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Evaluation of onion (*Allium cepa* L.) accessions for yield attributes and yield for central Uttar Pradesh

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Abstract
A Field experiment was conducted during Rabi season of 2018 at Vegetable Research Farm, Kalyanpur, Department of Vegetable Science, C. S. Azad University of Agriculture & Technology Kanpur, U.P. The soil of the experimental field was sandy loam texture having pH of 7.3. Soil is moderately fertile being low in available organic carbon (0.34%) and medium in available nitrogen (172 kg N ha^{-1}), available phosphorus (13.8 kg N ha^{-1}) and available potash (182 kg N ha^{-1}). Experiment was laid out in randomized complete block design (RCBD) replicated thrice with thirteen different onion accessions as treatments *viz*. KLO-1, KLO-2, KLO-3, KLO-4, KLO-5, KLO-6, KLO-7, KLO-8, KLO-9, KLO-10, KLO-11 with two checks i.e. Bhima Shakti (C) and Agrifound Light Red (C). The results showed that Polar diameter (cm) and Equatorial diameter (cm) was found highest in KLO-3. Neck thickness (cm) was recorded maximum in Bhima Shakti. KLO-9 observed maximum A- grade bulbs percentage, Bolter bulbs (%) and Double bulbs (%). Maximum B- grade bulbs percentage was recorded by KLO-8 where as KLO-4 recorded maximum C- grade bulbs percentage. Maximum Average bulb weight (g), Total yield (q/ha) and Marketable yield (q/ha) was recorded in KLO-6.

Keywords: Onion accession, yield attribute of onion, performance of onion accession

Introduction
The Onion (*Allium cepa* L.) which is also called a bulb onion. Chromosome number of onion is 2n (2x) =16. Onion is one of the most important vegetable and spice crop grown in temperate, sub-tropical and tropical climate throughout the world. Onion exhibit particular diversity in the Eastern Mediterranean countries, through Turkmenistan, Tajikistan to Pakistan and India, which are the most important sources of genetic diversity and believed to be center of origin. Onion is commercially cultivated in India for both vegetable and spices purpose and India ranks second in area and production in the world after China and third in export after the Netherland & Spain. In India it is cultivated in a large area 13.05 lakh hectares with a total production of 224.27 lakh tones and productivity of 17.18 tones per hectares. Among the different states Maharashtra is leading state in terms of area and production. In Uttar Pradesh, it is grown in about 0.0254 mha with a production of 0.423 million tone. (N.H.R.D.F. 2016-17). The onion smell and taste are important diagnostic features of the genus *Allium.* Other characteristics include the presence of bulbs formed by the attachment of swollen leaf bases to the underground part of the stem and inflorescence in the form of umbels with numerous small flowers. The pungency in onion is due to volatile oil as *allyl-propyl disulphide* ($C_6H_{12}S_2$). The colour of the outer skin of onion bulbs is due to *quercetin*. Onion is a very good source of vitamin C, B_6, biotin, chromium, vanadium, calcium and dietary fibre. In addition, it contains a good amount of folic acid and vitamin B_1 and K. Onion bulb contains 86.6 gm moisture and food value per 100 gm of edible portion is protein (1.2 gm), fat (0.1gm), mineral matter (0.4gm), fiber (0.6gm), carbohydrate (11.1 gm), calories (50 Kcal), phosphorus (50 mg), potassium (127 mg), calcium (46.9 mg), magnesium (16 mg), iron (0.6 mg), sodium (4 mg), copper (0.18mg), vitamin C (119 mg), niacin (0.4 mg), thiamine (0.08 mg), riboflavin (0.01 mg). (Anon, 2010). Most of cultivars grown in plains of north India are short day cultivars. Long day varieties will not produce bulbs under short day conditions and short day cultivars if planted under long day. A very limited information on suitable onion genotypes for Uttar Pradesh region is available. However, there is great potential for increasing area, production and productivity of this crop in the region, and hence, there is an urgent need to evaluate different onion accessions under Central Uttar Pradesh condition.

