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Positioning Cluster Bean, *Cyamopsis trtragonoloba* L. in an Effective way to Reduce the Major Insect Pest Load of Okra, *Abelmoschus esculentus* L.

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ABSTRACT

Field experiment was carried out to evaluate the role of cluster bean in suppressing the major insect pest load in okra crop by sowing in various fashions. Strip sowing of cluster bean adjacent to okra plots (T1) proved most superior to fulfill the prime objective as compared to border sowing (T2) and skip row sowing (T3) respectively. Sucking pests like okra leaf hopper and whitefly population found least (1.40-12.82 and 0.00-8.72 per 3 leaves respectively) in T1 as compared to T2 (1.75-16.94 and 0.25-11.25 per 3 leaves respectively) and T3 (1.50-20.54 and 1.54-14.55 per 3 leaves respectively). Similar trends were also encountered in case of highest shoot borer (18.72, 15.44, 13.30 and 12.32% mean shoot infestation) and leaf roller (0.35, 0.25, 0.20 and 0.10 mean larval population per plant) infestation in T4 followed by T3, T2 and T1 respectively. But, population of coccinellid predators and spider complex found significantly highest in T1 (1.46 and 0.85 number of motile stages per plant) followed by T2 (1.10 and 0.71 number of motile stages per plant) and T3 (1.05 and 0.70 number of motile stages per plant) respectively. Mean percent tender fruit infestation of okra by E. vittella was also found significantly lower in T1 (5.17-13.95%) along with highest yield potentiality of 10.55 t/ ha as compared to other treatments. T4 registered lowest yield of tender marketable okra (6.39 t/ ha) and proved the effective role of cluster bean in the reduction of major insect pest load under okra agro-ecosystem in a sustainable way.

Key words: *Insect Pests, Okra, Cluster Bean, Predators, Yield*

INTRODUCTION

Okra (*Abelmoschus esculentus* (L.) Moench) is one of the most important spring-summer vegetable crops extensively cultivated in India as well as in West Bengal. As high as 72 species of insects have been recorded to attack okra[1] of which, leafhopper (*Amrasca biguttula biguttula* Ishida), whitefly (*Bemisia tabaci* Gennadius), fruit borers *viz.*, *Earias vittella* (Fabricius), *Earias insulana* (Boisd) and *Helicoverpa armigera* (Hubner), leaf roller *Sylepta derogata* (Fabricius) are known to cause severe damage to the crop throughout vegetative as well as reproductive stages causing ample reduction in yield[2].

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Among the sap suckers, the cotton leafhopper is a serious sucking insect pest causes cupping, yellowing and bronzing of okra leaves under severe attack[3], while, whitefly has been the major threat for a number of crops; it not only sucks the sap from leaves, but is also considered as a vector for different viral diseases. On the other hand, fruit borers are alone reported to cause damage to the extent of 52.33 to 70.75 per cent[4] in okra. Moreover, Ogbalu[5] reported that, the presence of leaf roller on okra leaves even as early as after germination affects photosynthetic activities of the plant and the feeding activities affect the reproductive potentiality of the seeds as most seeds they fed on lost their viability. At present we are now on the way of organic certification of different vegetable crops. To achieve this, we should be very much rational in using different management programmes as bio-intensive pest management in present day hue and cry throughout the globe. On the other hand, developing countries like ours' needs to be rational in utilizing small and marginal farmers' economy. The conservation of prevailing natural enemies through different ways is of primary importance in modern day agriculture where it is well known that plants under the family Fabaceae, Umbeliferae, Asteraceae, Euphorbiaceae etc. harbour natural enemy fauna. Perusal of available literature revealed that ethanolic extract of cluster bean (*Cyamopsis tetragonoloba* Fab.) flower petals attracts huge natural enemy population[6]. Keeping these in backdrop, the present study was undertaken to make a clear comparison between the role of cluster bean and the incidence of okra pests along with their potential predators through best management practices.

