

Yield Potential Determination of Six Onion Cultivars with and Without Invasion of Thrips in the Agro-ecosystem of Balochistan, Pakistan

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Abstract: Yield potential of six onion (*Allium cepa* L.) cultivars (Red Creole, Chiltan-89, Local, Sariab Surkh, White Globe and Local Kandhari) was evaluated in thrips infested and control environment at Quetta, Balochistan, Pakistan. The results of the trial revealed that *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is the attacking species to onion in the region. The said pest infested more or less all varieties. Local Kandhari followed by Sariab Surkh were the most susceptible to thrips infestation while Chiltan-89 was the least. Red Creole and White Globe were discarded due to their poor performance in terms of yield. Maximum yield (12250 Kg ha⁻¹) was obtained by Chiltan-89 while maximum % increase in yield was observed in Sariab Surkh and Local Kandhari (18.6 and 16.69%, respectively). Results of the study showed that Chiltan-89 is the best onion cultivar for the region regarding minimum thrips infestation and maximum yield. But Sariab Surkh and Local Kandhari have great potential of yield in thrips controlled environment. The elimination of thrips could improve the onion yield up to 19%.

Key words: Onion, thrips, variety, botanical insecticide, biological agent, Balochistan

INTRODUCTION

Onion has a prominent place in Asian agriculture and is grown over an area of 109.8 thousands ha in Pakistan^[1]. The climatic conditions of Balochistan are well suited to the cultivation of this condimental crop. Balochistan is the second most onion-cultivated province after Sind, which contributes 26% of the total onion cultivated area of the country. It is grown over an average area of 20519 ha and produces about 380241 tons per annum in this province^[2].

Thrips are the only serious pest of the crop in the region^[3,4]. More often than not thrips are phytophagous. They attack leaves, buds, flowers and even fruits of plants. Nymphs do more damage than adults^[5] because they are more in number and less mobile. They not only cause feeding injuries but also mete out oviposition damage to the plants^[6,7]. When thrips feed on vascular plants, they puncture the epidermal tissue and imbibe the drain out sap of the cells causing their walls to collapse^[8], piecing the epidermis and rasping the leaf tissues within^[9] or rasping leaf tissue and sucking the sap as its exudes^[10,11]. Silvery white streaks along with the veins and thereafter patches on the under side of the infested leaves

are appeared on damaged plants. Most of thrips species are flower inhabiting, feeding on various parts of the inflorescence or on solitary flower, thereby causing retardation of flower growth, destruction of buds and flower and even malformation of fruits and ultimate minimization of crop yield^[6,12].

Numerous species of thrips are reported as serious agricultural pests of fiscal importance. Ramakrishna and Kylasam^[13] reported an historic damage of cardamom crop by *Frankliniella* spp. and *Ramakrishnothrips cardomomi* in India. Cotton seedlings, onion varieties and chilies suffer heavy loss from the attack of *Scirtothrips dorsalis* and *Thrip tabaci* in USA^[14]. *T. tabaci* was reported a serious pest of cotton in Egypt^[15]. Stroffberg^[16] reported 75 % damage of Virginian tobacco in South Africa by *Scirtothrips aurantii*. *Frankliniella fusca* retarded the growth of cotton seedlings more than 20 % in Louisiana^[17]. Thrips are capable to damage 50 to 90% crop of cucumber^[18]. Ripa and Rodriguez^[19, 20] reported that *T. tabaci* feed on young fruits of grapes and cause damage by scarring on perianth and at the base of stems and pollen and caused 35% fruit damage. Akram^[21] reported more than 50% infestation of *Caliothrips indicus* in peas in India and

serious damage of cotton by *T. tabaci* in Pakistan. During 1984 thrips destroyed about 70% of the crop in Mastung area. By controlling the said pest one could increase the production of the crop. Balochistan is the largest province of Pakistan but most of the area is barren and least is available for cultivation^[22]. Availability of water is the worst problem in the province^[23]. Onion crop requires around 24-30 irrigations in a season^[24]. Thus in the prevailing situation of water one could not increase the area under cultivation but by controlling thrips the production potential could be maximized.

Different varieties are being cultivated in the region but no work was reported about their yielding capacity with and without infestation of thrips.

Keeping in view the above discussion this study was designed to get an idea about the best suited variety regarding high potential of yield after eradication of the said pest in specific conditions of the region.

MATERIALS AND METHODS

To evaluate the best yielding onion variety with and without thrips infestation in the specific agro-eco system of Balochistan, an experiment was conducted on the experimental field of Horticulture Section, Agriculture Research Institute, Quetta, Balochistan, Pakistan during 2002-03. Six onion varieties (Red Creole, Chiltan-89, Local, Sariab Surkh, White Globe and Local Kandhari) were selected for the trial. Among these varieties Chiltan-89, Sariab Surkh, Local and white Globe was reported the most cultivated in the province while Red Creole and Local Kandhari are the two newly introduced varieties in the region^[24]. A piece of well-prepared land was divided into 48 plots of 8x10 (80 m²) equal sizes in RCBD 3 factorial way, at the end of February 2002-03 each year. Certified and treated seeds, of said onion varieties, were obtained from the Agriculture Research Institute, Quetta. The seeds were broadcast @ 96 g per plot (12 Kg ha⁻¹) in the prepared plots. Each variety has a set of treated and untreated plots. Pesticide were used in the treated plots to keep thrips under thresh hold level. Untreated plots were not sprayed. All other agronomic practices were kept constant in all the replications. The crop was irrigated 26 times by tube-well at different intervals. Hand weeding was done thrice to keep the experimental area free of weeds. Weed crop competition affects the yield or plays a possible role as alternate host for thrips^[25].

