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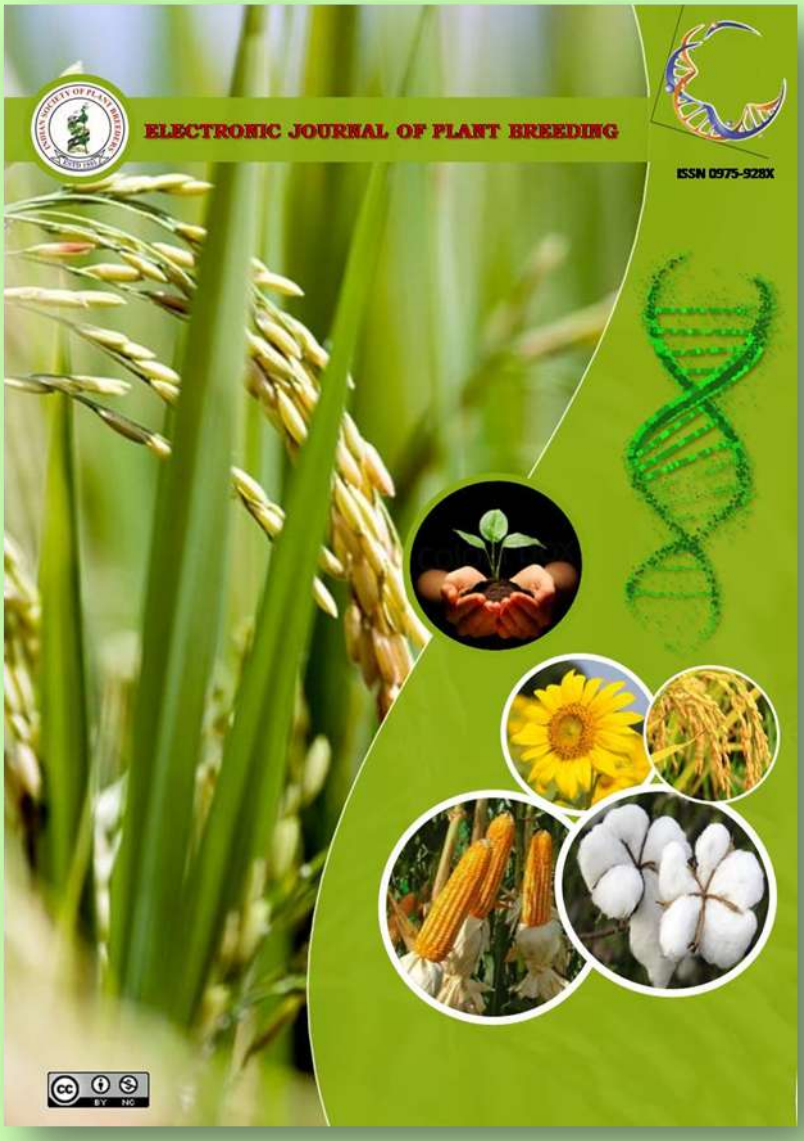

ISSN: 0975-928X

Volume: 10

Number:3

EJPB (2019) 10(3):1148-1160

DOI: 0.5958/0975-928X.2019.00146.7

Electronic Journal of Plant Breeding, 10 (3): 1148 - 1160(Sep 2019) DOI: 0.5958/0975-928X.2019.00146.7
ISSN 0975-928X

Research Article

CO 52 (IET 25487): A highly remunerative medium duration fine grain rice variety

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(Received: 05 Apr 2019; Revised: 31 Jul 2019; Accepted: 16 Aug 2019)

Abstract

In Department of Rice, Tamil Nadu Agricultural University, Coimbatore, a medium duration fine grain rice variety CO52 was released for cultivation in transplanted situation for *late samba* / *thaladi* season . CO52 rice variety recorded a mean grain yield of 6191 kg/ha and possessess quality grain traits comparable to the predominantly cultivated fine grain types. It is a derivative of the cross between BPT 5204 and CO(R) 50 which matures in 130-135 days. The variety was tested in the station trial for three (2009-2011)years, Multi Location Trial for two (2011-12 and 2012-13) years, Adaptive Research Trial for two (2013-14 and 2014-15) years, OFT for three (2013-14, 2014-15 and 2015-16) years and in AICRIP trial for two (2011 and 2015) years. CO52 variety is moderately resistant to insect pests *viz.,* plant hoppers and leaf hoppers and diseases *viz.,* blast, sheath rot, brown spot and sheath blight. It produces medium slender white rice with high milling percentage, high head rice recovery, high linear elongation ratio, intermediate amylose content, soft gel consistency and moderate gelatinization temperature indicating its suitability for cooking with a remunerative market price and consumer preference similar to Improved White Ponni and BPT 5204.

