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INFLUENCE OF INTERCROPS ON INCIDENCE OF SHOOT AND FRUIT BORER, *Leucinodes orbonalis* Guenee

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Abstract: Studies were taken up to understand the chemical ecology of Leucinodes orbonalis using intercrops. Studies on Intercrops coriander and cluster bean in brinjal caused reduction of L. orbonalis damage in the main crop. The mean of shoot damage observed in coriander intercropped plot was 6.19 per cent and was 8.05 per cent in cluster bean intercropped plot whereas in sole crop damage reported was 14.48 per cent. The Fruit damage observed was 57.52 per cent in sole crop and was only 37.16 per cent in coriander intercropped plot and 50.64 per cent in cluster bean intercropped plot. To identify intercrops as a "push factor strategy" in L. orbonalis management, coriander and cluster bean crops were evaluated.

Keywords: Coriander, Cluster bean, Intercrops, Damage

1. Introduction:

Brinjal (*Solanum melongena* L.), is commonly known as eggplant is one of the most important Solanaceous vegetable crop in our country cultivated both in *kharif* and *summer* season. It occupies an important position among the other regular vegetable crops as it is available throughout the year. The fruit and shoot borer, *Leucinodes orbonalis* Guenee is the key pest of brinjal (Latif *et al.*, 2010; Chakraborti and Sarkar, 2011; Saimandir and Gopal, 2012) inflicting sizeable damage in almost all the brinjal growing areas (Dutta *et al.*, 2011). The use of cultural practices like intercropping is one of the alternative control measures. It is a practice often associated with poor-resource farmers. Intercropping practice is of economic benefit and one of the best cultural practices that have potential of reducing insect pest infestation by increasing crop diversity (Willey, 1985; Trenbath, 1993). According to Paul *et al*., (2015) intercropping coriander with brinjal suppresses the population of *L. orbonalis.* Use of intercrops is an eco-friendly technique and is a vital tool to reduce the pest infestation and chemical ecology approach. The intercropping system is also observed to check the dispersal of flying insect and pests of shorter crops, thus preventing migration towards the main crop.

2. Materials and methods:

2.1. Studies on Influence of Intercropping on Incidence of *L. orbonalis* in Brinjal

With the objective of integrating intercrop as a tool in *L. orbonalis* management and exploring this agro- technique with behavioural control, a separate experiment was laid out during December 2016 using the brinjal variety KKM 1. Brinjal seedlings of 30 days old were transplanted on 20.12.2016 with a spacing of 60 cm x 60 cm. In treatment plot intercrops cluster bean, *Cymopsis tetragonolaba* (L.) Taub (Var.MDU 4) and coriander, *Coriandrum sativum* L. (Var. Co 1) were sown at the day of transplanting of main crop at 4:1 ratio. Thus the experimental plot had three sub plots *viz.*, Brinjal + Coriander (T_1), Brinjal + Cluster Bean (T2) and Sole crop(T_3) (Picture 1). In each subplot, seven micro plots of one square metre were marked out. Each subplot constituted a treatment and each micro plot in the sub-plot was considered as a replication. The data on

the incidence of *L. orbonalis* were recorded in terms of shoot damage and fruit damage from each micro plots on weekly basis (Picture 2).The observation on shoot damage was made from 31st DAT (3rd std week) to 121st DAT (16th std week). Fruit damage on micro plots were scored from 62 DAT (7thstd week) till harvest. The percent shoot damage and fruit damage were worked in sole crop and intercropped plots.

3. Results and Discussion:

With increase in concern for environmental awareness on chemical contamination of vegetables, based on the reports of Elanchezhyan (2007), Paul (2015) and Kandasamy (2016) the intercrops like coriander, cluster bean were explored for their characteristic repellent on the adult moths so that the oviposition preference behavior of the adult moth can be altered. The above two crops were selected for the exploitation in integrated pest management approach for L. orbonalis with the inherent benefit of getting higher economic return. The experiment was conducted during rabi 2016 to manage the L. orbonalis through intercropping with coriander and cluster bean as a crop diversification approach.

