

## Original Research Article

### Occurrence of STUDIES ON INSECT-PEST OF CLUSTER BEAN [CYAMOPSIS TETRAGONOLOBA (LINN.) TAUBERT] ASSOCIATED WITH METEOROLOGICAL PARAMETERS IN GIRD REGION OF MADHYA PRADESH

#### ABSTRACT

Insects are a big threat in agriculture. To study about insect pests complex of the cluster bean, A field experiment conducted at Research Farm, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh during Kharif season 2022-23. To study about insect pests complex of the cluster bean during Kharif, 2022, he incidence of insect pests were observed on kharif clusterbean, namely thrips, *Megleurothrips distalis* (karny), Jassid, *Empoasca kerri* (Pruthi) aphid, *Aphis craccivora* (Koch) and whiteflies, *Acaudaleyrodes rachipora* (Singh). Peak population of aphid, Jassid and whitefly were observed during 37<sup>th</sup> SMW (2<sup>nd</sup> week of September) (4.39, 5.74 and 5.67 individuals/leaf, respectively); while peak population of thrips were observed during 38<sup>th</sup> SMW (3<sup>rd</sup> week of September) (4.75 individuals/leaf, respectively), thrips peak population was observed 38<sup>th</sup> SMW (3<sup>rd</sup> week of August) (3.70 thrips/leaf). Population of aphid and Jassid showed positive significant correlation with rainfall ( $r = 0.505^*$ ) and ( $r = 0.498^*$ ), respectively. Population of aphid, jassid and whitefly showed highly significant positive correlation with minimum temperature ( $r = 0.684^{**}$ ), ( $r = 0.745^{**}$ ) and ( $r = 0.591^*$ ), respectively. Population of aphid, jassid, thrips and whitefly showed significant positive correlation with evening relative humidity ( $r = 0.606^*$ ), ( $r = 0.621^*$ ), ( $r = 0.511^*$ ) and ( $r = 0.498^*$ ).

**Keywords:** Cluster Bean, Aphid, Jassid, Thrips, Whitefly, correlation

#### Introduction

The cluster bean, also known as guar or *Cyamopsis tetragonoloba* (Linn.) Taub. is currently acknowledged as one of the most significant commercial crops of arid and semi-arid countries (Omprakash and Raju 2014). Its young pods of cluster bean are used as vegetables and are a low-cost source of energy, protein, fat, carbohydrate, vitamin A, vitamin C, calcium, and iron

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for every 100 g of edible portion. Its seed contains gum ranging from 31.4 to 41.23 per cent (Pathak *et al.*, 2009; Muthuselvi *et al.*, 2018). The cluster bean is reportedly good for several health benefits because it is entirely nutritious and treats anaemia, which is a growing health issue in almost all women. It improves cardiovascular health, strengthens bones, and promotes better blood circulation. It is advised throughout pregnancy since it is beneficial to the. Cluster beans are one of the most widely cultivated crops in the world, with 82% of the total output being produced in India. In India, 3.14 million hectares area with 1.52 million tonnes production of cluster bean seed and 484 kg/ha of productivity of cluster bean. Cluster beans are solely grown on 75280 hectares area in Madhya Pradesh, with a productivity of 750 kg/ha (Anonymous, 2021). In the cluster bean crop, sucking pests including whitefly, jassid, and aphid considerably decrease yields by draining the sap from the underside surface of the leaves. Pandey *et al.*, (1991) reported About 73.86 per cent yield loss was reported to be caused by due to its pest complex (Pandey *et al.*, 1991). The diseased areas develop a yellow colour as a result of their feeding, and the leaves finally fall off (Reference). In addition to feeding, these insects also produce honeydew, which encourages the development of sooty mould, which that prevents photosynthesis and stunts the growth of plants. If the crop is cultivated for fodder, not only is the seed production lowered, but the quality of the fodder also suffers. There are various insect pests infesting the cluster bean crop, viz., jassid, *Empoasca kerri* (Pruthi); Aphid, *Aphis craccivora* (Koch); whitefly, *Acaudaleyrodos rachipora* (Singh), thrips, *Megaleurothrips distalis* (Karny) were recorded (Singh, 1997; Pawar *et al.*, 2017; Dawar *et al.* 2022).