Key words

CO 52, Medium duration rice variety, fine grain, amylose content, soft gel consistency

Introduction

India is a predominant rice growing country. Rice is the staple food for 65% of the population in India. The demand for rice is expected to rise due to increase in population (1.6% per year) plus increased per capita income, while the area under rice cultivation is expected to reduce to 40 million ha in the next 15 to 20 years (Suryavanshi and Singh, 2015). Based on the current rate of population growth (1.4%) and per capita consumption (215 to 230g/day) the projected demand for rice by 2025 will be around 130 m. tonnes. India has the largest area under rice cultivation in the world and shares 17.9% of world's rice production and occupies second position next to China. Rice is cultivated in diverse ecologies spread over 43 million ha with a production of 108.86 million tonnes of milled rice which is an all time record (*Source : Directorate of Economics and Statistics, February 2017- GOI*). Currently India is not only self sufficient in food production but also emerged as a largest exporter of rice. To cope up with the present domestic demand, the food production growth must exceed the population growth for sustaining self sufficiency. Therefore it is highly essential to develop rice varieties with higher yield potential and greater yield stability. Attempts are being made in all parts of rice growing states in the country to improve the productivity through hybrids and high yielding varieties and to develop suitable varieties for targeted environments.

Tamil Nadu is one among the leading rice producing states of the country with an area of 17 to 20 lakh hectares. Out of this, three fourth area is covered with medium duration rice varieties. Among them, Improved white ponni and BPT 5204 are the predominantly cultivated rice varieties by the farmers of Tamil Nadu for their superior grain quality. However, these varieties are susceptible to major pests and diseases. Several outbreaks of pests and diseases particularly by BPH and blast due to cultivation of susceptible varieties ultimately affect the productivity of the State and makes the rice growing environment polluted. The rice growers are in need of good quality premium rice variety which could replace the old rice varieties that are susceptible to pest and disease infestation. Hence suitable variety for replacement is need of the hour. At this juncture CO52 a medium duration

high yielding fine grain rice variety that cater the present need of rice growers of Tamil Nadu was developed and released by TNAU in the year 2017. CO52 is an eco friendly variety that has resistance/tolerance to major pest and diseases.

Materials and Methods

In Department of Rice, Tamil Nadu Agricultural University, Coimbatore crossing was effected between BPT 5204 and CO(R) 50 during *kharif* 2006 with an objective to develop alternate variety for BPT 5204 and the homozygous line was fixed as CB 09123 in F_5 generation during *Rabi* 2008-09. The detailed breeding programme and method of evaluation of CB 09123 are shown in the fig.1. The culture was developed through pedigree breeding combining quality, yield and presence of Pi54 conferring resistance to blast that was established through markers(Balaji Aravindhan, 2015). The broad spectrum gene *Pi54* gene was present in the parent CO(R) 50. Culture CB 09123 was evaluated in different yield trials *viz.,* Station trials from 2009-2011, Multi Location Trial (MLT) for two years in 2011-12 and 2012-13 in 17 locations across Tamil Nadu and Adaptive Research Trial (ART) in the farmers holdings during 2013-14 and 2014-15 in 158 locations across 21 districts of Tamil Nadu and OFT for three years (2013-14, 2014-15 and 2015-16). Under All India Coordinated Rice Improvement Programme (AICRIP) the culture was tested for two years during 2011 in Initial Varietal Trial – Irrigated Medium and 2015 in Initial Varietal Trial – Medium Slender. Physical, milling and cooking quality characteristics of the culture were tested in Tamil Nadu Rice Research Institute, Aduthurai and Department of Rice, TNAU, Coimbatore. Pests and diseases reaction was tested in TNAU Rice Research Stations at Coimbatore, Aduthurai, and Madurai

