

## MTU 1121 (MTU II 178-34-1-1-2), A NEW ELITE RICE VARIETY DEVELOPED FROM MARUTERU FOR INTENSIVE CULTIVATION IN ANDHRA PRADESH

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**Abstract:** MTU 1121 was developed from the cross between popular variety BPT 5204 and MTU BB 8-24 through pedigree method of breeding from 2001-2005. In station yield trials conducted at APRRI & RARS, Maruteru between 2005-2011, it was recorded 19.1% more yield over the check MTU 1010. In All India Coordinated trails, over 41 locations across India it had shown 18.6% yield advantage than the national check IR 64 during Kharif 2011. Adaptive minikit testing (2012-13) was conducted in farmers field across Andhra Pradesh in which, it was recorded on an average 12% higher yield than the check variety MTU 1010. MTU 1121 by virtue of its good grain quality, yield potential coupled with non lodging, low shattering and acceptable grain quality is fast gaining popularity and is becoming alternate variety to MTU 1010 and MTU 1001. Characterization of a newly developed variety is a prerequisite for protection of a variety under PPV&FRA, 2001. Hence all the characteristics as per Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability On rice given by Government of India were also assessed.

**Introduction:** Breeding for rice varieties with enhanced productivity and tolerance to biotic and abiotic stresses is a continuous process. Paddy production is being affected by recent changes in global climate. There is a consistent demand for rice varieties possessing non lodging coupled with dependable seed dormancy, low grain shattering apart from resistance to major pests and diseases. In recent years grain quality is also being given due competence in breeding objectives owing to growing demand for food quality rices from consumers as well as millers.

Andhra Pradesh Rice Research Institute, Maruteru developed several varieties for cultivation in both Kharif and Rabi seasons. MTU 1010, MTU 3626, IR 64, MTU 1001 are being extensively cultivated in coastal Andhra Pradesh during rabi season. Though these varieties possess high yield potential, they lack one or few traits due to which often farmers suffer heavy yield losses. Hence there is an ever green demand for stable rice varieties with sustained production even under adverse climatic conditions.

An effort was made at Andhra Pradesh Rice Research Institute, Maruteru to breed and develop high yielding, short duration variety with 120-125 days, non lodging, low grain shattering, resistance to blast, plant hoppers coupled with good quality suitable for raw rice.

**Materials and methods:** A cross involving BPT 5204 / MTU BB 8-24 was attempted during 2001 and after confirming the hybridity, the F<sub>2</sub> was raised and several elite plants was selected and subsequent generations (F<sub>3</sub> to F<sub>6</sub>) were handled through pedigree method of breeding. Promising line MTU II 178-34-1-1-2 was advanced to yield trials viz., Observational Yield trial (OYT), Preliminary Yield

Trial (PYT), Advanced Yield Trial (AYT) and Multilocation Trial (MLT) starting from the year 2005. After two years of testing in MLT, throughout Andhra Pradesh, the line was being considered for minikit testing and accordingly it was tested in adaptive minikit trials from Rabi 2012-13. The promising line along with other lines and checks was also screened against major pests and diseases using IRRI standard screening protocols for Brown plant hopper (BPH) and blast. During yield trails it was tested against standard check varieties MTU 1010, MTU 1001 and BPT 5204. It was also tested across 41 locations of India as IET 22577 under All India coordinated Rice Improvement Programme during Kharif 2011.

**Results and discussion:** The development of one or more varieties depends on the final selection of superior plants by the plant breeder who uses several techniques to create the genetic variation and to select from within that variation (Chakravorty & Ghosh, 2012). In the present study selections for superior plants was done from F<sub>2</sub> to F<sub>6</sub> generation and the uniform elite line MTU II 178-34-1-1-2 was identified in F<sub>6</sub> generation for testing in yield trials. The advanced line MTU II 178-34-1-1-2 was tested in OYT Slender grain trial during Kharif 2005 and rabi 2006 and recorded 20.4 and 24.4% yield advantage than the popular check variety BPT 5204 (table 1). In all yield trials from OYT to MLT it was recorded an average of 6024 kg/ha grain yield which was 19.1% more than the popular check (5056kg/ha). During Kharif 2011, it was evaluated in Initial Varietal trial Irrigated mid early (IVT-IME) across 41 locations in different agro climatic zones of India and recorded 5534 kg/ha grain yield as against national check IR 64 (4653 kg/ha) showing 18.9% yield advantage. In

region 5 of India it ranked first with 18.3% (6516kg/ha) yield gain over IR 64 (5510kg/ha). On average over all yield trails it was recorded 6024kg/ha grain yield which is 18.9% more than the popular checks (5069kg/ha).

