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Research Article

# Rice CO 53: A high yielding drought tolerant rice variety for drought prone districts of Tamil Nadu

**S. Robin, P. Jeyaprakash, R. Pushpam*, K. Amudha, R. Saraswathi, K. Ganesamurthy, S. Muthuramu, P. Yogameenakshi, R. Arulmozhi, S. Radhamani, V. Ravichandran, S. Suresh, A. Ramanathan, R. P. Soundararajan, V. Balasubramani, C. Gopalakrishnan, K. Krishnasurender, G. Senthil Kumar and S.Geetha**

Department of Rice, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore- 641 003
***E-Mail** : pushpamtnau@gmail.com

**Abstract**
Early duration drought tolerant rice culture CB 06803, a derivative of the cross PMK (R ) 3 x Norungan was released as Rice CO 53 during the year 2020 as an alternate variety for Anna(R)4, with 115 -120 days duration. It possesses desirable features like high yield, drought tolerance and better physiological efficiency. This culture with semi dwarf stature has efficient tillering capacity, long droopy panicles with a highly acceptable plant characters and is a replacement for the rice variety Anna (R) 4 due to its grain yield and pest and disease resistance. In the overall yield analysis, the culture CB06803 recorded an overall mean grain yield of 3718 kg/ha which was 12.19 per cent increase over TKM (R) 12 and 14.08 per cent over Anna (R) 4 under dry condition. Under semi dry condition, it recorded 3866 kg/ha with 18.40 per cent increase over TKM (R) 12 and 8.67 per cent over Anna (R) 4. It is moderately resistant to WBPH, leaf blast, neck blast, sheath rot, brown spot and RTD under artificial condition. It has white short bold rice with high milling percentage (69.6), head rice recovery (59.6%) and suitable for idly making. The culture, CB 06803 had better agronomic efficiency than TKM (R)12 and Anna (R) 4 by recording more number of productive tillers per plant and grain yield under control and drought. The culture CB 06803 had better physiological efficiency under drought than TKM (R) 12 and Anna (R) 4 having higher RWC, total chlorophyll content, chlorophyll stability index, photosynthetic rate, stomatal conductance and photo chemical efficiency. The culture had higher proline content than TKM (R) 12 and was on par with Anna (R) 4. It had higher catalase activity than Anna (R) 4. CB 06803 had better physiological efficiency under drought by showing partial closure of stomata as that of Sahbagidhan. CO 53 with higher grain yield under drought, disease resistance and short bold grains and suitable for cultivation in drought prone districts of Tamil Nadu as direct seeded rainfed or semi dry rice ecosystem.

**Key words:** Rice CO 53, bold grain rice, short duration, drought tolerance

## INTRODUCTION

Rice is the world's most important food crop and the primary food source for about half of the world's population. The occurrence of abiotic stresses such as drought and submergence, frequently, have been identified as the key factors for low productivity in the rainfed ecosystem. Rainfed upland and rainfed lowland ecosystems contribute to 21% of the total production from 38% of the cropped area. In rainfed uplands, rainfed shallow

lowlands and rainfed medium lowlands, drought has been the single largest factor for a lower yield in rice. Drought during the cropping season directly affects grain yield, particularly at the reproductive stage, which is the most devastating stage (Lanceras *et al*., 2004; Venuprasad *et al*., 2009). Recent climate change estimates predict the water deficit to further deteriorate in the coming years (Wassmann *et al*., 2009) and the intensity and frequency of drought are predicted to become worse (Bate *et al*., 2008). Drought affects approximately 23 million ha of rainfed rice area worldwide (Huke and Huke, 1997). It affects roughly 42 million hectares of rice produced in rainfed lowlands and uplands each year, resulting in output losses of 13–35 per cent. As a result, it is critical to design drought-tolerant genotypes that can grow well on marginal soils with restricted water supplies while maintaining optimal production (Muthu *et al.*, 2020).

