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Assessment of losses (grain) due to insect pests on pearl millet [*Pennisetum glaucum* (L.) R. Br.] in semi-arid region of Rajasthan

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Abstract

Investigations on “Assessment of loss (grain) due to insect pests on pearl millet [*Pennisetum glaucum* (L.) R. Br.] in semi-arid region of Rajasthan” were conducted at Division of Entomology, RARI Durgapura during 2014 and 2015. The incidence of shoot fly, stem borer and white grub was observed as major pests, however, the incidence of other pests was meager. Generally the damage by white grub in pearl millet is reported to be about 20-30 per cent but the damage reported to be 80-cent per cent^[2].^[5] reported 23.3 to 36.5% grain loss by shoot fly and 20-60% loss due to stem borer. The pooled data of two years indicated that the avoidable losses of grain and fodder due to insect-pests of pearl millet were 42.67 and 23.89 per cent, respectively. However, increase in grain and fodder yield over untreated plots was 74.43 and 31.38 per cent, respectively.

Keywords: Yield, pearl millet, insect pests, grain

1. Introduction

Pearl millet, [*Pennisetum glaucum* (L.) A. Br.] is grown as a forage, cover and grain crop in the arid and semiarid regions worldwide. It has been studied in the U.S. in recent years as a poultry ration ingredient due to its nutritional quality^[13] which is grown for food, feed, green and dried (Karvi) forages and minimal processing costs^[14]. Shoot fly, *Atherigona Approximata* Malloch (Anthomyiidae: Diptera) as a pest of bajra in Rajasthan^[10].

Earhead products like cake, *nan khatai*, biscuits etc; Pearl millet ranks first under the category of millets in India, in terms of area, production and productivity. The states of Rajasthan, Uttar Pradesh, Maharashtra, Haryana and Gujarat account for roughly more than 90% of total area under this crop and contribute similar level of production. Whereas, in Rajasthan state cover total area 4.07 million hectares, production 4.45 million tones and its productivity 1093 kg/ha of Pearl millet^[4]

Forty five per cent dead hearts due to shoot fly was observed during survey in Jaipur zone^[3]. Generally the damage by white grub in pearl millet is reported to be about 20-30 per cent but sometimes in endemic areas, the damage reported to be 80-cent per cent^[2].^[5] reported 23.3 to 36.5% grain loss by shoot fly and 20-60% loss due to stem borer.

Out of these, shoot fly and white grub are the major insect-pests of pearl millet in semi-arid eastern regions of Rajasthan. The shoot fly female lays eggs singly on the under surface of leaves. After hatching, the larvae move to the growing point and cut the central leaf, resulting in the production of a dead heart. Infestation normally occurs in the 1-4 weeks after the seedling emergence stage. However, the tillers are also attacked under high shoot fly pressure^[1] Other than shoot fly, stem borer larva feeding to leaf scarification and than to shot holes, followed by dead formation. The larvae riddle the stem from the inside and there may be up to 20 larvae in one plant. The stems of attacked plants break easily.

2. Materials and methods

2.1 Field Experiment

The experiments were taken during *Kharif* 2014 and 2015. The variety RHB-177 of pearl millet was sown in paired plots having 12 plots in one strip. The plot size was 3.5 X 3.0 meter. One strip of 12 plots was kept free from insecticidal application and second strip of 12 plots was remained fully protected from the insect-pests utilizing recommended management

practices. The pearl millet seeds were treated with imidacloprid 600 FS @ 8.75 ml/kg seed. The first spray was done with imidacloprid 17.8 SL @ 300 ml/ha after 25 days of germination. The second spray was done with the thiamethoxam 25 WG @ 200 g/ha after 25 days of first spray. Grain and fodder yield from both the strips were recorded separately. Difference between yields were measured and tested by 't' test. Then per cent loss (grain and fodder) was calculated.

