STUDIES ON QUALITY AND YIELD CONTRIBUTING CHARACTERS IN RICE (*Oryza Sativa* L.)

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ABSTRACT

Rice (*Oryza sativa* L.) is the most important cereal crop cultivation widely in many parts of the world. The present investigation was carried out to assess the genetic diversity of 57 genotypes of rice. The degree of divergence was computed using D^2 analysis. Fifty seven rice genotypes were received from Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar. Seeds of all genotypes were sown in raised bed. One month old seedlings were transplanted with a spacing of 15cm within the plant and 15cm between the rows. Experiment was laid in a randomized block design in two replications. Data on five randomly selected plants from each genotype were collected. The mean of replications was used for statistical analysis. Eleven quality and yield contributing characters were observed, they are number of productive tillers per plant, panicle length, number of grains per panicle, grain length, grain breadth, grain L/B ratio, kernel length, kernel breadth, kernel L/B ratio, 1000 grain weight and grain yield per plant. Genetic diversity was studied using Mahalanobis D^2 statistics. The genotypes were grouped into ten clusters. D^2 analysis showed the absence of parallelism between geographic origin and genetic diversity. The possibilities of heterotic expression for yield and its components by inter crossing among genotypes from different clusters have been indicated. The genotypes G25 exhibited higher expression for grain yield per plant and also exhibited higher mean expression for number of grains per panicle. The genotype G43 possessed higher expression for grain yield per plant. it also showed higher mean expression for 1000 grain weight. The genotype G7 possessed higher expression for grain length and grain L/B ratio .it showed higher men expression for kernel length and kernel L/B ratio. The maximum inter cluster distance was observed between clusters II and X followed by clusters II and IX .This clearly indicated that the genotypes included in these clusters had broad spectrum of genetic diversity. It is therefore suggested that the superior genotype from these clusters may be used as parents in the hybridization programme.

KEY WORDS: Quality, Yield contributing characters, D^2 analysis.
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INTRODUCTION

Rice (*Oryza sativa* L. 2n = 24) is the most important cereal crop cultivated widely in many parts of the world. The genus *Oryza* belongs to the tribe *Oryzeae* in the family Poaceae. Genus *Oryza* includes 24 species, out of which only two species *viz.*, *O. sativa* and *O. glaberrima* are cultivated. South and South-east Asia form the primary centre of genetic diversity of the cultivated rice (*O. sativa*). Rice thrives over a wide range of climatic conditions extending from 45°N to 40°S and from sea level to3000 m altitude. Rice is the staple food of 65 per cent of the total population in India. Rice is a major cereal source of energy, continuity in yield amelioration and stepwise stabilization in thus the most important philosophy in rice. The greater the genetic diversity in the germplasm, enhances the breeding potential and scope for improvement. Crosses between genetically diverse parents are likely to produce high heterotic effects and also produce a wide spectrum of variability in segregating generations. The Mahalanobis D^2 statistic is a very useful tool for estimating such genetic divergence.

MATERIALS AND METHODS

Fifty seven rice genotypes were received from Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar. The genotypes used for the present study are given in table 1. Seeds of all genotypes were sown in raised bed. One month old seedlings were transplanted with a spacing of 15 cm within the plant and 15 cm between the rows. Three hundred plants per genotype were maintained in each replication. Experiment was laid in a randomized block design in two replications. Normal nursery management and main field practices were followed. Need based plant protection measures were given. The data were collected from five randomly selected plants in each genotype per replication for all the characters. The following morphological characters were studied. Number of productive tillers per plant, Panicle length, Number of grains per panicle, Grain length, Grain breadth, Grain L/B ratio, Kernel length, Kernel breadth, Kernel L/B ratio, 1000 Grain weight and Grain yield per plant. Data on five randomly selected plants from each genotype were collected. The mean of replications was used for statistical analysis.

RESULTS AND DISCUSSION

The results of analysis of variance are presented in Table 3. Variances due to genotype were significant for all characters indicating that the genotypes selected for the present study were genetically divergent. The results obtained here are in confirmatory with the results reported earlier by Rao and Gomathinayagam (1997), Karthikeyan (2002) and Venkatesan (2004).

