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Seasonal Incidence of Onion Thrips (*Thrips tabaci*) and the Abundance of Its Natural Enemies

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ABSTRACT: The present study was carried out in the Entomological research field of vegetable Research Farm, Institute of Agricultural Science, BHU Varanasi, during the Rabi season 2021-2022. The occurrence of coccinellids was observed from 50th SMW (1.28 beetle/plant) when maximum temperature, minimum temperature, rainfall, morning relative humidity, evening relative humidity, and wind speed were recorded as 24.6ºC, 8.6ºC, 94%, 44%, and 0.5 km/hr, respectively. The coccinellid population ranged from 0.82 lowest population (4th SMW) to 3.56 highest population (6th SMW) beetles/plant on onion. The correlation between thrips population on onion with evening RH (r=- 0.209) and rainfall (r= 0.229) shows negatively significant and morning RH (r=-0.529) negatively significant whereas, maximum temperature (r= 0.504), wind velocity (r=0.719), sunshine hours (r=0.634) and evaporation (r=0.823) were shown as positively significant.

Keywords: Antioxidant, Carbendazim, evaporation etc.

INTRODUCTION

Onions (*Allium cepa Lindeman*.) are abundant in flavonoids like quercetin and sulphur compounds like allyl propyl disulphide, which have been proven to have anti-inflammatory, antibacterial, and antioxidant characteristics and could be used to prevent cancer (Mautino *et al.,* 2012). It contains vitamins A, C, E, and K, as well as thiamine and riboflavin. Fresh onion has approximately 86.8% moisture, 11.6 percent carbs, 1.2 percent proteins, 0.2-0.5 percent calcium, 0.05 percent phosphorus, and traces of iron, thiamine, riboflavin, and ascorbic acid in terms of nutrition, according to (Yadav *et al.,* 2018). Thrips are tiny cylindrical and highly mobile insects with fringed wings. Thrips are the serious pest of onion which attack onion at all stages of crop development, but their numbers rises from bulb initiation to bulb maturity. *Thrips tabaci* causes 34-43% production loss and acts as a vector for Tospovirus, which causes Iris yellow spot virus (Dwivedi *et al.,* 2022). Failure to control thrips in a timely and effective manner causes severe damage and results in large economic losses, as yield can be reduced by up to 50%. When thrips attack onion crops in the early phases of growth, however, production losses of up to 90% have been observed (Zen *et al.,* 2008). The occurrence of thrips on onion began in November and rapidly grow over the summer months, according to Sathe and Pranothi (2015). Onion thrips infestation began in the first week of February and subsequently increased until the first week of April when it began to subside (Morsello *et al*., 2014). In both large-scale and small-scale onion production systems, the predator complex such as adult *Aeolothrips fasciatus,* Anthocorid bugs (Anthocoridae), lacewing larvae (Neuroptera), ladybird beetles (Coccinellidae), hoverfly larvae (Syrphidae), and predatory thrips (Aeolothripidae) was also regularly detected in non- onion cropping systems (Sabelis *et al*., 1997). The purpose of this study was to identify the insect pests that attack this crop and the occurrence of their natural enemies in theVaranasi region.

MATERIALS AND METHODS

During the years 2021-2022, the experiment was carried out at the Vegetable Research Farm of the Institute of Agriculture Science at Banaras Hindu University in Varanasi. Varanasi is located at an elevation of 80.71 meters (264.8 feet) above mean sea level, with a longitude of 82.98 degrees east and latitude of 25 degrees north. Seedlings of onion variety Agri found red was raised in a nursery of the vegetable Research farm BHU, Varanasi. 30 days old seedlings were transplanted on 05 December 2021 with a plant spacing of 15 × 10 cm. Before transplanting the seedlings were root dipped in the Bavistin (Carbendazim 0.1%) solution to prevent the initial fungal damage to the seedlings. The field was irrigated immediately after transplanting and thereafter frequently watered as required. Observations on the seasonal abundance of insect pests of rabi onion were made at weekly intervals from the day of establishment of plants after transplanting until the final harvest. Thrips populations were counted at every seven days interval, sampling was made from five randomly selected plants in three replications from each plot. Observations were recorded in early morning. Weather data were collected concurrently from the Institute of

Agricultural Sciences, Banaras Hindu University, Varanasi's meteorological unit, and associated with the occurrence of insect and mite pests in Onion. Rainfall (mm), maximum temperature (°C), minimum temperature (°C), morning relative humidity (percent), and evening relative humidity (percent) are all- weather parameter.

