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Effect of Weather Parameters on Population Dynamics of Bihar Hairy Caterpillar [Spilarctia (*Spilosoma) obliqua* Walker] in Mungbean [*Vigna radiata* (L.) Wilczek]

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

The present investigation revealed that Bihar hairy caterpillar was first recorded during 32nd standard week (1.92 larvae/plant) which reached to its maximum during 41st standard week (11.93 larvae/plant) and there after gradually decreased up to 1.33 larvae/plant during 44th standard week. The maximum temperature showed non-significant positive correlation, minimum temperature and relative humidity showed non-significant negative correlation while rain fall showed significant negative correlation with the population buildup of Bihar hairy caterpillar.

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1. INTRODUCTION

Pulses are third important group of crops in Indian agriculture after cereals and oilseeds. Pulses are an ideal component of human diet as they are rich source of proteins. Pulses are the cheap and best source of protein constituting about 27 percent of total dietary protein in our country. In poor income countries, pulses contributed about 10 per cent of the daily protein and about 5.0 per cent of the energy requirements in human diets. They maintain soil fertility through biological nitrogen fixation from environment by bacteria as *Rhizobium spp*. is prevalent in their root nodules. Pulses fulfill an important constituent of feeding ration of live stocks in the form of hay, silage, green fodder concentrate and other by-products. Besides all these, pulses also provide fuel, wood and construction materials. Pulses, the food legumes, have been grown by farmers since millennia providing nutritionally balanced food to the people of India [1] and many other countries in the world. The major pulse crops that have been domesticated and are under cultivation include black gram, chickpea, cowpea, faba bean, grass pea, mungbean, horse gram, lablab bean, lentil, moth bean, pea and pigeon pea. Mungbean is the third most important pulse crop of India after chickpea and pigeonpea [2]. Green gram in the cereal cropping system has the potential to increase farm income, improve human health and soil fertility as well as to promote long term sustainability of agriculture [3]. The nutritive value of mungbean is high and easily digestible protein with approximately protein 25-28%, oil 1.0-1.5%, fibre 3.5-4.5%, ash 4.5-5.5%, carbohydrate 62-65%, water 9.1%, and vitamins on dry weight basis [2]. Being an important short-duration *Kharif* grain legume, mungbean is grown extensively in major tropical and sub-tropical countries of the world [4]. In India, pulses are grown over an area of 29.28 m ha with a production and productivity of about 22.40 m tonnes and 765 kg/ ha, respectively [5]. This covers about 20 % of total area and 8 % of total grain production in India. These are the cheapest and best sources of vegetable proteins consisting of about 27 per cent of total dietary protein in our country. India has largest area and production of pulses in the world. The area under mungbean cultivation in India is about 3.83 m ha with production of 1.60 m tonnes, and productivity 418 kg per ha. In Uttar Pradesh, green gram is being cultivated on 97000 hectares that produce 44000 tonnes with an average productivity of 454 kg/hectare [6].

Incidence of insect-pests are main constrains. Pest play major role in low production in green gram in India.

In India, quantitative avoidable losses (7-35%) caused by insect pest complex, both in mungbean and urdbean vary with different agro-climatic conditions [7]. The annual yield loss due to the insect pests has been estimated at about 30 per cent in mungbean and urd bean. Duraimurugan et al. [8] reported that the avoidable losses due to pest complex on mungbean ranged from 27.03 to 38.06% with an average of 32.97%.

Among them, Bihar hairy caterpillar is a serious pest in Bihar, Uttar Pradesh, Punjab, Madhya Pradesh, Manipur and some other states. It is a known fact that Bihar hairy caterpillar showed certain levels of behavioral resistance to different class of insecticides, hence successful control of this pest is to some extent difficult.

The Bihar hairy caterpillar, (*Spilosoma obliqua* Walker) is considered as a dominant polyphagous pest of various crops including soybean, pulses, oilseeds, legumes etc [9]. This pest has been recorded in India, Pakistan, Sri Lanka, eastern Asia, Borneo, China and Japan [10].

