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Distribution and population dynamics of *thrips tabaci* (Thysanoptera: Thripidae) in selected districts of Khyber Pakhtunkhwa province Pakistan

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Abstract

The current study aims to know the prevailing distribution of *Thrips tabaci* as well as its level of infestation associated with onion crop in selected districts i.e. Charsadda, Swabi, Mardan, Nowshera, Swat and lower Dir of Khyber Pakhtunkhwa Province, Pakistan. To achieve objectives of study, an extensive survey was carried out during 2011-12. The average population of both nymphs and adults that were collected from district Swat had significantly high than other districts of Khyber Pakhtunkhwa Province. The lowest mean numbers of thrips plant⁻¹ (16.03) were recorded from East part of district Peshawar, whereas highest (36.49) incidence of different *Thrips* species were from district Swat. On basis of present investigation, it is concluded that thrips associated with onion crops were distributed from (March to May) though out in all districts of Khyber Pakhtunkhwa Province. The specimens collected from these areas were mostly consisted of *T. tabaci* however, in district Swat and district Dir *Thrips palmi*, *Frankliniella fuscus* and *Thrips tabaci* were coexisted with each other.

Keywords: Peshawar, Survey, *Frankliniella fuscus*, *Thrips tabaci*, *Thrips palmi*

1. Introduction

Onion (*Allium cepa* L.) is the member of family Amaryllidaceae (Alliaceae) and is a biennial herbaceous crop^[9]. This condimental bulbous crop is considered as a secondary food source which is used in as fresh as well as frozen form across the globe^[1]. The onion crop is seriously attacked by a number of different insect pests, which are the main yield reducing factors. These insect pests mainly included thrips, maggots, head borer, cutworm and leaf miners that's harm onion crop during various growth stages. Among these, onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is a potential major pest of onion crop^[8] causing damage directly by feeding and indirectly by transmitting viral diseases^[12]. During the past two decades, it has been found that *T. tabaci* became a global pest of *A. cepa*^[3]. *T. tabaci* is widely distributed from tropical to subtropical areas and also into the temperate region as well^[10]. The frequency of adults and nymphs fluctuates from April to May each year with peak abundance in early weeks of April^[6] and the nymphs are distributed in clusters^[11]. The highest population of thrips individuals were recorded^[5] during late July and early August for two growing seasons. Species distribution was determined in different locations by^[7&4] and they found different species among which the main species were western flower thrips, *Frankliniella occidentalis* (Pergande) followed by onion thrips, *Thrips tabaci* (Lindeman). Therefore, our objectives of study were to find out the distribution of *T. tabaci* as well as other existing species in the selected districts (Peshawar, Charsadda, Swabi, Mardan, Nowshera, Swat and Lower Dir) of Khyber Pakhtunkhwa Province, Pakistan, which may be of great help in identifying and adopting preventive measures against different *Thrips* species on onion crop.

2. Material and Methods

2.1 Survey

A detailed survey was carried out to know the abundance and distribution of various thrips species in the onion growing districts, particularly Peshawar, Charsadda, Swabi, Mardan, Nowshera, Swat and Lower Dir of Khyber Pakhtunkhwa Province, Pakistan during the onion growing season. During the course of investigation, five onion fields were randomly selected

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in each district with an intra-field distance of 5-10 Km. Infestations intensity of Thrips were recorded by counting their mean numbers plant⁻¹ and subsequently the collected specimens were preserved in vials filled with 70% alcohol. For infestation of thrips, 30 plants were randomly marked in each field and the number of thrips plant⁻¹ was counted with the help of magnifying lens by observing the whole plant very carefully. Finally, all the preserved specimens were examined under the stereo Microscope for identification purpose.

2.2 Statistical Analysis

Mean infestation data were statistically analyzed by using the Statistical Package, Statistix version 8.1. Analysis of Variance (ANOVA) was constructed for each surveyed site. Least Significant Difference (LSD) was performed for differentiation of means.

