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## Seasonal incidence of various pests and their natural enemies on red cabbage

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### Abstract

The present study entitled “Seasonal Incidence of various pests and their natural enemies on red cabbage” was undertaken at Agricultural farm of Krishi Vigyan Kendra, Dhule (Maharashtra)-424004 during *rabi* 2021-22. Study on seasonal incidence of different pests on red cabbage crop revealed that the incidence of aphid and tobacco leaf eating caterpillar reached its peak activity during the second week of February (113.06 aphids/3 leaves/plant and 2.33 larvae/plant respectively), whereas, the peak incidence of diamond back moth was noticed in the third week of February (5.20 larvae/plant). The peak incidence of painted bug was recorded during the last week of February (6.20 bugs/plant). The activity of coccinellid predators was at its peak during the second week of February (4.20 grubs/plant) i.e., when the population of aphids was at its peak.

**Keywords:** Red cabbage, seasonal incidence, diamond back moth, tobacco leaf eating caterpillar, aphids, painted bug

### 1. Introduction

Red cabbage (*Brassica oleraceae* L. var. *capitata* F. *rubra* 2n = 2x = 18) is a cole crop belongs to cruciferae family. Southern Europe is the original home of red cabbage. It is grown in this region to use as cut fresh and served as a beautiful garnish to packed salads made in the numerous salad restaurants. It is used as a salad item, boiling vegetable, curry ingredient, pickling ingredient and dehydrated vegetable. Although this cultivar may be cultivated all year round, cooler regions are best for its taste.

Red cabbage is recognised to provide health benefits. It possesses anticarcinogenic properties because it contains indole-3-carbinol. In addition to vitamin B complex and vitamin C, red cabbage also contributes some amount of potassium and calcium to the diet. Amount of vitamin C content in red cabbage is 57 mg per 100 gm. Red cabbage provides around 44 kcal of energy, 7% carbohydrate, 0.09% fat, 5% protein, 8% potassium, 6% calcium, 6% iron, 6% magnesium, 9% folate, 9% manganese, 4% fibre, 7% phosphorus and 5% vitamin B5. Red cabbage, which has numerous positive sensory qualities and remarkable health-improving qualities, has grown in importance in recent years.

Red cabbage crop is attacked by a number of insects viz, tobacco leaf eating caterpillar (*Spodoptera litura*), diamond back moth (*Plutella xylostella*), cabbage leaf webber (*Crocidolomia binotalis*), aphids (*Brevicoryne brassicae*), painted bug (*Bagrada cruciferarum*) and flea beetle (*Phyllotreta cruciferae*) from sowing to harvest.

Research into the ecological aspects of insect pests is necessary because this crop is new to the area in order to establish an efficient management strategy to boost yields. Red cabbage requires the adoption of long-term, cost-effective, eco-friendly pest management strategies because it is consumed both raw as well as cooked. Studies on the seasonal incidence of pest population provide reliable estimates of the densities of pests in the field, which are essential for pest control. The present study was undertaken to study the incidence of aphids, diamond back moth, tobacco leaf eating caterpillar, painted bug and their natural enemies on red cabbage as well as their relation with the weather parameters.

### 2. Material and Methods

The research work was carried out in the *rabi* season of 2021-22 at the Agricultural farm of Krishi Vigyan Kendra, Dhule (Maharashtra)-424004. Dhule is situated at 20.9° North Latitude and 74.78° East Longitude and at an altitude of 787 feet (250 meters) above the mean sea level (MSL). The site was uniform with typical black cotton soil having good drainage. To know the seasonal incidence of insect pests of red cabbage, 5 plants were tagged in each plot from the

compact block. The observations of number of aphids were recorded on upper and lower side of the leaf surface for three leaves plant<sup>-1</sup> and the number of painted bugs was recorded per plant. For chewing pests, viz. diamond back moth and tobacco leaf eating caterpillar, the number of larvae were recorded per plant. During the experimentation the weather parameters viz. maximum and minimum temperatures, relative humidity and sunshine hours were recorded and the pest population was correlated with the meteorological factors. To know the population density of natural enemies, i.e. lady bird beetle, the counts were made on per plant basis on tagged plants at weekly intervals.