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## MATERIALS AND METHODS

The experiment was carried out at the research farm, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India. Randomized Block Design (RBD) with 3 replications was deployed during *rabi*, 2021. The row-to-row and plant-to-plant spacing were 45 cm X 10 cm, respectively and the plot size was 5.0 m X 3.6 m. For recording observations of insect-pest, ten plants were randomly selected and tagged in each net plot area. The observations on the insect-pest population were recorded from a marked area in three leaves (upper, middle and lower) of the same selected plants. The observations were recorded at weekly intervals starting from the second week after sowing till to the harvest of the crop. The whole experimental plot was kept free from any acaricides. The data was collected as the mean

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number of insect/leaf area/plant and were correlated with meteorological parameters. Then experimental data were subjected to statistical analysis using analysis of variance (ANOVA).

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## RESULTS AND DISCUSSION

The results on periodic mean population of insect pests explicated that four important pests and a natural enemy of crop were found colonizing cluster bean crop in Gird region of Madhya Pradesh. In the pests complex of important insect pests of cluster bean four pests viz. thrips, *Megalurothrips distalis* (Karny); aphid, *Aphis craccivora* (Koch); whitefly, *Bemisiatabaci*(Singh) and jassid, *Empoasca kerri*(Pruthi) were sucking insect pests. They first invaded the crop ~~were the first to invade the crop~~ at early growth stage i.e., second week after sowing (WAS) and remained active till 14<sup>th</sup> WAS.

### Thrips, *Megalurothrips distalis* (Karny)

The observations on thrips recorded during Kharif, 2022 are presented in Table 2 and graphically depicted in Figure 1. The revealed that the population of *M. distalis* was first observed from 13<sup>th</sup> August to 19<sup>th</sup> August in 33<sup>rd</sup> SMW with 1.00 thrips/leaf and continued till 43<sup>rd</sup> SMW almost harvesting of the crop. Further, its population remained increasing and reaches its peak in 38<sup>th</sup> SMW with 3.70 thrips/leaf, and later on, the population of *M. distalis* started declining gradually and remained to 0.80 thrips/leaf during 43<sup>rd</sup> SMW. Among meteorological parameters, the correlation analysis revealed that evening relative humidity had significant positive effect on the population of *M. distalis* with 'r' value ( $r=0.511$ ) at 5% level of significance and the effect of the remaining weather parameters was found non-significant. More harmonically, Dawar *et al.* (2022) reported that the various pests attacking the crop viz., *P. vittula*, *M. distalis*, *E. kerri*, *A. craccivora*, *A. rachipora* were recorded on cluster bean crop throughout the crop season and the peak population of thrips was observed during 38<sup>th</sup> SMW in the third week of September and remained until the crop harvest. Similarly, Pawar *et al.* (2017) also reported that five insect pests viz., *E. kerri*, *A. rachipora*, *M. usitatus*, *C. dispar* and *O. obesus* were recorded on cluster bean. Among them, *M. usitatus* appeared little late (5 WAS) and disappeared from the crop from 13 WAS.

