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Studies of variability pattern in agro-morphological characters in the onion genotypes (*Allium cepa* L.) in Rabi season under Allahabad agro-climactic condition

Mukesh Kumar Jat and Balaji Vikram

Abstract
The present investigation on genetic variability, heritability and correlation study including mean, genotypic and phenotypic variances, coefficient of variation, heritability, and genetic advance was conducted on genetically diverse nineteen genotypes of onion (*Allium cepa* L.) in the "Rabi Season." was carried out in the rabi season Research field, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad during the year 2013-2014. The investigation was laid out in RBD with three replications. There were 7 genotypes wide variation was observed among the genotypes for all traits. Results revealed that the genotype the phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the traits. Performed betterin terms of yield and yield attributing characters and therefore, these lines may be used for breeding programme. Large amount of variability exhibited in the genotypes for selection. Significant differences were observed among the genotypes for all the traits. Similarly, the high heritability and genetic advance were also recorded on Fresh weight of bulb and Dry weight of bulb, being suggesting the major role of genetic constitution in the expression of the characters. Dry weight of bulb had positive and highly significant correlation with yield per ha and Bulb yield per plot both at phenotypic and genotypic level, respectively.

Keywords: onion (*Allium cepa* L.), variability, heritability, correlation coefficient

Introduction
Onion belongs to the family Alliaceae, genus Allium and *species cepa* L. with basic chromosome number x = 8 (2n = 16). The genus Allium is large genus containing 450 species, which are biennial and perennial, and all of them are bulbous. Cultivated onion is herbaceous annual for the bulb production and biennial for seed production. The flowers are bisexual which are protoandraus and cross-pollinated. It is consumed round the year by all the sections of people through-out the world due to healing properties of onion in case of cardiac diseases, rheumatism, cancer, digestive disorders, blood sugar and prolong cough. The inflorescence stalk with only internodes, which elongates in the life cycle of the plant. Onion is regarded as cash crop as at fetches high income per unit area of land for producing high yield only by applying the fertilizer to the crop is not helpful, because at certain level either they may be leached or washed out in rain water. Conventional breeding methods such as pedigree, bulk and back cross breeding with some modifications have been principal procedures useful for improvement of bulb crops. The genetic divergence analysis estimates the extent of diversity existed among selected genotypes (Singh *et al.,* 2011) [9]. Precise information on the nature and degree of genetic diversity helps the plant breeder in choosing the diverse parents for purposeful hybridization (Bharti *et al.,* 2011) [2]. Improvement in yield and quality is normally achieved by selecting genotypes with desirable character combinations existing in the nature or by hybridization. The parent identified on the basis of the divergence analysis would be more promising. Mohanty (2001) [8]; Aliyu *et al.* (2007) [1] have reported some results in onion. The D2 statistic provides a quantitative measure of genetic divergence among populations and assists in classifying genetic stocks into district groups which is further helpful for evolving superior genotypes. When breeding for a particular set of growing conditions, it is highly important to know the use of local populations, since in them the relationships among yield components are balanced and in harmony with the effects of the specific climatic and edaphic factors (Dhotre, *et al.,* 2010) [5].

Materials and Methods
The experiment was conducted in the Vegetable Research Farm, Department of Horticulture,

Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (Uttar Pradesh) during 2013-2014. All the facilities necessary for cultivation, including labor were made available in the department. The experiment was laid out in Randomized Block Design with 7 treatments. The treatments were replicated three times. Onions are sensitive to photoperiod. Long days are favorable to onion production as this enhances leaf development and formation which, in turn, is directly related to bulb size. Early varieties require 13 hours for bulb initiation while late varieties require 16 hours for bulb initiation. Name of different onion genotypes: Arka niketan, Bhima sakti, Bhima kiran, Arka kalian, Pusa madhavi, Bhima super and Bhima sweta. Raising of the Seedling the raised nursery beds of size 3m length, 1m breadth and 0.15 m height were prepared after bringing the soil to a fine tilth. The beds were levelled. The seeds of 7 onion genotypes were sown in lines drawn 10 cm apart on the beds on 23 octaber 2013. Before sowing nursery was prepared and levelled by mixing well rotten F.Y.M. and soil was treated with Carbendazim (0.20%) and seed were treated with Bavistin (0.2%). Immediately after sowing water was sprinkled uniformly over the bed. Carbendazim at rate of 0.2 % and copper oxychloride at rate of 0.2 % were sprayed at weekly interval to prevent damping off. Seedlings were protected from rain, whenever needed with the help of plastic sheet. Application of fertilizers Manure and fertilizer were applied according to recommended doses for onion i.e. 25-30 t/ha. FYM or compost along with fertilizer N: P: K @ 80-125: 50- 75:80-125 kg per ha-1. FYM was well incorporated in plots at least 20 days before transplanting. Apply 50% nitrogen and entire dose of P2O5 and K2O before transplanting or set sowing and remaining half nitrogen is top dressed 5-6 week after transplanting. Intercultural operations hand weeding was done five times at 20, 40, 65, 90 and DAT.

