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SEASONAL INCIDENCE OF MAJOR INSECT PESTS OF CAULIFLOWER (*Brassca oletacea* L. *Var. Botrytis*) IN EASTERN UTTAR PRADESH AND THEIR MANAGEMENT

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ABSTRACT

The present investigation was carried out to examine the seasonal incidence of major insect pests of cauliflower as flea beetle (*Phyllotreta cruciferae*), tobacco caterpillar (*Spodoptera litura*) and diamondback moth (DBM) (*Plutella xylostella*) during the *Rabi* season, year 2024. Seasonal study results revealed that many insect pests attacked on cauliflower crop likewise flea beetle, diamondback moth and tobacco caterpillar. It was found from seasonal incidence of these pest that flea beetle initial larval population (0.01 larvae/plant) was found at 43rd SMW and peaked (14.33 larvae/plant) during 50th SMW; tobacco caterpillar initial population was observed at 41st (SMW) with a population of (0.13 larvae/plant) and peaked (5.13 larvae/plant) during the 49th SMW and DBM larval population first appeared in 42nd (SMW) with an average population of (1.22 larvae/plant) and reached a peak (5.49 larvae/plant) during the 49th SMW. It was found from corelation study of weather parameter with pests' population that, different parameters were played an important role in fluctuation of their populations.

In this study management of flea beetle (*Phyllotreta cruciferae*) was conducted by using various insecticides. For management of flea beetle six insecticides such as Emamectin benzoate, Spinosad, Cypermethrin *Metarhizium anisopliae*, *Beauveria bassiana* and NSKE with one control plot. It was found from efficacy results that Spinosad 45% SC was the most effective among all insecticides which reduced flea beetle population (0.45 beetles/plant) with highest yield of cauliflower (120.12 q/ha). This treatment also achieved a highest benefit-cost ratio of 8.86. The order of effectiveness of different insecticide was Spinosad 45% SC>Emamectin benzoate 5% SG> Cypermethrin 25% SG> *Metarhizium anisopliae* > *Beauveria bassiana* > NSKE 5%. Therefore, it can be concluded that Spinosad 45% SC is a promising management option for management of flea beetle in cauliflower, and these findings can be helpful in developing integrated pest management (IPM) strategies to reduce flea beetle populations and prevent economic losses of the farmers.

***Keywords*:** Cauliflower, *Brassica oleracea*, Flea beetle, Seasonal incidence, Weather parameters, Insecticides.

Introduction

Cauliflower (*Brassica oleracea* L. var. botrytis L.) is an essential member of the Brassicaceae family, has been appropriately referred to as an aristocrat of the cabbage family, which is also known as the queen of winter vegetables (Karki et al., 2024). The name "Cauliflower" is made up of two Latin words: "Caulis" means cabbage and "Floris" means flowers (Choudhury, 2018) and is known as cole crop.

Cauliflower is grown in India from March to November in the hills and from July to March in the plains. It is rich in protein and has a high level of vitamin 'C' stability, even after frying. It is high in minerals such as potassium, sodium, copper, phosphorus, calcium and magnesium and it also has a lot of vitamin A, it protects against Bowel cancer due to the presence of Indole-3- carbinol (Singh, 2025).

Cauliflower is generally used as cooked vegetable either singly or mixed with potato as fried or in curry form. Small pieces of cauliflower can be fried with besan for the preparation of pakoras. Grated cauliflower is used to prepare stuffed parathas. It is also used in preparation of pickle with other vegetables (Savita, 2014).

Cauliflower crop production is affected by the many factors such as abiotic and biotic factors. One of the major limiting factors in the production of cauliflower is the extensive crop devastations caused due to increased pest menace. Cole crops are more prone to insect pests and diseases mainly due to their tenderness and softness as compared to other crops and virtual absence of resistance characters, because of intensive hybrid cultivation. Among the yield limiting factors, insect pests are important factors which reduces the crop production and are sometimes cause of complete failure of the crop. The following insect pests damaging cauliflower crop are cauliflower flea beetle (*Phyllotreta striolata*), aphid (*Brevicoryne brassicae* L. and *Lipaphis erysimi* K.), diamond back moth (*Plutella xylostella* L.), cabbage borer (*Hellula undalis* F.), cabbage semilooper (*Trichoplusia ni Hubner*), leaf Webber (*Crocidolomia binotalis* Z.), painted bug (*Bagrada cruciferarum* K.), cabbage butterfly (*Pieris brassicae* L.) and tobacco caterpillar (*Spodoptera litura* Fab.) (Saranya, 2017). Among them flea beetle, tobacco caterpillar and diamond back moth are most destructive pests of cauliflower and reduce the crop production. So, present investigation deals with the seasonal incidence of these three pests and management of flea beetle by using various insecticides. Flea beetle control relies mainly on conventional methods, with available insecticides having limited efficacy due to the development of resistance in flea beetle populations (Soroka *et al.* 2011).

