



Telangana sona (RNR 15048): a short duration, low glyceimic, super fine grain, high yielding rice variety

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Abstract

Telangana sona (RNR 15048) was derived from a cross between two released varieties, MTU 1010 and JGL 3855 through pedigree method of breeding. Telangana Sona is a short slender, super fine variety suitable for both *kharif* and *rabi* seasons. It is semi-tall, short duration (125 days), high yielding variety (6500-7000 kg/ha) having resistance to blast disease, suitable for late sowing conditions and has high head rice recovery (>67%). It is a low glyceimic index variety with GI of 51.0. Telangana Sona was released by Professor Jaya Shanker Telangana State Agricultural University (PJTSAU) through 1st State Variety Release Committee (SVRC) meeting of Govt. of Telangana and was notified vide Indian Gazette Notification NO. S.O 2238€, dated 29.06.2016 for cultivation in the State of Telangana. Considering the uniqueness of the variety, Telangana Sona (RNR 15048) variety was also registered under PPV&FRA bearing Registration No. 196 of 2018 at Govt. of India.

Keywords: Telangana Sona, State variety, super fine grain, low glyceimic index

Introduction

Rice is one of the major cereal crops feeding over more than half of the world's population. In India, rice crop is cultivated in 43.66 MHa producing 118.87 MT rice with productivity of 2722 kg/ha (Indiastat, 2019-20). Rice is being cultivated both in *kharif* and *rabi* seasons as one of the most important crop in Telangana. Rice being the staple food of Telangana, requires about 60-65 lakh tons annually to feed the population. During the year, 2019-20, rice crop was grown in Telangana in an area of about 31.78 lakh hectares producing 129 lakh tons of rice with the productivity of 4062 kg/ha (DES, 2020). Comparing the productivity of rice over other states, Telangana stood in second rank after Punjab which was evident in recent years with much emphasis paid on increasing irrigation facilities of the state.

Hitherto the proportion of coarse grain varieties was more in the state, in view of the ease of cultivation, mostly short duration and less prone to insect pests and diseases. However, huge demand exists from the

consumers for fine grain varieties and more specifically to super fine (short slender) varieties. The popular fine grain varieties in the state are BPT 5204, JGL 1798, WGL 14, HMT Sona. Though they have very good physical and cooking quality grain parameters, most of them were medium to long in duration and susceptible to major insect pests and diseases.

In the context of limited resources of irrigation water and electricity, there was a dire need to develop a super fine grain, short duration, biotic stress tolerant varieties with good eating qualities to meet the demands of producers as well as consumers.

Keeping this in view, Rice Research Centre, ARI, PJTSAU (Formerly ANGRAU), Rajendranagar, Hyderabad initiated a breeding programme during the year, 2006 with an objective to evolve very fine grain, short duration, blast resistant, BPH tolerant, high yielding variety with good cooking quality comparable with BPT 5204. The pedigree method of breeding was followed involving two released varieties *viz.*, MTU 1010 and JGL 3855 as parents (**Figure 1**). Female

parent, MTU 1010 was most popular long, slender, short duration variety having tolerance to blast and BPH, whereas the male parent, JGL 3855 was super

fine grain, medium duration variety having tolerance to blast and gall midge.