3. Results

Results on the study regarding distribution of *T. tabaci* and their level of infestation on onion crop, in different districts of Khyber Pakhtunkhwa Province, Pakistan are as under.

3.1 District Peshawar

3.1.1 Eastern Part

The data presented in (Table 1) revealed that number of nymphs plant⁻¹ (26.97) were observed from March to May in Tarnab area were statistically high as compared to other areas

in eastern part of district Peshawar. However, significantly lower number (18.66) of nymphs plant⁻¹ were recorded in Sookano village of district Peshawar. Highest number of adult thrips plant⁻¹ were (11.43) found in Jaghra site, whereas lowest incidence (8.26) was recorded in Sookano area of Peshawar. The average number of thrips plant⁻¹ both nymphs and adults recorded highest (18.73) infestation in Tarnab while lowest (13.46) mean population of adult thrips plant⁻¹ were noticed in Sookano location in eastern part of Peshawar. All the specimens collected, were identified as *T. tabaci* associated with different onion cultivars.

Table 1: Distribution of thrips in District Peshawar (Eastern Part) during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		Means
		Nymphs	Adults	
Tarnab	Swat-1	26.97 a	10.5 ab	18.73 a
Sookano	Local	18.66 c	8.26 c	13.46 c
Badabeera	Swat-1	24.23 ab	8.63 bc	16.43 ab
Surizai	Ambika	22.03 abc	9.63 abc	15.83 abc
Jaghara	Swat-1	19.97 bc	11.43 a	15.7 bc
LSD (0.05)		5.18	2.08	2.93

Columns having same letters are not statistically different ($P \geq 0.05$, ANOVA)

Table 2: Distribution of thrips in District Peshawar (Western Part) during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		Means
		Nymphs	Adults	
Nouguman	Swat-1	20.91 a	10.87 a	15.88 a
Warsak	Swat-1	17.53 ab	9.93 ab	13.73 ab
Agricultural Uni	Trichmir	20.87 ab	12.07 a	16.46 a
Palusai	Local	21.40 a	11.73 a	16.56 a
Gulbila	Local	14.80 b	8.67 b	11.73 b
LSD (0.05)		6.07	2.18	3.33

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

Table 3: Distribution of thrips in District Swabi during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		Means
		Nymphs	Adults	
Pirtab Banda	Swat-1	43.07 a	12.8 ab	27.93 a
BachaiMansori	Sunset	34.20 a	11.96 b	27.58 ab
Sher Ali Banda	Swat-1	34.20 b	13.16 a	23.68 b
Bam Khail	Hybrid	42.47 ab	13.56 a	28.01 a
Kota	Local	39.63 ab	13.90 a	26.76 ab
LSD (0.05)		8.40	12.85	4.08

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

Table 4: Distribution of thrips in District Mardan during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		Means
		Nymphs	Adults	
Turo	Local	28.43 b	12.53 ab	20.48 b
Chinar kali	Trichmer	29.43 ab	11.70 b	20.56 b
Takhtbahi	Red ball	27.80 b	13.06 ab	20.43 b
Shergarh	Hybrid	33.56 ab	13.70 a	23.63 ab
Katlang	Local	37.39 a	12.83 ab	25.11 a
LSD (0.05)		7.97	1.94	4.30

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

Table 5: Distribution of thrips in District Nowshera during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		
		Nymphs	Adults	Means
Amankot	Swato	24.19 c	10.73 b	17.46 c
Kaka Sahib	Granada Red	22.13 c	10.36 b	16.25 c
Jalozai	Swat-1	29.73 bc	13.8 a	21.76 b
Akorai	Local	41.07 a	11.53 b	23.04 ab
Perpai	Local	33.93 ab	12.13 ab	26.29 a
LSD (0.05)		8.86	1.92	4.12

