

EFFECT OF DATE OF SOWING ~~ON ON~~ INCIDENCE OF FALL ARMYWORM, *SPODOPTERA FRUGIPERDA* IN MAIZE

Abstract

Fall armyworm (*Spodoptera frugiperda*) ~~was is the member of noctuidae family which has~~ ~~gone to~~ economic ~~importance important as~~ polyphagous ~~and pest on extreme pest of many~~ ~~important several important~~ crops, including maize in India and elsewhere. ~~In this context, An~~ experiment regarding influence of different dates of sowing on incidence of fall armyworm was conducted in MARS, Dharwad. ~~The results revealed that least mean larval load of fall armyworm was recorded in crop sown during July 2nd fortnight (0.75 larvae per plant) and the highest was recorded in crop sown during August 2nd fortnight (1.53 larvae per plant). Whereas, the lowest mean leaf damage score of 2.95 was observed in crop sown during 2nd fortnight of July and highest was recorded in crop sown during 2nd fortnight of August (4.82). Of the three different dates of sowing at 15 days intervals viz., 2nd fortnight of July (1st date of sowing), 1st fortnight of August (2nd date of sowing) and 2nd fortnight of August (3rd date of sowing), the least mean larval load was noticed in first sown crop (0.75 larvae per plant) compared to third sown crop registered 1.53 larvae per plant. The mean leaf damage scores were 2.95, 3.78 and 4.82 in crops sown at first, second and the third date of sowing respectively, suggesting the importance of early sowing.~~

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Key words: Different sowing dates, Fall armyworm, Natural enemies, Maize

Introduction

Maize (*Zea mays*) is one of the ~~utmost~~ significant cereal crops in the global agriculture economy ~~being used equally~~ as food for man and fodder for animals ~~alike~~ and referred as “Queen of cereals” because of greater yield potential. It is ~~being~~ cultivated both in the tropical and subtropical ~~elimate conditions zones~~ of the world. ~~Maize produced in the country is mainly used as human diet. Maize seeds are consumed as human food, as feed stuff for poultry birds and for cattle and also used in production of starch, glucose and edible oil from industry. An~~ The annual global production of this crop is 1016 million tons from an area of 184 million hectare with productivity of 5,520 kg per hectare. ~~India is the fourth largest producer with a production of 27.15 million tons in an area of 9.60 million hectare and productivity is 2,830 kg per hectare. About 35 per cent of maize produce in India is utilized for consumption by humans, 48 while 48 per cent is used for poultry as well as cattle feed, where as 15, 17 per cent is used for~~

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preparation corn flakes, corn oil, popcorn, corn syrup, dextrose and starch in food processing industries. India is the fourth largest producer with a production of 27.15 million tons in an area of 9.60 million hectare and productivity is 2,830 kg per hectare. The major maize growing areas in India are Karnataka, Uttar Pradesh, Andhra Pradesh, Rajasthan, Tamil Nadu and Maharashtra which contribute to the area and production of 60 and 70 per cent, respectively. Maize is grown in an area of 1.36 million hectare in Karnataka, and the production is 4.09 million tons where as the productivity is 3020 kg per hectare (Anon., 2018). At present, the average yields of cereal grains are lower in India due to variety of factors, among which, the insect pests have been considered as one of the most important constraints. It is estimated that as many as 141 insect pests cause different degrees of damage to maize crop from sowing to harvesting (Reddy and Trivedi, 2008). Among these, stem borer (*Chilo partellus*), cob borer (*Stenachroia elongella*) and shoot fly (*Atherigona soccata*) were found to be as major pests. Stem borers are the major insect pests followed by defoliators but now Currently, the fall armyworm, *Spodoptera frugiperda* (J. E. Smith) (Noctuidae: Lepidoptera) is a polyphagous and extreme pest of many important crops, including maize in India and elsewhere. The different recommendations on dates appropriate for sowing exist across all agro-ecological zones where maize is cultivated. Maize cropping-planting is done between March/April (early) and August/September (late) in the Southern agro ecological zone of the country (rain forest) where the crop covers larger area. The proper sowing time is recommended considering various problems including pest and diseases. This study was intended to recognize sowing dates that would result in lower infestations that are sufficient to prevent economic crop loss so that insecticide application can be minimized.

