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Evaluation of Onion Landraces (*Allium cepa* L.) of Karnataka for Yield and Quality Parameters during *Kharif* Season

N. Lakshmipathi*, H. Amarananjundeswara, R. Veere Gowda, M. Anjanappa and T. B. Manjunatha Reddy

Department of Vegetable Science, College of Horticulture, Kolar,
Indian Institute of Horticultural Research, Bengaluru
*Corresponding Author E-mail: lakshmipathihortico@gmail.com

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ABSTRACT

In the experiment twenty five genotypes of onion were evaluated for their growth, yield and quality attributes during Kharif season at College of Horticulture, Kolar, Karnataka by adopting RBD with two replications. The growth characters appeared significant differences among the landraces evaluated. The genotype Molakalmuru Local exhibited maximum plant height (63.91cm), number of leaves (13.10) leaf length (58.23cm). The maximum leaf width was noticed in the genotype Hanumanthanahalli Local (1.80cm). While, minimum bulb neck and collar thickness was registered in Bengaluru Rose Onion (0.98cm) and Bagepalli Local (0.34cm), respectively. However, the genotype Mogalahalli Local registered maximum number of rings (9.90) and the genotype Arka Kalyan revealed minimum number of centers (1.20). the quality parameters like TSS, pungency and dry mater content was observed maximum in genotype Kumata Sweet Onion (16.35°brix), Bengaluru Rose Onion (6.34µmole./g FW) and GBD Bindhu (20.80%), respectively. But no bolting per cent was recorded in Belagavi White Onion. With respect to yield parameters, the genotype Arka Kalyan noticed maximum average bulb weight (131.0 g) and ten bulb weight (1266.00 g). Besides, higher bulb yield was documented in Arka Kalyan (33.19t/ha). The landrace Molakalmuru Local recorded maximum marketable bulb yield (31.72 t/ha). On the basis of yield and quality parameters Arka Kalyan, Molakalmuru Local, Thumbaraguddi Local and Kadur Local-RVG were found best suited for Kharif season cultivation in Eastern Dry Zone of Karnataka.

Key words: *Kharif, Allium cepa, Karnataka, Yield*

INTRODUCTION

Onion (*Allium cepa.* L.) is one of the most important vegetable crop whose leafy portion as a vegetable, bulbs as salad and spice are used daily. In Karnataka, onion is produced throughout the year and cultivated in an area of 159.60 million hectares with the production of 2395.60 million tonnes and productivity of 15.40 tonnes per hectare. In India, total production of onion is 16,813 metric tonnes, obtained in an area of 1051.50 million hectare.

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While, Maharashtra state stands first with production of 4,660 metric tonnes and Gujarat recorded highest productivity of 24.40 tonnes per hectare. Moreover, onion cultivars reveal wide variation in their yielding ability and potential when grown under varied agro-climatic zones of the country.

In India, of total annual onion production about 50 per cent comes from *Rabi* season harvested in April to May, 30 per cent from late *Kharif* season harvested in January to February and remaining 20 per cent from *Kharif* season onion harvested in October to November months. The *Rabi* season crop harvested in April to May is stored all over the country and slowly made available for domestic supply as well as for export up to October to November. There is a critical gap of supply in the country from October to December and as a result the onion price shoot up every year. The good harvest in *Kharif* season tries to bridge the gap of intermediary demand created in the country.

During *Kharif* season, cultivation of onion is undertaken on limited scale in the Karnataka owing to adverse climatic conditions. However, due to more profitability in growing onion during *Kharif* season, it is gaining popularity among the farmers. In addition there are few varieties of onion are suitable for cultivation during *Kharif* season and some local types available all over Karnataka which are suitable for Kharif season with high yield and good quality. Therefore keeping the above points in view, the present investigation was undertaken to ascertain the yield potential of 25 landraces and also to study their processing qualities under irrigated situation during *Kharif* seasons in the Eastern Dry Zone of Karnataka.