Materials and Methods

The present investigation was conducted at the Entomological Research Field, Deeksha Bhawan, Institute of Agriculture and Natural Sciences, Deen Dayal Upadhyaya Gorakhpur University, Gorakhpur (U.P.) India, during the *Rabi* season, 2024. The total experimental area was 21 m x 10 m (210 m²), with plot size of 3 m x 3 m (9 m²) each. Randomized Block Design (RBD) were used for experiment. Cauliflower seedlings were transplanted in experimental field on 7th October 2024, at a spacing of 45 cm × 60 cm (row-to-row and plant-to-plant distance).

Observations were recorded at different time intervals to determine the seasonal abundance of major insect pests as flea beetle (*Phyllotreta cruciferae*), tobacco caterpillar (*Spodoptera litura*), and diamondback moth (*Plutella xylostella*) in the cauliflower field. The absolute counting method was used for incidence on five randomly selected and tagged plants from each plot, starting from seven days after transplanting till the harvesting of the crop. Incidence of larvae (grub) of flea beetle was recorded by the method of Gaikwad *et al.* (2018).

Meteorological data as maximum and minimum temperature (°C), relative humidity (morning and evening, %), rainfall (mm), were obtained from the meteorological observatory station of Gorakhpur for the entire cropping season. These weather parameters were correlated with the population of insect pests. To assess the influence of weather variables on population dynamics, multiple linear regression analysis was carried out using SPSS software.

Results and Discussion

Seasonal incidence of different pests

Flea beetle larva: The results of seasonal incidence of flea beetle (*Phyllotreta cruciferae*) infesting cauliflower (*Brassica oleracea* var. *botrytis* L.) during the *Rabi* season, 2024, revealed that the first appearance of flea beetle population (0.01 larvae/plant) was observed in the 43rd Standard Meteorological Week (SMW), where the maximum and minimum temperatures were 30.6°C and 21.9°C, respectively, with morning and evening relative humidity of 79.57% and 75.14%, and no rainfall. Thereafter, the population persisted throughout the cropping season until harvest. The peak flea beetle population (14.33 larvae/plant) was recorded during the 50th SMW, when the maximum and minimum temperatures were 24.1°C and 7.4°C, respectively, with relative humidity in the morning and evening of 77.71% and 61.0%, and no rainfall was recorded (Table 1 and Fig. 1).

The correlation studies revealed that the maximum temperature showed a positive but non-significant correlation (r=0.928) with the flea beetle larval population, while the minimum temperature exhibited a significant positive correlation (r = 0.956*). Morning relative humidity had a positive but non-significant correlation (r = 0.067), whereas evening relative humidity was negatively correlated (r = –0.836, non-significant) with the larval population. No rainfall was recorded during the cropping season (Table 2).

These findings align with previous studies reported that flea beetles were highly sensitive to microclimatic conditions (Singh, Verma and Joshi, 2019; Sharma and Kumar, 2017). Moderate temperatures support egg hatching and larval growth, whereas extreme heat and high humidity can reduce survival rates (Blackman and Eastop, 2000). The positive correlation with minimum temperature further emphasizes that cooler night temperatures may promote larval activity and persistence. The weak or negative correlations with relative humidity suggest that excessive moisture, especially in the evening, may be detrimental to larval survival, possibly due to increased fungal infections or soil moisture stress (Kumar, Singh and Gupta, 2015).

Flea beetle adult: Infestation of flea beetle adults (*Phyllotreta cruciferae*) was recorded during *Rabi* season, 2024. Flea beetles were first recorded in the 42nd Standard Meteorological Week (SMW) after that the population persisted throughout the cropping season until harvest. The initial population (0.38 adults/plant) was observed during (42th SMW), where maximum and minimum temperatures was (33.18°C) and (21.7°C), and morning and evening relative humidity was (82.28%) and (76.28%) respectively. No rainfall was recorded during this observation. The peak population (15.5 adults/plant) was recorded in the 49th SMW, when the maximum and minimum temperatures was (26.0°C) and (9.9°C), and morning and evening relative humidity was (82.0%) and (65.85%) respectively. No rainfall was recorded during this period (Table 1 and Fig. 1).

