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ROLE OF WEATHER FACTORS ON THE INCIDENCE OF KEY PESTS OF GREEN GRAM

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ABSTRACT

Detailed field studies conducted on greengram at Agricultural College and Research Institute, Killikulam, Tamil Nadu in the year 1995-96, to workout simple correlations between important weather factors and damage level of major pests of greengram, showed that in the kharif 1995, significant positive correlation was found on the incidence of galerucid beetle, *Madurasia obscurella* (Jacoby), with relative humidity. The thrips, *Megalurothrips distalis* (Karny) population was positively influenced by sunshine and rainfall was positively correlated with podborers damage and the correlation coefficient values (r) of the above are 0.663, 0.293 and 0.418 respectively. The other factors like maximum and minimum temperature, wind velocity exhibited negative correlation. The incidence of stemfly, *Ophiomyia phaseoli* (Tryon) was positively correlated (r=0.900) with wind velocity, while leaf hopper, *Empoasca kerri* (Pruthi) showed positive trend with maximum temperature (r=0.592) and negative with relative humidity (r=0.343) in the rabi 1995, while other weather factors were found negatively correlated with their incidence.

KEY WORDS : Greengram, stemfly, galerucid beetle, leafhopper, flower thrips and podborers weather relationship

INTRODUCTION

Greengram, *Vigna radiata* (L.) (Wilezek) the composition of insect population changes on depends upon the crop stage and seasonal changes in the temperature, rainfall, relative humidity and hours of sunshine (Dhuri *et al.*, 1981 ; Sehgal and Ujagir, 1988). Singh and Beri (1973), Singh and Ipe (1973) and Manohar (1978) noticed the appearance of the stemfly, *O. phaseoli* on blackgram.

Gupta and Singh (1993) reported the occurrence of thirps (*M. distalis*) on greengram.

High incidence of blue butterfly. *L. boeticus* and *Heliothis armigera* (Hubner) damage were noticed during *rabi* season on green gram (Anonymous, 1988). The population of *Amrascea biguttula biguttula* (Ishida) was peak during the month of April on greengram (Borah, 1995). Information on the seasonal trends in population development of different species of insect-pest is essential for timely implementation of cultural and chemical control methods. Hence the present study was taken up on the influence of weather factors on the incidence of major pests of greengram and results are presented.

MATERIALS AND METHODS

Two field experiments were conducted during July, 1995 (*Kharif* season) and November, 1995 (*rabi* season) at AC & RI, Killikulam in a randomized block design replicated 10 times under unprotected condition. The cultivar CO 5 was sown with the spacing of 30 x 20 cm with the plot size of 800 m^2 in both the seasons. The experimental area was subdivided into 10 subplots at 80m^2 each. Each subplot was taken as individual replication.

Observations on incidence of pests

Observations on incidence of stemfly, *O. phaseoli*, the galerucid beetle. *M. obsccurella*, the leaf hopper, *E. kerri*, the flower thrips, *M. distalis* and the pod borers were made at weekly interval from seven days after sowing (DAS) from 10 tagged plants in each subplot under unprotected condition.

Stemfly, *O. phaseoli*

The total and affected plants exhibiting wilting and drying symptoms due to stemfly attack from each plot were recorded at weekly interval from seven to 28 DAS during *rabi* season, and the percentage of stemfly damage was worked out. The stemfly damage had not occurred during *kharif* season.

Galerucid beetle, M. *obscurella*

The percentage of leaf damage caused by the galerucid beetle was workedout by recording the total number of leaves and damaged leaves from five tagged plants from each subplot, at weekly intervals from seven to 42 DAS, during *kharif* season. But its damage was absent during *rabi* season.

Leafhopper, *E. kerri*

The total number of nymphs and adults was recorded from five tagged plants in each subplot in each plant, three leaves were examined (one top, one middle and one bottom) on both the surfaces for the incidence of leafhopper by carefully examining them during the early hours of morning when the pest was less active. The population of leafhopper was expressed as mean number per three leaves per plant. The above observations were recorded at weekly interval from 14 to 49 DAS, both during *kharif* and *rabi* seasons.

Thrips, *M. distalis*

The population of thrips (nymphs and adults) was counted from three flowers viz., one upper, one middle and one lower per plant, from each of five tagged plants per plot from 42 to 63 DAS, at weekly interval during *kharif* and *rabi* seasons. Each flower bud was gently tapped into a petridish having a rough wet cotton. The population of thrips was counted with the help of a hand lens (10x). The average number of thrips population per three buds per plant was worked out.