Results and Discussion

At Department of Rice, TNAU, Coimbatore, culture CB 09123 recorded a mean grain yield of 6879 kg/ha over three years of station trials with 16 per cent improvement over CO(R)49 and 20.93 per cent improvement over BPT 5204 (Table 1). Based on the performance at station trials, culture was promoted to multi location trial (MLT) and evaluated in MLT for two years in 2011-12 and 2012-13 in 17 locations. The mean grain yield of the culture was 5991 kg/ha which was 9.85 per cent higher than CO (R) 49 and 13.90% than BPT 5204 during 2011-12. In 2012-13 the mean grain yield was 5841kg/ha with 5.9% yield increase over TNAU rice ADT 49 and 3.8% over BPT 5204 (Table 1). Adaptive Research Trials (ART) were conducted with CB 09123 during 2013-14 and 2014-15 in 21districts at 158 locations, of which the culture has recorded more than 7000 kg/ha in 24 locations. It recorded a mean grain yield of 6122 kg/ha in 158 locations which was on an average, 4.81 percent higher than ADT(R) 49. At TherkuKadayam, Tirunelveli the culture has recorded the highest yield of 10,416 kg/ha, indicating the highest yield potential of this variety.

Based on its consistent performance the culture was recommended by the annual research meet for large scale demonstration. On Farm Trials (OFT) were conducted with CB 09123 during 2013-14, 2014-15& 2015-16 in 36 locations across Tamil Nadu in one-acre plots. In 2013-14, the culture recorded a mean grain yield of 6069 kg/ha which was 18.53 per cent higher than BPT 5204; in 2014-15 it recorded a mean grain yield of 6751 kg/ha which was 34.69 per cent higher than BPT 5204 and in 2015-16 out of 8 locations tested this culture recorded 6975kg/ha with 33.59 per cent increase over BPT 5204 (Table 1).

CO 52 variety was evaluated as IET 22518 under All India Coordinated Rice Improvement Programme for two years across the country. During 2011 in Initial Varietal trial – Irrigated medium it recorded a mean grain yield of 5586 kg/ha over nine trials representing 8.84per cent increase in yield over national check NDR 359 . During 2015 as IET 25487 in Initial varietal trial – medium slender it recorded a mean grain yield of 6285 kg/ha over seven trials representing 11.47 per cent increase in yield over national check WGL 14 (Table 1).

In agronomy trial evaluated during 2016-17, CB 09123 had better agronomic efficiency than TNAU Rice ADT 49 and BPT 5204, by registering more number of grains per panicle and grain yield (Table 2). Advantage of this variety was highlighted by physiological efficiency witnessed in terms of higher crop growth rate, leaf area index, flag leaf length, total chlorophyll content, photosynthetic rate, transpiration rate, radiation use efficiency and leaf nitrogen at flowering as compared to check TNAU Rice ADT 49 and BPT 5204 (Table 3). CO 52 registered optimum leaf area index, higher total chlorophyll content and there by increased photosynthetic rate and crop growth rate through its erect leaf nature resulting in higher yield as compared to checks evaluated as suggested by Peng and Ismail, 2004.

CO 52 is the variety with erect medium tall plant stature (100-105cm). It has high number of productive tillers (25 to 30), long droopy panicles (29 to 30 cm) with complete fertility. Variety has

greenish leaf with a length of 40.0cm (±5.0mm) and breadth of 1.2cm (±0.2mm). This variety is characterized with erect flag leaf and long droopy panicle. Panicle has 450 to 475 number of grains/panicle. Grains are medium slender with an L/B ratio of 3.0 and 1000 grain weight of 14.10g. Milled rice colour is white and abdominal white is occasionally present (Table 4).

Approximately 52 per cent global production of rice is lost annually owing to the damage caused by biotic stress factors of which around 21 per cent is attributed to the attack of insect pest (Yarasi *et al.,* 2008). Rice crop is attacked by more than 100 species of insects and about 20 per cent of them considered as serious pests and cause significant damage to rice crop. The rice brown planthopper, green leafhopper, leaf folder, stem borer, rice blast disease, sheath blight are some of major insect pests and diseases in rice growing regions of the country. Host plant resistance has long been used as a viable alternative to chemical control methods (Soundararajan *et al*., 2004). Susceptible rice cultivars often suffer severe yield loss up to 60 per cent from its attack (Panda and Khush, 1995). Screening and assessing the level of resistance to pest and diseases in rice genotypes is an important step for the development of new varieties. The culture CB 09123 was screened against all the major diseases *viz.,* blast, sheath rot, sheath blight, brown spot and rice tungro disease (RTD) under artificially inoculated and field condition during 2011-12, 2012-13 and 2013-14. The culture CB 09123 is found to be moderately resistant to blast, sheath rot, brown spot and sheath blight (scale 5), in 1 to 9 scale. The corresponding scores for BPT 5204 are 5 or 7 or 9 scale for all the diseases (Tables 5a, b & c). Under AICRIP, the culture was screened in NSN2 and DSN (Annonymous, 2011 and 2015) and recorded as moderately resistant to leaf blast, neck blast, brown spot, BLB, sheath blight, glume discolouration and sheath rot (Tables 5d & e).