2. MATERIALS AND METHODS

The field experiments entitled “Studies on population dynamics of Bihar hairy caterpillar [*Spilarctia (Spilosoma) obliqua* Walker] in Mungbean (*Vigna radiata* (L.) Wilczek)” were conducted at Students’ Instructional Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya at a distance of 42 km from Ayodhya district head quarter on Ayodhya-Rai Bareilly Road. (U.P.) during *Kharif* -2018.

The experimental site falls under subtropical climatic zone of Indo-Gangetic plains and situated at 26.470 N latitude and 82.120 E longitudes at an altitude of 113 meters from mean sea level.

Table 1. Weekly meteorological data during the crop season Kharif, 2018

Months	SW	Temperature ^{0}C		RH %	Rainfall (mm)
		Min.	Max.		
August	31	25.00	28.30	92.60	147.80
	32	26.50	32.60	79.60	9.60
	33	26.20	33.00	78.80	55.40
	34	25.50	32.70	86.00	123.00
September	35	26.00	31.80	87.60	66.00
	36	25.70	31.40	84.60	48.00
	37	25.00	32.40	80.30	27.20
	38	24.00	32.40	77.70	1.60
	39	23.90	33.40	75.40	0.00
October	40	21.60	34.30	71.40	0.00
	41	21.00	32.60	72.50	0.00
	42	17.50	33.50	65.50	0.00
	43	15.30	32.10	70.70	0.00
November	44	15.50	21.80	69.60	0.00

Source: *Department of Agro meteorology, College of Agriculture, NDUA&T Kumarganj, Ayodhy*

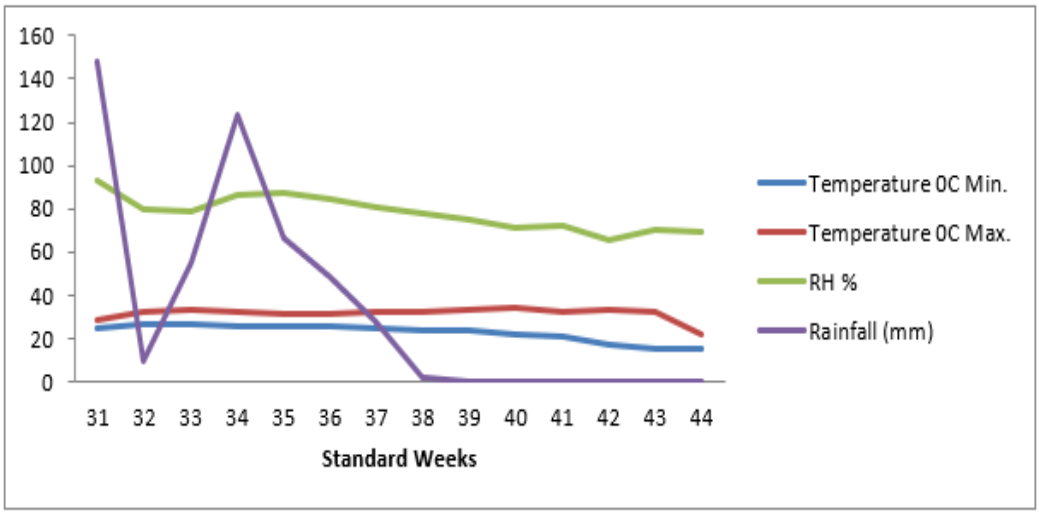

Fig. 1. Temperature variation during the crop season

2.1 Layout Plan

The mungbean variety NDM-1 The crop was shown on 21th July 2018 and harvested 10th November 2018. All the recommended agronomical practices were used to grow a good crop. The experiment was laid out in Randomized Block Design with 7 treatment and 3 replications. The seed were sown at spacing of 30×10 cm2.

