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POPULATION DYNAMICS OF ONION THRIPS *THRIPS TABACI* LINDEMAN

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ABSTRACT

A field experiment was conducted at Entomology farm, Faculty of Agriculture, SKUAST-K during rabi, 2019-20 to study the population dynamics of *Thrips tabaci* Lindeman in onion. The incidence of adults (31.00/ plant) and immatures (61.00/ plant) was observed from 9th standard meteorological week (SMW). It reached a peak on 22nd and 21st SMW and declined thereafter. The incidence revealed a positive correlation with temperature, rainfall and evening RH, and a negative one with morning RH; however, with nymphs it was a positive one with temperature and evening RH, and a negative one with rainfall and morning RH.

Key words: *Allium cepa*, *Thrips tabaci*, seasonal incidence, correlation, weather parameters, temperature, relative humidity, rainfall

Onion (*Allium cepa* L.) is an important horticultural crop grown in 3.10 thousand ha (Anonymous, 2018), but its productivity is low in India, with 10-15% loss due to insect and non-insect pests and weather factors (Muthuram et al., 2017). Among the insect pests onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is the major one with the affected plant exhibiting curling and drying of leaves which also affects the size and weight of the bulb. The bulb formation stage is most susceptible to thrips damage and as a result, the size and weight of onion bulb gets reduced. The yield losses in onion as a result of thrips damage can vary from 34.5 to 43% (Fournier et al., 1995) and can be up to 90% (Gupta et al., 1984). Therefore, the present study on its population dynamics at Wadura in Jammu and Kashmir.

MATERIALS AND METHODS

Field experiment was conducted at the Division of Entomology, Faculty of Agriculture, Wadura campus, Sopore, during rabi 2019-20. The seeds of variety "Yellow globe" were sown in mid-October under greenhouse conditions, with the seedlings transplanted during November, 2019 as per the package of practices recommended by SKUAST-K. The plot size was 12 x 4 m^2 with 16 rows, with row to row and plant to plant distance maintained at 15x 30 cm, respectively. Observation on thrips incidence (adult and immature stages) was recorded soon after the appearance of the thrips and continued till the harvest. The counts were made by randomly selecting three plants from each sampling unit and number of thrips counted with a magnifying lens (10x). The means computed from the data obtained at weekly intervals from 14DAT (days after transplanting) up to harvesting were used for analysis. The weather data was obtained from the meteorological observatory located at Faculty of Horticulture, SKUAST-K. The data on incidence were correlated with temperature, relative humidity and rainfall, and correlation (r) and regression coefficients (R^2) were computed.

RESULTS AND DISCUSSION

Table 1 reveals that the adults and immatures of *T. tabaci* appeared from 9th standard meteorological week (SMW) @ 0.33± 0.57 adults and 1.67± 0.57 nymphs/ plant; thereafter, incidence increased and reached its peak in 22nd SMW (31.00± 1.00- adults) and 21st SMW (61.00± 3.60- nymphs); and declined to 27.33± 0.57 adults and 40.00± 1.00 nymphs at 24th SMW. These observations corroborate with those of Khan et al. (2015) in the Khyber Pakhtunkhwa Province. El-Sherif and Mahmoud (2008) observed a declining trend by the end of May (21st SMW) similar to those of Reuda and Shelton (2003). Kannan and Mohamed (2001) noticed a gradual increase from March onwards, while Ullah et al. (2010) observed its activity on 3rd February (5th SMW) with a peak during last week of April (17th SMW). The correlation of incidence with weather factors revealed that adults of *T. tabaci* had a positive correlation with rainfall (r=0.033), evening RH (r=0.062), maximum temperature (r=0.805) and minimum temperature (r=0.966); and negative one with morning RH (r=-0.518). However, the nymphs revealed a positive

Table 1. Incidence of *Thrips tabaci* on onion crop under field conditions during rabi, 2019-20