The mean performance of fifty seven rice genotypes for number of productive tillers per plant ranged between 6.20 to 14.60. The genotype G31 had the least number of productive tillers per plant. While the genotype G8 registered the highest number of productive tillers per plant. Twenty six genotypes had superior mean value than their general mean (9.58). Panicle length ranged from 17.13 to 26.98 cm. The genotype G39 was found to be shortest, while the genotype G48 registered the longest panicle length. Thirty genotypes were excelled than the general mean (21.32 mm). The range of mean performance for number of grains per panicle was 48.70 to 336.50. The genotype G36 had the minimum, while the genotype G25 registered the highest number of grains per panicle. Twenty two genotypes had superior mean value than their general mean 149.21. Grain length ranged from 7.50 to 10.50 mm. The genotype G25 had the shortest grain length, while the genotype G32, G53 registered longest grain 10.50 mm followed by G4.G5 (10.40), Thirty one genotypes excelled the general mean (9.18 mm). The mean performance for grain breadth ranged from 2.23-3.63 the minimum grain breadth was recorded by the genotype G7, while the genotype G35 registered the maximum grain breadth. Thirty two genotypes exceeded the general mean of 2.79 mm. Grain L/B ratio for the genotypes ranged from 2.17-4.49. The genotype G 46 had the lesser value, white the genotype G7 registered the higher value 4.49 followed by G4 (4.46). Twenty five genotypes exceeded the general mean of L/B ratio (3.34). The mean performance for kernel length ranged from 5.65 to 8.50 mm. The genotype G38 recorded the shortest kernel length of 5.65 mm. while the genotype G32 registered the longest kernel length of 8.50 mm. Thirty genotypes are exceeded the general mean of 6.97 mm. Kernel breadth ranged from 2.00 to 3.23 mm. The maximum number of genotypes had lesser kernel breadth (2.00 mm), while the genotype G35 recorded the high kernel breadth of 2.30 mm. Twenty six genotypes exceeded the general mean of 2.30 mm. The genotypes G29, G57 had the lesser value, while the genotypes G18 registered the higher value of 4.48 followed by G32 (4.25) twenty three genotypes had more L/B ratio than the general mean of 3.10. The mean performance of kernel L/B ratio ranged from 2.00 to 4.48. The mean performance of 1000 grain weight ranged from 12.30 to 25.50 grams. The genotype G28 registered the lowest value, while the genotype G5 (25.50 g) recorded the highest value followed by genotype G7 (25.30 g). Twenty nine genotypes recorded highest mean value than general mean of 19.96 g. The mean performance of grain yield per plant ranged from 7.85 to 58.26 g. The minimum value was recorded by the genotype G36, while the maximum value was recorded by the genotype G25 followed by G47 (49.27g). Twenty six genotypes recorded higher grain yield than the general mean (27.87g) Table 3.

The general mean for grain yield per plant was higher in the genotype G25 (58.26 g) followed by G47 and G43 (49.27 and 44.44 g respectively). The genotype G25 also exhibited high number of grains per panicle (336. 50). The genotype G47 showed better performance for panicle length (25.05 cm). The genotype G43 showed better performance in 1000 grain weight 8). The genotype G57 showed the lowest general mean value for (24.80 kernel L/B ratio (2.00). Among 57 genotypes, G25 recorded high pooled mean values for number of grains per panicle and grain yield per plant, followed by G43 which recorded high pooled mean value for grain yield per plant. The genotype G43 showed the highest pooled mean value for the character of 1000 grain weight followed by G57. The genotype G57 recorded highest pooled mean value for grain breadth and kernel breadth.

