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TNAU Rice ADT 50 - A New Long Duration Fine Grain Rice Variety for Samba Season of Tamil Nadu

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TNAU Rice ADT 50 (AD 02235) variety is a long duration rice which is a derivative of BPT 5204 x CR1009 released during 2012 by TNAU for samba season of Tamil Nadu. This variety was evolved through pedigree breeding. This variety is medium tall (106-121 cm), erect with high tillering plant habit. It matures in 146 days with a duration range of 144-150 days The average grain yield of this variety in 156 locations tested is 5792 kg/ha which was on par with CR 1009 (5784 kg/ha) and 16.9 per cent higher than ADT 44 (4955 kg/ha). The variety is resistant to leaffolder, moderately resistant to stem borer and moderately susceptible to GLH, brown spot, blast and RTD. The rice is white, medium slender with a 1000 grain weight of 15.9 grams. The milling yield and head rice yield is higher than the checks *viz.,* ADT 44 and CR1009. Cooked rice is non sticky with good volume expansion. It is a multipurpose rice suitable for consumption as meals, for making tiffin, sweets and savouries.

Key words: *Oryza sativa*, Rice, variety, TNAU Rice ADT 50, Tamil Nadu

In India rice, this year (2011-12) recorded an all-time high production of 102.75 million tonnes from 45.54 million hectares (Anon. 2012) . However, the production and productivity scenario has no room for complacency. In view of the present annual population growth trend of around 1.5 % and per capita consumption of 235 g per day, it is estimated that the demand of rice in 2025 will be 117.3 million tonnes (Kumar et al. 2010). The projected demand can only be met by maintaining steady increase in production over the years. Rice is cultivated in major area during samba season in Tamil Nadu. But the choice of variety in the long duration group to the farmers is very limited. CR 1009, a coarse grain variety is being predominantly grown which is mainly for Tiffin purpose. The need for a fine grain variety in the long duration category that fetches higher price than CR 1009 with multipurpose use is a long felt need by the farmers. Yang et al. (1996) suggested that in order to develop super high -yielding rice varieties it was essential to increase the biological yield. Hence research efforts were undertaken with an objective to develop a slender rice variety with acceptable plant type and high biological yield in the long duration group. This resulted in the evolution of a high yielding long duration fine grain variety TNAU Rice ADT 50

Materials and Methods

The rice variety TNAU Rice ADT 50 is a derivative of BPT 5204 x CR 1009 evolved by adopting pedigree breeding. It was tested in the culture name AD 02235. The crossing programme was initiated during samba 1999 at Tamil Nadu Rice Research Institute, Aduthurai. The segregating progenies were selected and advanced during 1999-2002 and the homozygous culture AD 02235 was evaluated in Station trials with the check CR 1009 and ADT 44 since 2003. It was tested in Multilocation trials in different research Stations of TNAU in 26 locations between 2004-05 and 2009-10. Based on its superior performance over check varieties, this culture was assessed in Adaptive Research Trials during 2009-10 and 2010-11 in 106 locations spreading over eight samba growing districts in Tamil Nadu. Field Screening was carried out for its reaction to pests and diseases. Quality parameters were also assessed for this culture in comparison with the standard varieties.

Results and Discussion

AD 02235 has a medium tall (106-121 cm), erect, high tillering plant habit. It matures in 146 days with a duration range of 144-150 days. The overall mean performance of AD 02235 over years in terms of mean grain yield is on par with the predominant variety CR1009 and manifested yield superiority against the checks ADT 44 and BPT 5204 in different yield trials. The culture has recorded a mean grain yield of 5792 kg/ha in 146 days at 156 locations which is on par with grain yield of CR 1009 (5784 kg/ha) and 16.9 and 56.5 per cent increased yield over ADT 44 (4955 kg/ha) and BPT 5204 (3702 kg/ ha) respectively (Table 1).

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Table 1. Overall mean yield performance of AD 02235 in different trials

Name of the Trial	Grain yield (kg/ha)				Duration (days)			
	AD02235	CR1009	ADT 44	BPT5204	AD02235	CR 1009	ADT 44	BPT5204
On-Station trial	5986	5579	5083	4299	150	150	145	139
(2003– 2010)	(9)	(9)	(9)	(9)	(9)			
Multilocation trials	4855	5113	4611	4259	-	-	-	-
(2004 to 2010)	(25)	(25)	(23)					
Adaptive Research	5695	5608	5446	-	147	148	147	-
Trials (2009-10)	(34)	(34)	(34)		(34)			
Adaptive Research	5898	5915	-	-	144	146	-	-
Trials (2010-11)	(72)	(72)			(64)			
OFT/ KVKs	6877	6737	-	-	149	159	-	-
(2009-10)	(16)	(16)			(11)			
National trial	3839	4691			-	-	-	-
(Kharif 2005)*	(1)	(1)						
Overall Mean	5792	5784	4955	3702	146	148	146	139
	(156)	(156)	(68)	(24)				
% inc. over the check		0.13	16.9	56.5				

