

SUITABILITY OF VYTTILA-4 AS A RICE VARIETY FOR COASTAL SALINE AREAS

K. S. Shylaraj, T. U. George, K. M. George and N. K. Sasidharan

Rice Research Station, Vyttila, Cochin 682 022, India

Abstract: A breeding programme was undertaken at the Rice Research Station, Vyttila to evolve high yielding saline tolerant rice variety suitable for pokkali ecosystem. A cross was made between Chettivirippu and IR4630-22-2-17 and effective selection was made for the high yielding saline tolerant genotypes suited to coastal saline soils. The selected genotype KAU 906 performed best in comparative yield trials, farm trials and national level screening trials. The high yield of the genotype is mainly due to higher number of productive tillers and filled grains per panicle, low sterility percentage and higher 1000 grain weight. The genotype was also found to be having maximum stability of performance over years and was released as Vyttila 4 for cultivation in coastal saline soils.

Key words: Coastal saline areas, pokkali ecosystem, rice variety, Vyttila 4.

INTRODUCTION

A unique system of integrated farming with rice and fish as the major components is practised in the 26400 ha of coastal saline soils of Kerala, known as Pokkali area. The rice crop is raised during the low saline phase from June-October and fish culture / prawn filtration is done during the high saline phase from November - April. Extreme soil acidity, salinity and flash floods during seedling establishment stage are the major problems encountered. Hence a variety evolved for pokkali ecosystem should possess the following suitability criteria apart from high yield. The variety should be of medium duration (maximum 120 days), tall stature (minimum 120 cm), tolerant to flood, acidity and salinity and should possess seed dormancy.

The average rice production in pokkali fields is only 1.5 - 2.0 t ha⁻¹ and hence evolution of high yielding saline tolerant rice varieties suitable for this area is felt to be of prime importance. Therefore, a research programme was undertaken at the Rice Research Station, Vyttila with the objective of evolving a high yielding rice variety with the above suitability criteria for cultivation in pokkali ecosystem. The present paper describes the breeding

process, the genealogy, the performance in comparative yield trials, national level screening trials and farm trials and the morpho-agronomic traits of the variety, Vyttila 4.

MATERIALS AND METHODS

A cross was made between Chettivirippu and IR 4630-22-2-17 with the aim of transferring the high yield of IR 4630-22-2-17 to the naturally adapted variety Chettivirippu. The F₁ plants were grown in a green house in the rabi season of 1982. The F₂ bulk population was raised in the pokkali fields during the monsoon season of 1983. During 1984, the F₂ plants were grown in the field among which 193 plants were selected. In the course of breeding process, three F₂ lines (1986) were identified as promising materials in preliminary yield trial, for further yield tests. These lines were carried forward to comparative yield trials in the subsequent five years (1987-91).

The comparative yield trial was laid out in the monsoon season of each year in a randomized block design with five treatments (three superior cultures and Vyttila 1 and Vyttila 3 as check varieties) and four replications at the paddy field of the Rice Research Station, Vyttila. The plot size was 50 m².

Table 1(a). Grain yield of the saline tolerant rice genotypes in comparative yield trials at the Rice Research Station, Vyttila

Rice Genotypes	Grain yield, t ha ¹				Pooled mean
	1988	1989	1990	1991	
KAU 904	2.82	3.50	2.84	4.01	3.29
KAU 905	3.31	3.68	3.37	4.30	3.66
KAU 906	3.25	4.06	3.23	4.33	3.72
Vyttila 1	2.28	2.92	2.51	3.55	2.81
Vyttila 3	2.54	3.16	2.43	3.91	3.02
Mean	2.84	3.46	2.88	4.02	3.30
CD (0.05)	0.50	-	0.24	0.27	0.30

Table 1(b). The morpho-agronomic attributes of the saline tolerant rice genotypes in the comparative yield trials at the Rice Research Station, Vyttila (the data are the mean value of our years)

