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Assessment of onion (*Allium cepa* L.) advanced lines for bolting behavior on growth and bulb yield in late *Kharif* season

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ABSTRACT
A Field experiment was conducted at the Vegetable Research Farm of Chandra Shekhar Azad University of Agriculture & Technology, Kalyanpur, Kanpur during Late Kharif season in the year 2012-2013. Twelve onion lines were evaluated in a Randomized Block Design with three replications for growth and yield as well as bolter percentage parameters to identify the high yielding varieties and were tested at this region. The results revealed that significantly for better total bulb yield (415.41q ha^{-1}) and marketable bulb yield (388.17 q ha^{-1}) was noted in the line BRO-1201. The maximum bolting percentage was recorded in BRO-1229(15.37%) whereas; it was the minimum in BRO-1206 (1.14 %). However, the different onion lines for better performance of growth and yield as well as minimum bolters percentage was recorded all the genotypes except BRO-1229 and BRO-1225 during late Kharif planting for this region.
Keywords: *Onion, Bulb Yield, Bolters, Late Kharif*

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INTRODUCTION

Onion (*Allium cepa* L.) belongs to the family Amaryllidiaceae is one of the most important vegetable crops worldwide due to it contains carbohydrate, protein, vitamin A, thiamine, riboflavin, niacin, ascorbic acid [2], beta-carotene and lachrymatic compounds having antioxidant activity that helps to fight against cancer and chronic diseases [5][3].In India, onion is predominately grown as a *rabi* season crop but to overcome the problem of non-availability and sky-touching the price of onion during October to January, one has to go for cultivation of onion during the *Kharif* season. Most onion cultivars are very sensitive to photoperiod and range of adaption is limited. Thus, it is imperative to assess the stability in the performance of recommended varieties of onion for a specific location, especially for *Kharif* and late *Kharif* onion cultivation. Late *Kharif* onion cultivation is characterized by excessive vegetative growth, high incidence of pre-mature bolting and twin bulb, late maturity with a thick neck, bigger size bulb, the lower yield of the marketable bulbs and poor keeping quality due to more sprouting. It is mainly because since onion bulb development of this season takes place under adverse climatic conditions (*i.e.* lower temperature and short photoperiod) especially during the winter season. Bolting is the development of a seed stalk, important for onion seed production but not in bulb production [10]. Bolting will also reduce the marketable yield of onion bulbs. Un-timely bolting occurs when the onion plant is exposed to low temperatures (8-13°C) when plants are ready to start forming bulbs. However, the present investigation was planned to different onion varieties/lines for bolting behavior on growth and bulb yield in late *Kharif* season.

MATERIAL AND METHODS

The investigation was carried out at the Vegetable Research Farm, C.S.A. University of Agriculture and Technology at Kalyanpur, Kanpur under the All India Network Research Project on Onion and Garlic (ICAR) for late *Kharif* season during 2012- 2013. Twelve lines of onion sources from DOGR, Pune were tested in a Randomized Block Design with three replications. Eight weeks old healthy seedlings of each line were transplanted on flatbeds at a spacing of 15 x 10 cm from plant to plant and row to row,

respectively in a plot size of 3.0x 2.0 m during the one month early than *rabi* planted during the crop season. A total of 400 plants were accommodated in each plot. Well, decomposed farmyard manure at the rate of 15 tons per hectare was applied at the time of land preparation. Chemical fertilizers were applied at the recommended dose of 120:60:60 kg ha^{-1} of NPK. All phosphorus, potassium and half of the nitrogen were applied at the time of final land preparation; whereas, the other half nitrogen dose was applied two equal split dose at 30 and 45 days after transplanting. All the recommended cultural practices were followed to raise the crop successfully. The data was recorded on ten randomly selected plants in each plot. Observations were taken on plant height, number of leaves/plant; percent double bulbs, percent bolter bulbs, marketable bulb yield, total bulb yield and days to harvest. The bulb yield was accounted on a plot basis. The mean data over the year as subjected to statistical analysis according to standard procedure.

