Effect of Irrigation Intervals on Growth and Yield of Onion Varieties Swat–1 and Phulkara

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Abstract: To evaluate the effect of different irrigation intervals on onion varieties a study was carried out in the Research Area, Department of Horticulture, University of Arid Agriculture, Rawalpindi, during 2001 - 2002. The experiment was carried out to evaluate two onion varieties, namely, “Swat-I” and “Phulkara” for their performance. Treatments consist of: control, irrigation after 5 days interval, 10 days interval, 15 days interval and 20 days intervals. Results revealed that Maximum seedling survival percentage 98 % and 97 % was observed in plots with 5 days of irrigation interval in Swat I and Phulkara, respectively. It was observed that the maximum plant height, Number of leaves plant and sprouting after harvest was significantly different in 5 days of irrigation intervals than other treatments both in Swat-1 and Phulkara. Regarding the reproductive parameters both varieties showed better outcome in 5 days of irrigation intervals than other treatments. It is concluded that 5 days of irrigation interval is a better irrigation interval as compared to other treatments in case of plant growth and bulb yield. Whereas, Swat-1 performed better for bulb yield and plant growth parameters as compared to Phulkara under the climatic conditions of Rawalpindi. Further more results showed that more benefit of cost ratio was obtained in case of Swat-1 as compared to Phulkara.

Keywords: Onion, Irrigation intervals, Swat-I, Phulkara, Yield, Varietal and Economic Comparison.

INTRODUCTION

Onion (Allium cepa L.) is a bulbous crop widely cultivated in almost every country of the world. It is one of the important condiments being widely used either in green form or as mature bulb or both used as salad and in preparations of immeasurable number of dishes, like soups, sauces and for seasoning of foods. The smaller bulbs are pickled in vinegar. In Pakistan, there has been a progressive increase in its cultivated area and production. In 2000-01 a total area of 105.60 thousand hectares, with total production of 1563.30 thousand tones of onion bulbs were reported, resulting an average yield of 14.80 tones ha. Onion is grown in more than 135 countries in the world producing 29.3 billion kilograms of onion bulbs each year. About 8-9 percent of this enters the world trade. The leading onion producing countries reported in 2001 are; China, 575,820 hectares producing 12.03 million metric tons (average yield is 20.9 t/ha), India, 480,600 hectares producing 5.47 million metric tones (average yield is 11.37 t/ha), United States, 68,000 hectares producing 2.44 million metric tones (average yield is 4.28 t/ha). Onion bulb is rich in phosphorous, calcium, and carbohydrates, along with this a medium onion (50 g in weight) contains 60 calories, 1 gram proteins, 16 grams carbohydrate, no fat, 5 milligrams sodium, 200 milligrams potassium, dietary fiber 3 grams.

Onion crop has shallow root system and needs frequent irrigation after short intervals. In rainfed areas, like Rawalpindi, rainfall is torrential and concentrated in monsoon. So, supply of water is irregular and crop faces shortage of water during its active growth period i.e. February –April. There have been several reports on the effects of irrigation on onion bulb yield and their subsequent storage life. Similarly it has been observed that different onion varieties have different potential to produce under similar moisture regimes. Keeping under consideration the above points an experiment has been devised with the two main objectives: (i) to evaluate the yield potential of two onion varieties, namely, Swat-I and Phulkara under different irrigation intervals, (ii) to examine the storage life of resultant bulbs under normal room temperature.

MATERIALS AND METHODS

Field experiment was carried out in the Research Area of the Department of Horticulture, University of Arid Agriculture, Rawalpindi, during 2001-2002. The experiment was laid out using Randomized Complete Block Design.
Table 1: Physical and Chemical Characteristics of Crop Experimental Soil

<table>
<thead>
<tr>
<th>Soil Characteristics</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>%</td>
<td>55</td>
</tr>
<tr>
<td>Silt</td>
<td>%</td>
<td>32</td>
</tr>
<tr>
<td>Clay</td>
<td>%</td>
<td>13</td>
</tr>
<tr>
<td>Textural Class</td>
<td></td>
<td>Sandy loam</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>7.8</td>
</tr>
<tr>
<td>Ec</td>
<td>dSmG</td>
<td>0.33</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>g100g</td>
<td>0.13</td>
</tr>
<tr>
<td>Available Phosphorus</td>
<td>mg kgG</td>
<td>4.50</td>
</tr>
<tr>
<td>Potassium</td>
<td>mg kgG</td>
<td>118</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>g100g</td>
<td>0.83</td>
</tr>
</tbody>
</table>