SMW	Mean no. of adults/ plant*	Mean no. of nymphs/ plant*	Mean (adults+ nymphs)
09	0.33± 0.33	1.67± 0.57	2.00± 0.66
10	1.67± 0.33	4.00± 1.00	5.67± 1.16
11	4.00± 0.57	7.00± 1.00	11.00± 1.50
12	7.00± 0.57	12.67± 2.08	19.67± 2.83
13	8.33± 0.66	16.33± 2.08	24.67± 4.00
14	13.00± 1.15	20.67± 2.51	33.67± 3.83
15	14.00± 0.57	25.67± 3.51	39.67± 5.83
16	16.67± 0.66	29.67± 2.51	46.33± 6.5
17	19.00± 0.57	32.33± 2.08	51.33± 6.66
18	22.00± 0.57	36.67± 2.08	58.66± 7.33
19	24.33± 0.88	41.00± 1.00	65.33± 8.33
20	27.00± 0.57	46.67± 1.52	73.66± 9.83
21	29.00± 0.57	61.00± 3.60	90.00± 16.00
22	31.00± 0.57	59.67± 1.52	90.67± 14.33
23	29.00± 0.57	47.00± 2.00	76.00± 9.00
24	27.33± 0.33	40.00± 1.00	67.33± 6.33
Mean± S.E.	17.10± 0.59	30.13± 1.08	47.22± 6.51

Correlation coefficients (r)

Parameters	Adults	Immatures
Rainfall (mm)	0.033 (0.901)	-0.004 (0.988)
Maximum temperature (°C)	0.805* ($1.70e^{-04}$)	0.791*($2.63e^{-04}$)
Minimum temperature (°C)	0.966* ($1.41e^{-09}$)	0.920* ($4.47e^{-07}$)
Morning RH (%)	-0.518* (0.039)	-0.540* (0.030)
Evening RH (%)	0.062 ($8.21e^{-01}$)	0.047 ($8.63e^{-01}$)

Regression equation/ coefficient of multiple determination (R^2)

	Linear regression equation	Coefficient (r)	Coefficient of determination (R^2)	Coefficient of variance (%)
Thrips (Adults)	$Y_1=100.69-272X_1-887X_2+3.29X_3-1.02X_4+0.72X_5$	0.979	0.959	95%
Thrips (Immatures)	$Y_2=196.61-392X_1+0.07X_2+3.18X_3-2.77X_4+0.88X_5$	0.950	0.903	90%

*Mean of 3 replications± S.E; SMW: Standard Meteorological week; *Significant at $p \leq 0.05$; RH= Relative humidity where, Y=Mean number of thrips population/ leaf; X_1= Rainfall (mm); X_2=Maximum temperature (°C); X_3=Minimum temperature (°C); X_4=RH morning (%); X_5=RH evening (%).

correlation with evening RH (r=0.047), maximum temperature (r=0.791) and minimum temperature (r=0.920), and negative one with rainfall (r=-0.004) and morning RH (r=-0.540). These observations derive support from Moraiet and Ansari (2014) on the positive correlation with temperature and negative correlation with RH; Lorine et al. (1986) observed that incidence decreases with rainfall and increases with temperature; Vinuthan et al. (2018) observed a negative correlation of RH and rainfall, and a significant positive correlation with temperature; and temperature was found positively correlated in rabi, and in kharif season, there was a significant negative correlation with rainfall (Sudhir 2011). Low temperature could arrest development of thrips (Stacey and Fellowes, 2002). Murai (2000) suggested that that the intrinsic rate of growth of *T. tabaci* at the temperatures lower than 25°C is due to the advantage of the thelytokous reproduction in western Japan, and the opposite result at 30°C is due to hatchability of *T. tabaci*. The data on linear regression equations (Y=a+bx) for adults and immatures of *T. tabaci* during 2019-20 was found to

be Y_1=100.69-272X_1-887X_2+3.29X_3-1.02X_4+0.72X_5 and Y_2=196.61-392X_1+0.07$_x$2+3.18X_3-2.77X_4+0.88X_5, respectively. The corresponding correlation coefficient (R^2) values for adult and immature thrips were worked out to be 0.959 and 0.903, respectively. The overall impact of weather on adult thrips was 95%, while it was 90% with immatures.

AUTHOR CONTRIBUTION STATEMENT

All authors equally contributed.

CONFLICT OF INTEREST

No conflict of interest.

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