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Incidence of Major Insect Pest of Cluster Bean against Different Dates of Sowing

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Authors' contributions

This work was carried out in collaboration among all authors. Authors YNA and PS designed the study, performed the statistical analysis, wrote the protocol and the first draft of the manuscript. Author YNA managed the literature searches. Authors RSS, JS and ASY reviewed the trial and research protocols. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The present study was undertaken to determine the major sucking pests *viz*., jassid, *Empoasca kerri,* whitefly, *Bemisia tabaci* and aphid, *Aphis craccivora* and Thrips, *Megalurothrips distalis* attacking cluster bean crop sown at different dates to determine the optimum sowing of dates.

Place and Duration of Study: An experiment was conducted at the experimental farm, College of Agriculture, Gwalior (Madhya Pradesh) during two consecutive years of *Kharif* 2022 and 2023 to evaluate the effect of different sowing dates on incidence and severity of insect pest against cluster bean.

Methodology: An experiment was laid out in a simple randomized block design with five different dates of sowing. The observations on the population of sucking pest were recorded on Ten randomly selected tagged plants at weekly intervals. The data were subjected to statistical analysis by adopting the appropriate method of analysis of variance.

Results: The results show that the early sown crop had the minimum infestation of major sucking pests and the highest seed yield was obtained as compared to the late sowing crop. Our research found that sowing date has a substantial impact on pest populations, with early sowing dates often having fewer pest pressures than later dates. This can be attributed to the synchronization of crop development stages and insect life cycles.

Conclusion: The result was concluded that crops sown on early date are less susceptible to significant insect pests such aphid, jassid, thrips and whitefly. However, Crops sown later were more vulnerable to insect pest attack, resulting in more damage and lower production.

Keywords: A. craccivora; M. distalis; E. kerri; B. tabaci; cluster bean; sowing dates.

1. INTRODUCTION

The summer annual legume cluster bean, [*Cyamopsis tetragonoloba* (L.)] Taub., is a deep-rooted member of the *Leguminosae (Fabaceae)* family that is resistant to drought and extreme heat. The word gauaahar/guar is derived from the Sanskrit word, which denotes cattle or cow fodder. The cluster bean has several health advantages because it is highly nutritious and treats anemia. It strengthens bones, promotes blood circulation, and improves cardiovascular health. As it benefits the developing baby, it is advised throughout pregnancy. Researchers from several locations in India have confirmed that major cluster bean insect pests harm seed yield and quality. To address this issue, farmers dump vast amounts of chemicals in the field, posing many environmental and health risks. To address the issue of indiscriminate pesticide use, environmentally friendly measures such as agronomic practices can be used. One such strategy is to change the sowing dates to avoid peak insect activity on the crop. The date of sowing significantly affects pest incidence, which could be related to variations in climatic conditions [1,2,3,4,5,6,7]. Early-planted crops have fewer pests and a higher yield than later-planted crops [8,9,10]. Therefore, it is critical to determine the optimal planting times at which crops might avoid insect pest damage and provide an ideal opportunity for the development of pest management technologies. Therefore, the current study sought to investigate the effect of planting time on the incidence of cluster bean insect pests. Sucking pests are the most prevalent and damaging crop pests worldwide, causing significant output losses. Among all the attacking insects, cluster beans are attacked by aphids (*Aphis craccivora* Koch), jassids (*Empoasca kerri* Pruthi), whitefly, (*Acaudaleyrodes rachipora* Singh), thrips, (*Megalurothrips distalis* Karny), which infest the crop from seedling to maturity and reduce productivity. It produces rolling, chlorosis, yellowing, spots on young leaves, shortening of young shoot internodes, deformation, and lesions on growing plant components, resulting in diminutive plant remaining. The damage is caused by both "nymphs and adults."

