

Onion Response to Applied N, P, and K Fertilizers

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Abstract: Two field trials were conducted to study the onion response to various doses of N,P and K fertilizers. Plant height, bulb diameter, single bulb weight and total marketable bulb yield increased significantly by the NPK fertilizer treatments. Plots treated with 90:60:80 kg NPK/ha, displayed significantly maximum marketable bulb yield over other treatments. Onion planted on ridges gave significantly better yield over flat planting. It was suggested that for obtaining maximum marketable bulb yield of onion variety, Phulkara, the crop may be planted on ridges and fertilized with N,P and K fertilizers.

Key Words: Onion-Nitrogen-Phosphorus-Potassium-Planting-Yield-Growth

Introduction

Onion, *Allium cepa* L., is one of the most important commercial vegetable grown in Pakistan. Onion is used as salad and cooked in various ways in all curries, fried, boiled, baked, used in soup making, in pickles and for other purposes, Choudhry, (1979). The per hectare yield of onion obtained in Pakistan is low as compared to our demand, that can be stabilized by adopting proper package of technology. Among the agronomical factors, planting method and fertilizer levels are two most important factors and play pivotal role in the development of onion. Therefore, the present experiments have been performed to assess the influence of P₂O₅ and K₂O fertilizers with or without N on the growth and yield of ridge and flat planted onion variety, Phulkara.

Materials and Methods

Field trials were conducted to assess the influence of P₂O₅ and K₂O fertilizer combinations with or without nitrogen on the growth and bulb yield of ridge and flat planted onion variety, Phulkara at the experimental area of PCSIR Laboratory, Karachi. One-month-old seedlings were planted in three replicated RCBD (factorial arrangement) having a net plot size of 3m x 3m. Two planting methods viz, M₁ (ridge) and M₂ (flat) and five fertilizer levels including a control i.e. T₁ (control), T₂ (90:60:80 kg NPK/ha), T₃ (90:0:60 kg NPK/ha), T₄ (90:60:80 kg NPK/ha) and T₅ (0:60:80 kg NPK/ha) were tested.

A standard row and plant spacing of 30 cm x 15 cm was kept for both the methods. Nitrogen was applied as urea, phosphorus as TSP and potash as sulphate of potash respectively. All the required cultural operations were adopted according to the crop requirements in all the plots.

Particle size distribution was determined by hydrometer method, soil pH by glass electrode, total N by Kjeldhal method, Jackson, (1973), available P (NaHCO₃ extractable) and K by standard ammonium molybdate method of Olsen Black, (1965).

For recording agronomic observations, 10 plants from each plot were selected randomly and tagged. The observations were recorded on plant height after one and three months of transplanting, bulb diameter and single bulb weight. The bulb yield/plot was recorded and calculated as yield/ha. All the collected data were subjected to pooled analysis of variance, to discriminate

the superiority of treatment mean L.S.D. test was applied according to Gomez and Gomez (1984).

Results and Discussion

Physico-chemical properties of soil: The data regarding physico-chemical properties of experimental soil site before sowing depicts that the soil was clay loam in texture (Sand 25.00, Silt 40.00, and Clay 30.00 %), the nitrogen percentage in the soil was moderate (0.045%), deficient in available phosphorus (7.20 ppm), but contains sufficient available potassium (240.00 ppm) and pH was 7.7 to 8.0.

Effect of fertilizer treatment: The data depicts that plant height after one or three months of transplanting, bulb diameter, weight of single bulb and total marketable bulb yield differed significantly (P<0.01) due to NPK fertilizer treatments (Table 1). Plots treated with 90:60:80 kg NPK^{ha} displayed taller plants both at one or three months of transplanting, followed by 90:0:60 or 90:0:80 kg NPK^{ha}, respectively. Similarly, bulb diameter, single bulb weight and total marketable bulb yield was also maximum under same treatment. The combine application of NPK gave higher bulb yield, mainly due to increase in bulb size and weight, respectively. These results agree to those reported by Mitrache and Burileanu (1984), Achar, *et al.* (1984), Patil, *et al.* (1986) Iordachescu, *et al.* (1984), Ital, *et al.* (1979) and Pandey, *et al.* (1991) and Katwale and Saraf (1994) they reported that combine application of NPK gave significantly maximum bulb yield as compared to individual application (Table 2).