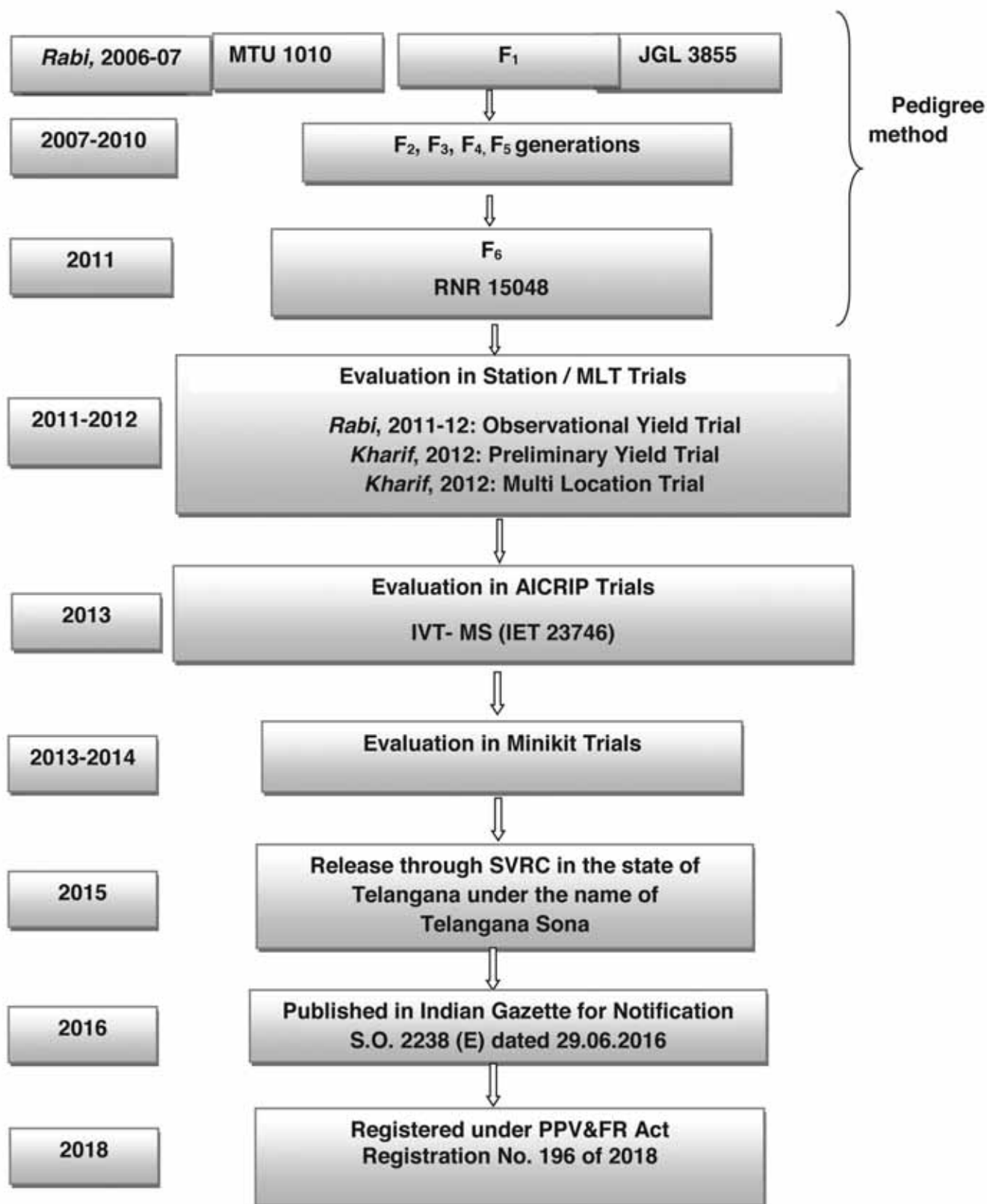


Figure 1: Pedigree flow chart of RNR 15048 (IET 23746) varietal development



Yield performance

During *kharif*, 2011, the F₆ plant to progeny row bearing number 15048 was identified as uniform with desirable phenotypic characters and promoted to Observation Varietal Trial (OVT) in *rabi*, 2011-12 with the designation RNR 15048. Considering its superior grain quality, yield and duration advantages, RNR 15048 was advanced to PVT and Multilocation Trials of PJTSAU during 2012. Simultaneously, RNR 15048 (IET 23746) was nominated to AICRIP trials during the year 2013. The mean data across years and trials clearly revealed that RNR 15048 (6085 kg/ha)

has recorded 6.65% additional grain yield compared to local check (5706 kg/ha) (Table 1).

