

A Preliminary Note on the Study of Inter-racial Hybrids in Rice

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Introduction: In general, the rice varieties grown in Japan belong to *Oryza sativa* forma *Japonica* which are characterised by short stature, stiff straw, non-lodging habit, and have short and coarse grains. Generally they are heavy yielders, the average yield being 4,000 lb. of paddy (rice in husk) per acre. In addition, these varieties show definite response to fertiliser applications. The rices that are cultivated in India belong to *Oryza sativa* forma *Indica*. The *Indica* rices easily lodge in most of the cases and the average yield of these varieties is less when compared to that of *Japonica* rice. Hence to combine the useful genes that exist in the two different races of rice, crosses were effected at the Central Rice Research Institute, Cuttack and the hybrids were distributed to the different States for study. The present note deals with the observations recorded during the study at the Paddy Breeding Station, Coimbatore.

Materials and Methods: F₂ seeds of ten sets of the following crosses, namely GEB. 24 x Norin 1, Norin 6 x GEB. 24, Norin 18 x GEB. 24, GEB. 24 x Norin 23, Asahi x GEB. 24, GEB. 24 x Asahi, GEB. 24 x Rikuu 132, Rikuu 132 x GEB. 24, GEB. 24 x Tihoku 6 and GEB. 24 x Taichu 65 were received from the Central Rice Research Institute, Cuttack during 1952-53. The study in the F₂ generation consisted in growing single plants in rows one foot apart with a spacing of six inches between the plants in the row. Height of plants, number of ear bearing tillers per plant, pigmentation, presence of awn on the spikelet, number of grains and chaff in the panicle were the main features studied. In each set of cross not less than 500 plants were studied for the above characters and desirable progenies were selected. The progenies in F₃ generation were studied for the segregation of parental characters and response to heavy manuring by growing them under two different doses of manure. The heavy dose of manure used in the study consisted of 6,000 lb. of green manure, 225 lb. of superphosphate and 200 lb. of ammonium

sulphate per acre, the normal dose of manure being 4,000 lb. of green leaf, 150 of superphosphate and 100 lb. of ammonium sulphate per acre. Observations regarding growth under the two conditions were made periodically and counts of ear bearing tillers and height of plants, were recorded.

Observations: The F₂ progenies were found segregating for morphological characters like pigmentation, colour of foliage and pericarp and other attributes such as height of plants, tillering habit, thickness of culm and non-lodging character, length of panicle, size and arrangement of grains, tendency for production of awns and sterility. Variation for pigmentation was noticed to a great extent since the parents involved possessed these characters. The progenies were segregating for pigmented and non-pigmented plants as shown in Table 1. In general, non-pigmented plants were more than the pigmented plants. Variation for colour of foliage such as light green and dark green, was also noticed in few of the progenies. Presence of red riced plants was another feature though the parents were all white riced ones. A few plants of the *Japonica* parents grown along with the progenies for comparison were very short in stature having a height of about two feet with eight to twelve earbearing tillers per plant. The panicles were short with 30-40 grains per earhead. The progenies were segregating for dwarf and tall plants resembling the *Japonica* and *Indica* parents and for intermediate types. The mean height of *Japonica* types ranged from 1'-7" to 2'-0" that of *Indica* types ranged from 2'-10" to 3'-4" and that of intermediate types from 2'-2" to 2'-8". Counts of these types in the F₂ population consisting of not less than 500 plants in each cross revealed that Japonicas ranged from 1.5 percent to 21.2 percent, Indicas ranges from 33.5 percent to 79.9 percent and the intermediate types ranged from 16.9 percent to 62.2 percent. Similarly a record of the number of earbearing tillers made in each plant showed that the progenies resembling the *Japonica* parents had tillers ranging from 2.0 to 5.6, those resembling the *Indica* parents had tillers ranging from 6.2 to 8.9 and the intermediate types 5.2 to 7.6. A number of plants with stiff straw and non-lodging habit were also noticed. Sterility was prevalent to a great extent and unsetting of spikelets was predominant. The percentage of setting varied from nil to 100 and fully sterile plants were not uncommon. Very few plants with full fertility were met with. However, a count of fertile and sterile spikelets in each panicle from 25 plants in each of the hybrid which were carried forward for further study showed, a sterility percentage ranging from

21.0 to 32.3. Presence of awn was another interesting feature though the parents involved were awnless. Plants with tip, medium and long awned spikelets were noticed. The data collected from the study of the F₂ progenies are presented in Table I.

The performance of the F₃ progenies under ordinary and heavy manured conditions is shown in Table II. Only four sets of crosses consisting of 131 progenies were studied for their behaviour under these conditions. Height of plant and number of earbearing tillers of ten plants in each of the progeny were recorded and the mean for each set of cross is presented in the table. It may be seen from these data that the progenies had grown taller by two inches to six inches under heavy manuring than under ordinary manuring. Similarly the number of tillers are also more.

Summary of Results: Of the various attributed² studied in F₂ and F₃ generations of the different sets of inter-racial crosses, namely, *Oryza sativa* forma *Indica* and *Oryza sativa* forma *Japonica*, height of plant, productive tillers and spikelet fertility may be considered as important from the point of view of productivity. Japonicas are short statured and unsuitable for growing under our conditions. Hybrid progenies which combined good tillering, thick culm and non-lodging habit and fully fertile forms were met with and it appeared that further elimination of undesirable characters in the subsequent generations are quite possible by continuous selection. It also appeared from the study of the F₃ progenies under different conditions of manuring that they respond favourably well to higher fertility and it might be possible to fix up hybrids which would respond to heavy manuring. For achieving this, selection of progenies should be done by growing them under high fertility. Further studies in these directions are in progress.

