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Seasonal incidence and bio-efficacy of eco-friendly insecticides of whitefly in cluster bean [*Cyamopsis tetragonoloba* (L.) Taub]

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Abstract
A study was carried out in Sher-e- Kashmir University of Agricultural Sciences and Technology, Jammu, Chatha, for investigating the seasonal incidence and to check the bio-efficacy of newer eco-friendly insecticides against whitefly, in correlation with the weather parameters. The study revealed that the cluster bean has been attacked by number of insect pests, but sucking pests like aphids, jassids and whitefly was seen to cause more damage to the crop in sub tropic Jammu. The study showed that the whitefly population was at its peak during 21st standard week in 2020. The incidence of whitefly was when correlated with weather parameters it was found that the whitefly had positive correlation with temperature whereas it shows negative correlation with relative humidity and rainfall. The bio-efficacy of newer eco-friendly insecticides against whitefly revealed that among sprayed eco-friendly insecticides for the management of whitefly after two sprays Novaluron 10 EC gave best results and found best in reducing the whitefly population by 50.80 per cent in the field of cluster bean in sub-tropical Jammu region, followed by spinosad 45 EC with 49.53 per cent reduction and *Metarrhizium anisopliae* with 46.73 per cent. The study was concluded with considering whitefly**,** *Bemisia tabaci* (Genn.) as the major sucking pest in sub- tropics of Jammu region on cluster bean crop and spinosad as the most promising eco-friendly insecticide against whitefly and other sucking pest.

Keywords: Newer, parameters, cluster bean, insecticides, bio-efficacy

Introduction
The cluster bean (guar) is attacked by a large magnitude of insect pest such as aphids, (*Aphis craccivora* Koch), jassids [(*Empoasca fabae* (Harris)]; *E. krameri* Ross & Moore and *E. kerri* Pruthi), white fly, (*Bemisia tabaci* Genn.), hairy caterpillars (*Ascotis imparta* Walk.) bihar hairy caterpillar, (*Spilosoma obliqua* Walk.), stem fly (*Ophiomyia phaseoli* Tryon), pod borer, (*Etiella zinckenella* Treit.) and so many. Among these, aphids, jassids and white flies have been reported as the major sucking pests of cluster bean crop. The nymphs and adults both cause damage by sucking the cell sap from the tender portions of the plant and also from lower portion of the leaves. On the other hand, in severe infestation, these above mentioned pests attack all parts of the plants which includes pods and results in stunted growth and lower yield. The present study was conducted to check the seasonal incidence of whitefly and to check the bio-efficacy of newer eco-friendly insecticides *viz*., neem oil, pongamia oil, spinosad, *Beauvaria bassiana*, *Metarrhizium anisopliae*, Novaluron, *Bacillus thuringenesis* and garlic oil, against whitefly. The incidence of insect pests depends totally on climatic conditions, crop growth stages, key weather parameters and natural enemies of a pest at a particular time. The interactions between pest activity with biotic and abiotic factors help in deriving predicative models that in turn forecast the pest incidence (Mrig and Singh, 1985; Dalwadi *et al*., 2007 and Godwal, 2010) [8, 1, 3].

Material and Methods
The experiment was laid out in Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu, Chatha. The trial on cluster bean variety PNB-181 raised in two plots of $10\times10m^2$, at Entomology experimental field of SKUAST-J, Chatha and the experiment was laid out in RBD (randomizes block design). During experiment seasonal abundance of major insect pests of the crop was recorded, during this period of recording data, fifteen plants were selected and tagged randomly and the data was recorded from three leaves i.e. one from twig, one from middle canopy and another from lower plant canopy by counting the whitefly

number. The weekly mean population of whitefly was recorded and correlated with the weather parameters. Than to check the bioefficacy of eco-friendly newer insecticides against whitefly were checked, for this the field was raised in Randomized Block Design consist of eight plots with one control with plot size 3x2.5 m. The crop was sprayed twice at 15 days interval. There were 9 treatments including control, *viz*., neem oil, pongamia oil, spinosad, *Beauvaria bassiana*, *Metarrhizium anisopliae*, Novaluron, *Bacillus thuringiensis* and garlic oil, and were replicated thrice. For recording the observations five plants were selected randomly from each plot. The observation on whitefly was recorded from three leaves (i.e.) one from twig, one from middle and one from lower plant canopy. Population of whitefly was counted before spray and after 1, 3, 7 and 14 days of spray.

