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Short Note

Relationship Between Weather Factors and Sucking Pests of Okra in Mizoram

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The population dynamics of *Aphis gossypii* (Glover), *Dysdercus koenigii* Fabr. and *Amrasca biguttula biguttula* (Ishida) with respect to meteorological parameters on okra was conducted at the experimental farm, ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib, Mizoram. The results revealed that a decrease in minimum temperature and minimum relative humidity and maximum relative humidity and increase in maximum temperature by 30 to 40% favour the population buildup of *A. gossypii*. Whereas an increase in temperature coupled with dry weather and decreased relative humidity favoured the build-up of *A. biguttula biguttula*. Peak population of *D. koenigii* was recorded as soon as maximum and minimum temperature was below 24 and 32^{0}C, respectively and minimum relative humidity and maximum relative humidity crossed 58 and 81%, respectively.

Key Words: Okra, *Aphis gossypii*, *Amrasca biguttula biguttula*, *Dysdercus koenigii*, Weather parameters

Okra, *Abelmoschus esculentus* (L.) Moench is an important vegetable crop grown throughout the year. It is a native crop of Africa, South East Asia and North Australia to the Pacific (Boswell and Reed, 1962). It is an annual crop of the old tropics and widely cultivated in the tropical and subtropical countries. Okra is a very common and widely consumed vegetable of North Eastern Hill Region of India. The crop is attacked by many insect pests (Ambegaonkar and Bilapate, 1984) and pest problem is the main limiting factor in production, causing more than 40% yield loss.

Climate conditions largely influence the pest number and activity as well as several parasitoids and predators either directly or indirectly (Chaudhari *et al*., 1999 and Arif *et al*., 2006). For developing weather-based pest forewarning system, information regarding population dynamics in relation to prevalent meteorological parameters (temperature, relative humidity, rainfall, etc.) is needed. Moreover, these 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. The present study was undertaken to develop a weather-based forewarning thumb rule model for sucking pests attacking okra.

Materials and Methods

The field experiments were conducted during rainy season of the year 2009 at the experimental farm, ICAR Research Complex for NEH Region, Mizoram Centre, Kolasib, Mizoram. Six okra cultivars namely, Crystel Seed, Green Challenger, Julie, Nisha, Parbhani Kranti and OH-597 were sown on 15th April, 2009. The net plot size was 4x5 m with a spacing of 30x60 cm plant to plant and row to row, respectively in Randomized Block Design with four replications. All the recommended agricultural practices were followed while raising the crop. No active plant protection measure was taken throughout the crop season. The population count of nymphs and adults of *A. gossypii*, *A. biguttula biguttula*, and *D. koenigii* were made from 3 leaves in bottom, middle and upper canopy of 5 plants per plot selected at random 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 correlations were worked out between the number of sucking pests and meteorological parameters and sucking pests' population; multiple regressions of sucking pests with meteorological parameters were worked out using IRRISTAT software for predicting sucking pests of okra using their weekly mean incidence.

Results and Discussion

Correlation between meteorological parameters and sucking pests population

Aphis gossypii: The data on *A. gossypii* activity are furnished in Table 1 for crop season 2009. The activity of *A. gossypii* started from 23rd standard

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Table 1. Seasonal incidence of sucking pests on okra and weather parameters

Date of observation	SMW	Number of insects per 5 plants			Weather parameters				
					Temperature (^{0} C)		Relative humidity (%)		Rainfall (mm)
		Aphis gossypii	*Amrasca biguttula biguttula*	*Dysdercus koenigii*	Maximum (X_1)	Minimum (X_2)	Maximum (X_3)	Minimum (X_4)	(X_5)
15.05.2009	20	0.000	0.000	0.000	31.0	22.5	60	54	0.0
22.05.2009	21	0.000	0.000	0.000	30.0	20.0	70	60	12.3
28.05.2009	22	0.000	0.063	0.000	27.7	24.0	88	75	16.0
03.06.2009	23	24.250	0.125	0.000	30.8	22.7	70	65	0.0
10.06.2009	24	31.958	0.375	0.000	30.2	23.0	67	59	0.0
17.06.2009	25	49.458	0.479	0.000	32.1	25.1	70	62	0.0
24.06.2009	26	26.688	0.125	0.000	33.0	25.0	96	58	0.0
30.06.2009	27	37.625	0.458	0.000	29.3	22.8	88	78	10.0
07.07.2009	28	27.646	0.667	0.000	30.0	23.8	95	60	0.0
15.07.2009	29	28.521	0.063	0.625	29.2	23.7	95	80	34
20.07.2009	30	5.750	0.125	1.896	32.5	24.1	81	58	0.0
27.07.2009	31	0.313	0.063	2.729	25.4	23.0	93	84	23
03.08.2009	32	0.000	0.063	14.375	28.9	24.2	93	70	17

SMW: standard meteorological week, Y : number of sucking pests per 5 plants

meteorological week (SMW). The peak population was recorded during June and July. Satter Shah *et al*. (2009) reported that the peak population of *A. gossypii* was recorded during last week of July. It is clear from Fig 1 that with increase in temperature and decrease in relative humidity favours the population buildup of *A. gossypii*. The correlation of *A. gossypii* population (Table 2) was negative with maximum relative humidity (r = -0.014), minimum relative humidity (r = -0.050) and rainfall (r = -0.276) but was positive with maximum temperature (r = 0.338) and minimum temperature (r = 0.404). The above results are in conformity with the findings of Anitha and Nandihalli (2008).