2. MATERIALS AND METHODS

The study of different sowing dates on the incidence of major sucking insect pests of cluster bean was carried out at the experimental farm, College of Agriculture, Gwalior (Madhya Pradesh) during *Kharif* 2022 and 2023. Gwalior is situated in the northern part (Gird region) of Madhya Pradesh. The Cluster bean genotype, HG-2-20 with a spacing of 45 × 10 cm, was sown on five different dates *viz.,* 26thJuly, 2ndAug,

9thAug, 16thAug & 23rdAug (2022 and 2023). An experiment was laid out in the Randomized Block Design in five replications with a plot size of 2.0m x 1.8m. The crop was allowed to have natural insect pest infestation. The population of the sucking pests, *viz.*, aphid, thrips, jassid, and whitefly, were recorded soon after their appearance by counting the number of nymphs and adults on ten randomly selected plants, during the early morning at weekly intervals by observing three leaves (upper, middle, and lower). All research data on the incidence of insect pests were transformed using the square root transformation as per the method described by Panse and Sukhatme [11]. The data were subjected to statistical analysis using the appropriate method of analysis of variance, as described by Fisher and Yates [12].

3. RESULTS AND DISCUSSION

"There were five dates of sowing studied in the present investigation. The population of *A. craccivora* gradually increased with a delay in sowing the cluster bean crop. The lowest pest population was recorded on the 26th July sown crop during both years (Table 1 and Fig. 1). The minimum *A. craccivora* population recorded was 2.75 and 2.88 per three leaves on the 26th July sown crop during 2022 and 2023, respectively. A significant difference in *A. craccivora* population build-up was noticed between 26th July, 2nd August, 09th August, 16th August, and the 23rd August sown crop in both years. The highest population was observed on 23rd August sown crop, *viz*., 5.12 and 5.16 *A. craccivora* per three leaves in 2022 and 2023, respectively (Table 1). The pooled data of two years also showed a similar trend having the lowest population of *A. craccivora* on 26th July and the highest population on 23rd August, *viz*., 2.82 and 5.14 *A. craccivora* per three leaves, respectively (Table 1). Yadav and Singh found that the early sowing crop had minimum infestation of *A. craccivora* in July compared to the late sowing crop" [13]. Similarly, Mishra and Gaurav [14] found that altering sowing dates reduces the *A. craccivora* population.

"The *M. distalis* population also increased with a delay in the sowing time of the cluster beans (Table 1). The lowest population of *M. distalis* (3.02 in 2022 and 3.06 in 2023 per three leaves) was observed on 26th July sown crop, whereas it was the highest on 23rd August sown crop during both years of study. The *M. distalis* population on 26th July, 2nd August, 09th August, 16th August, and the 23rd August during both the *kharif* seasons had found statistically significant differences with each other in their population. The pooled data (Table 1) also revealed that the lowest *M. distalis* population was observed on the 26th July sown crop (3.04 *M. distalis* per three leaves)" [13]. The current results are completely supported by the findings of Devi and Ram [15], who investigated the maximum population of *M. distalis* in late sown crops, while the population was least in early sown). Similarly, Prodhan *et al.* [16] and Bhatnagar [17] recorded a lower incidence of *M. distalis* in the early sown crops.

The data presented in Table 1 revealed that the maximum *E. kerri* population appeared in the last week of the August sown crop during both years of study. The population of the *E. kerri* recorded on 26th July, 2nd August, 09th August, 16th August, and the 23rd August sown crop differed significantly from one another. A similar trend was observed in *kharif* during both years of the study. All five sowing dates indicated that the incidence of *E. kerri* was significant on the crops sown on different dates in 2022 and 2023. The pooled of *E. kerri* revealed that minimum infestation was on the early sown crop and maximum infestation on the late sown crop with 3.09 and 6.28 *E. kerri* per three leaves, respectively (Table 1). Dobhal *et al.* [18] reported the maximum population of *E. kerri* on late sowing crops. Similar findings were reported by Jaba *et al.* [19].

