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Seasonal occurrence of major insect complex of onion (*Allium cepa*) and correlate with weather factors

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Abstract

The experiment will be conducted at Agricultural research farm, Rabindranath Tagore University, Raisen Bhopal (MP) during Rabi season 2020 and 2021. Onion variety Prasidhi Will be obtained from the Kalash seeds pvt Ltd. The experiment will be laid out in Randomized Block Design with three replications. Correlation studies revealed that the onion thrips are non-significant with maximum Temperature ($r=0.0204$). Correlation studies revealed that the onion Leek moth are significant correlated negative with Maximum Temperature ($r=-0.1439$), Minimum Temperature ($r=-0.4071$). Onion maggot are significant correlated negative with Minimum Temperature ($r=-0.4204$), Average Temperature ($r=-0.3011$).

Keywords: *Allium cepa*, *Thrips tabaci*, maggot, leek moth, temperature, humidity, rainfall, pest, red spider

Introduction

Onion, *Allium cepa* L. (Family: Alliaceae) is an important bulb, vegetable and spice crop of India. It can be consumed raw, cooked, fried, dried or roasted. It is cultivated in almost all parts of the country mainly for culinary purpose and also have medicinal value. Onions also possess antioxidant, hypoglycemic, anti-inflammatory, anticancer and antimicrobial properties. Onion also contains protein, vitamin C and minerals like phosphorus, calcium and carbohydrates. India is the second-largest onion-producing nation in the world. Bihar, Gujarat, Madhya Pradesh, Karnataka, and Maharashtra are the principal onion-growing states in the nation. Onion cultivation covered 85000 acres in Madhya Pradesh, with an annual production of 13.50 lakh tone. Globally, onion crop is infested by different insect and mite pests of which thrips *Thrips tabaci* Lindeman, onion maggot *Delia antiqua* (Meign), Leek moth *Acrolepiopsis assectella* armyworm *Spodoptera exigua* (Hubner), Leaf eating caterpillar *Helicoverpa armigera* Hubnerect. The population of thrips (nymphs and adults) and other insects and pests were recorded the number of thrips per plot, from five randomly selected and tagged plants at weekly intervals from 15 days after transplanting. The selected plants will be tagged with paper tag for their easy identification. The observation will be made in morning time. The mean population of Thrips will be recorded with the help of 10x magnifying glass.

Materials and Methods

The experiment entitled Seasonal occurrence of major insect complex of onion and correlate with weather factor was conducted at Agricultural research farm, Rabindranath Tagore University, Raisen Bhopal (MP) during Rabi season 2020 and 2021. Onion variety Prasidhi Will be obtained from the Kalash seeds pvt Ltd. Onion seeds will be in the nursery beds from the level of ground (15cm) with one meter width and five-meter length. 30 days old seedling will be transplanted in well pulverized main field with a plant spacing of 15x10cm. Before transplanting the seedling of onion will be treated with fungicide solution to stop the early infestation of fungal disease to the onion. All horticultural practices will be adopted during the experiment. The experiment will be laid out in Randomized Block Design. The population of thrips (nymphs and adults) was recorded as the number of thrips per plot, from five randomly selected and tagged plants at weekly intervals from 15 days after transplanting. The selected plants will be tagged with paper tags for their easy identification.

The observation was made in morning time. The mean population of Thrips were recorded with the help of 10x magnifying glass. The presence of insect and mite pests in onion was linked to weather information gathered concurrently from the Krishi Vigyan Kendra, Raisen (M.P.). All-weather parameters include rainfall (mm), maximum temperature (°C), minimum temperature (°C), morning relative humidity (%), evening relative humidity (%), evening relative humidity (%) and wind velocity.

Results and Discussion

The first appearance of the thrips was recorded on 15 January 2020 during the 3rd SW thereafter observations were recorded regularly twice in a standard week. The number of thrips (nymph & adult) and other insects and pests was worked out as weekly average per plant and given in Table 1 and 2 illustrated in Figure 1. Correlation studies revealed that the onion thrips are non-significant with maximum Temperature (r=0.0204) Morning Relative Humidity & Evening Relative Humidity (r=0.0154), Average Relative Humidity (%) (r=0.1144), correlated with, Total Rainfall (mm.) (r=0.3065), Sunshine (r=0.4574) and a negative significant association with Minimum Temperature (°C) (r=-0.4859) & (r= -0.3238) at 0.05 level was noticed (Fig. 1).