In the Adaptive Research Trials (ART Rice 6), the overall mean grain yield from 106 locations which spread in Cuddalore, Trichy, Perambalur, Karur, Pudukkottai, Thanjavur, Thiruvarur and Nagapattinam districts is 5833 kg/ha which is 7.1 per cent higher than the long duration variety ADT 44 (5446 kg/ha) and on par with CR 1009 (5817 kg/ ha) (Table 1). Similarly, under Multi Location Trials the culture AD 02235 recorded 14.4 % over ADT 44. The result manifests its stability in grain yield realization and adaptability to different districts of Tamil Nadu.

Table 2. Physical quality characteristics

Variety	Milling (%)	Head rice recovery (%)	1000 grain wt (g)	Milled Kernel length (mm)	Milled Kernel breadth (mm)	*GrainType
AD 02235	77.30	63.20	15.9	5.23	1.86	MS
CR 1009	74.79	54.60	23.5	5.04	2.56	SB
ADT 44	73.11	55.73	23.9	5.66	2.41	SB
BPT 5204	78.97	63.37	15.6	5.25	1.85	MS

* MS - Medium slender, SB – Short bold

The physical, biochemical and cooking quality traits of this culture in comparison with the checks CR 1009, ADT 44 and BPT 5204 is presented in the tables 2 to 4.

Table 3. Cooking quality characteristics

Parameters	AD 02235	CR 1009	ADT 44	BPT 5204
Kernel length after cooking (mm)	10.0	8.8	9.6	10.4
Kernel breadth after cooking (mm)	2.5	3.2	3.2	2.4
Linear elongation ratio	1.91	1.75	1.70	1.98
Breadthwise elongation ratio	1.34	1.25	1.33	1.30
Volume expansion ratio	4.6	4.1	4.2	4.5
Cooked rice appearance	Well Separated			

Grain quality in rice plays an important role in consumer acceptability. Juliano and Duff (1991) concluded that grain quality is second after yield as the major breeding objective for crop improvement. The quality in rice is considered based on milling quality, grain size, shape, appearance, aroma and other cooking characteristics (Dela Cruz and Khush 2000). The grain type of TNAU Rice ADT 50 is medium slender with 1000 grain weight of 15.9g. This variety is fine when compared to the long duration checks *viz.,* CR 1009 and ADT 44, both of which are short bold. The milling yield (77.30%) and head rice recovery (63.20%) of this variety is higher than CR 1009 and ADT 44 and on par with BPT 5204. Cooking tests revealed that the linear elongation ratio and volume expansion ratio of AD 02235 cooked rice is advantageous than CR 1009 and ADT 44. The gel consistency is soft and amylose content is intermediate.

Table 4. Biochemical characteristics

Parameters	AD 02235	CR 1009	ADT 44	BPT 5204
Gel consistency	Soft	Soft	Soft	Soft
Gelatinization temperature	High to intermediate	Intermediate	Intermediate	High to intermediate
Amylose content	20.3	20.8	19.0	19.5
Crude protein (%)	8.67	9.12	9.0	8.63

In organoleptic tests, this culture has high scores for appearance, tenderness on touching, chewing than all the checks. Its overall acceptability is better than CR 1009 and ADT 44 and almost equivalent to BPT 5204. One of the parents *viz*., CR 1009 is suitable for tiffin purpose and the other parent *viz*., BPT 5204 is a popular table variety. Hence the suitability of this culture for meals, tiffin, sweets and savouries were tested by making different recipes in each category and all the item were found to be tasty in panel evaluation. Hence, it was concluded that TNAU Rice ADT 50 has multiple utility unlike CR 1009 which is not delicious for meals.

Sustainable pest and disease management is

an important part of rice production systems as pests affect the yield and quality of rice (Anon. 2010). Inbuilt pest resistance is advantageous in developing countries, because there is no cost to farmers and resistant cultivars are easily adopted and disseminated in addition to the favourable concern to the environment (Bonman *et al*, 1992). The culture AD 02235 (TNAU Rice ADT 50) is resistant to leaffolder , moderately resistant to stem borer and moderately susceptible to GLH , brown spot, blast and RTD.

By virtue of all the above special features, AD 02235 has been accepted by State Variety Release Committee for release during 2012 as a new fine grain long duration variety suitable for general cultivation in samba season of Tamil Nadu.

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