

The seepage measured in the lined channel, tested by means of inflow and outflow method are presented in Table 1.

**Conclusions and recommendations :** The cost of the soil cement tiles channel works out to 33 paise per sq. feet inclusive of materials and labour charges. Preparation of tiles and formation of the channel can be done by an ordinary mazdoor saving 25% of expenditure. The one great advantage is the prevention of weed growth, and it is durable compared to other lining materials such as asphaltic lining, polyethene film lining *etc.*,

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## Salt Tolerance of Rice

by

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**Introduction :** In order to cater to the needs of nearly two lakhs acres cropped with rice under either saline or alkaline soil conditions in Madras State, rice breeding work was started at the Research Centre, Peravurani in 1960. Apart from field scale tests, pot culture studies were also undertaken during 1963 to 1966 for assessment of the salt tolerance capacity of some of the reputed salt resistant varieties and hybrid progenies of crosses effected between saline resistant types and high yielding strains.

**Review of literature :** Pearson (1960) reported that growth of rice is retarded by soil salinity. The grain production is affected much more than the vegetative growth. Rice can produce half its normal grain yield only if the average electrical conductivity of the soil solution during the growing season is 8 millimhos or less per cm. Pan (1961) found the tolerance capacity of rice to salinity to lie between 3 and 6 millimhos/cm, (roughly 0.2% and 0.4% salt) and it varies with different varieties. Pearson (1961) reported that three and six week old seedlings survive at soil salinity levels upto 9 and 14 millimhos/cm, (approximately equivalent to 0.6% and 0.9% salt) whereas younger seedlings are sensitive to salinity at 1 to 2 leaf stage. Salinity has an adverse effect on the germination of pollen grains which results in an increase in the number of sterile florets per panicle. The degree to which rice is affected by salinity depends on the criterion measured and varieties involved. Pan (1964) reported that rice cannot survive and grow to maturity in water with electrical conductivity of 6 millimhos/cm and over. Rice yield is directly affected by the salt content of irrigation water. Rice yield would be most affected when irrigated

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with salt water at the time immediately after emergence of seedlings and during the tillering stage. The experiments conducted at Coimbatore (1954) revealed that where drainage was satisfactory the growth was also good, the plants being able to withstand upto 0.25% salt concentration, but when the drainage was defective most of the plants succumbed except a few varieties like *Thellathokkavadlu*, *Kallimadayan*, *Vellakattai*, *Orkayama*, *Bali*, *Kuthir*, *Ezhome*, *Kalarata*, *Bhurarata* and *Karepatni*.

**Materials and Methods:** Twenty two cultures of cross derivatives between saline resistant types (S. R. 26B, T. 892 and *Bairuvadlu*) and high yielding strains (Co. 2, Co. 4, Co. 10, Co. 17, ADT. 1, ADT. 18, ADT. 22, PTB. 15 and ASD 1205) along with the donar parent S. R. 26B and an alkali resistant strain PVR. 1 were subjected to three levels of salinity with two replications under pot culture study in 1963-64. The treatments were (1) Water (control) (2) 0.25% and (3) 0.50% Na Cl solution at periodical intervals as and when needed. The twenty four variants which were under trial are given in Table 1.

During 1964-65 and 1965-66, the trials were repeated keeping the total number of variants at 24 with some additions and deletions in the variants which were already under trial in the previous year. But the treatmental levels were raised to five from three with a view to know whether rice seedlings can withstand beyond 0.50% salt concentration since all the materials studied during 1963-64 withstood 0.50% level of salinity. The treatments during 1964-65 and 1965-66 are finished below (1) Irrigating the plants with water (control), (2) 0.25%, (3) 0.50%, (4) 0.75% and (5) 1.00% Na Cl solution.

In all these years rice seedlings were grown 15 cm. apart on either way in cement pots having a small opening on the side at the bottom for drainage. A layer of gravel was placed at the bottom of the pot to a height of 5 cm. for facilitating drainage and the pots were filled up with known quantity of normal soil (pH 7.4 and EC. 0.2). The quantity of water required to saturate the weighed quantity of soil taken in the pots was determined and the salt concentrations of the various pots were kept constant throughout the period of study, the object being to screen the materials which are not capable of withstanding even 0.25% salt and to find out the maximum salt tolerance capacity and performance of the materials under varying degrees of salinity. Observations were recorded at periodical intervals on survival, growth, vigour, tillering, date of flowering and yield. The data on yield were analysed statistically and the pattern of tolerance to salinity with regard to prolongation of flowering duration was also studied by fitting orthogonal polynomials of second and third degree in respect of variants which withstood 0.50% and 0.75% salt concentrations.