MATERIALS AND METHODS

The present investigation was conducted at College of Horticulture, Kolar (Eastern Dry Zone of Karnataka) during *Kharif* season under irrigated situation using 25 landraces of onion collected from all over Karnataka *viz.*, Bidar Local, Jamakandi Local, Kadarakoppa Local, Belagavi White Onion, Telagi White Onion, Kotturu Local, Thumbarguddi Local, Rampur Local, Bellary Red, Challakere Local, Molakalmuru Local, Mogalahalli Local and Hanumanthanahalli Local, Kadur Local, Kadur Local-2012, Kadur Local-RVG. Kumata Sweet Onion, Handhigona Local, Bengaluru Rose Onion, Chinthamani Local, Cheluru Local, Gouribidanuru Local, GBD-Bindhu, Bagepalli Local and one variety Arka Kalyan was collected from Indian Institute of Horticulture Research (IIHR), Hesaraghatta, Bengaluru. For studies total 25 landraces were used in the present investigation to evaluate for various growth, yield and quality parameters. The experiment was laid out in Randomized Block Design with two replications during *Kharif* 2015. The seeds of different onion genotypes were sown in plastic pro-trays filled with coir pith as a rooting media during third week of June 2015 in low cost polyhouse and transplanted in the first week of September 2015. In each experimental plot consisted of 10 rows for every treatment. The plot size was 2.0 mx 1.5m. The plants were transplanted at a row to row spacing of 15 cm and plant to plant spacing of 10 cm. The recommended dosage of fertilizers were applied with following the production practices during the cropping period. Observations were recorded on five randomly selected plants in each treatment. The measurements on vegetative parameters were recorded on plant height (cm), number of leaves, leaf length (cm), leaf width (cm), collar thickness (cm), neck thickness (cm), number of rings, number of centers. The quality parameters like TSS, pungency, dry mater content, yield characters like average bulb weight (g) ten bulb weight, bulb yield (t/ha), marketable bulb yield and unmarketable bulb yield (t/ha).

RESULTS AND DISCUSSION

The results of growth parameters of onion landraces are presented in Table 1. A significant variations were observed among the landraces and variety with respect to

vegetative growth, yield and quality. The maximum plant height and leaf length was recorded in Molakalmuru Local (63.91 and 59.64 cm, respectively) and the minimum was recorded in Bagepalli Local (46.20 and 39.48 cm, respectively). The significantly higher number of leaves produced in Molakalmuru Local (13.10). Whereas, Handhigona Local produced lowest number of leaves (8.80).Among the landraces, Belagavi White Onion had revealed no bolting per cent (0.00 %). While, Cheluru Local registered the maximum bolting per cent (22.55 %) of different genotypes, no double bulbs were observed in landraces Jamakandi Local (0.00 %), Kumata Sweet onion (0.00 %) Thumbaraguddi Local (0.00 %), Rampur Local (0.00 %) and Arka Kalyan (0.00 %). While, highest percentage of double bulbs were observed in Chinthamani Local (7.17 %). Both of these characters are considered as undesirable, which negatively affect the quality of onion bulb. The landrace Bengaluru Rose Onion recorded the lowest bulb collar thickness of 0.98 cm. While, maximum collar thickness was observed in Mogalahalli Local (1.58 cm). With respect to neck thickness landrace Bagepalli Local recorded minimum neck thickness after curing (0.34 cm) followed by Cheluru Local (0.40 cm). Whereas, maximum neck thickness after curing was noticed in Jamakandi Local (0.67 cm). However, minimum collar and neck thickness were desirable trait for extending storage life.

With respect to quality parameters (Table 2) maximum number of rings per bulb was recorded in case of Mogalahalli Local (9.90). Whereas, Kumata Sweet Onion noticed the minimum number of rings per bulb (5.30). The number of centres was found to be minimum in Arka Kalyan (1.20) which was on par with Rampur Local (1.30) and Jamakandi Local (1.30). Whereas, Kadur Local-RVG and Chinthamani Local revealed the highest number of centres per bulb (3.90 each). The highest total soluble solids was documented in the genotype Kumata Sweet Onion (16.35 ° brix). Whereas, minimum total soluble solids was recorded in the genotype GBD- Bindhu (11.07 ° brix).