Result and Discussion

Seasonal incidence of whitefly, *Bemisia tabaci* (Genn.) on Cluster-bean

The whitefly population was recorded and it was concluded that the population of whitefly increased from 13th (2.93 whitefly leaf^{-1}) to 21st standard week (74.53 whitefly leaf $^{-1}$) and the peak value was observed in 21st standard week (74.53 whitefly leaf^{-1}) when mean maximum and minimum temperature, mean relative humidity (morning and evening) and rain fall were 41.8 and 20.9^{0}C, 48.9 and 18.2 per cent and 0.0 mm, respectively. Thereafter, whitefly population decreased and reached to 16.53 whitefly per leaf during 24th standard week when mean maximum, minimum temperature, mean relative humidity (morning and evening) and rainfall were 39.4 and 23.8^{0}C, 58.00 and 28.9 per cent and 1.0 mm, respectively. The correlation matrix between seasonal incidence of whitefly and weather factors revealed that mean maximum and minimum temperature had positive effect on whitefly population with 'r' values (r = 0.82 and r = 0.66). On the other hand mean relative humidity (morning and evening) and rainfall had negative effect on the whitefly population with 'r' values (r = -0.55, r = -0.75 and r = -0.44), respectively.

The findings of the experiment are in conformity with that of Mehra *et al.* (2017) [7] and Thriveni (2019) [6]. They reported that maximum and minimum temperatures favor the whitefly population. On the other hand, our results contradict with Dhatonde *et al*., 2014 [2]; Jadhao *et al.*, 2015 [4] and Jha *et al*., 2017 [5] they observed that temperature was negatively correlated with white fly population. This may be due to weather variability and geographical differences.

Efficacy of different treatments on the population of whitefly, *Bemisia tabaci* (Genn.) on Cluster-bean

The pre-treatment population of whitefly ranged from 9.67 to 10.47 per leaf in different plots. After fourteen days of second spray, the best effect was given by Novaluron with reduced the whitefly population by 50.80 per cent which is at par with spinosad 49.53 per cent treated plots. This was followed by the treatment of Metarrhizium in different plots, causing a reduction of 46.73 per cent whitefly population. Application of Beauvaria resulted in 11.43 per cent reduction while in case of neem oil 8.00 per cent reduction application of Bt resulted in 6.40 per cent reduction which is at par with pongamia oil causing a suppression of 5.87 per cent over control. Garlic oil was least effective and at par with pongamia oil after fourteen days of second spray and gave a reduction of 4.87 per cent in whitefly population.

The findings of the experiment are in conformity with the results of Gayathri and Geetha (2019) [9], they reported that spinosad effectively manage the white fly population upto 14 days after second spray by reducing whitefly population up to 63.54 per cent. On the other hand Yadav *et al.* (2015) [10] reported that Metarrhizium may manage white population up to 14 days by reducing the whitefly population 47.10 per cent which is in conformity with our results.

Table 1: Correlation between seasonal population incidence of whitefly, *Bemisia tabaci* (Genn.) and abiotic factors

Insect pest	Temperature (^{0}C)		Relative humidity (%)		Rainfall (mm)
	Maximum	Minimum	Morning	Evening	
Whitefly, *Bemisia tabaci* (Genn.)	0.82**	0.66**	-0.55**	-0.72**	-0.44*

** Significant at the 0.01 level, * Significant at the 0.05 level

Table 2: Regression equations and co-efficient of multiple determination (R^2) of whitefly, *Bemisia tabaci* (Genn.) in relation to abiotic factors

Regression linear equations of whitefly	Multiple correlation (R)	Co-efficient of determination (R^2)	F-value (P-value)
$Y = 66.59 + 3.37X_1 – 3.19X_2 – 2.34X_3 + 1.60X_4 – 0.12X_5)$	0.84	0.70	4.25

Where, Y= Mean number of aphid population / leaf, X_1=Maximum temperature, X_2=Minimum temperature, X_3= RH morning, X_4= RH evening, X_5= Rainfall (mm)