The data of the correlation study revealed that the maximum temperature exhibited the non-significant positive correlation (r = 0.907**) with the flea beetle larval (grub) population. In contrast, the minimum temperature showed a non-significant negative correlation (r = –0.939). Morning relative humidity had a positive but non-significant correlation (r = 0.151), whereas evening relative humidity showed a significant positive correlation (r = 0.797*) with the larval population during 2024 (Table 2).

Tobacco caterpillar: The data on the seasonal incidence of tobacco caterpillar (*Spodoptera litura*) in cauliflower, revealed that this pest was first appeared in the 41st Standard Meteorological Week (SMW) with a mean population of (0.13 larvae/plant). At this time, the minimum and maximum temperatures were (24.4°C) and (33.4°C) respectively, with morning and evening relative humidity of (77.0%) and (73.42%), and no rainfall was recorded. The population increased gradually and reached its peak (5.13 larvae/plant) during the 49th SMW, when the minimum and maximum temperatures were (9.9°C) and (26.0°C), and relative humidity was (82.0%) (morning) and (65.85%) (evening) respectively. Thereafter, the population declined slightly but persisted until harvest. A mean population (2.45 larvae/plant) was recorded during the 52nd SMW, when the minimum and maximum temperatures were (10.1°C) and (24.4°C) respectively, and morning and evening relative humidity was (89.85%) and (70.42%), with no rainfall (Table 1 and Fig 1).

The correlation analysis indicated that the larval population of tobacco caterpillar showed a positive but non-significant association with minimum temperature (r = 0.462), and maximum temperature exhibited a negative and significant correlation (r = –0.518) with the pest population. Morning relative humidity had a positive but non-significant correlation (r = 0.554), whereas evening relative humidity showed a positive significant correlation (r = 0.236) with the larval population (Table 2).

The absence of rainfall during the cropping season could have further supported population buildup, as rainfall can naturally reduce larval numbers through wash-off and increased mortality (Singh et al., 2019). The observed seasonal trend is in line with earlier studies on cruciferous crops, which report that tobacco caterpillar outbreaks generally occur during cooler, humid periods in the post-monsoon season (Kumar *et al*., 2020).

Diamondback Moth: Observations on the seasonal incidence of diamondback moth (*Plutella xylostella*) larvae on cauliflower revealed that DBM population ranged from (1.22 to 5.49 larvae/plant). The pest first appeared in the 42nd Standard Meteorological Week (SMW) with a population of (1.22 larvae/plant), when the minimum and maximum temperatures were (21.7°C) and (33.18°C), and morning and evening relative humidity was (82.28%) and (76.28%) respectively. The larval population gradually increased and reached a peak of (5.49 larvae/plant) during the 49th SMW, when the minimum and maximum temperatures were (9.9°C) and (26.0°C), and relative humidity was (82.0%) (morning) and (65.85%) (evening) respectively. Thereafter, the population declined with (2.62 larvae/plant) in the 52nd SMW, at minimum and maximum temperatures (10.1°C) and (24.4°C), and relative humidity (89.85%) (morning) and (70.42%) (evening) respectively. No rainfall was recorded during this period (Table 1 and Fig. 1).

The data revealed that maximum temperature and minimum temperature exhibited a non-significant positive correlation with the diamondback moth (DBM) population (r = 0.527) and (r = 0.565), respectively). Evening relative humidity showed a non-significant negative correlation (r = –0.508), whereas morning relative humidity showed a positive but non-significant correlation (r = 0.318) with the DBM population during 2024 (Table 2).

These findings are consistent with previous reports emphasizing the role of temperature, and relative humidity in regulating DBM populations (Rajput *et al*., 2022; Sharma *et al*., 2017; Guo & Qin, 2010). Monitoring these factors can facilitate timely pest management interventions, such as the judicious application of bio-pesticides or cultural control measures, to minimize crop damage.

Table 1 : Seasonal incidence of major insect pests of cauliflower and their corelation with weather parameters.

