Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.6394

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (2):** 370-383 (2018)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Response of Onion (*Allium cepa* L.) to Potassium Levels, Sources and Time of Application

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Received: 5.03.2018 | Revised: 7.04.2018 | Accepted: 11.04.2018

ABSTRACT

The present investigation on "Effect of potassium levels, sources and time of application on growth and growth parameters of onion var. Arka Kalyan" was carried out at the College of Horticulture, Bagalkot, Karnataka during Kharif season of 2015 and 2016. Potassium significantly influenced the growth components like plant height, number of leaves per plant, leaf length, leaf breadth, neck thickness and biomass per plant with increasing levels of potassium at 30, 60 and 90 days after transplanting. Application of 200 per cent RDK recorded significantly higher plant height (37.08, 54.00 and 56.69 cm, respectively), number of leaves per plant (5.59, 8.66 and 9.88, respectively), leaf length (33.85, 47.50 and 48.02 cm, respectively), leaf breadth (5.19, 7.44 and 7.84 mm, respectively), leaf area per plant (154.52, 490.92 and 582.72 cm^2, respectively), neck thickness (7.60, 13.90 and 15.08 mm, respectively) and biomass per plant (4.60, 8.22 and 14.70 g, respectively) and it proved significantly superior over 100 per cent RDK. Growth parameters like plant height, number of leaves per plant, leaf length, leaf breadth, leaf area per plant, neck thickness and biomass per plant varied significantly by potassium supplied as sulphate of potash over muriate of potash. The growth parameters was significantly influenced by the time of application of potassium. At 30 DAT, the application of 100 per cent potassium at transplanting was recorded significantly higher growth parameters compared to 50 per cent potassium at transplanting and 50 per cent K at 30 DAT was applied as basal. At 60 and 90 DAT, application of 50 per cent potassium at transplanting and 50 per cent K at 30 DAT was recorded superior growth over 100 per cent potassium at transplanting.

Key words: *Onion, Potassium, Sources, Time of Application.*

INTRODUCTION

Onion (*Allium cepa* L.) is one of the important commercial bulbous crops cultivated extensively in India and it belongs to the family Alliaceae. It is a most widely grown and popular crop among the *Alliums.* The primary centre of origin of onion lies in Central Asia Vavilov[1] and the near East and the Mediterranean regions are the secondary centres of origin.

Cite this article: Kumara, B.R., Mansur, C.P., Wani, S.P., Chander, G., Allolli, T.B., Jagadeesh, S.L., Mesta, R.K., Meti, S., Satish, D., and Reddy, S.G., Response of Onion (*Allium cepa* L.) to Potassium Levels, Sources and Time of Application, *Int. J. Pure App. Biosci.* **6(2):** 370-383 (2018). doi: http://dx.doi.org/10.18782/2320-7051.6394

It is an ancient crop utilized in medicine, rituals and as a food in Egypt and in India since 600 BC. References of onion as food were also found in Bible and Quran. In the genus *Allium, Allium cepa* (onion) and *Allium sativum* (garlic) are the two major cultivated species grown all over the world. It is an indispensible item in every kitchen as vegetable and condiment used to flavour many of the food stuffs. Therefore, onion is popularly referred as "Queen of Kitchen". India is the second largest producer of onion in the world next to china, accounting 22.60 per cent of the world production. In India, onion is being grown in an area of 12.03 lakh ha with the annual production of 194.01 lakh MT and the productivity is 16.10 MT ha^{-1}. Among onion growing states Maharashtra stands first followed by Karnataka, Gujarat, Bihar, Madhya Pradesh, Andhra Pradesh, Rajasthan, Haryana, Uttar Pradesh and Tamil Nadu. In Karnataka, onion is cultivated in an area of 1.36 lakh hectare with production of 20.65 lakh tones and the average productivity is 15.10 MT ha^{-1} [2], which is low compared to world average. The onion is a shallow rooted and potash loving crop, hence it requires fairly higher amount of nutrients including potassium must be maintained in the upper layer of the soil. Generally a heavy dose of fertilizer is recommended for onion cultivation. Like other tuber and root crops, onion is very responsive to potash. Potassium is helpful in many metabolic processes namely production and transport of carbohydrates and sugars, protein synthesis, imparting resistance to pests and diseases, activation of many enzymes, stalk and stem breakage and stress conditions, storage quality, increased bulb size and bulb yield Pachauri *et al*[3].

In India, very limited works have been earned out to evaluate the effect of different methods of application, sources, potassium levels on onion crop. In our country, muriate of potash is almost the sole source of potash fertilization which is used by the farmers. But there are some other sources of potash that would perform better than muriate of potash. Keeping in view the significance of above aspects in obtaining higher yields of better quality bulbs. Hence, the present investigation is alarmed with the objectives. To assess the growth and growth parameters of onion to higher graded levels, sources and time of application of potassium.

MATERIAL AND METHODS

The present investigation on "Effect of potassium levels, sources and time of application on growth and growth parameters of onion var. Arka Kalyan" was carried out at the College of Horticulture, Bagalkot, Karnataka during *Kharif* season of 2015 and 2016. The details of the materials used and the techniques adopted during the investigation are outlined in this chapter. Bagalkot is situated in the Northern Dry Zone (Zone-3) of Karnataka. The centre is located at 75° 42' East longitude and 16° 10' North latitude with an altitude of 542.00 m above Mean Sea Level (MSL). The district is grouped under arid and semi-arid region with mean annual rainfall of 517.3 mm and mean temperature of 32.6°C. The soil of the experimental site was red sandy soil.

Experimental details:

Treatments	: 20 (5 × 2 × 2)
Design	: Factorial R.B.D
Replications	: Three
Season	: *Kharif*
Variety	: Arka Kalyan
Spacing	: 15 cm × 10 cm
Plot size	: 2.1 m × 2.0 m
Fertilizer dose	: 125: 75: 125 kg NPK ha^{-1}
Location	: Haveli farm, COH, Bagalkot
Storage period	: Three months under ambient condition

Treatment details:

Factor I: Levels of potassium

1. 100% RDK + RDNP&FYM (K_1)
2. 125% RDK + RDNP&FYM (K_2)
3. 150% RDK + RDNP&FYM (K_3)
4. 175% RDK + RDNP&FYM (K_4)
5. 200% RDK + RDNP&FYM (K_5)

Factor II: Sources of potassium: 1. MOP (S_1), 2. SOP (S_2)

Factor III: Time of application; 1. 100% K at transplanting (T_1)

2. 50% K at transplanting and 50% K at 30 DAT (T_2)

Note: Recommended dose of NP @ 125:75 kg and FYM @ 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 days after transplanting.

Growth parameters

1. Plant height (cm): The plant height was measured from ground level to the tip of the longest leaf and average of ten plants was taken as plant height and it was expressed in centimeters.

2. Number of leaves: The number of fully grown functional leaves were counted in each of the ten plants and average was taken as number of leaves per plant at all crop growth stages.

3. Leaf length (cm): Length of middle leaf on ten selected plants was measured using centimeter scale. The average was expressed as length of the leaf.