During the year 2013, the RNR 15048 has been approved for 1st year minikit (farmer's field) testing for both *kharif* and *rabi* seasons by the university authorities during state level annual workshop. Accordingly, RNR 15048 was evaluated in farmer's field during *kharif*, 2013 and 2014 in comparison to popular check, BPT 5204 and during *rabi*, 2013-14 with check, MTU 1010. The results showed that RNR 15048 had performed well with 11.48% and 7.65% yield superiority over checks, BPT 5204 and MTU 1010, respectively (Table 2).

Table 1. Grain yield of RNR 15048 in different trials across seasons and years

Trial Name	Season/year	No. of locations/ trials	Grain yield (kg/ha)		Per cent increase over Check
			RNR 15048	Local Check	
Station Trials	<i>Kharif</i> (2012)	4	6649	6199	7.26
Station Trials	<i>Rabi</i> (2011-12 & 2012-13)	2	6582	6438	2.24
Multi Location Trials	<i>Kharif</i> (2012)	6	6114	5663	7.96
AICRIP Trial (Telangana State)	<i>Kharif</i> (2013)	3	4945	4648	6.39
Weighted Average		15	6085	5706	6.65

(Source: SVRC Release Proposals of RNR 15048)

Table 2. Grain yield (kg/ha) of RNR 15048 in minikit trials (at farmers' fields) across seasons and years in Telangana during 2013 and 2014

Agro-climatic Zone	District	<i>Kharif</i> (2013 & 2014)		<i>Rabi</i> (2013-14)	
		RNR 15048	Check (BPT 5204)	RNR 15048	Check (MTU 1010)
Central Telangana	Warangal	6072	5651	6507	5734
	Khammam	6345	5739	6453	6264
	Medak	6298	5685	5725	5575
Southern Telangana	Nalgonda	6936	6008	7630	7620
	Mahabubnagar	6120	5132	6660	5669
	Rangareddy	6998	6062	6785	6071
Northern Telangana	Karimnagar	7228	6751	-	-
	Adilabad	3460	3420	-	-
	Nizamabad	3392	2958	-	-
Mean		5872	5267	6627	6156
Per cent increase over Check		+11.48		+7.65	

(Source: SVRC Release Proposals of RNR 15048)

RNR 15048 was also evaluated in agronomic trials at Rice Research Centre, ARI, Rajendranagar at different fertilizer levels as well as various dates of sowings during *kharif*, 2013. The data revealed that RNR 15048 has exhibited higher grain yield (6351 kg/ha) than BPT 5204 (4833 kg/ha) and on par yield with MTU 1010 (6475 kg/ha) at recommended levels of nitrogen fertilizer (120 kg N/ha) (**Table 3**). Conspicuously, days to 50% flowering was reduced

drastically under late sowings compared to check varieties (**Table 4**). The same was also confirmed by other researchers at later date (Annual Report, 2016-17), indicating that RNR 15048 had photosensitivity and took more days to attain panicle initiation in case of early *kharif* sowings. Accordingly, it has been recommended for late sowings during *kharif* with optimum period as July 10th to July end.

Table 3. Grain yield of RNR-15048 in Agronomy Trials at Rice Research Centre, ARI, Rajendranagar during Kharif 2014

Variety	D1 (DS: 12.06.2014)			D2: (DS: 27.06.2014)			D3: (DS: 12.07.2014)			Mean		
	60 kg N/ha	120 kg N/ha	180 kg N/ha	60 kg N/ha	120 kg N/ha	180 kg N/ha	60 kg N/ha	120 kg N/ha	180 kg N/ha	60 kg N/ha	120 kg N/ha	180 kg N/ha
RNR 15048	6095	6472	6174	5223	6274	5804	5488	6306	5954	5602	6351	5977
BPT 5204	5260	5373	5477	4403	4878	4721	3846	4248	4125	4503	4833	4774
MTU 1010	6396	6592	6296	5613	6458	6045	5596	6374	6059	5868	6475	6133
Krishna	5603	5968	5747	4671	5634	5395	4333	5308	4952	4869	5637	5365

(Source: SVRC Release Proposals of RNR 15048)

Table 4. Days to 50% flowering of RNR 15048 as influenced by different dates of sowing at Rice Research Centre, ARI, Rajendranagar during Kharif 2014