Correlation studies revealed that the onion Leek moth are significant correlated negative with Maximum Temperature (r=-0.1439), Minimum Temperature(r=-0.4071), Average Temperature (r=-0.3460), Morning Relative Humidity (r=-0.1810) Total Rainfall (mm) (r=-0.2899), Sunshine (r=-0.3561). Correlated positive with significant association with Evening Relative Humidity (r=0.0673) & Average Relative Humidity (r=0.0509) at 0.05 level was noticed (Fig. 1). Onion maggots are significantly correlated negative with Minimum Temperature (r=-0.4204), Average Temperature (r=-0.3011), Morning Relative Humidity (r=-0.1164), Total Rainfall (mm) (r=-0.3690, Sunshine (r=-0.3911). Correlated with non-significant association with Maximum Temperature (r=-0.0275), Evening Relative Humidity (r=0.0463) & Average Relative Humidity (r=-0.0310) at 0.05 level was noticed (Fig. 1). Correlation studies revealed that the spider are significant correlated negative with Maximum Temperature (r=-0.0734), Minimum Temperature (r=-0.3329), Average Temperature (r=-0.2625), Morning Relative Humidity (r=-0.1256), Average Relative Humidity (r=-0.0841), Total Rainfall (mm) (r=-0.4868), Sunshine (r=-0.0887). Correlated with non-significant association with Evening Relative Humidity (r=-0.0381) & at 0.05 level was noticed (Fig. 1).

Table 1: Seasonal occurrence of major insect complex of onion and correlate with weather factor 2020-2021

SMW	Temperature(.C)			Relative Humidity (%)			Rainfall	Sunshine hrs.	Thrips	Leek moth	Onion maggot	Spider	Lady bird beetle
	Max.	Min.	Ave	Mor	Eve	Ave							
3	26.6	14.42	20.51	86.57	72.14	79.35	1.42	7.84	1.85	2.22	0.12	0.1	0
4	25.6	10.34	17.97	70.14	72.71	71.42	0	11.07	3.98	3.4	1.32	1.25	0
5	25.91	8.2	17.07	66.42	57.28	61.85	0	10.8	5.7	3	2.28	1.9	0
6	25.17	9.7	17.43	76	76.28	76.14	0	8.35	8.28	4.28	2.82	2.4	0
7	25.74	7.8	16.77	57	61.14	59.07	0	10	8.84	4.12	3.16	2.62	0
8	24.62	6.34	15.48	69	55.57	62.28	0	10	10.22	5.18	3.42	2	1.37
9	24.17	6.62	15.39	68.71	56.85	62.78	0	10	10.91	6.14	3.84	3.22	1.53
10	23.4	8.28	15.84	71.42	54.28	62.85	0	9.6	8.14	3.84	3.8	3.82	1.66
11	25.85	12.6	19.22	54.14	49.28	51.71	0	5.96	5.02	4.02	3.22	3	1.95
12	23.54	8.05	15.79	44.71	35	39.85	0	9.42	4.82	4.2	2.42	2.28	2.2
13	23.2	11.45	17.32	54.5	45	49.75	0	9.15	3.44	3.42	0.9	1.02	2.28
14	21.2	6.65	13.92	67.57	61	64.28	0	5.57	2.28	2.98	0.85	0.96	1.78
15	25.11	8.28	16.69	54.85	36	45.42	0	9.5	1.42	1.88	0.13	0.36	2.2
16	23.17	8.77	15.97	71.7	62.28	66.99	0	6.85	2.62	1.91	v1.7	2.2	2.28
17	26.91	10.37	18.64	73.28	45.85	59.56	0	7.46	2.82	2.03	1.37	1.99	2.41