Standard Week No.	Date	No. of flea beetle/plant	No. of Tobacco caterpillar/plant	No. of DBM /plant	Temp. ^{0}C		RH%		Rainfall (mm)
					Min.	Max.	Morn.	Even.	
41	07/10/2024	0.00 (1.00)	0.13 (1.06)	0.00 (1.00)	24.4	33.4	77.0	73.42	0.00
42	14/10/2024	0.00 (1.00)	0.75 (1.32)	1.22 (1.49)	21.7	33.18	82.28	76.28	0.00
43	21/10/2024	0.01 (1.00)	2.46 (1.85)	2.55 (1.87)	21.9	30.6	79.57	75.14	0.00
44	28/10/2024	0.31 (1.14)	3.87 (2.20)	3.79 (2.18)	21.7	33.2	84.42	69.71	0.00
45	04/11/2024	1.38 (1.53)	5.09 (2.46)	4.05 (2.24)	19.6	31.5	86.14	76.57	0.00
46	11/11/2024	3.04 (1.98)	5.22 (2.49)	5.17 (2.48)	17.3	28.6	91.85	77.14	0.00
47	18/11/2024	5.17 (2.47)	6.03 (2.64)	5.03 (2.45)	12.5	27.5	88.28	71.0	0.02
48	25/11/2024	8.55 (3.09)	4.60 (2.36)	4.34 (2.31)	11.2	27.2	88.85	70.42	0.00
49	02/12/2024	13.67 (3.83)	5.13 (2.46)	5.49 (2.53)	9.9	26.0	82.0	65.85	0.00
50	09/12/2024	14.33 (3.91)	3.93 (2.21)	4.15 (2.26)	7.4	24.1	77.71	61.0	0.00
51	16/12/2024	11.31 (3.50)	4.12 (2.24)	3.46 (2.11)	7.8	25.5	85.71	67.28	0.00
52	23/12/2024	10.26 (3.35)	2.45 (1.85)	2.62 (1.89)	10.1	24.4	89.85	70.42	0.00
C.D.		0.281	0.259	0.199					
SE(m)		0.095	0.088	0.067					
SE(d)		0.135	0.124	0.095					
C.V.		7.103	7.233	5.638					

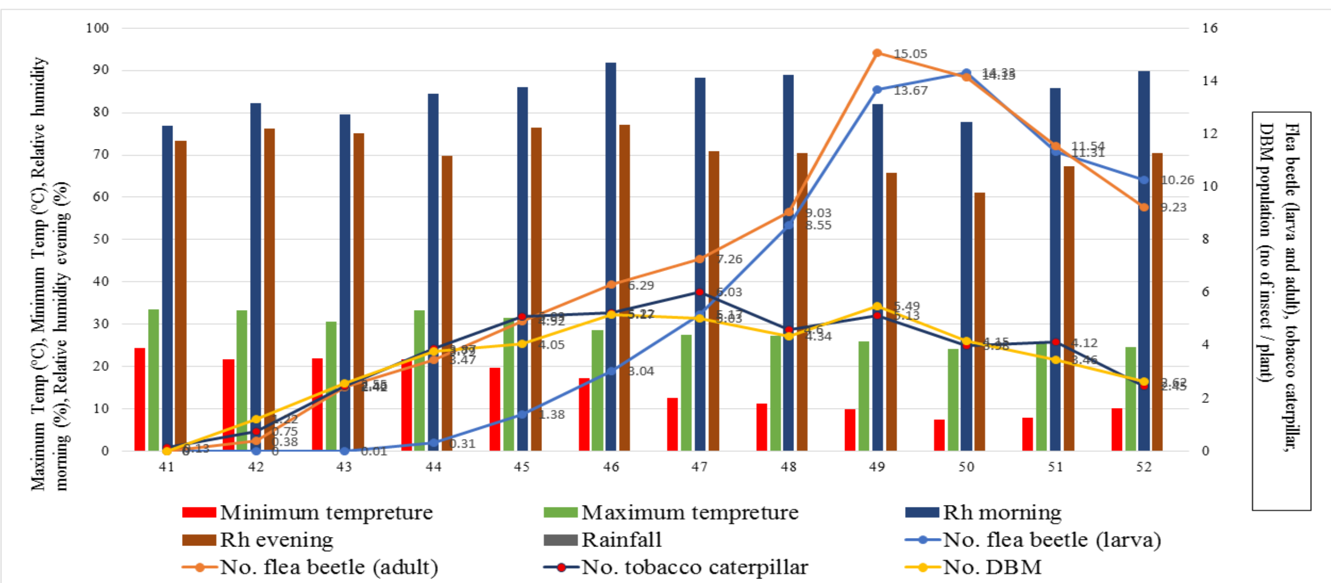

Fig. 1 : Bar diagram showing seasonal incidence of major insect pests of cauliflower and their corelation with weather parameters.