Materials and Methods

The soil of the experimental field was sandy loam texture having pH of 7.3. Soil is moderately fertile being low in available organic carbon (0.34%) and medium in available nitrogen (172 kg N ha^{-1}), available phosphorus (13.8 kg N ha^{-1}) and available potash (182 kg N ha^{-1}). Experiment was laid out in randomized complete block design (RCBD). Thirteen different onion accessions *viz*. KLO-1, KLO-2, KLO-3, KLO-4, KLO-5, KLO-6, KLO-7, KLO-8, KLO-9, KLO-10, KLO-11 with two checks i.e. Bhima Shakti (C) and Agrifound Light Red (C) was used as treatments and these treatments are replicated thrice. All the eleven genotypes of onion (Allium cepa L.) collected from Department of Vegetable Science, C.S.A. University of Agriculture and Technology; Kanpur along with two local checks Agrifound Light Red (ALR) and Bhima Shakti collected from NHRDF, Nasik and DOGR, Rajgurunagar, Pune, respectively was selected for investigation. Recommended doses of nitrogen (120kg/ha), phosphorus (60kg/ha), potassium (60kg/ha) and sulphur (25kg/ha) were applied in each plot. The source of nutrients were for nitrogen urea and DAP, for phosphorus DAP, for potash MOP and for sulphur elemental sulphur. Half dose of nitrogen and whole doses of phosphorus, potash and sulphur were applied as basal dose prior to transplanting of onion seedlings. While the rest of nitrogen was given in two equal split doses in transplanted onion seedling, first at 30 and second 45 days after transplanting. Pendimethalin @ 6 ml/l was applied as a pre-emergence herbicide to prevent the initial weed growth and hand weddings were carried out as and when necessary.

Spray of insecticide (Imidachlopride @ 0.5ml/l of water) and fungicide (Copper oxychloride @ 2g/l of water) was also done at intervals of 15 days of transplanting for protection of crop from insect pest and diseases.

Results and Discussion

Effect of onion accessions on yield attributes

Maximum polar bulb diameter (5.03cm) and equatorial bulb diameter (5.11cm) was recorded in KLO-3. The lowest polar bulb diameter was recorded in KLO-2(3.99) and lowest equatorial bulb diameter of 4.65 cm was recorded in Agrifound Light Red. Similar finding was also reported by Tripathy *et al*. (2014) [1], Shobha *et al.* (2017) [2].Utagi *et al*. (2015) [3] and Gowda *et al*. (2016) [4]. Maximum neck thickness was recorded in Bhima Shakti (0.86cm). However, minimum neck thickness was recorded in KLO-11(0.687 cm). Similar results were also obtained by Dewangan *et al*. (2012) [5] and Hosamani *et al.* (2010) [6]. On the basis of diameter of bulb, maximum A grade bulb obtain in KLO-9 (41.60). Lowest A grade bulbs obtain in KLO-4 (29.32). The maximum B grade bulb obtain in KLO-8 (41.33) while lowest B grade bulb obtain in KLO-1(26.52) and maximum C grade bulb produced from KLO-4(26.56) and lowest C grade bulb produced by KLO-9 (17.40). Sharma *et al.* (2015) [7] and Tarai *et al*. (2015) [8] also reported similar findings in their experimentation. Significantly maximum data recorded on maximum percentage of bolter bulbs obtained in KLO-9 followed by KLO-5 there were many genotypes in which bolting was not found such as KLO-2, KLO-3, KLO-4, KLO-6, KLO-7, KLO-8, KLO-11. These results are in accordance with the findings of earlier workers namely Hirave *et al*. (2015) [9], Lakshmipathi *et al*.(2017) [10] and Khar *et al*. (2007) [11]. Maximum average bulb weight was recorded in genotype KLO-6 (71.05 g). However, minimum bulb weight was recorded in KLO-5 (59.91 g). Similar findings were also reported by Lakshmipathi *et al*. (2017) [10] and Hosamani *et al.* (2010) [6]. Variation in yield attributes was due to inherent genetic makeup of genotypes, which may influenced these morphological expression through the activity of endogenous growth regulators.