TABLE 1. 1963-'64. Pot culture Study.

Cultures under trial :

1. 6619 (Co. 17 × SR 26B)	9. 32488 (ASD 1205 × T.892)	17. 416
2. 6680 " " "	10. 32490 " " "	18. 32183
3. 32507 (Co. 17 × T. 892)	11. CBE 150 (Co. 10 × T.892)	19. CBE. 153
4. 32508 " " "	12. 32500 (Co. 2 × T.892)	20. 513
5. 32509 " " "	13. 32535 (SR 26 B × ADT.18)	21. 256
6. 479	14. 704 (Co. 10 × T.892)	22. 258
7. 32551	15. 32525 (Co. 4 × T.892)	23. SR 26 B
8. 32554	16. 32532	24. PVR. 1

## INTERACTION

Mean Yield in grams			
No.	Control	0.25%	0.50%
1.	5.70	4.90	3.55
2.	6.25	5.00	2.90
3.	2.80	1.55	0.35
4.	3.50	1.90	1.75
5.	2.45	1.25	0.60
6.	1.75	1.40	0.90
7.	2.90	1.75	1.25
8.	4.35	3.30	2.90
9.	7.25	6.90	5.45
10.	8.65	6.95	5.55
11.	7.75	6.40	5.40
12.	2.25	1.05	0.55
13.	6.00	3.00	1.80
14.	3.90	3.25	2.45
15.	2.70	1.90	0.90
16.	3.95	2.15	1.05
17.	5.50	4.40	2.75
18.	3.40	2.15	0.75
19.	4.15	2.85	1.35
20.	5.05	3.00	2.00
21.	3.30	2.00	1.65
22.	3.30	0.75	—
23.	6.00	4.90	3.26
24.	6.05	5.00	3.75

S.E. = 0.32      C.D. = 0.91  
 S.E. i & ii with 48 observations 0.06  
       iii with 46 observations 0.07  
       i, ii or ii with iii 0.09  
 C.D. i & ii with 48 observations 0.18  
       iii with 46 observations 0.19  
       i, ii or ii with iii 0.26  
       Significant.

**Results and Discussion:** The results of the trials are furnished in Table 1, 2 and 3. In 1963-64 (Table 1), all the materials withstood the lower concentration of 0.25% salinity, while only 23 out of 24 were able to withstand the higher concentration of 0.50% salinity. Cultures 32490, 32488 and CBE. 150 were found to be the most tolerant ones and were all on a par under both levels *viz.*, 0.25% and 0.50% salinity followed by PVR. 1, S. R. 26-B and cultures 6680 and 6619.

The results in 1964-65 (Table 2) showed that all the variants withstood the lower concentration of 0.25% salinity, while all of them failed at 1.00% level of salt. Nineteen withstood 0.50% salt concentration whereas only 13 stood higher concentration of 0.75% salt. *Thillanayagam* was found significantly superior at 0.25% level of salt. *Uvarvellai*, Cultures 6680 and CBE 150 recorded better yields than the standards S. R. 26-B and PVR. 1.

TABLE 2. 1964-65. Pot culture studies.

Cultures under trial :

1. 6619 (Co. 17 × SR 26 B)	9. 32551	17. 32555
2. 6680 " "	10. 32554	18. 704
3. 32507 (Co. 17 × T. 892)	11. 32488 (ASD.1205 × T. 892)	19. <i>Uvar vellai</i>
4. 32508 " "	12. 32490 " "	20. <i>Pokkali</i>
5. 32509 " "	13. CBE 153	21. P.K. 1.
6. 256	14. 513	22. <i>Thillanayagam</i>
7. 258	15. CBE 150 (Co. 10 × T. 892)	23. SR 26B
8. 479	16. 32483	24. PVR. 1