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

Table 6: Distribution of thrips in District Charsadda during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		
		Nymphs	Adults	Means
Wardaga	Barkel	45.07 a	15.13 a	30.09 a
Shiekho	Red Ball	27.80 c	8.49 c	18.15 c
Sardheri	Granada Red	31.59 bc	15.43 a	23.51 b
Azimabad	Hybrid	37.50 b	13.83 ab	25.66 b
Shahidan	Swat-1	35.50 b	12.63 b	25.06 b
LSD (0.05)		6.81	1.96	3.44

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

Table 9: Average infestation of thrips on onion crop in selected districts of Khyber Pakhtunkhwa province, Pakistan during 2011-12

Name of District	Nymphs	Adults	Means
Peshawar (East Part)	22.37 e	9.69 c	16.03 e
Peshawar (West Part)	24.25 e	11.52 b	17.89 e
Nowshera	30.21 d	11.71 b	20.96 d
Charsadda	35.89 bc	13.11 b	24.5 bc
Mardan	31.32 cd	12.77 b	22.05 cd
Swabi	40.51 b	13.09 b	26.80 b
Swat	57.59 a	15.39 a	36.49 a
Dir	31.67 cd	12.63 b	22.15 c
LSD (0.05)	4.84	1.59	2.83

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

3.1.2 Western Part

The data presented in (Table 2) shows average number (21.40) of nymphs plant⁻¹ that is significantly high than other locations of each district. However, lowest counts (14.80) of nymphs plant⁻¹ were recorded from Gulbila village of district Peshawar. Similarly highest (12.07) numbers of adult thrips plant⁻¹ were recorded in onion fields located at main campus of The University of Agriculture in Peshawar district whereas lowest (8.67) adult thrips plant⁻¹ was recorded from Gulbila. Highest mean number (16.56) of thrips plant⁻¹ were recorded from Palusai and lowest (11.73) thrips plant⁻¹ from Gulbila site of district Peshawar. All the specimens collected were identified as *T. tabaci*.

3.2 District Swabi

Data presented in table-3 revealed that number of thrips (nymphs and adults) from (March to May) in each location in district Swabi varied from 34.20 to 43.07 and 11.96 to 13.90 thrips plant⁻¹ respectively. However, mean number (28.01) of

Table 7: Distribution of thrips in District Swat during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		
		Nymphs	Adults	Means
Jambile	Swat-1	52.09 b	13.30 b	32.70 b
Kokari	Swat-1	49.40 b	15.03 b	32.21 b
Kotchbarbagh	Local	51.60 b	14.43 b	30.01 b
Barikot	Swat-1	65.23 b	14.83 b	40.03 a
Aboha	Local	69.60 a	19.33 a	44.46 a
LSD (0.05)		11.18	3.19	5.93

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

Table 8: Distribution of thrips in District Dir during 2011-12

Location	Variety Name	Mean No. of Thrips in each location		
		Nymphs	Adults	Means
Chakdara	Swat-1	31.43 ab	12.2 b	21.81 ab
Talash	Swat-1	33.43 ab	14.69 a	24.06 a
Timergara	Swat-1	34.26 a	12.09 b	23.18 a
Rabat	Local	27.90 b	11.76 b	19.83 b
Bajawar	Local	31.30 ab	12.36 b	21.83 ab
LSD (0.05)		5.56	1.67	2.75

Columns having same letter are not statistically different ($P \geq 0.05$, ANOVA)

thrips recorded from Bamkhail and Pirtab banda (27.93) were significantly higher than Kota kalay (26.76) and Sher Ali Banda (23.68). All the Thrips individuals collected were identified as *T. tabaci*.

3.3 District Mardan

Data presented in the Table-4 indicated that number of thrips (nymphs and adults) from March to May in each location of district Mardan differed from 27.80 to 37.39 and 11.70 to 13.70 thrips plant⁻¹. Average number of thrips plant⁻¹ in Kattlang village of Mardan district was significantly more than other sites of Mardan. The lowest (20.43) number of thrips plant⁻¹ were counted in Takhtbahi village of Mardan district. The specimen collected from each location in district Mardan were *T. tabaci*.