The *B. tabaci* population also increased with a delay in the sowing time of the cluster bean (Table 1). The lowest population of *B. tabaci* (3.77 in 2022 and 3.86 in 2023 per three leaves) was observed on the 26th August sown crop, whereas it was the highest on 23rd August sown crop during both years of study. The *B. tabaci* population on the 26th July, 2nd August, 09th August, 16th August, and the 23rd August during both *kharif* seasons showed statistically significant differences. Pooled data (Table 1) also revealed that the lowest *B. tabaci* population was observed on the 26th July sown crop. These results corroborate those of Acharya and Singh [20], who reported that the *B. tabaci* population was lowest in July sown crops. Similar findings were reported by Yadav and Singh [13], who observed that early sowing of the crop was efficient in avoiding attack by *B. tabaci*.

Table 1. Effect of sowing date on the incidence of major sucking pests in cluster bean during *Kharif* 2022 and 2023

S. No.	Sowing dates	Mean population of insect pests per three leaves on different sowing dates											
		A. craccivora			*M. distalis*			*E. kerri*			*B. tabaci*		
		2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled	2023	2023	Pooled
1	**26-Jul**	2.75 (1.74) *	2.88 (1.76)	2.82 (1.82)	3.02 (1.81)	3.06 (1.82)	3.04 (1.88)	3.06 (1.82)	3.12 (1.84)	3.09 (1.90)	3.77 (1.99)	3.86 (2.01)	3.82 (2.08)
2	**02-Aug**	4.27 (2.18)	4.44 (2.22)	4.35 (2.20)	4.22 (2.17)	4.26 (2.18)	4.24 (2.18)	5.02 (2.34)	5.08 (2.36)	5.05 (2.36)	5.34 (2.41)	5.42 (2.43)	5.38 (2.42)
3	**09-Aug**	4.70 (2.28)	4.80 (2.3)	4.75 (2.29)	4.62 (2.26)	4.66 (2.27)	4.64 (2.27)	5.41 (2.43)	5.46 (2.44)	5.43 (2.44)	5.73 (2.49)	5.77 (2.5)	5.75 (2.50)
4	**16-Aug**	4.90 (2.32)	4.94 (2.33)	4.92 (2.33)	4.80 (2.3)	4.87 (2.32)	4.84 (2.31)	5.68 (2.48)	5.86 (2.52)	5.77 (2.50)	6.06 (2.56)	6.16 (2.58)	6.11 (2.57)
5	**23-Aug**	5.12 (2.37)	5.16 (2.38)	5.14 (2.37)	5.08 (2.36)	5.15 (2.38)	5.11 (2.37)	6.19 (2.59)	6.37 (2.62)	6.28 (2.60)	6.66 (2.67)	6.63 (2.67)	6.64 (2.67)
SE(m)±		0.11	0.12	0.10	0.10	0.11	0.10	0.12	0.12	0.10	0.13	0.14	0.11
C.D. at 5%		0.32	0.35	0.30	0.31	0.34	0.29	0.35	0.36	0.29	0.39	0.41	0.34