The culture CB 09123 was evaluated for four years (2011-12, 2012-13, 2013-14 and 2014-15) at Coimbatore under artificial condition at Thirupathisaram, Madurai and Aduthurai under field condition against the major pests and the culture CB 09123 is moderately resistant to WBPH (5) and GLH (5) (Table 6a,b,c& d). Under AICRIP, the culture was screened in NSN2 (Annonymous, 2011) and plant hopper screening trial (Annonymous,2015), wherein CB 09123 was resistant to plant hoppers (1) and leaf hopper (Table 6 e & f).

Good grain quality fetches higher price for the farmers. Demand for better grain quality is increasing in the economically developed and developing countries. Earlier emphasis was given for high yield and insect/disease resistance during varietal development. But now, quality is the important breeding objective in rice breeding programme in all rice growing countries. As unattractive grain character and unsatisfactory cooking quality hampers the acceptance and spread of modern variety, quality improvement receives special emphasis since last one decade. Milling out turn is the measure of rough rice recovery during milling. It is one of the important properties to the millers. The rice millers prefer varieties with high milling and head rice recovery, where as consumers preference depends on cooking and eating qualities (Merca and Juliano, 1981). More emphasis should be given to head rice recovery than to total rice yield since it is more important commercially. Head rice recovery is a highly heritable trait although environmental factors and post harvest handling are known to break the grain during milling (Fan *et al.,* 2000). The rice culture CB 09123 possess high milling percentage (68.6%) and head rice recovery (62.25%) desired by farmers and millers as well.

Cooking qualities in rice is associated with physico-chemical properties *i.e.* amylose content (AC), gel consistency (GC) and gelatinization temperature (GT). Apparently, the amylose content reported for *indica* rice varieties ranges from moderately low to intermediate and the level varies according to location and environment as well. However consumers prefer varieties with intermediate (20-25%) amylose content. Amylose consists of linearly linked glucose molecules and is relatively resistant to digestion (Oko *et al.,* 2012). It has a major influence on the characteristics of cooked rice. It correlates negatively with test panel sources for cohesiveness, tenderness, colour and gloss of the boiled rice. Gel consistency (GC) measures viscosity of pastes or gels made from milled rice flour and is a good determining factor of cooked rice texture. GC of rice with intermediate amylose content may be soft, medium, or hard. Cooked rice with hard gel consistency hardens faster than those with soft gel consistency. The later also remains tender and soft even upon cooling (Juliano, 1979). Consumer therefore prefers rice with soft to medium gel consistency (Tang et al., 1991). The gelatinization temperature of the endosperm starch refers to the cooking temperature at which water is absorbed and the starch granule swell irreversibly with a simultaneous loss of crystalline. During cooking, rice kernels absorb water and increase in volume through increase in length or breadth. Breadth-

wise increase is not desirable, whereas length-wise increase without increase in girth is a desirable characteristic in high-quality premium rice (Juliano, 1979). Kernel elongation is considered as a physical phenomenon and is influenced by several physicochemical and genetic factors, including genotypes, aging temperature, aging time, water uptake, amylose content and gelatinization temperature. Large volume expansion is a matter of great satisfaction to the average rice consumer irrespective of the increased volume due to length (Golam and Prodhan, 2012). CO 52 has desirable cooking quality traits like high linear elongation ratio (1.73), volume expansion (3.85ml) intermediate amylose content and gelatinization temperature and soft gel consistency and therefore would be highly relished by the consumers (Table 7).

CO 52 with higher yield (6191 kg/ ha), better pest and disease resistance, fine grain type and good cooking quality in comparison to the check BPT 5204 and other fine grain variety made this to be suitable for cultivation during *late samba/thaladi* season in Tamil Nadu and released during 2017.

