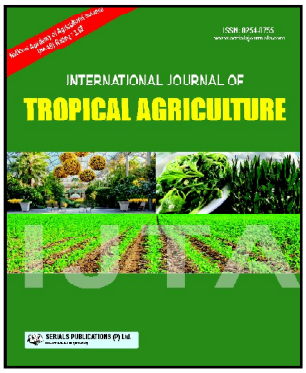

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Genetic Diversity in Rabi Onion (*Allium cepa* L.)

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Abstract: The experiment was conducted at scheme for Research on Onion storage, MPKV, Rahuri during Rabi season of 2012 to estimate the genetic diversity of onion. Twenty genotypes of onion were evaluated for 9 characters in a randomized block design to study the genetic divergence. D2 statistic indicated that the genotypes studied were genetically diverse. The genotypes under study were grouped into four clusters. Cluster III contained 10 genotypes, followed by cluster I (5 genotypes) and cluster II (4 genotypes). The cluster IV was monogenotypic. D^2 analysis suggested that in Rabi onion N-2-4-1, Sel 15, BRBO 1005, BRBO 1023 and ARBO 1007 were the most diverse parents. These genotypes could be utilized as parents in breeding programme to enhance the productivity of onion.

Key words: Genetic diversity, D^2 analysis, cluster, germplasm, Rabi onion.

INTRODUCTION

Onion (Allium cepa L.) is one of the important spice and vegetable crop grown in temperate (Brewster, 1990), sub-tropical (Corgan and Kedar, 1990) and tropical climate (Currah and Proctor, 1990) throughout the world. It is cultivated year round but maximum during Rabi season in our country. The crop is grown for variety of purposes from kitchen to factory made products/food and also for dehydration. It is valued for its distinct pungent flavor. 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. It is a photosensitive crop .To improve the yield through selection, information on the nature and magnitude of variability present in a population is an important prerequisite for starting any breeding programme. For a successful breeding program, the presence of

genetic diversity and variability play a vital role. Genetic diversity is essential to meet the diversified goals of plant breeding such as breeding for increasing yield, wider adaptation, desirable quality, pest and disease resistance. Selection of genetically diverse parents in any breeding programmes of immense importance for successful recombination breeding (Arunachalam, 1981). Therefore, the present study has been undertaken to estimate the genetic diversity of onion genotypes.

MATERIALS AND METHODS

The research work was carried out at scheme for Research on Onion storage, MPKV, Rahuri during Rabi season of 2012. The experimental site was situated in the western Maharastra region. Its geographical coordinates are 19° 23′ 0″ North, 74° 39′ 0″ east. The soil of the experimental field was sandy loam in texture having a pH around 6.5. The land was with uniform topography and almost homogenous in respect to soil fertility. The material comprised of twenty genotypes of onion (*Allium cepa* L.). The experiment was laid out in a randomized block design (RBD) with three replications. The unit plot size was 3 × 2 m^2. Row to row distance was 15 cm and plant to plant distance was 10 cm. Ten plants were selected at random in each plot to record the observations on plant height, neck thickness, leaves per plant, days to maturity, equatorial diameter, polar diameter, average bulb weight and TSS. The data was subjected to Mahalanobis D^2 statistics to measure the genetic divergence as suggested by Rao (1952).

RESULTS AND DISCUSSION

D2 statistics, a concept developed by Mahalanobis (1936) helps the plant breeder to classify the genotypes into different groups based on genetic divergence between them. Rao (1952) suggested the application of this technique for the assessment of genetic diversity in plant breeding. In the present study, the estimates of D2 values ranged from 0.07 to 155.94 in *Rabi* onion. The high range for D2 values indicated the presence of great amount of diversity in onion genotypes under study. High range for D2 values were also obtained by Patil (1984) and Shintre (1994).