### 3. Results and Discussion

#### 1. Seasonal incidence of major insect pests of red cabbage

##### 1.1 Aphid *Brevicoryne brassicae*

The data on the seasonal incidence of aphid *Brevicoryne brassicae* is presented in table 1 and Fig 1. It is clear that the pest began in the third SMW and peaked in the seventh SMW (113.06 aphids per three leaves per plant) when the maximum and minimum temperatures were 30.4 °C and 9.9 °C respectively, with 81 percent morning relative humidity, 35 percent evening relative humidity and 8 hours of sunshine. After then, the aphid population reduced gradually but remained until the crop was harvested. The current findings are consistent with [8], who observed the presence of cabbage aphids in mid-December and continued until harvest in late March.

##### 1.2 Diamond back moth *Plutella xylostella*

The observations of the diamond back moth (DBM) larval population are shown in table 1 and depicted in Fig. 1. The larval population appeared in 3<sup>rd</sup> SMW (0.8 larvae/plant) and peaked (5.2 larvae/plant) in the 8<sup>th</sup> SMW when the maximum temperature was 33.7 °C and the minimum temperature was 10.4 °C, with 86 percent morning relative humidity, 36 percent evening relative humidity and 8.8 hours of sunshine. Thereafter, the population reduced and was negligible till the end of the crop season [5]. Reported that the diamond back moth population first appeared in 1<sup>st</sup> SMW. According to [9], the peak larval population was observed on 1<sup>st</sup> March. The present findings are comparable with the above researchers.

##### 1.3 Tobacco leaf eating caterpillar *Spodoptera litura*

The data on the seasonal incidence of *Spodoptera litura* is shown in table 1 and Fig. 1. The incidence of tobacco leaf eating caterpillar first observed during 3<sup>rd</sup> SMW and reached its peak in the 7<sup>th</sup> SMW (3.2 larvae/plant) when the maximum and minimum temperatures were 30.40 °C and 9.9 °C respectively, with 81 percent morning relative humidity, 35 percent evening relative humidity and 8 hours of sunshine. After that, the larval population steadily decreased. The experimental results of [5] proved that tobacco caterpillar observed in the first week of January (SMW 1) and peak incidence was noticed in the fourth week of January (SMW 4). The current findings are in confirmation with the above researcher.

##### 1.4 Painted bug *Bagrada cruciferarum*

The data presented in the table 1 reveal that the population of painted bug ranged from 1.1 to 6.2 per plant and shown in Fig.1. The pest started in the 4<sup>th</sup> SMW and attained its peak population in the 9<sup>th</sup> SMW (6.20 per plant) when the maximum and minimum temperatures were 33.8 °C and 13.3

°C respectively, with 82 percent morning relative humidity, 40 percent evening relative humidity and 8.2 hours of sunshine. The findings of [1], shows that seasonal incidence of the painted bug was from 8<sup>th</sup> to 12<sup>th</sup> SMW [6]. Also reported maximum infestation of painted bug, *Bagrada cruciferarum* (Kirk.) on cabbage and cauliflower in second week of February. The experimental results of [11] reported two main peaks in the painted bug seasonal cycle, April to May and September to October. The current findings are in confirmation with the above researchers.

##### 1.5 Coccinellid beetle

Seasonal incidence of coccinellid beetle is shown in table 1 and Fig.1. The beetle was first recorded in the 4<sup>th</sup> SMW. The population was maximum in the 7<sup>th</sup> SMW (4.20/plant) when the maximum and minimum temperatures were 30.4 °C and 9.9 °C respectively with 81 percent morning relative humidity, 35 percent evening relative humidity and 8 hours of sunshine. The findings of [15] support the present results who reported maximum population in 4<sup>th</sup> week of the year, when maximum and minimum temperature were 21.6 °C and 5.7 °C respectively.

#### 2. Correlation of weather parameters with major insect pests and their natural enemies on red cabbage

The data on the average population of aphids, diamond back moth, tobacco leaf eating caterpillar, painted bug and coccinellid predator was recorded under field conditions and correlated with Meteorological parameters such as maximum and minimum temperature, morning and evening relative humidity and sunshine hours. The Pearson's correlation coefficient values (r) were calculated and presented in table 2. The population of aphid showed positive non significant correlation with maximum temperature (r= 0.087), morning relative humidity (r= 0.106), evening relative humidity (r= 0.162) and sunshine hours (r= 0.506). It shown negative non-significant correlation with minimum temperature (r= -0.152). The present findings are in agreement with [14] who indicated a positive non significant correlation with maximum temperature and morning relative humidity [9], also noticed that population of aphid shown non significant positive correlation with maximum temperature [13], also observed non significant positive correlation with maximum and minimum relative humidity.