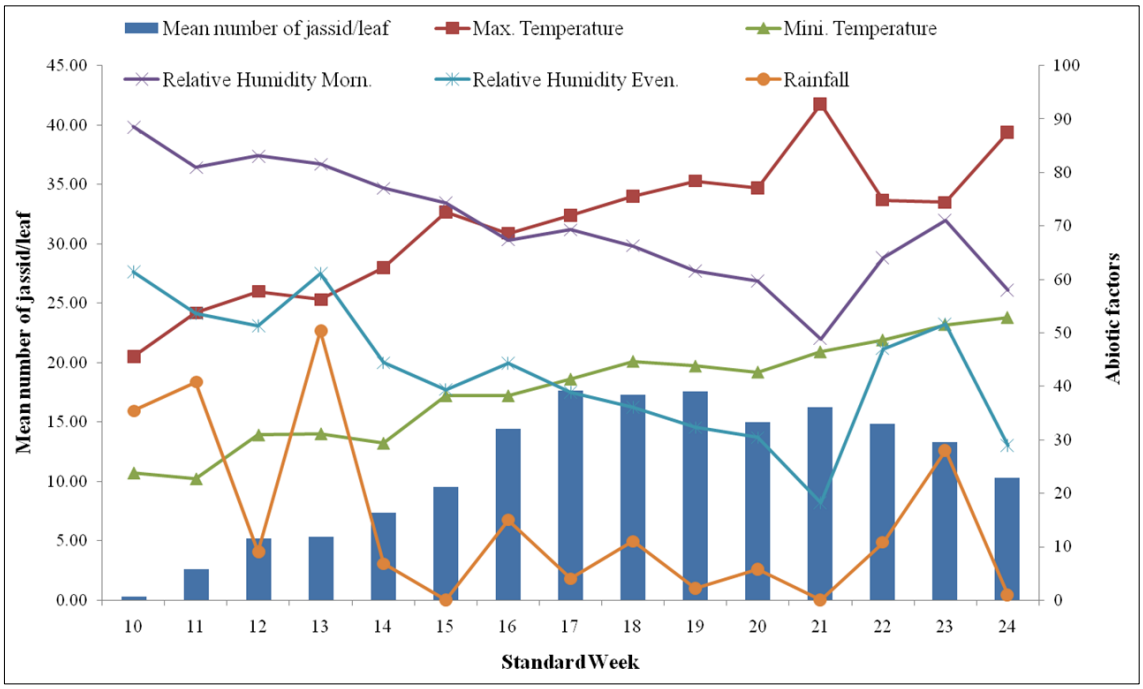

Fig 1: Seasonal population fluctuation of whitefly on cluster bean in relation to abiotic factors

Table 3: Evaluation of field bio-efficacy of botanical / insecticide against whitefly, *Bemisia tabaci* (Genn.) during 2020

S. No.	Pesticide(s)	1DBS	First spray				Second spray			
			Per cent reduction of whitefly population				Per cent reduction of whitefly population			
			1 DAS	3 DAS	7 DAS	14 DAS	1 DAS	3 DAS	7 DAS	14 DAS
1.	Neem oil	10.40	23.47 (28.96)*	31.80 (34.31)	40.40 (39.45)	7.80 (16.17)	22.67 (28.41)	32.47 (34.71)	39.60 (38.98)	8.00 (16.37)
2.	Garlic oil	9.73	6.47 (14.70)	12.73 (20.88)	12.33 (20.51)	4.53 (12.27)	6.07 (14.25)	12.00 (20.25)	11.80 (20.06)	4.87 (12.69)
3.	Pongamia oil	10.47	18.23 (25.27)	26.50 (30.96)	35.87 (36.77)	5.20 (13.10)	17.53 (24.74)	27.27 (31.46)	36.53 (37.17)	5.87 (13.97)
4.	Novaluron	9.67	60.47 (51.03)	70.40 (57.02)	60.40 (50.99)	50.67 (45.36)	61.13 (51.41)	70.87 (57.31)	60.93 (51.30)	50.80 (45.44)
5.	*Bacillus thuringiensis*	10.07	5.20 (13.14)	17.40 (24.64)	34.33 (35.85)	6.87 (15.17)	5.67 (13.71)	16.23 (23.74)	33.00 (35.04)	6.40 (14.65)
6.	*Beauvaria bassiana*	9.77	9.30 (17.73)	31.33 (34.02)	26.97 (31.27)	12.13 (20.38)	9.97 (18.39)	30.67 (33.61)	27.60 (31.68)	11.43 (19.74)
7.	*Metarrhizium anisopliae*	9.73	9.00 (17.43)	22.37 (28.20)	53.13 (46.78)	47.47 (43.53)	9.67 (18.08)	23.37 (28.89)	52.73 (46.55)	46.73 (43.11)
8.	Spinosad	10.27	13.93 (21.89)	48.13 (43.91)	73.53 (59.02)	49.00 (44.41)	14.57 (22.40)	48.83 (44.31)	74.33 (59.54)	49.53 (44.72)
9.	Control (water spray)	9.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S.Em ±		0.551	0.58	0.59	0.66	0.61	0.66	0.41	0.63	0.64
CD at 5%		N.S.	1.80	1.81	2.02	1.89	2.04	1.27	1.94	1.97