### Aphid, *Aphis craccivora*(Koch)

The results on the population of Aphids are presented in Table 2 and Figure 1. It is evident from the data presented in Table 2 and Figure 1 that the results revealed that the population of *A. craccivora* was first observed from 6<sup>th</sup> August to 12<sup>th</sup> August in 32<sup>nd</sup> SMW with 0.70 aphids/leaf. Further more, its population remained increasing and reaches its peak in 37<sup>th</sup> SMW (10<sup>th</sup> September to 16<sup>th</sup> September) at 4.39 aphids/leaf, and later on, the population of *A. craccivora* started declining gradually and remained to 0.90 aphids/leaf during 43<sup>rd</sup> SMW (22<sup>nd</sup> October to 28<sup>th</sup> October). The correlation analysis revealed that minimum temperature and evening relative humidity had significant positive effect on the population of *A. craccivora* with 'r' value ( $r = 0.591$  and  $0.498$ ) at 5% level of significance and the effect of the remaining weather parameters was found non-significant (Table 3). The present results are completely supported by Kumawat (2022) who also reported the similar results and found that various pests attacking the crop viz., *P. vittula*, *M. distalis*, *E. kerri*, *A. craccivora*, *A. rachipora* were recorded on cluster bean crop throughout the crop season and the peak population of thrips was observed during 38<sup>th</sup> SMW in the third week of September and remained until the crop harvest. Additionally, it was reported that Jat *et al.* (2017) at Udaipur (Rajasthan) also recorded that the pest population in black gram field and found that aphids, jassid, whitefly, thrips and blister beetle population in black gram field attained peak in the 1st week of September during 2013 and 2nd week of September during 2014 in Udaipur (Rajasthan) (Jat *et al.*, 2017). In contrary, the findings of Prasad *et al.* (2008) are partially supporting the present results, who stated that the morning and evening relative humidity were significantly positive, they also stated that minimum temperature showed significant negative correlation with aphid population on groundnut.

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#### Whitefly, *Acaudaleyrodes rachipora* (Singh)

The data presented in Table 1 and graphically depicted in Figure 1 revealed that the population of *A. rachipora* started from 3<sup>rd</sup> WAS i.e. 2<sup>nd</sup> week of August (32<sup>th</sup> SMW) with 2.99 whitefly/leaf. The population increased with crop growth and reached to a peak level of 5.67 whiteflies per/leaf during 8<sup>th</sup> WAS in 2<sup>nd</sup> week of September (37<sup>th</sup> SMW). The whitefly population declined thereafter continuously (1.20 whitefly/leaf) during 4<sup>th</sup> week of October (43<sup>th</sup> SMW). The correlation analysis revealed that the minimum temperature had significant positive effect on the population of *A. rachipora* with 'r' value ( $r = 0.684$ ) at 1% level of significance. Besides, and the evening relative humidity and rainfall had significant positive effect on the population of *A. rachipora* with 'r' value ( $r = 0.606$  and  $0.505$ ) at 5% level of significance and the effect of the

remaining weather parameters was found non-significant. Dawar *et al.* (2022) investigated on the population dynamics of cluster bean and observed ~~the similar results. In their study, various as in the present study who reported that the various~~ pests attacking ~~cluster bean the crop viz.,~~ *P. vittula*, *M. distalis*, *E. kerri*, *A. craccivora*, *A. rachipora* were recorded ~~on the cropon cluster bean crop~~ throughout the crop season and the peak population of aphids was observed during 37<sup>th</sup> SMW in the second week of September and remained until the second week of October. Similarly, Bali *et al.* (2021a) also investigated the seasonal incidence against whitefly, in correlation with the weather parameters and revealed that the cluster bean has been attacked by a number of insect pests, but sucking pests like aphids, jassid and whitefly was seen to cause more damage to the crop in sub-tropic Jammu. Pawar *et al.* (2017) also reported that five insect pests viz., *E. kerri*, *A. rachipora*, *M. usitatus*, *C. dispar* and *O. obesus* were recorded on cluster bean. Among them whitefly was noted on cluster bean up to 14 and 15 WAS, respectively.