Table 2 : Correlation between abiotic factors and population of major insect pest on Cauliflower crop during the season *Rabi* 2024.

Insect Name	Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)
	Max temp. (^{0}C)	Min. temp. (^{0}C)	Morning (%)	Evening (%)	
Flea beetle (larva)	0.928**	0.956**	0.067	0.836**	00
Flea beetle (adult)	0.907**	0.939**	0.151	-0.797**	00
Tobacco caterpillar	0.462	0.518	0.554	0.236	00
DBM	0.527	0.565	-0.508	-0.318	00

Bio-efficacy of different insecticides

Bio-Efficacy of different newer insecticides against Flea beetle (*Phyllotreta cruciferae*) in cauliflower crop during the *Rabi* season 2024

The effectiveness of various newer insecticide and phytoextracts against the flea beetle was assessed. The different treatments were viz., Spinosad 45% SC, Cypermethrin 25% SG, *Metarhizium anisopliae* 1×10^{8} CFU, Emamectin benzoate 5 % SG, *Beauveria bassiana* 1×10^{8} CFU, Neem Seed Kernel Extract 5% were used with one control plot (no treatment). Pretreatment observation was recorded a day before treatment and there after 3, 7 and 15 days of spraying.

One day prior to 1st spray

One day before 1st spray of insecticides, flea beetle incidence was ranged from 7.38 to 9.21/plant, which revealed no significant differences among different plotts, indicating more or less similar pest infestation on the crop under investigation.

Three days after application of first spray

The data revealed that three days after application of first spray, the plot treated with Emamectin benzoate 5 % SG recorded lowest number of flea beetle (7.15 flea beetle per plant) followed by Spinosad 45% SC (7.40 flea beetle/plant), *Metarhizium anisopliae* 1×10^{8} CFU (7.73 flea beetle/plant), Cypermethrin 25% SG (8.01 flea beetle/ plant) and NSKE 5% (8.01 flea beetle per plant), *Beauveria bassiana* 1×10^{8} CFUs/gram (8.62 flea beetle/plant), followed by untreated plot (9.16 flea beetle/plant) (Table 3 and fig 2).

Seven days after application of first spray

At seven days after first spray, Spinosad 45% SC recorded lowest population (5.96 flea beetle larvae/plant) followed by, Emamectin benzoate 5 % SG (6.67 flea beetle/plant) *Metarhizium anisopliae* 1×10^{8} CFU (7.07 flea beetle/plant), *Beauveria bassiana* (7.15 flea beetle/plant) Cypermethrin 25% SG (7.50 flea beetle/plant) NSKE 5% (7.97 flea beetle/plant), control (9.51 flea beetle/plant) as compared to untreated plot (9.51 flea beetle/plant)) (Table 3 and Fig 2).

Fifteen days after first spray

After fifteen days after first spray of Spinosad 45% SC recorded lowest population (5.05 flea beetle larvae/plant) followed by, Cypermethrin 25% SG (6.79 flea beetle/plant), *Metarhizium anisopliae* 1×10^{8} CFU (6.81 flea beetle/plant), Emamectin benzoate 5 % SG (6.67 flea beetle/plant), *Beauveria bassiana* (7.96 flea beetle/plant) NSKE 5% (8.09 flea beetle/plant), as compared to untreated plot (9.95 flea beetle/plant)) (Table 3 and Fig. 2).

Mean of first spray

The mean data of first spray revealed that the lowest number of flea beetle were recorded in plot treated with Spinosad 45% SC (6.14 flea beetle/plant) followed by Emamectin benzoate 5 % SG (6.72 flea beetle/plant), *Metarhizium anisopliae* 1×10^{8} CFU (7.21 flea beetle/plant), Cypermethrin 25% SG (7.44 flea beetle/plant), NSKE 5% (8.03 Flea beetle/plant), *Beauveria bassiana* (8.32 flea beetle/plant) as compared to untreated plot (9.36 flea beetle/plant) (Table 3 and Fig. 2).