The pungency varied from 4.51 to 6.34 µmol./g FW, maximum pungency was registered in Bengaluru Rose Onion (6.34 µmol./g FW). While, Thumbaraguddi Local recorded minimum pungency of 4.51 µmoles per gram of fresh weight. The highest dry matter content was noticed in GBD-Bindu (20.80 %). While, Rampur Local showed lowest dry matter content of 11.40 per cent. These results are in agreement to earlier workers[2,5,4].

Regarding yield attributes (Table 3), highest bulb width was noticed in Rampur Local (6.30 cm). Whereas, Chinthamani Local recorded the least (3.05 cm) bulb width. The maximum length of bulb was registered in Kadur Local-RVG (5.65 cm). While, minimum bulb length was recorded in genotype Chinthamani Local (2.75 cm). The maximum average and ten bulb weight was recorded in genotype Arka Kalyan (131.10 and 1266.00 g, respectively). However, Bagepalli Local registered the minimum average (34.90 g) and ten bulb weight (329.00 g). The highest bulb yield was obtained in Arka Kalyan (33.19 t/ha) which was on par with Molakalmuru Local (32.84 t/ha). However, lowest bulb yield was registered in GBD-Bindhu (8.34 t/ha).

The variation in genetic constitution may be attributed to varied growth parameters which in turn resulted in different synthesis and utilization efficiency of photosynthetic product thereby differences in yield characters of varieties, Mohanty and Prusti[4] have also reported the variation in growth and yield traits of different varieties. The genotype Molakalmuru Local recorded the maximum marketable bulb yield (31.72 t/ha) While, GBD-Bindhu recorded the minimum marketable bulb yield per hectare (7.38 t/ha) during *Kharif* season. Similarly, variations in bulb yield of different varieties due to genetic constitution have been reported by Aghora and Pathak[1], Patil *et al*.[6], Deka *et al*.[3] and Yadav *et al*.[7].