RESULTS AND DISCUSSION

The results obtained from the present investigation on the assessment of onion (*Allium cepa* L.) varieties/lines for bolting behavior on growth and bulb yield in the late *Kharif* season of 2012-13 are discussed and all the traits of mean data presented in Table 1.There were significant differences among the different varieties and advanced lines tested for various aspects under study. Among the varieties, the plant height varied from 48.68 to 56.50cm with a mean value of 52.39 cm. The genotype, BRO-1216 had produced significantly highest plant height of 56.50cm over the tasted variety. However, the significantly lowest plant height (48.68 cm) was observed for BRO-1225 followed by BRO-1208 (49.48 cm) and BRO-1218 (49.80 cm). The number of leaves per plant varies significantly and value ranged from 7.50 to 8.50 with the general mean of 8.02.Variation in these plant growth parameters has already been attributed by Tripathi *et al.,* [7]and Utagi *et al.,* [9].Doubles area very important parameter that contributes towards the yield and also determines the suitability of an onion variety for salad purpose. In the present study, the highest doubles (%) was found in BRO-1229 (9.56) followed by BRO-1218 (1.06), BRO-1211(0.26), BRO-1201 (0.22) and BRO-1213 (0.20) while rest of the lines, doubles were not found with a general mean of (0.94 %).On the other hand, bolting is the main problem of physiological nature and is undesirable for better bulb production as it causes mobilization of reserves towards the developing inflorescence, at the expense of bulb development. Such bulbs cannot be marketed because of the hard center of the bulb by Rabinowitch [6].

Table-1: Performance of onion varieties/lines for vegetative growth, percent bolter and yield parameters during late *Kharif* season

Varieties/ Lines	Plant Height (cm)	Number of Leaves/plant	Doubles (%)	Bolters (%)	Marketable Yield (q/h)	Total Yield (q/h)	Days to Harvest
BRO-1201	53.58	8.10	0.22	1.63	388.17	415.41	132.33
BRO-1204	54.53	8.50	0.00	2.91	299.87	322.89	134.00
BRO-1206	54.45	8.10	0.00	1.14	302.09	323.51	133.33
BRO-1208	49.48	8.10	0.00	1.92	297.09	309.16	134.00
BRO-1211	50.22	7.90	0.26	3.37	310.06	334.25	137.33
BRO-1213	53.42	7.80	0.20	4.24	295.37	309.46	131.33
BRO-1216	56.50	8.50	0.00	2.52	196.18	222.61	139.33
BRO-1218	49.80	7.60	1.06	1.81	288.64	305.69	136.66
BRO-1221	52.49	8.10	0.00	3.53	260.26	289.14	132.00
BRO-1223	51.61	7.70	0.00	2.62	205.12	228.92	134.00
BRO-1225	48.68	8.30	0.00	11.06	174.45	201.20	135.00
BRO-1229	53.87	7.50	9.56	15.37	227.69	252.93	138.33
Mean	52.39	8.02	0.94	4.34	270.41	292.93	134.80
CD(p=0.05)	3.83	0.60	1.09	1.47	1.31	1.20	7.63
CV %	4.32	4.42	68.54	20.10	4.77	4.03	3.34

The data regarding bolting percentage depicted significant diversity among onion cultivars and it was highest in BRO-1229 (15.37%). However, minimum bolting percentage (1.14%) was observed in BRO-1206.Variations in bolter (%) have also been confirmed with the study of Gupta *et al.,* [1]in onion. However, this variation in bolting percentage between onion cultivars could be attributed to differences in their genetic makeup. In many cultivars were found decreases yield affected by bolting. Both productions of doubles as well as bolters are considered as negative parameter concerning for to marketable bulb yield of onion. The significant variation was found among the genotypes for marketable

bulb yield andtotal bulb yield. The general mean for marketable yield was 270.41qha^{-1}andvalue ranged from 174.45 to 388.17 q ha^{-1}. The highest yield was recorded with variety BRO-1201(388.17 q ha^{-1}), while the minimum yield was observed in genotype BRO-1225(174.45 qha^{-1})followed by BRO-1216(196.18qha^{-1}) and BRO-1223(205.12qha^{-1}). Similarly, the production of highest total bulb yield was recorded in variety BRO-1201(415.41qha^{-1}), while the minimum yield was observed in genotype BRO-1225 (201.20 qha^{-1}) followed by BRO-1216(222.61qha^{-1}) and BRO-1223(228.92q ha^{-1}) with the general mean of 292.93 qha^{-1}and it ranged from 201.20 to 415.41qha^{-1}.These results are in close agreement with the findings of Umamaheswarappa *et al*., [8]and Joshi *et al.*, [4]. Days to harvesting is an important parameter that decided the cropped length and fitted well in a particular cropping sequence at a particular location. The earliness or late in maturity traits are utilized in the breeding program for crop improvement. The data indicated that non-significant variation for days to harvesting among the lines that differ from 131.33 days in BRO-1213to 139.33days inBRO-1216with the grand mean was noted in 134.80 days.

CONCLUSION

After this study, it may be concluded from the findings of the experiment that the line tested asBRO-1201 is superior variety followed by BRO-1211 and BRO-1206 concerning for to growth and yield. Furthermore, the minimum bolters were noted in all varieties except BRO-1225 and BRO-1229 was found more than ten percent bolters. Hence, there is dire need to characterize different onion varieties based on their vernalization requirement to avoid pre-mature bolting as well as to identify varieties suitable for processing and fresh consumption.

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