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Assessment of crop loss due to insect pests in Indian mustard in Semi-arid region of Rajasthan

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Abstract

The present investigation on 'Assessment of crop loss due to insect-pests in Indian mustard in Semi-arid region of Rajasthan' was conducted at S.K.N. college of Agriculture, Jobner (Rajasthan) during *Rabi*, 2016-17 and 2017-18. It was observed that the infestation of aphid, *L. erysimi* (Kalt.) commenced in the first week of January in both the years. An avoidable loss of 41.14% was registered due to insect pests of Indian mustard in two consecutive years of study.

Keywords: Assessment of crop loss, Indian mustard, Mustard aphid and *Rabi* season

1. Introduction

Indian mustard, *Brassica juncea* (L.) Czern and Coss is one of the important oilseed crops cultivated all over India. It occupies a prestigious position in the Indian economy. *Brassica* (rapeseed-mustard) is the second most important edible oilseed crop in India after groundnut and accounts for nearly 30 per cent of the total oilseeds produced in the country. When compared to other edible oils, the rapeseed-mustard oil has the lowest amount of harmful saturated fatty acids. It also contains adequate amounts of essential fatty acids, linoleic and linolenic which are not present in many of the other edible oils. The green leaves and stems of mustard are good source of green vegetable and fodder and rich source of protein, minerals, vitamin A and C. The oil content in mustard seeds ranged from 32-42 per cent. The seeds and oil of mustard have a peculiar pungency, thus making it suitable for condiments used in the preparation of pickles, curries and vegetables. Rajasthan, Gujarat, Madhya Pradesh, Uttar Pradesh, West Bengal and Assam are the leading states in production of rapeseed-mustard. The total area under rapeseed-mustard in India is 6.2 million hectares with an annual production of about 7.98 million tonnes and with an average productivity of 1281 kg ha⁻¹ [1]. In Rajasthan, it occupies an area of 26.81 lakh hectares with an annual production of 37.31 lakh tonnes and average productivity of 1391 kg ha⁻¹ [2]. It is mainly grown in the districts of Bharatpur, Alwar, Sawai Madhopur, Sri Ganganagar and Jaipur. Among the various constraints responsible for low productivity of mustard, the damage inflicted by various insect pests is important [3]. Listed 24 species of insect pests on rapeseed and mustard crop in India damaging at different crop phenology, while [4] enlisted 38 species. Among these, the mustard aphid, *Lipaphis erysimi* (Kalt.); mustard sawfly, *Athalia lugens proxima* (Klug.); painted bug, *Bagrada hilaris* (Kirk.) and the leaf miner, *Phytomyza horticola* (Goureau) are major pests of mustard.

The mustard aphid, *L. erysimi* is the key pest in all the mustard growing regions of the country. Nymphs and adults of the aphid suck cell sap from the leaves, inflorescences and immature pods resulting in very poor pod setting and yield. On the other hand, aphid produces a good amount of honeydew which facilitates the growth of sooty mould that makes the leaves and pods appear dirty black, which ultimately hampers the process of photosynthesis [5]. In terms of economic importance, mustard aphid, *L. erysimi* is regarded as a national pest [6], considered to be a major limiting factor in successful cultivation of the crop; reducing yield to the tune of 35.4-96.0% and oil content of 5-15 per cent [7, 8, 9, 10, 11, 12].

2. Material and Methods

The present investigation was conducted at Agronomy Farm, S.K.N. College of Agriculture, Jobner (Sri Karan Narendra agriculture University, Jobner) during two consecutive years, *i.e.* *rabi*, 2016-17 and *Rabi*, 2017-18. The experiment was laid out in simple paired plot design (Paired t-test) with two treatments, *viz.*, treated and untreated, each replicated thirteen times.

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The plot size was measured 5.0 x 3.6 m² with row to row and plant to plant distance of 30 cm and 10 cm, respectively. The plots were treated with alternate sprays of dimethoate 30 EC and chlorpyrifos 20 EC @ 0.03 and 0.01 per cent, respectively at weekly interval. The seed yield of treated and untreated plots was recorded at the time of harvesting and converted into quintal per hectare.

