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SCREENING OF RICE GERMPLASM FOR HIGHER YIELDS AND PEST RESISTANCE

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The Andaman and Nicobar group of Islands (4 to 6oN lat. and 92 to 94oE long.) with about 3000 mm rainfall has typical hot and humid climate favourable for growing rice as well as pests multiplication. Rice is grown in about 12,000 ha. With an average yield of 2 t/ha, probably the low yield is due to the age old practice of growing long duration varieties coupled with pest incidence. It is estimated that by 2000 AD, the requirement of rice will be 69,000 tonnes for an expected population of 4.5 lakhs. This target has to be achieved in rice cultivable area with the high yielding short duration and pest resistant varieties. This paper gives details on the evaluation studies carried out. 1817 cultures were screened in a phased manner from 1984 to 1992-93 procured from different agroclimatic zones. Twenty four high yielding accessions with resistant to sheeth blight, and blast and bacterial blight, were isolated. Accessions with resistance to the specific diseases were also identified.

Key words : Rice, germplasm, yield, pest resistance

The Andaman and Nicobar groups of islands in addition to its natural beauty have strategic importance for the nation. It lies in the Bay of Bengal between 4-6°N latitude and 92 to 94°E longitude. It has true maritime climate with least variation in maximum and minimum temperature throughout the year (Fig-1) The agricultural history starts in these Island around 1790, however, major agricultural activity started with the arrival of Lord Mayo in 1870. Till 1931, only about 18,000 hectare of land was cleared of the forest. Major clearing of land was taken up during post independence period for settlement of refugees from East Pakistan, repatriates from Sri Lanka and Myanmar. With these people, their staple food rice must have arrived and cultivation started. During 1942-44 when these Islands were under Japanese occupation, some rice varieties from lower Myanmar have also been introduced. The Karan tribes of Burmese origin brought some traditional varieties of Rice like Pe-Wah, Pe -tha etc. Out of 40,000 ha cultivable, land the rice occupies an area of 12000 ha and cultivated in different environments like upland, lowlands, saline and sandy soil conditions as rainfed. Though the Islands average rainfall is 3000 mm per year spread over in a period of 6-8 months the average yield

