

## Effects of potassium on the growth and yield of two summer onion varieties

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**Abstract:** A field experiment was conducted to study the effect of applied potassium fertilizer on growth and yield of two varieties of summer onion at the Horticulture Farm, Bangladesh Agricultural University, Mymensingh during March to June, 2005. In addition to potash, Cowdung, TSP, Gypsum and Zinc oxide were applied @ 5000, 150, 110 and 3 kg/ha as basal dose during final land preparation and mixed with soil properly. Urea was applied as the source of nitrogen. The urea and potash were applied treatment wise as side dressing with three installments at 15 days interval from one week after transplanting. Side dressing was followed by light irrigation with the help of watering cane. Potash was applied @ 0, 50, 75 and 100 kg K/ha. The positive effect of applied K was noted on both the varieties of onion. Maximum yield of 9.05 t/ha was obtained when K was applied to N 53 variety. The lowest yield of 6.33 t/ha was observed in no K fertilizer treatment in BARRI Piaz 2. It was observed that the application of K @ 75 kg/ha significantly increased the yield of both the varieties of onion.

**Key words:** Summer onion, Potassium fertilizer, varieties, yield

### Introduction

The onion (*Allium cepa* L.) is an herbaceous biennial plant and a member of the Alliaceae family. Onion is probably a native of Asia (McCollum, 1976). The leading onion producing countries are China, India, United States of America, Turkey, Russia, Pakistan, Japan, Brazil, Spain, Korea, Netherlands, Morocco, Egypt, Nigeria and Italy (FAO, 2003). The onion develops distinct bulb. The crop is grown for consumption in green state and as mature bulbs. In Bangladesh, almost all spicy dishes contain onion as one of the important ingredient. Onions are extensively used as condiment in the preparation of curry, chutney and pickle etc. The area under onion was 38 thousand hectares with production of 153 thousand metric tones per annum. Bangladesh largely meets her demand through importing of onion. This could attributed to fewer yields per unit area. This low production of onion is due to improper utilization of fertilizers and growing unsuitable varieties under the agro climatic conditions of an area. Optimum fertilizers application for onion and cultivation of suitable varieties in specific environment are necessary for obtaining good yield of onion. Onion is an exhaustive crop in nature and a crop producing 41 t/ha would remove 102 kg N, 41 kg P<sub>2</sub>O and 112 kg K<sub>2</sub>O/ha from soil (Halliday and Trenkel, 1992). Hence, fertilizers can play an important role in onion production. Keeping in view the above facts, study was planned to assess the impact of potash fertilizer on yield of two varieties of summer onion.

### Materials and Methods

The study was conducted at the Horticulture Farm of Bangladesh Agricultural University, Mymensingh following randomized complete block design with three replications. The factors taken for the experiment were: (i) two varieties of summer onion, viz., N 53 and BARI Piaz 2 and (ii) four levels of potassium, viz., 0, 50, 75 and 100 kg K/ha. Seeds were planted on the 9 of March 2005 and the seedlings were placed in lines 10 cm apart and were slightly covered with soil and irrigated with the help of sprinkler. Size of the unit plot was 1m × 1m. Cow dung, TSP, gypsum and Zinc

Oxide were applied @ 5000, 150, 110 and 3 kg/ha as basal dose during final land preparation and mixed with soil properly. Urea was applied as the source of nitrogen. The urea and potash were applied treatment wise as side dressing with three installments at 15 days interval from one week after transplanting. Side dressing was followed by light irrigation with the help of watering cane. Potash was applied @ 0, 50, 75 and 100 kg K/ha. All other agronomic practices were kept uniform for both the varieties. The data recorded for yield were statistically analyzed on randomized completely block design for analysis of variance, while the treatment effects were compared by LSD Test.

### Results and Discussion

#### Effect of variety on growth and yield

**Plant height:** The variation in plant height between two varieties of summer onion was significantly different towards maturity. The plant height was increased with the advancement of time up to 48 DAT. Between two varieties, the plant of N 53 was the tallest and attained a height of 32.48 cm at 48 DAT followed by BARI Piaz 2 (28.81 cm) (Table 1). This result is in agreement with the reports of Mohanty *et al.* (2000) who reported that cv. N 53 produced the tallest plant among 12 varieties of summer onion.