4. Leaf breadth (mm): Leaf breadth of middle leaf in the centre on ten selected plants was recorded using digital vernier caliper. The mean value was expressed as leaf breadth.

5. Leaf area (cm^2) per plant: The linear measurements were made for calculation of leaf area per plant at 30, 60 and 90 days after transplanting and expressed in cm^2 per plant. The leaf area was calculated by using formula as suggested by Laxman *et al*[4].

A = L × 2 B × 0.7865 × Total No. of leaves per plant

Where,

A : Area of the leaf per plant in cm^2

L : Length of the leaf in cm

B : Breadth of the leaf in cm

0.7865 : Factor for calculating leaf area in onion

6. Neck thickness (mm): The neck thickness below the joint of leaf lamina was measured with the help of digital vernier calipers. The mean value of ten selected plants was considered as neck thickness and the measurements were in millimeter.

7. Biomass (g/plant): The randomly selected five plants were uprooted at various stages of plant growth and the total biomass accumulation in plants were recorded in gram after drying the samples in hot air oven at 65 ^{0}c for 48 hrs.

RESULTS

Plant height at all the growth stages differed significantly by potassium levels during both the years as well as in pooled data (Table 1). In pooled data at 30 DAT, the maximum plant height was recorded significantly in 200% RDK (37.08 cm) over 100% RDK (34.48 cm) and 125% RDK (35.53 cm) but was on par with 150% and 175% RDK (36.59 and 36.52 cm, respectively). At 60 DAT, 200% RDK recorded significantly higher plant height (54.00 cm) and it was on par with 175% RDK (53.37 cm) over 100%, 125% and 150% RDK (49.58, 52.08 and 53.58 cm, respectively). At 90 DAT, the higher plant height was recorded significantly by 200% RDK (56.69 cm) over rest of the potassium levels.

Plant height varied significantly by potassium sources during both the years and in pooled data. At 30 DAT, pooled data indicated the plant height was significantly higher in potassium sources as SOP (36.61 cm) over MOP (35.47 cm). At 60 and 90 DAT, the plant height was recorded significantly higher in potassium sources as SOP (52.67 and 55.06 cm, respectively) over MOP (51.67 and 54.06 cm, respectively).

Time of potassium application influenced the plant height during both the years as well as in pooled data. In pooled data at 30 DAT, the higher plant height was recorded significantly with application of 100% potassium at transplanting (36.43 cm) over 50% potassium at transplanting and 50 % at 30 DAT. At 60 and 90 DAT, the higher plant height was recorded significantly by application of 50% potassium at transplanting and 50% K at 30 DAT (52.51 and 55.13 cm, respectively) over 100% potassium at transplanting (51.83 and 53.99 cm, respectively).

Number of leaves per plant at all the growth stages differed significantly by potassium levels during both the years as well as in pooled data (Table 2). In pooled data at 30 DAT, the number of leaves per plant was recorded significantly higher in 200% RDK

(5.59) over rest of the potassium levels. At 60 DAT, 200% RDK recorded significantly higher number of leaves per plant (8.66) over 100%, 125% and 150% RDK (7.84, 8.18 and 8.30, respectively). Except that the treatment 175% RDK (8.39) was on par and lower number of leaves per plant was recorded in 100% RDK. At 90 DAT, the higher number of leaves per plant was recorded significantly by 200% RDK (9.88) over rest of the potassium levels.

Number of leaves per plant varied significantly by potassium sources during both the years and in pooled data. At 30 DAT, pooled data indicated that the number of leaves per plant significantly higher in potassium sources as SOP (5.40) over MOP (5.28). At 60 DAT, the higher number of leaves per plant was recorded in potassium sources as SOP (8.41) over MOP (8.14). At 90 DAT, the trend was similar as that of 60 DAT.

Time of potassium application influenced the number of leaves per plant during both the years as well as in pooled data. In pooled data at 30 DAT, higher number of leaves per plant was recorded significantly with application of 100% potassium application at transplanting (5.63) over 50% at transplanting and 50% at 30 DAT (5.28). In pooled data, at 60 DAT, the higher number of leaves per plant was recorded significantly by application of 50% potassium at transplanting and 50% at 30 DAT (8.36) over 100% potassium at transplanting (8.18). At 90 DAT, number of leaves per plant did not differ significantly.

Leaf length (cm) at all the growth stages differed significantly by potassium levels during both the years as well as in pooled data (Table 3). At 30 DAT, the pooled data showed that the leaf length was significantly higher in 200% RDK (33.85 cm) over 100% RDK (31.39 cm) and 125% RDK (32.75 cm) but was on par with 150% and 175% RDK (33.25 and 33.66 cm, respectively). At 60 DAT, 200% RDK recorded significantly higher leaf length (47.50 cm) over 100%, 125%, 150% and 175% RDK (41.83, 43.99, 44.56 and 45.59 cm, respectively) and lower leaf length was observed in 100% RDK. At 90 DAT, higher leaf length was recorded significantly by 200% RDK (48.02 cm) over rest of the potassium levels and lowest leaf length was recorded in 100% RDK (43.39 cm).

Leaf length varied significantly by potassium sources during both the years and in pooled data. At 30 DAT, pooled data indicated that the leaf length was significantly higher in potassium sources as SOP (33.53 cm) over MOP (32.42 cm). At 60 DAT, leaf length was recorded significantly higher in potassium sources as SOP (45.30 cm) over MOP (44.08 cm). At 90 DAT, higher leaf length was recorded significantly in potassium sources as SOP (46.25 cm) over MOP (45.29 cm).

Time of potassium application influenced the leaf length during both the years as well as in pooled data. In pooled data at 30 DAT, the higher leaf length was recorded significantly with 100% potassium application at transplanting (33.33 cm) over 50% potassium at transplanting and 50% at 30 DAT (32.63 cm). At 60 and 90 DAT, the higher leaf length was recorded significantly by application of 50% potassium at transplanting and 50% at 30 DAT (45.15 and 46.14 cm, respectively) over 100% potassium at transplanting (44.23 and 45.39 cm, respectively).

Leaf breadth (mm) at all the growth stages differed significantly by potassium levels during both the years and in pooled data (Table 4). At 30 DAT, the pooled data showed that the leaf breadth was significantly higher in 200% RDK (5.19 mm) over 100% RDK (4.77 mm) and 125% RDK (4.95 mm) but was on par with 150% and 175% RDK (5.06 and 5.09 mm, respectively). At 60 DAT, 200% RDK recorded significantly higher leaf breadth (7.44 mm) over 100%, 125%, 150% and 175% RDK (6.64, 6.91, 7.09 and 7.26 mm, respectively) and the lowest leaf breadth was observed significantly in 100% RDK. At 90 DAT, the higher leaf breadth was recorded significantly by 200% RDK (7.84 mm) over rest of the potassium levels and lowest leaf breadth was recorded in 100% RDK (6.94 mm).

