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Short Communication

Genetic divergence in extra early rice (*Oryza sativa* L.) under two culture systems

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The study was conducted with 30 extra-early rice (*Oryza sativa* L.) genotypes (< 100 days duration) collected from various parts of the country. The entries were raised in randomized block design with three replications under each culture systems. For direct-seeding the seeds were dibbled in the puddle soil and for transplanting the seedlings were raised and the seedlings were transplanted on twentieth day in the main field. Three seedlings were maintained in each hill and the spacing followed was 15 × 10 cms. Normal agronomic practices for direct-seeding and transplanting were followed. Observations were recorded for grain yield and its component characters on five randomly selected plants in each replication in each of the experiment and the datas collected were subjected to divergence analysis [1].

The analysis of variance revealed a significant difference among the thirty genotypes for all the twelve characters indicating the existence of high genetic variability among the genotypes in both the culture systems. Based on the relative magnitude of the D^2 values the genotypes were grouped into three and eight clusters in direct seeding and transplanted conditions (Table 1). It was observed that cluster I consist of maximum number of genotypes in both the culture systems, while the clusters II and III of direct seeding and cluster V, VI, VII & VIII of transplanting are monogcnotypic [2&3]. The variation in the clustering pattern of the two culture systems was presumably due to differential response of different traits in the two culture systems [4]. The limited genetic diversity expressed in direct seeding might be due to the full expression of genetic potential of some of the genotypes for some of the traits; while the effect on the other were relatively not so pronounced as indicated by the earlier workers [5].

The distribution of genotypes belonging to same geographical region in different clusters and grouping of genotypes collected from different locations in one cluster is common in both the culture systems. This clustering pattern revealed that geographic distribution has no roll in clustering of genotypes. On the other hand genotypes evolved at Ambasamudram were distributed in three clusters in both the method of crop establishment suggesting that this kind of genetic diversity might be due to differential adaptation, selection criteria, selection pressure and environment [7]. This indicates that genetic drift and selection in different environment can produce greater diversity than the geographic diversity [7].

The maximum inter cluster distance was observed between cluster I and III (34.76) followed by cluster II and III (31.58) in direct seeded condition (Table 2), while under transplanted condition cluster II showed the highest inter cluster distance with cluster V (41.13) followed by cluster II and IV (37.94) suggesting wide diversity between these groups. Hybridizations between parental lines selected from these clusters are likely to produce most variable progenies. As far as the cluster means are concerned different clusters have higher mean vales for different traits indicating that none of the cluster contained genotypes with all the desirable characters so recombination breeding between genotypes of different clusters is needed (Table 3).

With respect to the characters contributing for genetic divergence, days to flowering contributed for more divergence in both direct seeding and transplanting, while, dry matter production and 1000-grain weight also had a major role in deciding genetic divergence in direct seeding. Under transplanting, in addition to days to flowering, plant height also had more contribution towards genetic divergence. Thus based on the D^2 analysis, it has been understood that the culture systems has significant effect on the clustering pattern of the genotypes, the character contributing for divergence and on the cluster means. As a result while breeding varieties for different culture system divergence has to be studied in different culture systems.

References

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Table 1. Distribution of rice genotypes in different clusters in direct seeding and transplanting

Cluster No.	Direct seeding		Transplanting	
	Number of Genotypes	Genotypes	Number of Genotypes	Genotypes
I	28	RR 354-1, RR 347-166, RR-361, RAU 1344-3-2, RAU 1344-7, RRU 2840, OR 1590-3-S_1C, OR 1516-1-S_1A, OR1509-7-S_1A, IR 61608, PNR 591-21, PNR 591-71, PNR 591-18, PNR 519, PNR 162, AD 93060, AD 95134, AD 95157, AD 98017, AD 95128, AD 99153, AD 97220, AD 98013, AD 97230, ASD 17, MDU 5, Aidtya, Heera	20	RR 354-1, RR 361-1, RAU 1344-3-2, RAU 1344-7, OR 1509-3-S_1C, OR1509-7-S_1A, OR 1516-1-S_1A, PNR 591-21, PNR 591-71, PNR 591-18, PNR 519, AD 95157, AD 95128, AD 95134, AD 97230, AD 98017, AD 98013, ASD 17, MDU 5, Heera
II	1	AS-95119	2	PNR 162, AS 95119
III	1	ASD 8	2	RR 347-166, AD 99153
IV	-	-	2	RRU2840, ASD8
V	-	-	1	IR 61608
VI	-	-	1	AD 93060
VII	-	-	1	AD 97220
VIII	-	-	1	Aditya