3.1. Studies on Intercrops Influence on *L. orbonalis:*

3.1.1. Shoot damage:

Influence of intercropping with cluster bean and coriander in colonization behavior of *L. orbonalis* was assessed by making observation on extent of crop damage in the sole crop and intercropped plot. The study was taken up during December 2016 to May 2017 crop season. The impact of intercropping on *L. orbonalis* colonization was compared in terms of shoot and fruit damage percentage (Table 1).

The shoot damage data taken during 3rd week of January (3rd and 4thstd week) ranged from 3.63 per cent in coriander intercropped plot to 5.95 per cent in the sole crop. However statistically there was no significant difference observed due to intercropping. Trend continued the same till 4th standard week. Shoot damage observed during this period ranged 7.66 per cent, 5.64 per cent and 4.23 per cent in treatment wise brinjal sole crop, Brinjal + Cluster bean, Brinjal + Coriander respectively. A significant variation in shoot damage due to intercropping was observed between the sole crop plot and intercropped plot on 5th week on wards. Compared to 10.86 per cent shoot damage recorded in the sole crop during 5thstd week, a significantly low level of 5.64 per cent and 6.89 per cent shoot damage was recorded in field intercropped with coriander, cluster bean respectively. In the control plot the shoot damage continued to increase to the extent of 27.50 per

cent during 10thstd week and a significantly low level of 10.88 per cent was noticed in brinjal + coriander plot and the extent of shoot damage was on 14.66 per cent in brinjal + cluster bean plot.

From the data furnished in table 4, it is apparent that both the intercrops had brought down the shoot damage to a significant level up to 14thstd week. During 13th and 14thstd week, the level of shoot damage was observed at minimum level (< 3.4 %) and there was no difference noticed among the plots. In terms of overall shoot damage, as again 14.48 per cent shoot damage recorded in brinjal sole crop, a minimum level of 8.05 per cent was recorded in cluster bean intercropped plot and in coriander intercropped plot the extent of damage was 6.19 per cent. (Figure 1)

3.1.2. Fruit damage

The results of the observation on extent of fruit damage is furnished in table 2, reveals reduction in damage level due to intercropping. A significant level of variation was observed from 7thstd week up to 16thstd week. The extent of fruit damage observed in brinjal sole crop in the experimental plot ranged from 46.78 per cent to the maximum level of 69.52 per cent during April 2nd week (14thstd week). Fruit damage observed during 7thstd week was 46.78 per cent in sole crop and was only 28.5 per cent in coriander intercropped plot and 33.66 per cent in cluster bean intercropped plot. In the brinjal + cluster bean intercropped field, the extent of fruit damage ranged between 33.66 per cent to 64.90 per cent. Compared to the sole crop an apparent reduction in fruit damage observed in coriander intercropped plot and the level of fruit damage ranged between 23.59 per cent to 43.01 per cent.

There was no variation seen among the treated plots during end of the crop period (17th and 18thstd week). The mean value indicated 57.52 per cent fruit damage in the sole crop over the entire crop period and was 50.64 per cent in cluster bean intercropped plot, this is only 37.16 per cent in brinjal crop with coriander.(Figure 2)

4. Conclusion:

Intercrops coriander and cluster bean in brinjal caused reduction of *L. orbonalis* damage in the main crop. The mean of shoot damage observed in coriander intercropped crop was 6.19 per cent and was 8.05 per cent in cluster bean whereas in sole crop damage reported was 14.48 per cent.The Fruit damage observed was 57.52 per cent in sole crop and was only 37.16 per cent in coriander intercropped plot and 50.64 per cent in cluster bean intercropped plot. From this research it is concluded that Brinjal intercropping with Coriander shows better result among all the treatments.