Effect of planting method: Planting method displayed significantly different trend (P<0.01) for plant height both at one or three months of transplanting, bulb diameter, single bulb weight and total marketable bulb yield. Flat planted onion produced taller plants both at one or three months of sowing, whereas bulb diameter, single bulb weight and total marketable yield was superior under ridge planting. The maximum plant height in flat planting was mainly due to reduced bulb size and weight. This trend was changed in ridge planting where plant height was reduced and produced greater bulb diameter and weight which resulted of increase in total marketable yield. Similar results have been reported by Gaafer and Hafeez (1979) and Zafar and Malkani (1976), they reported that transplanted onion on ridges gave significantly higher bulb yield due to increase in bulb size and weight as compared to flat

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Table 1: Mean squares corresponding to various sources of variations for marketable bulb yield and its economic characters of onion variety Phulkara as affected by different fertilizer levels, methods and years

Source of variation of planting	D.F.	Plant height at one month of planting (cm)	Plant height at three months (cm)	Bulb diameter (cm)	Weight of bulb (g)	Marketable bulb yield (Kg)
Years (Y)	1	10.41**	17.61**	0.006ns	268.81**	811.11ns
Replications within years	5	0.58ns	1.83ns	0.050ns	3.04*	1677.78ns
Treatments (T)	4	86.31**	200.45**	1.600**	555.93**	249444.44**
Methods (M)	1	22.81**	145.71**	1.020**	198.01**	2944.44**
Y X T	4	2.54**	1.59ns	0.210ns	41.60**	66.67ns
Y X M	1	2.03ns	1.83ns	0.023ns	2.20ns	7.78ns
T X M	4	4.03**	0.65ns	0.027ns	20.18**	1088.89**
Y X T X M	4	7.97**	5.95ns	0.122ns	37.44**	1488.89**
Pooled Error	35	0.66	1.78	0.061	4.00	255.65
Total	95					

* Significant at P < 0.05 % level of probability ** Significant at P < 0.01 % level of probability
 NS Non-Significant

Table 2: Mean marketable bulb yield and its economic characters of onion variety, Phulkara as affected by different fertilizer levels, transplanting methods and years

Treatment	Plant height (cm)		Diameter of bulb (cm)	Single bulb weight (g)	Marketable bulb yield (Kg/ha)
	After one month of planting	After three months of planting			
Fertilizer levels					
N - P - K					
Control	23.00	62.67	7.40	265.66	11544.44
90-0 -80 kg/ha	24.67	67.33	8.11	272.50	14433.44
90-0 -60 kg/ha	24.69	69.00	7.75	270.49	12977.78
90-60-80 kg/ha	28.67	73.67	8.34	282.66	15533.33
0-60-80 kg/ha	22.67	65.00	7.84	267.33	13177.78
S.E.	0.47	0.77	0.10	0.82	211.11
L.S.D at P < 0.05	0.94	1.54	0.20	1.66	433.33
L.S.D at P < 0.01	1.27	2.08	0.27	2.24	577.78
Planting methods					
Flat	24.13	67.90	7.74	270.36	13266.67
Ridge	22.90	64.78	8.03	273.96	13766.67
S.E.	366.67				
Years					
1996-97	23.93	67.77	7.90	274.29	13655.56
1996-97	23.10	65.80	7.87	270.06	13377.78
S.E	0.21	0.34	0.20	0.52	133.33
L.S.D. at P < 0.05	0.42	0.68	-	1.05	-
L.S.D. at P < 0.01	0.57	0.92	-	1.42	-

sown onion (Table 2).

Effect of seasons: Year differences were significant (P<0.01) for plant height both at one or three months of sowing and weight of single bulb, however bulb diameter and total marketable bulb yield was not affected by the seasons (Table 1). These differences in growth and bulb weight occurred due to seasonal fluctuations.

It is concluded that onion planted on ridges and fertilized with 90:60:80 kg NPK/ha, yielded significantly more, this increment in bulb yield was accompanied with greater size of bulb and weight which in turn caused greater marketable bulb yield of onion.

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