MATERIALS AND METHODS

The study was carried out at Students' Instructional Farm, Jaguli, under Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal during February to May of 2015 and 2016 with a popular okra cultivar "Shakti" in a completely randomized block design with four treatments and replicated five times each. Sowing was done at 5 × 8 sq m plots with 60 cm × 30 cm spacing followed by recommended horticultural practices. Cluster bean cv. Varsha was sown 15 days prior to sowing of okra in three different fashions viz. T-1: strip sowing at 5 × 8 sq m plot with 40 cm × 20 cm spacing beside okra plot; T-2: border sowing in a single row with 20 cm plant to plant spacing of okra plot; T-3: skip row sowing at the middle of okra plot by eliminating the middle row of okra by a single row of cluster bean with 20 cm plant to plant spacing; T-4: okra was sown solely without cluster bean. Observations were made at weekly intervals from the okra plants throughout the crop growth on number of leaf hopper (nymphs and adults/ 3 leaves), whitefly (nymphs and adults/ 3 leaves), shoot and fruit borer (no. of bored shoot/ 5 plants), leaf roller (no. of larva/ plant) and predators (coccinelid predators *viz. Coccinella septempunctata*, *Coccinella transversalis*, *Cheilomenes sexmaculata*, *Micraspis discolor* and spiders *viz. Oxyopes sp*. and *Argiope sp*.) (no. of motile stages/ plant) from ten randomly selected plants in each plot. From each plant, three different tires *viz*. top, middle and bottom leaves were considered for taking observation. Total number and weight of tender marketable okra capsules were recorded at each picking from where healthy and infested capsules were also counted to calculate damage percentage. The data on the pest population and yield were subjected to analysis of variance following RBD at 5% level of significance using SPSS (version 18.0: Inc., Chicago, IL, USA) software after making necessary transformation wherever required.

RESULTS AND DISCUSSION

Fig. 1 revealed that mean number of leafhopper population *A. biguttula biguttula* ranged between 1.4 and 12.82 per 3 leaves, 1.75 and 16.94 per 3 leaves, 1.5 and 20.54 per 3 leaves in T1, T2 and T3 respectively while, T4 registered 4.1 to 26.79 number of all the stages of leafhopper population per 3 leaves. Interestingly, the highest mean number of leafhopper population was observed at 7 WAS followed by started to decline gradually. The population of whitefly *B. tabaci* also varied significantly (0.05 level of significance) among different treatments where it has been observed that highest mean population of all the stages was encountered in T4 (17.28 per 3 leaves at 7 WAS) followed by T3 (14.55 per 3 leaves at 8 WAS) (Fig. 2). But, T1 followed by T2 again registered lowest mean number of whitefly population with 0.00 to 8.72 and 0.25 to 11.25 per 3 leaves between 3 and 12 WAS respectively. The overall load of both the sap suckers viz. leafhopper and whitefly recorded very much lower in T1 as compared to all other treatments particularly T4, where okra sown singly without cluster bean.

Mean incidence of okra shoot and fruit borer population *E. vittella* in terms of percent shoot infestation in different treatments has been depicted graphically on fig. 3 where it is clear that their infestation started in okra at 5 WAS in T4 (0.05% mean shoot damage) while, T1 (0.03% mean shoot damage), T2 (0.05% mean shoot damage) and T3 (0.09% mean shoot damage) showed their initial infestation from 6 WAS. Highest mean percent shoot infestation by *E. vittella* was observed at 9 WAS irrespective of all the treatments but T1 registered lowest mean percent infestation (12.32%) followed by T2 (13.30) found statistically at par. Whereas, 15.44% and 18.72% mean shoot infestation were encountered in T3 and T4 respectively and proved less effective than T1 and T2 in reducing the overall load of okra shoot and fruit borer. Fig. 4 revealed that mean larval population of okra leaf roller, *S. derogata* ranged from 0.00 to 0.35 per plant irrespective of all the treatments. T1 registered highest number of larval population at 8 WAS (0.10 per plant) found statistically at par with T2 (0.20 per plant). Presence of larval population was encountered in T3 up to 10 WAS and ranged between 0.00 to 0.25 larvae per plant while, T4 registered their population from 4 WAS to 11 WAS with highest population at 6 WAS (0.35 larvae per plant). Most of the larvae of leaf roller get trapped by the cluster bean plants where T1 found most effective to reduce their population throughout the season.