The genotypes under study were grouped into four clusters in *Rabi* onion. In *Rabi* onion were grouped into four clusters. Cluster III contained 10 genotypes, followed by cluster I (5 genotypes) and cluster II (4 genotypes). The cluster IV was monogenotypic (Table 1). Shaha (1985) grouped 42 genotypes in 14 clusters in onion. Similar work reported by Murthy and Arunachalam (1966), Patil and Kale (1985), Mohanty and Prusti (2002), Gurjar *et al* (2003) and Rashid *et al* (2012).

Intra and inter cluster D2 values were worked out using D2 values from divergence analysis. In *Rabi* onion the minimum inter-cluster distance was observed in the cluster I and IV (D2 = 4.73), followed by cluster III and IV (D2 = 5.02) and cluster II and III (D2 = 6.40). Genotypes falling between cluster I and II exhibited maximum inter- cluster distances (D2 = 11.20) followed by cluster II and cluster IV (D2 = 7.89) and cluster I and cluster III (D2 = 6.68) indicating that genetic makeup of genotypes falling in this cluster may be entirely different from one another. The minimum intra-cluster distance was found in cluster I (D2 = 2.14). The maximum intra cluster distance was observed for the genotype falling in cluster III (D2 = 4.12) followed by cluster II (D2 = 3.49). This implies that these clusters have the genotype with varied genetic architecture. The cluster IV showed zero intra cluster distance due to monogenotypic nature.(Table 2)

In *Rabi* onion cluster means for nine characters reveled wide range of variability among the clusters for the characters plant height (57.15 to 74.80), days to maturity (107.33 to 116.00), average bulb weight (57.81 to 76.09) and yield per hectare (33.68 to 44.57) (Table 3). Earlier workers Dhotre *et al* (2010), Rashid *et al* (2012), Wamser *et al* (2012), Singh *et al* (2013) and Kale *et al* (2014) also reported wide variability among the clusters for yield and most of the yield contributing characters.

Table 1
Grouping of *Rabi* onion genotypes into different clusters.

Cluster Number	*Sub-Cluster*	*No of genotypes*	*Genotype*
1.	I	5	Sel 14, Sel 15, BRBO 1031, N-2-4-1, Sel 16
2.	II	4	BRBO 1005, ARBO 1007, BRBO 1023, BRBO 1018
3.	III	10	BRBO 1011, Sel 12, BRBO 1001, BRBO 1024, BRBO 1026, BRBO 1025, BRBO 1021, BRBO 1019, ARBO 1003, BRBO 1004
4.	IV	1	Sel 18

Table 2
Intra and inter cluster distance values of *Rabi* onion.

Cluster	*I*	*II*	*III*	*IV*
I	2.14	11.20	6.68	4.73
II		3.49	6.40	7.89
III			4.12	5.02
IV				0.00

Table 3
Cluster means for different characters studied in *Kharif* onion.

Cluster No.	*Plant height (cm)*	*Neck thickness (cm)*	*Leaves/ plant*	*Days to maturity*	*Equatorial diameter (cm)*	*Polar diameter (cm)*	*Avg. bulb wt (g)*	*TSS*	*Yield t/ha*
I	74.80	1.66	13.42	107.33	6.08	4.89	76.09	12.73	44.57
II	57.15	1.41	13.26	116.00	5.06	4.19	57.81	12.59	33.68
III	64.82	1.41	12.57	114.10	5.63	4.50	68.07	12.95	40.88
IV	70.97	1.59	14.20	109.33	5.64	4.33	61.88	12.07	36.10