## INTERACTIONS

Mean Yield in grams				
No.	Control	0.25%	0.50%	0.75%
1.	11.15	12.10	4.12	1.45
2.	10.72	13.70	6.95	1.80
3.	6.62	6.85	3.55	—
4.	7.35	6.72	3.65	1.25
5.	7.17	6.62	1.35	—
6.	9.55	3.80	2.62	—
7.	9.15	8.40	—	—
8.	5.95	1.47	—	—
9.	9.77	11.15	2.75	—
10.	7.92	4.65	2.10	1.70
11.	12.87	13.10	2.65	1.10
12.	13.01	13.15	7.37	5.65
13.	5.20	2.15	—	—
14.	7.85	7.15	—	—
15.	11.80	13.65	6.90	5.60
16.	9.62	8.30	1.35	—
17.	13.05	6.15	1.27	1.40
18.	12.22	0.64	0.60	—
19.	14.15	15.60	6.37	9.55
20.	4.90	12.85	2.00	4.32
21.	12.00	8.50	—	—
22.	17.89	25.50	4.15	2.28
23.	7.20	7.50	6.53	5.12
24.	13.10	13.17	6.45	4.95

S.E. = 1.20	C.D. = 3.20
S.E. i & ii with 48 observations	0.20
i, ii or ii with iii	0.40
i, ii or ii with iv	0.40
iii & iv.	0.40
C.D. i & i with 48 observations	0.70
i, ii or ii with iii	1.00
i, ii or ii with iv	1.10
iii & iv.	1.20
Significant.	

TABLE 3. 1965-66. Pot culture study.

Cultures under trial:

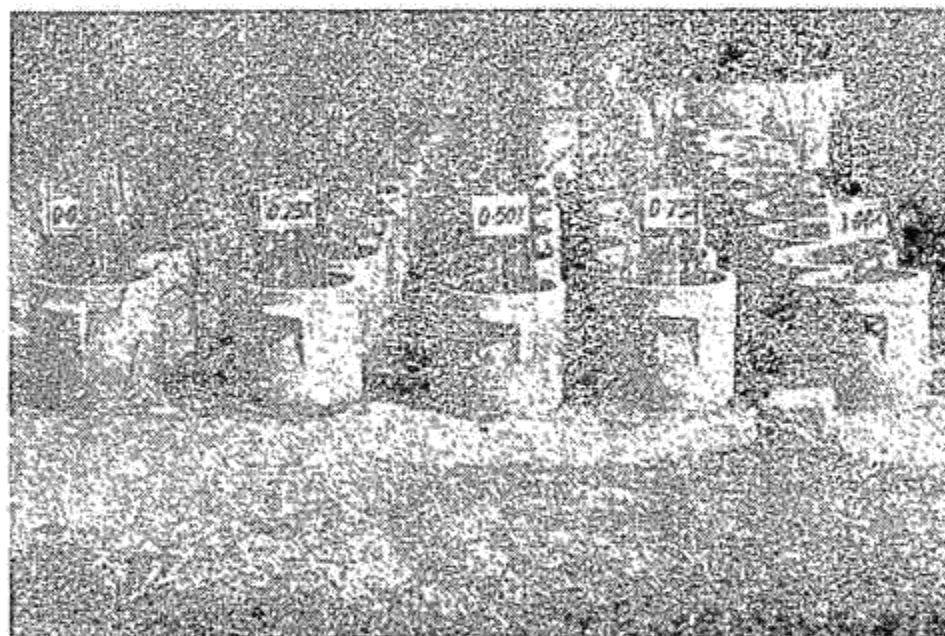
1. 6619 (Co 17 × SR 26 B)	9. 32488 (ASD. 1205 × T. 892)	17. 4124
2. 6680 " "	10. 32490 " "	18. <i>Thillanayagam</i>
3. 32508 (Co. 17 × T. 892)	11. CBE 150 (Co 10 × T. 892)	19. <i>Pokkali</i>
4. 32509 " "	12. 32483	20. P.K. 1
5. 256	13. 32535	21. <i>Uvar vellai</i>
6. 479	14. 704	22. <i>Valan</i>
7. 32551	15. 4055	23. SR 26-B
8. 32554	16. 4057	24. PVR. 1

