In the case of the two hybrids, SS 12B x 296 B and SS 4B x 648 B, the per cent hybrid vigour and *sca* effects were very high and the *per se* performance was also considerably high, in spite of the fact that the *gca* effects of either one or both of the parents were significantly low. In such cases the high heterosis may be due to contribution of non additive genes from both the parents. The hybrid vigour expressed in the hybrids in which 648 B was involved aptly confirmed the above view. The combinations SS 5B x 3660 B and SS 4B x 648 B considered as high and low combinations could result in the capitalisation of non additive effects over the super structure of additive gene effects.

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PATTERN OF SEGREGATION IN THE F2 PROGENIES OF RICE.

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ABSTRACT

The pattern of transgressive segregation in the crosses was positive in respect of days to flowering, panicle length, grain number per panicle and 100 grain weight, while it showed a negative trend for plant height. Early duration and high yielding segregants were predominant in the cross, Co 37/ADT 16. Four crosses viz., ADT 16/Co 33, Co 33/ADT 16, Co 37/ADT 16 and ADT 16/Co 37 recorded high percentage of late duration and high yielding segregants, while the cross Co 33/ADT 16 yielded a large number of transgressive segregants with profuse tillering, increased number of grains, high grain weight and high yield.

KEY WORDS : Rice, Segregation pattern

The F2 is the critical generation in rice breeding, as it determines eventual success or failure of the hybridization programme. (Jennings *et al.*, 1979). The typical F2 generation from diverse parents consists of a bewildering array of undesirable segregants, with a sprinkling of good ones. If the F2 segregates are not promising, the chances of finding superior recombination in the F3 or later generations are remote.

In the present study, three popular and high yielding varieties, namely, Co 33, Co 37 and ADT 16 were involved in a hybridisation to obtain six crosses. The mean performance, frequency distribution and pattern of segregation, the nature and

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extent of transgressive segregation were studied in the F2 progenies of these six crosses for seven quantitative characters.

MATERIALS AND METHODS

The material comprised of the F2 progenies of six inter-varietal crosses namely, ADT 16/Co 33, Co 33/Co 37, Co 37/ADT 16 and their reciprocals. During the first season 1984 (June-September), the F2 populations were raised in a randomised block design with two replications at Tamil Nadu Rice Research Institute, Aduthurai. In a replication each treatment consisted of five rows of 20 plants with a spacing of 20 x 10 cm. Observations were recorded on days to flowering, plant height, number of productive tillers per plant, panicle length, grain number per panicle, 100 grain weight and single plant yield.

The two hundred plants in the two replications were treated as a single unit for the purpose of statistical analysis. Mean, standard deviation, coefficients of variation and standard error computed for the parents and F2s in respect of all the seven traits, adopting the statistical methods suggested by Panse and Sukhatme (1961). The range of CV was catagorised as moderate (10-19%), high (20% and above) and low (below 10%). (Sivasubramanian and Madhava Menon, 1973 a)

Pattern of segregating in the F2 progenies was studied by determining the frequency of the plants counted according to fixed class intervals. The percentage of transgressive segregants was assessed for the yield and its four components.

RESULTS AND DISCUSSION

Regarding the days to flowering, the estimation of the means of the parents indicated that among the parents, Co 33 flowered early followed by ADT 16 and Co 37 respectively. But the crosses showed wide range of 58 to 129 days. The pattern of the F2 progenies also indicated transgressive segregation in both directions. The cross, Co 37/ADT 16 yielded high frequency of early duration segregants which had a range of 58 to 99 days, while the respective parents flowered in 78 and 84 days. The cross ADT 16/Co 33 also yielded similar early duration segregants, but in lower frequency. Similar early duration segregants were reported by Ranganathan *et al.* (1973), Balasubramanian (1975) and Natarajamoorthy (1979), in the intervarietal crosses of rice. Such early flowering segregants coupled with high yielding potential will offer good scope to develop high yielding lines. In the crosses involving Co 33 and Co 37, the trend of days to flowering was towards medium duration. However, early duration segregants were also observed in low frequencies in these crosses too.