Methodology

The experiment on this particular objective was conducted at MARS, Dharwad in *khariif* 2019 by growing with the maize hybrid, R-3033. The plot size was 7 × 4 m with spacing of 60 cm × 20 cm was followed. The crop was not implicated with any kind of plant protection measures except and regular agronomic practices without viz., tilling, fertilization, intercultivation and hand weeding operations as per the recommendation to maintain good crop stand crop protection measures were followed. The treatments consisted of 3 different dates of sowing at 15 days intervals viz., 2nd fortnight of July (1st date of sowing), 1st fortnight of August (2nd date of sowing) and 2nd fortnight of August (3rd date of sowing) and were replicated seven times.

Observations recorded

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Incidence of fall armyworm in different dates of sowing

~~Observations on incidence~~ Mean population of fall armyworm larvae in crops sown on different dates ~~of sowing~~ were recorded from five randomly selected plants in each replication at weekly intervals. ~~Further, this data was used for calculation of mean larval population per plant by~~ using the following formula.

$$\text{Incidence of larvae per plant (Nos.)} = \frac{\text{Number of larva}}{\text{Number of plants observed}}$$

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Comment [GN5]: Number of larvae

Leaf damage

Leaf damage assessment was made on 5 randomly selected plants by using visual scale ranged from 0 to 9. (Davis *et al.*, 1992) distinguished as

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0 = no visible leaf damage;

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1 = only pin-hole damage to the leaves;

2 = pin-hole and shot-hole damage to leaves;

3 = small elongated lesions (5–10mm) on 1–3 leaves;

4 = mid-sized lesions (10–30mm) on 4–7 leaves;

5 = large elongated lesions (>30mm) or small portions eaten on 3–5 leaves;

6 = elongated lesions (>30mm) and large portions eaten on 3–5 leaves;

7 = elongated lesions (>30cm) and 50 % of leaf eaten;

8 = elongated lesions (30cm) and large portions eaten on 70 % of leaves;

9 = most leaves have long lesions.

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Statistical analysis

The data on larval population was subjected to square root transformation obtained from all the sowing dates during the present study were subjected to and one-way ANOVA. The treatments means were compared by Duncan's Multiple Range Test (DMRT). The

observations regarding incidence was subjected to square root transformation. The differences among the treatments were compared by following Duncan's Multiple Range Test (DMRT).

Results and Discussion

Larval load of fall armyworm in maize crop at different dates of sowing

The infestation of fall armyworm on different date of sowing showed that, the larval load of fall armyworm at 15 DAS in first sown crop was found to be significantly least with infestation of 0.45 larvae per plant compared and significantly lower than that on to the other two dates of sowing (second (0.71 and 1.02 larvae/plant) on second and third sown crop (1.02 larvae/plant), respectively). Similarly, the infestation level of fall armyworm was continued upto 85 DAS in maize crop sown in first sowing. However, the peak level of infestation was observed in all the sowing dates with infestation of 3.37, 2.93 and 2.25 larvae per plant in third, second and first sown crops, respectively at 36 DAS.

The study revealed that, least mean larval load was noticed in first sown crop (0.75 larvae per plant) compared to third sown crop registered 1.53 larvae per plant. This is probably due to the unsuitable environmental factor for pest attack i.e heavy rainfall, as it was negatively correlated with the incidence of fall armyworm. The results of the present investigation are in accordance with the findings of According to Waddill *et al.* (1981) reported that heavy rainfall killed significant number of early instar instars of fall armyworm which reduced and reduced the adult population. Okweche *et al.* (2015) reported that damage variables and population dynamics of *C. partellus* were significantly lower in early planted maize as compared to late planted maize.