The occurrence of the diamond back moth was positively and non-significantly correlated with maximum temperature (r= 0.030), morning relative humidity (r= 0.229), evening relative humidity (r= 0.274) and negative non significant correlation with minimum temperature (r= -290). While, sunshine hours (r= 0.594) had shown significant positive correlation with occurrence of the diamond back moth [7]. reported significant positive correlation of diamond back moth with sunshine hours. The current findings are also consistent with [14], who noted that the diamond back moth population correlated positively with maximum temperature, morning relative humidity, evening relative humidity and sunshine hours.

The population of tobacco leaf eating caterpillar showed a positive non significant correlation with maximum (r = 0.063), morning relative humidity (r= 0.150), evening relative humidity (r= 0.287) and sunshine hours (r= 0.522). The correlation with minimum temperature (r= -189) was negatively non significant with population of tobacco leaf eating caterpillar. The present findings are in agreement with [10] who indicated a negative correlation with temperature

(minimum) and positive relation with relative humidity (morning and evening) [3]. reported the negative correlation of tobacco leaf eating caterpillar population with minimum temperature.

The population of painted bug showed positive and non significant correlation with all weather parameters viz. maximum temperature (r= 0.300), minimum temperature (r= 0.080), morning relative humidity (r= 0.005), evening relative humidity (r= 0.196) and sunshine hours (r= 0.519). The present findings are in agreement with [2] who reported that the painted bug population showed positive and non

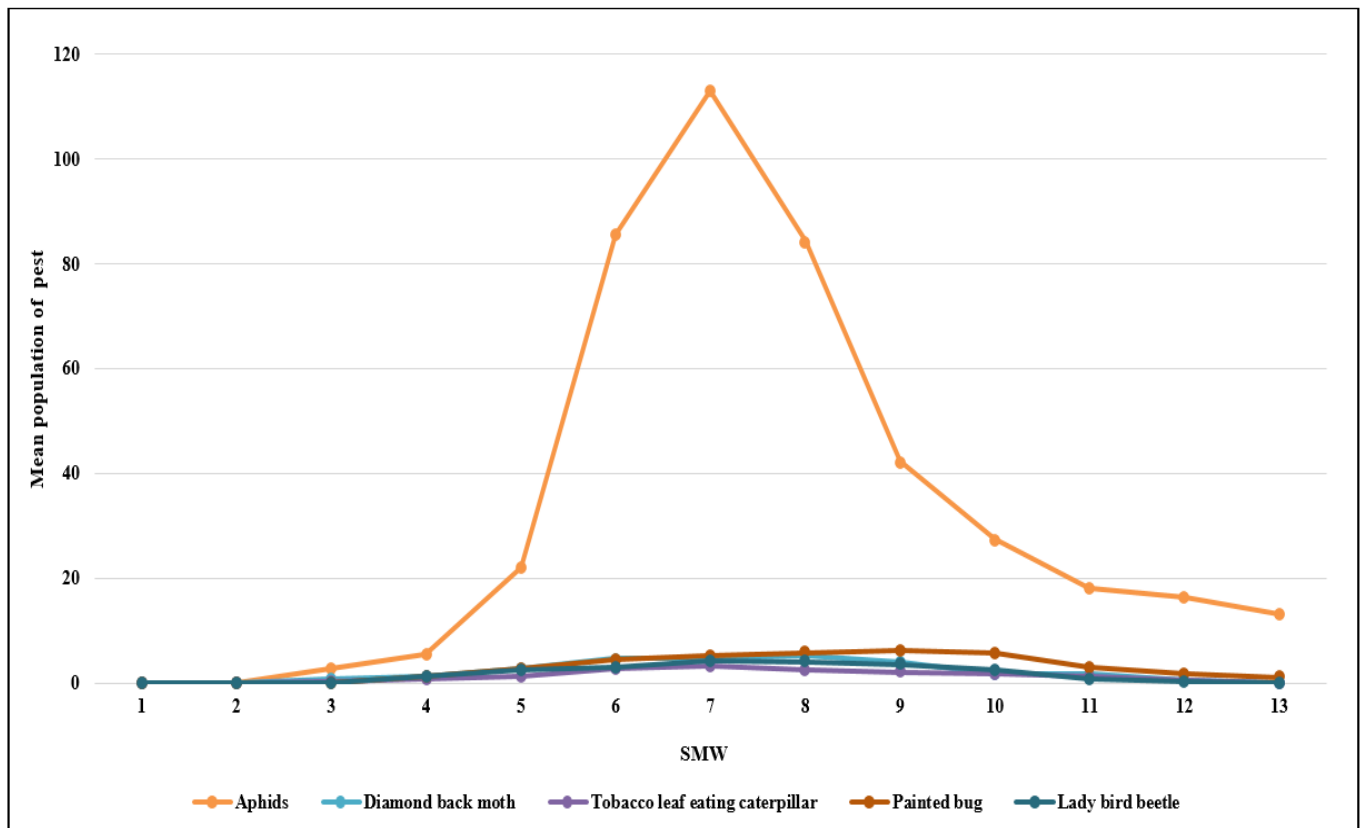
significant correlation with maximum and minimum temperature.

