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Short Communication

VARIABILITY STUDIES FOR SOME QUANTITATIVE CHARACTERS IN WHITE ONION (*ALLIUM CEPA* L.) ADVANCE LINES

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Onion (*Allium cepa* L.) is an important spices vegetable consumed throughout the year. It also has high export potential and comes under cash crop apart from vegetables (Pandey, 1989). India is the second largest producer of onion in the world after China. Onion are used as a salad or cooked in various ways in all curries, fried or baked. It is also used in processed from e.g. flakes, powder paste, crush and pickles etc. The production of white onion is now becoming popular among farmers, producers and exporter. The exporters export the white onion from Maharashtra and Gujarat which has greater potential for dehydration. The work conducted on selection of suitable white onion is very scanty (Sethi *et al*., 1993). Thus for improving the efficiency of selection in any base population, the knowledge of genetic variability present in it is of prime importance to the breeder. Since most of the economic plant characters in onion are polygenic in nature and highly influenced by the environment to improve the yield through selection of better varieties knowledge of the nature of association of bulb yield with yield contributing characters is very essential. Keeping this in view the present investigation was undertaken to study genetic parameters for important economic characters and their effect on total yield in white onion advance lines collected from different region of India.

Ten white onion advance lines selected from germplasms having distinct diversity in various qualitative and quantitative traits were planted in randomized block design with three replications during 2005-06 and 2006-07 at the experimental farm of National Horticultural Research and Development Foundation Nashik, Maharashtra. The Nashik (20^0 N latitude and 73^0 E longitudes) is located on altitude of 492.0 meter from mean sea level. The climate of Nashik is sub tropical with average minimum and maximum temperature and humidity ranging between 16^0C to 31^0C and 48.0 % to 80 % respectively with an annual rainfall around 881.0 mm. Eight week old seedlings of each diverse advance lines were transplanted in flat beds during the last week of December in the spacing of 15 cm x 10 cm in the plots of 3.6 m x 1.8 meter size. Recommended dose of package of practices were uniformly followed during whole experiment period to raise a successful crops. Ten plants from each plot were randomly selected to record the data on quantitative characters *viz*. plant height (cm), number of leaves per plant, neck thickness (cm), bulb diameter (cm), bulb size index (cm^2), 20 bulbs weight (kg), days for bulb initiation, days to harvesting, total soluble solids (%), dry matter content (%), gross yield (q/ha) and marketable yield (q/ha).

The pooled data of 2005-06 and 2006-07 were analyzed as suggested for genotypic and phenotypic coefficient of variation by (Burton and De Vane, 1953). Heritability in broad sense and expected genetic advance as percent of mean work out with suggested by (Johnson, *et al*. 1955) and correlation were marked out by the method of (Al-Jibouri *et al*., 1958).

A wide range of variability was observed for gross yield (301.99 q/ha to 387.81 q/ha), marketable yield (239.33 q/ha to 338.49 q/ha), bulb size index (21.31 to 23.09 cm^2) and plant height (62.73 to 68.43 cm). The spectrum of large variability for important characters will provide to breeder a good scope for the improvement in onion. Others traits showed moderate to low range of variations. The mean data indicated that, the advance line 562 showed highest bulb diameter (5.50 cm), bulb size index (23.09 cm^2) and weight of 20 bulbs (1.10 kg) which was however at par with advance line 627 (5.47 cm), (22.75 cm2) and (1.03 kg) and line 629 (5.40 cm) (22.30 cm2) and (1.06 kg) respectively. Highest gross yield (387.81 q/ha) and marketable yield (338.49 q/ha) was recorded in advance lines 629. It is suggested from the mean data that above advance lines can be used in crop

improvement programme for development in white onion varieties. The considerable amount of variation was observed for all traits. The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (CGV) in all characters. A higher magnitude of coefficient of variation was recorded for marketable yield (10.18 - 9.13%), followed by gross yield (9.80 – 9.16%) and weight of 20 bulbs (9.87 and 5.89 %). Medium phenotypic coefficient of variation was observed for dry matter (6.26%), TSS (6.08%) and number of leaf per plant (5.73%). Similar trend in some of the important characters was also reported by (Padda *et al*., 1972, Sidhu *et al*., 1986 and Hydar *et al*., 2007). All the above characters which showed high to medium coefficient of variation are of economic importance and there is an ample scope for improvement of these characters through selection.

