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INFLUENCE OF WEATHER FACTORS ON THE INCIDENCE OF PESTS AND DISEASES ON CABBAGE

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ABSTRACT

Studies on the influence of weather factors on the incidence of pests and diseases on cabbage revealed that for every unit increase in rainy days there was an increase of 2.67 larval population of diamond back moth. The morning relative humidity showed significant positive association with the parasitoid, **Apanteles plutellae**. The relative morning humidity had significant negative relationship with cutworm population. The maximum and minimum temperatures had significant positive association with the incidence of black rot whereas minimum temperature had significant positive association with ring spot.

Cabbage, **Brassica oleracea** var. **capitata** (L.) is one of the most popular cruciferous vegetables grown throughout India and it is one of the richest sources of energy. Cabbage is subjected to ravages of insect pests and diseases which include, diamond back moth (**Plutella xylostella** L.), cut worm (**Agrotis ipsilon** Hufn), aphid (**Lipaphis erysimi** Kalt.), black rot (**Xanthomonas campestris** pv. **campestris** (Pam.) Dows) and ring spot (**Mycosphaerella brassicicola** (Fries ex Duby) Lindau). The present study was undertaken to study the influence of weather parameters on the incidence of pests and diseases and also on the natural enemies of pests viz., larval parasitoid (**Apanteles plutellae** Kurd.) of diamond back moth and predatory coccinellid beetle (**Menochilus sexmaculatus**) affecting aphids.

MATERIALS AND METHODS

The observations on the incidence of pests, natural enemies of pests and diseases were recorded as indicated below every week in the plots laid out at Udhagamandalam.

Diamond back moth : Ten plants were selected at random in each of the plot and the number of larvae on the three opened inner leaves in each plant was recorded.

Cut worm : One hundred plants were examined in each of the selected field and the number of plants affected by larvae was recorded.

Aphid : The total number of nymphs and adults of the aphid was counted and recorded from the three leaves immediately following the primordium from 10 selected plants and the mean population per plant was arrived at.

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Larval parasitoid : From each plot, 10 plants were selected. The number of unopened cocoons of the parasitoid and parasitised larvae was counted.

Predatory coccinellid beetle : Ten plants were selected at random in each of the selected plot and the total number of the adult beetles was recorded.

Black rot and Ring spot : These two diseases were recorded on 10 randomly selected plants in each field by grading the three opened inner leaves in each of the plant in on a scale of 1 to 9 (Jayaraj et al. 1987).

The weather parameters (X) such as maximum temperature (X_1), minimum temperature (X_2), morning relative humidity (X_3), rainfall (X_4) and number of rainy days (X_5) were collected and correlated with the incidence of pests (Y) viz., diamond back moth, aphid, cut worm, natural enemies of pests viz., larval parasitoid and predatory coccinellid beetle and diseases viz., black rot and ring spot. In the present study, the mean weather parameters that prevailed for seven days prior to the date of observation were taken into consideration for their possible influence on the incidence of pests, natural enemies and diseases.

RESULTS AND DISCUSSION

The simple correlations made between the incidence of cut worm and weather parameters during winter season indicated the existence of significant negative association with morning relative humidity alone. But none of the weather elements exhibited significant influence on the damage by the cut worm, through multiple regression analysis. There was no significant influence of weather parameters on the population of aphid (Table 1).

Simple correlation worked out between the weather factors and the population of diamond back moth larvae revealed the positive association with maximum temperature, minimum temperature, morning relative humidity and rainy days and negative association with rainfall but they were not significant.

The prediction equation fitted with weather parameters during winter season and population of diamond back moth larvae based on multiple regression analysis indicated that

$$Y = -24.3851 + 1.2692\ X_1 - 0.5861\ X_2 + 0.0679\ X_3 - 0.1438\ X_4 + 2.6720\ X_5$$

with R^2 value of 0.7118

Among these, number of rainy days was alone found to be significant which indicated that for every unit increase in rainy days (X_5) there would be an increase in population of larvae of diamond back moth by 2.672 (Table 1). However, Gunn (1917), Miles (1924) and Sachan and Srivastava (1972) have reported that intensity of rainfall was highly detrimental to the larvae of diamond back moth.

Influence of weather parameters on the population of **A. Plutellae** revealed that the morning relative humidity alone

TABLE 1. Simple correlation of weather parameters on the incident of pests on cabbage during winter season (n=11)

	X_2	X_3	X_4	X_5	Y_1 (Diamond back moth)	Y_2 (Cut worm)	Y_3 (Aphid)
X_1 (Maximum temperature)	0.596	0.1442	-0.4634	-0.4918	0.3068	-0.1224	0.3356
X_2 (Minimum temperature)		0.3547	-0.1581	-0.1029	0.2576	-0.2268	0.0918
X_3 (Morning relative humidity)			-0.5973	-0.3296	0.4100	-0.6322*	0.2213
X_4 (Rainfall)				0.8451	-0.3197	0.3500	-0.3731
X_5 (Rainy days)					0.1047	0.1178	-0.0688

