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CO(R) 48 (IET 19037): A New High Yielding Medium Duration Fine Grain Rice Variety

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CO(R) 48, a medium duration rice variety was developed to meet the fine rice requirement of Tamil Nadu. It is a derivative of the cross between CO 43 and ASD 19. It has medium tall plant stature with high biomass and grain yield. It matures in duration of 130-135 days. CO (R) 48 recorded a mean grain yield of 6007 Kg/ha in 93 trials which was 9.8 and 16.6 per cent higher than Improved White Ponni and BPT 5204 respectively. It is moderately resistant to stem borer, BPH, WBPH, GLH, blast, RTD and sheath blight. It produces medium slender white rice with high milling percentage(71.9%), good head rice recovery (70.9%), intermediate amylose content (24.9%), soft gel consistency, good linear elongation ratio (1.43) and moderate gelatinization temperature (73.14°C), the characters accounting for market preference and superior cooking quality. In view of its superior performance with higher yield, better pests and diseases resistance and superior cooking quality, the variety CO(R) 48 was released for cultivation in the irrigated ecosystems of Tamil Nadu during thaladi season.

Key words: CO(R) 48, medium duration, fine grain rice variety

Tamil Nadu is one of the prominent rice growing states in India. In *samba* and *thaladi* seasons (Sep-Oct) of Tamil Nadu where rice is cultivated in about three-fourth of the total rice area, medium duration rice varieties maturing in 130-135 days are suited for cultivation. In these seasons, varieties like CO 43, Improved White Ponni (IWP), ASD 19, ADT 39 and ADT(R) 46 are grown extensively throughout Tamil Nadu. The varieties *viz*., IWP and BPT 5204 are grown exclusively for their superior grain quality and henceforth of high market preference. Although these varieties fetch high price in the market when compared to the other medium duration varieties, they are susceptible to pests and diseases which are prevalent during wet season. A suitable variety with comparable quality and with a widespread biotic resistance was needed as a replacement. Breeding programme was initiated with the objective of development of a new medium duration rice variety with superior grain quality with higher yield and advantages of biotic resistance over the existing varieties.

Materials and Methods

Hybridization was effected during Rabi 1996 between CO 43, a high yielding popular cultivar released in 1983 and ASD 19, a fine grain variety released in 1994. A homozygous line was identified in the pedigree nursery and was fixed as CB 01105 in F_4 generation during Rabi 2000-2001 at Department of Rice, TNAU, Coimbatore. Morphological description of the culture is furnished in box 1. Culture CB 01105 was evaluated in different trials *viz*., On-station trials from 2001 to 2005, Multi Location Trial (MLT) on Quality Rice (Medium) for two years in 2004-05 and 2005-06 in various stations of TNAU and under Adaptive Research Trials (ART) in the farmers' holdings during 2005-06 in 23 districts of Tamil Nadu. The culture was also evaluated as IET 19037 in Initial Varietal Trial-Slender Grain under All India Coordinated Rice Improvement Programme during 2004-05. Physical and cooking qualities of the culture was tested in Indian Institute of Crop Processing technology (IICPT), Thanjavur and Directorate of Rice Research (DRR), Hyderabad. Reaction to major pests and diseases was tested in TNAU rice research stations at Coimbatore, Madurai and Aduthurai.

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Results and Discussion

At Department of Rice, TNAU, Coimbatore, the culture recorded a mean grain yield of 6388 Kg/ha in five years of station trials with 16.1and 18.5 per cent increase over IWP and BPT 5204 respectively (Table 1). Based on this stable performance across seasons, the culture was promoted to MLT. CB 01105 was evaluated under MLT on Quality Rice (Medium) for two years and in 2004-05, it yielded 5998 Kg/ha which was 16.3 and 31.0 per cent higher than IWP and BPT 5204 respectively. In 2005-06, CB 01105 yielded 5158 Kg/ha which was 15.4 and 20.7 per

Table 1. Yield performance of CO (R) 48 (CB 01105) from 2001-2006

Name of the Trials	No. of trials	CO (R) 48(CB 01105)	IWP	BPT 5204
Dept. of rice, CoimbatoreStation trials (2001-2005)	5	6388	5503	5395
Multi-Location Trials (MLT quality rice medium(2004-05)	5	5998	5157	4578
Multi-Location Trials (MLT quality rice medium (2005-06)	5	5158	4468	4275
AICRIP- IVT SG trial (2004-'05)	2*	5473	-	-
Adaptive Research Trial (2005-06)	78	6037	5580	5232
No. of trials	95	93	93	
Overall weighted Mean Yield in Kg/ ha	6007	5473	5154	
Per cent increase over the checks	9.8	16.6		

