

Effect of Different Border Crops on Natural Enemies on Okra

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Abstract The present study was undertaken during *rabi* 2014-15 to study the effect of different border crops on natural enemies on okra under field condition. The data on the occurrence of natural enemies on main crop revealed that maximum number of lady beetle adults were recorded in Sweet corn (8.42) which was followed by Ambadi (6.58). The maximum number of lady beetle grubs were recorded in Sweet corn (7.67) which was significantly superior over rest of the treatments. As far as syrphid maggots and spiders were concerned, the maximum numbers were observed in Marigold (5.67) and Sweet corn (3.42) as a border crop, respectively. The results on the occurrence of different natural enemies on border crops revealed that maximum numbers of lady beetle adults

(10.00) and grubs (17.00) were recorded in Sweet corn. Also the maximum numbers of syrphid maggots (3.00) and spiders (4.17) were recorded in sweet corn.

Keywords Okra, Lady beetle, Sweet corn, Marigold, Syrphid fly.

Introduction

Okra (*Abelmoschus esculentus* L. Moench) is a member of the family malvaceae and is said to be native of Africa possibly Ethiopia. Okra is one of the most important fruit vegetable grown throughout the tropics and warm temperature zones. It is widely cultivated as a summer season crop in North India and as a *kharif* and summer season crop in Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu. In Maharashtra, area under this crop is 22 thousand ha with a production 3.28 lakh metric tonnes and productivity of 14.9 metric tonnes ha⁻¹ in the year 2012-13 [1].

Okra is susceptible to the attack of various insects from seedling to fruiting stage such as okra shoot and fruit borer, okra jassids, cut worm, white fly, aphids. Among these okra shoot and fruit borer (OSFB), *Earias* spp. is the most serious pest which cause direct damage to tender shoots and fruits. Natural enemies like parasitoids and predators are the main sources of reduction in the populations of noxious insect pests. Indiscriminate use of insecticides has resulted in killing of natural enemies and environmental pollution problem on large scale. Adoptions of IPM strategies ensure safety of environment. In this

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Table 1. Mean number of lady beetles on main crop. *Figures in parentheses are $\sqrt{n+1}$ transformed values.

Tr. No.	Treatments	Mean number of lady beetles/plant	
		Adults	Grubs
T ₁	Ambadi	6.58 (2.75)*	4.25 (2.29)
T ₂	Sweet corn	8.42 (3.05)	7.67 (2.94)
T ₃	Marigold	4.92 (2.43)	3.42 (2.09)
T ₄	Tomato	3.17 (2.04)	1.83 (1.68)
T ₅	Sunflower	4.42 (2.29)	2.25 (1.80)
T ₆	Mustard	2.83 (1.95)	2.92 (1.96)
T ₇	Check (No border crop)	3.83 (2.16)	3.17 (2.03)
	SEm±	0.17	0.10
	CD at 5%	0.53	0.33

regard, encouragement of natural enemies occupies a central position in integrated pest management because biological control of pests and weeds through natural enemies is eco-friendly [2].

In view of reducing the unnecessary use of insecticide, promoting natural biological control ecosystem services through border crops can significantly prevent pest outbreaks. Such practices focus on biodiversity conservation, enhancing ecosystem services and avoiding pollution and will build resilience in production system.

Materials and Methods

A statistically designed field experiment on okra variety Varsha Uphar using randomized block design having three replication and seven treatments was conducted during *rabi* season of 2014-15 at ASPEE Agricultural Research and Development Farm, Village: Nare, Tal: Wada, Dist: Palghar (M.S.).

Treatment Details

Treatments	Border crops
T ₁	: Ambadi (<i>Hibiscus cannabinus</i> L.)
T ₂	: Sweet corn (<i>Zea mays</i> L.)
T ₃	: Marigold (<i>Tagetes erecta</i> L.)
T ₄	: Tomato (<i>Lycopersicon esculentum</i> L.)
T ₅	: Sunflower (<i>Helianthus annuus</i> L.)
T ₆	: Mustard (<i>Brassica juncea</i> L.)
T ₇	: Check (No Border crop)

Table 2 . Mean number of syrphid fly maggots and spiders on main crop. *Figures in parentheses are $\sqrt{n+1}$ transformed values.

Tr. No.	Treatments	Mean number/plant	
		Syrphid fly maggots	Spiders
T ₁	Ambadi	2.67 (1.91)*	1.08 (1.44)
T ₂	Sweet corn	3.50 (2.11)	3.42 (2.09)
T ₃	Marigold	5.67 (2.58)	1.42 (1.55)
T ₄	Tomato	2.50 (1.87)	0.92 (1.38)
T ₅	Sunflower	3.25 (2.06)	1.42 (1.55)
T ₆	Mustard	1.83 (1.68)	1.08 (1.44)
T ₇	Check (No border crop)	2.42 (1.83)	0.92 (1.38)
	SEm±	0.10	0.10
	CD at 5%	0.32	0.30

Method of recording observations

population of natural enemies

Five plants of okra were selected randomly and marked permanently to record the natural enemies population on main crop. The natural enemies were recorded by necked eyes and counted plot wise. Similarly, for recording natural enemies on border crops five plants from each plot were selected randomly and natural enemies per border plant were recorded by visual observations.

Results and Discussion

The relative effect of different border crops on natural enemies on okra was evaluated under field condition during *rabi* season of 2014-15 and are presented herewith.

Lady beetles monitored on main crop

The data on mean number of lady beetle adults and grubs per plant of main crop i.e. Okra are presented in Table 1.