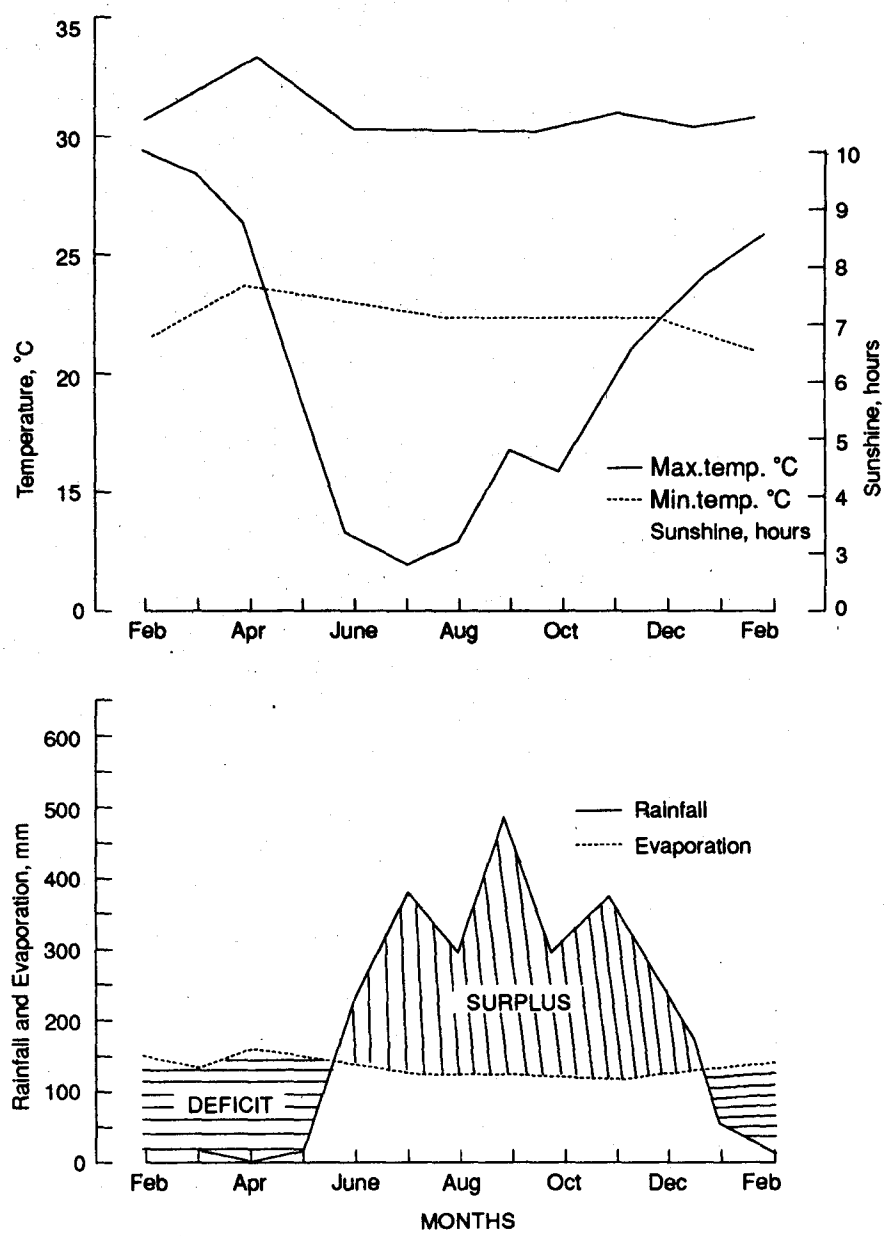

Fig. 1. Rainfall, O.P. evaporation, temperature and sunshine hours at Port Blair (average of 3 yrs.)

is 2t/ha with a single crop of rice between June to December. Several constraint are responsible for low production. The most important among them are fragmented holdings, non- availability of inputs, poor mechanization, poor inherent fertility (Fel-toxicity), weed growth, disease (Blast, sheath blight and bacterial blight) insects (stem borer, gundhi bug) attack. Due to these factors,

double cropping with high yielding varieties are not precipitating to farmers level. To overcome some of these problem and to encourage double cropping, Central Agricultural Research Institute, Port Blair has started screening and breeding rice varieties suitable for these islands.

MATERIALS AND METHODS

Experiment No. 1: Screening of rice germplasm

All the varieties received during that year were grown in R.B.D. in a plot of five lines with 1.5m long. All recommended agronomical practices were followed with a fertilizer dose 90:60:60 N.P.K where N was given in three splits. All biometrical observations and disease score were recorded. Most promising lines with resistance to common major diseases were selected for further trials.

Experiment No. 2: Yield and yield attributes

Most promising lines with initial higher yields and good grain quality in each maturity groups were grown in R.B.D. with the recommended agronomical practices and standard spacing. All other biometrical observation like days to flowering, plant height, panicle length, ear bearing tiller per hill, number of grains per panicle, test weight and yield were recorded. The disease incidence were recorded as per the IRRI standard evaluation system. (IRRI, 1980).

Experiment No. 3: Large scale yield trial

The five best performers have been selected for this study. They were grown in plot of 0.3 h at different location (Middle Andaman and South Andaman) in the farmers field under the Lab to Land project and national demonstration programme for yielding ability. All agronomic practices with proper spacings were followed. Data on yield was recommended farmer wise, year wise and mean of these are presented in Table 3. Twenty one day old seedlings were transplanted at 15 × 10 cm spacing for early and 20 × 10 cm for medium and late duration varieties in each experiment. To protect the crop from insect attack the recommended insecticides were used as and when required.

RESULTS AND DISCUSSIONS

Out of 1817 genotypes screened in a split over the years 50 were found resistant to blast, 59 to sheath blight and 41 to bacterial blight. The resistance varied from moderate to high (Table 1). Ansari *et al.* (1985), (1989) found some of these varieties resistant to blast and sheath blight in Andaman conditions under natural field infection. Five genotypes *viz* C 1136-3, I 18350-

Table 1. Performance of most promising genotypes

Variety/genotype	Duration	Days to 50% flowering	Plant height	Panicle length	Earbering tillers/ hill	No. of grains/ panicle	Test weight	Yield qt/ha	Sheath Blight	Reaction to pest	Blast
Thaaching Sen-yu	Early	76	99.3	24.29	5.69	59.69	23.18	36.03	MS	R	R
BG-1203	"	78	99.4	23.15	6.22	65.96	21.73	51.0	R	MS	R
SP 681032	"	78	104.3	22.64	5.48	64.16	24.00	31.91	R	MS	R
IR31805-20-2-3-1	"	78	103.3	23.63	6.76	58.86	20.47	42.02	R	MS	R
IR33249-47-3-2-2	"	74	96.1	23.17	7.50	57.13	24.01	39.50	R	MS	R
IR SO4044-57-2-2-3	"	74	89.2	22.20	5.38	59.2	24.38	47.13	R	MS	R
IR41996-118-2-1-3	"	73.0	101.0	23.58	6.40	67.43	23.97	40.34	R	MS	R
RP1442-2-2-3-5-1	"	76	90.4	22.78	6.37	40.75	23.95	31.25	R	R	R
BG 7312	"	79	105.7	23.07	5.74	62.53	25.30	45.33	R	MS	R
IR 50404-54-2-2-3	"	74	97.0	24.15	6.00	60.70	23.30	44.90	-	-	-
AT-77-1	"	77	93.9	24.12	5.22	51.70	24.61	48.42	-	-	-
C 1136-3	"	70	95.3	22.30	5.70	60.36	25.53	36.81	R	R	R
IR 318851-6-3-3-2	Medium	88	92.5	24.35	5.73	76.27	25.55	44.2	R	R	R
IR 18350 229-3	"	82	96.2	20.75	5.73	68.70	24.75	42.00	R	R	R

