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SEASONAL INCIDENCE OF THRIPS, *THRIPS TABACI* LINDEMAN AND OCCURRENCE OF ASSOCIATED NATURAL ENEMIES ON ONION (*ALLIUM CEPA* L.)

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ABSTRACT

An experiment was conducted at Rajasthan College of Agriculture, Udaipur during *rabi* 2013-14 to study the seasonal incidence of onion thrips. The incidence of onion thrips initiated on 4th SMW and gradually increased towards maturity and reached its peak in 13th SMW (35.1 thrips/ plant). The population of thrips had significant positive correlation with maximum (r = 0.81), minimum (r = 0.70), and mean atmospheric temperature (r = 0.79); while maximum relative humidity (r = -0.75) and mean relative humidity (r = -0.72) had significant but negative correlation with the population of thrips. The population of *Cheilomenes sexmaculata* (Fabricius) peaked during 12th SMW and had a highly positive and significant correlation with the population of thrips (r = 0.97).

Key words: Standard Meterological Week (SMW), Incidence*, Thrips tabaci* Lindeman, *Cheilomenes sexmaculata* (Fabricius)

INTRODUCTION

Onion is infested by several insect pests such as onion thrips, *Thrips tabaci* Lindemann, onion fly, *Delia antiqua* Meign, cutworm, *Agrotis ipsilon* Hufnegel, tobacco leaf eating caterpillar, *Spodoptera litura* Fabricius and gram pod borer, *Helicoverpa armigera* (Hubner). Among these, onion thrips cause serious damage to the crop being polyphagous. It occurs worldwide and attacks virtually all *Allium* crops (Rahman and Batra, 1945; Vevai and Talgeri, 1948). *Thrips tabaci* causes 90 per cent foliage injury (More, 1977 and Gupta *et al*., 1984) and 55 to 57 per cent yield reduction (Kisha, 1977; Rueda, 2000). Both nymphs and adult thrips are found between leaf sheaths and stem, under sever infestation it leads to an irregular or blotchy whitening of the leaves, a condition sometimes termed blast. Heavy levels of feeding injury disrupt the hormonal balance of the plant, causing the leaves to curl and twist, and the foliage to be stunted (Kendall and Bjostad, 1990). Such damage decreases onion bulb size, and may even lead to death of the plant. Onion thrips is reported to transmit purple blotch disease in onion (McKenzie *et al.*, 1993) and Tospo virus causing Irish yellow spots on onion (Kumar and Rawal, 1999).

MATERIALS AND METHODS

In order to study the population dynamics of onion thrips and their associated natural enemies an experiment was laid out in randomized block design with six replications. The seeds of N-53 onion variety were sown in raised nursery of 3x1x0.15m on 5th October, 2014. The seedlings of onion were transplanted in six well prepared plots that were laid out for natural infestation to facilitate observations on insect pests and their natural enemies. A plot size of 2.10 m x 2.0 m (4.20 sq m.) was maintained with row to row and plant to plant distance of 15 and 10 cm, respectively. All horticultural practices were followed as per recommendations given in package of practices for raising a good and healthy crop. Observations for onion thrips as well as the associated natural enemies were taken on a weekly basis from 5 randomly selected plants that were tagged in each replication. The population dynamics of *T. tabaci* was studied on the basis of population count of both nymphs as well as adults per plant and after working out the mean population. Population of *thrips* was recorded with the help of 10 X hand lens in the leaf sheath by gently pulling the older leaves.

In order to find out the specific impact of biotic and abiotic factors on onion thrips, population data of onion thrips obtained were subjected to statistical analysis to find out the coefficient of correlation with biotic (natural enemies) and abiotic factors *viz.,* temperature, relative humidity and sunshine. The meteorological observations during the investigation period were taken from the meteorological observatory, Rajasthan College of Agriculture, Udaipur.

$$r_{xy} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{n}\right]\left[\sum Y^2 - \frac{(\sum Y)^2}{n}\right]}}$$

Where;

r_{xy} = Simple correlation coefficient.

X = Independent Variable i.e. biotic and abiotic components.

Y = Dependent Variable i.e. mean number of onion thrips

n = Number of observations.

