Performance of promising lettuce variety Phule Padma (GKL-2) under Pune conditions

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ABSTRACT

Lettuce is a most popular and consumed vegetable in the world and the main leafy vegetable is marketed in Brazil. It is also gaining popularity in India. There are varieties/hybrids commercially grown in India viz Chinese Yellow, Grate Lake, Iceberg and hybrids from private sector. In Maharashtra, around peri-urban area this crop is more popular but as on today no public sector variety or genotype is available in Maharashtra for commercial cultivation which is an important constraint in popularization of this crop. Hence to explore the prospects and developing a new cultivar, the present study was undertaken. In the study, three promising selections viz GKL-1, GKL-2 and GKL-3 were evaluated with check variety Chinese Yellow for six years. The performance of a selection GKL-2 (renamed as Phule Padma) was found most promising for higher yield (298.74 q/ha) than Chinese Yellow (260.27 q/ha) and also had earliness, green leaves with shining and serrated margins and better nutritive value.

Key word: Lettuce; variety; growth; yield; quality

INTRODUCTION

Lettuce (*Lactuca sativa* L) is an important cool season salad vegetable crop belonging to family Asteraceae/Compositae. It is a native of Europe and Asia and was introduced in India by the Britishers. It is grown as an annual. Salad crops are now more popular because of their food value in the diet and health awareness worldwide. Several health-building qualities and many medicinal virtues are contained in lettuce. There are four distinct types of lettuce viz head type (butter head and crisp head) var *capitata*, leaf type var *crispa*, cos type var *longifolia* and asparagus type var *asparagus* (Lebeda et al 2007).

The loose leaf lettuce is regarded as better food as it is rich in iron and also has more vitamin A and C than the stem variety since it is more exposed to the sun (Saha 2013). Greener leaf has more chlorophyll and vitamins. It has rich content of mineral salts especially the alkaline elements. For consumption the leaves of lettuce should be fresh green. Since lettuce is very low in calories, it is very effective when consumed as a diet food. Due to its high water content, lettuce provides little health benefits beyond its nutrient contents. It is most often grown as a leafy vegetable and used in other kinds of foods such as soups, sandwiches and wraps and it can also be grilled. The nutrient content is highest in the darker green outer leaves. It is popular for its delicate, crispy texture and has slightly bitter taste with milky juice in fresh state.

There are very few varieties such as Chinese Yellow in leafy type, Grate Lake in semi-head type and Iceberg in head type commercially grown varieties in India. In Maharashtra, around peri-urban area this crop has gained more popularity but as on today no new variety or genotype is available in Maharashtra for commercial cultivation which is a major constraint in popularizing cultivation of this crop. Hence to explore the prospects and developing new cultivar, the breeding programme was initiated from 2004 under Vegetable Improvement Project. Three promising selections viz GKL-1, GKL-2 and GKL-3 were selected from the population. Location specific experimental trials with three genotypes viz GKL-1, GKL-2 and GKL-3 and cv Chinese Yellow as check were conducted for six years (rabi 2009 to 2014).

MATERIAL and METHODS

The field experiment was conducted during 2009 to 2014 in irrigated condition under Vegetable Improvement Project, National Agricultural Research Project, Ganeshkhind, Pune, Maharashtra. The experiment was laid out in randomized block design with five replications each having a plot size 3.00 m x 2.40 m using four selections during rabi/winter season. The transplanting was done with one month old seedlings at 30 cm x 20 cm spacing. The crop was fertilized with 10 tonnes/ha FYM and 100 kg N + 50 kg P_2O_5 + 50 kg K_2O/ha in the form of urea, single super phosphate and muriate of potash respectively. Ten random competitive plants in each selection were selected for recording the observations on growth, yield and quality parameters. The yield was computed by considering all plants in each plot and replication.

RESULTS and DISCUSSION

The results indicated significant differences among the lettuce selections for all growth, yield and quality characters under study.

