

Study of Impact of Different Treatments on per cent Reduction in Infestation of leaf folder over control

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Abstract: The data on impact of different treatments on leaf folder infestation revealed that the mean of per cent reduction in all five weeks was in the range of 23.88 to 90.53. The maximum (90.53%) reduction was observed in the treatment Sunflower as nectar rich plant on bunds followed by Ekdandi (83.98%), Mustard (81.70%), Sesamum (78.64%) and Marigold (76.78%).

Key word: leaf folder, rice, natural enemy, nectar rich border plants

INTRODUCTION

In Maharashtra, Rice leaf folder, rice blue beetle, brown plant hopper and stem borer are the major pests limiting the rice production in rice ecosystem. Rice is a staple food crop which cannot sustain more input cost for increasing production. It is therefore essential to evolve suitable location specific integrated pest management strategy that is environment friendly, economically viable and socially acceptable.

Naturally occurring biological control agents have a potential role to play in management of rice pests in fields of tropical south and south east Asia and there is a need to emphasize the impact of indigenous natural enemies as an essential part of IPM programmes (Way and Heong, 1994; Ooi and Shephard, 1994). In India, there are sufficient evidences to justify the vital role of natural enemies in suppressing the pest populations in rice (Rao *et al.*, 1983; Chelliah *et al.*, 1989). However, use of *Trichogramma* spp., the only bio control agent presently available in rice was not found adequately beneficial (Pathak *et al.*, 1996).

Conservation of the natural enemy fauna *in situ* for suppressing the pest population seems to be a very good alternative. Farmers continue to resort on insecticidal use for checking pest incidence in their fields without being aware of either the natural biological suppression taking place or impact of the insecticides on the natural bio agents. It is therefore essential to convince the farmers of its importance.

Odum (1962) was among the first who used the term 'Ecological engineering' which was reviewed as 'environmental manipulation by man using small amounts of supplementary energy to control systems in which the main energy drives are still coming from natural sources.

MATERIAL AND METHODS

The present investigation entitled "Study of impact of different treatments on per cent reduction in infestation of leaf folder over control." was undertaken at Agronomy Farm, College of Agriculture, Dapoli during *Kharif* 2014. The details of the material used and methodology adopted during the course of investigation are given below.

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Experimental site

The research work comprising field experiment of nectar rich plants on bunds of rice crop for habitat manipulation for biological control of rice pests was conducted at Agronomy farm of College of Agriculture, Dapoli.

Details of the material used

Seed

The healthy seeds of 'Local varieties of Sunflower, Mustard was obtained from the Krishi Sawardhan Kendra, Dapoli, and seeds of Sesamum and Niger was obtained from Department of Agronomy, College of Agriculture, Dapoli. Healthy seeds of Gomphrina, Calendula, Cosmos and Marigold were obtained from Department of Horticulture, College of Agriculture, Dapoli. The seeds of *Ekdandi* and *Cock's comb* were collected from field and 200 seeds of each were used for raising 200 seedlings.

Seedlings

The healthy 200 potted plants of all the treatments were raised in the Nursery, College of Horticulture, Dapoli.

Manures

Farm Yard Manure as organic manure was used to mix with soil for filling of polythene bag at the rate of 250-500 g per bag.

Fertilizers

Nitrogen and Phosphorus were applied in the form of straight fertilizers through Urea (46% N) and Single Super Phosphate (16% P₂O₅) to Sunflower, Mustard, Sesamum and Marigold seedlings according to requirements.

Rows of nectar rich plants on bunds

The potted plants of Mustard, Sesamum, Cosmos, Marigold, Niger, Sunflower, Gomphrina, *Ekdandi*, *Cock's comb*, Calendula were transferred and planted in three rows on bunds of the rice plots before flowering of rice crop to synchronize the flowering of nectar rich plants as well as rice.

Methodology

Habitat manipulation for biological control of rice pests.

Details of the experiment

A statistically designed field experiment using three replications, eleven treatments (ten with nectar rich flowering plants on bunds and without nectar rich plants as control) was conducted during *khariif* season of 2014 at Agronomy Farm, College of Agriculture, Dapoli to evaluate the effect of nectar rich flowering plants for conserving the natural enemies in rice ecosystem and their impact on rice pests.

