

Yellow onion (*Allium cepa* L.) natural top fall and pre mature bolting

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ABSTRACT

The present investigation entitled, "Genetic improvement of yellow onion for late *Kharif* season" was undertaken with an object to develop new yellow onion genotypes (from parental population of cv. PHULE SUVARNA by open pollinated (OP) synthetic lines). Study revealed that lower premature bolting was noticed in selected population than parental population at various crop stages and eventually 14.58% in parental population. At last the most significant result was recorded in selected population where more than fifty per cent natural top fall was recorded as a sign of physiological maturity which otherwise meager in parental population *i.e.* 16.43%.

Key words : Onion, Genetic, Genotypes, Bolting, Topfall

Maharashtra is the leading onion growing state accounting for 25 percent total production (1661.0 thousand tones) and 16 per cent of the total area (84.48 thousand ha). India is the second largest produce of onion with an area of 454.6 thousand ha and production 6034.25 thousand MT (Anonymos, 2005). Onion is predominately a *Rabi* season crop of India but in Maharashtra it can be grown year round under wide range of climatic condition. Phule suvarna is basically a *Rabi* season variety developed by Mahatma Phule Krishi Vidyapeeth, Rahuri especially for exhorting yellow onion bulb are generally harvested in the month of March to April (Anonymous, 1997).

However, onion export initiates from December onwards, therefore, *rangda* onion cultivation can be exploited for export. However, cv. PHULE SUVARNA is a moderately susceptible to pre-mature bolting during late *Kharif* season hence it is important to manipulate the cv. PHULE SUVARNA genetically so that improved strain can be suitable for late *Kharif* season.

MATERIALS AND METHODS

The investigation was carried out at the Instructional –cum –Research Farm, Department of Horticulture, Mahatma Phula Krishi Vidyapeeth, Rahuri (M.S.) during late *Kharif* 2002-03. The plot selected for the experiment had a uniform soil depth and fertility. The soil was light medium black and well drained. Selection of promising genotypes of yellow onion was done especially suitable to late *Kharif* (*i.e.* *rangda*) season. Selection pressure was applied at two stages on desirable horticultural traits particularly for *rangda* season such as controlled vegetative growth coupled with rapid bulb development, bigger bulb size and resistance against premature bolting

and twin bulbs. Accordingly, initially on the basis of plant growth characters, 250 seed bulbs were selected from plant population of one lakh bulbs and thus, 0.25 per cent selection pressure was applied on original plant population. However, at bulb harvesting stage from 250 initial selection only 25 seed bulb were finally selected to advance bulb crop on the basis of desirable bulb character such as natural top fall, thin bulb neck, shape and size of bulb, etc. However to maintain broad genetics and hetrozygosity of onion crop, random mating of initially selected 250 bulb was allowed during seed production program.

During late *Rabi* season, these seed bulb were planted on 19th January, 2003 and seed production was undertaken in isolation where random pollination or sib mating of 250 selected bulb was allowed. The seed of each mother plant was harvested separately as a synthetic selection on 5th May, 2003. However, seed of finally selected 25 genotypes were used to raise bulb crop during late *Kharif* (*rangda*) season of 2003-04. The recommended dose of 20 tons/h of farm yard manure and 50 kg K₂O in the form marinate of potash per hector was applied as a basal dose at the time of transplanting. The 50 kg/ha nitrogen in the form of urea was applied as a top dressing followed by light earthing up upon 30 DAT (days after transplanting) stage. Phule suvarna were statistically analyzed by t test for average performance and by F test for genetic variability (Panse and Sukhatme, 1987).

RESULTS AND DISCUSSION

The yellow onion cultivation in India and in Maharashtra is not regular practice at all. However, to

capture new horizons for exporting onion bulb particularly in West European market, a yellow onions with lower pungency is a pre-requisite. In this context, yellow onion cv. PHULE SUVARNA has been developed by M.P.K.V., Rahuri but it was suitable mainly for *Rabi* season. However, particularly during late *Kharif* season cv. PHULE SUVARNA displayed lower marketable bulb yield due to significant undesirable plant and bulb characteristics like induction of secondary vegetative growth coupled with premature bolting, late maturity and inferior keeping quality natural top fall. Onion is highly a cross pollinated crop due to protrandry condition where high degree of heterozygosity is maintained and inbreeding depression is a common phenomenon. Most of the important agronomic traits *viz.*, yield, maturity premature bolting, bulb weight, shape, size, etc in onion are inherited quantitatively with significant *gca* effect and prominent additive gene action with specific role environment. Thus, onion crop productivity is controlled by the combined effects of number of genes which influence the trait of which has a similar small influence. Hence, onion genotypes should contain all favorable alleles for the genes which determines high yield either in homozygous or hertrozygous dominant condition. Finally, it is concluded that onion required wide genetical base for improvement of important quantitative characters. In this context, importance of open pollinated (OP) varieties or synthetic genotypes in onion is much more significant as compared to narrow based or F_1 hybrids (Brewster, 1994).