Salient features of Rice CO 52

- Medium duration (130–135 days) and high yielding medium tall rice variety with mean grain yield of 6191 kg/ha
- Presence of *Pi 54* broad spectrum gene conferring resistance to blast was established.
- Moderately resistant to plant hoppers and leaf hopper
- Moderately resistant to sheath rot, brown spot and sheath blight
- White medium slender rice with high milling percentage, head rice recovery and linear elongation ratio

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Table 1. Overall yield performance of CO 52 (CB 09123) in different trials

	No. of trials	Grain Yield (kg/ha)			
		CO 52 CB 09123	**CO(R) 49**	**TNAU Rice ADT 49**	**BPT 5204**
Station trials (2009-2011)	3	6879 (137)	5925 (135)	-	5688 (139)
Multi-location trials (2011-12)	8	5991 (135)	5454 (128)	-	5260 (135)
Multi-location trials (2012-13)	9	5841 (137)	5077 (132)	5518 (135)	5629 (135)
AICRIP- IVT –IM (2011)	9	5586 (146)	5132 (130) (NDR 359)	-	-
AICRIP- IVT –MS (2015)	7	6285 (135)	5638 (138) (WGL -14)	3287 (123)	4698 (136)
Adaptive Research trial (2013-14)	75	6029 (130)	-	5738 (131)	5651 (131)
Adaptive Research trial (2014-15)	83	6215 (122)	-	5943 (122)	5759 (122)
OFT(2013-14)	12	6069 (131)	-	-	5120 (134)
OFT (2014-15)	13	6751 (135)	-	-	5012 (140)
OFT(2015-16)	8	6975 (133)	-	-	5221 (137)
No. of trials (227)		227	20	174	218
Overall weighted Mean Yield in kg/ ha		**6191 (130)**	**5355 (131)**	**5725 (130)**	**5563 (131)**
% increase over the checks			**15.61**	**8.14**	**11.29**

Mean duration (days) in the trials are furnished in the parentheses.

Table 2. Performance of CO 52 (CB 09123) in Agronomy trials

Characters	CB 09123	TNAURice ADT 49	BPT 5204
Days to 50% flowering	102	102	106
No. of productive tillers per m^2	367	325	310
Plant height at harvest (cm)	101	98	80.50
Grains per panicle (No)	410	220	190
Grain yield (kg/ha)	7120	6520	5900
Straw yield (kg/ha)	8093	7890	7670
Bio Mass (t/ha)	15213	14410	13570
Agronomic efficiency (%)	34	32	30

Table 3. Physiological characters of CO 52 (CB 09123)

Parameters	CB 09123	TNAU Rice ADT 49	BPT 5204
Plant height (cm) at flowering	98.6	91.3	72.6
Total Dry Matter Production ($g\ plant^{-1}$) at 50% flowering	75.6	58.2	63.7
Leaf Area Index at 50% flowering	5.6	4.3	3.9
Crop Growth Rate ($g\ m^{-2}\ day^{-1}$) at PI-50% Flowering	51.4	43.1	40.7
Flag leaf length (cm) at 50% flowering	36.3	27.4	26.1
Photosynthetic rate ($\mu mol\ CO_2\ m^{-2}\ s^{-1}$) at 50% flowering	31.2	25.3	23.7
Transpiration rate ($mmol\ H_2O\ m^{-2}\ s^{-1}$) at 50% flowering	12.3	8.7	6.3
Total chlorophyll content ($mg\ g^{-1}$) at 50% flowering	3.1	2.4	2.2
Light Transmission Ratio (%) at 50% flowering	22.2	35.4	33.6
Radiation Use Efficiency ($g\ MJ^{-1}day^{-1}$) at 50% flowering	1.93	1.71	-
Leaf Nitrogen (%) at 50% flowering	4.1	3.4	3.1