Rice genotypes	Duration, days	Plant height, cm	Productive tillers, No	Grains / panicle, No.	filled grains / panicle, No	Sterility, %	1000 grain weight, g
KAU 904	120.00	164.00	14.00	151.00	125.00	17.20	31.60
KAU 905	120.00	142.00	13.00	125.00	108.00	14.00	30.80
KAU 906	120.00	161.00	16.00	140.00	129.00	7.90	32.20
Vyttila 1	115.00	158.00	13.00	128.00	112.00	12.50	31.30
Vyttila 3	115.00	161.00	15.00	134.00	125.00	6.70	32.10
Mean	118.00	157.20	14.20	135.60	119.80	11.66	31.60

management practices were done as per the package of practices recommendations of the Kerala Agricultural University (KAU, 1986). The field experiment was conducted for five years from 1987-1991 for conclusive results. Ten randomly selected plants in each plot was utilized for recording the morpho-agronomic traits such as plant height, productive tillers, panicle length, number of grains per panicle, sterility percentage etc. The plot-wise yield was recorded to assess the yielding ability. The data collected were subjected to the analysis of variance year-wise to test the

significance of difference between varieties. The pooled analysis of the data for four years (1988-1991) was done (Gomez and Gomez, 1984) to study the variety x year interaction and consistency in the performance of varieties. The data for the year 1987 was not included in the analysis as the plot size was only 30 m². The stability parameters were also worked out to confirm the stability of performance of these genotypes (Eberhart and Russell, 1966). In the year 1991, an unrepeated performance trial was conducted in the farmer's field at four locations of Ernakulam

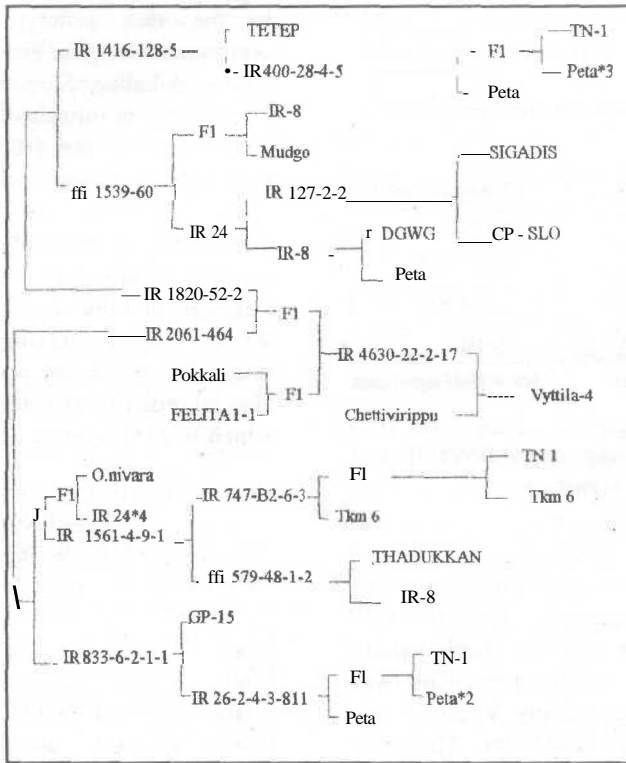


Fig 1. Genealogy of Vyttila 4

district and two locations of **Alappuzha** district of Kerala. Being an **unreplicated** trial, the analysis of variance was done treating the locations as replications. Simultaneously, these saline resistant genotypes were tested in National Saline Alkaline Screening Nurseries (Kerala, W. Bengal and Gujarat) so as to assess the performance in different states.

RESULTS AND DISCUSSION

The genealogy of the new rice variety Vyttila 4 is presented in Fig 1. It is clear that the saline tolerant **pokkali** gene is also involved in the high yielding male parent line IR 4630-22-2-17 (Khush and Gomez, 1979). Moreover, the broad genetic base of the new rice variety Vyttila 4 is evident from the illustration.

The data on grain yield and other **morpho-agronomic** attributes are presented in Table 1.