Considering all the information about breeding system, the present investigation, the development of OP synthetic lines through line or family selection was considered as the most effective method. Onion is basically environmental influence crop and more importantly late *Kharif* or *rangda* is a such unique season where genotype and environmental interaction are at the highest level. Therefore, original control population of cv. PHULE SUVANA was grown during late *Kharif* season particularly to make the selection methods more efficient and exclusively in the region of specific climatic condition for which variety need to develop. The prime important factor in development OP varieties in onion is the critical application of selection pressure in environmental

influenced characters. Hence, the appropriate selection pressure is the device to measure the selected character. Particularly for characters which are greatly influenced by environment, it is prerequisite to impose a high selection pressure for traits of breeders interest (Brewster, 1994) Normally in onion, 1-5 per cent seed bulbs are selected from parent population to initiate mass selection or family selection. However, in present investigation considering the environmental influence of *rangda* season on expression of physiological disorders like onset of excessive secondary growth responsible for late maturity, premature bolting, thick bulb neck, bigger bulb size responsible for twin bulbs and inferior marketing and keeping quality, etc. initially 0.25% selection pressure was applied on parental population and 250 genotypes were selected from one Lakh plant population. However, considering number of critical characters especially during late *Kharif* season, this selection pressure was further increased to 0.025% and finally only 25 seed bulbs were selected for advancement of family but their random mating was allowed in isolation with 250 seed bulbs to maintain wider genetical base and high degree of heterozygosity of the onion crop. The seed of 25 line were harvested separately and bulbs crop was evaluated in successive late *Kharif* season and performance and variability was compared with parental control population by using t and F tests, respectively.

This parameter was assessed from 60 to 110 DAT stages at interval of 5 days. Data of Table 1 revealed that occurrence of premature bolting was initiated at 65 DAT stages and it increased progressively in both genotypes *i.e.* selected and control. However, at all eleven crop stages, selected genotypes showed lower occurrence of premature bolting than the control one. At 110 DAT stages, premature bolting in selected population was observed 14.58% as compared to 20.45% in control. Thus, about five per cent improvement was noticed in selection population for occurrence of premature bolting in yellow onions during *rangda* season.

Attainment of physiological maturity is the most essential feature for post harvest handling in onion. Thus, 50 per cent natural top fall is the sign of physiological maturity in onion but normally it is only observed during

Table 1 : Premature bolting during late *Kharif* (*rangda*) season

Sr. No.	Population	Per cent natural topfall days after transplanting										
		60 DAT	65 DAT	70 DAT	75 DAT	80 DAT	85 DAT	90 DAT	95 DAT	100 DAT	105 DAT	110 DAT
1.	Selection	0.00	0.05	0.14	0.26	0.54	3.0	6.6	8.6	10.49	13.26	14.58
2.	Control	0.00	1.13	2.27	3.14	5.68	7.95	9.09	10.22	14.36	15.90	20.45

Values of per cent premature bolting based on total plant population of selections and check cultivar *i.e.* 6831 and 762, respectively

Table 2 : Natural top fall during rangda season

	Per cent natural topfall at days after transplanting				
	90	95	100	105	110
Selection	2.25	8.60	24.5	36.60	50.84
Check Phule Suvarna	0.11	2.12	4.96	11.33	16.43

Values of natural top fall based on total plant population of selections and check cultivar *i.e.* 6831 and 762, respectively.

Rabi onion cultivation. Hence, in present study, critical selection pressure was applied at selection of seed bulbs.

This particular feature was assessed in present investigation from 90 to 110 DAT stage at interval of 5 days. Data of Table 2 revealed that 50.84% natural top fall was noticed at 110 DAT stages in selected population as compared to only 16.43% in control population. Thus, with this result an important achievement was recorded in present investigation that physiological maturity can be obtained in promising yellow onion genotypes particularly during late *Kharif* cultivation at 110 DAT crop stage. Furthermore, it also displayed an early maturity for late *Kharif* onion cultivation.

An occurrence of fifty per cent topfall as a sign of physiological maturity particularly during late *Kharif* season is in agreement with findings of Sood (2000) and Joshi (2005) who stated that attainment of physiological maturity in development of onion genotype particularly

for late *Kharif* (*rangda*) season is one of the remarkable achievements.

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