The divergence in fifty seven rice genotypes were assessed for eleven yield contributing characters. Fifty seven genotypes of rice were grouped into ten clusters using clustering technique. The composition of different clusters are presented in Table 4. The cluster I comprises twenty six genotypes which includes maximum number of genotypes. This was followed by cluster III having fourteen genotypes, cluster II have five genotypes, cluster IV have four genotypes, cluster V have three genotypes and VI, VII, VIII, IX and X with one genotype each. The intra and inter-cluster distances among ten clusters were computed and presented in Table 5. The intra cluster distance ranged from 0.00 to 34.62. Cluster III showed minimum intra-cluster distance (30.30) and maximum intra-cluster distance was exhibited by cluster V (34.62).

Maximum inter cluster distance was found between clusters II and X (380.39). This was followed by clusters II and IX (376.63) Minimum inter cluster distance was observed between clusters V and VI (35.59).

The cluster mean values for eleven characters were studied are furnished in Table 6. Maximum mean value for this number of productive tillers per plant was observed in cluster V (11.80). Minimum value was noted in cluster IX (7.10). In panicle length, the maximum cluster mean value of 23.35 cm was observed it cluster VI. Minimum mean value of 19.40 cm was recorded in cluster IX. The maximum cluster mean value for number of grains per panicle of 336.50 was observed in cluster X. Minimum cluster mean value of 48.70 was recorded in cluster IX. The maximum cluster mean value for grain length (10.10 mm) was recorded in cluster VI. The minimum mean value for grain lengths as recorded in cluster X (7.50 mm). In grain breadth the maximum cluster mean value of 3.18 mm was found in cluster VIII. The minimum cluster mean value of this character was exhibited by cluster IX and X (2.50 mm). For grain L/B ratio the maximum cluster mean value of 4.00 was observed in cluster IX. Minimum cluster mean value of 2.52 was registered in cluster VIII. The character kernel length, recorded maximum cluster mean value for this character was showed in cluster IX (8.00 mm). The minimum mean value for this was exhibited by cluster VII (6.00 mm). The maximum cluster mean value for this character kernel breadth was recorded in cluster VIII (3.00 mm). The minimum mean value for this character was exhibited by clusters VI, IX and X (2.00 mm). Maximum cluster mean value for this kernel L/B ratio character (4.00) was observed the cluster IX and minimum cluster mean for this was noted in the cluster V III (2.00). The maximum cluster mean value for the 1000 grain weight was recorded in cluster VII (24.80g). The minimum value for this character was exhibited by cluster V (13.87 g). Maximum cluster mean value for grain yield per plant was observed in the cluster X (58.26 g) and minimum cluster mean value for grain yield per plant was noted in the cluster IX (7.85 g)

The crosses between genetically diverse parents are likely to produce high heterotic effects and more variability in segregating generations. Genotypes are often found with differential phenotypic response to different environments. The D^2 statistic is used to estimate genetic divergence among the genotypes. Mahalanobis D^2 statistic is a potential tool for estimating genetic diversity, as has been emphasised by many workers (Murty and Arunachalam, 1966, Singh and Bains, 1968, Singh and Gupta, 1968 Arunachalam, 1981; Karthikeyan, 2002: Venkatesan, 2004;)

A genotype producing stable and high yield over environments for wider adaptability. The genetic character for the wide adaptability is mainly comprised of two component characters i.e., stability over environments productivity (Matsuo, 1975). The relative value of adaptability is determined, by the degree of stability and than that productivity (yielding ability) of respective genotype under various environments.

It has long been recognized that plants respond to changes in the environmental constitutions during the process of growth and development the yield and its components being quantitative in nature and more sensitive to environmental fluctuation, exhibit differential reaction in their phenotypic expression and also variation in the relationship among them, indicating the problem of direct selection for yield to obtain results.

The present study was perfectly planned and carried out in an effort to appraise the extent of genetic divergence and to evaluate the relative contributions of different components to the total divergence among 57 genotypes of rice for grain yield and attributing characters. Seven genotypes were selected based on the genetic divergence of different clusters from 57 genotypes. The present study was also undertaken to identify the stability in performance of selected seven genotypes for grain yield per plant and its component characters. The results obtained are summarised below.

