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EFFECT OF TYPES OF SEEDLING NURSERIES ON THE PERFORMANCE OF TEN CULTIVARS GROWN AS TRANSPLANT AUS RICE

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Seedlings of 10 cultivars namely, Dharial, Kataktara, Charnock, Dular, Marichbati, MIFB-322–1, Taichung (Native) 1, IR8–288–3, IR5–47–2, and Peta, were raised in 3 different types of seedling nurseries—'Floating', 'Normal', and 'Dapog'—and transplanted, as *aus* crop at the age of 26 days.

Floating nursery was found to be the best type of seedling nursery for local cultivars, while the types of seedling nurseries had no measurable effect on the grain yield of the exotic varieties. A maximum yield of about 61 maunds of grains per acre was obtained in case of IR8 and IR5. Relatively lowest grain yield of about 38 maunds per acre was recorded in Marichbati and Charnock. Dharial, Kataktara, Taichung (native)1, and Dular were intermediate in grain production.

Aus rice in East Pakistan is usually grown as a directseeded broadcast-sown crop. Experimental evidences[5,7] indicate, however, that *aus* rice can also be grown as a transplant crop. For at least two reasons, growing of *aus* rice as a transplant crop is advisable provided irrigation water is available. Firstly, in growing *aus* rice in the normal way the cost of weed control by hand is excessively high and, with irrigation water available, this cost may be considerably reduced by growing the crop as a transplant one. Cost of water is likely to be lower than the cost of hand weedings. Secondly, the high yielding exotic cultivars of rice that have been brought into the country, especially from IRRI, seem to be better suited to transplantation than to direct seeding.[7] Higher yield in transplant crop than direct seeded broadcast crop has been explained to be primarily due to better plant spacing[9] in a transplant crop.

Seedlings for transplant rice are raised in different ways in different rice growing countries of the world. While growing seedlings on a seedling nursery on land, wet or dry, is the most widely used normal method of seedling raising in most of the rice growing countries, a type of seedling nursery, called 'Dapog', is extensively used in some parts of the Philippines.[4,8] Again, 'floating' type of seedling nursery made on water bodies like ponds, tanks, and beels, is also occasionally used in some areas of East Pakistan. The results reported in this paper were obtained by growing ten selected exotic and local cultivars of rice as a transplant *aus* crop with seedlings raised in three types of seedling nurseries, Floating, Dapog, and Normal.

Materials and Methods

The experiment was conducted at the Agronomy Field Laboratory of the East Pakistan Agricultural University, Mymensingh. The experimental field belonging to the Bramaputra Alluvial Soil tract[3] of East Pakistan, was a medium high land with silt loam soil having a pH range of 6.6 to 6.8. Five local cultivars, namely, Dharial, Kataktara, Charnock, Dular, and Marichbati and 5 exotic cultivars, namely, MIFB–322–1, Taichung (native) 1, IR8–288–3, IR5–47–2, and Peta were included in the present study. Seedlings of all the rice cultivars were raised in 3 different types of seedling nurseries—Normal, Floating, and Dapog.

Normal seedling nurseries were made in drums (dia 23 in, height 18 in) filled up with well prepared loamy soil. The soil in the drums was fertilized with urea, treble superphosphate and muriate of potash to apply 28 lb N, 12 lb P (element) and 30 lb K (element) per acre in addition to 4.4 tons of cowdung. The manure and fertilizers were thoroughly mixed up with the upper 6 in of soil. Cowdung was applied 7 days before sowing and the fertilizers were applied 2 days before sowing the seeds in the nursery. Three-day sprouted seeds were then sown in the nursery on 25-4-1968 and the seeds were covered with a thin layer of soil to avoid drying. The nursery was irrigated as and when necessary until the seedlings were uprooted for transplantation in the crop field.

