*Plant Archives* Vol. 17 No. 2, 2017 pp. 1058-1060 ***ISSN 0972-5210***

# GENETIC DIVERGENCE IN ONION GENOTYPES (*ALLIUM CEPA* L.)

**Deepanshu*, Abdul Shamad[1] and Dr. V. M. Prasad[2]**

*Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Science, Allahabad-211007 (U.P.) India.

## Abstract

Genetic divergence on onion was studied during *rabi* seasons involving 14 genotypes showing wider variations for all traits in Allahabad agro-climatic conditions. 14 genotypes were evaluated for 15 traits in a randomized block design to study genetic divergence. 14 genotypes formed 4 clusters, cluster 1 has 5 genotypes, cluster 2, cluster 3 and cluster 4 has 3 genotypes in each. Cluster 1 has the highest intra cluster distance (706.52) followed by cluster 4 and the lowest was found in the cluster 2 (440.465), inter cluster values are maximum for the 3 and 1 (2488.18) followed by 3 and 2 (1729.241) and the minimum was found in 4 and 2 (1293.290). Highest cluster mean was found in the cluster 3 for plant height (61.043), number of leaves per plant (7.623), collar thickness (16.364), fresh bulb weight (gm) (85.621), dry bulb weight (gm) (72.149), fresh bulb yield per plot (kg) (8.566), marketable bulb yield per plot (kg) (6.694), bulb size in diameter (cm)(6.493), fresh bulb yield quintal per hectare (248.304), marketable bulb yield quintal per hectare (194.112). More the diversity showed in the genotypes the greater the opportunity for improving the qualitative as well as quantitative characters in onion traits.

***Key words :*** *Rabi*, cluster, genetic divergence, qualitative, quantitative.

## Introduction

Onion (*Allium cepa* Linn.) is one of the important commercial vegetable and spice crop grown in India. As per Indian Horticulture Database, 2013 it was reported that India produced 16813.0 thousand metric tonnes of onion in 1051.5 thousand hectare area and productivity 16.0 metric tonnes. India ranks second in global onion production after China and with an annual production of 16 to 17 million tonnes accounts for around 20% of global production. In India onion is grown in three crop seasons, namely *kharif* (harvested in October-November), late *kharif* (January February) and *rabi* (April – May). *Rabi* season crop is the largest accounting for about 60 percent of annual production with *kharif* and late *kharif* accounting for about 20 percent each. In India, Mahrashtra, is the leading onion growing state followed by, Karnataka and Madhya Pradesh.

Improvement in any crop depends on the magnitude of genetic variability and the extent of transmission of characters from one generation to the next. The yield and its component characters are polygenic in nature, hence influenced by the environmental factors. The knowledge of inter-relationships among the various components and their direct and indirect effect on yield are the important pre-requisites to bring genetic improvement in onion. Selection of genetically diverse parents in any breeding programme is of immense importance for successful recombination breeding (Arunachalam,1981) the genetic divergence analysis estimates the extent of diversity existed among selected genotypes (Mondal, 2003). Precise information on the nature and degree of genetic diversity helps the plant breeder in choosing the diverse parents for purposeful hybridization (Samsuddin, 1985). Thus, the present study was conceived with objective to examine the genetic diversity in onion. Selection of genetically diverse parents in any breeding programme is of immense importance for successful recombination breeding (Arunachalam, 1981).

## Materials and Methods

The experiment was conducted at Vegetable Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad (Uttar Pradesh) during 2012-2013. Six week old healthy

***Author for correspondence :*** E-mail : deepanshumasih2@gmail.com

seedlings of each variety were transplanted on flat beds at a spacing of 15 cm × 10 cm in a plot size of 1.5m². Recommended package of practices were adopted to raise a successful crop. The present experiment was conducted in Randomized Block Design with 14 treatments. Observation were recorded for fifteen quantative and qualitative characters. $D^2$ statistics was used for assessing the genetic divergence among the population as suggested by Mahalanobis.

## Results and Discussion

The average of inter cluster (light values) and intra cluster (Bold values) are present in the table 2 given below. The $D^2$ values was calculated among 14 genotypes. Cluster 1 has the highest intra cluster distance (706.52) followed by cluster 4 and the lowest was found in the cluster 2, inter cluster values are maximum for the 3 and 1 followed by 3 and 2 and the minimum was found in 4 and 2.

**Table 1:** The distribution of 14 onion genotypes in different clusters.

| Cluster No. | No. of genotypes | Name of the genotypes |
|---|---|---|
| 1 | 5 | Line 28, U-103, L-355, U-101, Red Creole |
| 2 | 3 | Pusa Madhavi, Nasik Red, Pusa Red |
| 3 | 3 | N-2-4-1, AFLR, N-53 |
| 4 | 3 | Super Fursungi, AFDR, Arka Niketan |

Cluster mean of 14 onion genotypes is given below in table-3. Highest cluster mean was found for plant height, number of leaves per plant, collar thickness, fresh bulb weight (gm), dry bulb weight (gm), fresh bulb yield per plot (kg), marketable bulb yield per plot (kg), bulb size in diameter (cm), fresh bulb yield quintal per hectare, marketable bulb yield quintal per hectare in the cluster 3, whereas leaf girth was found highest in cluster 4, neck thickness in cluster 2, scales per bulb in cluster 4, loss % at 15 days after harvest in cluster 2 and TSS ($^0$Brix) in cluster 4. Among plant height cluster 3 has the highest mean value followed by cluster 1 and the lowest in cluster 2, leaves per plant cluster 3 has highest followed by cluster 1 and lowest was found in cluster 4, leaf girth was highest

**Table: 2.** The average of inter cluster (light values) and intra cluster (Bold values) of 14 onion genotypes is given below.