Table 4. Morphological characters (DUS descriptors) of CO 52

Characters	Remarks
Early plant vigour	Good
Coleoptile	Green
Basal leaf sheath colour	green
Leaf sheath	green
Leaf blade colour	green
Leaf pubescence	Intermediate
Leaf length	40.0 cm (± 5.0 mm)
Leaf width	1.20 cm (± 0.2 mm)
Days to 50% flowering	100-105 days
Panicle exertion	Well exerted panicle
Stigma colour	White
Apiculus colour	Light green
Number of effective tillers	25to 30
Panicle length (cm)	29 to 30 cm
No. of grains/panicle	450 to 475
Panicle type	Long, compact and droopy
Awning	Absent
Days to maturity (days)	135
Seed coat (Kernel) colour	White
Junction of auricle	Pale green
1000 grain weight (g)	14.10
Hull (husk) colour	Straw
Threshability	Good
Aroma of grain / rice	absent
Grain yield per plant (g)	50-55g
Grain size	Medium slender
LxB (mm)	5.50 x 1.80
L / B ratio	3.00
Rice grade	Medium slender
Milled rice colour	White
Abdominal white	Occasionally present

Table 5a. Reaction of Rice CO 52 (CB 09123) against major rice diseases in 2011- 12

Sl. No.	Culture	Blast	Sheath rot		Sheath blight	Brown spot	
		CBE[a]	ADT[a]	MDU[f]	MDU[f]	ADT[f]	MDU[f]
1.	CB 09123	5	5	5	5	5	5
2.	CO (R) 49	5	5	5	7	5	5
3.	BPT 5204	8	9	5	7	7	5

Table 5b. Reaction of Rice CO 52 (CB 09123) against major rice diseases in 2012- 13

Sl. No.	Culture	Blast	Sheath rot		Brown spot	RTD
		CBE[a]	ADT[a]	MDU[f]	ADT[f]	CBE[a]
1.	CB 09123	5	5	5	3	5
2.	CO (R)49	-	5	5	3	-
3.	TNAU Rice ADT 49	4	7	5	3	7
4.	BPT 5204	9	9	5	7	7

Table 5c.Reaction of Rice CO 52 (CB 09123) against major rice diseases in 2013-2014

S. No	Cultures	Blast	Sheath blight	Sheath rot
		CBE[a]	MDU[f]	MDU[f]
1.	CB 09123	3	5	5
2.	TNAU Rice ADT 49	5	5	5
3.	BPT 5204	5	3	7

Table 5d.Resistance reaction of Rice CO 52 (CB 09123) against major rice Diseases in AICRIP (NSN 2)

Sl. No	Culture	Leaf blast	Neck blast	BLB	Brown spot	Sheath blight	Glume discolouration
1	CB 09123	5.3	4.5	4.9	5.3	4.9	3.5
2	CO39	6.4	6.3	4.9	5.2	6.4	4.5
3	BPT 5204	5.5	7.5	5.1	6.2	6.5	3.5

Table 5e. Resistance reaction of Rice CO 52 (CB 09123) against major rice Diseases in AICRIP (DSN)

Sl. No.	Culture	Blast	Glume discolouration	Brown spot	Sheath rot	Neck blast	BLB	Sheath blight	RTD
1.	CB 09123	4.5	4.3	4.5	5.3	5.1	4.9	5.3	3.6
2.	CO 39	6.5	6.0	5.5	6.6	6.1	5.6	6.4	3.6
3.	BPT 5204	5.2	5.0	4.7	4.7	4.6	6.0	6.2	3.8

[a].under artificial condition [f]. under field condition

Table 6a. Reaction of Rice CO 52 (CB 09123) against major sucking pests of rice under + artificial condition (Coimbatore) in 2011-12

S.No.	Cultures	BPH	WBPH	GLH
1.	CB 09123	3	5	5
2.	CO (R) 49	7	5	9
3.	BPT 5204	9	9	7

Table 6b. Reaction of Rice CO 52 (CB 09123) against major sucking pests of rice under Field/artificial condition in 2012-13

SNo.	Cultures	Yellow stem borer damage					Leaf folder (%)
		Dead heart (%)		White ear (%)			
		ADT[f]	MDU[f]	ADT[f]	MDU[f]	TPS[f]	MDU[f]
1.	CB 09123	4.8	5.13	0	27.09	3.54	4.17
2.	TNAU Rice ADT 49	6.1	2.38	0	4.86	3.15	5.54
3.	BPT 5204	4.4	12.07	0.8	12.87	-	14.87

Table 6c. Reaction of Rice CO 52 (CB 09123) against major insect pests of rice under field /net house conditions in 2013-14