Second spray

Three days after second spray

The data revealed that three days after second spray, the plot treated with Spinosad 45% SC (1.14 flea beetle/plant), followed by *Metarhizium anisopliae* 1×10^{8} CFU (3.24 flea beetle/plant), Cypermethrin 25% SG (7.44 flea beetle/plant), *Emamectin benzoate* 5 % SG (4.51 flea beetle per plant), *Beauveria bassiana* (4.75 flea beetle/plant) and NSKE 5% (4.75 flea beetle/plant) as compared to untreated plot (7.51 flea beetle/plant) (Table 3 and Fig. 3).

Seven days after second spray

After seven days of second spray, the plot treated with Spinosad 45% SC (0.19 flea beetle per plant), followed by Cypermethrin 25% SG (2.21 flea beetle per plant), *Metarhizium anisopliae* 1×10^{8} CFU (2.41 flea beetle/plant), Emamectin benzoate 5 % SG (3.63 flea beetle/plant), *Beauveria bassiana* (3.71 flea beetle/plant) and NSKE 5% (3.66 flea beetle/plant) as compared to untreated plot (6.26 flea beetle/plant) (Table 3 and Fig. 3).

Fifteen days after second spray

After fifteen days of second spray the lowest flea beetle were recorded in Spinosad 45% SC showed lowest population of flea beetle (0.00 flea beetle/plant), followed by Cypermethrin 25% SG (0.85 flea beetle/plant), *Metarhizium anisopliae* 1×10^{8} CFU (1.51 flea beetle per plant), Emamectin benzoate 5 % SG (1.93 flea beetle/plant), *Beauveria bassiana* (2.55 flea beetle/ plant) and NSKE 5% (2.97 flea beetle/plant) as compared to untreated plot (5.40 flea beetle/plant) (Table 3 and fig 3).

Mean of second spray

Mean data of second spray revealed that the most effective treatment was Spinosad 45% SC (0.45 flea beetle/plant), followed by Emamectin benzoate 5 % SG (2.36 flea beetle/plant), Cypermethrin 25% SG (2.39 flea beetle/plant), *Metarhizium anisopliae* 1×10^{8} CFU (2.39 flea beetle/plant), *Beauveria bassiana* (3.67

flea beetle/plant) and NSKE 5% (4.03 flea beetle/plant) as compared to untreated plot (6.39 flea beetle/plant) (Table 3 and fig 3).

Overall mean of two sprays

Overall mean of two spray revealed that the most effective treatment was Spinosad 45% SC (3.29 flea beetle/plant) were recorded, which was followed by Emamectin benzoate 5 % SG (4.80 flea beetle/plant), Cypermethrin 25% SG (4.91 flea beetle/plant), *Metarhizium anisopliae* 1×10^8 CFU (5.04 flea beetle/plant), *Beauveria bassiana* (5.99 flea beetle/plant) and NSKE 5% (6.03 flea beetle/plant) as compared to untreated plot (7.88 flea beetle/plant) (Table 3).

Table 3 : Bio efficacy of different insecticides against flea beetle (*Phyllotreta cruciferae*) following 1st spray and 2st spray during *Rabi* season 2024.