The analysis of data revealed that the genotypes significantly differed annually except in 1989 with respect to grain yield. The rice genotype KAU 906 recorded the maximum grain yield during the years 1989 and 1991 whereas the genotype KAU 905 recorded the maximum during 1988 and 1990. The maximum pooled mean yield was recorded by the genotype KAU 906 and was on par with KAU 905. The pooled analysis of the data for four years revealed that the genotypes differed significantly (Table 2). The variety x year interaction was not significant showing the consistency in performance of the genotypes over years.

The duration up to maturity of all the new genotypes was 120 days, the desirable limit under the pokkali ecosystem. The plant height was more or less same for all the genotypes

though the maximum was recorded by KAU 904. The maximum productive tillers was

Table 2. Pooled ANOVA for grain yield (1988 to 1991)

Source	df	Mean squares
Variety	4	62.262**
Year	3	154.760**
Variety x year	12	1.419 NS
Error	60	3.409

** Significant at 0.01 level NS = Non significant

produced by the genotype KAU 906 followed by the check variety Vyttila 3. The maximum number of grains per panicle was for the genotype KAU 904 followed by KAU 906. But the maximum number of filled grains per panicle was for the genotype KAU 906 followed by KAU 904 and the check variety Vyttila 3. The least sterility percentage was recorded by the check variety Vyttila 3 followed by the genotype KAU 906. The thousand grain weight was more or less same for all the genotypes, though the maximum was recorded by KAU 906. The higher number of productive tillers, the maximum production of filled grains per panicle, maximum 1000 grain weight and comparatively less sterility percentage may be the reasons for higher grain yield

Table 4. Grain yield and productive tillers of the saline tolerant rice genotypes in farm trials during kharif 1991

Location	Grain yield, kg ha ⁻¹				Productive tillers, No.				
	KAU 904	KAU 905	KAU 906	Check (local)	KAU 904	KAU 905	KAU 906	Check (local)	
<i>Alappuzha District</i>									
Kuthiathode	1800	1600	1700	1200	12.00	11.00	14.00	15.00	
Thuravoor	1150	1100	1300	1100	16.00	16.00	17.00	16.00	
<i>Ernakulam District</i>									
Palluruthy	1800	1700	1770	1500	12.00	13.00	14.00	10.00	
Kuzhuppilly	1022	1200	2222	1300	12.00	13.00	14.00	11.00	
Cheranelloor	1825	1743	1892	1700	11.00	11.00	13.00	8.00	
Vyttila	4007	4300	4333	3906	14.00	14.00	15.00	12.00	
Pooled mean	1934	1941	2203	1784	12.83	13.60	14.50	12.00	
CD (0.05)	277.85				NS				

in the rice genotype KAU 906. The performance of these genotypes in the National Saline Alkaline Screening Nursery during kharif 1991 is furnished in Table 3. The rice genotype KAU 906 (IET No. 13418) performed better in Gujarat and West Bengal also.

The data on grain yield and productive tillers of the rice genotypes in the farm trials are furnished in Table 4. The rice genotype KAU 906 recorded the maximum yield in five locations. The maximum pooled mean yield was also recorded by the rice genotype KAU 906 which is 23% more over the check variety.

Table 3. Performance of the saline tolerant rice genotypes in National Saline Alkaline Screening Nurseries of Kerala, W. Bengal and Gujarat (Kharif 1991)

IET No.	Designation	Grain yield, kg ha ⁻¹		
		Vyttila (Kerala)	Canning (W.Bengal)	Nawagaon (Gujarat)
13416	KAU 904	4500	3260	2821
13417	KAU 905	4688	3260	2949
13418	KAU 906	4688	3650	5897
Check	SR 26-B	2812	3200	4166

The maximum number of **productive** tillers was also produced by KAU 906 which may be the main reason attributable to the higher yield of the genotype.

The gene interaction was non-significant (Table 2) showing its highly stable performance across environments tested. Apart from high yield, this genotype possesses very good yield attributing characters such as maximum number of productive tillers and filled grains per panicle and very low sterility percentage. This genotype was released as Vyttila 4 during the year 1993 by the State Variety Release Committee, for cultivation in the coastal saline soils (Anon, 1993).

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