- Location** : Agronomy Farm, College of Agriculture, Dapoli.
Variety : Karjat-2
Design : R.B.D.
Replications : Three
Treatments : Treatment Plots

| Tr. No. | Name of the plant | Botanical name | Family |
|---------|--------------------|----------------------------|----------------------------|
| T1 | Marigold | <i>Tagetes erecta</i> | Asteraceae |
| T2 | Niger | <i>Guizotia abyssinica</i> | Asteraceae |
| T3 | Mustard | <i>Brassica rapa</i> | Brassicaceae |
| T4 | Sesamum | <i>Sesamum indicum</i> | Pedaliaceae |
| T5 | Sunflower | <i>Helianthus annuus</i> | Asteraceae |
| T6 | Cosmos | <i>Cosmos bipinnatus</i> | Asteraceae |
| T7 | Gomphrina | <i>Gomphrena globose</i> | Amaranthaceae |
| T8 | <i>Ekdandi</i> | <i>Tridax procumbens</i> | Compositae (Asteraceae) |
| T9 | <i>Cock's comb</i> | <i>Celosia argentea</i> | Amaranthaceae |
| T10 | Calendula | <i>Calendula arvensis</i> | Asteraceae |
| T11 | Control | - | - |

Bund size for each treatment : 10m length and 0.5m width

Distance between two plots : 2m

Distance between two nectar rich plants : 0.5m

Total experimental area : 1100 m²

Date of sowing : 09.06.2014

Date of harvesting : 27.10.2014

Potting mixture of polythene bag

Farm Yard Manure as organic manure was used to mix with the soil in 2:1 proportion for filling the polythene bag and bags were filled up to one third height.

Sowing of seeds

The healthy seeds of Mustard, Sesamum, Cosmos, Marigold, Niger, Sunflower, Gomphrina, Ekdandi, Cock's comb and Calendula were sown in 200 polythene bags each in nursery and watering was done at regular interval.

Raising of seedlings

Thirty to thirty five days old seedlings of all the nectar rich plants were ready to transfer in rice ecosystem.

Planting of border crops on the bunds

The raised nectar rich plants in the polythene bags were planted on the rice bunds at a distance of 0.5 m between plants. Three rows of nectar rich plants were planted by keeping 0.25 m distance between two rows on rice bunds for 10 m length.

Method of recording observations

Five hills per plot were selected randomly to record the observations on the incidence of rice pests and for recording the natural enemies in rice ecosystem. Same rice hills were used for recording the presence of different natural enemies. Similarly, five nectar rich flowering plants on bunds were randomly selected for recording the natural enemies. The total of eleven treatments having ten nectar rich plants on bunds (mentioned in treatments details) and one control (No nectar rich plants i.e. open bund) were used around the plot size of 5 x 5 m. The experiment was replicated thrice. The nectar rich plants were grown on the bunds at a distance of 0.5 m. between two plants and 0.25 m between two rows.

To record the incidence of rice leaf folder

Five hills per plot were selected randomly for recording the observations on the incidence of rice pests. The total number of leaves per hill and

number of infested leaves per hill were recorded at weekly interval starting from the incidence of the pest. The observations were recorded up to harvest. The average pest population per plot in the different treatments was calculated. The per cent infestation of each pest was calculated by using total number of leaves per hill and infested leaves per hill.

$$\text{Per cent pest infestation} = \frac{\text{Number of infested leaves}}{\text{Total number of leaves}} \times 100$$

To record the natural enemies in rice eco system

The same five hills selected for recording rice pest infestation and five randomly selected nectar rich flowering plants on bunds were used for recording the number of natural enemies in different plots having different nectar rich plants on the bunds. Different natural enemies were recorded at weekly interval. The natural enemies were recorded up to the harvest of the crop. The natural enemies were recorded by necked eyes and by collecting with the help of insect collection net. The recorded natural enemies like dragonfly, damselfly, spiders, black ants, syrphid fly, tachinid fly, bombylid fly, and wasp were counted plot wise. The unidentified natural enemies were got identified from the Department of Agril. Entomology, College of Agriculture, Dapoli. Data thus obtained were summed and analyzed.

To study the impact of conserved natural enemies on rice pests

Data on pest incidence recorded in different treatments was used to calculate per cent reduction in infestation of different rice pest over control to find out the impact of conserved natural enemies in rice by using following formula;

$$\% \text{ reduction in pest infestation} = \frac{100}{\% \text{ pest infestation in control}} \times \% \text{ infestation in treatment} - 100$$

Statistical Analysis

Data on per cent infestation of rice pests was converted in arc sine transformation and then analyzed, whereas data on number of natural enemies was summed and the standard deviation was calculated.