2.2 Interpretation of data

To interpret the results of crop losses inflicted by incidence of insect-pests on pearl millet paired 't' test was applied. The avoidable loss and increase in yield of seed over control (untreated) was calculated for each treatment by the following formula [8].

$$\text{Avoidable loss (\%)} = \frac{\text{Yield in treated plot} - \text{Yield in untreated plot}}{\text{Yield in treated plot}} \times 100$$

$$\text{Increase in yield (\%)} = \frac{\text{Yield in treated plot} - \text{Yield in untreated plot}}{\text{Yield in untreated plot}} \times 100$$

3. Results and discussion

The mean grain yield obtained was 20.13 and 19.43 q/ha during 2014 and 2015, respectively in treated plots and 11.87 and 10.80 q/ha in untreated plots during 2014 and 2015, respectively (Table 1). The calculated t- value was greater than t- tabulated value (2.18, df-12) at 5 per cent of level of significance during both the years of study and was proved to be significant. Therefore, the yield obtained in two treatments (treated and untreated) was differed from each other significantly during the study. In present investigation the difference between the mean grain yield of treated and untreated (increase in grain yield over untreated) during *Kharif* 2014 and 2015 were 8.26 and 8.63 q/ha, respectively. The per cent increase in grain yield over control was recorded 69.59 and 79.91 during both the year, respectively. The pooled data of both the year (2014 and 2015) indicated

that the mean grain yield in treated and untreated plots were 19.78 and 11.34 q/ha, respectively. The increase in mean grain yield in treated plots over untreated plots was 8.44 q/ha and per cent increase in grain yield over untreated plots was 74.43 per cent. If the losses due to insect-pests could be avoided by pest control measures, the production can be appreciably increased. During *Kharif* 2014 and 2015; the per cent avoidable losses recorded were 41.03 and 44.42 in treated and untreated plots, respectively. The pooled data of two consecutive years showed 42.67 per cent avoidable losses.

The mean fodder yield obtained in treated plots were 41.14 and 39.16 q/ha during 2014 and 2015, respectively and in untreated plots were 31.17 and 29.95 q/ha during 2014 and 2015, respectively (Table 2). The difference between the mean fodder yield of treated and untreated (increase in fodder yield over untreated) were 9.97 and 9.21 q/ha, respectively during *Kharif* 2014 and 2015. The per cent increase in fodder yield over control was recorded to be 31.98 and 30.75 during both the year, respectively.

The pooled data of both the year (2014 and 2015) indicated that the mean fodder yield in treated and untreated plots were 40.15 and 30.56 q/ha, respectively. The increase in mean fodder yield in treated plots over untreated plots was 9.59 q/ha and per cent increase in fodder yield over untreated plots was 31.38 per cent. If the losses due to insect-pests could be avoided by pest control measures, the production can be appreciably increased. During *Kharif* 2014 and 2015; the per cent avoidable losses recorded were 24.23 and 23.52 in treated and untreated plots, respectively. The pooled data of two consecutive years showed 23.89 per cent avoidable losses [4]. reported avoidable losses of 23.17% (grain) and 14.71% (fodder) and increase in yield over control 30.16% (grain) and 17.25 (fodder) at Jamnagar however avoidable losses and increase in yield over control was 9.64% and 10.67% (grain) at Jaipur, respectively support the present finding [11]. reported 23.3 to 36.5% grain losses by shoot fly and 20-60% losses due to stem borer. The avoidable losses reported by [9] (9.2-39%) [6, 7], (23.3-59.3%) and [12] (35.3%) supported the present finding.

Table 1: Assessment of loss (grain) due to insect pests on pearl millet

Group	2014	2015	Pooled	Increase in grain yield (%)			Avoidable loss (%)		
				2014	2015	Pooled	2014	2015	Pooled
Treated (q/ ha)	20.13	19.43	19.78	69.59	79.91	74.43	41.03	44.42	42.67
Untreated (q/ ha)	11.87	10.80	11.34						
Increase in grain yield (q/ ha)	8.26	8.63	8.44						
t-cal.	11.45	12.43	14.65						
t-tab	2.20	2.20	2.20						

Table 2: Assessment of loss (fodder) due to insect pests on pearl millet

Group	2014	2015	Pooled	Increase in fodder yield (%)			Avoidable loss (%)		
				2014	2015	Pooled	2014	2015	Pooled
Treated (q/ ha)	41.14	39.16	40.15	31.98	30.75	31.38	24.23	23.52	23.89
Untreated (q/ ha)	31.17	29.95	30.56						
Increase in fodder yield (q/ ha)	9.97	9.21	9.59						
t-cal.	13.42	14.62	18.81						
t-tab	2.20	2.20	2.20						

4. Conclusion

The pooled data of both the year (2014 and 2015) indicated that the mean fodder yield in treated and untreated plots were 31.38 pre cent and avoidable losses of fodder due to insect –

pests of pearl millet 23.89 per cent respectively. The increase in mean grain yield in treated plots over untreated plots was 74.43 per cent increase and avoidable losses of grain due to insect – pests of pearl millet 4.67 per cent respectively.

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