Incidence of predatory fauna viz. coccinellids and spider complex in different treatments has been shown in fig. 5 and 6 respectively. It is clear from the figures that both the populations varied significantly in each treatment at different weeks after sowing where T1 registered highest number of coccinellids (1.46 per plant) and spider complex (0.85 per plant) at 8 WAS. In T2, mean number of coccinellids and spider complex varied from 0.25 to 1.10 and 0.22 to 0.71 per plant respectively found statistically at par with T3. In T4, predatory population was found to be 0.15 to 0.78 (coccinellids) and 0.15 to 0.52 (spiders) proved much lesser as compared to T1. In association with cluster bean, predators started to appear from 3 WAS in okra and gradually their population started to build up till 8 WAS and afterwards started to decline in the last phase of the crop due to their food scarcity as overall pest load was retarded in okra ecosystem. [6] reported that cluster bean has been identified as cost effective intercrop in okra eco-system to manage Lepidopteran pests (*Earias vittella*, *Helicoverpa armigera*) by influencing the activity of natural enemy population. Cluster bean as an effective reservoir of coccinellids and spiders has also been documented by [7], also supports the present findings.

Fig. 7 indicated that T1 registered lowest mean percent fruit infestation by *E. vittella* ranged between 5.17% and 13.95% as compared to T4 (6.73% and 32.54%). In T2 and T3, highest mean percent fruit infestation was encountered by 17.83% and 19.63% at 4th and 12th picking respectively. The effective performance of predators in the suppression of *E. vittella* larval population has perfectly highlighted in the mean percent fruit infestation, which is clear from the line graph. Effect of cluster bean in association with okra has also been found significantly promising in mean yield of fresh marketable okra fruit (Fig. 8). T1 registered highest yield to the tune of 10.55 t/ ha while, T2 and T3 found statistically at par to each other with 9.64 and 8.54 t/ ha respectively. But, in T4 the yield of okra was recorded as 6.39 t/ ha without any influence of cluster bean and any other pest management practices respectively.

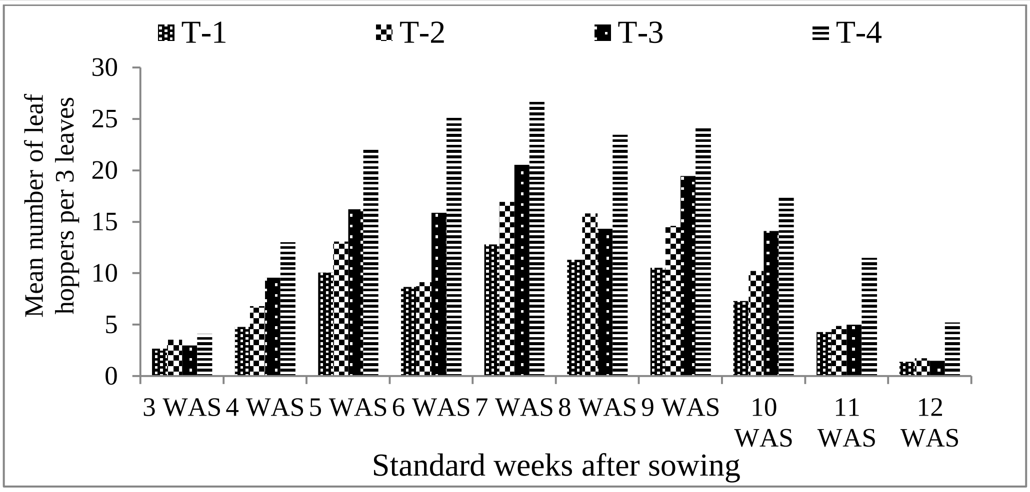

Fig. 1: Relative effects of different treatments in the incidence of leaf hopper population, *Amrasca biguttula biguttula* in okra at different weeks after sowing (pooled data of 2015 and 2016)