Pod borers

The damage to pods caused by the podborers was assessed at harvest from five tagged plants from each plot. The total number of pods and affected pods from five tagged plant per plot from 42 to 63 DAS at weekly interval were recorded in both the seasons and the percentage of pod damage was workedout.

Statistical analysis

The data recorded on the above pests under unprotected condition were subjected to simple correlation analyses in relation to the weather parameters viz., maximum and minimum temperatures (^{o} C), relative humidity (RH) (%), sunshine hours, wind velocity (Km/hr) and rainfall intensity (mm) for both *kharif* and *rabi* seasons, 1995.

RESULTS AND DISCUSSION

The results indicated that the galerucid beetle posed problem on *kharif* crop (July to September),

Table 1. Correlation between weather factors and the incidence of galerucid beetle damage of greengram (*Kharif* 1995)

Pest	Season	Weather Parameters					
		Temperature ° C		Relative humidity (%)	Sunshine hours	Wind velocity (km/hr)	Rainfall (mm)
		Maximum	Minimum				
Garlerucid beetle	Kharif						
	R	-0.450	-0.735	0.663	-0.598	-0.613	- 0.514
	R^2	0.20	0.55	0.44	0.35	0.37	0.02
	Y = a + bx	168.90	415.42	-114.78	55.07	60.62	25.03
		-4.15x	-14.52x	+2.05x	-3.99x	-4.89x	-7.11x
	Significance						
	* P = 0.05	-	-	-	-	-	-
	** (P = 0.01)	**	**	**	**	**	**
	NS - Not significant	-	-	-	-	-	-

while the stemfly was abundant during *rabi* (November to February) season.

Galerucid beetle, *M. obscurella*

Simple correlations workedout between five weather parameters and galerucid beetle damage during *kharif* 1995 showed that maximum temperature (= -0.450), minimum temperature (= -0.735), sunshine hours (= -0.595) and wind velocity (= -0.613) exhibited significant negative associations with galerucid beetle damage and relative humidity had a positive association with beetle damage (= 0.663) (Table 1). Though the occurrence of galerucid beetle damage was reported earlier during August to September (Anonymous, 1992), the influence of different weather parameters on damage by this pest was not spelt out.

However, the positive association of relative humidity with galerucid beetle damage is in conformity with the finding of Shanmugaraj (1995) who reported that the spotted leaf beetle, *Henosepilachna vigintioctopunctata* Fab., population was increased with increase in relative humidity on brinjal. In the present study, the increase in maximum and minimum temperatures each by 1° C, sunshine by every one hour and wind velocity by one km/hr would decrease the galerucid beetle damage by 4.15, 14.52, 3.99 and 4.89 percent respectively, and increase in relative humidity by one per cent would increase the galerucid beetle damage by 2.05 per cent (Table 1).

Stemfly, *O. phaseoli*

The correlation studies made between weather parameters and stemfly damage during *rabi* revealed that maximum at minimum temperatures, relative humidity and sunshine hours showed significant negative association, recording the values of -0.573, - 0.340, -0.610 and -0.939 respectively, and wind velocity had a positive association with stemfly damage (= 0.900). The findings are in conformity with the results of Gain and Kundu (1986) who reported the negative effect of maximum temperature and low humidity on infestation of stemfly, *Melanagromyzae sojae* (Zehntner) on soybean.

Table 2. Correlation between weather parameters and the incidence of stemfly damage of greengram (*Rabi* 1995)

Pest	Season	Weather Parameters					
		Temperature ° C		Relative humidity (%)	Sunshine hours	Wind velocity (km/hr)	Rainfall (mm)
		Maximum	Minimum				
Stemfly	*Rabi*						
	R	-0.573	-0.340	-0.610	-0.939	0.900	-0.192
	R^2	0.328	0.12	0.37	0.88	0.81	0.037
	Y = a + bx	22.43-6.67x	8.69-0.04x	9.186-0.017x	1.27-0.81x	31.59+1.796x	56.697-5.05x
	Significance						
	* P = 0.05	-	*	-	-	-	-
	** (P = 0.01)	**	-	**	**	**	-
	NS - Not significant	-	-	-	-	-	NS

Table 3. Correlation between weather parameters and the incidence of leafhopper population of greengram