Leaf breadth varied significantly by potassium sources during both the years and in pooled data. At 30 DAT, pooled data indicated that the leaf breadth was significantly higher in potassium sources as SOP (5.07 mm) over MOP (4.95 mm). At 60 DAT, the leaf breadth was recorded significantly higher in potassium sources as SOP (7.15 mm) over MOP (6.99 mm). At 90 DAT, the higher leaf breadth was recorded significantly in potassium sources as SOP (7.44 mm) over MOP (7.21 cm).

Time of potassium application significantly influenced the leaf breadth during both the years and in pooled data. In pooled data at 30 DAT, the higher leaf breadth was recorded significantly with 100% potassium application at transplanting (5.06 mm) over 50% at transplanting and 50% at 30 DAT (4.96 mm). At 60 and 90 DAT, the higher leaf breadth was recorded significantly by application of 50% potassium at transplanting and 50% at 30 DAT (7.11 and 7.39 mm, respectively) over 100% potassium at transplanting (7.02 and 7.25 mm, respectively).

Leaf area per plant (cm^2) at all the growth stages differed significantly by potassium levels during both the years and in pooled data (Table 5). At 30 DAT, the pooled data showed that the leaf area per plant was significantly higher in 200% RDK (154.52 cm^2) over 100% RDK (117.37 cm^2), 125% RDK (134.79 cm^2), 150% and 175% RDK (144.71 and 145.03 cm^2, respectively). At 60 DAT, 200% RDK recorded significantly higher leaf area per plant (490.92 cm^2) over 100%, 125%, 150% and 175% RDK (352.39, 395.30, 424.34 and 447.91 cm^2, respectively) and lowest leaf area per plant was observed significantly in 100% RDK. At 90 DAT, the higher leaf area per plant was recorded significantly by 200% RDK (582.72 cm^2) over rest of the potassium levels.

Leaf area per plant varied significantly by potassium sources during both the years and in pooled data. At 30, 60 and 90 DAT, pooled data the higher leaf area per plant was recorded significantly in potassium sources as SOP (144.89, 437.39 and 485.92 cm^2, respectively) over MOP (133.67, 406.96 and 432.63 cm^2, respectively).

Time of potassium application influenced the leaf area per plant during both the years as well as in pooled data. In pooled data at 30 DAT the higher leaf area per plant was recorded significantly with application of 100% potassium at transplanting (143.44 cm^2) over 50% at transplanting and 50% at 30 DAT (135.13 cm^2). At 60 and 90 DAT, the higher leaf area per plant was recorded significantly by application of 50% potassium at transplanting and 50% at 30 DAT (432.84 and 475.87 cm^2, respectively) over 100% potassium at transplanting (411.50 and 442.68 cm^2, respectively).

Neck thickness (mm) at all the growth stages differed significantly by potassium levels during both the years as well as in pooled data (Table 6). At 30 DAT, the pooled data showed that the neck thickness was significantly maximum in 200% RDK (7.60 mm) over 100% RDK (6.84 mm), 125% RDK (7.21 mm) and 150% RDK (7.29 mm) but was on par with 175% RDK (7.44 mm). At 60 DAT, the maximum neck thickness was recorded significantly in 200% RDK (13.90 mm) over 100%, and 125% RDK (12.11 and 13.26 mm, respectively) but was on par with 150% and 175% RDK (13.69 and 13.63 mm, respectively). At 90 DAT, the maximum neck thickness was recorded significantly by 200% RDK (15.08 mm) over rest of the potassium levels and lowest neck thickness was observed in 100% RDK (12.79 mm).

Neck thickness varied significantly by potassium sources during both the years and in pooled data. At 30, 60 and 90 DAT, pooled data indicated that the neck thickness was significantly maximum in potassium sources as SOP (7.39, 13.73 and 14.46 mm, respectively) over MOP (7.16, 12.91 and 13.69 mm, respectively).

Time of potassium application influenced the neck thickness at 60 and 90 DAT, during both the years as well as in pooled data except 30 DAT. In pooled data at 30 DAT, the higher neck thickness was recorded significantly with application of

100% potassium at transplanting (7.35 mm) over 50% at transplanting and 50% at 30 DAT (7.19 mm). At 60 and 90 DAT, the higher neck thickness was recorded significantly by application of 50% potassium at transplanting and 50% at 30 DAT (13.65 and 14.34 mm, respectively) over 100% potassium at transplanting (12.97 and 13.79 mm, respectively).

Biomass per plant (g/plant) at all the growth stages differed significantly by potassium levels during both the years as well as in pooled data (Table 7). At 30 DAT, the pooled data showed that the biomass per plant was significantly maximum in 200% RDK (4.60 g) over 100% RDK (4.21 g), 125% RDK (4.35 g) and 150% RDK (4.27 g) but was on par with 175% RDK (4.47 g). At 60 DAT, the maximum biomass per plant was recorded significantly in 200% RDK (8.22 g) over 100% RDK (7.14 g) but was on par with 125%, 150% and 175% RDK (7.79, 7.79 and 8.03 g, respectively). At 90 DAT, the maximum biomass per plant was recorded significantly by 200% RDK (14.70 g) over rest of the potassium levels and lowest biomass per plant was observed in 100% RDK (9.58 g).

Biomass per plant varied significantly by potassium sources during both the years and in pooled data except at 60 DAT, in pooled data. At 30 and 90 DAT, pooled data indicated that the biomass per plant was significantly maximum in potassium sources as SOP (4.44 and 12.20 g, respectively) over MOP (4.32 and 11.36 g, respectively).

Time of potassium application did not differ significantly the biomass per plant at 30 and 60 DAT, during both the years as well as in pooled data except 90 DAT. In pooled data at 90 DAT, the higher biomass per plant was recorded significantly in application of 50% potassium at transplanting and 50% at 30 DAT (11.97 g) over 100% potassium at transplanting (11.58 g).

Interaction effects of potassium levels, sources and time of application on growth and growth parameters of onion did not differ significantly at 30, 60 and 90 DAT, during both the years as well as in pooled data.

DISCUSSION

Potassium significantly influenced the growth components like plant height, number of leaves per plant, leaf length, leaf breadth, neck thickness and biomass per plant with increasing levels of potassium at 30, 60 and 90 days after transplanting. Application of 200 per cent RDK recorded significantly higher plant height (37.08, 54.00 and 56.69 cm, respectively), number of leaves per plant (5.59, 8.66 and 9.88, respectively), leaf length (33.85, 47.50 and 48.02 cm, respectively), leaf breadth (5.19, 7.44 and 7.84 mm, respectively), leaf area per plant (154.52, 490.92 and 582.72 cm^2, respectively), neck thickness (7.60, 13.90 and 15.08 mm, respectively) and biomass per plant (4.60, 8.22 and 14.70 g, respectively) and it proved significantly superior over 100 per cent RDK. The vigorous growth in terms of these parameters might be due to significantly higher uptake of potassium at higher levels of potassium applied along with recommended dose of nitrogen, phosphorus and farmyard manure. Since potassium plays an important role in the translocation of photosynthates from leaves to bulb, the added potassium might have resulted in increased synthesis of photosynthates which were further utilized in building up of new cells leading to better height, vigour and more number of leaves per plant, leaf length and breadth, neck thickness and ultimately increased the leaf area per plant. The dry matter production is a result of photosynthetic activity from increased leaf area. At higher potassium levels, there was higher leaf area which contributed for increased dry matter production and its distribution. The dry matter accumulation in leaf as well as in bulb increased with increasing application of potassium. This might be due to greater uptake of potassium, which increased biomass of plants interms of plant height, number of leaves per plant, leaf length and breadth and leaf area per plant leading to maximum photosynthesis resulting in increased plant dry matter production. The results obtained in the present investigations confirm with the earlier findings of Akhtar *et* *al.*[5], Islam *et al.*[6], Faten *et al.*[7], Shafeek *et al.*[8], Barman *et al.*[9] and Deshpande *et al*[10].