RESULTS AND DISCUSSION

Population dynamics of *Thrips tabaci* L. the onion plant was monitored for occurrence of thrips population from December to April on five randomly selected plants at weekly intervals. Thrips were first noticed at the seedling stage, and their population increased rapidly during the vegetative stage, reaching a peak during the crop's physiological maturity stage. The population of thrips infesting onion from 50th SMW to 10th SMW 2021, revealed that the thrips population ranged from 4.64 (50th SMW) to 24.86 (8th SMW) thrips/plant, during the ten weeks of observations population started increasing gradually and also fluctuated at some time period but the higher level of infestation was recorded from 3rd SMW (15.80 thrips/plant) to 8th SMW (24.86 thrips/plant), with the highest incidence recorded during the 08th SMW (24.86 thrips/plant) during that time maximum temperature, minimum temperature, rainfall, morning relative humidity, evening relative humidity, and wind velocity were recorded as 26.7ºC , 12.3ºC, 0.3 mm, 90%, 59%, and 3.7 km/hr respectively. The thrips population starts gradually decline from 9 SMW. The current investigation closely relates to earlier research findings by Lee and Wen (1982), who observed thrips infestations in onions throughout the year, with a higher population density during the dry season. Similarly, Ibrahim and Adesiyun (2010), observed that thrips populations peaked in March on transplanted onions in December and January.

Population dynamics of ladybird beetle. The noticeable incidence of the ladybird beetle population began from 50th SMW to 10th SMW 2021 and 2022. The data on population dynamics of coccinellids are presented in Table 1 and Fig. 2. The occurrence of coccinellids was observed from 50th SMW (1.28 beetle /plant) when maximum temperature, minimum temperature, rainfall, morning relative humidity, evening relative humidity, and wind speed were recorded as 24.6ºC, 8.6ºC, 0 mm, 94%,44%, and 0.5 km/hr, respectively. The coccinellid population ranged from lowest population of 0.82 (4th SMW) to highest population of 3.56 (6th SMW) beetles/plants on onion. Similar findings, According to Wagan and Wagan (2015), ladybird beetle occurrence peaked in the seventh WAT (2.95 per plant) and peaked at its lowest level in the thirteenth WAT.

Simple correlation between weather parameters and Thrips population and lady bird beetle

Simple correlation studies of *Thrips tabaci* L. The correlation between thrips population with rainfall (r=-0.229) and evening RH (r=-0.209) were negatively correlated whereas, maximum temperature (r=0.504), wind velocity (r=0.719), sunshine hours (r=0.634) and evaporation (r=0.823) were positively correlated, with minimum temperature (r=0.403), shows positively non-significant correlation. Verma *et al.* (2012) reported that minimum temperature was positively correlated with the thrips population. The results are in conformity with Tong-Xian Liu (2004) who reported that temperature affected only the early infestation in January and February and a daily rainfall of 1.8 cm or more caused a temporary reduction of thrips densities on onion plants.

Simple correlation studies Ladybird beetle. Correlation between weather parameters and the ladybird beetle population was studied. The coccinellid count showed a negative and non-significant correlation with rainfall (r=-376), wind speed (r=-198), and bright sunshine (r=-0.471), showing positive and non-significant correlation with morning RH (r=0.400) and evening RH (r=0.399), whereas minimum temperature (r=-0.509), maximum temperature (r=-607) and evaporation (r=-0.537) shows a significant negative correlation.