#### **Jassid, *Empoasca kerri* (Pruthi)**

The data recorded on Jassid during *Kharif*, 2022 ~~are~~ presented in Table 1 and Figure 1. ~~indicated that the~~ The population of cowpea pod borer initiated from 2<sup>nd</sup> WAS i.e. 1<sup>st</sup> week of August (31<sup>st</sup> SMW) ~~was of with occurs~~ 0.89 Jassid /plant. ~~The pest population reached to a peak level (5.74 Jassid /plant) during 8<sup>th</sup> WAS coincided i.e. 2<sup>nd</sup> week of September (37<sup>th</sup> SMW) and thereafter decreased gradually and reached to a low level of 0.90 Jassid per plant during 1<sup>st</sup> week of November (44<sup>th</sup> SMW).~~ The correlation analysis revealed that minimum temperature had significant positive effect on the population of *E. kerri* with 'r' value ( $r = 0.745$ ) at 1% level of significance. ~~Furthermore, and the~~ evening relative humidity and rainfall had significant positive effect on the population of *A. rachipora* with 'r' value ( $r = 0.621$  and  $0.498$ ) at 5% level of significance and the effect of the remaining weather parameters was found non-significant. ~~This result congruent with Pawar et al., 2017 who reported that The results of the present investigation are completely supported with the findings of Pawar et al. (2017) also reported that~~ five insect pests viz., *E. kerri*, *A. rachipora*, *M. usitatus*, *C. dispar* and *O. obesus* were recorded on cluster bean. Among them, *E. kerri* was noted first during 3 weeks after sowing (WAS). Similarly, Kumawat (2022) revealed ~~that insect pests such as the similar results and found that various pests attacking the crop viz.,~~ *P. vittula*, *M. distalis*, *E. kerri*, *A. craccivora*, *A. rachipora* were ~~also~~ recorded on cluster bean crop throughout the crop season and the peak population of jassid was

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observed during 38<sup>th</sup> SMW in the third week of September and remained until the crop harvest. Bali *et al.* (2022b) reported that the jassid population was at its peak in the 17th standard week during 2020. The correlation study shows that jassid had positive correlation with temperature whereas it shows negative correlation with relative humidity and rainfall. Also, Pawar *et al.* (2011) observed that the jassid was the first to appear during 3 weeks after sowing (WAS), and whitefly 4 weeks after sowing (WAS) ~~at~~ under North Gujarat conditions. Nitharwal and Kumawat (2009) reported that the infestation gradually reached at peak 12.40 jassid/three leaves during *Kharif* 2006 and 13.2 jassid/three leaves during *Kharif* (2007) in the first week of September during year. A positive significant correlation of jassid and whitefly with relative humidity ( $r=0.62$  and  $0.63$  in 2006 and  $0.70$  and  $0.56$  in 2007) was observed.

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## References

Anonymous (2021). Ministry of Agriculture, Government of India.

<https://www.indiastatagri.com/table/agriculture/area-production-yield-guar-seed-india-1997-1998-20/421001>

Bali R.; Singh A. K.; Kumawat P. K.; Singh M.; Hussain T. and Sharma R. N. (2021a). Seasonal incidence and bio-efficacy of eco-friendly insecticides of whitefly in cluster bean [*Cyamopsis tetragonoloba* (L.)]. *The Pharma Inn. J.* 11(1): 1725-1728

Bali, R., Singh, A.K., Kumawat, P. K., Hussain, T., Singh, M., Sharma, R. N., Bajjiya, S., and Kakraliya, S.S. (2022b). Seasonal Incidence and Eco-friendly Management of Jassids in Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub]. *Biological Forum – An International Journal.* 14(1): 1316-1320.

Dawar, P.; Dwarka; Vishwakarma, D.; Yadav, P. S.; Rien, S. P.; and Singh, U. C. (2022). Seasonal incidence of insect pests and natural enemies of cluster bean associated with meteorological parameters. *The Pharma Inn. J.* 11(2): 157-161

Jat, S.K.; Lekha and Rana, B.S. (2017). Effect of abiotic factors on the Incidence of major Insect pests of blackgram [*Vigna mungo* L. Hepper]. *Int. J. of Agril. Sci.* 9(17): 4159-4161.

