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Incidence of chewing pests in okra in north eastern hill region of India

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ABSTRACT

An experiment was conducted to study the incidence of chewing insect pest populations in okra ecosystem in north eastern hill region of India. The results revealed that a peak population of *Nodostoma* spp. was noticed during July (56.46 per 5 plants). Maximum relative humidity had a significant positive correlation with *Nodostoma* spp. (r = 0.672*). When there was an abrupt fall in minimum and maximum relative humidity coupled with increase in maximum and minimum temperature, a build-up in *Nodostoma* spp. population was recorded. A peak population of *Mylabris pustulata* recorded during July (3.81 per 5 plants). The highest population build-up of *M. pustulata* was observed an increase in minimum and maximum temperature and a decrease in minimum and maximum relative humidity. The highest population of *Alcidodes affaber* was observed during July (2.57 per 5 plants). A peak population of *A. affaber* was recorded as soon as maximum and minimum temperatures crossed 24 and 32°C, respectively and minimum and maximum relative humidity was below 80 and 95%, respectively. Correlation between chewing pests indicated that *Nodostoma* spp. recorded positive significant correlation with *M. pustulata* (r = 0.285) and *A. affaber* (r = 0.533). Similarly, *M. pustulata* showed strong positive significant correlation with *A. affaber* (r = 0.581).

Key words: Okra, *Nodostoma* spp., *Mylabris pustulata*, *Alcidodes affaber*, weather parameters.

INTRODUCTION

Okra, *Abelmoschus esculentus* (L.) Moench is one of the important vegetables of India. It is grown throughout the tropical and sub-tropical regions and also in the warmer parts of the temperate regions. The nutritional value of edible okra is characterized protein, fat, carbohydrate, minerals and fibres. Okra has a good potential as a foreign exchange crop and accounts for 60% of the export of fresh vegetables. It is cultivated in 0.349 M ha area with the production of 3.344 M mt and productivity of 9.6 mt/ ha (NHB, 8). The crop is also used in paper industry as well as for the extraction of fibre.

The pest problem is the main limiting factor in vegetable production, which causes more than 40% yield loss (Ambegaonkar and Bilapate, 1; Boopathi *et al*., 3). Okra is attacked by many insect pests (Echezona *et al*., 6; Munthali and Tshegofatso, 7; Pal *et al*., 9). Climate conditions largely influence the pest number and activity as well as several parasites and predators either directly or indirectly (Arif *et al*., 2). For developing weather-based pest forewarning system, information regarding population dynamics in relation to prevalent meteorological parameters (temperature, relative humidity, rainfall, etc.) is needed (Boopathi *et al*., 4). Moreover, the same meteorological parameters also influence the growth and development of crop. Therefore, a thorough understanding of interaction between crop growth stage and meteorological parameters/ pest dynamics is pre-requisite for weather-based pest forecasting model. Hence, the present study was undertaken to know the relationship between weather parameters and chewing pests in okra ecosystem in north eastern hill region of India.

MATERIALS AND METHODS

The field experiments were conducted during rainy season (2009 and 2010) at the experimental farm, ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib, Mizoram. Six okra cultivars (Crystel Seed, Green Challenger, Julie, Nisha, P. Kranti and OH-597) were sown during April. The net plot size was 4 m × 5 m with spacing of 30 cm × 60 cm plant to plant and row to row, respectively in Randomized Completely Block Design (RCBD) with four replications. All the recommended agricultural practices were followed in raising the crop (TNAU, 10). No plant protection measure was taken throughout the crop season. *Nodostoma* spp. and *M. pustulata* were recorded as the number of insects per plant, while, *A. affaber* recorded the number of infested plant on each of these selected or tagged plants at weekly intervals starting from second week of May to first week of August. The weather data with respect to maximum and minimum temperature, maximum and minimum relative humidity and rainfall were also recorded for the corresponding standard meteorological week. Simple

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correlations were worked out between chewing pests and between meteorological parameters and chewing pests' population. Multiple regressions of chewing pests with meteorological parameters were worked out and calculated to the predicted chewing pests of okra using their weekly mean incidence following IRRISTAT software.