Pest	Season	Weather Parameters					
		Temperature ° C		Relative humidity (%)	Sunshine hours	Wind velocity (km/hr)	Rainfall (mm)
		Maximum	Minimum				
Leafhopper	*Kharif* 1995						
	R	-0.149	-0.031	0.080	-0.230	-0.012	0.152
	R^2	0.02	0.0009	0.006	0.05	0.0014	0.02
	Y = a + bx	2.443-0.023x	1.733-0.004x	1.567+0.002x	1.93+0.044x	1.67+0.010x	1.59+0.24x
	Significance						
	* P = 0.05	-	-	-	-	-	-
	** (P = 0.01)	-	-	-	-	-	-
	NS - Not significant	NS	NS	NS	NS	NS	NS
Leafhopper	*Rabi* 1995						
	R	0.592	-0.014	-0.343	-0.082	0.142	0.084
	R^2	0.35	0.002	0.12	0.007	0.020	0.007
	Y = a + bx	-37.90+1.37x	6.99+0.024x	56.07-0.61x	8.91-0.27x	5.03+0.14x	6.33+0.06x
	Significance						
	* P = 0.05	-	-	-	-	-	-
	** (P = 0.01)	**	-	**	-	-	-
	NS - Not significant	-	NS	-	NS	NS	NS

The simple linear regression equations fitted with significant weather parameters on stemfly damage revealed that increase in maximum and minimum temperatures each by 1° C, relative humidity by one percent and sunshine by every one hour would decrease the stemfly damage by 6.67, 0.04, 0.017 and 0.81 percent respectively, while in increase in wind velocity by one km/hour would increase in stemfly damage by 1.80 percent (Table 2).

Leafhopper, *E. kerri*

Simple correlations workedout between weather parameters and leafhopper population during *Kharif* had shown no significant associations between them. However, during *rabi* 1995, maximum temperature and relative humidity recorded high positive and negative associations respectively with the leafhopper populations recording the values of 0.592 and -0.343 respectively. However, these results are quite contradictory with the findings of Falerio *et al.*, (1990) who predicted negative relationship of maximum temperature and positive association of relative humidity on leafhopper, *E. kerri* on cowpea. The positive association of maximum temperature on leafhopper population on

Table 4. Correlation between weather parameters and the incidence of thrips population of greengram

Pest	Season	Weather Parameters					
		Temperature ° C		Relative humidity (%)	Sunshine hours	Wind velocity (km/hr)	Rainfall (mm)
		Maximum	Minimum				
Thrip's	*Kharif* 1995						
	R	0.059	0.149	0.040	0.293	-0.680	-0.472
	R^2	0.004	0.02	0.002	0.084	0.46	0.22
	Y = a + bx	6.49+0.034x	4.99+0.11x	5.64+0.06x	2.89+0.58x	17.27-1.603x	9.02-2.81x
	Significance						
	* P = 0.05	-	-	-	*	-	-
	** (P = 0.01)	-	-	-	-	**	**
	NS - Not significant	NS	NS	NS	-	-	-
Thrip's	*Rabi* 1995						
	R	-0.113	0.185	0.064	-0.097	-0.08	0.423
	R^2	0.013	0.034	0.004	0.009	0.006	0.179
	Y = a + bx	8.50-0.08x	3.82+0.10x	4.69+0.13x	6.49+0.01x	6.59+0.07x	5.12+0.48x
	Significance						
	* P = 0.05	-	-	-	-	-	-
	** (P = 0.01)	-	-	-	-	-	**
	NS - Not significant	NS	NS	NS	NS	NS	-

Table 5. Correlation between weather parameters and the incidence of pod borers damage of greengram

Pest	Season	Weather Parameters					
		Temperature °C		Relative humidity (%)	Sunshine hours	Wind velocity (km/hr)	Rainfall (mm)
		Maximum	Minimum				
Pod borers	*Kharif* 1995						
	R	0.016	-0.034	0.025	0.05	-0.813	-0.290
	R^2	0.004	0.001	0.006	0.0003	0.66	0.084
	Y = a + bx	10.23+0.02x	12.19-0.05x	9.03+0.03x	10.83+0.013x	22.70-1.92x	12.09-4.77x
	Significance						
	* P = 0.05	-	-	-	-	-	*
	** (P = 0.01)	-	-	-	-	**	-
	NS - Not significant	NS	NS	NS	NS	-	-
Pod borers	*Rabi* 1995						
	R	0.030	0.200	0.267	-0.431	-0.203	0.418
	R^2	0.009	0.04	0.07	0.19	0.041	0.18
	Y = a + bx	8.678+0.02x	6.69+0.14X	3.37+0.08x	18.37-1.17x	5.77-0.38x	7.28+1.53x
	Significance						
	* P = 0.05	-	-	-	-	-	-
	** (P = 0.01)	-	-	-	**	-	**
	NS - Not significant	NS	NS	NS	-	NS	-