The genotype G25 exhibited higher expression for grain yield per plant and also exhibited higher mean expression for number of grains per panicle. The genotype G43 possessed higher expression for grain yield per plant. It also showed higher mean expression for 1000 grain weight. The genotype G57 exhibited high expression for 1000 grain weight and also exhibited higher mean expression for kernel breadth. The genotype G28 possessed higher expression for number of productive tillers per plant. The genotype G49 exhibited higher expression for panicle length. The genotype G7 possessed higher expression for grain length and grain L/B ratio. It also showed higher men expression for kernel length and kernel L/B ratio. Fifty seven genotypes were grouped into 10 clusters using D clustering technique. Absence of parallelism was observed between geographical origin and genetic diversity as the genotypes from various geographical sources fell in one and the same cluster and vice versa. This study indicated that geographical races with different origins were distinct from each other. Local varieties and their derivatives were better adapted due to their homestic effect. The maximum inter cluster distance was observed between clusters II and X followed by clusters II and IX. This clearly indicated that the genotypes included in these clusters had broad spectrum of genetic diversity. It is therefore suggested that the superior genotype from these clusters may be used as parents in the hybridization programme.

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Table 1. Genotypes Used for the Present Study

Genotypes	Name of genotypes	Grain type	Genotypes	Name of genotypes	Grain type
G 1	KJT 3-2-67-10-21	LB	G 30	UPR 237-13-1-1	LS
G2	MTU 1067	MS	G 31	UPR 2431-22-2-1	LB
G3	AD 99110	MS	G 32	UPR 2442-5-2	LS
G4	NWGR 35	LS	G 33	RAU 729-12-44	LS
G5	NWGR 37	LS	G 34	RAU 649-108-5-9	LS
G6	NLR 34303	MS	G 35	Boro-3	MB
G7	RP 4081-450-32-10	MS	G 36	PSRM 1-16-48-11	LS
G8	AD 98254	MS	G 37	R 1070-2588-1-1	LB
G9	AUR 4	MB	G 38	R 1213-715-1-1	MS
G10	CN 1229-7-5-8-2	LS	G 39	R 1213-320-2-363-1	LS
G11	CB 20035	MB	G 40	HUR-BL-174	MB
G12	CB 20090	MS	G 41	HUR-DBS-7	MB
G13	CB 99019	MS	G 42	CR-WITA 12	LB
G14	IR 70810-23-NDR2-2-60	LB	G 43	CRAC 2221-67	LS
G15	IR 68830-NDR-1-1	MB	G 44	CRAC 2222-259	MS
G16	NDR 3128	LB	G 45	OR 1912-26	MS
G17	NDR 3130	LS	G 46	OR 2310-12	MB
G18	JKRV 100	MS	G 47	OR 2311-3	MS
G19	HKR 2000-3	LS	G 48	AAUR-2	MB
G20	HKR 2000-15	MS	G 49	AAUR-7	MB
G21	HKR 2000-58	LS	G 50	UPRI 2000-27	LS
G22	HKR 95-222	LS	G 51	P4	LS
G23	MTU-1072	MS	G 52	PAU 2881-22-1-3-	LS
G24	MTU-1073	SS	G 53	PAU 2963-42-1-3-2	LS
G 25	MTU-1074	MS	G 54	PAU 2964-30-1-6-2	LS
G 26	NWGR-46	MB	G 55	Jaya	-
G 27	NWGR-47	LS	G 56	Triguna	-
G 28	NWGR-48	MS	G 57	TRY-1	-
G 29	NR-17	MB			

Table 4. Composition of D^2 Clusters for 57 Rice Genotypes

Cluster	Number of genotypes	Name of genotypes
I	26	MTU 1067, NWGR 35, NEGR 37, RP 4081-450-32-10, AD 98254, CN 1229-7-5-8-2, IR 70810-23-NDR2-2-60, NDR 3130, HKR 2000-3,HKR 2000-15, HKR 2000-58, HKR 95-222, UPR 237-13-1-1, UPR 2431-22-2-1, UPR2442-5-2, RAU 729-12-44, RAU 649-08-5-9, R 1070-2588-1-1, CR-WITA 12, UPRI 2000-27, PAU 2881-2-1-3-1, PAU 2963-42-1-3-2, PAU 2964-30-1-6-2, Jaya, Triguna
II	5	MTU-1072, MTU-1073, OR 2311-3, AAUR-2, AAUR-7