*Checks for AICRIP trials are PR 106 and IR 64 and the data were not included in the calculation of the weighted mean.

cent higher than IWP and BPT 5204 respectively. The culture was evaluated as IET 19037 in Initial Varietal Trial-Slender Grain under All India Coordinated Rice Improvement Programme

Table. 2. Performance of CO (R) 48 (CB 01105) in Adaptive Research Trials in Tamil Nadu

Districts	CO (R) 48(CB 01105)	IWP	BPT 5204
Theni	7058	6398	6473
Vellore	4663	4273	4561
Tirunelveli	7408	7273	6944
Namakkal	6027	5949	5390
Coimbatore	5803	5948	5161
Dharmapuri	5535	4522	4115
Trichy	6246	6229	5998
Cuddalore	6626	4421	4912
Kancheepuram	6368	5657	5328
Thanjavur	5432	5722	4521
Salem	6729	5193	4024
Karur	5645	5302	5995
Villupuram	5323	5159	4714
Thoothukudi	6605	6555	6550
Madurai	6399	5989	5700
Kanniyakumari	5564	4780	3624
Perambulur	5411	5316	5097
Overall Mean	6037	5580	5232
Per cent increase over		8.2	15.4

(AICRIP) wherein it recorded a mean grain yield of 5473 Kg/ha which was 9.9 and 13.6 per cent increased yield over IR 64 and PR 106, the national checks (DRR reports 2006).

Based on its apparent adaptability across Tamil Nadu studied through MLT, the culture was nominated to ART. Under ART, CB 01105 was tested in 23 districts of Tamil Nadu in which the culture outyielded the checks in 17 districts. It recorded a mean grain yield of 6037 Kg/ha in 78 locations of those 17 districts which was 8.2 and 15.4 per cent higher than IWP and BPT 5204 respectively (Table 2).

In the overall yield analysis on weighted mean, the culture, CB 01105 recorded a mean grain yield of 6007 Kg/ha in 93 trials which was 9.8 and 16.6 per cent higher than IWP and BPT 5204 respectively. It recorded the maximum of 9625 Kg/ha at Usilampatti village of Madurai district in Tamil Nadu.

The culture CB 01105 was screened against all major pests and diseases of rice during 2004-05 and 2005-06 at Coimbatore, Madurai and Aduthurai locations.The culture CB 01105 registered a score of 3.0 for dead hearts and white ears symptoms of stem borer against score 7.0 registered by IWP and BPT 5204 for white ear and 5.0 for dead heart by IWP and score 7.0 by BPT 5204. For BPH, this culture scored 5.0 against 9.0 scored by IWP and BPT 5204. A similar trend of reaction was observed with respect to WBPH and GLH also. The results indicated that the culture CB 01105 has an improved resistance to major pests *viz* ., stem borer, BPH and WBPH when compared to IWP and BPT 5204.

Table 3a. Resistance reaction of CO (R) 48 (CB 01105) against major rice pests

Culture	Stem Borer				BPH		WBPH	GLH	LF
	CBE_f		ADT_f		CBE_a	ADT_f	CBE_a	CBE_a	MDU_f
	DH	WE	DH	WE					
CO (R) 48(CB 01105)	3	3	3	3	5	5	5	5	1
I.White Ponni	5	7	5	7	9	7	7	7	1
BPT 5204	7	7	7	7	9	9	9	9	1

f - under field condition a under artificial condition
DH. Dead hearts (stem borer) ; WE.White ears (stem borer); LF. Leaf folder
BPH. Brown plant hopper ; WBPH. White backed plant hopper;
GLH. Green leaf hopper CBE Coimbatore; ADT Aduthurai

Among the diseases affecting rice, blast is considered the most severe and CB 01105 recorded a score of 3.0 under artificial conditions. The checks IWP and BPT 5204 scored 7.0 and 9.0 respectively. The moderate resistance of CB 01105 for this dreadful fungal pathogen is considered as a very significant feature. Similarly the culture also recorded a favourable score against bacterial blight, sheath blight and RTD when compared to BPT 5204 (Table 3a and b).