Table 1: Growth attributes in different onion landraces

Sl. No.	Landraces/ Genotypes	Plant height (cm)	Number of leaves	Leaf length (cm)	Bolting (%)	Split bulbs (%)	CT (cm)	NT (cm)
1	**Bidar Local**	58.53	12.40	54.13	02.20 (8.52)	01.61 (07.27)	1.29	0.52
2	**Jamakandi Local**	53.74	11.80	49.38	00.80 (5.10)	00.00 (00.40)	1.49	0.67
3	**Belagavi White Onion**	55.32	10.00	50.13	00.00 (0.40)	01.21 (06.26)	1.19	0.51
4	**Kumata Sweet Onion**	56.38	10.40	52.64	01.35 (6.67)	00.00 (00.40)	1.11	0.47
5	**Bellary Red**	61.78	12.70	53.14	02.45 (9.00)	03.87 (10.66)	1.28	0.52
6	**Handhigona Local**	56.45	8.80	52.46	02.15 (8.43)	05.92 (14.08)	1.30	0.44
7	**Kadur Local-2012**	53.38	10.60	49.85	00.25 (2.23)	00.00 (00.40)	1.31	0.59
8	**Gouribidanuru Local**	51.72	10.40	47.17	10.25 (18.60)	04.98 (12.88)	1.27	0.45
9	**Cheluru Local**	52.14	10.00	47.86	22.55 (28.32)	03.90 (11.39)	1.06	0.40
10	**Bagepalli Local**	46.20	9.30	39.48	11.30 (19.65)	03.42 (10.66)	1.17	0.34
11	**Kotturu Local**	60.24	12.80	56.74	03.55 (10.81)	07.11 (15.47)	1.26	0.50
12	**GBD- Bindhu**	53.84	10.80	49.84	19.50 (26.19)	06.69 (14.98)	1.18	0.42
13	**Molakalmuru Local**	63.91	13.10	59.64	03.60 (10.90)	02.11 (08.35)	1.38	0.43
14	**Hanumanthanahalli Local**	53.18	11.80	49.74	02.55 (9.13)	03.19 (10.28)	1.43	0.43
15	**Kadur Local**	57.19	11.20	53.23	00.25 (2.85)	04.02 (11.57)	1.50	0.44
16	**Challakere Local**	53.39	11.80	50.40	02.00 (8.12)	01.93 (07.98)	1.18	0.45
17	**Kadur Local-RVG**	56.24	10.20	52.24	00.55 (4.25)	01.49 (06.99)	1.21	0.47
18	**Chintamani Local**	53.27	10.14	48.28	13.40 (21.46)	07.17 15.53)	0.99	0.45
19	**Bengaluru Rose Onion**	50.76	10.40	46.31	02.80 (9.63)	03.20 10.28)	0.98	0.41
20	**Mogalahalli Local**	47.72	10.00	41.15	06.80 (15.10)	04.95 (12.84)	1.58	0.44
21	**Thumbaraguddi Local**	52.43	12.60	47.19	01.05 (5.86)	00.00 (00.40)	1.26	0.54
22	**Telagi White Onion**	59.12	9.60	53.26	01.75 (7.57)	02.45 (08.99)	1.48	0.52
23	**Kadarakoppa Local**	49.85	10.40	44.81	02.60 (9.27)	03.78 (11.20)	1.30	0.52
24	**Rampur Local**	55.51	12.80	51.87	01.75 (7.60)	00.00 (00.40)	1.33	0.51
25	**Arka Kalyan (check)**	58.13	12.12	53.30	01.55 (7.16)	00.00 (00.40)	1.23	0.48
SEm±		**2.78**	**0.57**	**2.63**	**0.773**	**0.88**	**0.08**	**0.05**
CD at 5%		**8.11**	**1.67**	**7.68**	**2.257**	**2.59**	**0.24**	**0.08**

*SEm-Standard error of mean *CD-Critical difference *Values given in parenthesis are arc sine transformed

Table 2: Quality attributes in different onion landraces

Sl. No.	Landraces/ Genotypes	Rings /bulb	Centers /bulb	TSS (° brix)	Pungency (Pyruvic acid µmoles/g FW)	Dry matter (%)
1	**Bidar Local**	8.40	3.10	11.70	4.80	15.95
2	**Jamakandi Local**	8.50	1.30	13.52	5.55	16.11
3	**Belagavi White Onion**	8.70	1.90	13.81	5.34	13.45
4	**Kumata Sweet Onion**	5.30	3.70	16.35	4.68	15.00
5	**Bellary Red**	9.60	2.90	12.24	4.89	13.90
6	**Handhigona Local**	7.90	3.50	12.68	5.10	15.65
7	**Kadur Local-2012**	8.50	2.50	12.21	4.86	12.40
8	**Gouribidanuru Local**	7.70	3.10	16.10	6.21	20.55
9	**Cheluru Local**	6.90	2.30	16.24	5.61	19.90
10	**Bagepalli Local**	8.70	2.90	14.20	6.24	19.85
11	**Kotturu Local**	9.70	1.90	11.77	5.86	12.45
12	**GBD- Bindhu**	7.90	2.70	11.07	5.88	20.80
13	**Molakalmuru Local**	8.10	3.20	12.86	5.24	14.30
14	**Hanumanthanahalli Local**	8.10	3.60	13.54	6.11	12.85
15	**Kadur Local**	8.70	2.80	12.80	4.80	13.30
16	**Challakere Local**	8.30	2.40	13.65	5.20	12.90
17	**Kadur Local-RVG**	9.10	3.90	14.21	4.75	15.65
18	**Chintamani Local**	8.30	3.90	14.86	5.45	18.95
19	**Bengaluru Rose Onion**	9.30	2.90	15.42	6.34	19.04
20	**Mogalahalli Local**	9.90	3.50	12.91	4.96	15.04
21	**Thumbaraguddi Local**	9.70	2.40	12.40	4.51	15.65
22	**Telagi White Onion**	8.60	2.70	13.00	5.30	13.95
23	**Kadarakoppa Local**	8.10	3.70	14.12	5.21	14.95
24	**Rampur Local**	9.50	1.30	12.42	4.98	11.40
25	**Arka Kalyan (check)**	7.90	1.20	13.21	5.80	13.05
SEm±		**0.31**	**0.27**	**2.30**	**0.34**	**1.21**
CD at 5%		**0.91**	**0.78**	**2.25**	**1.09**	**3.78**