2.2 Observation

Bihar hairy caterpillar population was recorded on five randomly selected plants at each location at weekly interval starting with 20 “Days After Showing” (DAS) on 3 farmers’ fields in terms of (egg mass/ plant or no. of larvae/plant). Weekly meteorological data during crop period was collected from agro meteorological observatory of the university. Correlation between Bihar hairy caterpillar population and abiotic factors was worked out.

Reduction percent = (Initial population - Reduced population) / (Initial population) *100

3. RESULTS AND DISCUSSION

The results obtained have been presented in tables and illustrated graphically wherever necessary.
Work on different aspects of proposed technical programme has yielded following results-

3.1 Population of Bihar Hairy Caterpillar (*S. obliqua*)

The Bihar hairy caterpillar population was recorded for the first time during 32nd standard week at a minimum temperature of 26.50^0 C, maximum temperature of 32.60^0 C, relative humidity 79.60 per cent and 9.60 mm rainfall in villages Sidhauna , Jorium and Pithla. The population of Bihar hairy caterpillar showed increasing trend and reached to maximum population of 11.93 larvae/ plant during 41th standard week at a minimum temperature 21.00^0 C, maximum temperature 32.60^0 C, relative humidity 72.50 per cent and rainfall 00.0 mm. Thereafter decline population was recorded during 42th & 43th standard weeks. Young larvae fed gregariously on under surface of the leaves. (Table-2).

The present finding is in accordance with the finding of Upadhyay and Nikhare [11] who observed *S. obliqua* as *Kharif* pest attacking crops like black gram, green gram in different parts of India and also revealed that infestation was first observed in mid- July on black gram and sesame, remained low during August and again build up in September.

The present finding is also supported by the finding of Hussain and Begum [12], Gupta and Bhattacharya (2008) found the Bihar hairy caterpillar as a serious pest in Bihar, Uttar Pradesh, Punjab, Madhya Pradesh, Manipur and some other states. The third and onward instars larvae cause serious damages and significant reduction in yield.

To know the effect of abiotic factors on insect-pest, simple correlation analysis was carried out. The results of the analysis have been presented in (Table-3) and details have been given as under.

The maximum temperature showed non-significant positive correlation, minimum temperature and relative humidity showed non-significant negative correlation while rain fall showed significant negative correlation with the population of Bihar hairy caterpillar. The influence of different weather parameters on the population dynamics of *S. obliqua,* the maximum temperature showed non-significant positive correlation, minimum temperature and relative humidity showed non-significant negative correlation while rain fall showed significant negative correlation with the population of Bihar hairy caterpillar.

Table 2. Population dynamics of bihar hairy caterpillar on mungbean crop during *kharif* 2018

Months	S. W	Population of Bihar hairy caterpillar per plant	Temp. Min. ºC	Temp. Max. ºC	RH %	Rainfall (mm)
August	31	0	25.00	28.30	92.60	147.80
	32	1.92	26.50	32.60	79.60	9.60
	33	1.12	26.20	33.00	78.80	55.40
	34	0	25.50	32.70	86.00	123.00
September	35	2.22	26.00	31.80	87.60	66.00
	36	3.66	25.70	31.40	84.60	48.00
	37	4.00	25.00	32.40	80.30	27.20
	38	3.76	24.00	32.40	77.70	1.60
	39	11.33	23.90	33.40	75.40	0.00
October	40	11.13	21.60	34.30	71.40	0.00
	41	11.93	21.00	32.60	72.50	0.00
	42	3.36	17.50	33.50	65.50	0.00
	43	1.70	15.30	32.10	70.70	0.00
November	44	1.33	15.50	21.80	69.60	0.00

Source: Department of Agro meteorology, College of Agriculture, NDUA&T Kumarganj, Ayodhy