Data on thrips population were collected weekly from five randomly selected plants in each plot as recommended by Hussain^[26], till the digging of the crop. Thrips specimens were identified and corroborated by the Entomology Section, ARI, Quetta, Pakistan. After digging, produce of each onion variety was measured and was compared with one another for the thrips infestation response.

Data were analyzed by the Microcomputer Statistical Program for Experiments, Designs and Analysis^[27]. Three factors, variety, year and treatment were considered as group variables. Observations were recorded on thrips population. ANOVA was constructed to test the significant differences between the variables. Least Significant Difference test was applied to differentiate the means.

RESULTS AND DISCUSSION

Thrips tabaci Lindeman (Thysanoptera: Thripidae) is the attacking species to onion in the region. Same was discovered by Hazara *et al.*^[3,4]. Local Kandhari was observed the most susceptible to thrips that got maximum number of thrips per plant. Red Creole and White Globe seemed the most tolerant that got minimum number of thrips. Chiltan-89 got optimum number of thrips per plant. Sariab Surkh got second most number of thrips per plant. Though Sariab Surkh and Local showed statistical difference but in observation the varieties were almost at par (Table 1).

Sariab Surkh followed by Local Kandhari showed maximum percentage of yield increase in the absence of thrips. That means that the varieties have great potential regarding yield. No difference in yield was observed between Red Creole and White Globe (Table 2). Malik *et al.*^[24] rejected the two varieties for the specific agro-ecosystem of Balochistan because these two are short day varieties. Chiltan-89 that had optimum (6.232) number of thrips showed only 5.84% increase after controlling thrips. Hazara *et al.*^[3,4] reported 6 as lower and 9 thrips per plant as upper thresh hold level for onion crop. Since the number of thrips on Chiltan-89 were of lower thrush hold level thus even after eliminating them the crop did not show improvement in yield. On the other hand if the numbers of thrips reach to the upper thrush holds level may cause a big damage the crop as in case of Local Kandhari and Sariab Surkh and Local cultivars.

Table 1: Mean total number of thrips observed on six onion cultivars from un-treated plots in two years during, 2002-03 at Quetta, Pakistan

| Varieties | Total mean no. of thrips /plant | | |
|----------------|---------------------------------|----------|-------------------------|
| | 1st year | 2nd year | Mean total of two years |
| Red creole | 2.612g | 1.923h | 2.267E |
| Chiltan-89 | 7.048e | 5.416f | 6.232D |
| Local | 8.944d | 7.161e | 8.052C |
| Sariab surkh | 9.363c | 9.015d | 9.189B |
| White globe | 2.457g | 1.901h | 2.179E |
| Local kandhari | 12.21a | 11.77b | 11.99A |

Lower case letters indicate significant difference down and across the columns for thrips population in 1st and 2nd year using the LSD test. LSD values for 1st and 2nd years thrips population per plant was 0.3206 at significance level of 0.05. Upper case letters indicate significant difference down the column for total thrips population in two year using the LSD test. LSD values for total thrips population per plant for two years was 0.2267 at significance level of 0.05

Table 2: Mean total % increased yield (Kg ha⁻¹) of six onion cultivars calculated from un-treated and treated plots during, 2002-03 at Quetta, Pakistan

| Cultivars | Un-treated Yield | Treated yield | %Increased yield |
|----------------|------------------|---------------|------------------|
| Red creole | 886.4E | 890.7E | 0.48 |
| Chiltan-89 | 11130A | 11780A | 5.84 |
| Local | 6401B | 7001B | 9.37 |
| Sariab surkh | 3537D | 4195CD | 18.6 |
| White globe | 1088E | 1094E | 0.55 |
| Local kandhari | 3912CD | 4565C | 16.69 |

Upper case letters indicate significant difference inter and intra column for un-treated and treated yield (Kg ha⁻¹) using the LSD test values at significance level of 0.05 was 695.5

Table 3: Mean yield (Kg ha⁻¹) of six onion cultivars from un-treated and treated plots during two years, 2002-03 at Quetta, Pakistan

| Cultivars | Mean thrips/plant year 1 | | Mean thrips/plant year 2 | |
|----------------|--------------------------|---------|--------------------------|---------|
| | Un-treated | treated | Un-treated | treated |
| Red creole | 960.3I | 961.7I | 812.5I | 815.8I |
| Chiltan-89 | 10750B | 11303AB | 11500AB | 12250A |
| Local | 5334DE | 5788D | 7469C | 8215C |
| Sariab surkh | 2543H | 3008GH | 4531EF | 5383DE |
| White globe | 972.8I | 978.1I | 1203I | 1210I |
| Local kandhari | 3418GH | 3959FG | 4406EF | 5171DE |

Upper case letters indicate significant difference inter and intra column for un-treated and treated yield (Kg ha⁻¹) using the LSD test values at significance level of 0.05 was 983.5

Table 3 shows a triple interaction between cultivars, year and treatment. Excluding Red Creole and White Globe all cultivars expressed positive relation with yield in absence of thrips activities.

The over all results showed that Chiltan-89 is the best onion cultivar for the region regarding thrips infestation and yield. But Sariab Surkh and Local Kandhari have great potential of yield in thrips controlled environment. The elimination of thrips could improve the onion yield up to 19%.

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