Table 2. Correlation between weather parameters and sucking pests population during *kharif* 2009

Meteorological parameter	Sucking pests of okra		
	Aphis gossypii	*Amrasca biguttula biguttula*	*Dysdercus koenigii*
Minimum temperature (^{0}C)	0.404ns	0.299ns	0.130ns
Maximum temperature (^{0}C)	0.338ns	0.144ns	-0.223ns
Minimum relative humidity (%)	-0.050ns	-0.130ns	0.197ns
Maximum relative humidity (%)	-0.014ns	0.082ns	0.317ns
Rainfall (mm)	-0.276ns	-0.418ns	0.299ns

ns = non significant

In order to study the combined effect, all the factors considered in the multiple linear regression models irrespective of their degree of contribution. All the abiotic factors jointly had the non-significant impact (F = <1) on *A. gossypii*. The coefficient of determination (R^2) was found to be 0.41 (Table 3). $Y= -307.110 + 2.542 (X_1) + 5.558 (X_2) + 1.880 (X_3) - 0.229 (X_4) - 0.872 (X_5)$ with all abiotic factors considered as full regression model.

Table 3. Multiple regressions of sucking pests with weather parameters

Multiple regression	*A. gossypii*	*A. biguttula biguttula*	*D. koenigii*
R^2	0.41	0.40	0.20
F value	<1	<1	<1
Regression equation	$Y= -307.11 + 2.542 (X_1) + 5.558 (X_2) + 1.880 (X_3) - 0.229 (X_4) - 0.872 (X_5)$	$Y= -0.456 + 0.017 (X_1) - 0.019 (X_2) + 0.009 (X_3) + 0.004 (X_4) - 0.020 (X_5)$	$Y= 16.754 + 0.719 (X_1) - 0.724 (X_2) - 0.256 (X_3) + 0.063 (X_4) + 0.166 (X_5)$

Y : number of sucking pests per 5 plants, minimum temperature (X_1), maximum temperature (X_2), minimum relative humidity (X_3), maximum relative humidity (X_4) and Rainfall (X_5)

Amrasca biguttula biguttula: The data on *A. biguttula biguttula* activity in okra is given in Table 1 for crop season 2009. The activity of *A. biguttula biguttula* commenced from 22nd SMW. It is clear from Table 1 that with decreases in temperature favour the population buildup of *A. biguttula biguttula*. The correlation of *A. biguttula biguttula* population (Table 2) was positive with minimum temperature (r =

0.299), maximum temperature (r = 0.144) and maximum relative humidity (r = 0.082) but was negative with minimum relative humidity (r = -0.130) and rainfall (r = -0.418). Similar results were reported by Aheer *et al*. (2006) which indicates positive correlation between population of *A. biguttula biguttula* and temperature.

In order to study the combined effect, all the abiotic factors *viz*., maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall jointly had the non-significant impact (F = <1) on *A. biguttula biguttula*. The coefficient of determination (R^2) was found to be 0.40 (Table 3). Y= -0.456 + 0.017 (X_1) - 0.019 (X_2) + 0.009 (X_3) + 0.004 (X_4) - 0.020 (X_5) with all abiotic factors considered as full regression model.

Dysdercus koenigii: The data on *D. koenigii* population is given in Table 1 for crop season 2009. The population of *D. koenigii* appeared from 29th SMW. It is clear from Table 1 that with decrease in relative humidity and temperature favours the population buildup of *D. koenigii*. The correlation of *D. koenigii* population (Table 2) was positive with minimum temperature (r = 0.130), minimum relative humidity (r = 0.197), maximum relative humidity (r = 0.317) and rainfall (r = 0.299) but was negative with maximum temperature (r = -0.223). These results are in corroboration with the findings of Kalaisekar *et al*. (2008).

All the abiotic factors jointly had the non-significant impact (F = <1) on *D. koenigii*. The coefficient of determination (R^2) was found to be 0.20 (Table 3). Y= 16.754 + 0.719 (X_1) - 0.724 (X_2) - 0.256 (X_3) + 0.063 (X_4) + 0.166 (X_5) with all abiotic factors considered as full regression model.

Table 4. Correlation between sucking pests of okra

Sucking pests of okra	*Aphis gossypii* (Glover)	*Amrasca biguttula biguttula* (Ishida)	*Dysdercus koenigii* Fabr.
Aphis gossypii (Glover)	1.000	0.601**	-0.215ns
Amrasca biguttula biguttula (Ishida)		1.000	-0.147ns
Dysdercus koenigii Fabr.			1.000

** = significant at 1 % level, ns : non significant

Correlation between sucking pests

A. gossypii recorded strong positive significant correlation with *A. biguttula biguttula* (r = 0.601) but had negative non-significant correlation with *D. koenigii* (r = -0.215). Similarly *A. biguttula biguttula* showed negative non-significant correlation with *D. koenigii* (r = -0.147) (Table 4).

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