III	14	KJT 3-2-67-10-21, AD 99110 , NLR 34303, CB 20035, CB 20090, CB 99019, NR-17, R 1213-715-1-1, HUR-BL-174, HUR-DBS-7, CRAC 2221-259, OR 1912-26, OR 2310-12, P4
IV	4	AUR 4, NWGR-46, Boro-3, R 13-320-2-363-1
V	3	JKRV 100,NWGR-47,NWGR-48
VI	1	IR 68830-NR-1-1
VII	1	CRAC 2221-67
VIII	1	TRY-1(LC)
IX	1	PSRM -16-48-11
X	1	MTU-1074

Table 2. Analysis of Variance of 57 Genotypes For Various Characters

Source	df	MSS										
		Number of productive tillers per plant	Panicle Length (cm)	Number of grains per panicle	Grain Length (mm)	Grain Breadth (mm)	Grain L/B ratio	Kernel Length (mm)	Kernel Breadth (mm)	Kernel L/B ratio	1000 Grain Weight (g)	Grain yield per plant (g)
Replication	1	0.27	1.01	1.05	0.04	0.00	0.00	0.01	0.00	0.00	1.07	8.36
Genotypes	56	5.69**	6.15**	5168.82**	1.59**	0.19**	0.64**	1.21**	0.21**	0.77**	26.99**	187.99**
Error	56	0.13	0.18	4.43	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.70
****significant at 1 per cent**												

Table 3. Mean Performance of 57 Rice Genotypes For 11 Characters

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No. of productive tillers /plant	10.40	10.30	10.70	9.80	10.30	11.00	11.00	14.60	13.30	11.20	10.80	10.70	10.40	11.30	9.40	8.30	7.60	11.50	9.30	7.60
Panicle length	20.18	21.18	22.16	22.50	22.25	21.46	21.47	21.72	19.09	18.61	19.51	21.90	20.84	23.90	23.35	21.62	19.98	19.94	20.98	21.92
No. of grains/panicle	186.00	158.60	161.20	122.60	123.20	158.00	120.60	127.10	109.60	127.25	119.15	141.00	202.00	118.20	114.50	114.30	135.10	182.50	139.75	130.85
Grain length	8.14	10.00	8.02	10.40	10.40	8.00	10.00	8.70	9.00	9.50	8.00	8.50	8.30	10.30	10.10	8.70	8.60	9.00	10.10	10.30
Grain breadth	2.54	2.70	3.00	2.38	2.50	2.50	2.23	2.34	3.00	2.41	2.85	3.00	2.81	2.80	3.00	3.05	3.00	2.29	2.41	2.41
Grain L/B ratio	3.21	3.70	2.67	4.46	4.16	3.20	4.49	3.63	3.00	4.09	2.81	2.83	2.96	3.69	3.37	2.86	2.87	3.93	4.19	4.27
Kernel length	6.14	8.00	6.00	8.00	8.00	6.00	8.00	6.50	7.00	7.60	6.00	6.50	6.15	6.90	7.50	6.70	6.95	6.95	8.00	8.00
Kernel breadth	2.04	2.20	2.50	2.00	2.00	2.00	2.00	2.00	2.50	2.00	2.40	2.50	2.20	2.03	2.00	2.50	2.29	2.00	2.00	2.00
Kernel L/B ratio	3.01	3.64	2.44	4.00	4.00	3.00	4.00	3.30	2.80	3.80	2.50	2.61	2.79	3.40	3.25	2.69	3.04	4.48	4.00	4.00

1000 Grain weight	14.60	24.60	18.60	22.30	25.50	19.50	25.30	18.40	14.80	24.75	19.25	18.35	17.25	21.50	15.60	21.60	20.60	14.10	24.35	20.25
Grain yield /plant	28.36	39.35	32.07	26.49	32.35	36.39	33.56	33.52	20.40	32.86	23.90	27.78	35.39	30.18	16.13	20.49	20.97	29.59	31.66	20.15

Table 3. Contd. . .