In Tamil Nadu, out of 17 lakh hectare of rice area, direct seeded rainfed rice is cultivated in 2 lakh hectares in districts of Ramanathapuram, Sivagangai and parts of Vridhunagar districts. Further, due to lack of moisture, the direct seeded area is increasing in coastal districts namely Cuddalore, Thiruvarur, Nagapattinam and Pudukkotai districts during Northeast monsoon periods. The landraces *Norungan* and *Kuliyadichan* are cultivated in certain pockets tolerates drought. Drought tolerant rice varieties released for this ecosystem are PMK (R) 3 and Anna (R) 4. PMK (R) 3 was released in 2003 and Anna (R) 4 in 2009. Anna (R) 4 has long slender grains and consumer/miller preference is less compared to short bold or medium slender grains. Hence, the development of a new short bold rice variety was aimed for dry and semi dry areas. To achieve this, PMK (R) 3 was crossed with *Norungan* from the Department of Rice, Tamil Nadu Agricultural University, Coimbatore which resulted in the selection of CB 06803 with short bold white rice and acceptable grain quality.

## MATERIALS AND METHODS

The rice variety CO53 is a hybrid derivative of the cross PMK (R ) 3 x *Norungan*, effected during *Kharif* 2003 and stabilized in $F_6$ generation and fixed as CB 06803 during *Kharif* 2008 at Department of Rice, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University (TNAU), Coimbatore. Performance of the culture was tested in different yield trials at the Department of Rice, from 2009-2011 along with drought tolerant checks. Further the culture was tested in station trials under dry and semi dry conditions at CSRC, Ramnad and ARS, Paramakudi during 2017-19. Rice CO 53 was tested in a Multilocation trial -Dry /semidry for two years in 2012-13 and 2013-14 under dry and semi dry conditions. Under the All India Coordinated Rice Improvement Programme (AICRIP) this new culture was evaluated as IET 24057 in Initial Varietal Trial – EDS (Drought) during *Kharif* 2013. Based on the performance in Multilocation trial, it was tested under Adaptive Research Trial during 2014-15 and 2015-16 in farmer's holdings covering six drought prone districts in Tamil Nadu. Reaction to pest and disease was tested under artificial and field conditions at Aduthurai and Coimbatore. Agronomic efficiency of this variety was tested under drought during 2017-18 at the Department of Rice. Physiological parameters for drought tolerance were studied during 2017-18 and 2018-2019 at the Department of Rice. Physical, cooking and biochemical properties of the variety were tested along with checks Anna (R)4 and TKM (R)12 at the Department of Rice and TRRI, Aduthurai, TNAU, Coimbatore (**Fig.1**).

## RESULTS AND DISCUSSION

In three years of station trials, the culture CB 06803 registered an average grain yield of 3062 kg/ha with 40.26 and 40.91 per cent yield increase over TKM (R) 12 and Anna (R) 4, respectively under dry conditions; an average grain yield of 5082 kg/ha with 16.37 and 9.12 per cent increase over TKM (R) 12 and Anna (R) 4, respectively under semi dry condition. CB 06803 was evaluated in Coastal Saline Research Centre, Ramnad for two years in 2017-18 and 2018-19, it recorded a mean grain yield of 4525 kg/ha which was 39.23 per cent increase over Anna (R) 4 under dry conditions. CB 06803 was evaluated under semi dry conditions in ARS, Paramakudi for two years in 2017-18 and 2018-19, wherein it recorded a mean grain yield of 4675 kg/ha which was 44.0 per cent higher than the best check, Anna (R) 4.

The promising pre release culture CB 06803 was evaluated in Multilocation trial (MLT) for two years 2012-13 and 2013-14. In 2012-13, its mean grain yield was 2817 kg/ha which was 60.1 and 41.7 per cent increase over TKM (R) 12 and Anna (R) 4, respectively under dry conditions; a mean grain yield of 3270 kg/ha with 40.8 per cent increase over TKM (R) 12 under semi dry condition. In 2013-14, under MLT, its mean grain yield was 2388 kg/ha which was 42.5 and 40.0 per cent higher than TKM (R) 12 and Anna (R) 4, respectively under dry conditions; a mean grain yield of 2667kg/ha with 2.6 per cent and 5.7 per cent increase over TKM (R) 12 and Anna (R) 4, respectively under semi dry condition. The culture was evaluated as IET 24057 under the All India Coordinated Rice Improvement Programme (AICRIP) during *Kharif,* 2013, across the country, in Initial Varietal Trial –Early in drought and normal condition. It registered a mean grain yield of 1805 kg/ha under dry and 2825 kg/ha under normal conditions.

