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RESEARCH ARTICLE :

Seasonal incidence and influence of dates of sowing on thrips infestation in *Kharif* onion

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SUMMARY : A field experiment was conducted at Research Farm of Department of Agricultural Entomology, VNMKV, Parbhani, during *Kharif* 2016, to study The seasonal incidence of onion thrips and effect of transplanting dates on thrips infestation in *Kharif* onion, their effect on ladybird beetle and onion bulb yield. The maximum incidence of thrips was noticed during October to December 2016. Non significant correlation was observed between weather parameters and thrips population in onion. Whereas the predator delivered a positive tropic interaction and maximum count was obtained during November when pest abundance was high. The correlation of coccinellids with temperature, wind velocity and evaporation was significantly negative. Studies on effect of transplanting dates on thrips revealed that the lower population of thrips was noticed in the crop transplanted on 20th July and 30th July during seedlings stage. The higher population of thrips was recorded in seedling transplanted on 10th September, 30th August and 20th August.

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KEY WORDS :
Seasonal incidence, Transplanting dates onion, Thrips

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BACKGROUND AND OBJECTIVES

India is the second largest producer of onion in the world after China. In India, the area under onion cultivation is 1177.6 Mha with a production of 20333.1 MT. The average yield of onion in India is reported to be around 16.1 MT/ha. The major onion growing states are Maharashtra, Karnataka, Andhra Pradesh, Gujarat, Madhya Pradesh and Andhra Pradesh (Anonymous, 2015). Maharashtra is the leading state in onion production and trade in India. The area under onion cultivation is 441.9 Mha with a production 5361 MT followed by Karnataka (3227 MT), Madhya Pradesh (2842 MT) Bihar (1247.3 MT), Gujarat (1126.6 MT) and Andhra Pradesh (575.6 MT). Major area being concentrated in Nasik, Ahmadnagar, Satara and Pune districts. Onions and related crops are subjected to a variety of diseases and attack by arthropod pests that can reduce crop yield and quality (Lorbeer *et al.*, 2002). Onion crop is attacked by several insect pests among those, onion thrips (*Thrips tabaci* L.) is a major pest and reported to cause significant economic losses upto 30-50% (Nault and Shelton, 2012). Immature and adult thrips prefer to feed on young leaves in the inner neck of plants. Thrips damage to young onions is more devastating than on larger plants late in the growing season; however, thrips feeding

opens up the onion to secondary infections. Soni and Ellis (1990) listed seven species of thrips as onion pests, the best known of which is Thrips tabaci, the onion thrip, which attacks all edible onions. It is important to protect the onions from thrips damage throughout the entire growing season. Insecticides are the only way adopted by farmer to protect onion from thrips. The increasing concern for environmental safety and global demand for pesticide residue free commodities have evolved a keen interest and necessitated a deep insight into issue of pest management. Keeping in view the above facts, the studies were planned with objectives:

Objectives :

– Effect of different transplanting dates on incidence of thrips in *Kharif* season.

– To study seasonal incidence of onion thrips in relation to weather parameters.

RESOURCES AND METHODS

The present investigation was carried out in *Rabi* season of 2016-17 at Research Farm, Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

The experiment was laid on uniform, heavy black cotton soil having good fertility and drainage. The sowing was done on 10th June 2015 by using N-53 variety. The plant to plant and row to row distance was 45 x 30 .

Method of recording observations :

Effect of different dates of transplanting on incidence of onion thrips during Kharif season :

Tr. No	Sowing dates	Transplanting dates
1.	10th June	20th July
2.	20th June	30th July
3.	30th June	10th August
4.	10th July	20th August
5.	20th July	30th August
6.	30th July	10th September

Non replicated plot size 10×10 m^2 was transplanted with onion seedlings at respective dates and 5 plants from middle row were tagged and observed for the incidence of thrips from transplanting to harvest. These plots were not be sprayed with any insecticides.

Seasonal incidence of thrips :

The seasonal incidence of thrips was observed on randomly selected 5 plants from untreated plots of 10×10m^2 of onion crop from emergence to maturity. The plants were observed early in the morning at weekly intervals.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads and Table 1 to 4.

Seasonal incidence of thrips :

The data on population of thrips *T. tabaci* infesting onion during 27th SMW to 50th SMW 2016 (Table 1 and Fig. 1), showed that thrips population was ranged from 1.5 (27th SMW) to 16.4 (44th SMW) thrips/plant on onion.