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No. of productive tillers /plant	9.10	10.70	7.10	11.50	13.10	7.90	12.30	11.60	7.30	7.40	6.20	8.50	7.70	6.70	7.50	7.10	9.30	9.30	10.70	8.70
Panicle length	20.59	19.30	21.05	19.83	22.11	21.40	19.60	19.50	21.30	21.60	22.04	19.65	23.25	17.65	19.40	21.15	19.25	20.91	17.13	21.90
No. of grains/panicle	112.20	124.10	224.40	241.55	336.50	109.30	125.50	130.85	168.00	140.00	138.30	109.40	139.65	146.25	106.30	148.70	106.50	114.85	102.10	136.50
Grain length	10.00	9.70	9.70	7.70	7.50	9.70	9.70	9.00	8.00	9.75	9.80	10.50	10.00	9.75	9.25	10.00	9.40	8.00	8.10	8.00
Grain breadth	2.50	2.85	2.85	2.68	2.50	3.00	2.50	3.00	3.15	3.15	2.90	2.50	3.00	2.63	3.63	2.50	3.06	3.00	3.00	2.56
Grain L/B ratio	4.00	3.41	3.41	2.88	3.00	3.24	3.88	3.00	2.54	3.10	3.38	4.20	3.33	3.72	2.55	4.00	2.96	2.67	2.70	3.20
Kernel length	8.00	7.00	7.00	5.70	6.00	6.70	7.00	7.00	6.00	7.75	6.90	8.50	8.00	8.00	7.25	8.00	7.00	5.65	6.00	6.00
Kernel breadth	2.00	2.35	2.85	2.41	2.00	2.41	2.03	2.00	3.00	2.63	2.38	2.00	2.50	2.00	3.23	2.00	2.83	2.13	2.50	2.00
Kernel L/B ratio	4.00	2.98	2.46	2.37	3.00	2.83	3.46	3.50	2.00	2.95	2.90	4.25	3.20	4.00	2.25	4.00	2.44	2.65	2.40	3.00
1000 Grain weight	24.50	18.45	20.80	15.50	15.60	15.10	15.10	12.30	16.50	24.70	24.90	23.10	22.70	22.30	17.60	22.70	25.40	13.70	21.50	15.60
Grain yield /plant	25.47	24.49	33.15	43.06	58.26	13.04	23.31	18.68	20.24	25.59	21.36	21.48	24.41	21.93	14.03	7.85	25.15	18.46	23.56	18.53

Table 3. Contd. . .

	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
No. of productive tillers /plant	8.50	11.20	9.50	9.70	9.30	7.30	9.50	8.80	9.30	9.10	9.50	9.70	8.30	8.30	9.30	10.50	10.90
Panicle length	22.08	21.60	19.45	19.54	22.45	21.05	25.05	26.98	22.50	24.38	23.28	21.03	22.28	22.55	23.05	23.00	21.60
No. of grains/panicle	150.90	136.90	188.60	178.25	165.75	167.40	256.15	287.10	266.00	104.50	175.30	104.40	101.80	102.00	150.80	122.90	163.10

Grain length	8.50	9.25	9.35	9.70	8.70	7.60	8.50	8.97	9.00	10.10	10.00	9.55	10.50	10.00	10.30	9.05	8.00
Grain breadth	2.63	2.50	2.63	3.00	2.85	3.50	3.10	3.14	3.00	3.00	3.00	3.00	2.50	2.50	2.50	3.07	3.50
Grain L/B ratio	3.07	3.70	3.57	3.24	3.05	2.17	2.60	3.00	3.00	3.37	3.33	3.19	4.20	4.00	4.12	2.95	2.29
Kernel length	6.00	7.00	7.35	7.00	6.90	6.00	6.00	6.47	6.50	7.60	7.00	7.10	8.30	7.06	8.00	6.88	6.00
Kernel breadth	2.10	2.00	2.14	2.29	2.41	2.75	2.75	2.69	2.50	2.55	2.50	2.50	2.07	2.00	2.00	2.63	3.00
Kernel L/B ratio	2.86	3.50	3.44	3.06	2.87	2.18	2.18	2.41	2.60	2.98	2.80	2.84	4.01	3.53	4.00	2.62	2.00
1000 Grain weight	21.88	24.20	24.80	15.60	18.10	18.10	20.25	17.20	17.50	18.70	19.30	24.90	17.70	22.50	22.50	21.70	24.10
Grain yield /plant	28.06	37.11	44.44	26.97	27.91	22.12	49.27	43.45	43.30	17.79	32.14	25.22	14.96	19.06	31.56	28.00	42.85