Growth parameters like plant height, number of leaves per plant, leaf length, leaf breadth, leaf area per plant, neck thickness and biomass per plant varied significantly by potassium supplied as sulphate of potash over muriate of potash. In the present investigation among the potassium sources the higher growth parameters was recorded due to application of sulphate of potash as compared to muriate of potash. The significantly superior growth parameters seen could be attributed to positive effect of potassium and sulphur present in sulphate of potash than other sources. Readily available forms of potassium and sulphur could be taken up by plants easily and adequately. Sulphate of potash has great contribution in the physiological processes, like photosynthates translocation from leaves to bulbs and reducing the excess uptake of ions. Similar results have been reported by Geetha *et al.*[11], Desuki *et al.*[12], Faten *et al.*[7] and Deshpande *et al*[10].

The growth and growth parameters was significantly influenced by the time of application of potassium. At 30 DAT, the application of 100 per cent potassium at transplanting was recorded significantly higher growth parameters compared to 50 per cent potassium at transplanting and 50 per cent K at 30 DAT was applied as basal. At 60 and 90 DAT, application of 50 per cent potassium at transplanting and 50 per cent K at 30 DAT was recorded superior growth over 100 per cent potassium at transplanting. This may be due to more loss of applied potassium in various form from soil when applied in single split compared to double split. These results also revealed that the application of 50 per cent potassium at transplanting and 50 per cent K at 30 DAT gave higher growth and growth parameters over 100 per cent basal application of potash. These findings are in agreement with the results of Singh and Verma[13], Lee-JongTae *et al.*[14] and Islam *et al*[6].

Table 1: Plant height (cm) at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Plant height (cm)								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	34.08	34.60	34.48	49.33	49.83	49.58	52.06	51.94	52.00
K_2-125 % RDK	34.50	36.47	35.53	50.39	52.08	51.24	53.91	54.15	54.03
K_3-150 % RDK	36.46	36.62	36.59	51.76	53.58	52.67	55.07	54.73	54.90
K_4-175 % RDK	36.09	36.88	36.52	52.56	54.19	53.37	54.82	55.78	55.30
K_5-200 % RDK	36.87	37.05	37.08	52.89	55.10	54.00	56.61	56.56	56.69
S.Em±	**0.53**	**0.41**	**0.38**	**0.35**	**0.30**	**0.22**	**0.46**	**0.54**	**0.37**
C.D. (p= 0.05)	**1.51**	**1.16**	**1.08**	**1.00**	**0.86**	**0.63**	**1.32**	**1.55**	**1.06**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	35.04	35.70	35.47	51.00	52.34	51.67	54.03	54.09	54.06
S_2- Sulphate of potash (SOP)	36.24	36.94	36.61	51.77	53.57	52.67	54.95	55.17	55.06
S.Em±	**0.33**	**0.26**	**0.24**	**0.22**	**0.19**	**0.14**	**0.29**	**0.34**	**0.23**
C.D. (p= 0.05)	**0.95**	**0.74**	**0.68**	**0.64**	**0.54**	**0.40**	**0.84**	**0.98**	**0.67**
Time of application (T)									
T_1- 100 % K at transplanting	36.14	36.73	36.43	50.99	52.67	51.83	53.95	54.04	53.99
T_2- 50 % K at transplanting & 50 % K at 30 DAT	35.13	35.92	35.64	51.77	53.24	52.51	55.03	55.23	55.13
S.Em±	**0.33**	**0.26**	**0.24**	**0.22**	**0.19**	**0.14**	**0.29**	**0.34**	**0.23**
C.D. (p= 0.05)	**0.95**	**0.74**	**0.68**	**0.64**	**0.54**	**0.40**	**0.84**	**0.98**	**0.67**
Interactions									
$K_1S_1T_1$	34.83	34.40	34.61	48.22	48.36	48.29	50.82	50.52	50.67
$K_1S_1T_2$	31.77	32.73	32.25	49.41	48.98	49.20	51.60	51.21	51.41
$K_1S_2T_1$	36.72	35.98	36.35	49.10	50.92	50.01	52.18	52.62	52.40
$K_1S_2T_2$	33.79	35.30	34.71	50.61	51.07	50.84	53.62	53.41	53.52
$K_2S_1T_1$	34.41	36.03	35.22	49.26	51.35	50.31	54.20	52.65	53.43
$K_2S_1T_2$	33.63	35.86	34.93	50.36	51.71	51.04	53.21	54.15	53.83
$K_2S_2T_1$	35.80	37.29	36.54	50.69	52.59	51.64	53.51	54.65	54.08

$K_2S_2T_2$	34.16	36.69	35.42	51.26	52.66	51.96	54.39	55.14	54.77
$K_3S_1T_1$	36.45	36.79	36.62	51.51	53.00	52.26	54.75	54.02	54.38
$K_3S_1T_2$	35.30	35.82	35.76	51.87	53.71	52.79	55.35	55.59	55.47
$K_3S_2T_1$	37.45	37.14	37.29	51.08	53.43	52.25	54.50	54.06	54.28
$K_3S_2T_2$	36.65	36.73	36.69	52.27	54.16	53.37	55.66	55.26	55.46
$K_4S_1T_1$	35.40	37.20	36.30	52.07	53.86	52.97	52.97	55.38	54.18
$K_4S_1T_2$	35.47	35.79	35.80	52.40	54.04	53.22	55.13	56.02	55.58
$K_4S_2T_1$	36.87	37.51	37.19	52.21	54.27	53.24	54.57	54.75	54.66
$K_4S_2T_2$	36.60	37.01	36.80	53.55	54.59	54.07	56.59	56.97	56.78
$K_5S_1T_1$	36.45	36.70	36.58	52.81	53.62	53.22	55.71	54.98	55.34
$K_5S_1T_2$	36.69	35.70	36.64	52.07	54.74	53.41	56.24	56.40	56.32
$K_5S_2T_1$	37.10	38.25	37.68	53.07	55.29	54.18	56.28	56.73	56.61
$K_5S_2T_2$	37.25	37.54	37.43	53.61	56.76	55.19	58.22	58.13	58.18
S.Em±	**1.05**	**0.81**	**0.76**	**0.70**	**0.60**	**0.44**	**0.92**	**1.08**	**0.74**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT.