Data given in Table 1 show that the plant height and number of leaves/plant varied non-significantly among different selections. The plant height varied from 23.61 to 25.30 cm and number of leaves/plant from 24.41 to 25.97. Plant spread varied from 28.49 to 32.49 cm (EW) and 29.12 to 32.36 cm (NS). Maximum EW plant spread was recorded in case of GKL-2 (32.49 cm) which was significantly higher than other two selections and the check which were at par. Maximum NS plant spread of 32.36, 31.38 and 31.05 cm was recorded in Chinese Yellow, GKL-2 and GKL-1 respectively which were at par with one another and minimum in selection GKL-3 (29.12 cm).

Significantly maximum plant weight (170.38 g) was recorded in selection GKL -2 which was at par with the GKL-1 (158.32 g) and was significantly higher than 145.25 (GKL-3) and 154.83 (Chinese Yellow) the latter two being at par. Plant leaf length was significantly higher in GKL-2 (25.41 cm) and GKL-3 (25.02 cm) which were at par with each other. Higher leaf breadth (14.50 cm) was recorded in GKL-2 in comparison to Chinese Yellow (12.25 cm), GKL-1 (12.37 cm) and GKL-3 (12.79) which were at par. Significantly minimum number of days required for first harvest was recorded in selection GKL-1 (34.50), Chinese Yellow (35.50) and GKL-2 (36.33) the three being at par and higher in case of GKL-3 (38.33).

Same was the pattern in case of number of days for last harvest. Minimum number of days for last harvest was recorded in case of selection GKL-1 (44.00), Chinese Yellow (45.50) and GKL-2 (45.50) the three being at par and higher in case of GKL-3 (50.33).

The data on yield performance (Table 2) show that selection GKL-2 and GKL-3 gave significantly higher yield of 298.74 and 274.28 q/ha respectively which were at par in comparison to check variety Chinese Yellow (260.27 q/ha) and GKL-1 (246.38 q/ha) the latter two being at par.

For disease and pest reaction, the selection GKL-2 proved resistant to downy mildew (PDI 4.98) followed by GKL-1 (PDI 8.51) and GKL-3 (PDI 12.26) the latter being at par with Chinese Yellow (PDI 14.65) (Table 3). GKL-3 and Chinese Yellow however showed moderate resistance to downy mildew. However the selections did not show any differences wrt resistance towards aphids and cutworms.

Among the quality characteristics (Table 4), the lettuce selection GKL-2 recorded higher vitamin A as β-carotene (15,264.36 µg/100 g), dietary fibre (2.9 g/100 g), vit C (2.8 $\pm$ 0.47 mg/g), calcium (42.0 mg/100 g) and iron (2.53 mg/100 g) as compared to check variety Chinese Yellow with vitamin A β-carotene (4,912.31 µg/100 g), dietary fibre (2.7 g/100 g), vit C (2.5 $\pm$ 0.49 mg/g), calcium (37.0 mg/100 g) and iron (2.30 mg/100 g). Similar observations were also made by Dolma and Gupta (2011) and Gupta et al (2009).

Qualitative parameters were also assessed by visual observations and are shown in Table 5. The leaf colour in different selections viz GKL-1: pale green, GKL-2: green, GKL-3: dark green and check variety Chinese Yellow: yellowish green were recorded. Leaf texture was smooth and non-serrated in selection GKL-1, GKL-3 and check variety Chinese Yellow while selection GKL-2 showed shining on leaves and leaves with serrated margin. Leaf shape of all the selections was oblong except GKL-3 having fan shape. All the selections were sweet except GKL-1 which was slightly bitter in taste. All the selections were crispier except GKL-3 which was less crispy. Similar observations were also made by Kumar et al (2015). Under organoleptic evaluation on 0-9 hedonic scale, the

Table 1. Growth performance of promising lettuce selections vis a vis check variety Chinese Yellow (pooled data rabi 2009-2014)

Selection	Average plant height (cm)	Average number of leaves/ plant	Average plant spread (cm)		Average plant weight (g)	Average leaf size (cm)		Leaf colour	Days to first harvest	Days to last harvest
			EW	NS		L	B			
GKL-1	23.61	24.41	29.33	31.05	158.32	21.59	12.37	Pale green	34.50	44.00
GKL-2	25.30	25.27	32.49	31.38	170.38	25.41	14.50	Green with shining margins serrated	36.33	45.50
GKL-3	25.00	25.28	28.49	29.12	145.25	25.02	12.79	Dark green	38.33	50.33
Chinese Yellow (C)	24.27	25.97	28.87	32.36	154.83	22.19	12.25	Yellowish green	35.50	45.50
SE+	0.39	0.34	0.85	0.56	5.15	0.93	0.49		0.75	1.50
$CD_{0.05}$	NS	NS	2.56	1.70	15.51	2.80	1.47		2.28	4.57
CV (%)	3.91	3.32	6.99	4.42	8.02	9.67	9.19		5.09	7.95