Sl. No.	Cultures	Leaf folder damage(%)	Silver Shoot (%)		GLH No/hill	
		ADT[f]	ADT[f]	MDU[f]	ADT[f]	CBE[a]
1.	CB 09123	10.7	2.8	4.76	0.3	3
2.	TNAU Rice ADT 49	8.9	4.2	6.67	0.4	5
3.	BPT 5204	18.1	5.7	7.02	0.9	9

Table 6d. Reaction of Rice CO 52 (CB 09123) against major insect pests of rice under field/artificial condition in 2014-15 (grades / scores in 0 to 9)

S.No.	Cultures	BPH CBE[a]	WBPH CBE[a]	GLH CBE[a]
1.	CB 09123	5	5	3
2.	TNAU Rice ADT 49	7	9	5
3.	BPT 5204	7	9	9

Table 6e. Resistance reaction of Rice CO 52 (CB 09123) against major rice pests in AICRIP (NSN 2)

Sl. No.	Culture	GLH (Jagdalpur)	PH (Maruteru)	WM (Jagdalpur)
1.	CB 09123	3.0	5.0	0.9
2.	TN1	7.0	7.0	1.0

Table 6f. Resistance reaction of Rice CO 52 (CB 09123) against planthoppers in AICRIP (Planthoppers screening trial)

Sl. No.	Culture	Gangavathi	Maruteru	Pantnagar No/10 hills	Warrangal
1.	CB 09123	3.0	1.0	117	1.0
2.	TN1	-	9.0	118	9.0
3.	PTB33	3.0	0.0	128	1.0

BPH : Brown planthopper WBPH : White backed planthopper
PH : Planthopper GLH : Green leafhopper
WM : Whorl maggot
[a]. under artificial condition [f]. under field condition

Table 7. Quality characteristics of Rice CO 52 (CB 09123)

a) Milling quality traits

Centres /Characters	Hulling (%)	Milling (%)	Head rice recovery (%)
CB 09123			
Aduthurai	80.00	70.00	65.00
Coimbatore	74.60	67.20	59.50
Mean	77.30	68.60	62.25
TNAU Rice ADT 49			
Aduthurai	75.00	65.00	58.50
Coimbatore	68.20	63.60	52.80
Mean	71.60	64.30	55.65
BPT 5204			
Aduthurai	77.50	65.00	58.50
Coimbatore	74.00	68.40	63.80
Mean	75.75	66.70	61.15

b) Physical grain quality traits

Centres/ Characters	Kernel length(mm.)	Kernel breadth(mm.)	L/B ratio	Grain type
CB 09123				
Aduthurai	5.70	1.90	3.00	MS
Coimbatore	5.90	1.80	3.20	
Mean	5.80	1.85	3.10	
TNAU Rice ADT 49				
Aduthurai	5.70	1.90	3.00	SS
Coimbatore	5.20	1.80	2.80	
Mean	5.45	1.85	2.90	
BPT 5204				
Aduthurai	5.90	2.00	3.00	MS
Coimbatore	6.00	1.90	3.10	
Mean	5.95	1.95	3.05	

c) Cooking quality traits

Centres/ Characters	Kernel length (mm.)	Kernel breadth (mm.)	Linear elongation ratio	Breadth wise elongation ratio	Volume expansion ratio	Gel consiste-ncy (mm)	Alkali spreading value
Rice CO 52 (CB 09123)							
Aduthurai	9.60	2.70	1.70	1.40	4.00	98	3.0
Coimbatore	10.40	2.70	1.76	1.50	3.70	97	3.0
Mean	10.00	2.70	1.73	1.45	3.85	96	3.0
TNAU Rice ADT 49							
Aduthurai	9.30	2.70	1.60	1.40	3.30	78	3.0
Coimbatore	9.20	2.60	1.77	1.44	3.40	90	2.0
Mean	9.25	2.65	1.68	1.42	3.35	84	2.5
BPT 5204							
Aduthurai	10.00	2.40	1.70	1.20	4.20	90	3.0
Coimbatore	10.20	2.70	1.70	1.42	3.70	85	1.0
Mean	10.10	2.55	1.70	1.31	3.95	87.5	2.0

d) Biochemical properties of Rice CO 52 (CB 09123) (Coimbatore)