Results and Discussion

The mean of the different traits for 7 genotypes of Onion (*Allium cepa* L.) have been presented in table 1.

Plant height 90 DAT (cm)

At 90 DAT maximum plant height was in PusaMadhavi (68.50) followed by BhimaKrian (64.66) and the minimum plant height was recorded in ArkaKalyan (58.88) followed by ArkaNiketan (59.54) and Bhima Super (61.02) Dhotre *et al*., 2010 [5] The plant height (cm.) was obtained Pusa Madhavi (68.50) to ArkaKalyan (58.88) at 90 DAT with mean 50.62

Leaf height 90 (cm)

The leaf height (cm.) was obtained PusaMadhavi (63.76) to ArkaKalyan (52.02) at 90 DAT with mean 45.72

At 90 DAT the maximum leaf height in PusaMadhavi (63.76) followed by Bhima Shakti (60.27) and the minimum leaf height was recorded an ArkaKalyan (52.02) and followed by ArkaNiketan (53.31) and Bhima Super (56.48). (Haydar *et al.*, 2007),

Number of leaves at 90 DAT

The number of leaves (cm.) was obtained PusaMadhavi (68.50) to ArkaKalyan (58.88) at 90 DAT with mean 20.72.

At 90 DAT the maximum number of leaves was PusaMadhavi (12.00) followed by BhimaSweta (11.73) and minimum number leaves was noticed in genotype ArkaNiketan (9.40) and followed by Bhima Super (9.66) and BhimaKiran (10.13).

Fresh weight of bulb (g)

The bulb weight per plant ranged from PusaMadhavi to ArkaNiketan at 90 DAT with mean 141.11.

Maximum bulb weight per plant (gm) was obtained in PusaMadhavi (192.40) followed by Bhima Shakti (154.66) and minimum bulb weight per plant was observed in ArkaNiketan (127.20) so the genotype PusaMadhavi was height per plot while the genotype ArkaNiketan was lowest in bulb weight per plant. Hosamani *et al*. 2010 [6]

Dry weight of bulb (g)

The bulb weight per plant ranged from PusaMadhavi (171.00) to Arkakalyan (96.66) at 90 DAT with mean 117.71.

Maximum bulb weight per plant (gm) was obtained in PusaMadhavi (171.00) followed by Bhimashakti (126.00) and minimum bulb weight per plant was observed in ArkaKalyan (96.66) so the genotype PusaMadhavi was highest per plant while the genotype ArkaKalyan was lowest in bulb weight per plant.

Bulb diameter (cm)

The bulb diameter ranged from PusaMadhavi (8.00) to ArkaKalyan (4.80) at 90 DAT with mean 6.14.

Maximum bulb diameter (cm) was obtained in PusaMadhavi (8.00) followed by Bhima Super (7.20) and minimum bulb diameter was observed in ArkaKalyan (4.80) So the genotype PusaMadhavi was highest bulb diameter while the genotype ArkaKalyan was lowest in bulb diameter.

Bulb yield per plot (kg)

The bulb yield per plot ranged from PusaMadhavi (5.77) to ArkaKalyan (3.48) at 90 DAT with mean 4.20.

Maximum bulb weight per plot (kg) was obtained in PusaMadhavi (5.77) followed by Bhima Shakti (4.64) and minimum bulb weight per plot was observed in ArkaKalyan (3.48) So the genotype PusaMadhavi was highest per plot while the genotype ArkaKalyan was lowest in bulb weight per plot.