(Contd. on next page)

Sl. No.	Variety/genotype	Duration	Days to 50% flowering	Plant height	Panicle length	Earbering tillers/ hill	No. of grains/ panicle	Test weight	Yield qt/ha	Sheath Blight	Reaction to pest	Blast
	IET 6314 (Manasarover)	"	93	115.3	25.40	4:73	-	-	38.80	-	-	-
	IET 5656 (Swarnadhan)	"	93	104.8	25.73	4.35	-	-	40.20	-	-	-
	Arkavati	"	90	87.0	24.00	4.73	-	-	44.2	R	R	R
	IET 7626	"	86	100.0	22.60	5.73	-	-	39.0	-	-	-
	IET 8059	"	87	95.5	23.50	5.30	-	-	38.1	-	-	-
	MW 10	"	75	103.53	24.50	6.22	53.30	25.53	57.7	MR	-	MR
	IR 22082-91	Late	100	80-48	23.52	6.30	55.80	26.38	55.8	MR	R	-
	IET 5912	"	100	112.90	22.50	11.1	-	-	45.0	NA	NA	R
	CR 1009	"	103	121.4	23.0	-	112.00	22.60	46.15	-	-	R
	IET 8890	"	100	110.0	-	-	40.00	-	40.15	-	MS	-

229-3, IRI31851-6-3-3-2 and Arkavati were found having multiple resistance character to major diseases (Table 1). The data presented showed that the genotypes varied in different characters. Among the twelve most promising early duration lines the plant height ranges from 89.2 (IR 50404-57-2- 2-3) to 105.7 cm (BG 7312); Panicle length varied from 22.3 cm. (C 1136-3) to 24.3 (Thai ching Sen *Yu*); Number of grains per panicle was more (67.43) in IR 41996-118-2-1-3 however, the test weight was more in C1136-3, and BG 7312. The genetic variability and yield components in rice has been recorded by many workers (Talwar and Goud, 1974; Raivinaya and Murty, 1979; Sinha and Biswas, 1986; Mohanty *et al.*, 1989).

High disease tolerance to all the three major diseases with moderate yield, were recorded in C 1136-3 and RP 1442-2-2-30501. These two genotypes after further confirmation at farmers field may be used as a Ist crop in disease proned areas, whereas Thaiching Sen Yu which showed resistance to bacterial blight (BB) and blast (B) may be used in the BB and BL affected areas.

Out of eight medium duration genotypes IR 31851-6-3-2, IR 18350- 229-3 and Arkavati had multiple resistance character to the major diseases with an average yield of 42-44 q/ha. First two lines i.e., IR 31851-6-3-3-2 and IR 18350-229-3 has showed the constant and stabilized yield during last five years which confirms the earlier report of Sharma *et al.* (1988). Among the four late duration rice varieties tested, none of them found resistant to the diseases as well as in good yield. However, the var IR 22- 82-91 produced 55.8q/ha yield with bacterial blight resistance.

Table 2. Performance of rice culture/varieties in LLP/NO programmes.

Genotype	Yield quintal/ha	
	1st Crop	IInd crop
Taichung Sen Yu		32.6
IR 18350-229-3	40.6	36.4
IR31851-6-3-3-2.	40.5	38.0
IE-6314	36.0	
IET8656	38.8	

Under the yield trials at farmers field in lab to land programme national demonstration scheme. All the five genotypes showed constant and stabilized yield Genotypes, IR 18350-229-3 and IR 31851-6-3-3-2 were good yielder and produced 40 to 43 q/ha as a first crop and 36 to 38 q/ha as a second crop (Table 3).

Table 3. Genotypes resistant to BLB, sheath blight and blast and their yield

Sl No.	Genotype	duration	Plant Height	Yield
1.	C1136-3	early	104.0	34.40
2.	IR 18350-229-3	medium	96.2	42.00
3.	Arkavati	medium	87.2	44.02
4.	IR31851-6-3-3-2	medium	92.5	44.00

Four genotypes presented in Table 3 have been found to possess the multiple resistance characters against major diseases like BB, Bl and sheath blight. The initial yield trial showed that they are the moderate yielders After testing to a large area under the lab to land or national demonstration it may be useful to be recommended for the areas having severe disease problems.

By using the vars RPI442-2-2-2-3-5-1, C 1136-3, IR31851-6-3-3-2 IR 18350-229-3 and Arkavati, two rice crop can be taken in the island ecosystem and the future projection can be achieved.

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