The results revealed that the maximum lady beetle adults were recorded in T₂ (8.42) which, was signifi-

Table 3. Mean number of lady beetles on border crop. *Figures in parentheses are $\sqrt{n+1}$ transformed values.

Tr. No.	Treatments	Mean number of lady beetles/plant	
		Adults	Grubs
T ₁	Ambadi	5.58 (2.57)*	3.00 (2.00)
T ₂	Sweet corn	10.00 (3.32)	17.00 (4.22)
T ₃	Marigold	0.50 (1.22)	0.00 (1.00)
T ₄	Tomato	0.00 (1.00)	0.00 (1.00)
T ₅	Sunflower	4.25 (2.29)	3.50 (2.10)
T ₆	Mustard	2.75 (1.93)	2.50 (1.87)
T ₇	Check (No border crop)	–	–
	SEm±	0.05	0.16
	CD at 5%	0.14	0.50

cantly superior over but at par with T₁ (6.58). It was also observed that treatments viz., T₁ (6.58), T₃ (4.92) and T₅ (4.42) were also at par. Further, T₃ (4.92) was found at par with T₄ (3.17), T₅ (4.42), T₆ (2.83) and T₇ (3.83).

As far as grubs were concerned, the maximum number was recorded in T₂ (7.67) which, was significantly superior over rest of the treatments. It was followed by T₁ (4.25) which, was at par with T₃ (3.42), T₇ (3.17) and T₆ (2.92). It was also observed that treatment T₃ (3.42) was further at par with T₅ (2.25). The minimum numbers of grubs of lady beetles were recorded in treatment T₄ (1.83) i.e. Tomato as a border crop.

Syrphid fly maggots and spiders on main crop

The data on number of syrphid fly maggots and spiders recorded per plant of okra are presented in Table 2.

The maximum numbers of syrphid maggots were recorded in T₃ (5.67) which were significantly superior over all other treatments. It was followed by T₂ (3.50) which, was at par with T₁ (2.67), T₄ (2.50), T₅ (3.25) and T₇ (2.42). The lowest numbers of maggots were reported in T₆ i.e. mustard as a border crop (1.83).

The data on spider population revealed that the

Table 4 . Mean number of syrphid fly maggots and spiders on border crop. *Figures in parentheses are $\sqrt{n+1}$ transformed values.

Tr. No.	Treatments	Mean number/plant	
		Syrphid fly maggots	Spiders
T ₁	Ambadi	0.00 (1.00)*	1.17 (1.47)
T ₂	Sweet corn	3.00 (1.99)	4.17 (2.27)
T ₃	Marigold	0.00 (1.00)	1.17 (1.46)
T ₄	Tomato	0.00 (1.00)	0.75 (1.32)
T ₅	Sunflower	0.00 (1.00)	1.17 (1.47)
T ₆	Mustard	1.25 (1.50)	0.92 (1.37)
T ₇	Check (No border crop)	–	–
	SEm±	0.07	0.08
	CD at 5%	0.32	0.24

maximum number of spiders were recorded in treatment T₂ (3.42) which, was significantly superior over rest of the treatments. Further the data revealed that except T₂ All the remaining treatments were at par.

Thus, from above results it was clear that all the crops were more or less attractive to above mentioned natural enemies. However, among them sweet cron, marigold and sunflower were more preferred by them which was noticed in the form of more number of natural enemies which, might have migrated to main crop.

Lady beetles monitored on border crops

The data on mean number of lady beetle adults and grubs recorded per plant of the respective border crop are presented in Table 3.

The result revealed that the maximum numbers of lady beetle adults were recorded in T₂ (10.00) which, was significantly superior over other treatments. It was followed by T₁ (5.58) which, was superior over T₅, T₆ and T₃. It was also observed that T₅ (4.25) was superior over T₆ (2.75) and T₃ (0.50), whereas lady beetle adults were not observed in T₄.

As far as grubs were concerned, the maximum number was recorded in T₂ (17.00) which, was significantly superior over other treatments. It was followed

by T₅ (3.50) which, was at par with T₁ (3.00) and T₆ (2.50). Whereas, lady beetle grubs were not observed in T₃ and T₄. As T₇ represented no border crop, it was not considered for any natural enemy.

Syrphid fly maggots and spiders on border crops

The data on mean number of syrphid fly maggots and spider recorded per plant of the respective border crop are presented in Table 4.

The maximum number of syrphid maggots were recorded in T₂ (3.00) which, was significantly superior over all other treatments. It was followed by T₆ (1.25), whereas no syrphid maggots were observed in T₁, T₃, T₄ and T₅.

The maximum numbers of spider were recorded in T₂ (4.17) which, was significantly superior over other treatments. It was followed by T₁ (1.17) which further was at par with T₃ (1.17) and T₅ (1.17). It was also observed that T₆ (0.92) at par with T₄ (0.75). No spiders were reported in T₇.

The population of lady beetle grubs and adults on border crops like sweet corn, ambadi and sunflower were more may be because of the large number of aphid population on these crops.

The population of syrphid fly maggots was observed more in plots where marigold was planted as border crop which, may be because of the yellow color of flowers preferred by flies to locate nectar and pollen sources which might have resulted in more egg laying on corp.

Tatagar et al. [3] conducted the field experiment to determine the effect of maize as a border crop on the activity of *Cheilomenessexmaculata* (Fab.) and *Coccinellaseptempunctata* (Fab.) in chillies and revealed that the chilli with 2 rows of maize all along the border exhibited higher population of coccinellids and gave the highest chilli yield as compared to the control. The results of present findings are corroborative with the finding of earlier workers.

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