greengram observed in the present study is also in agreement with the findings of Harukava (1951) on *Nephotettix* spp. on rice and of shukla (1989) and Shyamprasad (19920 on *Amrasca devastans* on brinjal. An increase temperature by 1° C and relative humidity by one percent resulted in an increase of 1.37 and reduction 0.61 leafhopper per plant respectively (Table 3).

Thrips. *M. distalis*

During *Kharif* sunshine had positive association with thrips population (= 0.293 while wind velocity and rainfall exhibited negative association with thrips population with the values of 0.680 and 0.472 respectively. It was also predicted that an increase in sunshine by one hour would increase the thrips population by 0.58 while increase in wind velocity by one km/hr and rainfall one mm would decrease the population of thrips by 1.60 and 2.81 percent respectively. During *rabi*, rainfall alone exhibited its positive association with thrips population recording the value of 0.423 and also predicted that an increase in rainfall by one mm would increase the thrips population 0.48 per plant (Table 4).

Podborers

During *Kharif* season recorded significant negative associations of the wind velocity and rainfall with podborers damage, recording values of -0.813 and -0.290 respectively, and an increase in wind velocity by one km/hr and rainfall by one mm would decrease the podborers damage by 1.92 and 4.77 percent respectively was predicted.

During *rabi* sunshine hours had negative influence an podborers damage and rainfall has positive association recording the values of -0.431 and 0.418 respectively. The results also predicted that an increase in sunshine by every one hour, would decrease the podborers damage by 1.17 percent while increase in rainfall intensity by one mm, would increase the podborers damage by 1.53 percent (Table 5).

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EVALUATION OF CARBOSULFAN AGAINST CARMINE SPIDER MITE *Tetranychus cinnabarinus* (Boisd.) ON BHENDI

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ABSTRACT

A field study conducted on bhendi to evaluate the efficacy of carbosulfan (Marshal) 25 EC against the carmine spidermite *Tetranychus cinnabarinus* indicated that carbosulfan 0.075% is equally effective as that of proven acaricides viz., Ethion 50 EC and Fenpropathrin 10 EC in reducing mite population when applied twice on 30th and 45th days after sowing.

KEY WORDS : Bhendi, Carbosulfan, Bioefficacy, Carmine spider mite.

Carmine mite *Teranychus cinnabarinus* (Boisd.) has been found to be a serious pests of lady's finger apart from cucumber, egg plant, bean, watermelon etc. The attack of this mite results in yellowing, crumbling curling and twisting of leaves. In addition the leaves are covered with heavy webs which adversely affects the photosynthetic activity of the plants. The leaves eventually dry up and fall off (Singh and Singh 1993). In severe cases growth, flowering and fruit formation also affected (Singh *et al.*, 1991). Even malformation of fruit leading to loss of its marketability has also been noticed in field condition. This spider mite is widely distributed in tropical regions of the globe causing heavy yield loss (Cherian, 1931). To control this pest dicofol, ethion and sulphur have been found to be very effective (Rai and Singh, 1996). Continued use of these acaricides over years may lead to development of resistance by the carmine spider mite. Hence to evaluate some alternate newer pesticide molecules like carbosulfan -a carbomate insectice was tested in the present field study.

MATERIALS AND METHODS

The field study was conducted during kharif 1996 with red loam soil type with a plot size of 20 M^2 each replicated thrice with Indo- American hybrid as the cultivars. Seven chemicals were applied (Table 1-2) and compared with untreated check. The first application was given on 30th day after sowing and the same was repeated 15 days later. The observations were recorded on 1, 3, 7 & 15th day after each application. From each plot five plants were selected at random and from each plant 3 leaves were selected from top, middle and bottom. The number of mites cm sq^{-1} area was counted using an one cm square card and the mean number of mite population cm sq^{-1} was taken for statistical analysis. Corrected per cent mortality was worked out using Henderson and Tiltons formula (Henderson and Tilton, 1955).

RESULTS AND DISCUSSION

The results revealed that (Table 1 & 2) among the different treatments, the acaricides ethion 50 EC 0.05% and Fenpropathrin 10 EC 0.05% are on