Under ART 2014-15 and 2015-16, the culture was tested in seven drought prone districts of Tamil Nadu. During 2014-15 the mean grain yield recorded was 4108 kg/ha which was 13.44 and 4.71 per cent higher than TKM (R) 12 and Anna (R) 4, respectively. During 2015-16 it registered a mean grain yield of 4199 kg/ha which was 7.08 and 5.14 per cent higher than TKM 12 and

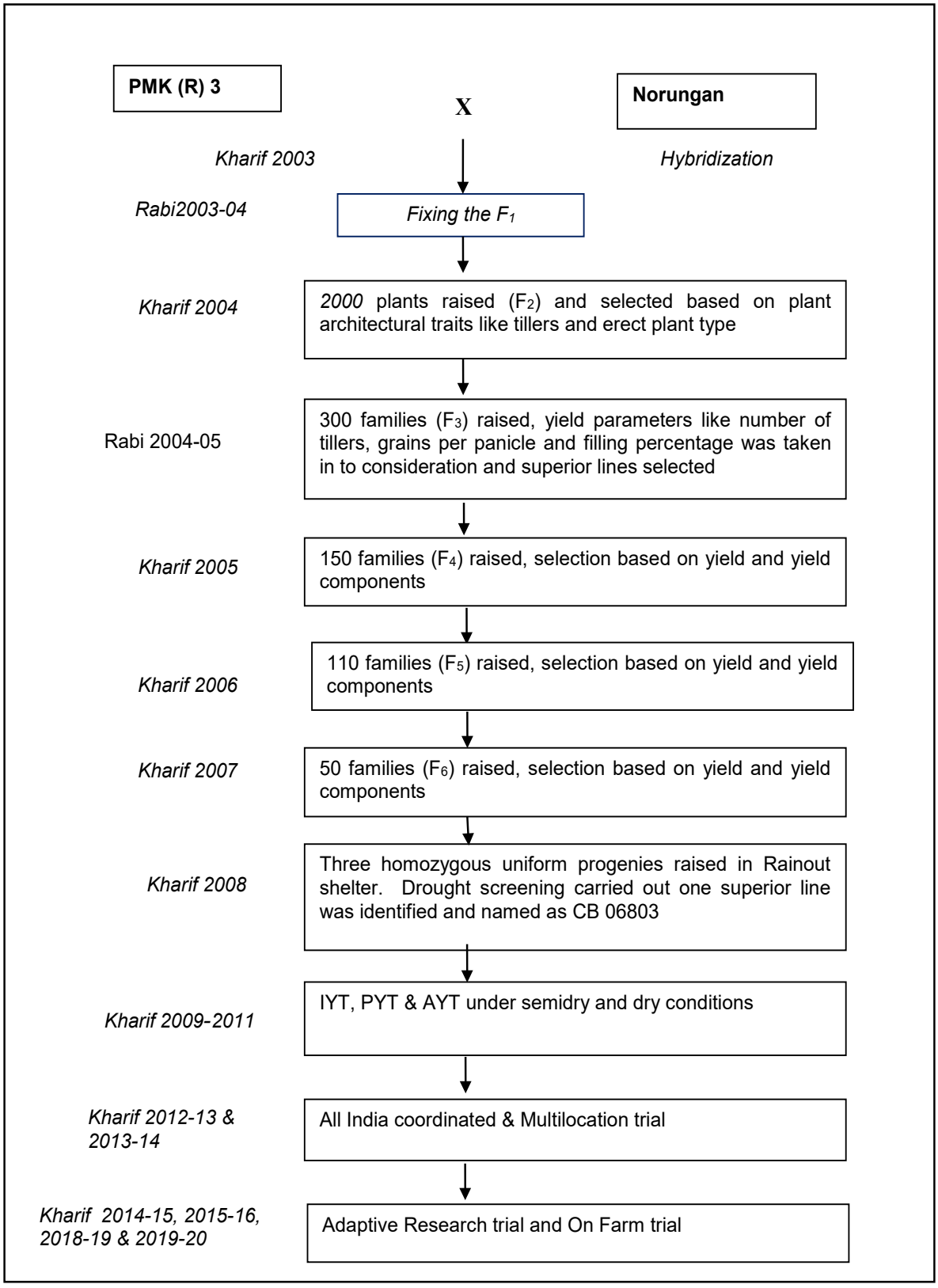


**Fig.1. Pedigree chart of CB 06803**

**Table 1. Overall yield performance of Rice CO 53 (CB 06803) in various trials**

| Name of the Trials | Number of trials | Grain yield (kg/ha) | | | | | |
|---|---|---|---|---|---|---|---|
| | | CB 06803 | | TKM (R) 12 | | Anna(R)4 | |
| | | Dry | Semidry | Dry | Semidry | Dry | Semidry |
| Station trials (2009-2011) Coimbatore | 9 | 3062 (119) | 5082 (124) | 2183 (125) | 4367 (124) | 2173 (116) | 4657 (114) |
| Station trials (2017-2019) ARS, Paramakudi | 2 | - | 4675 (108) | - | - | - | 3240 (109) |
| Station trials (2017-2019) CSRC, Ramnad | 2 | 4525 (113) | - | - | - | 3250 (115) | - |
| Multi-location trials (2012-13) | 7 | 2817 (112) | 3270 (114) | 1759 (130) | 2323 (133) | 1988 (116) | 3270 (118) |
| Multi-location trials (2013-14) | 7 | 2388 (123) | 2667 (117) | 1675 (135) | 2598 (126) | 1705 (118) | 2524 (112) |
| AICRIP- IVT*( 2013) | 16 | 1805 (113) | 2825 (114) | - | - | - | - |
| Adaptive Research trial (2014-15 ) | 33 | 4108 (124) | - | 3621 (124) | - | 3923 (120) | - |
| Adaptive Research trial (2015-16 ) | 37 | 4199 (121) | - | 3921 (120) | - | 3993 (118) | - |
| OFT(2014-15) | 9 | 2334 (119) | - | - | - | 1765 (116) | - |