Partial regression co-efficient of weather parameters on the incidence of pests on cabbage

	Partial regression Co-efficient (Y_1)	t	Partial regression Co-efficient (Y_2)	t	Partial regression Co-efficient (Y_3)	t
X_1 (Maximum temperature)	1.26923	1.20436	-0.27597	-0.27623	18.78942	0.91886
X_2 (Minimum temperature)	-0.58609	-0.30015	0.31410	0.16974	-17.67266	-0.46643
X_3 (Morning relative humidity)	0.06793	0.23765	-0.32100	-1.18493	-1.28519	-0.23170
X_4 (Rainfall)	-0.14384	-0.07935	0.01156	0.17632	-1.99016	-1.48268
X_5 (Rainy days)	2.67199	2.87761*	-0.36337	-0.41295	130.62630	1.69985
Constant term	-24.3851		35.4500		-13.2782	
F (5, 5)	2.469851		0.743164		0.953505	
R^2	0.7118		0.4264		0.4881	

* Significant at 5% level

TABLE 2 : Simple correlation of weather parameters on the incidence of natural enemies on cabbage during winter season (n=11)

	X_2	X_3	X_4	X_5	Y_1 (Apanteles plutellae)	Y_2 (Predatory coccinellid beetle)
X_1 (Maximum temperature)	0.5926	0.1442	-0.4634	-0.4918	0.5705	0.1230
X_2 (Minimum temperature)		0.3547	-0.1581	-0.1029	0.4228	0.0007
X_3 (Morning relative humidity)			-0.5973	-0.3296	0.6595*	0.0365
X_4 (Rainfall)				0.8451	-0.5370	-0.1347
X_5 (Rainy days)					-0.2894	0.0836

Partial regression co-efficient of weather parameters on the incidence of natural enemies on cabbage

	Partial regression Co-efficient (Y_1)	t	Partial regression Co-efficient (Y_2)	t
X_1 (Maximum temperature)	0.95209	1.94709	0.09546	0.36046
X_2 (Minimum temperature)	-0.59400	-0.65561	-0.09337	-0.19028
X_3 (Morning relative humidity)	0.23201	1.74917	-0.02567	-0.35727
X_4 (Rainfall)	-0.01329	-0.41402	-0.01662	-0.95627
X_5 (Rainy days)	0.41890	0.97231	0.26389	1.13094
Constant term	-32.8458		1.7617	
F (5, 5)	2.832324		0.292851	
R^2	0.73906		0.22652	

* Significant at 5% level.

TABLE 3 : Simple correlation of weather parameters on the incidence of diseases on cabbage during winter season (n=11)

	X_2	X_3	X_4	X_5	Y_1 (Black rot)	Y_2 (Ring spot)
X_1 (Maximum temperature)	0.5926	0.1442	-0.4634	-0.4918	0.6428*	0.4227
X_2 (Minimum temperature)		0.3547	-0.1581	-0.1029	0.7539**	0.6388*
X_3 (Morning relative humidity)			-0.5973	-0.3296	0.4210	0.5216
X_4 (Rainfall)				-0.8451	-0.2693	-0.2816
X_5 (Rainy days)					-0.0720	-0.0180

Partial regression co-efficient of weather parameters on the incidence of diseases on cabbage

	Partial regression co-efficient (Y_1)	t	Partial regression co-efficient (Y_2)	t
X_1 (Maximum temperature)	12.14241	1.38735	5.06413	0.53679
X_2 (Minimum temperature)	18.61498	1.14788	16.25966	0.93017
X_3 (Morning relative humidity)	1.31863	0.55543	1.52415	0.59560
X_4 (Rainfall)	-0.32718	-0.56949	-0.43819	-0.70760
X_5 (Rainy days)	0.27506	1.20276	9.43052	1.13453
Constant term	-603.9676		-411.8957	
F (5, 5)	3.000315		1.618237	
R^2	0.750019		0.618063	

* Significant at 5% level ** Significant at 1% level

showed significant positive associations (Table 2). The present finding is in agreement with Lim (1982) who has reported that relative humidity ranging from 70 and 80 per cent was more favourable for multiplication of **A. plutellae**

None of the weather parameters exhibited significant influence on the population of predatory coccinellid beetle during winter season (Table 2).

The simple correlation drawn between the incidence of black rot and weather showed the existence of significant positive association with maximum and minimum temperatures during winter season (Table 3).

The simple correlation made between incidence of the ring spot and weather parameters indicated the existence of significant positive association only with minimum temperature. In the above two cases, the multiple regression analysis showed no significant influence of weather factors and the incidence of diseases (Table 3).

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EFFECT OF PREMONSOON SOWING ON THE YIELD OF SORGHUM UNDER DIFFERENT METHODS OF SOWING IN VERTISOL OF SOUTHERN DISTRICTS

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ABSTRACT

An experiment to study the effect of various time of sowing and method of sowing on sorghum K-tall was conducted during Rabi at Agricultural Research Station, Kovilpatti.