Treatment No.	**Treatment Name**	**Dose**	**Mean number of flea beetle per plant**									
			Before spray	**After 1st spray**				**After 2rd spray**				**Overall mean of both spray**
				3rd DAS	**7th DAS**	**15th DAS**	**Mean of 1st spray**	**3rd DAS**	**7th DAS**	**15th DAS**	**Mean of 2nd spray**	
T1	Spinosad 45% SC	200 ml/ ha	9.21 (3.91)	7.40 (2.89)	5.96 (2.63)	5.05 (2.45)	6.14	1.14 (1.44)	0.19 (1.08)	0.00 (1.00)	0.45	1.14 (1.44)
T2	Cypermethrin 25% SG	1ml/ l	8.77 (3.12)	8.01 (2.99)	7.50 (2.91)	6.79 (2.78)	7.44	4.11 (2.25)	2.21 (1.79)	0.85 (1.35)	2.39	4.11 (2.25)
T3	*Metarhizium anisopliae*	1×10^8 CFUs/gram	8.08 (3.01)	7.73 (2.95)	7.07 (2.83)	6.81 (2.79)	7.21	3.24 (2.05)	2.41 (1.83)	1.51 (1.57)	2.39	3.24 (2.05)
T4	Emamection Benzoate 5% SG	0.4 gm/l	7.38 (2.88)	7.15 (2.84)	6.67 (2.76)	6.34 (2.70)	6.72	4.51 (2.33)	3.63 (2.08)	1.93 (1.63)	3.36	4.51 (2.33)
T5	*Beauveria bassiana*	1×10^8 CFUs/gram	9.08 (3.17)	8.62 (3.10)	8.36 (3.05)	7.96 (2.99)	8.32	4.75 (2.35)	3.71 (2.15)	2.55 (1.87)	3.67	4.75 (2.35)
T6	Neem seed Kernel Extract	5ml/lit.	8.27 (3.04)	8.01 (2.99)	7.97 (2.99)	8.09 (3.01)	8.03	5.47 (2.53)	3.66 (2.01)	2.97 (1.98)	4.03	5.47 (2.53)
T7	Control		9.16 (3.18)	8.63 (3.10)	9.51 (3.24)	9.95 (3.30)	9.36	7.51 (2.91)	6.26 (2.69)	5.40 (2.49)	6.39	7.51 (2.91)
C.D.			N/A	N/A	0.191	0.236		0.527	N/A	0.544		
SE(m)±			0.081	0.075	0.061	0.076		0.169	0.295	0.175		
SE(d)			0.114	0.106	0.087	0.107		0.239	0.417	0.247		
C.V.			4.519	4.349	3.636	4.584		12.910	26.186	17.747		

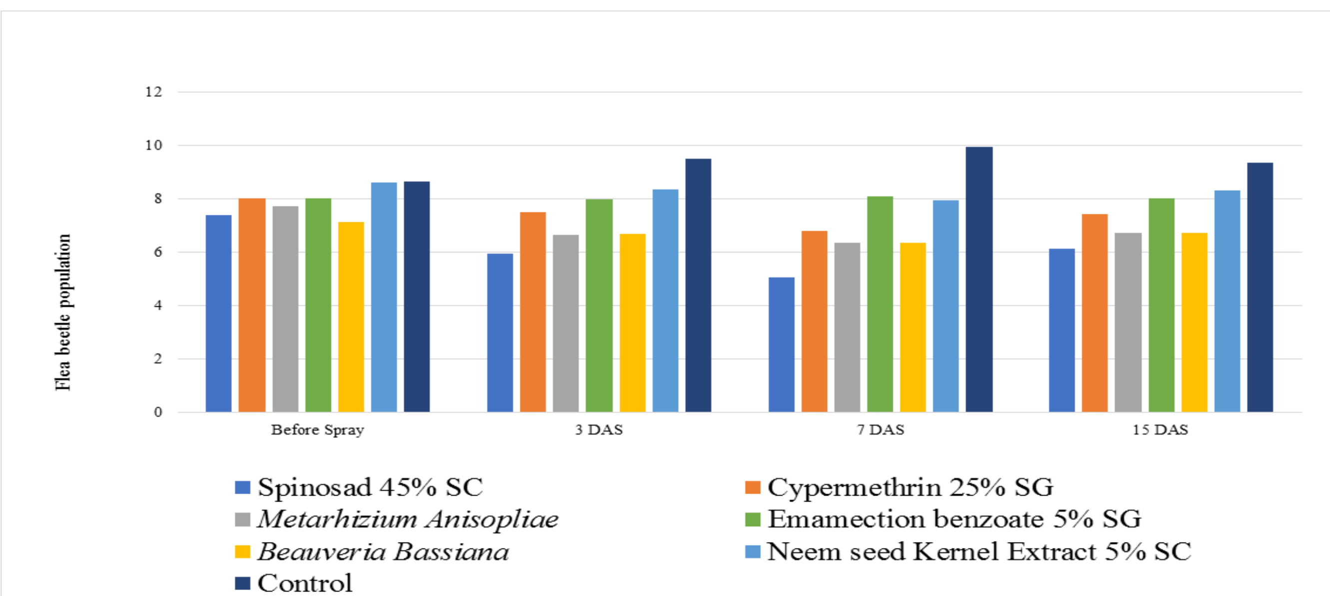

Fig. 2 : Efficacy of insecticides and bio pesticides against flea beetle in cauliflower during season *Rabi* 2024 after first spray.