| OFT (2015-16) | 7 | 2211 (119) | - | - | - | 1747 (115) | - |
| OFT (2018-19) | 12 | 4741 (106) | - | - | - | 3640 (110) | - |
| **Number of trials** | **141** | **123** | **25** | **93** | **23** | **123** | **25** |
| **Overall weighted Mean yield in kg/ ha** | | **3718 (119)** | **3866 (118)** | **3314 (124)** | **3206 (127)** | **3259 (117)** | **3558 (114)** |
| **% increase over check** | | | | **12.19** | **18.40** | **14.08** | **8.67** |

*Mean duration in different trials are furnished in the parentheses.*
**not included for calculating weighted mean yield*

Anna (R) 4, respectively under drought conditions. Under OFT is conducted in one acre demonstration plots, the culture recorded a mean grain yield of 2334 kg/ha in nine locations which was 32.23 per cent higher than Anna (R) 4 during 2014-15; in 2015-16 it recorded a mean grain yield of 2211kg/ha in seven locations which was 26.6 per cent higher than Anna (R);in 2018-19 it recorded a mean grain yield of 4741kg/ha in 12 locations which was 30.0 per cent higher than Anna (R) 4. The culture CB 06803 registered an overall mean grain yield of 3718kg/ha which was 12.19 per cent increase over TKM (R) 12 and 14.08 per cent over Anna (R) 4 under dry conditions; 3866 kg/ ha with 18.40 per cent increase over TKM (R) 12 and 8.67 per cent over Anna (R) 4 under semi dry condition (**Table 1**). Distinguishing morphological characters of this culture are given in **Table 2**. It has compact panicles and short bold grains with semi erect flag leaf. The culture has thousand grain weight of 24.0 g.