## INTERACTION

No	Mean Yield in grams					
	Control	0.25%	0.50%	0.75%		
1.	6.50	5.70	0.73	0.70		
2.	9.92	5.85	1.00	0.90		
3.	4.15	3.85	2.90	—		
4.	4.15	1.75	1.80	—		
5.	1.67	2.40	0.75	—		
6.	8.00	2.50	—	—		
7.	6.25	5.17	0.95	—		
8.	11.15	4.00	—	—		
9.	7.00	6.85	1.45	0.62	S.E. = 0.48	C.D. = 1.36
10.	14.60	7.90	1.42	0.63	S.E.	i & ii with 48 observations 0.10
11.	10.50	5.95	2.95	—		ii, i or ii with iii 0.10
12.	12.77	5.05	2.20	—		iii, i or ii with iv 0.20
13.	4.50	1.05	3.26	—	C.D.	i, ii with 48 observations 0.30
14.	4.05	6.35	2.05	—		ii, i or ii with iii 0.40
15.	4.75	1.30	0.60	—		iii, i or ii with iv 0.50
16.	3.25	0.65	0.63	...		iii & iv. 0.60
17.	5.22	1.40	...	...		Significant.
18.	2.90	2.77	2.73	0.62		
19.	4.20	5.70	3.60	...		
20.	8.55	1.72	1.45	0.30		
21.	3.75	3.95	1.75	...		
22.	7.05	6.40	3.95	0.35		
23.	7.10	4.15	6.17	0.65		
24.	7.40	6.12	6.77	0.68		

The cultures 32490, 6680 and CBE. 150 were all on a par with the standards at 0.50% salinity level, the first and second place being occupied by cultures 32490 and 6680. At 0.75% level of salt the variety *Uvarvellai* from Ceylon was found significantly superior with regard to yield and resistance to salinity and was followed by the cultures 32490 and CBE. 150 which were on a par with the standards S. R. 26-B, PVR. 1 and the variety *Pokkali*.

The results obtained in 1965-66 (Table 3) revealed that all the cultures withstood 0.25% salt concentration, while all the material failed at 1.00% salt level which was in conformity with the results of 1964-65. Twenty one cultures withstood 0.50% salt level and only nine were capable of survival at 0.75% level though recording very poor yields with high percentage of unset grains. The culture 32490 was found to give the highest yield at 0.25% level, though culture 32488 of the same parentage was on a par with the cultures CBE. 150, 704, 6619, 6680, *Pokkali*, *Valan* and PVR. 1. The varieties *Valan* and *Pokkali* as well as cultures 32535, CBE. 150 and 32508 recorded higher yields at 0.50% salt level than the other components though none has out-yielded the standards S. R. 26-B and PVR. 1. The cultures 6680, 6619, 32490, 32488, PVR. 1, S. R. 26-B and Varieties *Thillanayagam*, *Valan* and P. K. 1 which survived at 0.75% level of salinity were all on a par, the first and second place being occupied by cultures 6680 and 6619.



Distinct differences in growth under different levels of salinity

Observations recorded on survival, growth, vigour and tillering revealed in all these years that rice seedlings started withering when irrigated with 0.75% salt water and above especially during tillering phase resulting in complete drying of the seedlings within a period of 30-45 days after planting with the exception of a few tolerant ones which were capable of survival upto 0.75% level with comparatively lesser vigour, growth and tillering than their counterparts under control. The distinct differences in growth under different levels of salinity viz., 0.0%, 0.25%, 0.50%, 0.75% and 1.00% may be seen in the photograph. The growth was affected with higher concentrations of salt viz., 0.75% and 1.00% levels.