In respect of plant height, parent ADT 16 was the tallest among the parents and the other two parents Co 33 and Co 37 were semidwarf. None of the F2 progenies exceeded the height of tall parent ADT 16, but exceeded height of the dwarf parent. Such extremely dwarf progenies were observed in the crosses, ADT 16/Co 33, Co 33/ADT 16, Co 37/Co 33, Co 37/ADT 16 and ADT 16/Co 37. Among these, the frequency of dwarf plants was high in ADT 16/Co 33 and the segregation pattern of this cross also showed negative skewness for plant height, indicating the predominant occurrence of dwarf segregants which was shorter than the dwarf parent, Co 33. ADT 16, being a tall parent, was found to produce high frequency of dwarf transgressive segregants, while the semi-dwarf parents, Co 33 and Co 37, produced medium tall segregants when they were involved in the crosses. The deviations of the expected segregation pattern for this trait might be under the control of modifier complexes on the major dwarfing genes, as reported by 'able 1. Phenotypic (P), genotypic (G) and environmental (E) correlation coefficients among characters in sorghum types (pooled)

Characters/ Parameters	Parents			Crosses					
	ADT 16	Co 33	Co 37	ADT 16 Co 33	Co 33/ ADT 16	Co 33/ Co 37	Co 37/ Co 33	Co 37/ ADT 16	ADT 16/ Co 37
1. Days to flowering									
Range	78-88	74-82	80-94	62-109	65-116	69-122	73-115	58-99	67-116
Mean ± S.E.	83.9 ± 0.18	78.2 ± 0.20	87.8 ± 0.26	92.8 ± 0.88	98.7 ± 0.64	100.9 ± 0.51	98.1 ± 0.50	80.9 ± 0.91	102.0 ± 0.61
C.V. (%)	2.4	2.9	3.2	11.0	7.7	6.0	6.0	12.7	7.0
2. Plant height(cm)									
Range	121-179	68-88	86-107	49-130	60-130	80-133	70-145	50-105	70-139
Mean ± SE	152.0 ± 0.53	79.9 ± 0.39	99.3 ± 0.47	87.2 ± 1.0	103.7 ± 1.0	114.2 ± 0.93	115.4 ± 1.1	90.3 ± 0.67	102.2 ± 0.71
C.V. %	6.0	5.3	5.2	17.0	13.8	11.5	13.7	10.5	9.9
3. No.of productive tillers/plant									
Range	3-12	5-16	5-16	2-21	3-24	3-24	2-22	2-22	2-24
Mean ± SE	8.0 ± 0.20	10.4 ± 0.23	10.9 ± 0.21	7.1 ± 0.22	10.9 ± 0.31	9.2 ± 0.29	9.2 ± 0.29	8.3 ± 0.27	9.3 ± 0.28
C.V. %	27.6	23.9	20.9	43.2	40.5	44.2	45.1	45.5	42.1
. Panicle length (cm)									
Range	16-26	19-26	20-27	16-31	18-31	19-31	13-34	13-31	15-30
Mean ± SE	22.1 ± 0.17	23.6 ± 0.17	24.8 ± 0.14	22.1 ± 0.23	25.1 ± 0.23	25.8 ± 0.19	25.9 ± 0.26	24.9 ± 0.18	22.8 ± 0.23
C.V %	8.4	7.8	6.3	14.8	13.0	10.4	14.1	10.2	14.4
. Grain No./panicle									
Range	72-177	42-124	61-137	59-179	53-179	52-164	61-196	67-198	51-221
Mean ± S E	104.6 ± 2.0	74.0 ± 1.6	97.0 ± 1.5	99.9 ± 2.0	95.3 ± 1.8	91.5 ± 1.7	96.1 ± 1.8	103.0 ± 11.9	95.4 ± 12.2
C.V. %	21.3	23.8	16.6	27.8	27.2	26.5	25.8	25.7	32.7
. 100 grain weight (g)									
Range	1.0-1.6	1.8-2.7	1.8-2.7	1.3-2.7	1.6-3.0	1.9-3.4	1.5-3.0	1.4-2.8	1.6-3.1
Mean ± S.E	1.3 ± 0.13	2.1 ± 0.02	2.3 ± 0.02	2.0 ± 0.02	2.3 ± 0.02	2.5 ± 0.03	2.3 ± 0.02	2.2 ± 0.02	2.4 ± 0.02
C.V %	10.8	11.6	8.9	17.5	12.9	13.9	13.3	12.0	12.0
7. Grain yield/ plant (g)									
Range	3.6-27.0	5.3-27.7	10.1-39.3	3.8-58.0	5.3-88.7	4.5-76.9	4.5-58.6	4.5-41.7	4.3-62.3
Mean ± S.E.	12.1 ± 0.43	16.0 ± 0.43	24.2 ± 0.56	13.6 ± 0.50	23.3 ± 0.83	21.1 +0.82	19.7 ± 0.64	17.8 ± 0.53	19.8 ± 0.61
C.V. %	39.0	29.4	25.2	51.7	48.9	55.1	45.8	42.1	43.6