Leaf damage

The scoring of least leaf damage score of 0.63 at 15 DAS by fall armyworm was significantly least found in first sown crop with leaf damage score of 0.63. The which was significantly lower than the subsequent sown second and third dates of sown crop were registered higher leaf damage score of 1.14 and 1.63, observed on subsequent sown second and third sown crop, respectively at 15 DAS. Similarly, the leaf damaging score was increased over a period of observation upto 85 DAS in all the dates of sowing. The peak leaf damage was noticed at 36 DAS in all the sowing dates with leaf damage score of 6.69, 5.74 and 4.63 in third,

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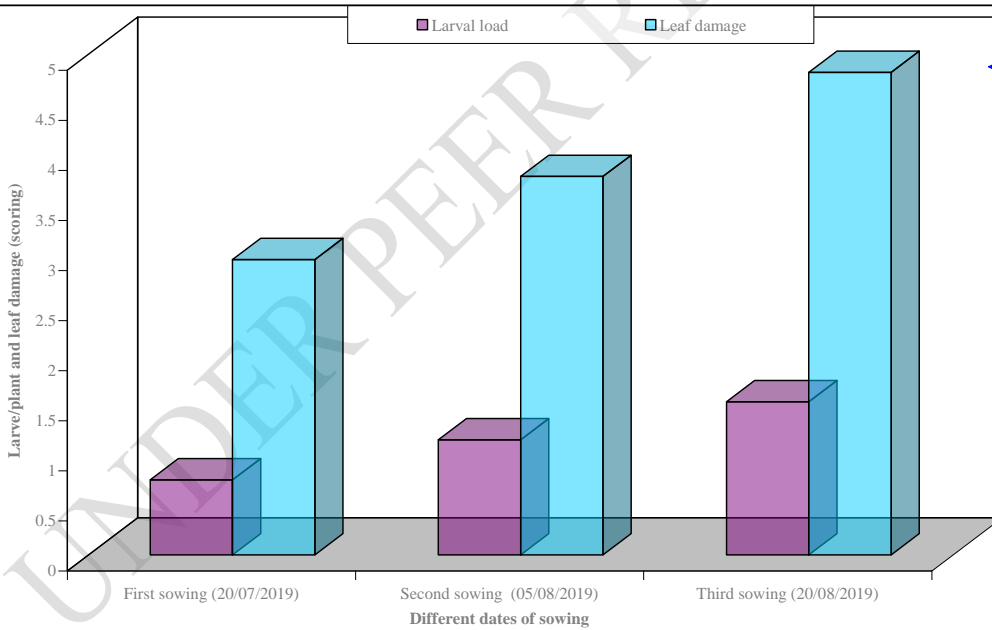
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second and first sowing, respectively. However, the lowest mean leaf damage score-s were 2.95 was observed in first sown crop (2.95) followed by 3.78 and 4.82 in crops sown at first , second and date of sowing (3.78) and the highest mean leaf damage score was noticed in the third date of sowing (4.82)-respectively. Thus early sowing may be useful in managing the population of Fall army worm in maize,

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The lowest mean leaf damage score was noticed in first sowing (2.95) whereas, the highest mean leaf damage score was recorded in third sowing (4.82). This might be due to least larval load recorded in first sowing compared to third sowing. Results pertaining to the different dates of sowing which affects the incidence of fall armyworm in maize is scanty. However, Leaf damage caused by *Spodoptera litura* Nath et al. (2017) reported that leaf damage caused by *Spodoptera litura* was the highest in late sown groundnut crop (20th July) compared to early sown crop (Nath et al.,2017), similar to our findings (20th June and 5th July).



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Fig 1. Influence of different dates of sowing on incidence of fall armyworm

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