Table 2: Number of leaves per plant at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Number of leaves per plant								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	4.92	5.02	4.97	7.44	8.23	7.84	7.91	7.83	7.87
K_2-125 % RDK	5.25	5.33	5.29	7.78	8.58	8.18	8.71	8.28	8.50
K_3-150 % RDK	5.44	5.50	5.47	8.14	8.46	8.30	8.62	8.70	8.66
K_4-175 % RDK	5.37	5.39	5.38	8.14	8.63	8.39	8.96	9.14	9.05
K_5-200 % RDK	5.54	5.63	5.59	8.60	8.73	8.66	9.52	10.25	9.88
S.Em±	**0.06**	**0.04**	**0.04**	**0.12**	**0.11**	**0.10**	**0.26**	**0.15**	**0.19**
C.D. (p= 0.05)	**0.17**	**0.12**	**0.11**	**0.34**	**0.32**	**0.28**	**0.76**	**0.42**	**0.53**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	5.25	5.31	5.28	7.87	8.41	8.14	8.49	8.63	8.56
S_2- Sulphate of potash (SOP)	5.36	5.44	5.40	8.17	8.64	8.41	8.99	9.05	9.02
S.Em±	**0.04**	**0.03**	**0.02**	**0.08**	**0.07**	**0.06**	**0.17**	**0.09**	**0.12**
C.D. (p= 0.05)	**0.11**	**0.08**	**0.07**	**0.22**	**0.20**	**0.18**	**0.48**	**0.26**	**0.34**
Time of application (T)									
T_1- 100 % K at transplanting	5.34	5.44	5.63	7.93	8.43	8.18	8.58	8.73	8.65
T_2- 50 % K at transplanting & 50 % K at 30 DAT	5.25	5.31	5.28	8.10	8.62	8.36	8.90	8.94	8.92
S.Em±	**0.04**	**0.03**	**0.02**	**0.08**	**0.07**	**0.06**	**0.17**	**0.09**	**0.12**
C.D. (p= 0.05)	**NS**	**0.08**	**0.07**	**NS**	**NS**	**0.18**	**NS**	**NS**	**NS**
Interactions									
$K_1S_1T_1$	5.00	5.13	5.07	6.97	7.77	7.37	7.42	7.40	7.41
$K_1S_1T_2$	4.67	4.63	4.65	7.40	8.30	7.85	8.13	7.87	8.00
$K_1S_2T_1$	5.13	5.28	5.21	7.80	8.37	8.08	7.80	7.93	7.87
$K_1S_2T_2$	4.87	5.04	4.95	7.60	8.50	8.05	8.28	8.11	8.20
$K_2S_1T_1$	5.05	5.19	5.12	7.13	8.27	7.70	8.49	8.20	8.34
$K_2S_1T_2$	5.20	5.27	5.23	7.88	8.43	8.16	8.40	8.20	8.30
$K_2S_2T_1$	5.40	5.52	5.46	8.13	8.77	8.45	9.29	8.33	8.81
$K_2S_2T_2$	5.33	5.35	5.34	7.97	8.83	8.40	8.68	8.40	8.54
$K_3S_1T_1$	5.40	5.50	5.45	7.83	8.40	8.12	8.57	8.47	8.52
$K_3S_1T_2$	5.53	5.55	5.54	8.13	8.47	8.30	8.39	8.60	8.50
$K_3S_2T_1$	5.57	5.57	5.57	8.27	8.43	8.35	8.53	8.80	8.67
$K_3S_2T_2$	5.27	5.36	5.32	8.33	8.53	8.43	8.97	8.93	8.95
$K_4S_1T_1$	5.33	5.38	5.36	8.00	8.43	8.22	8.25	8.93	8.59
$K_4S_1T_2$	5.53	5.30	5.32	8.20	8.57	8.38	8.89	9.00	8.95
$K_4S_2T_1$	5.40	5.47	5.43	8.31	8.73	8.52	8.97	9.23	9.10
$K_4S_2T_2$	5.40	5.39	5.40	8.07	8.80	8.43	9.72	9.38	9.55
$K_5S_1T_1$	5.53	5.61	5.57	8.53	8.67	8.60	8.96	9.60	9.28
$K_5S_1T_2$	5.43	5.52	5.48	8.63	8.80	8.72	9.44	10.07	9.75
$K_5S_2T_1$	5.63	5.73	5.68	8.37	8.47	8.42	9.56	10.43	10.00
$K_5S_2T_2$	5.57	5.67	5.62	8.87	8.97	8.92	10.10	10.92	10.51
S.Em±	**0.12**	**0.08**	**0.07**	**0.24**	**0.23**	**0.19**	**0.53**	**0.29**	**0.37**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT.

Table 3: Leaf length (cm) at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Leaf length (cm)								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	32.18	30.61	31.39	40.03	43.63	41.83	42.55	44.23	43.39
K_2-125 % RDK	33.89	31.61	32.75	42.88	45.10	43.99	43.91	46.11	44.89
K_3-150 % RDK	33.97	32.52	33.25	42.81	46.30	44.56	45.17	46.64	45.88
K_4-175 % RDK	34.41	32.90	33.66	44.02	47.16	45.59	46.20	47.10	46.65
K_5-200 % RDK	35.06	32.64	33.85	46.31	48.68	47.50	47.73	48.32	48.02
S.Em±	**0.38**	**0.27**	**0.21**	**0.57**	**0.15**	**0.29**	**0.47**	**0.38**	**0.31**
C.D. (p= 0.05)	**1.08**	**0.76**	**0.61**	**1.63**	**0.43**	**0.84**	**1.33**	**1.08**	**0.89**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	33.50	31.35	32.42	42.42	45.75	44.08	44.66	46.04	45.29
S_2- Sulphate of potash (SOP)	34.30	32.77	33.53	44.00	46.61	45.30	45.57	46.92	46.25
S.Em±	**0.24**	**0.17**	**0.13**	**0.36**	**0.09**	**0.19**	**0.29**	**0.24**	**0.20**
C.D. (p= 0.05)	**0.69**	**0.48**	**0.38**	**1.03**	**0.27**	**0.53**	**0.84**	**0.69**	**0.56**
Time of application (T)									
T_1- 100 % K at transplanting	34.36	32.35	33.33	42.57	45.88	44.23	44.68	46.03	45.39
T_2- 50 % K at transplanting & 50 % K at 30 DAT	33.49	31.77	32.63	43.83	46.46	45.15	45.55	46.92	46.14
S.Em±	**0.24**	**0.17**	**0.13**	**0.36**	**0.09**	**0.19**	**0.29**	**0.24**	**0.20**
C.D. (p= 0.05)	**0.69**	**0.48**	**0.38**	**1.03**	**0.27**	**0.53**	**0.84**	**0.69**	**0.56**
Interactions									
$K_1S_1T_1$	31.73	30.52	31.13	38.48	41.75	40.12	41.39	42.46	41.93
$K_1S_1T_2$	30.71	29.17	29.94	39.49	43.85	41.67	42.65	43.69	43.17
$K_1S_2T_1$	33.12	31.71	32.47	40.52	44.35	42.44	42.82	45.34	44.08
$K_1S_2T_2$	33.16	30.93	32.04	41.61	44.57	43.09	43.35	45.42	44.38
$K_2S_1T_1$	33.91	30.83	32.37	42.54	44.64	43.59	43.52	46.43	45.14
$K_2S_1T_2$	33.88	30.77	32.33	42.27	44.80	43.54	44.18	46.64	44.77
$K_2S_2T_1$	34.13	32.93	33.53	42.84	45.16	44.00	43.69	45.32	44.50
$K_2S_2T_2$	33.63	31.93	32.78	43.87	45.80	44.84	44.25	46.05	45.15
$K_3S_1T_1$	34.19	32.97	33.58	43.74	46.04	44.89	44.29	46.23	45.43
$K_3S_1T_2$	33.34	30.84	32.09	41.94	46.21	44.08	44.74	47.10	45.66
$K_3S_2T_1$	34.96	33.33	34.15	40.03	46.30	43.17	45.04	46.03	45.53
$K_3S_2T_2$	33.40	32.96	33.18	45.54	46.66	46.10	46.62	47.20	46.91
$K_4S_1T_1$	33.63	32.90	33.27	42.36	46.79	44.58	45.45	46.25	45.85
$K_4S_1T_2$	33.51	31.93	32.72	42.74	47.06	44.90	46.13	47.27	46.70
$K_4S_2T_1$	36.24	33.13	34.69	44.01	47.32	45.67	46.16	46.69	46.43
$K_4S_2T_2$	34.25	33.64	33.95	46.95	47.46	47.21	47.06	48.19	47.62
$K_5S_1T_1$	35.48	31.48	33.48	44.95	47.76	46.36	46.85	46.67	46.76
$K_5S_1T_2$	34.65	32.04	33.35	45.69	48.55	47.12	47.35	47.61	47.48
$K_5S_2T_1$	35.71	33.56	34.64	46.33	48.72	47.53	47.59	48.92	48.26
$K_5S_2T_2$	34.40	33.47	33.93	48.26	49.69	48.98	49.12	50.07	49.60
S.Em±	**0.76**	**0.53**	**0.42**	**1.14**	**0.30**	**0.59**	**0.93**	**0.76**	**0.62**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT.