RESULTS AND DISCUSSION

Data on per cent reduction in infestation of rice leaf folder due to different treatments of nectar rich plants at bunds is presented in Table.

The data on impact of different treatments on leaf folder infestation revealed that in week 1 (4th week of August) the per cent reduction in the infestation of leaf folder recorded was in the range of -5.30 to 86.67. The treatment Sunflower (86.67%) was found to be the best treatment in reducing the per cent infestation of leaf folder by attracting the number of natural enemies towards the nectar rich

flowering plants. The next best treatments in order were Marigold (80.51%), *Ekdandi* (75.25%), Sesamum (72.56%) and Mustard (64.54%) over the Control treatment. The per cent reduction in infestation of rice leaf folder in the week 2 (1st week of September) was in the range of 13.48 to 92.35. The highest reduction (92.35%) in the infestation of leaf folder was observed in the treatment Sunflower. The next best treatments in order of efficacy were Sesamum (87.24%), Mustard (74.81%), Marigold (72.78%), *Ekdandi* (68.66%), Niger (52.53%) and *Cock's comb* (31.09%).

Table
Impact of different treatments on per cent reduction in infestation of leaf folder over control

| Treatments | Per cent reduction in infestation of leaf folder over control | | | | | |
|-----------------------|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|-------------------------------|
| | Week 1 August 4 th week | Week 2 Sept. 1 st week | Week 3 Sept. 2 nd week | Week 4 Sept. 3 rd week | Week 5 Sept. 4 th week | Pooled mean of all 5 weeks |
| T1 Marigold | 80.51 | 72.78 | 66.03 | 69.12 | 99.85 | 76.78 |
| T2 Niger | 48.56 | 52.53 | 33.50 | 46.94 | 78.59 | 49.98 |
| T3 Mustard | 64.54 | 74.81 | 99.91 | 99.88 | 99.85 | 81.70 |
| T4 Sesamum | 72.56 | 87.24 | 62.12 | 84.04 | 99.85 | 78.64 |
| T5 Sunflower | 86.67 | 92.35 | 83.13 | 99.88 | 99.85 | 90.53 |
| T6 Cosmos | 53.00 | 30.51 | 80.72 | 86.85 | 99.85 | 62.19 |
| T7 Gomphrina | -5.30 | 13.48 | 38.16 | 58.23 | 74.10 | 23.88 |
| T8 <i>Ekdandi</i> | 75.25 | 68.66 | 99.91 | 99.88 | 99.85 | 83.98 |
| T9 <i>Cock's comb</i> | 53.61 | 31.09 | 70.75 | 99.88 | 99.85 | 62.45 |
| T10 Calendula | 33.84 | 26.17 | 25.81 | 39.80 | 37.67 | 32.00 |
| T11 Control | - | - | - | - | - | - |

The infestation of rice leaf folder in week 3 (2nd week of September) was reduced in the range of 25.81 to 99.91 per cent. The highest per cent reduction in infestation of leaf folder recorded was in the treatments Mustard and *Ekdandi* (99.91%) as nectar rich flowering plants on bunds. The treatment Calendula showed the lowest 25.81 per cent reduction in leaf folder infestation. The per cent reduction in infestation of leaf folder in week 4 (3rd week of September) was in the range of 39.80 to 99.88. The maximum (99.88%) reduction in infestation of leaf folder was observed in the treatments Mustard, Sunflower, *Ekdandi* and *Cock's comb*. The treatment Calendula showed lowest (39.80) per cent reduction. The reduction in

infestation of leaf folder in week 5 (4th week of September) was 99.85 per cent in the treatments Marigold, Mustard, Sesamum, Sunflower, Cosmos, *Ekdandi* and *Cock's comb* over the control.

The pooled mean of per cent reduction of all five weeks was calculated. The pooled mean of per cent reduction in all five weeks was in the range of 23.88 to 90.53. The maximum (90.53%) reduction was observed in the treatment Sunflower as nectar rich plant on bunds followed by *Ekdandi* (83.98%), Mustard (81.70%), Sesamum (78.64%) and Marigold (76.78%).

The results of present findings are more or less similar with the results of Wagh (2014). The data

on impact of different treatments on per cent reduction in pest infestation over control revealed that the nectar rich plants Aster, Cufia, Petunia and Niger were found better for reducing the leaf folder infestation in rice ecosystem.

From the present study, it was observed that plantation of Sunflower, *Ekdandi*, Mustard, Sesamum and Marigold as nectar rich plants on rice bunds helps to reduce leaf folder infestation respectively, by enhancement of different natural enemies.

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