*SEm-Standard error of mean *CD-Critical difference

Table 3: Yield attributes in different onion landraces

Sl. No.	Landraces/Genotypes	Bulb width (cm)	Bulb height (cm)	Avg. Bulb weight (g)	Ten bulb weight (g)	Total bulb yield (t/ha)	Marketable yield (t/ha)
1	**Bidar Local**	5.45	4.65	84.20	794.00	15.66	14.86
2	**Jamakandi Local**	5.25	4.38	60.80	556.00	13.16	12.56
3	**Belagavi White Onion**	4.80	4.18	80.54	752.50	14.00	13.14
4	**Kumata Sweet Onion**	4.65	4.88	82.30	777.50	16.87	15.93
5	**Bellary Red**	5.45	5.05	101.20	1061.00	29.33	27.43
6	**Handhigona Local**	5.65	4.28	97.70	991.00	24.34	22.50
7	**Kadur Local-2012**	5.65	4.40	77.20	739.00	27.03	24.43
8	**Gouribidanuru Local**	4.95	4.55	36.10	356.00	10.34	8.48
9	**Cheluru Local**	4.27	4.52	37.10	350.00	13.53	12.43
10	**Bagepalli Local**	4.05	2.88	34.90	329.00	13.83	12.63
11	**Kotturu Local**	5.15	4.26	104.50	1030.00	31.61	27.76
12	**GBD- Bindhu**	4.70	3.10	39.40	379.00	8.34	7.38
13	**Molakalmuru Local**	6.15	4.85	87.90	865.00	32.84	31.72
14	**Hanumanthanahalli Local**	5.40	4.30	66.90	642.00	17.67	15.55
15	**Kadur Local**	5.50	4.30	116.30	1015.00	28.83	26.22
16	**Challakere Local**	5.65	4.30	88.80	867.00	29.00	26.47
17	**Kadur Local-RVG**	5.60	5.65	65.80	644.00	30.33	27.19
18	**Chintamani Local**	3.05	2.75	39.40	366.00	18.34	17.22
19	**Bengaluru Rose Onion**	4.45	3.75	39.70	385.00	17.34	15.80
20	**Mogalahalli Local**	5.25	4.25	119.70	1170.00	14.50	13.38
21	**Thumbaraguddi Local**	5.45	4.25	69.80	686.00	29.84	28.72
22	**Telagi White Onion**	4.85	4.60	109.20	994.00	12.84	11.74
23	**Kadarakoppa Local**	5.95	4.35	117.90	1110.00	30.16	27.20
24	**Rampur Local**	6.30	5.10	100.40	999.00	29.83	27.39
25	**Arka Kalyan (check)**	6.05	4.80	131.10	1266.00	33.19	30.69
	SEm±	**0.26**	**0.17**	**7.24**	**37.06**	**2.40**	**2.25**
	CD at 5%	**0.79**	**0.54**	**21.15**	**108.18**	**7.00**	**6.58**

*SEm-Standard error of mean *CD-Critical difference,

CONCLUSION

The results showed that Molakalmuru Local recorded significantly highest bulb yield along with maximum plant height, number of leaves/plant, weight of bulb, yield with moderate dry matter content, TSS and pungency. The variety Arka Kalyan produced comparable bulb yield and stand next to it with all other characters. The remaining varieties Kotturu Local, Kadarakoppa Local, Thumbaraguddi Local and Challakere Local exhibited bulb yield in decreasing order.

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