Variety	D1 (DS: 12.06.2014)			D2: (DS: 27.06.2014)			D3: (DS: 12.07.2014)			Mean		
	60 kg N/ha	120 kg N/ha	180 kg N/ha	60 kg N/ha	120 kg N/ha	180 kg N/ha	60 kg N/ha	120 kg N/ha	180 kg N/ha	D1	D2	D3
RNR 15048	111	112	112	95	95	97	94	95	96	112	96	95
BPT 5204	117	117	117	114	115	115	114	116	118	117	115	116
MTU 1010	99	101	101	91	92	92	93	95	95	100	92	94
Krishna	111	113	113	107	107	107	105	105	106	112	107	105

(Source: SVRC Release Proposals of RNR 15048)

Reaction to biotic stresses

Reaction of RNR 15048 was evaluated against blast and sheath blight incidence during *kharif*, 2012 and 2014 at Rice Research Centre, ARI, Rajendranagar and the results clearly showed that RNR 15048 was resistant to blast and sheath rot (**Table 5**). Similarly, the data pertaining to entomology trials indicated that RNR 15048 was susceptible to stem borer compared to checks (**Table 6**).

Grain quality parameters

RNR 15048 was classified under super fine grain segment with more than 3 kernel length breadth ratio. RNR 15048 was extensively evaluated for cooking quality parameters and the data showed that it had very high percent head rice recovery compared to check, BPT 5204 (**Table 7**). Further, it had recorded intermediate amylose content with desirable eating quality.



Table 5. Reaction of RNR 15048 against diseases across years during *khariif* season at Rice Research Centre, ARI, Rajendranagar

Variety	Leaf Blast score		Neck Blast score		Sheath Rot score	
	2012	2014	2012	2014	2012	2014
RNR 15048	0	0	0	0	0	0
BPT 5204	9	-	7	-	9	-
NLR 34449	0	0	0	0	0	0
Swarna	9	9	7	9	7	7

(Source: SVRC Release Proposals of RNR 15048)

Table 6. Reaction of RNR 15048 against stem borer (white ear %) at Rice Research Centre, ARI, Rajendranagar

Variety	2013 <i>Kharif</i> (OPCT)	2013 <i>Kharif</i> (MRST-IIRR)	2013-14 <i>Rabi</i> (OPCT)	Mean
RNR 15048	26.82	13.3	18.92	19.7
BPT 5204	2.97	-	-	3.0
MTU 1010	13.28	-	9.27	11.3
W 1263	-	5.35	-	5.4
TN-1	-	16.5	-	16.5

(Source: SVRC Release Proposals of RNR 15048)

Table 7. Quality characters of RNR 15048 in comparison to Check, BPT 5204 conducted by ICAR-IIRR during 2013

Parameter	RNR 15048	BPT 5204
Hulling (%)	81.0	80.0
Milling (%)	71.6	71.2
Head rice recovery (%)	67.9	58.8
Kernel length (mm)	4.91	4.75
Kernel breadth (mm)	1.62	1.78
Kernel L/B ratio	3.03	2.66
Grain type	Short Slender	Medium Slender
Grain chalkiness	Absent	Absent
Volume expansion ratio	5.3	4.7
Water uptake	250	215
Kernel length after cooking	8.0	8.5
Kernel elongation ratio	1.62	1.78
Alkali spreading value	5.0	5.0
Amylose content	20.72	23.90
Gel consistency	22.0	22
Aroma	Non Scented	Non Scented

(Source: SVRC Release Proposals of RNR 15048)

Glycemic Index:

Generally, all high carbohydrate foods are rated as high in Glycemic Index (GI) which evaluates the standard (GI of glucose is 100). Diets which are higher in glycemic load implicated the development of various metabolic and chronic diseases such as diabetes and various cardiovascular diseases. Several studies have reported that higher intake of rice is strongly associated with type 2 diabetes. Systematic reviews from various parts of the world have shown that the GI of various varieties of rice ranged between 48 to 93. Foods are categorised as low-GI (≤ 55), medium-GI (56-69), high-GI (≥ 70), based on their ability to raise blood glucose.