The occurrence of thrips was observed during seedling stage and it was gradually increased its population during vegetative stage and reached a peak during physiological maturity stage of the crop. During first week of observation (27th SMW) the population was 1.5 thrips/ plant and then population increased steadily reaching peak at 39th SMW (15.6 thrips/plant). There after population fluctuated within narrow range and reached maximum at 44th SMW (16.4 thrips/plant). The present investigation was closely related with earlier workers, Hammon (2002) reported that, thrips population appeared in onion in early June and peaked at about 600 per plant in mid-July before collapsing to less than 10 per plant in early August. Similarly, the results of experiment conducted by Lee and Wen (1982) documented that incidence of thrips was found in onion throughout the year, higher population was recorded during dry season. The findings reported by Kranz *et al.* (1977) also support the present experiment by stating that the number of thrips on onion crop increased rapidly during dry weather and decreased rapidly after rain.

The nymphs and adults are observed between leaf sheaths and stem lacerating the epidermis of leaves and sucking the exuding cell sap (Lewis, 1997). Thrips attack onion at all the stages of crop growth, but their number increased from bulb initiation (Ibrahim and Adesiyun, 2009). The early bulb enlargement stage of onion growth was the most sensitive to thrips feeding and caused indirect damage as vector of viral diseases *viz.*, Iris yellow spot virus. The affected leaves show silvery blotches

Table 1 : Seasonal incidence of thrips infesting onion and natural enemies

Duration	SMW	Thrips	Coccinelids	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
					MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
July	27th	1.5	0	2.2	29.4	22.1	83	66	4.1	4.5	5.4
	28th	0	0	22.8	31.2	23.3	94	71	3.8	5.4	3.8
August	29th	4.7	1.21	1.7	28.4	22.3	92	75	3.5	2.2	6.1
	30th	7.9	1.96	0	31.9	22	83	57	5.2	6.2	5.4
	31st	9.8	2.43	0.9	32.8	21	86	50	5.5	8.2	5.1
	32nd	8.4	3.32	8.8	31.7	22.4	91	65	4.5	5.9	3.7
September	33rd	10.8	3.11	2	30.4	21.6	86	59	5.4	7.2	5.8
	34th	9.7	2.92	4.8	29.6	22.4	86	77	4.3	2.7	4.6
	35th	8.1	1.62	23	29.4	22.2	96	82	3.6	2.4	3.4
	36th	12.9	2.88	14.3	30.1	21.8	92	76	3.6	3.4	4.6
	37th	11.7	2.5	13.7	29.6	21.4	91	70	4.2	5.5	3.7
October	38th	14.2	3.23	7.1	32.2	20.1	89	48	4.5	7.9	2.5
	39th	15.6	3.69	0	32.3	16.9	73	31	6	9.7	2.5
	40th	15.3	3.46	0	31.9	15.5	76	31	5.3	9	3.3
November	41st	15.5	3.48	0	31	13	74.1	32.7	5	9.6	2.8
	42nd	15.9	3.61	0	31	11	79	26	4.6	9.1	1.9
	43rd	15.2	3.55	0	30.3	10.8	73.4	27.8	3.9	8.6	3.2
	44th	16.4	3.72	0	31	9.7	76.5	23.3	4.9	9	2.3
December	45th	14.2	2.12	0	30	12.3	74.6	37.6	4.6	8.4	3.1
	46th	13.9	1.92	0	30	12.3	73.4	28.5	4.7	8.7	3.9
	47th	13.1	1.32	0	29.6	8.8	75.1	24.1	4.6	9.8	2.1
	48th	12.3	1.77	0	29.5	8	75	29	4.2	9.8	2.3
January	49th	11.2	1.10	0	29.2	8.5	78	27	4.2	9.3	2.0
	50th	8.4	0.52	0	27.6	7.7	77	36	4.0	9.0	3.0

SMW: Standard Metrological Week RF: Rainfall MAX. : Maximum Temperature MIN.: Minimum Temperature
RH1: Morning Relative Humidity RH2: Evening Relative Humidity EVP: Evaporation BSS: Bright Sunshine WV: Wind Velocity

Table 2 : Simple correlation and regression between weather parameters and thrips and their natural enemies on onion

