annual crop was planted. This might be due to non availability of favourable microclimate for fruit weevil activity in and around *ber* tree. Growing intercrop could have been provided favorable humidity and shade for survival and population buildup of fruit weevil. On the other hand, studies were reported that growing non host plants in between the annual crops helps in reducing the target pest, which is mainly through repellent mechanism prevails in the intercrop. The crop, marigold was found promising, while coriander found to be encouraging in reducing *ber* fruit fly infestation under *ber* based intercropping model (Karuppaiah *et al*., 2014). Similarly, studies also established that 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).

Our results conclude that, intercropping of non host annual crops in between the *ber* plantation may add the monetary return but could facilitate the fruit weevil incidence. However, in the view of *ber* based intercropping model, the combination model, *ber* + barley would be a better combination model that could minimize the stone weevil incidence than the other combination tried in this study.

Table 1. Mean damage (%) of *ber* fruit weevil, *Aubeus himalayanus* Voss on *ber* based intercropping system

Treatments	Environments (spacing)		
	16 m x 12 m	8 m x 8 m	6 m x 6 m
T1- *Ber* + radish	7.52 (2.43)	18.39 (3.53)	32.82 (4.61)
T2- *Ber* + coriander	7.79 (2.44)	13.22 (2.99)	19.67 (3.69)
T3- *Ber* + marigold	11.73 (2.83)	14.80 (3.21)	12.83 (3.07)
T4- *Ber* + mustard	10.50 (2.77)	20.37 (3.69)	26.96 (4.24)
T5- *Ber* +barley	10.51 (2.83)	10.46 (2.80)	10.33 (2.68)
T6- *Ber* (sole)	7.42 (2.20)	7.23 (2.27)	7.21 (2.40)
SEd	0.13	0.24	0.43
CD (0.05) *bt/w intercrop combinations	0.30	0.54	0.95

Figure in parenthesis are *sqrt* transformed values

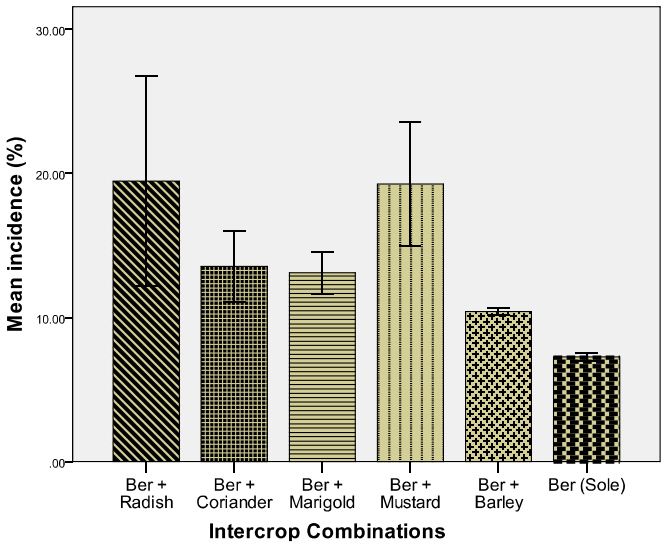

Figure 1. Incidence level of fruit weevil, *Aubeus himalayanus* Voss in different intercrop combination

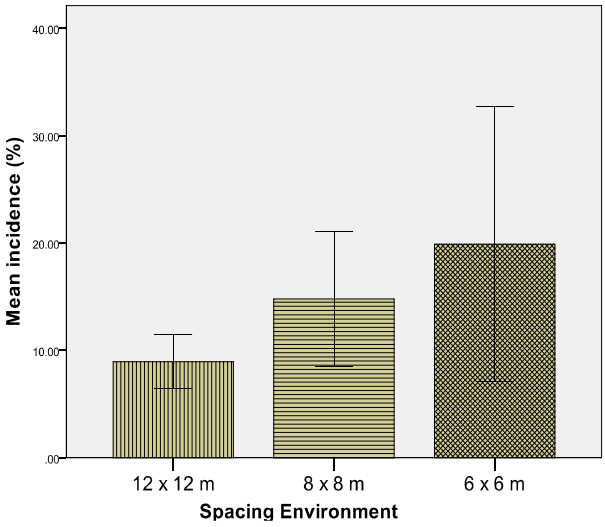

Figure 2. Incidence level of fruit weevil, *Aubeus himalayanus* Voss in different plant planting system

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