2.1 Interpretation of data

The data of the seed yield obtained per plot were converted into quintal per hectare to interpret the results of crop loss inflicted by incidence of insect pests on mustard crop. The avoidable loss and increase in yield over control (untreated) was calculated for each treatment with the formula given by [13].

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

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

3. Result and Discussion

The mean seed yield obtained was 13.25 and 13.61 q ha⁻¹ during 2016-17 and 2017-18, respectively in treated and 7.83 and 7.98 q ha⁻¹ in untreated plots during 2016-17 and 2017-18, respectively (Table 1). The calculated 't' value during both the years of study was greater than 't' tabulated value (2.18, d.f. 12) at 5.00 per cent level of significance hence proved to be significant. The yield obtained in two treatments (treated and untreated) during the study differed from each other significantly. In present investigation, the difference between the mean seed yield of treated and untreated (increase in yield over untreated) during *Rabi*, 2016-17 and 2017-18 was 5.42 and 5.63 q ha⁻¹, respectively. The per cent

increase in yield over control was recorded to be 69.22 and 70.55 during both the years, respectively.

The pooled data of two years (*Rabi*, 2016-17 and *Rabi*, 2017-18) indicated that the mean yield in treated and untreated plots were 13.43 and 7.91 q ha⁻¹, respectively. The increase in mean yield in treated plots over untreated plots was 5.52 q ha⁻¹ and per cent increase in yield over untreated plots was 69.89 per cent. If the losses due to insect pests could be avoided by pest control measures, the production can be appreciably increased. During *Rabi*, 2016-17 and 2017-18, the per cent avoidable losses recorded were 40.91 and 41.37 per cent in treated and untreated plots, respectively. The pooled data of two consecutive years showed 41.14 per cent avoidable loss. Prior to proceeding for management of the insect pests on crops, it is imperative to know, how much loss does an insect pest inflict? In present investigation, the mean yield in treated and untreated plots was 13.43 and 7.91 q ha⁻¹ respectively. The increase in mean yield in treated plots over untreated plots was 5.52 q ha⁻¹ and per cent increase in yield over untreated plots was 69.89 per cent. If the losses due to insect pest could be avoided by pest control measures, the production can appreciably be increased. The pooled data of both the years showed 41.14 per cent avoidable loss [14], reported that the mustard aphid, *L. erysimi* damaged the crop from vegetative stage to maturity, the highest population occurred during the flowering and silique formation inflicting a reduction in seed yield of 90.0-93.2 per cent as compared with insecticide treated plots [15]. reported the avoidable yield loss due to mustard aphid, *L. erysimi* as 88.72 and 90.52 per cent during two consecutive years of study. Loss in yield of mustard crop due to infestation of mustard aphid, *L. erysimi* was estimated by [16] from two sets of ten healthy plants grown in caged area. The yield loss was 84.96, 89.53 and 74.57 per cent, respectively in 2002-03, 2003-04 and 2004-05, which corroborate the present findings.

Table 1: Assessment of crop loss due to insect pests in Indian mustard (Pooled, *Rabi*, 2016-17 and 2017-18)

Treatment	Yield (q ha ⁻¹)			Increase in yield over untreated (%)			Avoidable loss (%)		
	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled
Treated plots	13.25	13.61	13.43	69.22	70.55	69.89	40.91	41.37	41.14
Untreated plots	7.83	7.98	7.91						
Increase in yield	5.42	5.63	5.52						
t cal.	22.6	31.85	33.87						

4. Conclusion

The pooled data (*Rabi*, 2016-17 and 2017-18) on assessment of crop loss due to insect pests mustard revealed 13.43 and 7.91 q ha⁻¹ seed yield in treated and untreated plots, respectively. The increase in mean yield in treated plots over untreated plots was 5.52 q ha⁻¹ and per cent increase in yield over untreated plots was 69.89 per cent. If the losses due to insect pests could be avoided by the pest control measures, the production can appreciably be increased. During *Rabi*, 2016-17 and 2017-18, the per cent avoidable losses recorded were 40.91 and 41.37 per cent in treated and untreated plots, respectively. The pooled data of two consecutive years showed avoidable loss of 41.14 per cent.

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