In the case of floating seedling nursery, a floating bed was prepared with bamboo matting placed on a raft of banana stems floating on water in a pond. The bed was plastered with a layer (1.5″ thick) of mud rich in humus. Three-day sprouted seeds were then sown in the bed on 25-4-1968. Care was taken so that the seed bed remained just on the surface of water and that the bed did not hold standing water on it. No manure and fertilizer were applied in the seed bed.

For the purpose of raising rice seedlings in Dapog method, a compact, levelled, and flat bed

was prepared with soil to a height of 2 in from the ground. A piece of polyethylene sheet was spread on the raised bed. The polyethylene sheet was kept in position by fixing some small pegs along the sides of the bed. Three–day sprouted seeds were then sown thickly over the bed on the same day as in the other two types of seedling nurseries. The seeds were kept moist by frequent splashing and sprinkling of water and the nursery was protected during day time from the scorching sun by providing a temporary removable shade to it. During the first few days the seedlings were pressed down lightly by hand in order to keep the roots of the seedlings in contact with the polyehylene sheet so that they could absorb necessary moisture from it. No fertilizer was applied.

Twenty–six–day old seedlings were transplanted in the main field on May 18, at a constant spacings of 10″ × 10″ in straight rows with 2 seedlings per hill. The crop was fertilized with urea, treble superphosphate and muriate of potash to apply 47 lb N, 20 lb P (element) and 40 lb K (element) per acre in addition to 1.8 ton of cowdung. Half of N and the whole of P and K were applied one day before transplantation and the remaining half of N was top dressed at the panicle initiation stage[6] of the crop. The total rainfall received at the experiment station during the period of experimentation (April to October, 1968) was 67.57 in with daily average maximum and minimum temperatures being 98.47 and 76.37°F respectively. While the daily maximum and minimum air humidities were 89.66 and 56.25 percent respectively, the day lengths from 12.55 in April to a maximum of 13.40 hr in June with a minimum of 11.52 hr in October.

The experiment was laid out in split-plot design with cultivars in the main plots and the types of seedling nurseries in the unit plots, using three replications and a net plot size of 1/580.8 acre. In each unit plot, ten hills were selected at random at the early stage of plant growth and the data in respect of average number of shoots per hill at harvest, average number of ears per hill, average number of flowers per ear, average number of grains per ear, percent fruit setting, weight of individual grain (in terms of 1000–grain weight), average ear length, and average plant height at harvest were collected from them. The total grain and straw yields of each plot were separately processed to a storable state and the yield data were collected. The grain–straw ratio was calculated out in the normal way.

Results and Discussion

Results obtained in respect of the different crop characters studied have been presented in Tables 1, 2, and 3. Statistical significance of the mean differences was adjudged by the LSD method.[10] However, the Standard Earror (S.E.) for each character studied has been indicated in the tables to enable the readers to use other methods, if desired, to determine the significance of the mean differences.

In rice, grain yield is the joint function of the number of hills per unit area, the average number of ears per hill, the average number of grains per ear, and the average individual grain weight. It will be evident from the results, presented in Table 1, that the nursery types significantly influenced the production of per ear grains, with the average number of ears per hill and the average weight of 1000–grains remaining unaffected. The floating nursery seedlings produced significantly the highest number of grains per ear whereby it ultimately yielded significantly highest grain yield. Since the number of hills per unit area was constant and since the grain yield contributing characters like the number of ears per hill and the weight of individual grains remained unaffected by the seedling nursery types (Table 1), the only single character which contributed to the increased grain yield production in the 'floating seedlings was evidently the highest number of per ear grains.

