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Research Article

KKL(R)-1: A promising long duration rice variety

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Abstract
A new long duration rice: KKL (R) 1, suitable for *Samba* season was developed. It recorded an average grain yield of 5524 kg/ha with an increase of 4.58% over CR 1009 and 5.97 % over ADT 44 respectively. It has medium slender grain with white rice and possesses good cooking qualities comparable to that of Improved white Ponni. It is moderately tolerant to sheath rot.

Key words
Rice, KKL(R)1, Long duration, variety.

Introduction

Rice, the principal food crop of Puducherry Union Territory, is cultivated widely in all rice growing seasons. CR 1009 and ADT 44 are popular long duration rice varieties grown in *Samba* season. These two varieties, though high yielding, possess bold grain and therefore, it was necessary to develop long duration rice variety with medium slender grain. Traditional hybridization and selection is still a widely used strategy for developing crop varieties with a higher yield potential. In this methodology, the segregating populations derived from crosses between two parents are screened for desirable recombinants and selected lines are evaluated in replicated yield trials. This approach is therefore based on the variability created through hybridization between diverse parents and subsequent selection of desirable individuals. With this objective, a separate breeding programme was started which resulted in evolution of KKL (R) -1.

Materials and method

KKL (R) -1, tested as KR 99001 which is a cross derivative of CR 1009 and ADT 39. It was identified through pedigree method of selection. The single plant was selected during 1998 and the homozygous line during 1999. Subsequently, it was nominated for Multi Location Trial (MLT) of Tamil Nadu Agricultural University, tested as IET 18440 in Initial Varietal Trial – Late (IVT-L) of All India Coordinated Rice Improvement Programme (AICRIP) in 2002 and for Adaptive Research Trials (ART) in 2003. Simultaneously an agronomic experiment to optimize spacing and nitrogen requirement for KR99001 was conducted during 2004-05 and 2005-06.

Result and discussion

This culture KR 99001 was tested in as much as 130 trials in various locations, both in research stations and farmers' holdings in Tamil Nadu and Puducherry Union Territory. These include station trials, conducted at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, multilocation trials of TNAU MLT-Group IV and Perunthalivar Kamaraj Krishi Vigyan Kendra (PKKVK), Puducherry, Adaptive Research Trials (ART) and On Farm Trials (OFT), conducted in farmers' holdings in Tamil Nadu and Puducherry respectively.

The overall performance of KR 99001 in different trials is presented in Table 1. The data on pooled mean revealed that the proposed culture recorded an average grain yield of 5.5 t/ha with an increase of 4.58 per cent over CR 1009 (5.2 t/ha) and 5.97 per cent over ADT 44 (5.2 t/ha).

The results of the agronomic experiment revealed (Table 2) that the grain yield did not vary significantly at different spacing (16 to 44 hills m^{-2}). Similarly, the grain yield did not differ significantly due to different levels of nitrogen (100,125,150,175 and 200 kg Nha^{-1}) indicating stable nature of KR99001 and can give higher grain yield at low levels of nitrogen at any population level. Therefore, it was recommended that 30 days old seedlings of KR99001 be transplanted at a wider spacing of 25 x 25cm (16 hills m^{-2} or 1.60 lakh hills ha^{-1}) and a fertilizer dose of 125:50:50 kg NPK ha^{-1} may be adopted for realizing higher yield and maximum profit.

The morphological and grain characteristics of KKL (R) -1 are presented in Table 3. It is erect and tall to a height of 130 cm with profuse tillering maturing in 150-155 days. It possesses long, dense, drooping and well exerted panicles. Its grain is medium slender with white endosperm. Milling and cooking characteristics of both raw and parboiled rice were analyzed at Indian Institute of Crop Processing Technology (IICPT), formerly Paddy Processing Research Centre (PPRC), Thanjavur and the results are presented in Table 4. It recorded high hulling, milling and high head rice recovery. It had also recorded good elongation

ratio of 1.98 (raw rice) and 1.66 (par boiled rice) and elongation index of 1.37 (raw rice) and 1.11 (par boiling) revealing better cooking qualities. The volume of cooked rice is graded as good in case of both raw rice (410 ml/100g) and parboiled rice (405 ml/100g) and is comparable to that of Improved White Ponni – a popular rice variety known for superior grain quality. It is moderately resistant to sheath rot and can withstand water logging. Owing to superior grain quality, comparable to that of Improved White Ponni, KR 99001 fetches higher market price, even though it registered marginal yield increase over CR 1009.

With a duration of 150-155 days from seed to seed, it is suitable for cultivation during *Samba* season. Considering the performance of KR 99001 it was recommended and approved for release by the State Seed Sub Committee of Government of Puducherry on 19th April, 2008 and subsequently notified by Central Sub Committee on Crop Standards, Notification and Release of Varieties for Agricultural and Horticultural crops, vide Notification No.449 (E) dated 11th February 2009, Government of Puducherry.