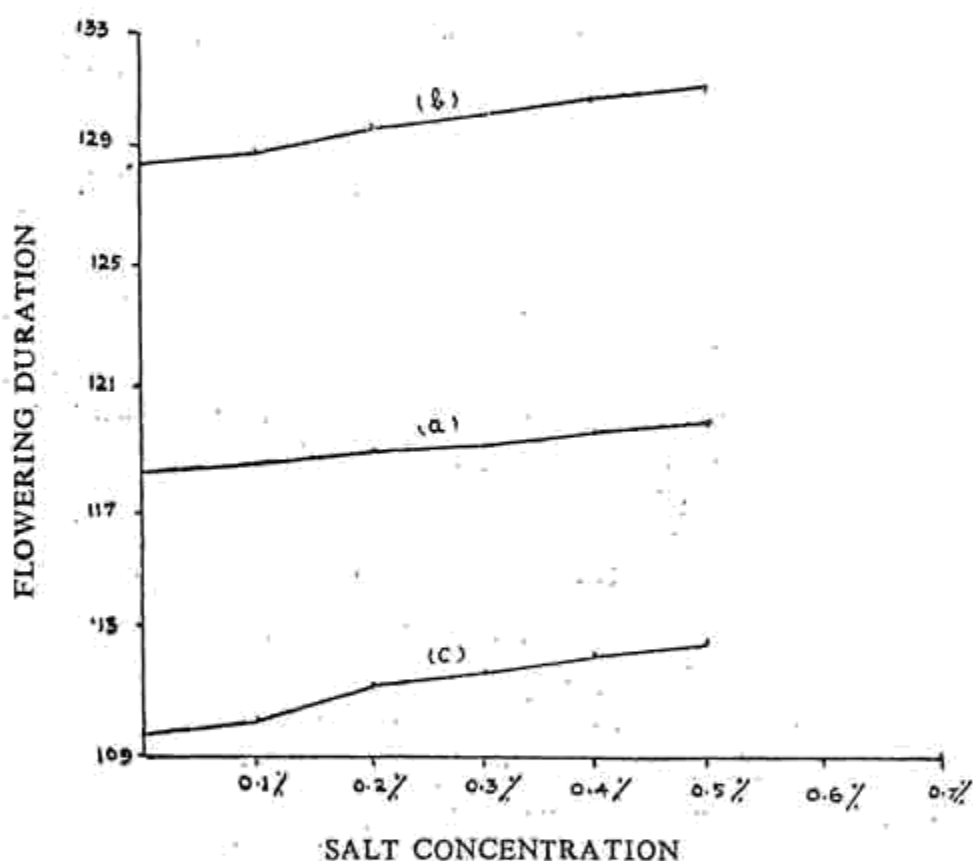
Regression equations fitted to show the trend of relationship between the salt concentrations and prolongation of flowering duration of rice is presented in Text Figure. The curves gradually move up and show linear trend thereby indicating that the materials exhibit prolongation in flowering duration when irrigated with high concentration of salt water.

Orthogonal polynomial of second degree for salt concentration and flowering duration 1963-'64, 1964-'65 & 1965-66.

a) 1963-64:-  $y=118.3+3.5x-0.6x^2$

a) 1964-65:-  $y=128.3+4.8x-1.1x^2$

c) 1965-66:-  $y=109.6+2.4x-$



**Summary and Conclusion:** Pot culture trials were conducted to test the tolerance capacity of rice to salinity. The limit of tolerance to salinity lies around 0.05% salt (Na Cl) and none including the most resistant parental types as S. R. 26-B is capable of survival at 1.00% salt level. The tolerance capacity differs among different rice varieties reaching as high a level as 0.75% under provision of good drainage. High salt content in the water adversely affects the grain yield by increasing the number of unset grains. Levels of salinity above 0.50% affects growth and tillering. Flowering duration gets prolonged under high concentrations.

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### Studies on Groundnut on Black Soils in the Nagarjunasagar Project, Andhra Pradesh

by

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**Introduction :** Groundnut is at present grown under rainfed conditions both on red and black soils in the Nagarjunasagar Project area from June-July to September-November. In Ongole area where rains extend upto November, spreading type of groundnut is grown and in the remaining area where rains normally cease by middle of October, bunch type is cultivated. The yields of *kharif* crop are generally low. With the availability of water for irrigation from the Nagarjunasagar Project in the *rabi* season it is possible to cultivate groundnut in the project area in this season. Information on the suitability of the variety, optimum time of sowing, spacing, manurial requirements etc., relating to irrigated groundnut, is not available. To obtain data on these aspects, investigations were carried out on the Project Development and Demonstration Farm, Amaravathi, Guntur district and the results are presented.

**Materials and Method :** The experiments were conducted on black soils of 3 to 4 feet depth. The top foot of the soil contains 50% clay and it increases to 59% in the fourth foot. The pH ranges from 8.2 to 8.5. The organic matter

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