3.4 District Nowshera

Data recorded on the number of thrips plant⁻¹ from March to May in different sites of district Nowshera presented in Table-

5. Numbers of thrips (nymphs and adults) plant⁻¹ were ranged from 22.13 to 33.93 and 10.36 to 13.80 respectively. Perpai site located in district Nowshera had significantly more (26.29) number of thrips plant⁻¹ than other parts of district Nowshera. Similarly, lowest (16.25) number of thrips plant⁻¹ was recorded in Kaka Sahib. The entire specimens collected from the area were *T. tabaci*.

3.5 District Charsadda

Data regarding average number of thrips (nymphs and adults) plant⁻¹ recorded from March to May in different locations of district Charsadda is furnished in Table-6. Average number (30.09) of thrips plant⁻¹ in Wardaga thrips was significantly high than other parts of district Charsadda. Lowest counts (18.15) of thrips plant⁻¹ were made in Shieko village of district Charsadda. The thrips specimens collected from the entire area were *T. tabaci*.

3.6 District Swat

Numbers of thrips recorded in district Swat from March to May presented in table-7 showed that highest (44.46) number of thrips plant⁻¹ was recorded from Aboha whereas lowest number (30.01) thrips plant⁻¹ were recorded in Kot Charbagh village. Thrips individuals collected in all different sites were identified as *Thrips palmi*, *Frankliniella fuscus* were recorded along with the other known species *T. tabaci*.

3.7 District Dir

Data presented in Table-8 showed that number of thrips from March to May in each location of district Dir were ranged from mean counts of 33.43 to 27.90 nymphs and 11.76 to 14.69 adult thrips plant⁻¹. It was found that there were no significant variation in average number of thrips plant⁻¹ in district Dir. However, highest (23.18) number of thrips plant⁻¹ were recorded in Timergara whereas, lowest (19.83) were counted in Rabat village of district Dir. The same species *Thrips palmi* and *Frankliniella fuscus* were recorded along with the other known species *T. tabaci*.

3.8 Average infestation of thrips on onion in selected districts of Khyber Pakhtunkhwa Province.

Data presented in Table-9 shows the intensity of average infestation of *T. tabaci* associated with onion crop from March to May in selected districts of Khyber Pakhtunkhwa Province. The number of both nymphs and adults recorded from district Swat had significantly more than other selected districts of Khyber Pakhtunkhwa province.

The lowest average number (16.03) thrips plant⁻¹ was recorded from Peshawar (East part) whereas, highest (36.49) thrips plant⁻¹ was counted in district Swat. It learnt that thrips individuals were active from March to May though out in these selected districts. The specimens collected were mostly *T. tabaci* species. However, two other species *Thrips palmi* and *Frankliniella fuscus* were also coexisted in district Swat and Dir.

4. Discussion

Results of survey regarding the distribution and infestation level of *T. tabaci* in selected districts of Khyber Pakhtunkhwa Province presented in Tables 1-8 whereas comparison of average infestation amongst selected districts (Table-9)

showed that *T. tabaci* (nymphs as well as adults) were widely distributed throughout these districts. Results on the studies showed significant differences among different parts of each district. The population of *T. tabaci* both (nymphs and adults) in district Swat was significantly more than other selected districts. However, minimum number of *T. tabaci* plant⁻¹ were recorded in district Peshawar (East and West part). Present results are comparable with the earlier findings of Edelson,^[5] who observed the population abundance of thrips (adults and nymphs) from February to May with peak in April and became over dispersed as density of thrips increased per plant. *T. tabaci* distributed throughout the world and the larvae found in clustered form than that of adults. The results are compatible with the findings of Deligeorgidis,^[2] and Duchovskiene,^[5] who stated that peak population of western flower thrips and onion thrips on cucumber and tomato crop were observed in May and July during the cropping season.

5. Conclusion

On the base of current studies, it is concluded that *T. tabaci* are equally distributed throughout all the selected districts of Khyber Pakhtunkhwa Province, Pakistan. Average maximum and minimum number of thrips was recorded in district Swat and eastern part of Peshawar district, respectively.

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