The rice culture CB 06803, was screened against the epidemic diseases like a blast, bacterial blight, sheath rot, sheath blight, brown spot and rice tungro disease (RTD) under artificially inoculated and field conditions in 2013-14 under AICRIP. It was observed to be moderately resistant to leaf blast, neck blast, sheath rot, brown spot and RTD (score of less than 5 or 5) (**Table 3a**). Under artificial evaluation for major diseases at Coimbatore during 2019-20, the culture CB 06803 exhibited moderate resistance to leaf blast, brown spot and RTD (score of less than 5 or 5) (**Tables 3b**). It was also evaluated for resistance to a major pest, at Coimbatore (2015-16 & 2019-20) under artificial conditions and in AICRIP (2013-14). The culture CB 06803 was observed to be moderately resistant to WBPH (score 5) (**Tables 4a, b, c & d**).

In an agronomy trial conducted during 2014-15, the culture CB 06803 was observed to have higher agronomic

**Table 2. Distinguishing morphological characters of CB 06803**

| Traits | | Description |
|---|---|---|
| Early plant vigour | : | Good |
| Coleoptile | : | Green |
| Basal leaf sheath colour | : | Green |
| Leaf sheath | : | Green |
| Leaf blade colour | : | Green |
| Leaf: Intensity of green colour | : | Medium |
| Leaf Auricle | : | Present |
| Leaf: Anthocyanin colouration | : | Absent |
| Leaf:Ligule | : | Present |
| Leaf: Shape of the Ligule | : | Split |
| Leaf: Colour of the ligule | : | White |
| Leaf:Collar | : | Present |
| Leaf pubescence | : | Intermediate |
| Flag leaf angle | : | Semi erect |
| Flag leaf length | : | 48.0 cm (± 5.0 mm) |
| Leaf width | : | 0.90 cm (± 0.2 mm) |
| Days to 50% flowering | : | 85-90 |
| Panicle exertion | : | Well exerted panicle |
| Stigma colour | : | White |
| Apiculus colour | : | Light green |
| Number of effective tillers | : | 8-10 |
| Panicle length (cm) | : | 17-20 cm |
| Number of grains/panicle | : | 100 -120 |
| Panicle type | : | Compact |
| Awning | : | Absent |
| Days to maturity (days) | : | 115-120 days |
| Seed coat (Kernel) colour | : | White |
| Junction of auricle | : | Pale green |
| 1000 grain weight (g) | : | 24.0 |
| Hull (husk) colour | : | Straw |
| Threshability | : | Good |
| Aroma | : | Absent |
| Grain yield per plant (g) | : | 35 - 40 g |
| Grain type | : | Short bold |
| LxB | : | 5.50 x 2.0mm |
| L / B ratio | : | 2.78 |
| Rice grade | : | Short bold |
| Milled rice colour | : | White |
| Abdominal white | : | Occasionally present |

efficiency than TKM (R) 12 and Anna (R) 4 by showing more the number of productive tillers per plant and grain yield under control and drought (**Table 5c**). In physiology trial conducted during 2017-2018 and 2018-2019, the culture CB 06803 had better physiological efficiency with higher RWC, total chlorophyll content, chlorophyll stability index, stomatal conductance, photosynthetic rate, and photochemical efficiency under drought conditions, as compared to the check TKM (R) 12 and Anna (R) 4. The culture also recorded higher proline content than TKM (R) 12, but was on par with Anna (R) 4. In the case of catalase, the culture was observed to be better than check Anna (R) 4.