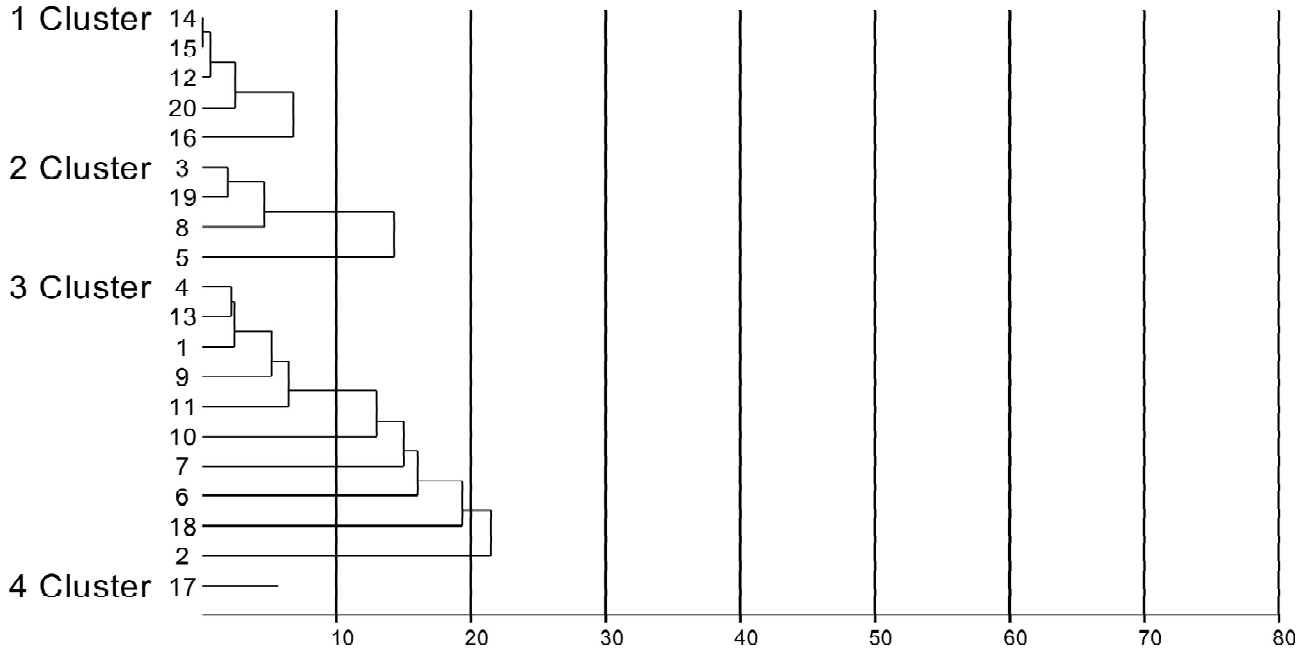

Figure 1 : Cluster diagram for 20 *Rabi* onion genotypes.

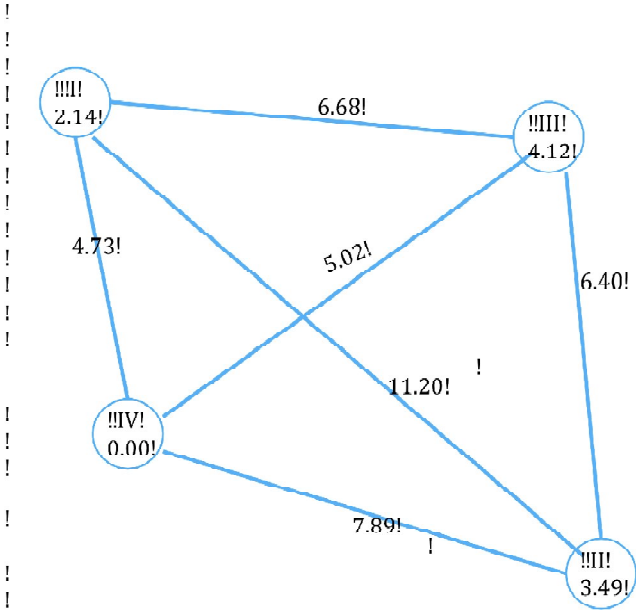

Figure 2 : Intra and inter cluster distances among 4 clusters in *Rabi* onion.

CONCLUSION

In overall D2 analysis for *Rabi* onion suggested genotypes N-2-4-1, Sel 15, BRBO 1005, BRBO 1023 and ARBO 1007 were the most diverse parents which could be used in crossing programme. The superior most diverse genotypes identified could be utilized in breeding programmes to improve and to widen the genetic base of onion for the selection of superior lines. Genotypes with multiple superior traits could be utilized for simultaneous transfer of multiple genes in crop improvement.

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