Sr. No	Parameters	Intercept (a)	Slope (b)	'r' value
Thrips				
1	Rainfall	12.052	-0.273	-0.404
2	Maximum Temperature	-25.998	1.204	0.284
3	Minimum Temperature	21.926	-0.630	-0.709**
4	Morning RH	44.056	-0.400	-0.635**
5	Evening RH	19.562	-0.173	-0.733**
6	Evaporation	-2.982	3.040	0.407
7	Bright sun shine (hrs)	2.0581	1.269	0.658**
8	Wind velocity(km/hrs)	20.328	-2.528	-0.652**
Coccinelids				
1	Rainfall	2.537	-0.044	-0.263
2	Maximum Temperature	-12.860	0.497	0.474**
3	Minimum Temperature	3.673	-0.075	-0.345
4	Morning RH	6.691	-0.025	-0.336
5	Evening RH	3.647	-0.025	-0.444**
6	Evaporation	-1.316	0.195	0.436**
7	Bright sun shine (hrs)	0.990	0.195	0.409
8	Wind velocity(km/hrs)	3.824	-0.395	-0.413

Table : 'r' value = 0.413

which later turn into brownish colour. Leaves get distorted from tips downwards and plant ultimately wilt and dry. (Jenser *et al.,* 2003).

Seasonal incidence of coccinelids :

The data on population dynamics of coccinellids during 27th SMW to 50th SMW 2016 and 2017 are presented in Table 1 and Fig. 1. The coccinellid population ranged between 1.21 (29th SMW) to 3.72 (44th SMW) beetles/plant on onion. The occurrence of coccinelids started from 29th SMW (1.21beetles /plant). The first peak was observed during 32nd SMW (3.32 beetles / plants) showing positive trophic interaction between the pest and preadator relationship.

Simple correlation and regression between weather parameters and thrips population and their natural enemies :

Thrip (*Thrips tabaci* L) :

The data presented (Table 2) showed that the correlation between thrips population on onion and rainfall (r=-0.404), was negatively non significant and minimum temperature (r=-0.709**), morning RH (r=-0.635**) and evening RH (r=-0.733**) and wind velocity (r=-0.652**) were negative and highly significant. While, maximum temperature (r=0.284) and evaporation (r=0.407**) was positive non-significant and BSS (r=0.658**) was positive and significant.

The earlier workers including Domiciano *et al.*

Table 3 : Incidence of thrips on onion transplanted on 20th July

Months	Date	Thrips	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
				MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
July	20th	0.5	21.9	28.1	21	86	75	3.8	5.7	3.7
	30th	3.5	1.4	29.2	22	90	70	3.9	3.4	6.1
August	10th	6.8	1.1	32	21	84	54.5	5.1	6.3	5.4
	20th	8.9	6.2	32.3	22	89	60.1	4.9	7.1	3.9
	30th	8.4	1.7	30.4	21	83	60.8	4.9	7	4.7
September	10th	7.8	16.1	29.3	22	90	81.4	3.8	1.8	3.8
	20th	11.2	14.7	30	22	93	77.9	3.7	3.2	4.6
	30th	13.8	15.5	30	21.6	92	68	4.2	5.4	3.8
October	10th	13.2	1.2	30.2	18.5	81	39	5	9.3	2.1
	20th	15.9	0	31.1	15.8	75	30	5.7	9.1	3.1
	30th	15.7	0	30.8	12.4	74	28	4.8	9.6	2.5
November	10th	15.4	0	30.2	11.1	77	29	4.2	8.4	2.8
	20th	15.8	0	31.1	9.5	97	23	4.7	9.8	2.3

Table 4 : Incidence of thrips on onion transplanted on 30th July

Months	Date	Thrips	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
				MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
July	30th	2.9	1.4	29.2	22	90	70	3.9	3.4	6.1
August	10th	6.9	1.1	32	21	84	54.5	5.1	6.3	5.4
	20th	8.4	6.2	32.3	22	89	60.1	4.9	7.1	3.9
	30th	8.1	1.7	30.4	21	83	60.8	4.9	7	4.7
September	10th	8.7	16.1	29.3	22	90	81.4	3.8	1.8	3.8
	20th	10.5	14.7	30	22	93	77.9	3.7	3.2	4.6
	30th	12.9	15.5	30	21.6	92	68	4.2	5.4	3.8
October	10th	13.6	1.2	30.2	18.5	81	39	5	9.3	2.1
	20th	16.1	0	31.1	15.8	75	30	5.7	9.1	3.1
	30th	15.6	0	30.8	12.4	74	28	4.8	9.6	2.5
November	10th	15.8	0	30.2	11.1	77	29	4.2	8.4	2.8
	20th	16.4	0	31.1	9.5	97	23	4.7	9.8	2.3
	30th	15.7	0	30	11.5	74	34	4.6	8.7	2.9