Relative Water Content (RWC) is a measure for plant water status in terms of the physiological consequence of

**Table 3a. Resistance reaction of CB 06803 against rice Diseases in AICRIP (NSN 2)**

| S. No. | Culture | Leaf blast | Neck blast | BLB | Brown Spot | Sheath blight | Sheath rot | RTD |
|---|---|---|---|---|---|---|---|---|
| 1 | CB 06803 | 5.0 | 4.4 | 7.3 | 4.6 | 6.5 | 3.4 | 4.3 |
| 2 | TN 1 | 5.0 | 5.1 | 7.1 | 5.0 | 6.5 | 4.3 | 5.6 |
| 3 | IR 50 | 5.1 | 6.1 | 6.8 | 4.6 | 6.8 | 4.2 | 4.5 |

**Table 3b. Reaction of CB 06803 against rice diseases under artificial condition (Coimbatore) in 2019 20**

| S. No. | Culture | Leaf blast | Brown Spot | RTD |
|---|---|---|---|---|
| 1 | CB 06803 | 5.0 | 5.0 | 3.0 |
| 2 | Anna (R ) 4 | 7.0 | 6.0 | 3.0 |

**Table 4a. Reaction of CB 06803 against sucking pests of rice under artificial condition (Coimbatore) in 2015-16**

| S.No. | Cultures | BPH | WBPH | GLH |
|---|---|---|---|---|
| 1. | CB 06803 | 9 | 5 | 9 |
| 2. | TKM 12 | 7 | 7 | 3 |
| 3. | Anna (R) 4 | 5 | 7 | 3 |

**Table 4b. Reaction of CB 06803 against sucking pests of rice under artificial condition (Coimbatore) in 2019-20**

| S.No. | Cultures | BPH | WBPH | GLH |
|---|---|---|---|---|
| 1. | CB 06803 | 7 | 5 | 7 |
| 2. | Anna (R) 4 | 7 | 5 | 7 |

BPH : Brown planthopper WBPH : White backed planthopper GLH : Green leafhopper

**Table 4c. Resistance reaction of CB 06803 against rice pests in AICRIP (NSN 2)**

| S. No. | Culture | BPH | | | WBPH | | PH | Leaf folder | |
|---|---|---|---|---|---|---|---|---|---|
| | | DRR | Ludiana | Gangavathi 62 DT No/hill | Gangavathi 62 DT No/ hill | DRR | Maruteru 65 DT | Gangavathi 62 DT No/hill | Ludiana 65DT |
| | | | | | | | | % damaged leaves | |
| 1. | CB 06803 | 9.0 | 9.0 | 6.8 | 5.5 | 8.6 | 9.0 | 8.0 | 28.1 |
| 2. | TN 1 | 9.0 | 9.0 | 13.6 | 8.9 | 9.0 | 9.0 | 8.1 | 28.5 |
| 3. | IR 50 | 8.9 | 9.0 | 29.6 | 22.1 | 6.9 | 9.0 | 3.9 | 27.9 |

PH : Planthopper BPH : Brown planthopper WBPH : White backed planthopper

**Table 4d. Resistance reaction of CB 06803 against rice pests in AICRIP (NSN 2)**

| S. No. | Culture | Stem borer | | | | | | GLH | WM |
|---|---|---|---|---|---|---|---|---|---|
| | | Ludiana 65DT | Chinsurah 56DT | Sambalpur 50DT | Chinsurah 93DT | Rajendranagar 123DT | Gangavathi Preharvest | Jagdalpur 50DT No/10h | Jagdalpur 50DT |
| | | % Dead Hearts | | | % White ear heads | | | | |
| 1. | CB 06803 | 2.4 | 9.9 | 15.0 | 0.0 | 23.7 | 16.8 | 21 | 2.2 |
| 2. | TN 1 | 2.0 | 1.0 | 7.0 | 1.9 | 12.7 | 4.9 | 8 | 5.6 |
| 3. | IR 50 | 3.1 | - | 4.9 | - | 3.7 | 7.9 | 11 | 6.0 |