The correlation coefficient (r) values were subjected to the test of significance using t-test:

$$t = \frac{r}{\sqrt{1 - r^2}} \times \sqrt{n-2}$$

The calculated t-value obtained was compared with tabulated t-value at 5% level of significance.

RESULTS AND DISCUSSION

During the present investigation the data (Table 1 & Fig. 1) revealed that *Thrips tabaci* remained a consistent pest on onion during the growing season, it initiated in the 10th week after transplanting (4th SMW) and continued up to crop maturity on 13th SMW. The population density of thrips gradually increased towards maturity with 0.6 to 35.1thrips/plant during the season and reached its peak in the last week of March. Earlier, El-Serwiy *et al.* (1985) observed the peak during the 1st week of April on onion. Likewise, many other workers have also reported the peak incidence of thrips during March and April (Edelson *et al.,* 1986; El-Gendi, 1998; Chhatrola *et al.,* 2006; Ullah *et al.,* 2010).

The population of onion thrips exhibited a positive and significant correlation with atmospheric temperature (maximum, minimum, and mean) with correlation coefficient (r) values as 0.81, 0.70 and 0.79, respectively; while, maximum relative humidity and mean relative humidity had significant negative correlation with the population of thrips and the r-values were -0.75 and -0.72, respectively. The population of thrips was positively correlated with sunshine (r = 0.49); while, it was negatively correlated with minimum relative humidity (r = -0.55) through was non-significant (Table 2 & Fig. 1). Earlier, Butani and Verma (1976) stated that dry weather favoured the multiplication of thrips in garlic and onion: whereas, heavy rains and humid weather were unfavourable for its development. Domiciano *et al*. (1993) observed positive association between temperature and population of onion thrips, while negative with relative humidity.

During the crop season, the coccinellid, *Cheilomenes sexmaculata* (Fabricius) was first observed in the 2nd week of February (0.1/plant) that reached to the maximum during 4th week of March (0.7 /plant) which later started to decline. The population of the predator *Ch. sexmaculata* had a positive and significant correlation with the population of thrips with the r-value being 0.97. The population of *Ch. sexmaculata* persisted as long as the population of thrips was observed on the crop indicating low, but steady predatory activity. The present findings are similar to that of Kadri and Goud (2005) who reported that coccinellids were the major predators of thrips and had a positive correlation with the incidence of thrips. Eyre *et al.* (2011) also noticed high ladybird beetle, hoverfly and parasitc wasp (Icheumonidae) numbers to be associated with lowest damage by onion thrips.

Table 1. Seasonal incidence of *T. tabaci* and *Ch. sexmaculata* on onion during *rabi*, 2013-14

Months and Weeks		Week after transplanting	Standard Meteorological Week	No. of *T. tabaci* per plant	No. of *Ch. sexmaculata per* plant
January	IV	10	4	0.6	0.0
February	I	11	5	2.0	0.0
	II	12	6	6.6	0.1
	III	13	7	11.4	0.3
	IV	14	8	20.4	0.4
March	I	15	9	23.5	0.4
	II	16	10	27.8	0.5
	III	17	11	30.7	0.5
	IV	18	12	34.5	0.7
	V	19	13	35.1	0.5
Mean		-	-	19.26	0.34

Table 2. Population dynamics of onion thrips, *T. tabaci* as influened by abrotic and triti factors during *rabi*, 2013-14