**Diameter of bulb:** Effects of variety on the diameter of bulb were found statistically significant. The larger diameter (2.68 cm) of bulb was obtained from the cv. N 53 compared to BARI Piaz 2 (2.52 cm) (Table 1). Deka *et al.* (1994) reported that bulb diameter of different onion varieties showed much variation and also pointed out that N 53 had a marketable bulb diameter.

**Individual weight of bulb:** The variation in individual weight of bulb was found to be significant due to the response of two varieties of summer onion. The average fresh weight of bulb was recorded to be the higher (16.83 g) in N 53, which was followed by in BARI Piaz 2 (15.07 g) (Table 1). Present results agreed with Masthanareddy *et al.* (1998). Rahim (1982) also reported that the cv. N 53 produced bulbs of maximum size and in diameter as well as in weight.

**Table 1. Main effects of variety on vegetative growth and production of onion bulbs during the summer season**

Variety	Plant height (cm) at different DAT						Diameter of bulb (cm)	Individual weight of bulb (g)	Yield of bulb (t/ha)
	20	27	34	41	48	55			
BARI Piaz 2	20.60	22.84	25.49	27.67	28.81	27.69	2.52	15.07	7.54
N 53	21.43	25.85	28.34	30.40	32.48	31.13	2.68	16.83	8.43
LSD (0.01)	0.70	0.77	0.52	0.62	0.72	0.64	0.09	0.57	0.28

DAT=Days after transplanting

**Yield:** The results of yield of bulb found to be significant due to the varieties of summer onion. The higher yield of bulb was obtained from variety N 53 (8.43 t/ha) followed by BARI Piaz 2 (7.54 t/ha) (Table 1). A number of authors have also noted this variety as a high yielder of bulb. They suggested that cv. N 53 give highest yield. Yield ability of a variety of onion, like in other crops, is an inherent genetic characteristic, which is subjected to modification to a considerable extent by environmental factors.

#### Effect of potassium on growth and yield

**Plant height:** The mean values for plant height of onion at different doses of potassium were 28.89, 30.86, 31.79 and 31.06 cm for treatment 0, 50, 75 and 100 kg K/ha, respectively (Table 2). Among the doses, the tallest plant was for the treatment 75 kg/ha that was statistically similar with 50 and 100 kg K/ha, and the shortest plant for treatment 0 kg/ha. The result showed that the plant height of onion varied significantly among the potassium doses. On the present investigation, plant height increased gradually with time up to 48 DAT, and then it began to decrease in all the doses of potassium used due to drying out of leaf tips.

**Diameter of bulb:** Potassium markedly influenced the diameter of bulb. Significant variation in diameter was found due to different potassium levels. The highest diameter of bulb (2.70 cm) was produced by the plant having received 75 kg K/ha and the lowest diameter of bulb (2.48 cm) by the control treatment (Table 2). The bulb diameter was probably decreased as the N absorption was impeded due to high dose of potassium. Kumar *et al.* (1998) showed that potash applied at 70 kg/ha gave the best results with regard to plant height, length and diameter of the longest leaf, diameter of the thickest stem, number of leaves per plant, plant spread, time to bulb maturity, bulb diameter, bulb FW and DW, length of the longest root, and bulb yield.

**Individual weight of bulb:** Statistically significant variation due to different doses of nitrogen was found in weight of onion bulb. The maximum weight (17.03 g) was produced by the plant having received 75 kg K/ha and the minimum by the control treatment (Table 2). There was significant increase in weight up to a certain level then it was not significant.

**Table 2. Main effects of potassium on vegetative growth and production of onion bulbs during the summer season**

Potassium (Kg/ha)	Plant height (cm) at different DAT						Diameter of bulb (cm)	Individual weight of bulb(g)	Yield of bulb (t/ha)
	20	27	34	41	48	55			
0	19.05	21.94	24.65	27.69	28.89	28.01	2.48	13.24	6.62
50	21.04	24.74	27.46	29.35	30.86	29.51	2.59	16.65	8.35
75	22.41	25.89	28.22	29.96	31.79	30.41	2.70	17.03	8.52
100	21.57	24.82	27.34	29.12	31.04	29.70	2.62	16.88	8.44
LSD(0.01)	1.08	1.18	0.80	0.97	1.11	0.99	0.11	0.64	0.32