GLH : Green leafhopper WM : Whorl maggot

cellular water deficit. The culture CB 06803 was observed to have higher RWC (77.4% and 81.3%) under drought conditions. The relatively lesser reduction of RWC in the culture could be the cause for less reduction in photosynthesis, transpiration and stomatal conductance. Chlorophyll Stability Index (CSI) and Membrane Stability Index (MSI) are key indices for measuring the drought tolerance capacity of plants and is a degree of integrity of chloroplast and other cellular membranes. CB 06803 had higher CSI (75.9% and 76.4%) and MSI (79.2) (**Table 5a & 5b**) under drought conditions. Higher CSI and MSI help the plants to endure drought through enhanced accessibility of chlorophyll which leads to augmented photosynthetic rate and higher productivity which specifies how well the chlorophyll can perform under drought.

Proline acts as an important osmolyte and helps plants to preserve tissue water potential under drought. The rice culture CB 06803 had higher proline content (1941µg/g FW and 1578µg/g FW) (**Table 5a & 5b**) under drought

**Table 5a. Physiological characters for drought tolerance (2017-2018)**

| Physiological Characters | CB 06803 | | TKM (R) 12 | | ANNA (R) 4 | |
|---|---|---|---|---|---|---|
| | Control | Drought | Control | Drought | Control | Drought |
| Leaf Area Index | 5.1 | 4.2 | 4.6 | 2.8 | 4.0 | 3.0 |
| Relative water content (%) | 89.6 | 77.4 | 85.6 | 68.3 | 87.6 | 71.3 |
| Total chlorophyll (mg/g FW) | 2.82 | 2.46 | 2.67 | 2.08 | 2.75 | 2.27 |
| Chlorophyll Stability Index (%) | 88.3 | 73.6 | 75.9 | 62.3 | 78.9 | 64.1 |
| Photosynthetic rate (µmol $CO_2$ $m^{-2}$ $s^{-1}$) | 31.3 | 18.6 | 25.6 | 14.4 | 28.6 | 15.4 |
| Transpiration rate (mmol $H_2O$ $m^{-2}$ $s^{-1}$) | 11.3 | 13.4 | 11.6 | 14. | 9.7 | 13.7 |
| Stomatal conductance (mole $H_2O$ $m^{-2}$ $s^{-1}$ | 1.11 | 0.91 | 0.94 | 0.68 | 0.87 | 0.56 |
| Photochemical efficiency (Fv/Fm ratio) | 0.71 | 0.58 | 0.61 | 0.51 | 0.68 | 0.46 |
| Proline Content (µg/g FW) | 874 | 1941 | 725 | 1354 | 689 | 2013 |

**Table 5b. Physiological characters for drought tolerance (2018-2019)**

| Physiological Characters | CB 06803 | | ANNA (R) 4 | |
|---|---|---|---|---|
| | Control | Drought | Control | Drought |
| Leaf Area Index | 4.7 | 3.9 | 3.7 | 2.8 |
| Relative water content (%) | 94.1 | 81.3 | 93.7 | 76.3 |
| Total chlorophyll (mg/g FW) | 2.62 | 2.29 | 2.56 | 2.11 |
| Chlorophyll Stability Index (%) | 82.1 | 76.4 | 78.4 | 71.6 |
| Membrane Stability Index (%) | 80.7 | 79.2 | 77.1 | 72.8 |
| Photosynthetic rate (µmol $CO_2$ $m^{-2}$ $s^{-1}$) | 33.5 | 19.9 | 26.6 | 14.3 |
| Transpiration rate (mmol $H_2O$ $m^{-2}$ $s^{-1}$) | 10.5 | 12.5 | 9.0 | 12.7 |
| Stomatal conductance (mole $H_2O$ $m^{-2}$ $s^{-1}$) | 1.03 | 0.85 | 0.81 | 0.52 |
| Photochemical efficiency (Fv/Fm ratio) | 0.66 | 0.54 | 0.63 | 0.43 |
| Proline content (µg/g FW) | 812.0 | 1578.0 | 710.0 | 1642.0 |
| Catalase activity (Units / g FW / min) | 31.8 | 44.5 | 27.4 | 32.6 |