The high heritability values in broad sense are also helpful in selection if coupled with high phenotypic performance. Robinson, (1966) categorized the estimates of heritability as low (5-10%), medium (10-30%) and high (30 and above). Based on this classification the present study revealed that very high heritable characters for onion are days for bulbs initiation, days for harvest, gross yield, marketable yield, weight of 20 bulbs and number of leaves per plant. The finding of our present study in respect of heritability are in accordance with the report of (Haydar *et al*., 2007, Mohanty, 2001 and Ghetia *et al*., 2000)) for yield and weight of bulb. As per Johnson, (1966) in soybean heritability along with the genetic advance are more useful than the heritability alone for selecting the best individuals. It is noted in present investigation that the high values of heritability ranged from (35.53 to 91.33 %) in broad sense were realized in traits *viz*. days for bulb initiation, days for harvesting, gross yield, marketable yield, number of leaves per plant and moderately low for others attributes which indicates that, they were least affected by environment modifications and selection based on phenotypic performance would be reliable. Mehta (2005) had also reported high heritability for bulbs weight and days to maturity. The genetic advance as percent of mean ranged from (0.18 to17.62). High genetic advance for recorded in gross yield (17.62 %), marketable yield (16.88 %) and days for bulb initiations (8.85 %) and rest of others characters showed low genetic advance. Gross yield, marketable yield and days for bulb initiation indicated higher estimates of genetic advance as percent of mean coupled with high heritability, suggesting the improvement of additive genetic variance for these traits (Panse, 1957). These results are similar to (Haydar *et al.,* 2007) in respect of bulb yield.

High to moderate heritability associated with low genetic advance as percent of mean observed for number of leaves per plant, plant height, neck thickness and total soluble solid, indicating that these traits are governed by non additive gene action and high genotypic environment interaction. The traits which showed high heritability with high genetic advance will be more amendable to improvement through mass selection, progeny selection or any other modified selection procedure aiming at exploiting the additive variance.

Study on correlation among different traits revealed that in general the genotypic correlation coefficients were larger than the phenotypic correlation (Table-3).

Table 1. Coefficient of variation, heritability and genetic advance for different characters in white onion

Characters	Range	G. Mean	SEM±	Coefficient of Variation			Heritability (%)	Genetic Advance	GA as percent of mean
				PCV (%)	GCV (%)	ECV (%)			
Plant height (cm)	62.73-68.43	65.84	1.53	4.54	2.04	4.05	20.32	1.24	1.89
Number of leaves/plant	8.40-9.70	8.84	0.23	5.73	3.41	4.60	35.53	0.37	4.18
Neck thickness (cm)	1.46-1.61	1.55	0.03	4.65	2.21	4.09	22.60	0.03	1.93
Bulb Diameter (cm)	5.30-5.50	5.38	0.07	2.24	0.43	2.28	3.76	0.09	1.67
Bulb Size Index (cm^2)	21.31-23.09	22.14	0.57	4.41	0.65	4.46	2.20	0.04	0.18
Weight of 20 bulb (Kg)	0.930-1.10	0.97	0.04	9.87	5.89	7.92	35.60	0.07	7.21
Days for bulb initiation	46.00-55.60	48.11	0.38	4.70	4.49	1.38	91.33	4.26	8.85
Days for harvesting	110.33-114.33	112.37	0.40	1.74	1.63	0.61	87.50	3.54	3.15
TSS (%)	11.41-12.83	12.27	0.38	6.08	2.68	5.46	19.48	0.29	2.36
Dry matter (%)	12.45-13.84	13.21	0.49	6.26	1.56	6.45	6.21	0.10	0.75
Gross yield (q/ha)	301.99-387.81	349.62	7.05	9.80	9.16	3.49	87.28	61.63	17.62
Marketable yield (q/ha)	239.33-338.49	305.47	7.93	10.18	9.13	4.49	80.49	51.59	16.88

This indicated little role of environment in the expression of genetic relationship of the traits in the phenotypes. The marketable yield was significantly and positively correlated with plant height, bulb diameter, weight of 20 bulbs, days for bulbs initiation, dry matter content and gross yield at both genotypic and phenotypic levels and neck thickness and number of leaves per plant at genotypic levels. Gross yield was positive and significantly correlated with bulb diameter, weight of 20 bulbs and dry matter at both levels and negatively correlated with days for harvesting. Neck thickness was positively correlated with number of leaves per plant. Bulb size index positively and significantly correlated with plant height, number of leaves per plant, neck thickness at genotypic level and bulb diameter at both phenotypic and genotypic level. Weight of 20 bulbs was positive and significantly correlated with plant height and number of leaves per plant at genotypic level and bulb diameter at both genotypic and phenotypic levels.

Days for bulb initiation were positive and significantly correlated with number of leaves per plant, bulb diameter, bulb size index and weight of 20 bulbs at both levels. A day for harvesting was significant strongly positive correlated with days for bulb initiation. In correlation studies it was noted that, the traits *viz*. plant height, number of leaves per plant, bulb diameter, bulb size index, weight of 20 bulbs, days for bulbs initiation, and yield were most important yield and yield contributing traits and correlate to each other and these finding was in consonance with Patel *et al*. (1985) and Pal *et al*. (1988).

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