Kumawat (2022). Studies on Pest complex of Cluster bean [*Cyamopsis tetragonoloba*(Linn.) Taubert] in Northern M.P.M.Sc. (Ag.) Thesis. RVSKVV, Gwalior, M.P. pp62.

- Muthuselvi, R., Shanthi, A. and Praneetha, S. (2018). Mean performance of cluster bean (*Cyamopsis tetragonoloba*) genotypes for yield and quality parameters. *International Journal of Chemical Studies*. 6(2): 3626-3629.
- Nitharwal, M. and Kumawat, K.C. (2009). Population dynamics of insect pest of green gram, *Vigna radiata* (Linn.) in Semi-Arid region of Rajasthan. *Indian Journal of Applied Entomology*. 23: 90-9.
- Pandey, S.N., Singh, R., Sharma, V.K. and Kanwat, P.M. (1991). Losses due to insect pests in kharif pulses. *J Ent. Res*. 53(4): 629-631.
- Panwar, S.T. and Patel, P.S. (2011). Pest succession, varietal screening and management of important pests of cluster bean. M.Sc. Thesis Submitted to Chimanbhai Patel College of Agriculture, SardarkrushhinagarDantiwada Agriculture University, Sardarkrushhinagar, Gujarat.
- Pathak, R., Singh, M. and Henry, A. (2009). Genetic divergence in Cluster bean (*Cyamopsis tetragonoloba*) for seed yield and gum content under rainfed conditions. *Indian Journal of Agricultural Sciences*. 79(7): 559-61.
- Pawar, S.T., Patel, P.S., Pareek, D., Sushm, A., Patel, B.C. (2017). Pest succession of important pests and their natural Enemies on Cluster bean, *Cyamopsis tetragonoloba*(L.) Taubert. *AGRES –Int. e-Journal*. 6(1): 71-79.
- Prasad, T. V., Nandagopal, V., & Gedia, M. V. (2008). Effect of abiotic factors on the population dynamics of *Aphis craccivora* Koch in groundnut in Saurashtra region of Gujarat. *Indian Journal of Entomology*. 70(4): 309-313.
- Singh, S.P. (1997). Insect pest management in Forage Crops. Proceeding of Advanced Training Course on Insect Pest Management, 10-29, March 1997, Department of Entomology, CCS Haryana Agricultural University, Hisar. pp. 132-135.

**Table 1 Meteorological data recorded in cluster bean crop growth period during *Kharif 2022* at Gwalior.**

SMW	Dates	Temperature (°C)		Relative Humidity (%)		Rainfall
		Maximum	Minimum	Morning	Evening	
30	July 23-29	32.20	26.10	91.10	76.20	3.40
31	July 30- Aug 5	33.40	26.60	88.80	58.50	27.00
32	Aug 6- 12	32.80	25.90	90.70	66.40	87.00
33	Aug 13- 19	30.30	21.70	88.40	74.40	64.60
34	Aug 20- 26	32.10	24.30	89.20	73.20	135.00
35	Aug 27- Sept 2	34.20	25.90	86.20	60.50	9.80
36	Sept 3- 9	35.30	26.00	80.40	55.50	0.00
37	Sept 10- 16	32.20	24.90	95.40	72.00	60.00
38	Sept 17- 23	31.00	24.10	92.50	75.00	61.00
39	Sept 24- 30	32.50	23.80	89.10	58.00	13.80
40	Oct 1- 7	33.60	23.30	89.00	61.40	8.40
41	Oct 8- 14	29.90	21.70	94.20	70.20	103.00
42	Oct 15- 21	32.50	17.60	85.40	55.80	0.00
43	Oct 22- 28	32.90	15.30	81.00	47.40	0.00
44	Oct 29- Nov 4	32.90	14.80	89.70	48.70	0.00