Table 2. Intra and inter cluster divergence in direct seeding and transplanting

Cluster	I		II		III		IV	V	VI	VII	VIII
	DS	TP	DS	TP	DS	TP	TP	TP	TP	TP	TP
I	**271.14**	199.80	**793.97**	674.52	**1208.52**	342.69	791.73	743.85	291.71	469.38	367.62
	(16.46)	(14.13)	**(28.17)**	(25.97)	**(34.76)**	(18.51)	(28.13)	(27.27)	(17.07)	(21.66)	(19.17)
II			**0**	110.23	**997.56**	793.79	1439.87	1692.34	957.44	487.57	1266.41
				(10.49)	**(31.58)**	(28.17)	(37.94)	(41.13)	(30.94)	(22.08)	(35.88)
III					**0**	257.73	316.74	499.05	301.09	697.54	372.07
						(16.05)	(17.79)	(22.33)	(17.35)	(26.41)	(19.28)
IV							162.21	469.83	694.30	1310.43	499.41
							(12.73)	(21.67)	(26.34)	(36.19)	(22.34)
V								0	791.32	1088.28	489.79
									(28.13)	(32.98)	(22.13)
VI									0	751.18	467.19
										(27.40)	(21.61)
VII										0	1032.49
											(32.13)
VIII											0

Intra - cluster divergence - Diagonal values; Inter-cluster divergence - Off diagonal values; D values - Values in parenthesis; Bold values - Values of direct sown crop (DS); Unbold values - Values of transplanted crop (TP)

Table 3. Cluster means for twelve characters in direct sowing and transplanting

Characters\Clusters	I		II		III		IV	V	VI	VII	VIII
	Ds	Tp	Ds	Tp	Ds	Tp	Tp	Tp	Tp	Tp	Tp
Days of flowering	64.55	71.12	**72.00**	**75.99**	**60.66**	66.49	64.83	72.00	**64.00**	69.00	67.66
Days of maturity	90.36	97.71	**95.33**	**99.33**	**86.00**	92.66	**87.66**	97.33	88.00	99.00	96.66
Plant height (cm)	**92.35**	87.69	99.93	101.73	**141.20**	102.76	**117.76**	104.73	85.46	**84.93**	99.60
Panicle per hill	**9.75**	8.59	8.86	**7.43**	**8.60**	9.33	8.93	8.26	8.20	7.93	**11.13**
Panicle length (cm)	20.30	19.42	**25.48**	**21.97**	**19.46**	21.30	20.25	19.63	18.67	19.28	**18.05**
Panicle weight (g)	1.75	1.47	**2.76**	2.01	**1.74**	1.99	**2.03**	1.35	1.92	**1.18**	1.57
Spikelet fertility	**0.80**	0.79	**0.76**	0.80	**0.80**	**0.85**	0.79	0.76	0.74	**0.68**	0.77
Grains per panicle	**70.80**	59.86	**126.46**	78.56	72.06	76.03	59.89	56.33	**88.00**	**44.86**	55.40
100 grain weight (g)	2.35	2.32	**2.21**	2.17	**2.39**	2.36	2.33	**2.12**	2.16	2.42	**2.66**
Drymatter production (g)	**19.21**	13.56	26.65	20.17	**30.48**	15.96	16.14	13.19	11.72	**23.44**	**11.33**
Harvest index	**0.36**	0.38	0.33	**0.41**	**0.21**	0.40	**0.34**	0.38	0.40	0.38	0.37
Grain yield per hill (g)	8.46	7.87	**9.80**	11.10	**7.69**	9.23	8.38	7.59	7.24	**12.24**	**3.50**

Bold numerical indicate maximum and minimum values, Ds - Direct Sowing, Tp - Taransplanting

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