Table 5. Average Intra and Inter Cluster Values for 57 Rice Genotypes

CLUSTER	I	II	III	IV	V	VI	VII	VIII	IX	X
I	1005.17 (31.71)	7368.86 (85.84)	4819.29 (69.42)	18692.95 (136.72)	27089.90 (164.59)	83053.75 (291.78)	85133.25 (291.78)	87990.32 (296.63)	90455.59 (300.76)	106448.90 (326.27)
II		954.14 (30.89)	3861.34(62.14)	21995.25 (148.31)	36087.70 (189.97)	117937.1 (343.42)	121116.6	126200.8 (355.25)	141851.4 (376.63)	144695.50 (380.39)
III			918 (30.30)	2003.04 (44.76)	4517.35 (67.21)	16367.80 (127.94)	18316.70 (135.34)	20343.68 (142.63)	26145.36 (161.70)	36473.79 (190.96)
IV				937.30 (30.62)	1860.53 (43.13)	6913.96 (83.15)	11062.96 (105.18)	13883.31 (117.83)	16593.50 (128.82)	34790.45 (186.52)
V					1198.66 (34.62)	1266.26 (35.59)	4718.95 (68.70)	9176.77 (95.80)	13253.12 (115.12)	27224.97 (165.00)
VI						0.00 (0.00)	4677.44 (68.39)	9650.82 (98.24)	11643.70 (107.91)	30800.09 (175.50)
VII							0.00 (0.00)	2050.27 (45.28)	8868.74 (94.17)	17337.48 (131.67)
VIII								0.00 (0.00)	6858.96 (82.82)	19581.62 (139.93)
IX									0.00 (0.00)	27804.82 (166.75)
X										0.00 (0.00)

Table 6. Cluster Mean of 57 Rice Genotypes for Various Characters											
CLUSTER	**Number of productive tillers per plant**	**Panicle Length (cm)**	**Number of grains per panicle**	**Grain Length (mm)**	**Grain Breadth (mm)**	**Grain L/B ratio**	**Kernel Length (mm)**	**Kernel Breadth (mm)**	**Kernel L/B ratio**	**1000 Grain Weight (g)**	**Grain yield per plant (g)**
I	9.39	21.62	125.30	9.78	2.69	3.69	7.53	2.21	3.46	22.57	26.39
II	9.24	22.79	255.04	8.68	2.95	2.98	6.33	2.64	2.40	18.25	42.44
III	9.54	20.82	161.02	8.36	2.88	2.92	6.24	2.34	2.70	17.60	27.02
IV	9.85	19.76	106.83	9.01	3.16	2.87	6.74	2.66	2.57	17.25	17.76
V	11.80	19.68	146.29	9.23	2.60	3.60	6.98	2.01	3.48	13.83	23.86
VI	9.40	23.35	114.50	10.10	3.00	3.37	7.50	2.00	3.75	15.60	16.13
VII	9.50	21.60	188.60	9.35	2.63	3.57	7.35	2.14	3.44	24.80	44.44
VIII	10.90	23.00	163.10	8.00	3.18	2.52	6.00	3.00	2.00	24.10	42.85
IX	7.10	19.40	148.70	10.00	2.50	4.00	8.00	2.00	4.00	22.70	7.85
X	11.10	22.11	336.50	7.50	2.50	3.00	6.00	2.00	3.00	15.60	58.26