The results conducted at Post Graduate & Research Centre, Department of Home Science, PJTSAU, Hyderabad on glycemic index revealed that, RNR 15048 has been classified as low glycemic Index variety with value of 51.0 whereas, BPT 5204 has been classified as moderate with GI of 56.5. Further, the results showed that RNR 15048 had recorded significant difference with respect to GI (blood glucose response) when compared with reference food. These results are akin to the reports of Prasanthi *et al.* (2019) where the GI of Telangana Sona rice was reported as 51.72.

Release and notification

Based on several advantages of the culture, RNR 15048 over existing varieties, PJTSAU has released RNR 15048 as **Telangana Sona** through 1st State Variety Release Committee meeting of Govt. of Telangana held during 2015. Subsequently, Telangana Sona (RNR 15048) variety was notified vide Indian Gazette Notification No.S.O. 2238 (E) dated 29.06.2016 and recommended for cultivation in the state of Telangana. Further, considering the uniqueness of the variety, Telangana Sona (RNR 15048) variety was also registered under PPV&FRA bearing Registration No. 196 of 2018 at Govt. of India (**Figure 2**).



Figure 2: Field view of Telangana Sona (RNR 15048) variety

Varietal spread

Keeping in view of its desirable traits with respect to farmer (high yield, blast tolerance, short duration, good market price), trader (super fine grain, high demand), miller (high head rice recovery), consumer (low glycemic index, good cooking quality), the variety was cultivated in about 13 lakh acres in the state of Telangana during 2020-21. Due to wider adoptability and preferences, the variety is being cultivated in many other states *viz.*, Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra, Odisha, West Bengal etc. To meet the demand for supply of quality seed, about 250 quintals of breeder seed is being produced every year by PJTSAU and being supplied to various seed producers.

Further, a tripartite agreement was signed on strategic branding and marketing of Telangana Sona (RNR 15048), super fine rice between Dept. of Agriculture., Govt. of Telangana, PJTSAU and Indian School of Business (ISB) on 14.08.2020. This agreement assists in improving the brand image of Telangana Sona rice

at national and international markets. The University is also popularising the benefits of low GI rice through MOAs with various firms for branding and marketing of super fine rice variety, Telangana Sona. Due to branding with private companies Telangana Sona rice is being exported to other countries also. In order to take advantage of this unique rice variety, many companies are looking forward to sign MOA with PJTSAU which would certainly assist in further popularisation and making the quality and healthy rice available to the consumer.

Salient features of Telangana Sona (RNR 15048) variety:

- It is a short slender (super fine) variety suitable for both *kharif* and *rabi* seasons.
- It is a semi-tall, short duration (125 days) high yielding variety having resistance to blast.
- It has grain yield potential of about 6500 to 7000 kg/ha.
- Suitable for late sowing conditions and hence provision to raise green manure crops immediately after the onset of monsoon which certainly assists



in improving the soil physical and chemical properties for sustainable rice production.

- It has high Head Rice Recovery (> 67 %) and hence even suitable during *rabi* season, which is a major advantage to the farmers and millers.
- It became popular on account of its unique grain size and shape (short slender) and cooking qualities on par with BPT 5204 as evident from equal values of amylose content, alkali spread (ASV) and gel consistency.
- RNR 15048 has been classified as low Glycemic Index variety with GI of 51.0.
- Being super fine grain, fetching ₹150 – 200 more per quintal than other fine grain varieties generating ₹500 - 600 cr. additional income to Telangana farmers annually.
- Large scale adoption of Telangana Sona played key role in increasing the productivity of the State.

Impact

- With adoption of Telangana Sona (125 days) in place of BPT 5204 (145 days) in an area of 10 lakh acres, Telangana state could save 28 TMC water during 2020-21.
- Telangana Sona being resistant to blast, less BPH incidence than BPT 5204 could save ₹2000 per acre on plant protection cost accounting ₹20.0 cr. per every 1 lakh acres.
- 5 % higher milling recovery than BPT 5204 resulted in 1 lakh tonnes additional rice yield to millers of Telangana State during 2020-21.

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