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Plate 3.Coriander intercropped brinjal field

a. Field view

b. Coriander intercropped plot

Plate 4. Damage symptoms of *L. orbonalis*

a. Shoot damage

b. Flower bud damage

c. Fruit damage

d. Entry and exit hole of larva

Tables:

Table 1. Influence of Coriander (*C. sativum*), Cluster bean (*C. tetragonolaba)* intercropping on shoot damage by *L. orbonalis*

Mean of shoot damage percentage															
Week / Treatment	3rd STDW	4th STDW	5th STDW	6th STDW	7th STDW	8th STDW	9th STDW	10th STDW	11th STDW	12th STDW	13th STDW	14th STDW	15th STDW	16th STDW	Mean
T1 (Brinjal + Coriander)	3.63 (1.87)	4.23 (2.04)	5.64 (2.36)	7.66 (2.73)	6.95 (2.61)	9.65 (3.07)	9.99 (3.10)	10.88 (3.28)	7.92 (2.63)	4.64 (2.11)	5.62 (2.33)	4.85 (2.14)	2.50 (1.57)	2.55 1.59	6.19 (2.38)
T2 (Brinjal + Cluster bean)	4.90 (2.21)	5.64 (2.29)	6.89 (2.53)	8.02 (2.74)	7.06 (2.59)	10.67 (3.26)	13.77 (3.63)	14.66 (3.72)	14.67 (3.81)	6.98 (2.57)	5.43 (2.30)	7.60 (2.75)	3.00 (1.73)	3.42 (1.84)	8.05 (2.71)
T3 (Brinjal sole crop)	5.95 (2.33)	7.66 (2.70)	10.86 (3.25)	19.44 (4.36)	22.01 (4.66)	17.98 (4.21)	23.95 (4.80)	27.50 (5.17)	21.08 (4.58)	13.78 (3.66)	13.82 (3.61)	12.98 (3.51)	2.52 (1.59)	3.22 (1.77)	14.48 (3.58)
SEd	0.28	0.35	0.32	0.34	0.23	0.21	0.49	0.52	0.39	0.35	0.34	0.32	0.08	0.12	
CD	NS	NS	0.69*	0.73**	0.51**	0.47**	1.06*	1.13**	0.85**	0.76**	0.73**	0.70*	NS	NS	

Figures in parentheses are transformed values (Square root transformation)

STDW – Standard Week Mean (Transformed mean) * Significant @ 5% ** Significant @ 1%

Table 2. Influence of Coriander (*C. sativum*) and Cluster bean (*C. tetragonolaba)* intercropping on fruit damage by *L. orbonalis*

Mean offruit damage percentage													
Std week / Treatment	7th STDW	8th STDW	9th STDW	10th STDW	11th STDW	12th STDW	13th STDW	14th STDW	15th STDW	16th STDW	17th STDW	18th STDW	Mean
T1 (Brinjal + Coriander)	28.56 (32.24)	33.56 (35.32)	43.01 (40.96)	38.59 (38.22)	35.78 (36.52)	34.63 (36.04)	36.66 (37.21)	33.38 (35.28)	36.15 (36.87)	23.59 (28.89)	50.69 (46.80)	51.33 (45.66)	37.16 (36.50)
T2 (Brinjal + Cluster bean)	33.66 (35.34)	38.02 (38.01)	45.67 (42.50)	33.03 (35.05)	60.86 (51.33)	55.64 (48.27)	64.52 (53.47)	64.90 (53.72)	63.16 (52.73)	43.30 (41.06)	51.54 (45.88)	53.48 (46.98)	50.64 (45.36)
T3 (Brinjal sole crop)	46.78 (43.14)	49.62 (44.78)	53.63 (47.10)	56.77 (48.90)	64.65 (53.53)	59.76 (50.63)	67.73 (55.40)	69.52 (56.52)	65.84 (54.25)	45.77 (42.56)	54.52 (47.62)	55.67 (48.30)	57.52 (49.39)
SEd	2.31	1.94	1.58	2.34	2.17	1.41	1.54	1.51	2.23	1.90	2.50	3.88	
CD	5.03**	4.22**	3.43**	5.10**	4.72**	3.07*	3.35*	3.30*	4.86*	4.13*	NS	NS	