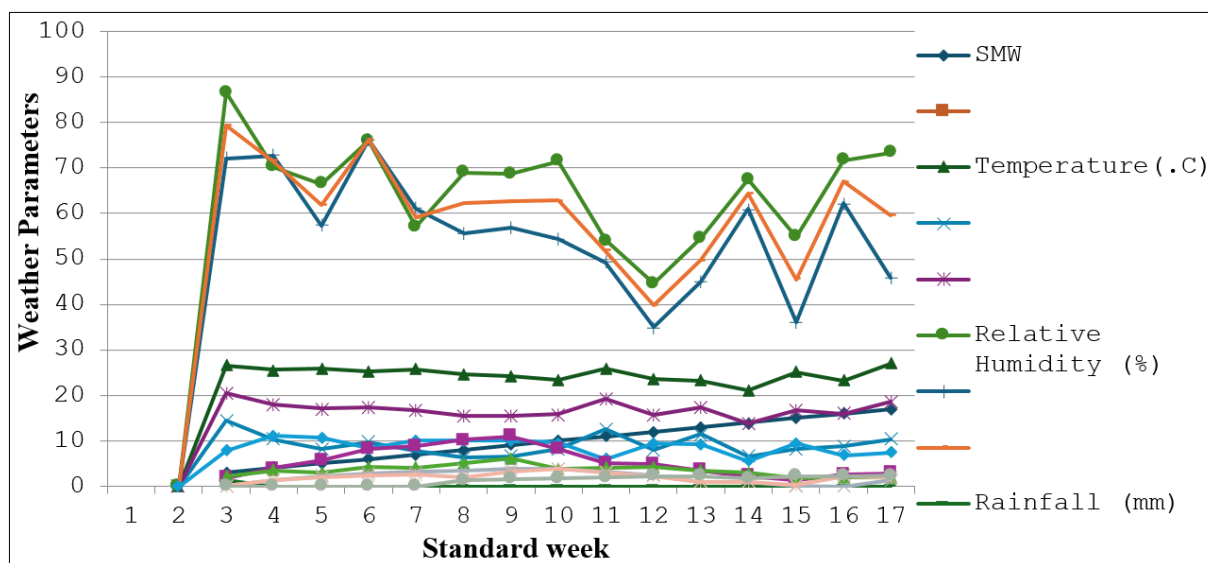


Fig: Seasonal occurrence of major insect complex of onion and corelate with weather factors

Table 2: Correlation coefficient between weather parameter and incidence of major insect pest & natural enemies of onion 2020-2021

Weather parameter	Thrips	Leek moth	Onion maggot	Spider	Lady bird beetle
Max. Temp. (°C)	0.0204 ^{NS}	-0.1439	-0.0275 ^{NS}	-0.0734	-0.4542
Min. Temp. (°C)	-0.4859	-0.4071	-0.4204	-0.3329	-0.1459
Average Temp. (°C)	-0.3238	-0.3460	-0.3011	-0.2625	-0.3110
Morning R.H. (%)	0.0154 ^{NS}	-0.1810	-0.1164	-0.1256	-0.4319
Evening R.H. (%)	0.1861	0.0673	0.0463 ^{NS}	-0.0381 ^{NS}	-0.7615
Average R.H. (%)	0.1144	0.0509	-0.0310 ^{NS}	-0.0841	-0.6506
Total Rainfall (mm.)	0.3065	-0.2899	-0.3690	-0.4868	-0.3617
Sunshine	0.4574	0.3561	-0.3911	0.0887	-0.4153

Significant at 0.05%

Correlation studies revealed that the Lady bird beetle are significant correlated negative with Maximum Temperature ($r=-0.4542$), Minimum Temperature ($r=-0.1459$), Average Temperature ($r=-0.3110$), Morning Relative Humidity ($r=-0.4319$), Evening Relative Humidity ($r=-0.7615$), Average Relative Humidity ($r=-0.6506$), Total Rainfall (mm) ($r=-0.3617$), Sunshine ($r=-0.4153$). Correlated positive with significant association with at 0.05 level was noticed (Fig. 1).

Conclusion

The study conducted over the Rabi seasons of 2020 and 2021 at Rabindranath Tagore University's Agricultural Research Farm in Bhopal focused on the seasonal occurrence of major insect pests affecting onion (*Allium cepa*). Through comprehensive correlation studies with weather factors such as temperature, humidity, rainfall, and sunshine hours, significant insights were gained into the dynamics of pest populations. Notably, onion thrips (*Thrips tabaci*), onion maggot (*Delia antiqua*), leek moth (*Acrolepiopsis assectella*), and other pests showed varied responses to environmental conditions, particularly temperatures and humidity levels. These findings underscore the complex interactions between insect pests and weather patterns, crucial for developing effective pest management strategies in onion cultivation. Further research in this area is essential for enhancing agricultural practices and ensuring sustainable onion production amidst changing climatic conditions.

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