| Clusters | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 706.52 | 925.622 | 2488.118 | 1458.233 |
| 2 | | 440.465 | 1729.241 | 1293.290 |
| 3 | | | 448.915 | 1479.446 |
| 4 | | | | 619.974 |

**Table3:** Cluster mean of 14 onion genotypes of 15 different traits based on $D^2$ analysis.

| Cluster | Plant Height cm | Leaves/ Plant | Leaf Girth cm | Neck Thickness cm | Collar Thickness cm | Fresh Bulb Weight (gm) | Dry Bulb Weight (gm) | Fresh Bulb Yield/ Plot kg | Marketable Bulb Yield/ Plot kg | Bulb Size In Dia (cm) | Scales/ Bulb | Fresh Bulb Yield Q/ha | Marketable Bulb Yield Q/ha | Loss % At 15 days After harvesting | TSS ($^0$BRIX) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 58.781 | 7.459 | 1.350 | 0.707 | 13.832 | 65.765 | 55.207 | 6.577 | 4.801 | 5.341 | 6.298 | 190.721 | 139.249 | 16.111 | 9.561 |
| 2 | 55.586 | 7.278 | 1.300 | 0.789 | 15.297 | 82.119 | 68.421 | 8.211 | 6.146 | 5.392 | 6.831 | 238.147 | 178.220 | 16.677 | 9.649 |
| 3 | 61.043 | 7.623 | 1.320 | 0.610 | 16.364 | 85.621 | 72.149 | 8.566 | 6.694 | 6.493 | 7.017 | 248.304 | 194.112 | 15.751 | 8.804 |
| 4 | 58.252 | 7.058 | 1.413 | 0.502 | 15.176 | 77.681 | 65.437 | 7.769 | 5.880 | 5.976 | 7.634 | 225.812 | 170.498 | 15.757 | 10.104 |

in cluster 1 followed by cluster 3 and lowest was in cluster 2, neck thickness was highest in cluster 2 followed by cluster 1 and lowest was in cluster 4, collar thickness, fresh bulb weight (gm), dry bulb weight (gm), fresh bulb yield/plot (kg) and marketable bulb yield plot/ kg, fresh bulb yield quintal per hectare, marketable bulb yield quintal per hectare has got highest in cluster 3 followed by cluster 2 and lowest was in cluster 1, bulb size in diameter and scales per bulb has highest in cluster 3 followed by cluster 4 and lowest in cluster 1 and loss % at 15 days after harvest has highest in cluster 2 followed by cluster 1 and lowest in cluster 4 and TSS ($^0$Brix) has highest in cluster 4 followed by cluster 2 and lowest in cluster 1.Based on above results cluster 3 can be used as parents for plant height, number of leaves per plant, collar thickness, fresh bulb weight (gm), dry bulb weight (gm), fresh bulb yield per plot (kg), marketable bulb yield per plot (kg), bulb size in diameter (cm), fresh bulb yield quintal per hectare, marketable bulb yield quintal per hectare in the future hybridization programme. Crosses involving parents belonging to more divergent clusters would be expected to manifest maximum heterosis and wide variablility in genetic architecture (Singh *et. al*., 1987).

## Conculsion

Cluster distance revealed that intra cluster 1 (Line 28, U-103, L-355, U-101, Red Creole) and in cluster mean cluster 2 (N-2-4-1, AFLR, N-53) can be used as parents in future breeding programme and can be exploited for yield and yield contributing traits in Allahabad agro-climatic conditions.

## References

Arunachalam, G. (1981). Genetic distances in plant breeding. *Indian J. Genet.* **41**:226-236.

Akter1, M.S., A. Biswas, S.S. Siddique, S. Hossain and N.A. Ivy (2015). ”Estimation of Genetic Diversity in Onion (*Allium cepa* L.)” A Scientific Journal of Krishi Foundation *The Agriculturists,* **13(1)**: 26-34.

Chaurasia, P.C., Murlee Yadav and S.C. Ghosh (2012). “Genetic divergence in okra (*Abelmoschus esculentus* (L.) Moench.)”. *Vegetable Sc.,* **39(1)**: 63:64.

Mahalanobis. P.C. (1936). On the generalized distance in statistics. *Proc. Nation. Acad. Sci.* (India) **2**:49-55.

Mehta, Reetu, Diwakar Singh and M.K. Bhalala (2012). “Genetic divergence in muskmelon (*Cucumis melo* L.)”. *Vegetable Sc.,* **39(1)**: 76:78.

Mondal, M.A. (2003). Improvement of potato (*Solanum tuberosum* L.) through hybridization and *in vitro* culture technique. PhD Thesis. Rajshahi University, Rajshahi, Bangladesh.

Samsuddin, A.K. (1985). Genetic diversity in relation to heterosis and combining analysis in spring wheat. *Theoretical Appl. Genet.,* **70**:306- 308.

Shinde, K.G., U.M. Birajdar, M.N. Bhalekar and B.T. Patil (2012). “Genetic divergence in brinjal (*Solanum melogena* L.)”. *Vegetable Sc.,* **39(1)**: 103:104

Singh, S.K., R.S. Singh, D.M. Maurya and O.P. Verma (1987). Genetic divergence among lowland rice cultivars: Annual Report of Indian Agricultural Research Institute (IARI), New Delhi, India.

Singh, S.R., N. Ahmed, S. Lal, S.A. Ganie, Mudasir Amin, Nusrat Jan and Asima Amin (2013). “Determination of genetic diversity in onion (*Allium cepa* L.) by multivariate analysis under long day conditions”. *African Journal of Agricultural*, **8(45)** : 5599-5606.