DAT=Days after transplanting

**Yield:** It was observed that the effect of potassium levels on bulb yield per plot as well as per hectare was statistically significant. The dose 75 kg K/ha gave the highest yield (8.52 t/ha) which was similar with 50 kg and 100 kg K/ha. The lowest bulb yield (6.62 t/ha) was found under control treatment. The above result indicated that a high rate of potassium was not affected (Table 2). Kumar *et al.* 1998 showed that potash applied at 70 kg/ha gave the best results with regard to bulb yield. Onions, remove almost as much potash as nitrogen for production (Halliday and Trenkel, 1992). Hence, for high yield the application of fertilizers in a balanced ratio is required. The results show that potash

application is an integral component of balanced fertilizers application for high yield.

#### Combined effect of variety and potassium on growth and yield

**Plant height:** The combined effect of variety and potassium was found significant. The tallest plant (33.46 cm) was found in variety N 53 with 75 kg K/ha which was statistically identical with 50 and 100 kg K/ha. The lowest plant height (26.82 cm) was recorded in variety BARI Piaz 2 with control treatment (Table 3).

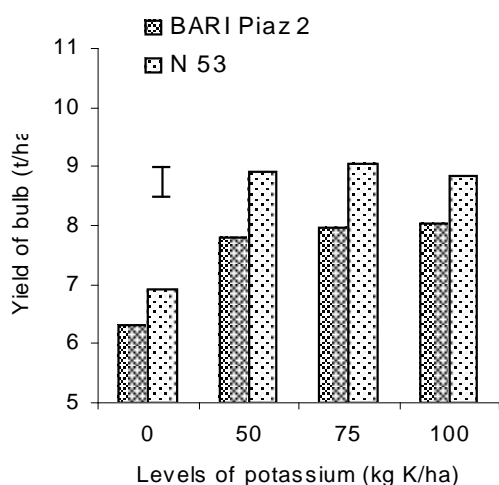
**Diameter of bulb:** It was observed that diameter of bulb was significantly influenced by two varieties of summer onion with different doses of potassium when interacted with each other but combinedly it was significant. Variety N 53 gave the highest diameter (2.79 cm), in the contrast; BARI Piaz 2 gave the lowest diameter (2.42 cm) (Table 3). From the above result, it is clear that the diameter of bulb was the highest in the variety N 53 with the level of 92 kg K/ha.

**Individual weight of bulb:** Significant variation in weight was observed. The interaction effect was insignificant. The highest bulb weight (18.10 g) was obtained for the variety N 53 with 75 kg K/ha while the lowest bulb weight (12.64 g) was found in variety BARI Piaz 2 with 0 kg K/ha (Table 3).

**Table 3. Combined effects of variety and Potassium on the growth and yield of summer onion**

Treatments		Plant height (cm) at different DAT						Diameter of bulb (cm)	Individual wt. of bulb (g)
Variety	K (kg/ha)	20	27	34	41	48	55		
BARI Piaz 2	0	18.54	20.83	22.67	25.85	26.82	26.05	2.42	12.64
	50	20.65	22.95	26.18	28.02	29.07	27.90	2.53	15.59
	75	22.29	24.30	26.99	29.01	30.13	28.81	2.62	15.95
	100	20.94	23.28	26.13	27.79	29.23	27.98	2.52	16.09
N 53	0	19.57	23.05	26.62	29.53	30.95	29.97	2.54	13.84
	50	21.42	26.54	28.74	30.69	32.65	31.12	2.65	17.71
	75	22.53	27.47	29.46	30.91	33.46	32.01	2.79	18.10
	100	22.20	26.35	28.54	30.45	32.86	31.41	2.72	17.67
LSD	(0.01)	1.52	1.67	1.14	1.37	1.57	1.39	0.15	0.91

**Yield:** The results of the study showed that the yield differences of various varieties were highly significant. The maximum yield was produced by N 53 followed by BARI Piaz 2. It was clear that the combined effects of variety and potassium were found significant on the mean bulb yield. The highest yield (9.05 g) was found in cv. N 53 with 75 kg K/ha whereas the lowest bulb yields (6.33 g) was found in cv. BARI Piaz 2 with control dose of potassium (Fig. 1).



**Fig.1.** Combined effect of variety and potassium on the yield of onion bulb. Vertical bar indicates the LSD value at 1% level of significance.

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