Dates of Observation	Abiotic factors							Biotic factor	No. of thrips per plant
	Temperature			Relative Humidity			Sunshine (h.)	No. of *C. sexmaculata* per plant	
	Max. Tem ^{0}C	Min. Tem ^{0}C	Mean Tem.^{0}C	Max. R.H. (%)	Min. R.H. (%)	Mean R.H. (%)			
25 /1/2014	21.1	9.9	15.5	89.3	62.4	75.9	4.7	0.0	0.6
1/2/ 2014	24.8	7.3	16.1	87.3	28.0	57.6	8.9	0.0	2.0
8/2/2014	27.6	10.9	19.3	80.7	28.6	54.6	8.4	0.1	6.6
15/2/2014	23.9	7.9	15.9	81.6	32.7	57.1	8.3	0.3	11.4
22/2/2014	24.9	8.4	16.6	83.9	33.0	58.4	6.7	0.4	20.4
1/3/2014	26.4	11.2	18.8	91.9	39.7	65.8	6.9	0.4	23.5
8/3/2014	26.6	9.3	18.0	77.6	24.6	51.1	9.0	0.5	27.8
15/3/2014	30.2	12.3	21.3	68.6	25.6	47.1	8.9	0.5	30.7
22/3/2014	33.5	13.6	23.5	66.3	24.1	45.2	9.5	0.7	34.5
29/3/2014	34.4	16.4	25.4	62.0	27.3	44.6	8.7	0.5	35.1
Coefficient of correlation (r) for population and maximum atm. temperature									0.81*
Coefficient of correlation (r) for population and minimum atm. temperature									0.70*
Coefficient of correlation (r) for population and mean atm. temperature									0.79*
Coefficient of correlation (r) for population and maximum relative humidity									-0.75*
Coefficient of correlation (r) for population and minimum relative humidity									-0.55 NS
Coefficient of correlation (r) for population and mean relative humidity									-0.72*
Coefficient of correlation (r) for population and sunshine hours									0.49 NS
Coefficient of correlation (r) for population and coccinellid predator									0.97*

*Significant at 5 % level of probability, NS: Non Significant

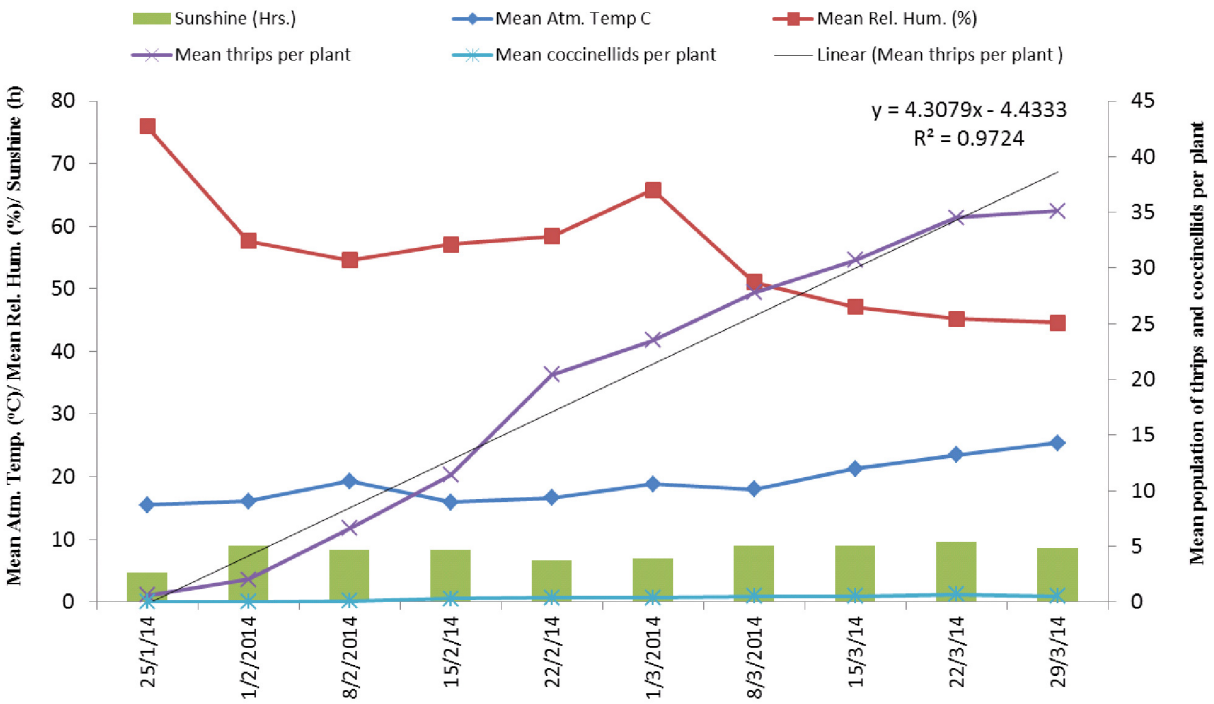

Fig. 1: Population dynamics of onion thrips during *rabi*, 2013-14

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