N. S. = Non-Significant; DBS=Days before Spray, DAS=Days after spray, * Figures in parenthesis angular transformed values

Conclusion

Cluster bean is a leguminous vegetable crop and is prone to the attack of a large magnitude of insect pests. Among several insect pests, whitefly has been recorded as the major insect pests causing economic damage to the cluster bean. Weather parameters play a crucial role in the insect-pest attack this requires the development of sustainable management strategy. The correlation studies showed that maximum temperature had a positive and highly significant impact on bean whitefly whereas, relative humidity and rainfall showed the significant negative correlation. The bio-efficacy of botanicals, microbial insecticides, insect growth regulator and chemical insecticide against bean whitefly, showed that after two sprays Novaluron 10 EC was found to be the best treatment in reducing 50.80 per cent on cluster bean followed by spinosad 45 EC 49.53 per cent and *Metarrhizium anisopliae* 46.73 per cent, respectively.

References

1. Dalwadi MM, Korat DM, Tank BD. Population dynamics of major insect-pests of Indian bean in relation to weather parameters. Research of Crops. 2007;8(3):672-677.
2. Dhatonde JA, Pandya HV. Sesonal abudance of Jassid and whitefly on brinjal (*Solanum melonngena* L.) in relation to major abiotic factors. International Journal of Plant Protection. 2014;7(1):257-259.
3. Godwal B. Population dynamics and varietal preferance of aphid, *Aphis craccivora* (Koch) on Indian bean. Thesis submitted to S.K. Rajasthan Agricultural University, Bikaner. 2010.
4. Jadhao SM, Shetgar SS, Bhamare VK. Population dynamics of sucking insect-pests infesting sunflower and its relationship with weather parameters. Annals of Plant and Soil Research. 2015;17:486-488.
5. Kumari Jha, Sudeepa, Kumar Manoj. Effect of weather parameters on incidence of whitefly, *Bemisia tabaci* (Gennadius) on tomato. Journal of Entomology and Zoology Studies. 2017;5(6):304-306.
6. Thriveni KP. Correlation of Whitefly population with weather parameters and management of leaf curl of chilli. Journal of Pharmacognosy and Phytochemistry. 2019;8(3):4624-4628.
7. Mehra Swati, Rolania Krishna. Seasonal abundance of whitefly (*Bemisia tabaci*, Gennadius) on *Bt* cotton in relation to meteorological parameters under Haryana condition. International Journal of Agricultural Sciences.

2017;5(9):3759-3762.
8. Mrig KK, Singh R. Incidence of insect-pests on garden bean, Dolichos lablab Linn. Bulletin of Entomology. 1985;26(1):5-7.
9. Gayathri S, Geetha B. Evaluation of Biorational Pesticides against Sucking Insect Pests of Brinjal (*Solanum melongena*). International Journal of Current Microbiology and Applied Sciences. 2019;8(6):2319-7706.
10. Yadav SR, Kumawat KC, Khinchi SK. Efficacy of new insecticide molecules and bioagents against sucking insect pests of cluster bean, *Cyamopsis tetragonoloba* (Linn.) Taub. Legume Research. 2015;38(3):407-410.