Figures in parentheses are transformed values (Arc sine transformation)

STDW – Standard Week Mean (Transformed mean) * Significant @ 5% ** Significant @ 1%

Figures:

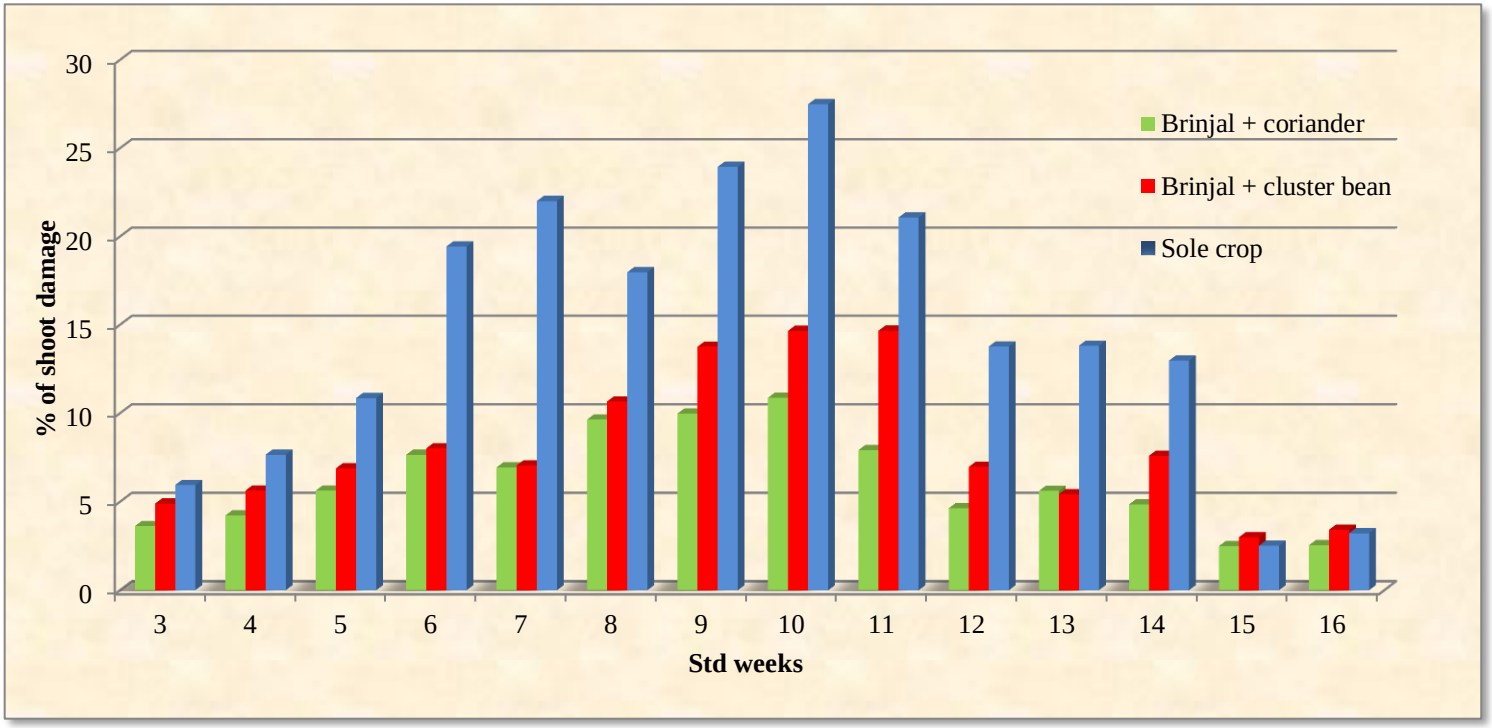