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Table 1 Mean Performance of KK L(R) -1 in different trials

Year and Trial	Grain yield (t/ha)				
	KR 99001	**CR 1009**	**ADT 44**	**BPT 5204**	**SWA RNA**
Station Trial (1999-2002)	6.69 (3)	6.02 (3)	5.90 (3)	-	-
Multi Location Trial (2002-2005)	5.47 (22)	5.23 (22)	4.93 (22)	4.51 (14)	4.78(7)
Adaptive Research Trial (2003-2005)	5.54 (66)	5.59 (66)	5.39 (64)	4.69 (66)	4.78 (66)
On Farm Trial (2003-2005)	4.40 (42)	4.29 (42)	4.62 (34)	-	-
Pooled Mean	**5.52**	**5.28**	**5.21**	**4.60**	**4.78**
% increase over checks		**4.58**	**5.97**	**20.12**	**15.59**

Figures in parenthesis indicate number of trials

Table 2. Effect of spacing and nitrogen levels on the yield of KR 99001

Trt. No.	Plant Spacing	Grain yield (kg/ha) *Samba* 2004	*Samba* 2005	Mean	Trt. No.	Levels of Nitrogen (kg/ha)	Grain yield (kg/ha) *Samba* 2004	*Samba* 2005	Mean
S_1	15x15 cm	5688	3523	4605	T_1	N_1 (100 kg/ha)	5625	4248	4936
S_2	20x15 cm	5688	3860	4778	T_2	N_2 (125 kg/ha)	5391	4263	4811
S_3	20x20 cm	6032	3838	4934	T_3	N_3 (150 kg/ha)	5688	4078	4866
S_4	25x20 cm	5141	4190	4665	T_4	N_4 (175 kg/ha)	5688	3688	4692
S_5	25x25 cm	5531	4368	4918	T_5	N_5 (200 kg/ha)	5688	3503	4595
SEd		313	286	225	**SEd**		296	236	276
CD (5%)		**NS**	**NS**	**NS**	**CD (5%)**		**NS**	493	**NS**

Table 3. Morphological and grain characteristics of KKL (R)-1

Characters	Description
Habit	**:** Erect
Plant height	: 130 cm
Duration	: 150-155 days
Anthocyanin pigment	: Absent
Leaf sheath	: Green
Collar	: White
Auricle	: Pale green
Ligule	: White
Septum	: Cream
Leaf blade	: Green
Flag leaf	: Longer than panicle, intermediate
Fertile glumes	: Green when fresh and turn dirty furrow at maturity
Apiculus	: Green
Awns	: Absent
Panicle	: Long dense and drooping
Exsertion	: Well exserted
1000 grain weight (g)	: 17.9
Rough Rice L X B (mm)	: 7.75 X 2.62
Brown Rice L X B (mm)	: 5.25 X 2.16
L/B ratio	: 2.42
Rice grade	: Medium Slender
Rice colour	: White
Abdominal white	: Absent
Translucency	: Translucent

Table 4: Milling and cooking quality characteristics of KR 99001

Quality traits	KR 99001		CR 1009		ADT 44		I. W. Ponni	
	Raw	Par boiled	Raw	Par boiled	Raw	Par boiled	Raw	Par boiled
Husk (%)	21.3	21.50	19.30	19.30	20.70	20.80	22.40	22.50
Polished rice yield (%)	71.9	73.10	75.30	47.90	73.50	73.40	70.40	71.50
Polish (%)	6.30	5.40	6.00	5.40	6.40	5.40	6.40	5.70
Broken (%)	21.80	6.30	1.50	0.00	5.70	1.90	43.50	3.40
Head rice yield (%)	56.20	68.50	74.20	74.90	69.30	72.00	39.80	69.10
Sun check (%)	21.00	-	2.00	-	4.00	-	54.00	-
Rice moisture content (%)	11.33	10.30	11.30	10.90	11.50	10.30	11.10	10.20
Paddy moisture content (%)	10.70	10.10	10.60	10.40	10.70	10.10	10.60	9.90
Cooked rice volume (ml /100 g)	410	405	400	405	395	385	425	410
Elongation ratio	1.98	1.66	1.91	1.48	2.01	1.56	2.11	1.67
Elongation index	1.37	1.11	1.37	1.05	1.32	1.05	1.45	1.16
Gruel loss (%)	4.00	3.50	4.00	2.50	4.50	3.50	4.00	3.50

Note
Cooked rice volume

350-375 ml	-	Poor
375-400 ml	-	Satisfactory
400-425 ml	-	Good
More than 425 ml	-	V. Good