In Andhra Pradesh in Rabi season MTU 1010 is the popular rice variety but it often suffers with high grain shattering and also when rains occurs at maturity stage crop lodges incurring heavy losses interms of grain and monitory returns. Further MTU 1010 is not suitable for raw rice. Hence MTU 1121 is gaining popularity across Andhra Pradesh as it has several advantages over MTU 1010 (table 2). Adaptive or minikit trial is a method of determining the suitability or otherwise a new practice in the farmers' situations (RKMP website). Hence during Rabi 2013, MTU 1121 was given for minikit testing in farmers fields in the districts of West Godavari, East Godavari, Krishna, Guntur, Khammam, Karimnagar, Nalgonda, Srikakulam, Vijayanagaram district and about 1000 minikits were evaluated. The data indicated 12% increase over MTU 1010. Farmers also reported clear advantage over MTU 1010 in many aspects as given in table 2.

MTU 1121 by virtue of its good grain quality, yield potential (>12% over MTU 1010) coupled with non lodging, low shattering and acceptable grain quality is fast gaining popularity and is becoming alternate variety to MTU 1010 and MTU 1001. MTU 1121 is taking 135-140 days during Kharif season and it is showing

non lodging coupled with low shattering, two weeks seed dormancy and tolerance to brown plant hopper. Farmers are showing keen interest to cultivate MTU 1121 even in Kharif season due to many positive traits (table 2). MTU 1121 due to its convenient duration and other positive traits, it is most suitable for cultivation in both Kharif and Rabi seasons with sustained yield potential.

Being signatory to the general agreement on Trade and Tariffs, Government of India has enacted its sui generis system Protection of Plant Varieties and farmers Right Act (PPV&FRA), 2001 for providing protection to plant varieties based on distinctiveness, uniformity and stability (DUS) test apart from novelty. Therefore the characterization of a variety is prerequisite. Hence the plant characteristics were observed according to the Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability On rice given by PPV & FR Authority, GOI, New Delhi (2007) (table 3).

For release and notification of a variety the variety should be suitable for specified agro-climatic and soil conditions, have an ability to withstand typical stress conditions, and have tolerance/resistance to pests and diseases. It should also show distinct advantages over the existing equivalent released varieties (Virk, 2001). The present variety MTU 1121 met all the requirements to release for cultivation in Andhra Pradesh.

## References:

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<b>Table 1: Performance of MTU 1121 in yield trials from 2005-2011</b>							
S. No	Name of the Trial	Code/ IET No	Year of testing	Entry		Check	Increase (%) over check
				Grain yield(kg/ha)			
<b><i>Station trials</i></b>							
1	OYT-Slender grain	ALSg 145	Kharif 2005	5444	4520 (BPT 5204)	20.4	
2	OYT-Slender grain	AESg 170	Rabi 2006	6760	5434 (BPT 5204)	24.4	
3	PYT- Slender grain	BESg 92	Kharif 2006	4094	5062 (BPT 5204)	-19.1	
4	AYT-Early	CE 260	Kharif 2007	6320	4130 (MTU 1010)	53.0	
5	AYT-Early	CE 260	Rabi 2008	6007	5281 (MTU 1010)	13.8	
6	AYT-Early	CE 269	Rabi 2009	7667	6667 (MTU 1010)	15.0	
7	AYT-Early	CE293	Kharif 2010	5752	3935 (MTU 1010)	46.2	
8	MLT-Early	E 342	Rabi 2009	6063	6029 (MTU 1010)	0.6	
9	MLT-Early (Maruteru)	E 356	Kharif 2009	5740	4527 (MTU 1010)	26.8	
10	MLT-Early (Across locations in AP)	E 356	Kharif 2009	6457	4712 (MTU 1010)	37.0	
11	MLT-Early (Maruteru)	E 388	Kharif 2011	6180	4862 (MTU 1010)	27.1	
12	MLT-Early (Across 8 locations in AP)	E 388	Kharif 2011	5801	5517 (MTU 1010)	05.1	
			<b>Average</b>	<b>6024</b>	<b>5056</b>	<b>19.1</b>	
<b><i>AICRIP Trials</i></b>							
13	IVT-IME (Across 41 locations in India) Region 5	IET 22577	Kharif 2011	5534	4653 (IR 64)	18.9	
				6516	5510 (IR 64)	18.3	
			<b>Average</b>	<b>6025</b>	<b>5082</b>	<b>18.6</b>	
			<b>Overall Average</b>	<b>6024.5</b>	<b>5069</b>	<b>18.9</b>	