(RCBD) with factorial arrangements. Two onion varieties, namely, “Swat-1” and “Phulkara” were evaluated for their performance under different treatments of irrigation intervals: no irrigation (rain fed), irrigation after 5, 10, 15 and 20 days intervals. For nursery raising, onion seeds were sown on 6th November, 2001 in raised bed. The seedlings were transplanted in their respective plots at two leaves stage. A field block of 300 m² was prepared during January 2002. Recommended NPK (120:60:60) were applied to all treatments in the form of Urea, Di Ammonium phosphate and Sulphate of Potash, at the time of field preparation. For each variety a field plot of 150 m² was prepared, which included 3 replications and 5 treatments. The plot size for each treatment was 2.1 m² with in an area of 50 m² for each replication and 54 seedlings were transplanted for each of the treatments. The physical and chemical characteristics of experimental soil such as pH, ECe, organic matter, NPK, etc. were calculated and presented in Table 1.

**Crop data:** Simple randomization of each plot was done to select eight plants and following plant parameters were recorded i.e. Seedling Survival Percentage, Plant height, Number of Leaves plantG, Time of Senescence / Harvest (day), Total Number of Bulbs PlotG, Total Weight PlantG (g), Total Yield (t haG) and Initiation of Sprouting After Harvesting.

**Economic comparison:** Benefit cost ratio for each treatment was evaluated. Income calculated on the basis of current local market price of onion at Rawalpindi during 2002.

**Statistical analysis:** The data collected for various variables were subjected to statistical analysis using Analysis of Variance (ANOVA) technique. The means were compared by applying Least Significant Difference (LSD) at test5% according to Steel and Torrie[9].

**RESULTS AND DISCUSSION**

**Effect of treatments on vegetative growth:** Data regarding to different plant growth parameters represented graphically in Fig 1, 2, 3 and 4. It was clear from the results that 5 days of irrigation interval had significantly affected maximum seedling survival percentage (97.83% and 96.90%), Plant height(45.99 cm and 40.95 cm), Number of leaves plantG (9.81 and 7.54) and number of days for sprouting after harvest(32.33 and 36.33) as compared to any other treatments for Swat-1 and Phulkara, respectively. Data also revealed that varietal means for vegetative plant parameters were better for Swat 1 as compared to Phulkara under 5 days of irrigation interval. Olalla and Valero[11] reported that onion seedling survival percentage and plant height increased with decrease of irrigation interval and vice versa. Results are also in accordance in case of number of leaves plantG with Vijay et al.[11]. According to them onion produced more number of leaves per plant with 5 days of irrigation interval.

![Graph](image-url)
Effect of tretments on reproductive growth: Data regarding to different plant growth parameters presented in Fig 5, 6 and 7. It was clear from the results that 5 days of irrigation interval had significantly affected number of days for senescence and total number of bulbs pot G for both verities. It is clearly depicted from data that treatment means differed significantly from each other for total weight per plant. Maximum weight plantG (106.20 and 98.28 g) for both varieties respectively, was recorded with 5 days of irrigation interval. Further, results pointed out that varietal means also differed significantly from one another. Swat-1 produced more plant biomass as
Effect on yield: Results pertaining to yield of onion t ha\(^{-1}\) are presented in Fig. 8. Maximum yield was obtained 26.62 t ha\(^{-1}\) and 22.72 t ha\(^{-1}\) with 5 days of irrigation interval, irrigation in case of Swat-1 and Phulkara respectively. These results showed that Swat-1 performed better for total yield per treatment. This might be due to better survival percentage, greater number of total bulbs per unit area and total number of large bulbs per unit area produced under Swat-1, resulting in greater yield than Phulkara. The results are correlated with the findings of Mohammad and Gamie\(^{[5]}\), who observed that varieties have different potential of total biomass production and they behave differentially at variable moisture status. Results also revealed that Swat-1 producing more number of leaves and greater number of bulbs were resulting in a greater biomass production and yield as compared to Phulkara.

Economic comparison: Data pertaining to economic comparison is presented in Fig 9. In plots where 5 days of irrigation interval were applied, gave maximum benefit cost ratio i.e. 2.39 %. While minimum benefit cost ratio 1.34 % and 1.35 % was obtained from treatments with no irrigation interval and 20 days of irrigation interval respectively in case of Swat-1. Whereas, in case of Phulkara maximum benefit cost ratio 1.97 % was obtained from treatments 5 days of irrigation interval. Further more results showed that more benefit of cost ratio was obtained in case of Swat-1 as compared to Phulkara.

REFERENCES