Table 1: Mean performances of different accessions of onion for polar diameter (cm), equatorial diameter (cm) and Neck thickness (cm)

S. No.	Accessions	Polar diameter (cm)	Equatorial diameter (cm)	Neck thickness (cm)
1	KLO-1	4.44	4.69	0.68
2	KLO-2	3.99	4.2	0.72
3	KLO-3	5.03	5.16	0.74
4	KLO-4	4.31	4.59	0.71
5	KLO-5	4.63	4.83	0.72
6	KLO-6	4.30	4.57	0.80
7	KLO-7	4.02	4.24	0.73
8	KLO-8	4.45	4.7	0.75
9	KLO-9	5.00	5.03	0.82
10	KLO-10	5.01	5.11	0.78
11	KLO-11	4.87	4.93	0.70
12	Bhima Shakti (C)	4.61	4.79	0.86
13	ALR (C)	4.54	4.65	0.85
SE(m)		0.543	0.190	0.016
CD at 5%		0.158	0.555	0.046

Table 2: Mean performances of different accessions of onion for A grade, B grade and C grade bulbs (%)

S. No.	Accessions	A- grade bulbs (%)	B- grade bulbs (%)	C- grade bulbs (%)
1	KLO-1	34.69	26.52	25.78
2	KLO-2	37.48	31.18	17.43
3	KLO-3	29.40	38.78	22.57
4	KLO-4	29.32	31.71	26.56
5	KLO-5	32.36	27.50	25.34
6	KLO-6	40.94	30.93	18.06
7	KLO-7	38.47	34.29	20.05
8	KLO-8	30.45	41.33	25.54
9	KLO-9	41.60	31.36	17.40
10	KLO-10	37.34	36.10	18.56
11	KLO-11	33.30	32.08	22.73
12	Bhima Shakti (C)	36.30	31.55	25.07
13	ALR (C)	31.31	36.52	22.47
SE(m)		0.518	0.531	0.441
CD at 5%		1.514	1.551	1.290

Table 3. Mean performances of different accessions of onion for bolter (%) and double bulbs (%) and Average bulb weight (g).

S. No.	Accessions	Bolter bulbs (%)	Double bulbs (%)	Average bulb weight (g)
1	KLO-1	1.13	1.13	66.01
2	KLO-2	0.0	0.85	61.65
3	KLO-3	0.0	0.0	70.8
4	KLO-4	1.36	0.0	62.84
5	KLO-5	0.0	0.0	59.91
6	KLO-6	0.0	0.0	71.05
7	KLO-7	0.0	1.81	67.43
8	KLO-8	0.0	1.45	60.76
9	KLO-9	2.15	2.16	69.07
10	KLO-10	1.08	0.0	63.52
11	KLO-11	0.0	0.0	66.98
12	Bhima Shakti (C)	1.14	0.85	68.23
13	ALR (C)	1.21	1.2	64.93
SE(m)		0.030	0.326	0.934
CD at 5%		0.088	0.953	2.726

Effect of onion accessions on yield

Present study revealed that maximum total yield was recorded in KLO-6 (301.8 q/h) while lowest total yield was noted in KLO-10 (200.43 q/h) where as maximum marketable yield was recorded in KLO-6 (271.1q/h) while lowest marketable bulb yield was noted in KLO-3(181.6q/h). The similar type of results were also reported by different researchers i.e. Gupta *et al*. (2018) [12] and **U**mamaheswarappa *et al*. (2014) [13]. This might be due to genetic makeup of the accessions KLO-6.

Table 4: Mean performances of different accessions of onion for average bulb weight (g), marketable and total bulb yield (q/ha)

S. No.	Accessions	Total yield (q/ha)	Marketable yield (q/ha)
1	KLO-1	232.7	200.8
2	KLO-2	263.5	226.2
3	KLO-3	201.2	181.6
4	KLO-4	272.8	244.7
5	KLO-5	280.6	244.7
6	KLO-6	301.8	271.1
7	KLO-7	215.2	192.3
8	KLO-8	224.5	205
9	KLO-9	241.8	214.3
10	KLO-10	200.43	196.7
11	KLO-11	238.2	212.5
12	Bhima Shakti (C)	256.6	238.9
13	ALR (C)	243.9	220.9
SE(m)		7.374	6.595
CD at 5%		21.524	19.364

Conclusion

It can be concluded from the findings of investigation that different accessions under study exhibited a differential response, which resulted into significant changes in most of quantitative traits and finally the yield. It was observed that accession KLO-6 observed superior in many traits *viz*. total bulb yield, marketable bulb yield, bulb weight and hence it is most suitable and considerable accessions of onion under regional climatic condition of Central Uttar Pradesh.

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