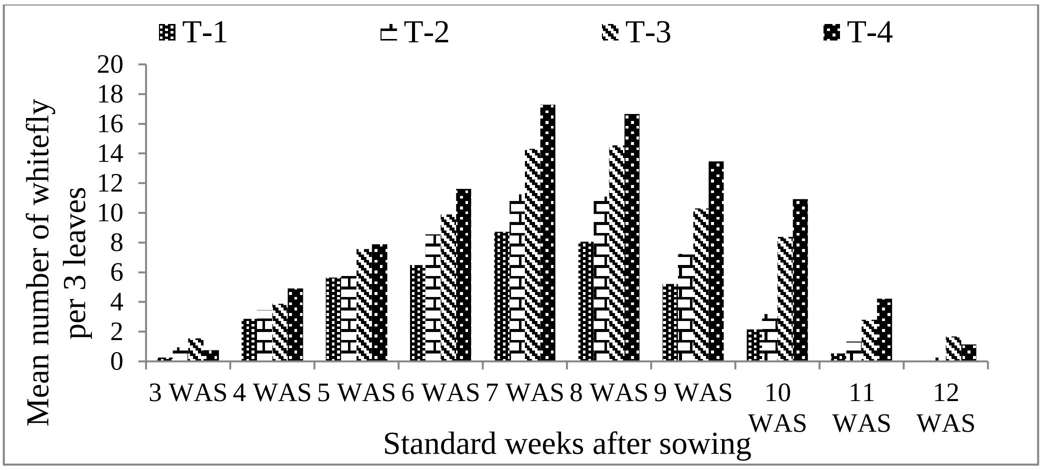

Fig. 2: Relative effects of different treatments in the incidence of whitefly population, *Bemisia tabaci* in okra at different weeks after sowing (pooled data of 2015 and 2016)

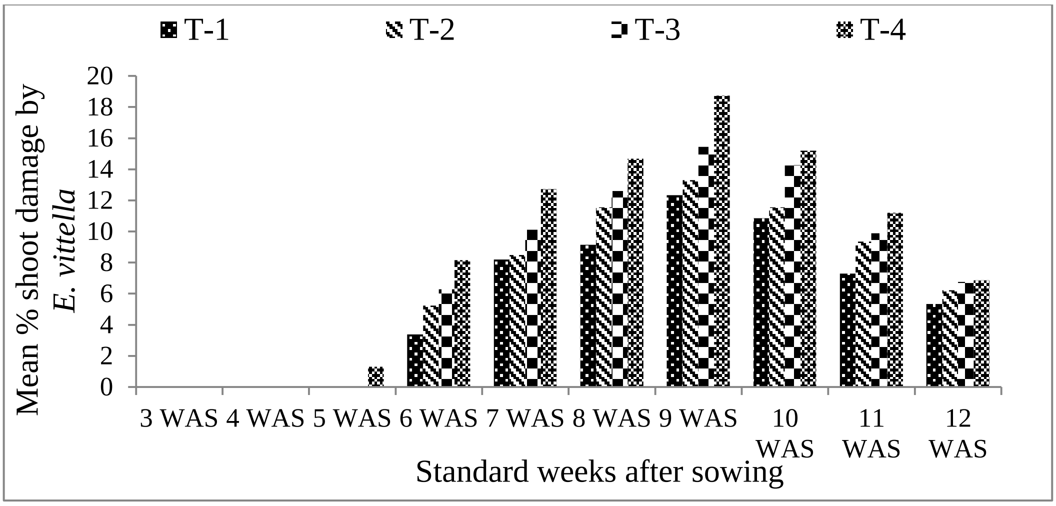

Fig. 3: Relative effects of different treatments in the percent shoot damage of okra caused by *Earias vitella* at different weeks after sowing (pooled data of 2015 and 2016)