Table 1: **Seasonal population dynamics of *Thrips tabaci* on onion and Ladybird beetle in relation to different weathers parameters during 2021-2022.**

SMW	Mean thrips/plant	Mean beetles/plant	R (mm)	T (°C)		Rh(%)		Wv (Km/hr)	Sh	E (mm)
				Max	Min	Morn	Eve			
50	4.64	1.28	0.0	24.6	8.6	94	44	0.5	5.4	1.2
51	7.18	2.25	0.0	22.3	7.2	91	53	1.1	6.0	1.3
52	8.02	2.42	8.6	21.9	10.0	97	72	1.0	3.1	0.8
1	9.20	2.80	1.2	19.2	8.8	98	75	0.9	3.3	0.6
2	9.05	2.68	5.4	22.1	11.8	96	74	1.4	1.6	0.9
3	15.8	3.15	0.0	18.5	6.7	93	70	1.6	2.2	1.2
4	10.4	0.82	4.9	20.0	9.8	94	68	3.1	3.4	1.7
5	13.65	2.22	4.3	22.7	8.6	94	61	3.7	7.2	1.9
6	16.94	3.56	0.0	22.6	9.6	94	57	2.9	5.7	2.0
7	18.45	2.19	0.0	25	7.9	92	47	2.6	9.6	2.7
8	24.86	1.32	0.3	26.7	12.3	90	59	3.7	8.7	3.2
9	18.32	1.18	0.4	28.6	12.5	95	53	1.9	8.4	2.9
10	17.55	0.92	0.0	29.7	13.5	89	54	2.4	9.4	3.5

R- Rainfall, T- Temperature, Rh- Relative humidity, Wv- Wind velocity Sh- Sunshinehours, E- Evaporation, Max- Maximum, Min – Minimum, Morn-Morning, Eve- Evening

Table 2: Simple correlation between weather parameters and thrips and ladybird beetleon onion on onion during 2021-2022.

Weather factors	insect	
	Thrips	Ladybird beetle
	r	r
Rainfall (mm)	-0.229^{NS}	-0.376^{NS}
Maximum temperature (°C)	0.504*	-0.607*
Minimum temperature (°C)	0.403^{NS}	-0.509*
Morning relative humidity (%)	-0.529*	0.400^{NS}
Evening relative humidity (%)	-0.209^{NS}	0.399^{NS}
wind speed (km/hr)	0.719**	-0.198^{NS}
sunshine hours	0.634*	-0.471^{NS}
Evaporation (mm)	0.823**	-0.537*

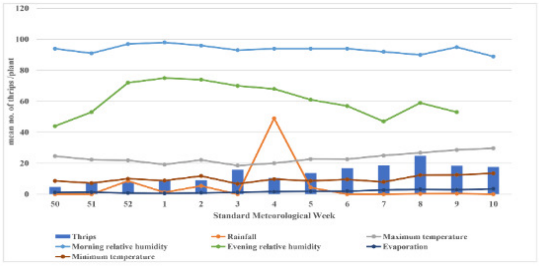

Fig. 1. Seasonal population dynamic of *thrips tabaci.*

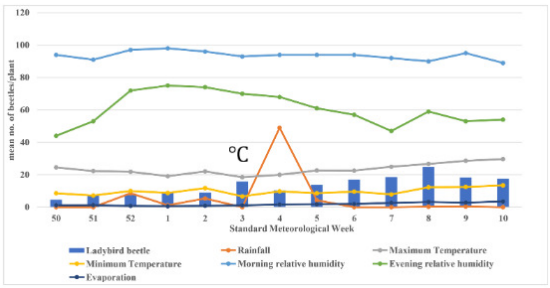

Fig. 2. Seasonal population dynamic of lady bird beetle.

CONCLUSIONS

Thrips first appeared in the 50th SW, with 4.64 thrip/plant. The population fluctuated and peaked at 24.86 thrips/plant in the 8th SW. The population of ladybird beetle was recorded in 50TH SW with 1.28 beetle per plant. The population fluctuated and peaked at 3.56 beetle/plant in the 6TH SW. The population of *Thrips tabaci* was negatively correlated with rainfall and evening RH. but positive and non-significant correlated with minimum temperature. However, the thrips population shows a positive and significant correlation with maximum temperature, wind velocity, sunshine hours, and evaporation. The population of ladybird beetle shows a negative significant correlation with maximum and minimum temperature and evaporation. However, negative non-significant correlation with rainfall, wind, and sunshine.

FUTURE SCOPE

In current research, a noteworthy discovery reveals that as the population of thrips increases, there is a corresponding increase in the population of ladybird beetles. Therefore, utilizing ladybird beetles for thrips management proves to be highly effective for farmers, offering a cost-efficient and environmentally friendly solution.

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