Yield t/ha

The bulb yield per hectare ranged from PusaMadhavi (38.48) to ArkaKalyan (23.22) at 90 DAT with mean 28.03.

The maximum yield per hectare was observed in genotype PusaMadhavi (38.48) tones followed by Bhimashakti (30.93) and BhimaKiran (30.16) and the minimum yield per hectare was observed in genotypes ArkaKalyan (23.22) followed by Bhimasweta (23.94) and ArkaNiketan (24.05).

Genetic components of variability

With a view to understand the extent to which the observes variation are due to genetic factors, the phenotype variance (PV) and genotype variance (GV), genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), broad sense variability (h^2) genetic advance (GA) and genetic advance over mean (GAM) were worked out and presented in table 2. The data revealed the existence of large amount of variability for the most of the characters studied.

Variability for growth parameters of onion

Plant height 90 DAT

The genotypic and phenotypic variance were (7.84) and (19.54) respectively. The estimate of genotype coefficient of variance were low (4.43) and phenotype coefficient of variance were low (7.00) respectively. The estimate of

heritability is medium (40.1) with low genetic advance (3.65) and low genetic advancement as percent of mean (5.79%).

Leaf height 90 DAT

The genotypic and phenotypic variance were (14.15) and (22.48) respectively. The estimate of genotype coefficient of variance were low (6.50) and phenotype coefficient of variance were low (8.20) respectively. The estimate of heritability is high (62.9) with low genetic advance (6.14) and medium genetic advancement as percent of mean (10.63%).

Number of leaves 90 DAT

The genotypic and phenotypic variance were (0.74) and (1.45) respectively. The estimate of genotype coefficient of variance were low (8.16) and phenotype coefficient of variance were low (11.41) respectively. The estimate of heritability is medium (51.1) with low genetic advance (1.26) and medium genetic advancement as percent of mean (12.02%).

Fresh weight of bulb

The genotypic and phenotypic variance were (646.94) and (902.60) respectively. The estimate of genotype coefficient of variance were medium (18.02) and phenotype coefficient of variance were high (21.29) respectively. The estimate of heritability is high (71.7) with high genetic advance (44.35) and high genetic advancement as percent of mean (31.43%).

Dry weight of bulb

The genotypic and phenotypic variance were (564.64) and (869.20) respectively. The estimate of genotype coefficient of variance were high (20.18) and phenotype coefficient of variance were high (25.04) respectively. The estimate of heritability is high (65.0) with high genetic advance (39.45) and high genetic advancement as percent of mean (33.51%).

Bulb diameter

The genotypic and phenotypic variance were (1.10) and (1.84) respectively. The estimate of genotype coefficient of variance were medium (17.12) and phenotype coefficient of variance were high (22.12) respectively. The estimate of heritability is medium (59.9) with low genetic advance (1.67) and high genetic advancement as percent of mean (27.29%).

Bulb yield per plot

The genotypic and phenotypic variance were (0.55) and (0.96) respectively. The estimate of genotype coefficient of variance were medium (17.74) and phenotype coefficient of variance were high (23.31) respectively. The estimate of heritability is medium (57.9) with low genetic advance (1.17) and high genetic advancement as percent of mean (27.81%).

Yield (t/ha)

The genotypic and phenotypic variance were (24.74) and (42.72) respectively. The estimate of genotype coefficient of variance were medium (17.74) and phenotype coefficient of variance were high (23.31) respectively. The estimate of heritability is medium (57.9) with low genetic advance (7.79) and high genetic advancement as percent of mean (27.81%). Similar observations were also reported by Hosamani, *et al*. (2010) [6] and Dewangan and Sahu (2014) in onion.

The extent of progress that could be achieved in any crop depends on the primary raw material, the variability existing in the base material. In the absence of which there shall be no response to selection. The bulb yield is the key issue in onion improvement and yield is the ultimate results of the components characters therefore, in addition to yield, variability for the components characters is very important. Absolute variability of different characters dose not reveal which of the particular characters are showing the highest variability. This could only be accessed through standardizing the phenotype and genotype variances and by obtaining of variability. Similar observations were also reported by Chattoo *et al*. (2015) [3] and Mahanthesh *et al*. (2008) [7] in onion.