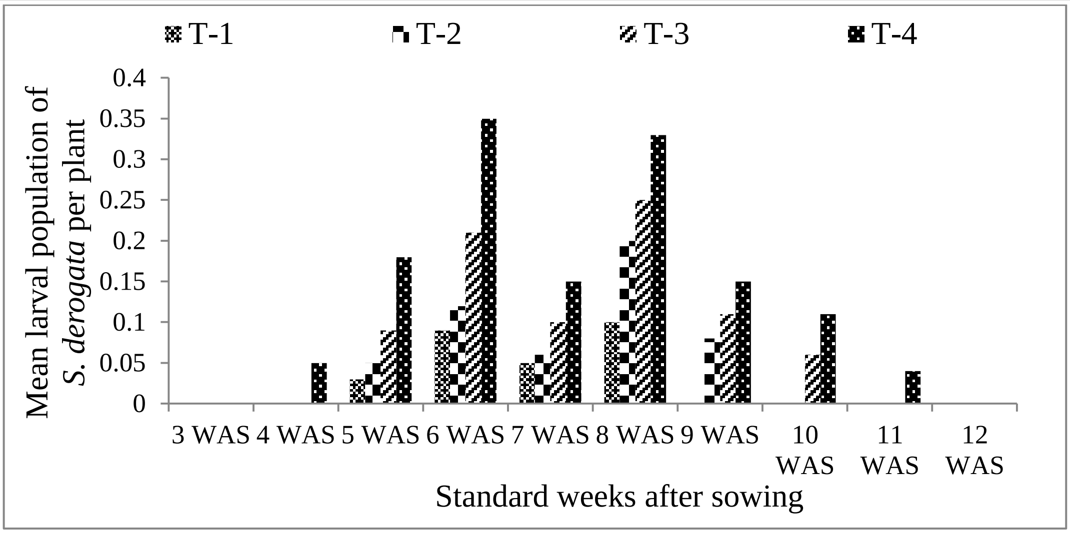

Fig. 4: Relative effects of different treatments in the incidence of leaf roller population, *Sylepta derogata* in okra at different weeks after sowing (pooled data of 2015 and 2016)

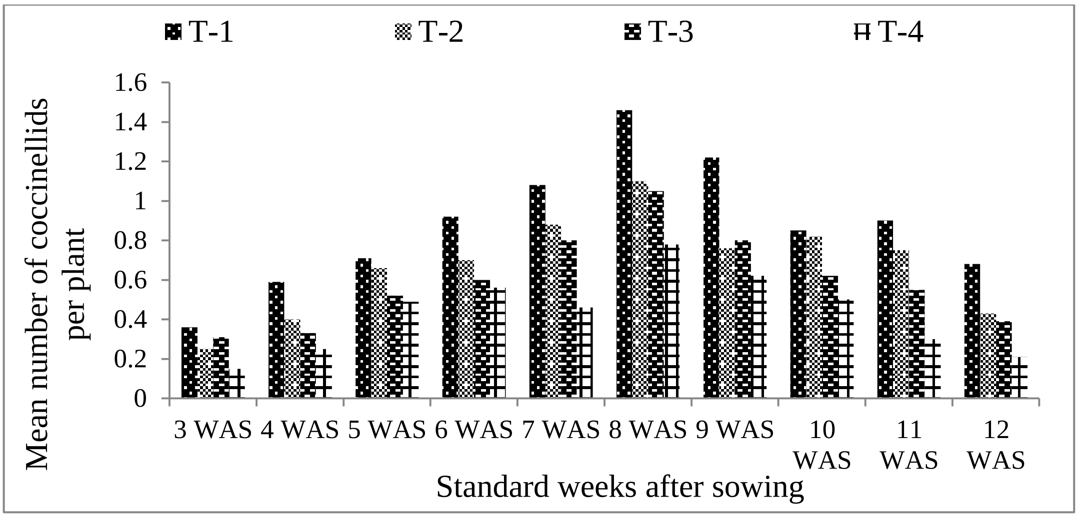

Fig. 5: Relative effects of different treatments in the incidence of different coccinellid predators in okra agro-ecosystem at different weeks after sowing (pooled data of 2015 and 2016)