**Figures in parentheses are $\sqrt{x + 0.5}$ transformed values*

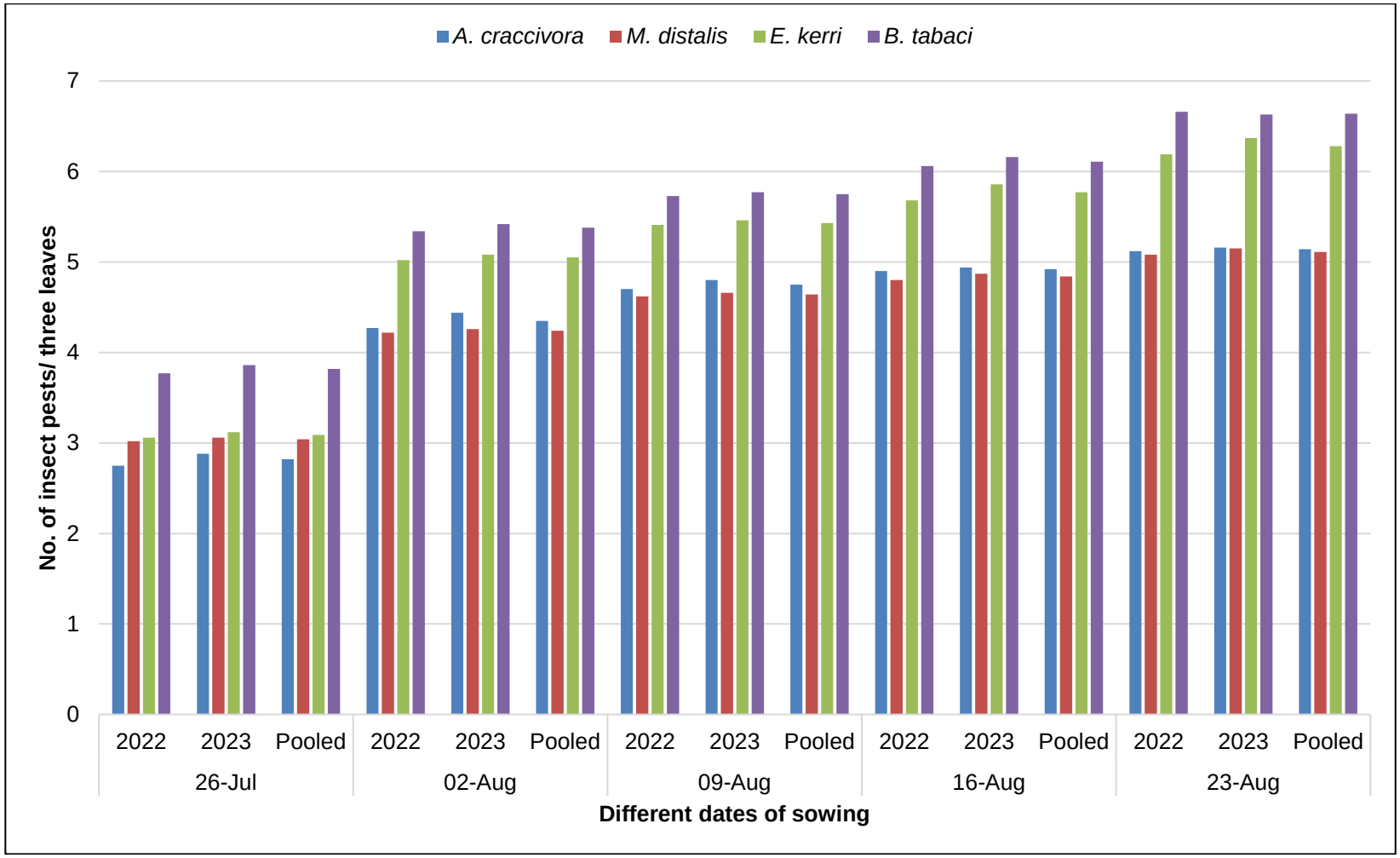

Fig. 1. Effect of different sowing dates on the incidence of major sucking insect pests in cluster bean during *Kharif* 2022 and 2023

These findings highlight the importance of choosing proper planting dates as a strategic tool in integrated pest management (IPM). Farmers who modify sowing dates may be able to reduce their reliance on chemical pesticides, lower production costs, and limit their environmental impacts. Based on our findings, we recommend that farmers in the gird region of Madhya Pradesh sow their crops in the early season to reduce the risk of insect infestations.

4. CONCLUSION

The present findings indicate that altering the date of sowing is an effective tool for combating insect populations. The incidence of sucking insect pests in cluster bean could be prevented by understanding the ecological background of pests and minor changes in the microclimate. The current study showed that minimum infestation occurred in the early sowing crop compared to the late sowing crop at the end of August in the Gwalior region of Madhya Pradesh.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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