Conclusion

On the basis of presence performance for different characters genotype PusaMadhavi was found superior in terms of bulb yield per hectare. Large amount of variability was observed in the experimental for selection. Characters like plant height, leaf height, leaves per plant, diameter of bulb, fresh weight of bulb, dry weight of bulb, bulb yield per plot, high and heritability coupled with high to moderate genetic advance.

Table 1: Mean performance of different genotypes various character

S. No	Characters / Genotypes	Plant height (cm) 90 DAT	Leaf height (cm) 90 DAT	Leaves/plant 90 DAT	Bulb diameter (cm)	Fersh weight of bulb (g)	Dry weight of bulb (g)	Bulb yield per plot (kg)	Yield (t/ha)
1	ArkaNiketan	59.54	53.31	9.40	5.30	127.20	101.66	3.60	24.05
2	BhimaSakti	64.50	60.27	10.66	6.00	154.66	126.00	4.64	30.93
3	BhimaKiran	64.66	59.36	10.13	5.20	150.80	120.33	4.52	30.16
4	ArkaPragati	62.94	54.89	10.43	5.02	120.15	102.15	3.54	24.71
5	PusaMadhavi	68.50	63.76	12.00	8.00	192.40	171.00	5.77	38.48
6	BhimaSuper	61.02	56.48	9.66	7.20	127.20	102.66	3.81	25.44
7	BhimaSweta	64.57	59.32	11.73	6.50	119.73	105.33	3.59	23.94
8	ArkaKalyan	58.88	52.02	10.26	4.80	115.80	96.66	3.48	23.22
	Mean	63.08	57.43	10.53	6.00	138.49	115.72	4.12	27.62
	S.E.	1.97	1.66	0.48	0.49	9.23	10.07	0.36	2.44
	C.D.5%	6.08	5.13	1.49	1.53	28.44	31.04	1.13	7.54
Range	Range Lowest	58.88	52.02	9.40	4.80	115.80	96.66	3.48	23.22
	Range Highest	68.50	63.76	12.00	8.00	192.40	171.00	5.77	38.48

References

1. Aliyu U, Magaji MD, Yakubu AI, Dikko AU. Correlation and path coefficient analysis for some yield-related traits in onion (*Allium cepa* L.). J Plant Sci. 2007; 2:366-369.
2. Bharti NR, Meena ML, Yogita RB. Genetic variability studies in onion (*Allium cepa* L.). Ann. Horti. 2011; 4:171-175.
3. Chattoo MA, Angrej Ali, Kamaluddin. Genetic variability, interrelationship and path analysis for yield and yield related traits in Onion (*Allium cepa* l.) under temperate condition in Kashmir valley. Plant Archives. 2015; 15:1161-1165.
4. Dewangan SR, Sahu GD. Genetic variability, correlation and path coefficient analysis of different *Kharif*Onion genotypes in Chhattisgarh plains. Agric. Sci. Digest. 2014; 34:233-236.
5. Dhotre M, Allolli TB, Athani SI, Halemani LC. Genetic variability, character association and path analysis studies in *Kharif*Onion (*Allium cepa* var. *cepa* L.). The Asian J Hort. 2010; 5:143-146.
6. Hosamani RM, Patil BC, Ajjappalavara PS. Genetic variability and character association studies in Onion (*Allium cepa* L.). Karnataka J Agric. Sci. 2010; 23:302-305.
7. Mahanthesh B, Sajjan MRP, Thippesha D, Harshavardhan M, Janardhan G. Studies on multiple correlation between bulb yield, growth and yield attributes in different genotypes of onion (*Allium cepa* L.) under irrigated conditions. Res. on Crops. 2008; 9:90-93.
8. Mohantry BK, Prusti AM. Studies on variability, heritability, correlation and path coefficients in Kharif onion. Orissa J Hort. 2001; 29:75-78.
9. Singh RK, Bhonde SR, Gupta RP. Genetic variability in late kharif (Rangada) onion (*Allium cepa* L.). J App. Hort. (Lucknow);, 2011; 13(1):74-78.