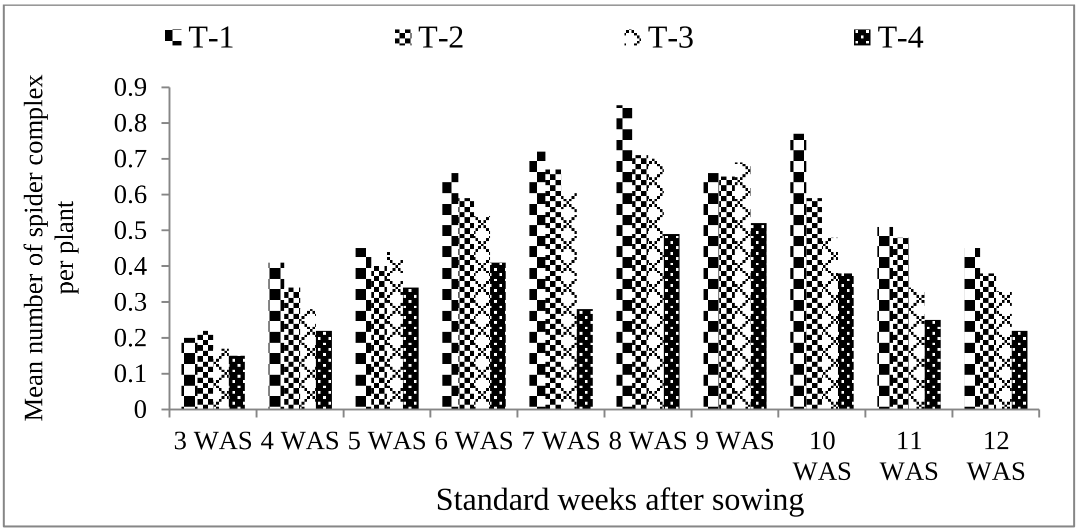

Fig. 6: Relative effects of different treatments in the incidence of spider complex in okra agro-ecosystem at different weeks after sowing (pooled data of 2015 and 2016)

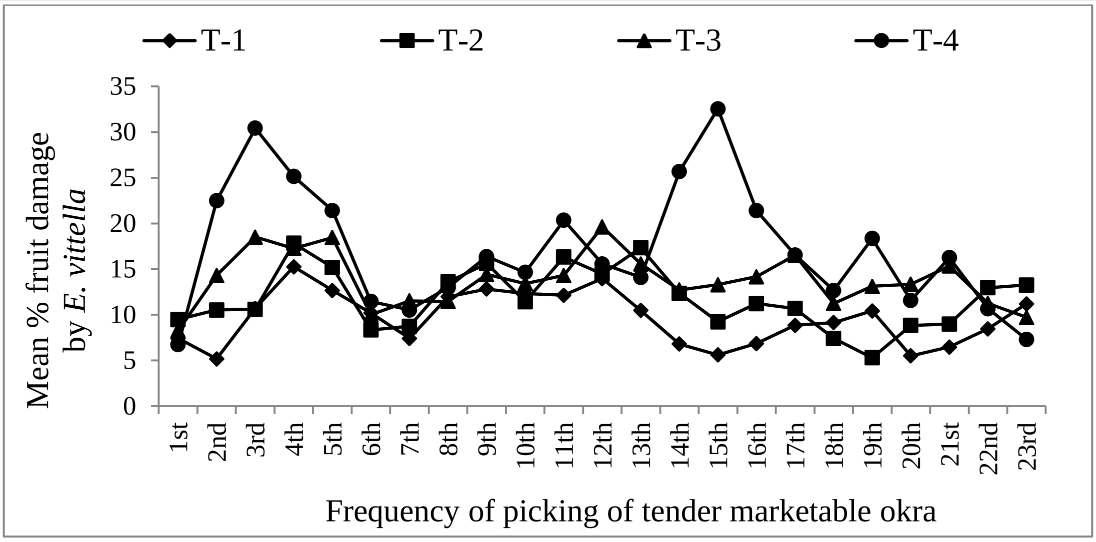

Fig. 7: Relative effects of different treatments in the percent tender fruit infestation of okra by *Earias vittella* at different weeks after sowing (pooled data of 2015 and 2016)