RESULTS AND DISCUSSION

The mean data on *Nodostoma* spp. activity is given in Table 1 for the two crop seasons. The activity of *Nodostoma* spp. started from 20th standard meteorological week (SMW). A peak population was recorded during last week of June (18.64 per 5 plants) and third week of July (20.00 per 5 plants). Similarly, Boopathi *et al*. (5) reported that *Nodostoma* was active from the second week of May to first week of August with a peak level of population during third week of July (3.68 per plant). Munthali and Tshegofatso (7) reported that the pod damage caused by *Podagrica uniforma* (Jac.) was about 23% per plant. The correlation of *Nodostoma* spp. population was positive significant correlation with maximum relative humidity (r = 0.672*) (Table 2), while, minimum and maximum temperature, minimum relative humidity and rainfall had positive non-significant correlation. The above results are in conformity with the findings of Boopathi *et al*. (5) who reported that temperature had a positive correlation with flea beetle in okra. However, Pal *et al*. (9) observed that abiotic factors had negative correlation with mean insect population of flea beetle, *P. uniforma*. During the crop season when there was abrupt fall in minimum and maximum relative humidity coupled with increase in maximum and minimum temperature, a build-up in *Nodostoma* spp. population was recorded (Table 1; Fig. 1).

The activity of *M. pustulata* commenced from 29th SMW (Table 1). A peak population of *M. pustulata* was recorded during July (3.81 per 5 plants). Similarly, Boopathi *et al*. (5) reported that the abundance of *M. pustulata* started to appear from second week of July and a peak population was recorded during July month (1.01 per plant). The correlation of *M. pustulata* population was positive with minimum temperature (r = 0.162), maximum relative humidity (r = 0.427), minimum relative humidity (r = 0.393) and rainfall (r = 0.523), but was negative with maximum temperature (r = -0.262) (Table 2). Similar results were also reported by Boopathi *et al*. (5) who observed positive correlation between population of *M. pustulata* and temperature and relative humidity. The peak in the *M. pustulata* population was recorded during rainy season where from 28th to 32nd SMW and a peak population build-up of *M. pustulata* was observed an increase in minimum and maximum temperature

Table 1. Relative abundance of chewing pests on okra ecosystem and weather parameters (weekly chewing pests' incidence).

Date of observation	SMW	No. per 5 plants						Weather parameter				
		Nodostoma spp.		*Mylabris pustulata*		*Alcidodes affaber*		Temp. (°C)		Relative humidity (%)		Rainfall (mm)
		Observed value	Predicted value	Observed value	Predicted value	Observed value	Predicted value	Max.	Min.	Max.	Min.	
15th May	20	1.92	-0.26	0.00	0.08	0.00	0.05	22.5	31.0	54	60	0.0
22nd May	21	1.60	3.11	0.00	0.24	0.00	0.09	20.0	30.0	60	70	12.3
28th May	22	2.26	8.78	0.00	0.63	0.00	0.45	24.0	27.7	75	88	16.0
3rd June	23	2.56	6.17	0.00	-0.04	0.00	-0.06	22.7	30.8	65	70	0.0
10th June	24	2.10	2.10	0.00	0.03	0.00	0.10	23.0	30.2	59	67	0.0
17th June	25	5.46	6.44	0.00	0.21	0.00	0.03	25.1	32.1	62	70	0.0
24th June	26	18.64	17.65	0.00	0.47	0.00	0.18	25.0	33.0	58	96	0.0
30th June	27	11.48	12.00	0.00	0.25	0.00	0.17	22.8	29.3	78	88	10.0
7th July	28	9.63	13.33	0.00	0.30	0.06	0.34	23.8	30.0	60	95	0
15th July	29	11.29	12.17	1.08	1.33	0.33	0.58	23.7	29.2	80	95	34
20th July	30	20.00	11.90	1.48	0.27	0.63	0.02	24.1	32.5	58	81	0
27th July	31	15.54	7.58	1.25	0.67	1.02	0.63	23.0	25.4	84	93	23
3rd August	32	9.65	11.16	1.40	0.79	1.02	0.49	24.2	28.9	70	93	17

