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# Performance of salt tolerant paddy varieties for Nagapattinam district of Tamil Nadu

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**Abstract**
Paddy on farm trials was conducted by Krishi Vigyan Kendra, Nagapattinam to assess suitable saline tolerant variety in terms of yield, acceptability and adoption potential during rabi season in Nagapattinam district of Tamil Nadu. On farm trials revealed that paddy variety TRY 3 recorded higher grain yield (51.50 q /ha), germination percentage (98.8), plant height (116.9 cm), Number of tillers / hill (29), Number of productive tillers/hill (10), Number of panicles/$M^2$ (356), panicle length (31.2 cm), Number of grains per panicle (150), 1000 grain weight (24.81 g) as compared to CSR 36 and Gangavathy Sona. Paddy varieties, TRY 3, CSR 36 and Gangavathy Sona recorded 24.1, 19.3 and 14.5 per cent higher grain yield than check variety ADT 49, respectively. Gross and net returns were Rs 77,250/- and Rs 35,100/- ha, respectively by cultivating TRY 3 as against Rs 62,250/- and Rs. 25, 250/- ha in the check variety (ADT 49). Farmers were satisfied with TRY 3, as the crop did not suffer from salinity. The variety TRY 3 would be a better option for salinity in Nagapattinam district.

**Keywords:** Salt, tolerance, paddy, variety TRY 3, CSR 36 and Gangavathy Sona

## Introduction
In India, about 6.73 million ha area is salt affected in Tamil Nadu, the major rice producing state of India, a total area of 4.97 lakh ha is affected either by salinity or sodicity [3]. Hence more attention is required for increasing agricultural productivity under salinity. Rice is the main crop in saline soils of Tamil Nadu due to its ability to tolerate inundated water condition. Rice productivity in salt affected areas is very low, less than 1.5 t/ha, but can reasonably be raised by atleast 2t / ha [5], thereby providing food for more than 10 million of the poorest people living off these lands. High salinity causes even 70 per cent yield reduction [6]. Though, by way of application of gypsum the saline soil could be reclaimed, the adoption rate of this technique is poor as it requires copious quantity of good quality water, good drainage facilities, more horizontal level of adoption, more cost and labour. Hence, growing salt tolerant rice varieties would be a sustainable way to increase rice yield under salinity. The soil salinity is a severe abiotic stress caused primarily by an abundance of sodium chloride, from both natural accumulations and from irrigation and crop evapotranspiration [2]. The adverse effects of salinity are well known. Salinity can reduce yield due to a significant metabolic effort afforded to plant adaptation, growth maintenance and stress responses [4]. In the study area of Nagapattinam district, about 13, 5000 ha was salt affected. The Village Anaimattam had approximately 120 ha of salt affected area. The water table is also high as a result of which salts could not be leached down. Even in *Rabi* season, the paddy varieties could not withstand owing to higher salt accumulation in root zone. Hence, the study was planned with the objectives to evaluate the saline tolerant rice varieties with high yield and saline tolerance under rabi season through on farm trials to work out farmers preference for rice cultivation in Nagapattinam district.

## Materials and methods
On farm trials with farmer's participatory mode were conducted during rabi 2015 with five farmers from Anaimattam and Kokkur villages of Nagapattinam district of Tamil Nadu. Three saline tolerant varieties *viz.,* TRY 3, CSR 36 and Gangavathy Sona (Table 1) and check variety ADT 49 were taken for the study. Nursery sowing was taken under irrigated condition between 10 th and 15 th September in both the villages and transplanted on first week of October with a spacing of 20 x10 cm, in randomized block design with five replication. The recommended packages of practices for saline tolerant rice varieties cultivation were followed as per TNAU

Recommendation. The growth parameters *viz.*, germination percentage, plant height, number of tillers per $m^2$, number of productive tillers per $m^2$, panicle length, 1000 grain weight, and grain yield were recorded. Gross return and net return of all the varieties were calculated. The data obtained were statistically analysed for analysis of variance.

