

Screening of indigenous onion varieties of Sindh, Pakistan against *Thrips tabaci* Lindeman

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Abstract

Thrips tabaci (Lind.) is one of the most important insect pests which damage all stages of onions. Therefore, present study was conducted at experimental field of Entomology Section, Agriculture Research Institute, Tandojam during cropping season 2018. The four indigenous onion varieties of Sindh, Pakistan Phulkara, Ghotki, Naserpur and Thano Bulla Khan was used in the study as its nursery was obtained from the Onion Research Station, Husri. Experiment was arranged in a RCBD design with five replications. The observations were taken fifteen onion plants from each treatment per replication. The population of *T. tabaci* appeared on onions since its transplanting on all varieties. The lowest population of *t. tabaci* was recorded on variety Phulkara and highest population recorded on Thano Bulla Khan. The minimum population of *T. tabaci* (23.67+4.23 thrips/plants) was recorded on Phulkara and the maximum population of *T. tabaci* (53.49+4.09 thrips/plants) was recorded on Thano Bulla Khan variety. Whereas other varieties Ghotki and NasarPuri the maximum population (35.08+4.51 thrips/plants) and (48.91+4.92 thrips/plants) was recorded. Overall population of thrips showed minimum (18.95+1.01thrips/plants) and maximum (40.05+1.21thrips/plants) population was recorded. The highest yield of onion was recorded (80.33+1.73 mds/acre) of variety Phulkara. whereas, the lowest yield of onion was recorded (64.67+2.00 mds/acre) of Thano Bulla Khan variety. Therefore, it is concluded that Phulkara variety considered better for sowing which resistance against thrips and high yielding variety.

Keywords: *Thrips tabaci*, varieties, onion, yield, population

Introduction

Thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is a polyphagous pest which occurs throughout the world [1, 2, 3, 4]. *Thrips tabaci* and *Frankliniella occidentalis* are the two major agricultural pests in various vegetable, ornamental and field crops. These species cause extensive damage by a direct feeding on plants, reducing quality of the produce, secreting honeydew and transmitting economically important viruses [5, 6]. The *T. tabaci* is destructive pest of onion found in all grown areas and causing direct and indirect damages [7, 8, 9]. Nymphs and adults that live in the leaf sheath and stalk, have very distinct feeding behaviors by punching through the leaf surface and then sucking up the plant, appears as silvery patches, streaks on the leaves or tiny black spots, succulent causing loss of chlorophyll, reduced photosynthetic efficiency and significant yield loss [2, 10, 11, 12]. Feeding on leaves also can create an entry point for plant pathogens, such as Iris yellow spot virus (IYSV) and reduced bulb weight and decrease yield which leading to a complete crop failure [13, 14, 15]. The high infestation of *T. tabaci* can reduce the of yields onion 23-85% [16, 17]. The response of onion varieties against *t. tabaci* infestation, some varieties are susceptible, and others are resistant, but there are no onion variety are highly resistant to *t. tabaci* [7]. The onion varieties with waxy leaves and tight necks were more attractive to *t. tabaci* compared to glossy to semi-glossy leaf surfaces and an open neck [18, 19]. The different concentrations of primary metabolites (sugars, proteins and carbohydrates) influence oviposition, feeding time, plant exploitation and consequently, the duration of each stage of their life [4, 20].

Also, volatiles and various allelochemicals viz. monoterpenes considered as chemical defense system against thrips through their deterrent activity and feeding inhibition [21, 22].

Materials and Methods

The experiment was conducted in the field of Entomology Section, Agriculture Research Institute Tandojam, during cropping season 2018. The four indigenous onion varieties of Sindh i.e., Phulkara, Nasar Puri, Ghotki, Thano Bulla Khan were transplanted on 04.02.2018 in the experimental field. The nursery of different varieties was brought from Onion Research Station Husri working under Horticulture Research Institute, Mirpurkhas. The recommended seed rate of onion was followed as standard (2 to 2.5 kg/ acre). The distance between row to row and plant to plant was maintained at 30 cm and 20 cm, respectively. All the agronomic practices were done as recommended. The experiment was conducted in Complete Randomize Block Design (RCBD) where each treatment was replicated five times. The size of individual replicated plot was 15 x 30 sq. feet. The observations were taken on weekly basis from randomly selected fifteen plants per replication of each treatment. Observations were started form sowing till harvesting of the crop, whereas, yield data was recorded at the end of experiment by harvesting the entire crop. Analysis of Variance was used to analyze the data, whereas, means with significant difference were separated using Least Significant Difference (LSD) at 5% probability level. All analysis was done using STATISTIX 8.1 computer software.

Results

Population of *Thrips tabaci* on various indigenous onion cultivars of Sindh, Pakistan

Results of the study confirmed the significant impact ($P < 0.05$) of different varieties used on the population of *T. tabaci* that appeared on the onion crop since its transplanting. The initial population recorded on various varieties i.e., Phulkara, Ghotki, Nasar Puri and Thano Bulla Khan was 6.64+1.41 thrips per plant, 8.91+1.43 thrips per plant, 13.11+2.03 thrips per plant and 16.27+2.27 thrips per plant, respectively. The population then showed a rapid increase in various treatments that fluctuated throughout the study duration. Thus, the highest mean population in an observation was recorded on Thano Bulla Khan variety (58.45+4.39 thrips per plant) on 10th April, 2018. Moreover, the maximum population on Phulkara, Ghotki and Nasar Puri varieties was 26.79+4.16 thrips per plant, 38.33+4.34 thrips per plant and 54.35+4.40 thrips per plant, respectively. A declining trend in population of thrips was

observed towards the maturity of onions.