SMW = Standard meteorological week

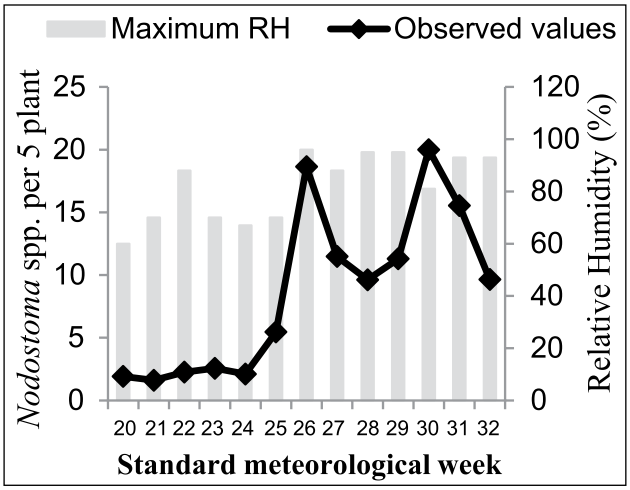

Fig. 1. Relationships between weekly meteorological parameters and *Nodostoma* spp. in okra ecosystem.

and a decrease in minimum and maximum relative humidity (Table 1).

The population of *A. affaber* appeared from 28th SMW (Table 1). The highest population of *A. affaber* was observed during July (2.57 per 5 plants). Boopathi *et al*. (5) reported that the highest per cent infestation was recorded during last week of July, *i.e.*, fifteenth week after sowing and first week of August, *i.e.*, sixteenth week after sowing (20.00%). The correlation of *A. affaber* population was positive with minimum temperature (r = 0.105), minimum relative humidity (r = 0.440), maximum relative humidity (r = 0.443) and rainfall (r = 0.485) (Table 2). These results are in corroboration with the findings of Boopathi *et al*. (5) who reported that *A. affaber* had a positive correlation with temperature. A peak build-up of *A. affaber* was observed from 28th to 32nd SMW, when the maximum and minimum temperature were below 33 and 25°C, respectively; minimum relative humidity and maximum relative humidity was above 58 and 81%, respectively. From 30th SMW, there was an increase in maximum and minimum temperature, decrease in minimum and maximum relative humidity along with heavy rainfall, which led an increased the activity of *A. affaber* (Table 1). *Nodostoma* spp. recorded positive significant correlation with *M. pustulata* (r = 0.285*) and *A. affaber* (r = 0.533**) (Table 3). It signifies that the activity of *Nodostoma* spp. remained uninterrupted even with the increase of *M. pustulata* and *A. affaber* populations. Similarly, *M. pustulata* showed strong positive significant correlation with *A. affaber* (r = 0.581**). It also signifies that the activity of *M. pustulata* remained uninterrupted even with the increase of *A. affaber* population. The incidence of pest population varied greatly during the different crop growth stages. *Nodostoma* spp. occurred mainly at early crop periods after which *M. pustulata* and *A. affaber* were found to infest on reproductive stage of the crop. However, fluctuation of their population was found affected by weather parameters.

Table 2. Correlation between meteorological parameters and chewing pests populations on okra.

Meteorological parameter	Chewing pests		
	Nodostoma spp.	*Mylabris pustulata*	*Alcidodes affaber*
Min. temp. (°C)	0.445ns	0.162ns	0.105ns
Max. temp. (°C)	0.098ns	-0.262ns	-0.448ns
Min. RH (%)	0.196ns	0.393ns	0.440ns
Max. RH (%)	0.672*	0.427ns	0.443ns
Rainfall (mm)	0.124ns	0.523ns	0.485ns

*, **Significant at 5 and 1% levels, ns = non-significant

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Table 3. Correlation coefficient between chewing pests of okra.

Chewing pests of okra	*Nodostoma* spp.	*Mylabris pustulata* (Thunb)	*Alcidodes affaber* Auriv.
Nodostoma spp.	1.000	0.285*	0.533**
Mylabris pustulata (Thunb)		1.000	0.581**
Alcidodes affaber Auriv.			1.000

*, **Significant at 5 and 1% levels, NS = non-significant

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