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Population dynamics of Jassid on mungbean (*Vigna radiata* (L.) Wilczek) throughout the summer of 2018

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Abstract
The investigation was conducted at the Research Farm of Birsa Agricultural University in Kanke, Ranchi during the summer of 2018. The population of jassids began in the 5th week after sowing, specifically during the 16th standard meteorological week of April 2018. It increased steadily each week, peaking at the 10th week after sowing with 3.0 jassids per cage. This peak coincided with maximum temperatures (39.0 °C), minimum temperatures (22.7 °C), maximum relative humidity (85.6%), minimum relative humidity (45.0%), and rainfall (4.3mm). Subsequently, the Jassid population gradually declined and became negligible by the time of harvest. Correlation coefficient analysis indicated a positive and significant correlation with maximum and minimum temperatures, while relative humidity and rainfall did not show significant correlations.

Keywords: Jassid, Mung bean, Population dynamics, seasonal abundance, *Vigna radiate*

Introduction
Green gram, or mungbean (*Vigna radiata* (L.) Wilczek), holds the distinction of being India's 3rd most significant pulse or leguminous crop after chickpea and pigeon pea (Ved *et al*., 2008) [10]. Believed to originate from India and central Asia, mung bean cultivation traces back to prehistoric times in the Indian subcontinent. Referred to by various names such as mung, mungo, moong, green gram and golden gram (Chhabra and Kooner, 1998) [2], this legume offers a nutritious blend of protein, fiber, and an array of vitamins and minerals. Notably, mung beans play a pivotal role in enhancing soil fertility by fixing atmospheric nitrogen (Hafeez *et al*., 1988) [3]. Following chickpea, mung bean is often considered a staple among lower-income groups due to its protein-rich nature, fulfilling a significant portion of their dietary protein requirements (Shafique *et al*., 2009) [8]. Mung beans are grown in many different nations, mostly in Asia's tropical and subtropical zones. Key mung bean-producing nations worldwide include India, Burma, China, the Philippines, Pakistan & Bangladesh.
India leads the world in pulse production, however average productivity is still poor because of biotic and abiotic variables. This study is to examine the effects of climatic variables on jassid infestation and stability in mung bean crops, including rainfall (mm), temperature (°C), and relative humidity (%). As such, efforts have been undertaken to clarify the relationships between the dynamics of the jassid population and these abiotic variables, providing important information for formulating management plans to counteract them.

Materials and Methods
An experimental plot study was carried out during the summer crop season of 2018 at the research farm of Birsa Agricultural University, Kanke, Ranchi (Jharkhand), to look into the population dynamics of the Jassid, a significant insect pest of mung beans, in connection to abiotic factors. The test variety, mung beans of genotype SML 668, was planted in 10 × 10 m plots during the third week of March, with a 30 cm x 10 cm gap between rows and plants. All other agronomic operations were carried out in accordance with scientific recommendations, and the experiment was reproduced three times using a randomised block design (RBD).
Weekly weather reports were gathered from the university's agro-meteorological observatory. Insecticide spraying was not applied to the crop during the cropping season; it was sowed on March 20th, 2018.

Weekly counts of the Jassid population were made using the split cage (Kooner cage) method, and the results were correlated with meteorological data. A wooden frame measuring 60 cm in height and 45 cm in diameter is used in the split cage (Kooner cage) method. It is coated in black cloth on all sides except the one where a rectangle glass pane measuring 28.5 cm by 58.5 cm is installed. The bottom of the cage is open. To facilitate observation, the cage is opened, encircling the crop plants, and the glass pane side is facing the sun. This allows jassids or whiteflies to gather on the glass, making it simple to count them (Kooner and Cheema, 2007) [5]. It was then determined what the Jassid mean population was.

Results and Discussion

An insect with a thin body that can feed on plant sap is equipped with sucking and piercing mouthparts. Both nymphs and adults exhibit sap-sucking behavior, injecting a toxin that leads to yellowing of leaves or the formation of yellow patches along the leaf margins. This is followed by vein distortion, leaf curling, and eventual burn-off (death) starting from the tips. These symptoms are referred to as hopper burn. The results on population dynamics of jassid showed that the population of jassid started before the flowering stage and continue till harvesting stage of mung bean crop. The number of jassid population varied from 0.6 to 3.0 per cage and was commenced in the field from 16th standard meteorological week and continued up to 22nd standard meteorological week. The 21st standard meteorological week had the greatest number of jassid 3.0/cage, followed by 2.3, 2.0, and 2.0 in the 20th, 19th, and 22nd standard meteorological weeks, in that order. The correlation coefficients between jassids and weather parameters are presented in the table. The data indicate that the jassid population exhibited a significant positive correlation with maximum temperature (r = 0.773*) and minimum temperature (r = 0.813*), influencing the population, while relative humidity and rainfall did not show any significant correlation with the jassid population. It can be concluded that the jassid population is highest with an increase in temperature (°C), while the other weather variables do not influence the population of jassid.

These results were consistent with the findings of Mahmood *et al*. (2002) [7]. Jamshaid *et al.* (2010) [4] observed a significant and positive correlation between temperature and the jassid population, while the other weather factors were found to be ineffective on the jassid population. Bairwa and Singh (2017) [1], along with Kumar *et al*. (2016) [6], also reported that morning and evening relative humidity (R.H.) and rainfall had a non-significant correlation with the jassid population. When Singh and Yadav (2013) [9] looked at the seasonal abundance of pest insects on mung beans, they found that the average number of jassids per cage ranged from 0.4 to 5.8.

Table 1: Population dynamics of jassid on mungbean throughout the summer of 2018

Observation date	WAS	SMW	Jassid/cage	Meteorological variables				
				Temperature (°C)		Relative humidity (%)		Rainfall
				Max.	Min.	Max.	Min.	(mm)
March 20, 2018	01	12th	0.0	31.70	16.20	85.70	33.70	0.00
March 27, 2018	02	13th	0.0	34.20	15.70	84.90	36.30	0.00
April 03, 2018	03	14th	0.0	29.10	14.10	85.60	36.00	8.50
April 10, 2018	04	15th	0.0	29.20	15.50	86.30	37.70	18.60
April 17, 2018	05	16th	0.6	35.20	19.70	84.10	35.40	0.00
April 24, 2018	06	17th	1.7	37.40	21.10	85.40	39.00	0.00
May 01, 2018	07	18th	1.7	33.90	20.20	85.00	41.40	17.40
May 08, 2018	08	19th	2.0	39.00	22.70	84.70	40.90	5.30
May 15, 2018	09	20th	2.3	37.60	22.90	84.40	39.70	0.00
May 22, 2018	10	21st	3.0	39.00	22.70	85.60	45.00	4.30
May 29, 2018	11	22nd	2.0	35.30	21.60	86.90	36.90	59.60
June 05, 2018	12	23rd	0.0	35.70	21.80	86.00	58.40	32.40
Correlation coefficient with the mean jassid population (r)				0.773*	0.813*	-0.169^{NS}	0.065^{NS}	0.054^{NS}

SMW: Standard Meteorological Week
WAS: Week after Sowing
* Demonstrate the significance of the value at P=0.05

Conclusion

The abiotic variables that affected the variation in the jassid population infestation on mung beans were temperature (Temp. °C), relative humidity (RH %), and rainfall (mm). The average number of jassids per cage exhibited a substantial positive link with both maximum and minimum temperatures in correlation experiments, but no significant correlation was found with the other weather variables.

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