(1993) support the present investigation by showing negative correlation between thrips population and relative humidity on onion. Kirk (1997) revealed negative effects of rainfall on thrips population because heavy precipitation killed larvae and suppressed dispersal of adult. Population during rainy and cool season was significantly lower than those during dry and hot seasons, presumably because of high larval mortality and slower population growth rates. Verma *et al.* (2012) documented that the population density of *T. tabaci* infesting garlic was increased with temperature and minimum temperature was negatively correlated with thrips population.

The regression equation set up were Y = 12.052-0.273 x, Y = 21.926-0.630 x, Y = 44.056-0.400 x, Y = 19.562-0.173 x and Y=20.328-2.528 indicating that every unit increase in rainfall, minimum temperature, morning RH and evening RH, the thrips population decreased by 0.273, 0.630,0.400, 0.173 and 2.528, respectively.

Coccinellids :

The correlation and regression between weather parameters and coccnellid population are presented in Table 2. The coccinellid count showed negative and non-significant correlation with rainfall (r=-0.263), minimum temperature (r=-0.345) and morning RH (r=-0.336) and wind velocity (r=-0.413). Maximum temperature (r=0.474**) and evaporation (r=0.436**) were positively significant. While evening RH (r=-0.444) was negatively significant.

Table 5 : Incidence of thrips on onion transplanted on 10th August

Months	Date	Thrips	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
				MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
August	10th	4.9	1.1	32	21	84	54.5	5.1	6.3	5.4
	20th	8.6	6.2	32.3	22	89	60.1	4.9	7.1	3.9
	30th	8.4	1.7	30.4	21	83	60.8	4.9	7	4.7
September	10th	7.9	16.1	29.3	22	90	81.4	3.8	1.8	3.8
	20th	9.8	14.7	30	22	93	77.9	3.7	3.2	4.6
	30th	11.8	15.5	30	21.6	92	68	4.2	5.4	3.8
October	10th	13.4	1.2	30.2	18.5	81	39	5	9.3	2.1
	20th	16.3	0	31.1	15.8	75	30	5.7	9.1	3.1
	30th	15.7	0	30.8	12.4	74	28	4.8	9.6	2.5
November	10th	15.4	0	30.2	11.1	77	29	4.2	8.4	2.8
	20th	16.3	0	31.1	9.5	97	23	4.7	9.8	2.3
	30th	15.9	0	30	11.5	74	34	4.6	8.7	2.9
December	10th	14.3	0	29.8	12.3	75	30	4.8	8.9	3.5

Table 6 : Incidence of thrips on onion transplanted on 20th August

Months	Date	Thrips	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
				MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
August	20th	8.3	6.2	32.3	22	89	60.1	4.9	7.1	3.9
	30th	8.6	1.7	30.4	21	83	60.8	4.9	7	4.7
September	10th	8.3	16.1	29.3	22	90	81.4	3.8	1.8	3.8
	20th	13.1	14.7	30	22	93	77.9	3.7	3.2	4.6
	30th	12.9	15.5	30	21.6	92	68	4.2	5.4	3.8
October	10th	13.3	1.2	30.2	18.5	81	39	5	9.3	2.1
	20th	16.4	0	31.1	15.8	75	30	5.7	9.1	3.1
	30th	15.9	0	30.8	12.4	74	28	4.8	9.6	2.5
November	10th	15.8	0	30.2	11.1	77	29	4.2	8.4	2.8
	20th	16.7	0	31.1	9.5	97	23	4.7	9.8	2.3
	30th	16.2	0	30	11.5	74	34	4.6	8.7	2.9
December	10th	14.7	0	29.8	12.3	75	30	4.8	8.9	3.5
	20th	13.9	0	29.5	7.7	74	26	4.2	9.8	2.2

Effect of different dates of transplanting on incidence of onion thrips during *Kharif* season :

Six transplanting dates *viz.*, 20th July, 30th July, 10th August, 20th August, 30th August and 10th September were studied to find out most congenial date of transplanting onion in *Kharif* season in respect to thrips incidence. The lower population of thrips was noticed in the crop transplanted on 20th July and 30th July during seedlings stage. The higher population of thrips was recorded in seedling transplanted on 10th September, 30th August and 20th August. The peak period of thrips incidence was observed in the month of October to November.