It has been reported[1] that the dapog seedlings give higher grain yield than that of normally raised seedlings, raised either in dry or wet system, probably because the 'dapog seedlings do not suffer from any root or stem injury while they are taken out from the seed bed for transplanting in the field. Pande and Mittra[8] obtained higher grain yield from dapog seedlings than from the normally raised seedlings. They suggested that the higher grain yield in dapog seedlings was due to the fact that the roots of the dapog seedlings were not injured at the time of removal from the nursery unlike other methods. The root injury of the seedlings delays their establishment after transplantation. In the present experiment the dapog nursery was found to produce significantly the lowest amount of grains. The age of the seedlings transplanted was, most probably, responsible for this lowest yield. Pande and Mittra[8] stated that the success of dapog nursery seedlings was dependent upon the age of the seedlings transplanted. For successful crop production, the dapog seedlings should be transplanted, they suggested, when they are 12–14 days old. Iso[4] reported that dapog seedlings of 9–12 days were suitable for transplanting and he suggested that any increase in the seedling age might reduce the value of the seedlings. Grist[2] stated that the dapog seedlings should be transplanted within two weeks after germination. In the present experiment the

seedlings raised in the 3 different types of nurseries were transplanted at the age of 26 days. The prolonged nursery period was, most probably, the main reason for reduced grain yield in the dapog seedlings. An important point may be mentioned here that due to their normally short stature, dapog seedlings are quite likely to be at a great disadvantage in most of the transplant *aman* rice areas of East Pakistan. However, in transplant *aus* rice, seedling stature may not be any problem.

So far the straw yield was concerned, 'dapog seedlings produced the highest amount of straw per acre (Table 1). The highest straw yield in the dapog nursery seedlings was due to the production of highest number of shoots per hill (Table 1). Although the plants produced by the floating seedlings were significantly taller than that of the dapog seedlings, the dapog seedlings produced excessively higher number of shoots per hill than did the floating seedlings. This ultimately contributed to the higher straw yield, though not significant, in the dapog nursery seedlings than in the floating seedlings. The normal seedlings produced shortest plants and lowest number of shoots per hill and ultimately gave significant the lowest straw yield.

It will be evident from Table 2 that there was a significant interaction between the seedling nursery types and the different cultivars under study in respect of grain yield production. The floating nursery was, in general, superior to dapog as well as normal nurseries in respect of grain production, particularly in the case of the local cultivars. In

TABLE 1.—EFFECT OF SEEDLING NURSERY TYPES ON THE YIELD CONTRIBUTING CHARACTERS AND THE GRAIN AND STRAW YIELDS OF TEN CULTIVARS GROWN AS TRANSPLANT *aus* RICE.

Crop character / Nursery type	Average number of ears per hill	Average number of grains per ear	Weight of 1000 grains (g)	Grain yield per acre (mds.) 1 md.= 82.28 lb =37.355kg)	Average number of shoots/hill at harvest	Average plant height at harvest (cm.)	Straw yield per acre (mds)) 1 md= =82.28 lb =37.355 kg)
1	2	3	4	5	6	7	8
Floating	11.56a	136.46a	25.05a	49.54a	13.94b	94.65a	73.10ab
Dapog	11.56a	124.39c	25.13a	44.03c	15.78a	92.96b	73.54a
Normal	11.44a	131.65b	25.11a	47.10b	13.4b	92.54b	70.56b
S.E.±	0.148	1.521	0.052	0.335	0.253	0.452	1.025
LSD p=0.05		4.35		0.96	0.72	1.29	2.93
LSD p=0.01		5.82		1.28	0.97	1.73	3.92

In a column, values followed by no common alphabet are significantly different from each other. Values followed by a common alphabet are statistically identical.10

TABLE 2.—INTERACTION BETWEEN THE TYPES OF SEEDLING NURSERIES AND THE CULTIVARS OF RICE UNDER STUDY.

Nursery type	Grain yield, maunds per acre									
	Dharial	Kataktara	Charnock	Dular	Marichbati	MIFB 322-1	Ttaichung (native)1	IR 8	IR 5	Peta
Floating	56.05a	52.56a	46.17a	49.08a	43.56a	40.08ab	45.30b	60.98a	60.12a	41.53ab
Dapog	46.46c	36.30c	32.82c	44.72b	34.27b	41.53a	40.08c	62.44a	61.57a	40.08b
Normal	51.69b	49.08b	36.30b	43.56b	35.14b	38.04b	52.56a	60.11a	60.98a	43.56a

S.E.=±1.061. LSD at p=0.05, 3.03; LSD at p=0.01, 4.06

In a column, values followed by no common alphabet are significantly different from each other. Values followed by a common alphabet are statistically identical.10

TABLE 3.—IMPORTANT CROP CHARACTERS OF TEN SELECTED CULTIVARS OF RICE GROWN AS TRANSPLANT *aus* RICE IN EAST PAKISTAN.