<b>Table 2: Comparative performance of MTU 1121 and MTU 1010</b>			
S.No	Trait	MTU 1121	MTU 1010
1	Duration (days)	125	120
2	Grain yield (tonnes/hectare)	7.5	7.0
3	Shattering	Low (<2%)	High (>10%)
4	Blast resistance	Score 1 (High)	Score 5 (Moderate)
5	BPH resistance	Score 3 (High)	Score 5 (Moderate)
6	Grain quality	Medium slender grain suitable for raw rice.	Long slender grain not suitable for raw rice.

<b>Table 3 : MTU 1121 DUS characters</b>		
<b>S.No</b>	<b>Characteristics</b>	<b>State of character in MTU 1121</b>
1	Coleoptile: Colour	Colourless
2	Basal leaf: Sheath colour	Green
3	Leaf: Intensity of green colour	Dark
4	Leaf: Anthocyanin colouration	Absent
5	Leaf: Distribution of anthocyanin colouration	Absent
6	Leaf Sheath: anthocyanin colouration	Absent
7	Leaf sheath: Intensity of anthocyanin colouration	Absent
8	Leaf: Pubescence of blade surface	Weak
9	Leaf: Auricles	Present
10	Leaf: Anthocyanin colouration of auricles	Absent
11	Leaf: Collar	Present
12	Leaf: Anthocyanin colouration of collar	Absent
13	Leaf: Ligule	Present
14	Leaf: Shape of ligule	Split
15	Leaf: Colour of ligule	White
16	Leaf: Length of blade	Medium (33cm)
17	Leaf: Width of blade	Medium (1.6cm)
18	Culm: Attitude (for floating rice only)	--
19	Culm: attitude	Semi erect
20	Time of heading : 50% of plants	Medium (95 days)
21	Flag leaf: Attitude	Semi erect
22	Spikelet: Density of pubescence	Medium
23	Male sterility	Absent
24	Lemma: Anthocyanin colouration of keel	Absent
25	Lemma: Anthocyanin colouration of area below apex	Absent
26	Lemma: Anthocyanin colouration of apex	Absent
27	Spikelet: Colour of stigma	White
28	Stem: Thickness	Thick
29	Stem: Length (excluding panicle)	Very short (80cm)
30	Stem: Anthocyanin colouration of nodes	Absent
31	Stem: Intensity of coloration of nodes	Absent
32	Stem: Anthocyanin colouration of internodes	Absent
33	Panicle: Length of main axis	Long (26 cm)
34	Flag leaf: Attitude of blade (late observation)	Semi erect
35	Panicle: Curvature of main axis	Semi straight
36	Panicle: Number per plant	Few (8-10)
37	Spikelet: Colour of tip of lemma	White
38	Lemma and Palea: Colour	White
39	Panicle: Awns	Absent
40	Panicle: Colour of awns (late obsevation)	--
41	Panicle: Length of longest awn	--

42	Panicle: Distribution of awns	--
43	Panicle : Presence of secondary branching	Present
44	Panicle : Secondary branching	Strong
45	Panicle: Attitude of branches	Semi erect
46	Panicle: Exertion	Well exerted
47	Time maturity (days)	Medium (125 days)
48	Leaf: Senescence	Early
49	Sterile lemma: Colour	Straw
50	Grain: Weight of 1000 fully developed grains	Medium (21grams)
51	Grain: Length	8.2
52	Grain: Width	2.4
53	Grain: Phenol reaction of lemma	--
54	Decorticated grain: Length	5.85
55	Decorticated grain: Width	2.03
56	Decorticated grain: Shape (in lateral view)	--
57	Decorticated grain: Colour	Light brown
58	Endosperm: Presence of amylose	Present
59	Endosperm: Content of amylose	Medium (22.8)
60	Varieties with endosperm of amylose absent only: Polished grain: Expression of white core	--
61	Gelatinization temperature through alkali spreading value	3
62	Decorticated grain: Aroma	Absent

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