The above results are in conformity with the findings

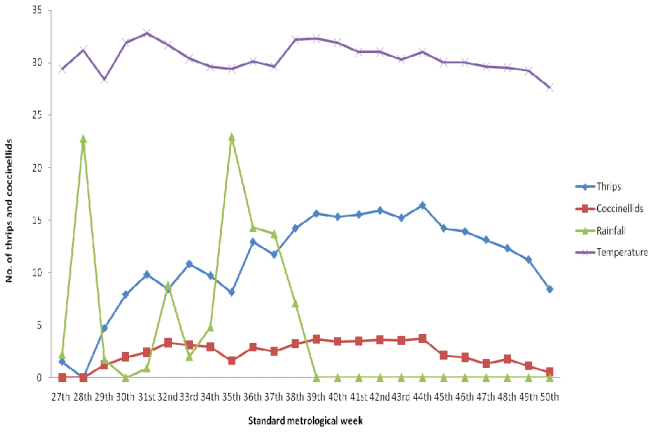

Fig. 1 : Seasonal incidence of thrips and their natural enemies

Table 7 : Incidence of thrips on onion transplanted on 30th August

Months	Date	Thrips	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
				MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
August	30th	8.7	1.7	30.4	21	83	60.8	4.9	7	4.7
September	10th	6.1	16.1	29.3	22	90	81.4	3.8	1.8	3.8
	20th	8.6	14.7	30	22	93	77.9	3.7	3.2	4.6
	30th	9.8	15.5	30	21.6	92	68	4.2	5.4	3.8
October	10th	13.9	1.2	30.2	18.5	81	39	5	9.3	2.1
	20th	16.5	0	31.1	15.8	75	30	5.7	9.1	3.1
	30th	16.1	0	30.8	12.4	74	28	4.8	9.6	2.5
November	10th	15.9	0	30.2	11.1	77	29	4.2	8.4	2.8
	20th	16.4	0	31.1	9.5	97	23	4.7	9.8	2.3
	30th	15.9	0	30	11.5	74	34	4.6	8.7	2.9
December	10th	13.6	0	29.8	12.3	75	30	4.8	8.9	3.5
	20th	13.3	0	29.5	7.7	74	26	4.2	9.8	2.2
	30th	10.8	0	29.3	9	79	30	4.2	9.2	3.2

Table 8 : Incidence of thrips on onion transplanted on 10th September

Months	Date	Thrips	RF	Temperature ^{0}C		Humidity (%)		EVP	BSS	WV
				MAX	MIN	RH1	RH2	(mm)	(Hrs)	(Kmph)
September	10th	8.9	16.1	29.3	22	90	81.4	3.8	1.8	3.8
	20th	19.8	14.7	30	22	93	77.9	3.7	3.2	4.6
	30th	13.5	15.5	30	21.6	92	68	4.2	5.4	3.8
October	10th	13.9	1.2	30.2	18.5	81	39	5	9.3	2.1
	20th	16.7	0	31.1	15.8	75	30	5.7	9.1	3.1
	30th	16.4	0	30.8	12.4	74	28	4.8	9.6	2.5
November	10th	16.3	0	30.2	11.1	77	29	4.2	8.4	2.8
	20th	16.8	0	31.1	9.5	97	23	4.7	9.8	2.3
	30th	16.1	0	30	11.5	74	34	4.6	8.7	2.9
December	10th	13.9	0	29.8	12.3	75	30	4.8	8.9	3.5
	20th	12.9	0	29.5	7.7	74	26	4.2	9.8	2.2
	30th	9.5	0	29.3	9	79	30	4.2	9.2	3.2
January	10th	7.8	0	28.0	7.9	77	35	4.1	9.1	2.9

of Upendhar *et al*. (2006). They reported a positive correlation of thrips population with maximum temperature and negative correlation with minimum temperature, relative humidity (morning and evening) and rainfall. Bagle (1993) reported that planting of chilli from 30th June to 15th July could escape the thrips damage. Similarly, Hosmani (1982) reported that, chilli crop transplanted in early June and July escape incidences of thrips and mites than the crop transplanted in late July and early August. Two peaks of thrips populations were recorded during third week of August and fourth week of September coinciding with the dry spell after moderate rainfall (Singh, 2005) and he reported a strong positive correlation with maximum temperature.

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