Table 3b. Reaction of CO (R) 48(CB 01105) against major rice pests and diseases

Pests/ Diseases	CO (R) 48(CB 01105)	IWP	BPT 5204
Blast	3	7	9
Bacterial Blight	5	5	9
Sheath blight	5	7	5
RTD	5	5	7
Sheath rot	7	9	7

RTD Rice Tungro Disease

With increase in yield, there is also a need to look into the quality aspects to have better consumer acceptance. CB 01105 has medium slender grain

Table 4. Results of rice quality analysis of CO (R) 48 (CB 01105) IICPT,Thanjavur

a) Physical dimensions of brown rice/ polished rice

Variety	Brown rice			Polished rice			Category
	L (mm)	B (mm)	L:B	L (mm)	B(mm)	L:B	
CO (R) 48(CB 01105)	6.4	2.2	2.91	5.3	1.9	2.79	Fine
IWP	6.3	2.5	2.52	6.1	2.0	3.05	Fine
BPT 5204	5.7	2.1	2.71	5.5	1.9	2.89	Fine

b) Milling Performance (%)

Character	CO (R) 48 (CB 01105)	IWP	BPT 5204
Milling (raw rice)	70.7	66.7	68.7
Head rice recovery(raw rice)	66.5	59.6	67.5
Milling (par boiled)	71.90	73.54	72.46
Head rice recovery(Par boiled)	70.90	72.87	71.88

c) Cooking qualities

Sample	Variety	Elongation Ratio	Optimal Cooking time (min)	Cooked rice Volume (ml/100g)
Raw	CO (R) 48 (CB 01105)	1.81	20	440
	IWP	1.90	18	430
	BPT 5204	1.84	22	440
P.B.	CO (R) 48	1.43	25	390
	IWP	1.51	23	400
	BPT 5204	1.57	27	400

Quality of rice with reference to cooked rice volume

350 – 375 ml / 100 g of rice - Poor; 375-400 ml / 100 g of rice - Satisfactory

400 – 425 ml / 100 g of rice - Good >425 ml / 100 g of rice - Very good

d) Biochemical properties of CO (R) 48 (CB 01105)

Traits	CO (R) 48(CB 01105)	IWP	BPT 5204
Amylose content (%)*	24.9	22.34	23.73
Gelatinization temperature ^{o} C	73.14	74.54	73.70

* mean of tests conducted at IICPT,Thanjavur, DRR, Hyderabad and Post harvest Technology Centre (PHTC), Coimbatore

type with a 1000 grain weight of 18.0g and an L/B ratio of 2.79. The kernel is white and translucent. The studies conducted at PPRC and DRR indicated that it had a good milling percentage and high head rice recovery (Table 4). Head rice recovery is the key factor for giving more profit that depends mainly on grain type, drying condition and cultural practices (Sanjukta Das *et al*., 2007). The rice had intermediate amylose content (24.9%), soft gel consistency, moderate gelatinization temperature (73.14°C) and good elongation ratio (1.43). Juliano *et al*., (1964) reported that gelatinization temperature and amylose content reflected the cooking quality. Rice varieties with high gelatinization temperature require more time to cook and expand very little. Rice with intermediate gelatinization temperature is more preferable in India (Prabhavati *et al*., 2007). Rice with intermediate amylose content remains non sticky and tender after cooking. Linear elongation ratio is an important component which gives good shape to rice than breadth wise elongation (Sanjukta Das *et al*., 2007). These component characters contribute to the superior cooking quality of the rice

Table 5. Morphological characters (DUS descriptors) of CO (R) 48 (CB 01105)

Characters		Remarks
Habit	:	erect, medium tall
Coleoptile	:	Green
Basal leaf sheath colour	:	Green
Leaf sheath	:	Green
Leaf blade colour	:	Green
Leaf pubescence	:	Intermediate
Leaf length	:	55.0 cm (± 5.0 mm)
Leaf width	:	1.80 cm (± 0.2 mm)
Days to 50% flowering	:	100-105 days
Panicle exertion	:	well-exerted panicle
Stigma colour	:	White
Apiculus colour	:	Green
Number of effective tillers	:	15-20
Panicle length (cm)	:	30-35 cm
Panicle type	:	long, compact, drooping
Awning	:	Absent
Seed coat (Kernel) colour	:	White
Junction of auricle	:	Pale green
Grain yield per plant (g)	:	28 - 33 g

The medium duration rice varieties *viz*., ADT 39, ASD 19, IWP and CO 43 are widely grown in Tamil Nadu at present. The new culture CB 01105 was considered as an alternative and developed and released as CO(R) 48. This new cultivar of medium duration and many desirable features like high yield with resistance to BPH, WBPH, GLH, blast, sheath blight and rice tungro disease is recommended for cultivation in Tamil Nadu during *thaladi* (Sep-Oct) season. The culture possesses high yield, good milling and cooking qualities and hence would cater to the demands of all the stakeholders namely farmers, traders, millers and consumers.

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