Table 4: Leaf breadth (mm) at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Leaf breadth (mm)								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	4.94	4.61	4.77	6.92	6.36	6.64	6.88	6.99	6.94
K_2-125 % RDK	5.14	4.76	4.95	7.16	6.65	6.91	6.92	7.27	7.10
K_3-150 % RDK	5.21	4.90	5.06	7.23	6.96	7.09	7.06	7.31	7.19
K_4-175 % RDK	5.27	4.92	5.09	7.39	7.14	7.26	7.50	7.67	7.58
K_5-200 % RDK	5.34	5.04	5.19	7.51	7.36	7.44	7.98	7.70	7.84
S.Em±	**0.05**	**0.08**	**0.06**	**0.10**	**0.03**	**0.05**	**0.10**	**0.09**	**0.07**
C.D. (p= 0.05)	**0.15**	**0.23**	**0.16**	**0.28**	**0.07**	**0.15**	**0.29**	**0.25**	**0.20**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	5.13	4.77	4.95	7.15	6.82	6.99	7.15	7.28	7.21
S_2- Sulphate of potash (SOP)	5.23	4.92	5.07	7.34	6.97	7.15	7.39	7.50	7.44
S.Em±	**0.03**	**0.05**	**0.03**	**0.06**	**0.02**	**0.03**	**0.06**	**0.05**	**0.05**
C.D. (p= 0.05)	**0.10**	**0.15**	**0.10**	**0.18**	**0.05**	**0.10**	**0.18**	**0.16**	**0.13**
Time of application (T)									
T_1- 100 % K at transplanting	5.23	4.90	5.06	7.18	6.85	7.02	7.19	7.31	7.25
T_2- 50 % K at transplanting & 50 % K at 30 DAT	5.13	4.78	4.96	7.29	6.93	7.11	7.33	7.45	7.39
S.Em±	**0.03**	**0.05**	**0.03**	**0.06**	**0.02**	**0.03**	**0.06**	**0.05**	**0.05**
C.D. (p= 0.05)	**NS**	**NS**	**0.10**	**NS**	**0.05**	**0.10**	**NS**	**NS**	**0.13**
Interactions									
$K_1S_1T_1$	4.99	4.66	4.82	6.72	6.17	6.46	6.88	6.90	6.89
$K_1S_1T_2$	4.65	4.44	4.55	6.90	6.31	6.60	6.79	6.90	6.85
$K_1S_2T_1$	5.07	4.73	4.90	7.03	6.42	6.69	6.92	6.97	6.94
$K_1S_2T_2$	5.05	4.60	4.83	7.05	6.55	6.80	6.93	7.21	7.07
$K_2S_1T_1$	5.19	4.67	4.93	7.03	6.57	6.81	6.90	7.22	7.06
$K_2S_1T_2$	5.05	4.64	4.85	7.15	6.63	6.89	6.82	7.25	7.03
$K_2S_2T_1$	5.17	4.93	5.05	7.15	6.68	6.92	6.92	7.25	7.08
$K_2S_2T_2$	5.15	4.79	4.97	7.32	6.72	7.02	7.06	7.36	7.21
$K_3S_1T_1$	5.20	4.78	4.99	7.06	6.86	6.97	6.64	7.19	6.91
$K_3S_1T_2$	5.15	4.98	5.06	7.16	6.93	7.04	7.10	7.25	7.17
$K_3S_2T_1$	5.26	5.03	5.15	7.26	6.98	7.12	7.22	7.40	7.31
$K_3S_2T_2$	5.25	4.82	5.03	7.43	7.05	7.24	7.28	7.42	7.35
$K_4S_1T_1$	5.25	4.93	5.09	7.27	7.07	7.17	7.37	7.45	7.41
$K_4S_1T_2$	5.23	4.79	5.01	7.34	7.12	7.23	7.74	7.63	7.69
$K_4S_2T_1$	5.33	5.12	5.23	7.46	7.16	7.31	7.36	7.62	7.49
$K_4S_2T_2$	5.26	4.83	5.05	7.48	7.21	7.34	7.53	7.96	7.75
$K_5S_1T_1$	5.34	4.93	5.13	7.36	7.22	7.29	7.56	7.45	7.51
$K_5S_1T_2$	5.24	4.89	5.06	7.48	7.36	7.42	7.72	7.53	7.62
$K_5S_2T_1$	5.48	5.25	5.37	7.49	7.39	7.44	8.20	7.78	7.99
$K_5S_2T_2$	5.28	5.08	5.18	7.70	7.49	7.59	8.43	8.04	8.24
S.Em±	**0.11**	**0.16**	**0.11**	**0.20**	**0.05**	**0.11**	**0.20**	**0.17**	**0.14**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT

Table 5: Leaf area (cm^2) per plant at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Leaf area (cm^2)								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	117.39	117.34	117.37	359.69	345.10	352.39	380.97	344.01	362.49
K_2-125 % RDK	135.37	134.22	134.79	404.51	386.10	395.30	433.88	406.23	420.05
K_3-150 % RDK	144.14	145.28	144.71	429.60	419.08	424.34	465.87	410.70	438.28
K_4-175 % RDK	143.81	146.25	145.03	458.12	437.69	447.91	518.38	467.32	492.85
K_5-200 % RDK	157.16	151.88	154.52	494.94	486.90	490.92	602.14	563.29	582.72
S.Em±	**3.26**	**1.88**	**1.95**	**7.83**	**9.64**	**7.78**	**13.48**	**19.46**	**14.71**
C.D. (p= 0.05)	**9.33**	**5.39**	**5.57**	**22.41**	**27.60**	**22.26**	**38.58**	**55.72**	**42.12**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	134.14	133.21	133.67	415.45	398.47	406.96	455.83	409.44	432.63
S_2- Sulphate of potash (SOP)	145.01	144.78	144.89	443.29	431.48	437.39	504.67	467.18	485.92
S.Em±	**2.06**	**1.19**	**1.23**	**4.95**	**6.10**	**4.92**	**8.52**	**12.31**	**9.30**
C.D. (p= 0.05)	**5.90**	**3.41**	**3.52**	**14.17**	**17.45**	**14.08**	**24.40**	**35.24**	**26.64**
Time of application (T)									
T_1- 100 % K at transplanting	144.44	142.44	143.44	419.59	403.40	411.50	466.13	419.23	442.68
T_2- 50 % K at transplanting & 50 % K at 30 DAT	134.72	135.54	135.13	439.14	426.53	432.84	494.36	457.37	475.87
S.Em±	**2.06**	**1.19**	**1.23**	**4.95**	**6.10**	**4.92**	**8.52**	**12.31**	**9.30**
C.D. (p= 0.05)	**5.90**	**3.41**	**3.52**	**14.17**	**17.45**	**14.08**	**24.40**	**35.24**	**26.64**
Interactions									
$K_1S_1T_1$	119.47	119.55	119.51	313.87	307.09	310.48	340.42	310.98	325.70
$K_1S_1T_2$	98.93	100.00	99.47	360.43	342.05	351.24	371.77	341.72	356.74
$K_1S_2T_1$	129.96	130.34	130.15	374.66	365.59	370.12	393.39	346.14	369.76
$K_1S_2T_2$	121.22	119.49	120.35	389.79	365.69	377.24	418.29	377.20	397.75
$K_2S_1T_1$	129.14	127.01	128.08	381.35	344.81	363.08	436.83	388.74	412.78
$K_2S_1T_2$	130.33	127.26	128.79	393.25	392.17	392.71	424.18	379.52	401.85
$K_2S_2T_1$	146.17	144.52	145.34	415.28	401.01	408.14	428.19	433.49	430.84
$K_2S_2T_2$	135.84	138.07	136.96	428.14	406.40	417.27	446.32	423.16	434.74
$K_3S_1T_1$	141.32	145.70	143.51	418.25	387.47	402.86	446.76	390.88	418.82
$K_3S_1T_2$	145.19	138.31	141.75	427.27	410.55	418.91	455.60	395.22	425.41
$K_3S_2T_1$	154.06	153.67	153.87	430.10	424.30	427.20	470.26	390.75	430.50
$K_3S_2T_2$	135.99	143.42	139.71	442.76	454.00	448.38	490.84	465.95	478.40
$K_4S_1T_1$	140.22	144.81	142.52	440.43	417.66	429.04	482.41	407.86	445.13
$K_4S_1T_2$	134.08	139.92	137.00	452.34	435.73	444.03	509.87	462.68	486.28
$K_4S_2T_1$	159.78	149.86	154.82	465.65	450.73	458.19	515.34	460.12	487.73
$K_4S_2T_2$	141.44	150.41	145.77	474.08	446.65	460.37	565.92	538.60	552.26
$K_5S_1T_1$	155.08	146.06	150.57	471.29	465.56	468.43	522.95	483.41	503.18
$K_5S_1T_2$	147.60	143.47	145.53	496.03	481.58	488.80	567.47	533.25	550.41
$K_5S_2T_1$	169.16	162.97	166.07	485.05	469.92	477.49	624.76	580.01	602.38
$K_5S_2T_2$	156.80	155.02	155.91	527.39	530.52	528.95	693.38	656.39	674.88
S.Em±	**6.52**	**3.77**	**3.89**	**15.65**	**19.28**	**15.55**	**26.95**	**38.92**	**29.42**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT.

Table 6: Neck thickness (mm) at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Neck thickness (mm)								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	6.60	7.07	6.84	11.96	12.26	12.11	13.32	12.26	12.79
K_2-125 % RDK	6.96	7.39	7.21	13.43	13.09	13.26	14.74	13.13	13.94
K_3-150 % RDK	7.02	7.56	7.29	13.96	13.41	13.69	14.81	13.41	14.11
K_4-175 % RDK	7.26	7.62	7.44	14.09	13.17	13.63	15.13	13.78	14.45
K_5-200 % RDK	7.44	7.75	7.60	14.24	13.56	13.90	15.76	14.40	15.08
S.Em±	**0.11**	**0.10**	**0.08**	**0.25**	**0.21**	**0.16**	**0.32**	**0.21**	**0.18**
C.D. (p= 0.05)	**0.33**	**0.29**	**0.23**	**0.71**	**0.60**	**0.45**	**0.91**	**0.61**	**0.51**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	6.94	7.36	7.16	13.14	12.68	12.91	14.31	13.07	13.69
S_2- Sulphate of potash (SOP)	7.17	7.59	7.39	13.94	13.52	13.73	15.20	13.72	14.46
S.Em±	**0.07**	**0.06**	**0.05**	**0.16**	**0.13**	**0.10**	**0.20**	**0.14**	**0.11**
C.D. (p= 0.05)	**0.21**	**0.18**	**0.15**	**0.45**	**0.38**	**0.28**	**0.58**	**0.39**	**0.32**
Time of application (T)									
T_1- 100 % K at transplanting	7.14	7.55	7.35	13.17	12.78	12.97	14.44	13.14	13.79
T_2- 50 % K at transplanting & 50 % K at 30 DAT	6.96	7.40	7.19	13.89	13.41	13.65	15.05	13.64	14.34
S.Em±	**0.07**	**0.06**	**0.05**	**0.16**	**0.13**	**0.10**	**0.20**	**0.14**	**0.11**
C.D. (p= 0.05)	**NS**	**NS**	**0.15**	**0.45**	**0.38**	**0.28**	**0.58**	**0.39**	**0.32**
Interactions									
$K_1S_1T_1$	6.27	7.02	6.65	10.69	11.31	11.00	12.23	11.57	11.90
$K_1S_1T_2$	6.60	6.60	6.60	12.12	11.90	12.01	13.55	12.28	12.92
$K_1S_2T_1$	6.75	7.38	7.07	12.14	12.85	12.50	13.38	12.28	12.83
$K_1S_2T_2$	6.78	7.28	7.03	12.88	12.98	12.93	14.13	12.89	13.51
$K_2S_1T_1$	7.07	7.36	7.23	13.01	12.49	12.75	14.73	13.16	13.94
$K_2S_1T_2$	6.79	7.27	7.09	13.52	13.17	13.35	14.28	12.87	13.58
$K_2S_2T_1$	7.17	7.56	7.36	13.14	12.65	12.90	14.17	12.97	13.57
$K_2S_2T_2$	6.82	7.39	7.18	14.05	14.05	14.05	15.80	13.53	14.67
$K_3S_1T_1$	6.97	7.57	7.27	13.37	12.85	13.11	14.98	12.95	13.97
$K_3S_1T_2$	6.83	7.48	7.17	13.40	13.29	13.35	13.40	13.51	13.45
$K_3S_2T_1$	7.25	7.62	7.43	14.31	13.66	13.98	14.36	13.15	13.75
$K_3S_2T_2$	7.03	7.58	7.30	14.78	13.84	14.31	16.49	14.04	15.26
$K_4S_1T_1$	7.49	7.62	7.56	13.78	12.60	13.19	14.89	12.81	13.85
$K_4S_1T_2$	6.93	7.52	7.23	13.79	13.53	13.66	14.59	13.65	14.12
$K_4S_2T_1$	7.40	7.72	7.56	13.81	12.72	13.27	14.77	14.17	14.47
$K_4S_2T_2$	7.23	7.62	7.42	14.98	13.82	14.40	16.29	14.47	15.38
$K_5S_1T_1$	7.28	7.64	7.46	13.38	12.80	13.09	15.15	13.79	14.47
$K_5S_1T_2$	7.19	7.56	7.38	14.31	12.87	13.59	15.28	14.15	14.72
$K_5S_2T_1$	7.84	8.05	7.95	14.15	13.91	14.03	15.86	14.64	15.25
$K_5S_2T_2$	7.46	7.75	7.60	15.14	14.67	14.91	16.76	15.02	15.89
S.Em±	**0.23**	**0.20**	**0.16**	**0.50**	**0.42**	**0.31**	**0.64**	**0.43**	**0.36**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT.