Table 3. Correlation coefficient between insect and meteorological parameters

S. No.	Insect	Max. Tem.	Min. Tem.	R. H. (%)	Rain fall
1	*Spilosoma obliqua*	0.389 NS	-0.086 NS	-0.421 NS	-0.543*

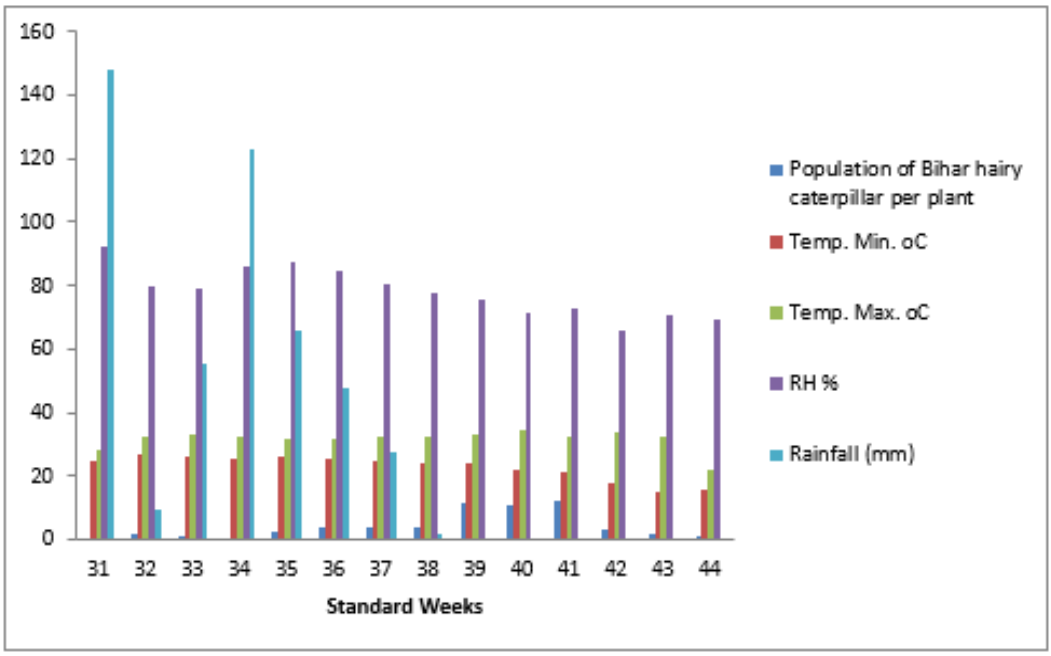

Fig. 2. Population dynamics during *Kharif season*

The present findings are in contrary with the findings of Faleiro et al. [13] who found that the pest abundance negatively correlated with maximum temperature.

Present findings are in contrary with the findings of Kumar et al. [14] who found that the population of *S. oblique* was negatively correlated with rain fall, minimum temperature and relative humidity while maximum temperature showed non-significant positive correlation.

The present findings are in contrary with the findings Chandra et al. (2010) who reported that the population of Bihar hairy caterpillar found negatively correlated with minimum and maximum temperature and positively correlated with relative humidity and rainfall

The present finding is also accordance with the findings of Yadav et al. [15] who found significant negative correlation of *S. obliqua* with the rainfall.

The present investigations are in partial agreement with the findings of Mohapatra et al. [16,17] who reported the temperature (maximum & minimum) and rain fall showing non-significant positive correlation while relative humidity showed non-significant negative correlation with the population of Bihar hairy caterpillar [18].

4. CONCLUSION

On the basis of result obtained it was conducted that:

Incidence of Bihar hairy caterpillar on mung bean crop started during 32nd standard week and reached in maximum during 41th standard week.

Correlation of Bihar hairy caterpillar population with abiotic factors showed maximum temperature non-significant positive correlation, whereas minimum temperature and relative humidity showed non-significant negative correlation while rain fall showed significant negative correlation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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