Figure 1. Influence of intercrops on *L. orbonalis* shoot damage

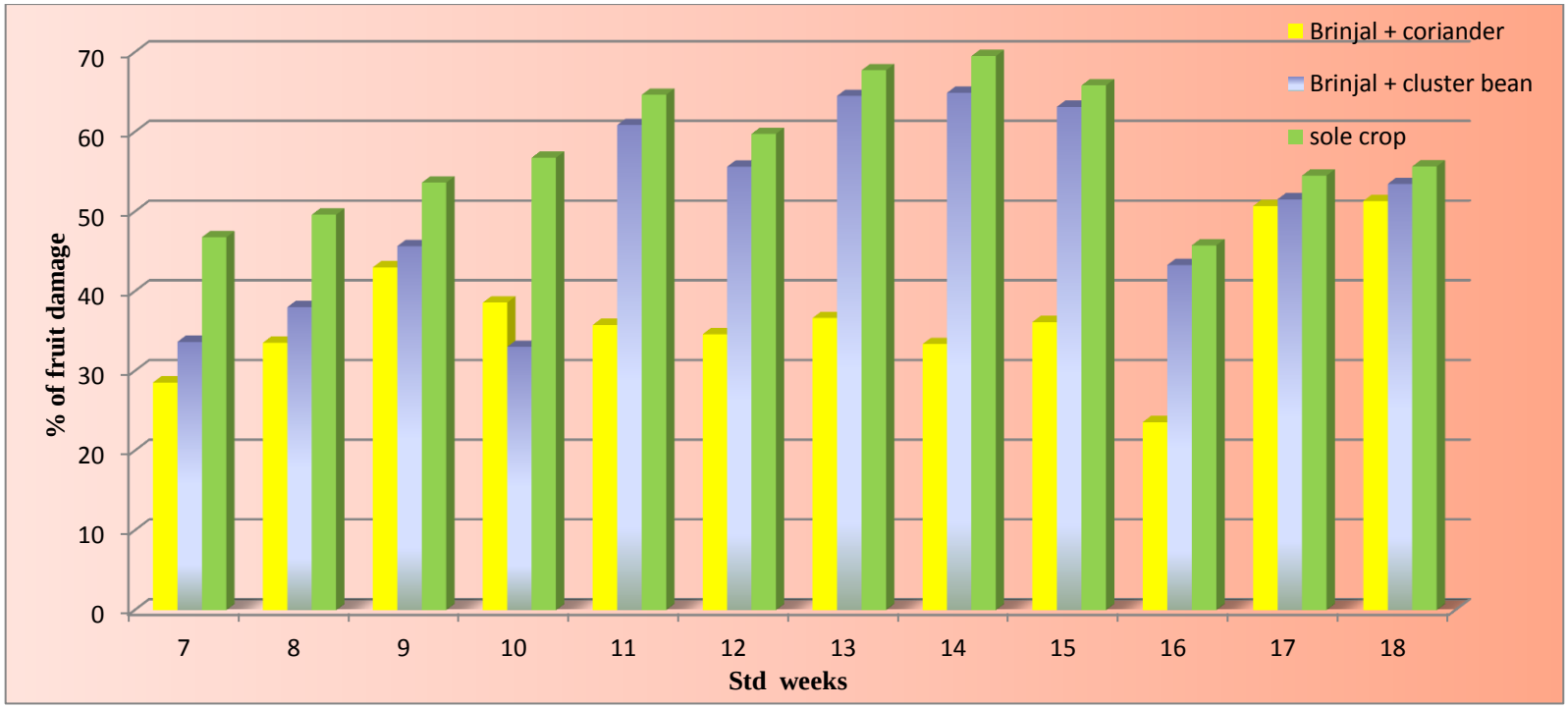

Figure 2. Influence of intercrops on *L. orbonalis* fruit damage