Table 2. Transgressive segregation potential of the intervarietal crosses in the F_2 progenies

Crosses	Percentage of transgressive segregants in the F2 progenies			
	Yielding Early and low	YieldingLate and low	Early and high yielding	Late and high yielding
i) single plant yield Vs. days to flowering				
ADT 16/Co 33	13.5	16.0	15.0	18.0
Co 33/ADT 16	5.0	33.0	15.5	19.0
Co 33/Co 37	16.0	24.5	9.0	10.0
Co 37/Co 33	13.0	21.5	10.5	8.5
Co 37/ADT 16	29.0	7.0	19.0	19.0
ADT 16/Co 37	6.0	26.0	10.0	20.5
ii) single plant yield Vs. number of productive tillers per plant				
ADT 16/Co 33	23.5	0.0	6.0	12.5
Co 33/ADT 16	8.0	5.5	5.0	43.5
Co 33/Co 37	26.0	0.5	2.0	22.0
Co 37/Co 33	25.0	0.0	2.0	22.5
Co 37/ADT 16	19.5	0.0	4.0	14.5
ADT 16/Co 37	16.5	1.0	2.5	20.5
iii) single plant yield Vs. grain number per panicle				
ADT 16/Co 33	8.0	6.5	4.0	14.0
Co 33/ADT 16	4.5	5.5	15.5	25.0
Co 33/Co 37	4.5	7.5	6.5	16.5
Co 37/Co 33	7.0	19.0	7.0	14.0
Co 37/ADT 16	4.0	5.5	6.5	9.0
ADT 16/Co 37	13.0	8.0	8.5	12.0
iv) single plant yield Vs. 100 grain weight				
ADT 16/Co 33	17.0	15.5	6.5	9.0
Co 33/ADT 16	4.5	14.5	18.5	24.0
Co 33/Co 37	5.0	25.0	9.5	18.5
Co 37/Co 33	10.0	15.0	8.5	17.5
Co 37/ADT 16	23.5	21.5	3.0	8.5
ADT 16/Co 37	17.5	22.5	2.5	19.0

Sivasubramanian and Madhava Menon (1973 b), Latif and Zaman (1965) and Sukanya Subramanian and Madhava Menon (1973) in the F2 populations of rice.

Transgressive segregation for the number of productive tillers per plant was observed in all the crosses. High tillering segregants occurred in a large measure in the cross Co 33/ADT 16. The number of productive tillers per plant ranged from 3 to 6 in the parents, while it ranged from 2 to 24 in the F2 progenies. This offers scope for selecting plants with high tiller number. The positive trend of segregation of this trait will enable the breeder to exercise assured selection of the desirable segregants. Similar results were reported by Kaul and Bhan (1974), Nagesha (1976) and Verma *et al.* (1977) in rice varieties and Shanmuga sundaram (1975) and Balasubramanian (1975) in the F2 populations of rice.

Regarding the panicle length, transgressive segregation was observed in all the crosses. The cross Co 37/Co 33 and its reciprocal yielded higher frequency of segregants with longer panicles. In the cross Co 37/Co 33, senventeen out of 200 plants reached the panicle length of 31 to 35 cm which was greater than that of the parents involved in the cross, while in the crosses, ADT 16/Co 33 and ADT 16/Co 37, greater frequencies of plants were observed in the class interval of 16 to 20 cm which was lower than the parental values of 22.1 and 23.6 cm respectively. High frequency of plants with increased panicle length was observed in majority of the crosses especially in Co 33/Co 37 and its reciprocal, indicating the potentiality of the parents in improving this trait. A similar trend showing plants with increased panicle length in the F2 populations of intervarietal crosses was reported by Shanmugasundaram (1975) and Balasubramanian (1975) in the crosses involving Co 33 as one of the parents.