Traits	CB 09123	BPT 5204	TNAU Rice ADT 49
Amylose content (%)	24.80	21.50	25.30

e) Organo-leptic evaluation of cooked rice

Details	CB 09123	TNAU Rice ADT 49	BPT 5204
Colour and appearance	7	7	7
Flavour	7	7	7
Texture	8	8	8
Taste	7	7	7
Overall acceptability	7	7	7

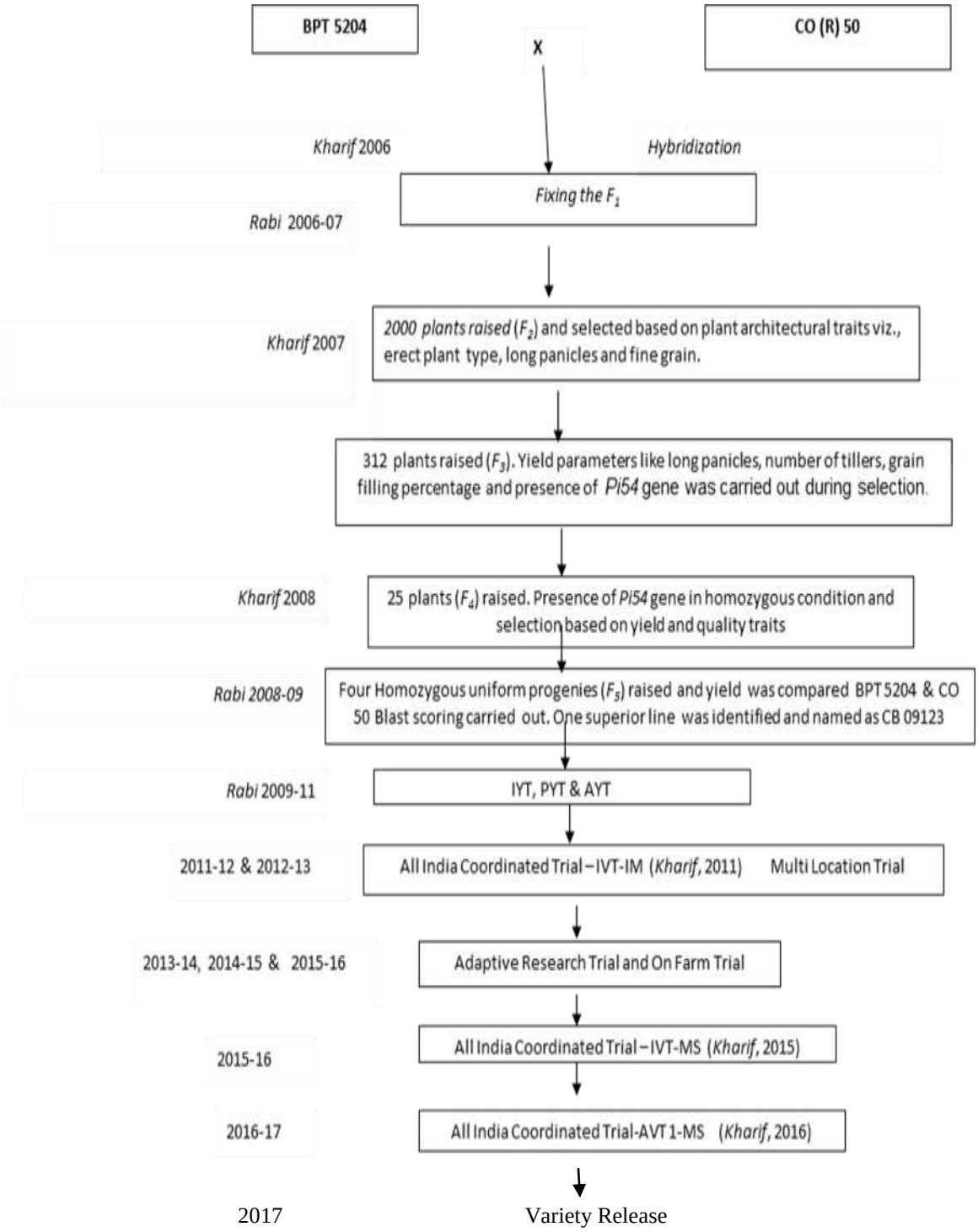

Fig. 1. Pedigree breeding flow chart of Rice CO 52 (CB 09123)

Plate 1. Morphological features and grain type of Medium Duration Fine Grain Rice Variety CO 52

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