Overall, results indicated that maximum and minimum population of thrips was recorded on Thano Bulla Khan (40.05+1.21 thrips per plant) and Phulkara (18.95+1.01 thrips per plant) varieties, whereas, the population recorded on Ghotki and Nasar Puri varieties were 25.46+1.01 thrips per plant and 36.13+1.19 thrips per plant, respectively.

Impact of incidence of *Thrips tabaci* on yield of various indigenous onion cultivars of Sindh, Pakistan

The appearance of *T. tabaci* on various varieties also contributed significantly ($F = 8.18$, $P < 0.05$) towards the yield recorded. Results of the study showed that maximum onion yield was recorded in Phulkara variety (132.00+4.62 mds / acre), followed by variety Ghotki (117.80+5.42 mds / acre). Moreover, the lowest yield of onions was obtained for Thano Bulla Khan variety (103.20+2.08 mds / acre), followed by Nasarpuri onions (114.20+4.09 mds / acre).

Table 1: Over all mean population of *T. tabaci* on various indigenous onion cultivars of Sindh, Pakistan

Date	Phulkara	Ghotki	Nasar Puri	Thano Bulla Khan
20/02/2018	6.64+1.41	8.91+1.43	13.11+2.03	16.27+2.27
27/02/2018	9.56+2.16	12.65+1.97	17.65+2.46	22.72+2.61
06/03/2018	14.48+2.54	18.63+2.05	24.45+3.00	26.08+3.18
13/03/2018	18.23+3.01	22.35+2.73	30.89+3.50	32.97+3.65
20/03/2018	20.52+3.58	26.87+3.30	34.60+3.74	36.57+3.99
27/03/2018	21.53+3.61	27.59+3.95	37.31+4.61	40.33+4.33
03/04/2018	23.67+4.23	35.08+4.51	48.91+4.92	53.49+4.09
10/04/2018	26.79+4.16	38.33+4.34	54.35+4.40	58.45+4.39
17/04/2018	23.84+4.15	34.79+4.16	51.59+4.91	55.63+4.02
18/04/2018	22.73+3.77	31.21+4.05	48.85+4.13	53.71+4.99
01/05/2018	20.33+3.76	27.08+3.03	40.52+4.09	47.70+4.36
08/05/2018	19.16+4.06	22.12+3.33	31.40+3.42	39.65+4.43
Over all Mean	18.96+1.73d	25.47+2.60c	36.14+3.87a	41.90+3.87a

*Means followed by same letters on significantly different (LSD, $P < 0.05$)

Table 2: Effect of various sticky traps on the yield of onion

Treatment	Yield (Mds/acre)
Phulkara	132.00+4.62 ^a
Ghotki	117.80+5.42 ^b
Nasarpuri	114.20+4.09 ^{bc}
Thano Bulla Khan	103.20+2.08 ^c

*Means followed by the same letters are not significantly different (LSD, $P < 0.05$)

Discussion

It has been reported that *T. tabaci* is destructive and polyphagous pest of onion throughout the world that invade almost all the onion cultivars [2, 8]. The study conducted by Vinuthan *et al.* [22] to determine the preference of twenty cultivars of onion against *T. tabaci* observed that none of the variety was resistant against thrips, however, fourteen cultivars especially Arka Pragati, Arka Kalyan and Arka Niketan were found moderately resistant. The outcome of this study also confirmed that none of the indigenous variety of Sindh, Pakistan evaluated were found resistant against *T. tabaci*, however, relatively lower population were recorded on Phulkara and Ghotki varieties, whereas, Thano Bulla Khan variety suffered the highest attack of thrips. But in Tanzania, field study on evaluation of onion varieties for their resistance against *T. tabaci* revealed that variety V103852 was found highly resistant against thrips, whereas, varieties V1038512 and AVON1067 were

recorded as resistant [8]. The same study also confirmed a negative relationship between leaf angle and toughness with the damage of thrips and can be considered as the base of resistance for resistant cultivars. The yield data of study indicated that highly resistant varieties i.e., V103852 and V1038512 also gave the highest yield and their bulb sizes were equivalent to the commercial Texas variety. However, resistant variety AVON1067 produced significantly lower yield [8]. In selection of resistant onion varieties against *T. tabaci*, Karar *et al.* [23] found that none of the variety screened showed resistant against thrips, however, Desi Large showed moderate resistance and VRIO-3 revealed highly susceptible. The study also highlighted the lack of resistant onion genotypes against thrips and emphasized on breeders and researchers to develop such varieties to boost the production of onions in Pakistan (Karar *et al.*, 2013).

Conclusion

The study showed that Phulkara variety was found comparatively resistant among the indigenous onion varieties of Sindh, Pakistan against *T. tabaci* which suffered lowest population of thrips. Moreover, Thano Bulla Khan suffered the maximum population of *T. tabaci* but not significantly different from Nasar Puri variety and was referred as highly susceptible. Moreover, the highest and lowest yield of onions was obtained for Phulkara and Thano Bulla Khan Varieties. Therefore, to maximize the onion

yield with lower incidence of *T. tabaci*, cultivation of Phulakara variety is recommended in Sindh, Pakistan.

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