Variety	Hill population per acre	Average number of shoots/hill	Average number of ears/hill	Average number of flowers/ear	Average number of grains/ear	Percent fruit setting	Weight of 1000-grains (g)	Average ear length (cm.)	Average plant height at harvest (cm)	Grain yield per acre (md.) (1 md.=82.28 lb. =37.355 kg.)	Straw yield per acre (maund)	Grain-straw ratio
IR8-288-3		16.27c	12.43cd	148.77bc	135.47bc	91.00bc	30.73b	24.51de	66.96e	61.18a	65.69b	0.93a
IR5-47-2		19.67a	14.63ab	145.00bc	129.58cde	90.24c	24.89c	25.26cd	98.50d	60.89a	130.04a	0.47f
Dharial		11.49d	10.59ef	138.63c	132.69bcd	95.63a	28.85c	24.66de	97.55d	51.40b	56.03cd	0.92f
Kataktara		10.47de	9.43fg	159.50b	139.10bc	87.04d	22.63h	25.50c	103.06c	45.98bc	53.52cd	0.86b
Taichung (native)1		18.99a	15.62a	100.43d	92.82f	92.38b	24.27f	21.83f	60.01f	45.98bc	56.92cd	0.81c
Dular	62,726	9.88e	8.94g	151.21bc	143.63b	94.98a	26.97d	24.98cd	105.65bc	45.79bc	52.72cd	0.87b
Peta		17.67b	11.48de	179.01a	128.18cde	71.71g	23.50g	30.19a	134.33a	41.72cd	142.13a	0.30g
MIFB-322-1		18.71ab	13.46bc	144.33bc	119.58be	82.83f	19.63i	25.07cd	61.97f	39.88cd	72.71b	0.55e
Charnock		10.52de	9.73fg	186.63a	168.53a	90.32c	17.82j	27.72b	99.17a	38.43d	50.19d	0.76d
Marichbati		10.38de	9.01g	139.71c	118.73e	84.96e	31.67a	24.10e	106.65b	37.66d	44.04d	0.85b
S.E.±		0.432	0.477	5.305	4.546	0.692	0.094	0.258	1.147	2.215	4.757	0.009
L.S.D. p—0.05		1.28	1.42	15.76	13.51	2.06	0.28	0.77	3.41	6.58	14.13	0.03
L.S.D. p—0.01		1.76	1.94	21.59	18.50	2.82	0.38	1.05	4.67	9.01	19.36	0.04

In a column, values followed by no common alphabet are significantly different from each other. Values followed by one or more comn on alphabets are statistically identical.10

the exotic cultivars, however, the seedling nurseries were almost identical in their influence on the grain production.

It may be recalled, as stated earlier, that no fertilizer was applied in the dapog nursery and the seedlings were transplanted at the age of 26 days. The dapog seedlings might have suffered due to want of proper nutrients while in the seed bed for prolonged period.

The 10 different cultivars included in the present study were found to differ significantly in their respective average number of ears per hill, average number of grains per ear, and weight of 1000 grains and ultimately they gave significantly different grain yields (Table 3). A maximum yield of about 61 maunds of grains per acre was produced by both IR8 and IR5 individually. Charnock and Marichbati produced the lowest grain yield of about 38 mds per acre, while Dharial, Kataktara, Taichung (native)1 and Dular were intermediate in grain production.

From Table 3 it will be clearly evident that the cultivars under study were also variable in their respective abilities in producing straw. This variation of straw yielding abilities was associated with the production of variable numbers of shoots of variable heights by the cultivars under study.

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