**Table 2: Population of major insect pests complex in cluster bean crop during *Kharif* 2022.**

SMW	Dates	Population of major insect pests (no/ 3 leaves)				Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
		<i>M. distalis</i>	<i>A. craccivora</i>	<i>A. rachipora</i>	<i>E.kerri</i>	Maximum	Minimum	Morning	Evening	
31	July 30- Aug 5	0.00	0.00	0.00	0.89	33.40	26.60	88.80	58.50	27.00
32	Aug 6- 12	0.00	0.70	2.99	3.11	32.80	25.90	90.70	66.40	87.00
33	Aug 13- 19	1.00	1.45	3.72	4.21	30.30	21.70	88.40	74.40	64.60
34	Aug 20- 26	2.90	2.78	4.90	4.93	32.10	24.30	89.20	73.20	135.00
35	Aug 27- Sept 2	2.10	3.29	4.88	4.10	34.20	25.90	86.20	60.50	9.80
36	Sept 3- 9	1.40	4.06	5.26	5.10	35.30	26.00	80.40	55.50	0.00
37	Sept 10- 16	<b>3.58</b>	<b>4.39</b>	<b>5.67</b>	<b>5.74</b>	32.20	24.90	95.40	72.00	60.00
38	Sept 17- 23	3.70	3.83	4.45	4.80	31.00	24.10	92.50	75.00	61.00
39	Sept 24- 30	3.44	2.10	3.73	4.62	32.50	23.80	89.10	58.00	13.80
40	Oct 1- 7	2.70	1.10	2.10	3.26	33.60	23.30	89.00	61.40	8.40
41	Oct 8- 14	1.80	2.55	3.70	3.10	29.90	21.70	94.20	70.20	103.00
42	Oct 15- 21	1.10	1.27	2.10	1.33	32.50	17.60	85.40	55.80	0.00
43	Oct 22- 28	0.80	0.90	1.20	1.10	32.90	15.30	81.00	47.40	0.00
44	Oct 29- Nov 4	0.00	0.00	0.00	0.90	32.90	14.80	89.70	48.70	0.00
45	Nov 5- 11	0.00	0.00	0.00	0.00	33.10	16.90	90.40	54.50	0.00
46	Nov 12- 18	0.00	0.00	0.00	0.00	30.40	11.40	87.00	62.10	0.00

SMW= Standard Meteorological Week

**Table 3: Correlation coefficients (r) and co-efficient of determination (R<sup>2</sup>) between seasonal population of major insect pests complex and weather parameters in cluster bean crop during *Kharif* 2022.**

Major insect pests complex	Weather parameters									
	Maximum Temperature (°C)		Minimum Temperature (°C)		Morning Relative Humidity (%)		Evening Relative Humidity (%)		Rainfall (mm)	
	r	R <sup>2</sup>	r	R <sup>2</sup>	r	R <sup>2</sup>	r	R <sup>2</sup>	r	R <sup>2</sup>
<i>M. distalis</i>	-0.082 <sup>NS</sup>	-	0.495 <sup>NS</sup>	-	0.325 <sup>NS</sup>	-	0.511*	0.2614	0.329 <sup>NS</sup>	-
<i>A. craccivora</i>	0.069 <sup>NS</sup>	-	0.591*	0.3495	0.125 <sup>NS</sup>	-	0.498*	0.2475	0.344 <sup>NS</sup>	-
<i>A. rachipora</i>	0.024 <sup>NS</sup>	-	0.684**	0.4682	0.142 <sup>NS</sup>	-	0.606*	0.3672	0.505*	0.2551
<i>E. kerri</i>	0.042 <sup>NS</sup>	-	0.745**	0.5546	0.209 <sup>NS</sup>	-	0.621*	0.3851	0.498*	0.2482

NS= Non significant; \*significant at 5% level; \*\*significant at 1% level