Regarding the grain number per panicle, there was not much difference in mean values between the parents and the progenies. However, the frequency of plants exceeding the higher parental limits was more in the F2 populations of five out of six crosses as shown by the transgressive segregation. In the cross ADT 16/Co 37, a single segregant exceeded 200 grains per panicle, as against the highest parental values of 177 and 137 grains per panicle.

With respect to 100 grain weight, there was much difference between the parents and progrenies for the mean values of this trait. In the crosses Co 33/ADT 16, Co 33/Co37, Co 37/Co 33 and ADT 16/Co 37, the progenies exceeded the better parental limit of 2.7 g. In the cross, Co 33/Co 37, forty one segregants with high 100 grain weight ranging from 2.9 to 3.1 g were observed. This cross also showed highest mean values for this character. High grain weight parents Co 33 and Co 37 might have transmitted this trait in a larger degree to their progenies. Ravindranath *et al.* (1983) also reported similar results in the F2 population of rice for this trait.

As far as single plant yield in concerned, both positive and negative trends in the F2 progenies were observed in all the cross combinations, revealing the potentiality of the high yielding parents Co 33 and Co 37. There was not much difference between the parental and progeny mean values for grain yield. The range was quite wide in the cross (3.8 to 88.7 g), as against the parental range (3.6 to 39.3 g). In the cross Co 33/ADT 16, a high frequency of plants exceeding the parental values was obtained and a particular segregant out of 200 plants recorded an yield of 88.7 g per plant. This offers scope for selection of high yielding palnts in rice improvement. Similar high yielding transgressive segregants were isolated by Sukanya Subramanian and Madhava Menon (1973).

An attempt was made to spot segregants which possessed desirable combinations of yield and any of its components. The desirable combinations of transgressive segregants were (i) early and high yielding, (ii) high tillering and high yielding, (iii) high yielding with high grain number and (iv) high yielding with high grain weight. The percentage of these desirable segregants in the present study ranged from 9.0 to 19.0, 12.5 to 43.5, 9.0 to 25.0 and 8.5 to 24.0 per cent respectively in the crosses. Among the six crosses, Co 37/ADT 16 yielded high percentage of early and high yielding segregants, while Co 33/ADT 16 yielded the other three combination in high frequencies indicating the potentiality of the cross.

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INDUCED DARK BROWN MUTANT IN MOTHBEAN

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ABSTRACT

Seeds of 'Jadia' variety of mothbean (**Vigna aconitifolia** (Jacq) Marechal) were treated with aqueous solution of 0.3% Ethyl Methane Sulphonate (EMS). Four mutants having dark brown seed coat colour, increased number of pods and early in maturity with varying plant characteristics were isolated in M 2. The mutants were studied further upto M 6 generation and the segregation not conforming to the mutant plant types were discarded and tested during kharif along with parent and superior checks. It was observed that mutants JMM-DBS-1, JMM-DBS-2 and JMM-DBS-3 consistently maintained their superiority in early maturity, higher number of pods per plant and maintained dark brown seed coat colour as compared to its parent Jadia and check Jwala having buff seed coat colour under varying rainfall situations. It is suggested that these JMM-DBS mutants could be utilized as genetic marker in future hybridization programmes.

KEY WORDS : Moth bean, Mutant, Seed Coat

Mothbean (*Vigna aconitifolia* (Jacq) Marechal) is one of the drought tolerant grain legumes grown mostly in arid zone of India. The seeds are rich in protein (22-24%) and used either whole or split, as a pulse. It is also a quality forage under arid and semi arid conditions (Henry and Singh, 1985). Existing varieties are chosen more for their survival under conditions of acute moisture stress of 'Thar desert' than for highe productivity. Smartt (1985) concluded tha moth bean crop is still existing i undomesticated form. The technique o mutation breeding offers a wide scope fo genetic improvement of mothbean in whicl limited narrow genetic variability i: available (Henry and Daulay, 1983).

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