Table 7: Biomass (g) per plant at various growth stages of onion var. Arka Kalyan as influenced by the soil application of potassium levels, sources and time of application during *kharif* season

Treatment	Biomass (g) per plant								
	30 DAT			60 DAT			90 DAT		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Potassium levels (k)									
K_1-100 % RDK	4.24	4.19	4.21	7.11	7.16	7.14	9.70	9.46	9.58
K_2-125 % RDK	4.38	4.32	4.35	7.67	7.90	7.79	10.66	10.52	10.59
K_3-150 % RDK	4.27	4.27	4.27	7.80	7.78	7.79	11.35	11.35	11.35
K_4-175 % RDK	4.47	4.47	4.47	8.01	8.05	8.03	12.62	12.74	12.68
K_5-200 % RDK	4.60	4.60	4.60	8.23	8.21	8.22	14.67	14.74	14.70
S.Em±	**0.07**	**0.07**	**0.07**	**0.23**	**0.22**	**0.23**	**0.21**	**0.18**	**0.17**
C.D. (p= 0.05)	**0.20**	**0.19**	**0.19**	**0.65**	**0.64**	**0.65**	**0.61**	**0.50**	**0.50**
Potassium sources (S)									
S_1- Muriate of potash (MOP)	4.34	4.30	4.32	7.66	7.54	7.60	11.36	11.35	11.36
S_2- Sulphate of potash (SOP)	4.44	4.44	4.44	7.98	7.98	7.98	12.24	12.17	12.20
S.Em±	**0.04**	**0.04**	**0.04**	**0.14**	**0.14**	**0.14**	**0.14**	**0.11**	**0.11**
C.D. (p= 0.05)	**NS**	**0.12**	**0.12**	**NS**	**0.41**	**NS**	**0.39**	**0.32**	**0.31**
Time of application (T)									
T_1- 100 % K at transplanting	4.45	4.40	4.43	7.61	7.57	7.59	11.61	11.56	11.58
T_2- 50 % K at transplanting & 50 % K at 30 DAT	4.34	4.33	4.34	8.02	7.94	7.98	11.99	11.94	11.97
S.Em±	**0.04**	**0.04**	**0.04**	**0.14**	**0.14**	**0.14**	**0.14**	**0.11**	**0.11**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.32**	**0.31**
Interactions									
$K_1S_1T_1$	4.30	4.11	4.21	6.61	6.61	6.61	9.10	8.87	8.98
$K_1S_1T_2$	4.18	4.18	4.18	6.91	7.11	7.01	9.39	9.28	9.33
$K_1S_2T_1$	4.28	4.28	4.28	7.27	7.27	7.27	10.21	9.77	9.99
$K_1S_2T_2$	4.19	4.19	4.19	7.66	7.67	7.66	10.44	9.93	10.02
$K_2S_1T_1$	4.49	4.25	4.37	7.18	7.45	7.31	10.19	10.21	10.20
$K_2S_1T_2$	4.22	4.22	4.22	7.65	8.31	7.98	10.66	10.59	10.62
$K_2S_2T_1$	4.49	4.49	4.49	7.57	7.98	7.77	10.73	10.61	10.67
$K_2S_2T_2$	4.31	4.31	4.31	8.09	8.05	8.07	11.07	10.67	10.87
$K_3S_1T_1$	4.37	4.37	4.37	7.32	7.40	7.36	11.11	11.03	11.07
$K_3S_1T_2$	4.06	4.06	4.06	8.08	8.10	8.09	11.22	11.23	11.23
$K_3S_2T_1$	4.37	4.37	4.37	7.44	7.47	7.45	11.50	11.49	11.49
$K_3S_2T_2$	4.26	4.26	4.26	8.25	8.26	8.25	11.57	11.64	11.61
$K_4S_1T_1$	4.50	4.50	4.50	8.05	8.19	8.12	11.99	12.21	12.10
$K_4S_1T_2$	4.29	4.29	4.29	7.58	7.59	7.59	12.59	10.52	12.45
$K_4S_2T_1$	4.43	4.43	4.43	7.81	7.83	7.82	12.74	12.87	12.80
$K_4S_2T_2$	4.66	4.66	4.66	8.59	8.58	8.59	13.35	13.35	13.35
$K_5S_1T_1$	4.63	4.63	4.63	8.02	8.06	8.04	13.33	13.75	13.54
$K_5S_1T_2$	4.34	4.34	4.34	7.93	7.86	7.89	13.85	14.25	14.05
$K_5S_2T_1$	4.61	4.61	4.61	8.20	8.21	8.21	14.97	15.11	15.04
$K_5S_2T_2$	4.81	4.81	4.81	8.73	8.72	8.73	16.12	16.24	16.18
S.Em±	**0.14**	**0.13**	**0.14**	**0.46**	**0.45**	**0.45**	**0.44**	**0.35**	**0.35**
C.D. (p= 0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

DAT – Days after transplanting, NS-Non significant.

Note: Recommended dose of N:P at 125:75 kg and farmyard manure 30 t ha^{-1} was applied commonly to all the treatments and nitrogen was applied 50 % at transplanting and 50 % at 30 DAT.

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