**Table 1:** Characteristic of varieties selected for on farm trial

| S. No | Name of variety | Characters/traits of the variety |
|---|---|---|
| 1. | TRY 3 | Duration of 135 days; Grain yield (Kg/ha): 5833/ha; grain type medium bold, Special features :– Resistant to leaf folder, stem borer, brown plant hopper, blast, brown spot, sheath rot and sheath blight |
| 2. | CSR 36 | Duration of 135 days; grain yield in normal soils (Kg/ha) 6500/ha; grain yield (kg/ha) 4000/ha in salt affected soils, grain type is long slender. Special features: - drought tolerance, easily threshable, good grain and eating quality. |
| 3. | Gangavathy Sona | Duration of 130-135 days; grain yield 6000-6500 kg/ha, grain type medium slender. Special feature: - moderately resistant to BPH and neck blast; gives better grain yield even in soil salinity (EC 6.5 to 8.5 ds/m). |
| 4. | ADT 49 | Duration of 130 to 137 days; grain yield - 6173 kg/ha, grain type - medium slender , Special features:- Non-sticky cooked rice, moderately resistant to blast, sheath rot, sheath blight and resistant to RTD under artificial conditions; moderately resistant to leaf folder and brown spot under field conditions |

**Table 2:** Performance of saline tolerant varieties in farmers field (Average of five trials)

| S. No | Parameters | TRY 3 | CSR 36 | Gangavathy Sona | ADT 49 (Check) | S.Ed. | C.D.(0.05) |
|---|---|---|---|---|---|---|---|
| 1. | Germination percent | 98.8 | 96.7 | 94.5 | 90.0 | 1.07 | 3.41 |
| 2. | Plant height (cm) | 116.9 | 115.1 | 95.0 | 110.2 | 1.39 | 4.44 |
| 3. | Number of tillers per $m^2$ | 29.0 | 25.0 | 21.0 | 21.0 | 0.82 | 2.61 |
| 4. | Number of productive tillers per hill | 10.0 | 9.00 | 6.00 | 7.00 | 0.61 | 1.96 |
| 5. | Panicle length (cm) | 31.20 | 28.50 | 25.60 | 25.20 | 1.00 | 3.21 |
| 6. | Number of panicles per $m^2$ | 356 | 358 | 355 | 345 | 4.67 | 14.93 |
| 7. | Number of grains per panicle | 150.00 | 132.00 | 127.00 | 119.00 | 1.83 | 5.85 |
| 8. | 1000 grain weight (g) | 24.81 | 24.74 | 24.63 | 24.32 | 0.43 | 1.38 |
| 9. | Grain yield (q per ha) | 51.50 | 49.50 | 47.50 | 41.50 | 1.02 | 3.25 |

**Table 3:** Yield and Economics of rice varieties in salt affected soils

| Variety | Yield (q/ha) | Economics of Trials (Rs./ha) | | | |
|---|---|---|---|---|---|
| | | Gross cost | Gross income | Net income | B:C Ratio |
| TRY 3 | 51.50 | 37000 | 77250 | 35100 | 1.94 |
| CSR 36 | 49.50 | 37000 | 74250 | 35000 | 1.94 |
| Gangavathy Sona | 47.50 | 37000 | 71250 | 33500 | 1.90 |
| ADT 49 (Check) | 41.50 | 37000 | 62250 | 25250 | 1.68 |

## Result and Discussion

The trials were conducted in salt affected soils and the results are being explained as average of different locations.

### Germination per cent

Based on the perse performance of saline tolerant rice varieties in different locations of farmer's field, TRY3 (98.80 per cent) and CSR 36 (96.70 per cent) had on par and highest germination percent under saline condition, whereas as Gangavathy Sona (94.50 percent) and check variety ADT 49 (90.00 percent) had lesser germination per cent [1] suggested that different cultivars exhibit different levels of salt resistance and salt sensitivity due to more exclusion of Na and Cl ions by salt tolerant varieties and possible salt injuries which may be due to less effective sequestration or mobility of ions towards some innocuous centres of plant tissues

### Plant height

Among the four rice varieties including the check variety ADT 49, both TRY 3 (116.90 cm) and CSR 36 (115.10 cm) had on par and highest plant height followed by ADT 49 (110.20 cm) and the least plant height was recorded by Gangavathy Sona (95.00 cm). This can be attributed that TRY 3 can tolerant the salinity levels than other variety

### Number of tillers per $m^2$

For the trait number of tillers per $m^2$, the varieties TRY 3 (29.00) followed by CSR 36 (25.00 cm) recorded the highest number of tillers per $m^2$, whereas Gangavathy Sona and ADT 49 both recorded the least value of 21.00.