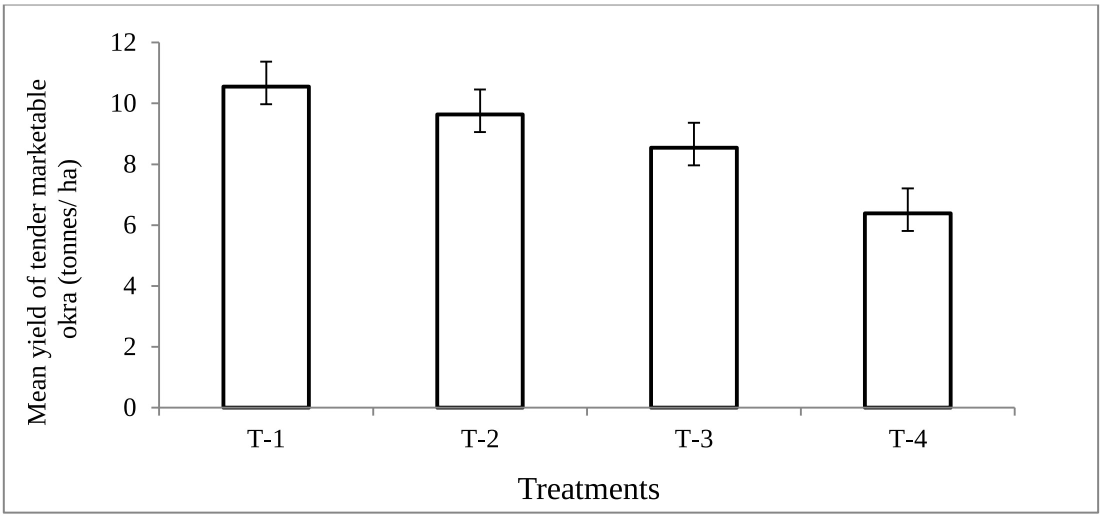

Fig. 8: Relative effects of different treatments in yield potentiality of okra (pooled data of 2015 and 2016)

CONCLUSION

Strip sowing of cluster bean adjacent to okra crop about 15 days earlier of okra sowing can be an effective way of successful reduction of major insect pests load in okra by harbouring huge number of coccinellids and spider predators followed by trapping the larval population of okra leaf roller.

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REFERENCES

1. Rao, N. S. and Rajendran, R. Joint action potential of neem with other plant extracts against the leafhopper, *Amrasca devastans* (Distant) on okra. *Pest Manag. Econ. Zool*. **10:** 131-136 (2002).
2. Mandal, S. K., Sah, S. B. and Gupta, S. C. Efficacy and economics of biopesticide and insecticide combinations against okra pests. *Int. J. Agril. Sci*., **2:** 377-380 (2006).
3. Dhandapani, N., Shelkar, U.R. and Murugan, M. Bio-intensive pest management (BIPM) in major vegetable crops: an Indian perspective. *Food Agric. Environ*., **2:** 333-339 (2003).

4. Pareek, P. L. and Bhargava, M. C. Estimation of avoidable losses in vegetables caused by borers under semi arid condition of Rajasthan. *Insect Environ*., **9:** 59-60 (2003).
5. Ogbalu, O.K., Bob Manuel, R.B. and Gbarakoro, T. The role of *Sylepta derogata* [Lepidoptera: Pyralidae] in the abscission and defoliation of okra flowers, seeds and pods in mono crop gardens in Port Harcourt, Nigeria. *IOSR J. Pharm. Biol. Sci*., **10:** 134-138 (2015).
6. Baskaran, R.K.M. Enhanced activity of *Trichogramma chilonis* and *Chrysoperla carnea* on eggs of *Earias vittella* and *Helicoverpa armigera* through kairomonic activity of acetone extracts of clusterbean. *Ann. Pl. Prot. Sci*., **21:** 50-52 (2013).
7. Rao, M.S., Rama Rao, C.A., Srinivas, K., Pratibha, G., Vidya Sekhar, S.M., Sree Vani, G. and Venkateswarlu, B. Intercropping for management of insect pests of castor, *Ricinus communis*, in the semi-arid tropics of India. *J. Insect Sci*., **12:** 14 (2012).