EW= East-West, NS= North-South, L= Length, B= Breadth, Station: NARP, Ganeshkhind, Pune, Maharashtra; Locations: 1. Rahuri, 2. Kolhapur, 3. Mahabaleshwar, 4. Pimpalgaon Baswant (Nasik)

Table 2. Yield performance of promising lettuce selections vis a vis check variety Chinese Yellow (pooled data rabi 2009-2014)

Selection	Average yield (q/ha)		
	(at the station)	(locations)	(station + locations)
GKL-1	233.17	259.59	246.38
GKL-2	256.83	340.66	298.74
GKL-3	223.47	325.10	274.28
Chinese Yellow (C)	230.33	290.21	260.27
SE+	6.58	9.90	10.62
$CD_{0.05}$	20.03	29.41	28.23
CV (%)	6.84	8.37	7.83

Station: NARP, Ganeshkhind, Pune, Maharashtra; Locations: 1. Rahuri, 2. Kolhapur, 3. Mahabaleshwar, 4. Pimpalgaon Baswant (Nasik)

Table 3. Field reaction of promising lettuce selections vis a vis check variety Chinese Yellow to major diseases and pests (pooled data rabi 2009-2014)

Selection	Downy mildew (PDI)	Reaction	Average number of aphids/three leaves	Reaction	Average number of cutworm larvae/10 plants	Reaction
GKL-1	8.51 (16.87)	R	1.51 (1.58)	R	1.21 (1.48)	R
GKL-2	4.98 (12.74)	R	1.22 (1.48)	R	1.03 (1.41)	R
GKL-3	12.26 (20.44)	MR	1.30 (1.51)	R	0.79 (1.31)	R
Chinese Yellow (C)	14.65 (22.33)	MR	1.39 (1.54)	R	1.21 (1.48)	R
SE+	0.77	-	0.05	-	0.06	-
$CD_{0.05}$	2.41	-	NS	-	NS	-
CV (%)	9.58	-	7.84	-	9.73	-

Figures in parentheses indicate √n+1 transformed values, PDI= Per cent disease incidence, R= Resistant, MR= Moderately resistant

Table 4. Comparative analysis of nutritional value of lettuce selection GKL-2 vis a vis check variety Chinese Yellow (values based on fresh weight)

Character	Selection	
	GKL-2	Chinese Yellow (C)
Vitamin A as β-carotene (µg/100 g) by HPLC method	15,264.36	4,912.31
Dietary fibre (g/100 g) IS: 11062-2010	2.9	2.7
Vitamin C (mg/g)	2.8 + 0.47	2.5 + 0.49
Calcium (mg/100 g)	42.0	37.0
Iron (mg/100 g)	2.53	2.30

Table 5. Qualitative performance of lettuce selections and check variety Chinese Yellow

Selection	Leaf colour	Leaf texture	Leaf shape	Taste	Crispiness	Organoleptic Evaluation
GKL-1	Pale green	Non-serrated	Oblong	Slightly bitter	More	6.83
GKL-2	Green	Serrated shining	Oblong	Sweet	More	7.67
GKL-3	Dark green	Smooth, non-serrated	Fan type	Sweet	Less	7.00
Chinese Yellow (c)	Yellowish green	Non-serrated	Oblong	Sweet	More	6.50

Evaluation based on hedonic scale 0 to 9, Score below 5 indicates disliking for the character

selection GKL-2 recorded maximum score (7.67) for all the characters as compared to check Chinese yellow (7.00) (Table 5).

CONCLUSION

GKL-2 later renamed as Phule Padma was proved an early selection having higher leaf yield with excellent leaf quality and showed better reaction against major pests and diseases over the check cv Chinese Yellow under Pune, Maharashtra conditions.

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