### Number of productive tillers per hill

The number of productive tillers per hill recorded on par and highest values for TRY 3 (10.00) and CSR 36 (9.00) as against on par and least values of ADT 49 (7.00) and Gangavathy Sona (6.00) (Table 2).

### Panicle length (cm)

For the trait panicle length, both TRY 3 (31.20cm) and CSR 36 (28.50 cm) had on par and highest value, while Gangavathy Sona (25.60 cm) and ADT 49 (25.20 cm) had on par and least value.

### Number of panicles per $m^2$

Regarding number of panicles per $m^2$, all the rice varieties including check variety had on par values under salinity condition. Hence, there is no significant difference among the varieties**.**

### Number of grain per panicle

Among the four rice varieties test under salinity, TRY 3 (150.00) had the highest number of grains per panicle followed by CSR 36 (132.00) and Gangavathy Sona (127.00) as against the least value of check variety ADT 49 (119.00)

**Thousand grain weight**

There was no significant difference among the four varieties for 1000 grain weight under salinity condition.

**Grain Yield (q per ha)**

Regarding grain yield per ha, TRY 3 (51.50 q per ha) and CSR 36 (49.50 q per ha) had on par and highest grain yield; whereas Gangavathy Sona (47.50 q per ha) had least yield but higher than check entry ADT 49 (41.50 q per ha) (Table 3).

Based on the performance of four entries for all the nine traits taken for study under salinity, the entry TRY3 had the highest values or on par performance with CSR 36, this entry had significant and highest value for two traits *viz.*, number of tiller per $m^2$, numbers of grains per panicle, whereas for all other traits including grain yield per ha had on par highest value with CSR 36.

[1] Suggested that different cultivars exhibit different levels of salt resistance and salt sensitivity due to more exclusion of Na and Cl ions by salt tolerant varieties and possible salt injuries which may be due to less effective sequestration or mobility of ions towards some innocuous centres of plant tissues.

Based on the B:C ratio, both TRY 3 and CSR 36 had the highest value (1.94) followed by Gangavathy Sona (1.90). The check entry ADT 49 had the least B:C ratio (1.68). Since ADT 49 was not recommended for the salt affected condition, its low B:C ratio is acceptable. The test entry TRY 3 had the highest net income (Rs 35,100) followed by CSR 36 (Rs 35,000). The check entry ADT 49 had the least net income of Rs 25,280. The growing of variety ADT 49 was not recommended in salt affected as it caused less net return of Rs.25,280/-ha whereas TRY 3 proved to be a boon for the farmers causing a net return of Rs.35,100/-ha followed by CSR 36 (Rs. 35,000/-ha). The respective B: C ratios were 1.68 and 1.94 for local check and TRY 3 and CSR 36. The probable reason was lesser incidence of stem borer and brown plant hopper insect coupled with higher number of productive tillers per plant resulting higher grain yield and straw yield, these results were in agreement with the findings of [8]. The poor yield of ADT 49 may be attributed to damage of roots of the plant by salts prevailing in the soil thereby reducing nutrient uptake while being a salt tolerant variety, the plants of TRY 3 were healthy and gave good crop yield.

**Conclusion**

The salt tolerant varieties proved to be beneficial among the existing agro climatic situation of the village. Three salt tolerant varieties performed better than ADT 49 in terms of yield. The sowing of ADT 49 was not economically viable but the salt tolerant varieties proved to be boon for the farmers. Among the three salt tolerant varieties, TRY 3 proved to be more effective in the existing village agro climatic situation and performed better as compared to CSR 36 and Gangavathy Sona. Paddy variety, TRY 3 recorded more number of productive tillers per hill, less incidence of stem borer, leaf folder and BLB, higher grain yield, tolerant to saline condition and performed very well compared to CSR 36, Gangavathy Sona and check variety ADT 49. So, the paddy variety TRY 3 would be better option for saline condition.

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