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TABLE I. F2 Progenies

S. No.	Particulars	Pigmented Plants			Non-Pigmented Plants			Habit			Mean Height			Mean Tillers						
		Japonica %	Indica %	Intermediate %	Japonica %	Indica %	Intermediate %	Japonica %	Indica %	Intermediate %	Japonica ft. inch.	Indica ft. inch.	Intermediate ft. inch.	Japonica	Indica	Intermediate	Storility %			
1.	GEB. 24 x Norin 1	57.4	53.9	48.7	42.6	46.1	51.3	18.4	37.8	43.8	2	0	2	11	2	5	4.4	6.6	5.2	21.0
2.	Norin 6 x GEB. 24	1.7	14.4	1.1	98.3	85.6	98.1	21.2	47.1	31.7	1	11	2	10	2	6	4.9	6.3	5.3	23.5
3.	Norin 18 x GEB. 24	—	14.6	4.5	100.0	85.4	95.5	7.8	62.5	29.7	1	11	3	0	2	5	4.0	6.2	5.2	25.4
4.	GEB. 24 x Norin 23	—	11.6	2.9	100.0	88.4	97.1	15.7	53.4	30.9	1	10	2	11	2	5	2.0	6.5	5.2	23.3
5.	ASAHI x Norin 24	—	17.1	2.4	100.0	82.9	97.6	4.3	33.5	62.2	1	8	3	4	2	7	5.6	8.9	7.1	28.4
6.	GEB. 24 x ASAHI	10.0	9.1	—	90.0	90.9	100.0	3.6	35.2	61.2	1	7	3	1	2	6	5.4	7.7	7.6	25.1
7.	GEB. 24 x RIKUU 132	52.4	47.8	55.2	47.6	52.2	44.8	6.1	60.6	31.8	1	8	2	11	2	4	4.0	6.6	5.5	21.5
8.	RIKUU 132 x GEB. 24	40.0	57.2	56.1	60.0	42.8	43.9	7.1	66.3	22.3	1	7	2	10	2	2	4.4	6.7	5.8	26.3
9.	GEB. 24 x TIHOKU 6	—	13.6	5.3	100.0	86.4	94.7	4.0	69.0	25.3	1	9	3	0	2	5	4.8	7.0	6.0	27.0
10.	GEB. 24 x TAICHU 65	—	19.6	14.5	100.0	80.4	85.5	1.5	79.9	16.9	1	7	3	4	2	8	2.8	7.0	5.4	32.3

TABLE II. F3 Progenies

S. No.	Particulars of Cross	Number of Progenies			Mean Height			Mean Number of Tillers		
		Ordinary Manuring	Heavy Manuring	Storility %	Ordinary Manuring	Heavy Manuring	Storility %	Ordinary Manuring	Heavy Manuring	Storility %
1.	GEB. 24 x TAICHU 65	52	5.0	5.5	3'—0"	4'—0"	5.0	5.0	5.5	5.5
2.	RIKUU 132 x GEB. 24	26	5.3	6.5	3'—4"	3'—8"	5.3	5.3	6.5	6.5
3.	GEB. 24 x RIKUU 132	27	5.3	6.4	3'—5"	3'—9"	5.3	5.3	6.4	6.4
4.	GEB. 24 x TIHOKU 6	26	4.6	5.6	3'—9"	3'—11"	4.6	4.6	5.6	5.6

BIBLIOGRAPHY

1. Mitsui, S. (1952) Rice Production in Japan. Madras agric. J. 8, 456—57.
2. Narasinga Rao, M. B. V. (1951) Rice in other countries. Madras agric. J. 3, 169—70.
3. Narasinga Rao, M. B. V. (1953) Japan and Japanese Agriculture. Madras agric. J. 10, 463—65.
4. Ramiah, K. and Vachhani, M. V. (1950) Features of Rice work in Japan and how they differ from those in India. Indian Farming, Vol. XI, No. 3.
5. Ramiah, K. and Narasinga Rao, M. B. V. (1953) Rice Breeding and Genetics. The Indian Council of Agricultural Research, Scientific Monograph, No. 19.

Research Notes

A peculiarity of flowering in gingelly
(*Sesamum indicum* L.)

Flowering in gingelly is normally of the racemose type with a flower in each leaf axil. Two extra floral nectaries are found on either side of the flower. In a few varieties and types one or both of these nectaries develop into flower and produce capsules. The result is the characteristic whorled appearance in each leaf axil and the type is described as 1 to 3 flowers in an axil. This is obviously an economic character in that the production of capsules per plant is increased. An extracted pureline X-52-a (cross between S. I. 61, Dholka & S. I. 1, Local) is the standard type for the character maintained on this Research Station. Even in this type a few leaf axils may produce only a single or two flowers but a majority have three flowers. A selection S. I. 1047 from the local variety of Samlkot also exhibits this character.

Though found in only a few varieties this character breeds true to type and has therefore been taken as a distinguishing feature in the classification of gingelly varieties by KashiRam (1930), Rhind & Thein (1933) and Hilterbrandt (1932). The inheritance of this character was worked out by John (1934), who found that single flower in an axil is dominant to 1 to 3 flowers in an axil.