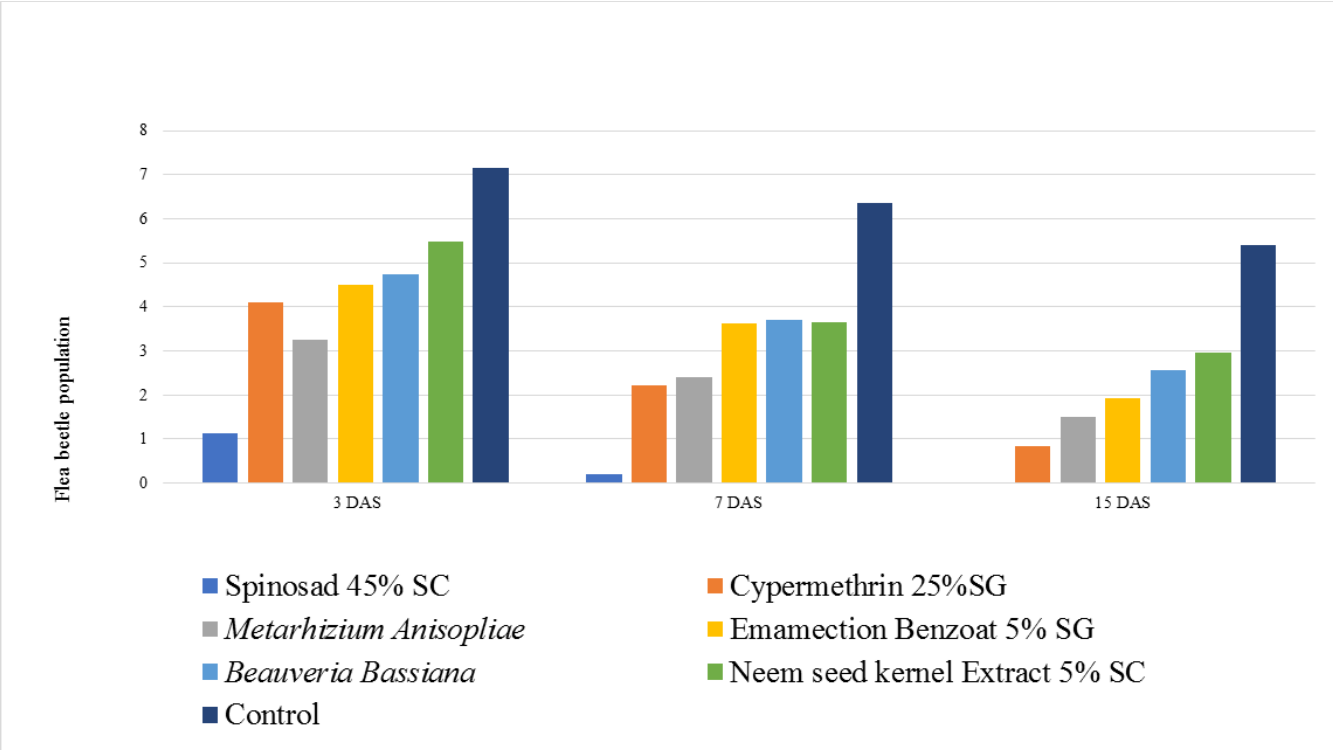

Fig. 3 : Efficacy of insecticides against flea beetle in cauliflower during season *Rabi* 2024 after Second spray.

Conclusion

Studies on seasonal incidence of flea beetle in cauliflower revealed that larval population of flea beetle recorded from fourth week of October 2024 (43th meteorological standard week) to December 2024 (52th meteorological standard weeks) of crop. The pest population recorded in 43th standard week is 0.01 larvae/ plants. The pest population of Tobacco caterpillar recorded in 41th standard week is 0.13 insect/plant. The pest population of Diamond back moth, recorded in 42th standard week is 1.22 larvae/plant.

The minimum and maximum temperature prevailing during the initial infestation was 28.7° C and 91.90^{o} C respectively. While the average relative humidity morning and evening was existed to the tune of 91.9% and 77.14% during the standard week. The larval population increase gradually with fluctuations during the period and reached peak during 47th SMW i.e., third week of November with the larval population of 06.3 larva/plants. The larval population increase gradually with fluctuations during the period and reached peak during 47th SMW i.e., second week of November with the larval population of 05.17 larva/plant. The larval population increase gradually with fluctuations during the period and reached peak during 50th SMW i.e., fourth week of February with the larval population of 14.15 larva/plant.

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