The population of lady bird beetle shown positive and non significant correlation with maximum temperature (r= 0.021), morning (r= 0.264) and evening (r= 0.315) relative humidity and sunshine hours (r= 500). The correlation with minimum temperature was negative (r= -0.268). These findings are similar to [12] who indicated negative non significant correlation with minimum temperature [4]. Reported the positive and non significant correlation of maximum temperature with population of lady bird beetle.

**Table 1:** Seasonal incidence of insect pests and their natural enemies on red cabbage during *rabi* 2021-22

Month	Date	SMW*	Aphid/ three leaves/ plant	DBM larvae/ plant	Spodoptera litura larvae/plant	Painted bug/ plant	Coccinellid Predator/ plant	Temperature (°C)		Relative Humidity (%)		Sunshine hours
								Max	Min	Morning	Evening	
January	1-7	1	0.00	0.00	0.00	0.00	0.00	28.90	11.40	89.00	42.00	3.70
	8-14	2	0.00	0.00	0.00	0.00	0.00	25.70	9.50	87.00	40.00	5.10
	15-21	3	2.80	0.80	0.26	0.00	0.00	28.60	9.00	88.00	37.00	7.10
	22-28	4	5.46	1.33	0.66	1.26	1.20	25.50	6.00	80.00	35.00	6.40
	29-4	5	22.06	2.67	1.20	2.73	2.40	30.40	7.00	85.00	34.00	8.50
February	5-11	6	85.53	4.60	2.73	4.40	3.07	29.40	8.40	83.00	42.00	8.30
	12-18	7	113.06	4.80	3.20	5.14	4.20	30.40	9.90	81.00	35.00	8.00
	19-25	8	84.33	5.20	2.52	5.80	4.06	33.70	10.40	86.00	36.00	8.80
	26-4	9	42.20	3.90	2.10	6.20	3.60	33.80	13.30	82.00	40.00	8.20
March	5-11	10	27.40	1.78	1.80	5.60	2.46	32.60	13.50	82.00	40.40	6.00
	12-18	11	18.19	1.66	1.20	3.05	0.73	37.50	15.00	68.00	28.40	8.90
	19-25	12	16.40	0.60	0.40	1.80	0.20	33.80	18.20	66.00	30.30	5.90
	26-1	13	13.20	0.00	0.00	1.10	0.00	40.40	15.90	68.00	21.30	8.90

\*SMW: Standard Meteorological Week



**Fig 1:** Seasonal incidence of insect pests and natural enemies on red cabbage during *rabi* 2021-22

**Table 2:** Correlation between major insect pests of red cabbage and weather parameters

Pest	Correlation coefficient values (r)				Sunshine hours
	Temperature (°C)		Relative humidity (%)		
	Maximum	Minimum	Morning	Evening	
Aphids	0.087	-0.152	0.106	0.162	0.506
Diamond back moth	0.030	-0.290	0.229	0.274	0.594*
Tobacco leaf eating caterpillar	0.063	-0.189	0.150	0.287	0.522
Painted bug	0.300	0.080	0.005	0.196	0.519
Coccinellid beetle	0.021	-0.268	0.264	0.315	0.500

\*- significant at 5%

#### 4. Conclusion

The results of seasonal incidence showed that aphids were more common than diamond back moth, tobacco leaf eating caterpillar and painted bug. At 5% level of significance, the diamond back moth ( $r = 0.594$ ) revealed a significant positive correlation with the number of hours of sunshine. The non significant correlation with climatic factors and various pests clearly indicates that during *rabi* season pests of red cabbage were not influenced by weather parameter.

#### 5. Future Scope

The experimental results create a record on the seasonal incidence of important pest of red cabbage and their relationship with abiotic factors during *rabi* season, educating farmers on how to implement prompt management practices against major pests of red cabbage.

#### 6. Acknowledgement

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