**Table 5c. Agronomic characters of drought tolerance**

| Agronomical Characters | CB 06803 | | TKM (R) 12 | | ANNA (R) 4 | |
|---|---|---|---|---|---|---|
| | Control | Drought | Control | Drought | Control | Drought |
| Days to 50 % Flowering | 90 | 85 | 93 | 85 | 85 | 78 |
| Plant height at harvest (cm) | 123.4 | 114.4 | 112.3 | 102.4 | 104.3 | 91.2 |
| Number of productive tillers per plant | 18 | 15 | 15 | 11 | 17 | 14 |
| Grain yield (kg/ha) | 6075 | 3874 | 6252 | 3125 | 6475 | 4125 |
| Agronomic efficiency (%) | 24 | 19 | 25 | 18 | 26 | 19 |

**Table 6. Quality characteristics of CB 06803**

**a) Milling traits**

| Characters | Hulling (%) | Milling (%) | Head rice recovery(%) |
|---|---|---|---|
| CB 06803 | 78.80 | 69.60 | 59.55 |
| Anna (R) 4 | 81.00 | 66.70 | 54.15 |
| TKM (R) 12 | 74.40 | 67.20 | 59.10 |

**b) Physical quality traits**

| Characters | Kernel Length (mm) | Kernel Breadth (mm) | L/Bratio | Grain type |
|---|---|---|---|---|
| CB 06803 | 5.4 | 2.5 | 2.2 | SB |
| Anna(R) 4 | 6.8 | 2.1 | 3.1 | LS |
| TKM (R) 12 | 5.8 | 2.2 | 2.70 | MS |

**c) Cooking quality traits of CB 06803**

| Characters | Kernel length after cooking (mm) | Kernel breadth after cooking (mm) | Linear elongation ratio | Breadth wise elongation ratio | Volume expansion ratio | Gel consistency (mm) | Alkali spreading value |
|---|---|---|---|---|---|---|---|
| CB 06803 | 8.8 | 3.3 | 1.59 | 1.33 | 3.9 | 114 | 7 |
| Anna (R) 4 | 10.9 | 3.1 | 1.61 | 1.47 | 3.8 | 89 | 6 |
| TKM (R) 12 | 8.8 | 2.9 | 1.53 | 1.34 | 4.1 | 83 | 3 |

**d) Biochemical properties of CB 06803**

| Traits | CB 06803 | Anna (R ) 4 | TKM (R) 12 |
|---|---|---|---|
| Amylose content (%) | 23.50 | 22.60 | 20.40 |

conditions. $H_2O_2$, which is produced during photo respiration in peroxisomes, is highly toxic to plants and reduces the tolerance capacity of the plants to abiotic stress. Catalase is an important enzyme that converts $H_2O_2$, into non- toxic form of water. The culture CB 06803 recorded higher catalase enzyme activity (44.5Units / g FW / min) under drought conditions thus making it drought tolerant. It also exhibited better physiological efficiency under drought by having partial closure of stomata as compared to the national check Sahbagidhan (national check).

The culture CB 06803 has short bold grains with high milling percentage (69.6%) and good head rice recovery (59.6%), thus exhibiting a positive association between these two traits, which is in accordance with Shivani *et al*. (2007) and Oko *et al.* (2012). It has intermediate amylose content. As the culture possess short bold grains it is highly suitable for idly making (**Table 6**). The culture matures in 115-120 days, is a medium tall, non- lodging, high yielding one (3.7 t/ha under dry conditions) with drought tolerance and moderate resistance to diseases *viz.,* leaf blast, neck blast, sheath rot, brown spot and RTD (less than 5) and the pest WPBH. It has short bold white rice with good milling and head rice recovery. Considering the higher grain yield under drought, disease resistance and short bold grains, the culture CB 060803 was released as CO 53, during 2020 and same was notified in gazette notification number SO 3482 (E) dt 7.10.2020. It is suitable for cultivation in drought prone districts of Tamil Nadu as direct seeded rainfed or semi dry rice.

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