

F₂ generation for all the characters, its extent varied from character to character. Two hybrids namely 2KU 53 X LC 216 and ADT 5 X 2Ku 53 yield more in F₂ generation for number of clusters per plant, which indicated the role of fixable gene effects. In such crosses pedigree method of selection may be adopted for development of high yielding varieties by increasing the number of clusters. On the other hand except ADT5 X 2KU 53, all the four crosses revealed significant heterobeltiosis in F₁ coupled with high inbreeding depression in F₂ generation indicating the presence of non-additive gene action (dominance and epistasis) for seed yield per plant. These results are in agreement with the findings of Deshmukh and Bhapkar (1981). Therefore, the segregating materials generated during this study may be utilized in identification and selection of desirable recombinants in later generations in

order to develop high yielding varieties with specific attributes.

References:

- Haldane, JBS. (1948). The number of genotypes which can be formed with a given number of genes. *Genet*, **49**: 117-119.
- Shinde, N. V. and Deshmukh, R.B. (1990). *Indian J. Pulses Res.*, **3** : 121-126.
- Sawale, V.S., Patil, J.V., Deshmukh, R.B and Kute, N.S. (2003). Heterosis and inbreeding depression for yield and its components in mungbean. *Legume Res.*, **26** (2): 134-136.
- Joseph, J. and Santhoshkumar, A.U. (2000). *Legume Res.*, **23** : 118-121.
- Deshmukh, R.B. and Bhapkar, D.G. (1981). *Indian J. Genet.*, **42** : 208-212.

Madras Agric. J., 95 (7-12) : 457-461 July-December 2008
<https://doi.org/10.29321/MAJ.10.100613>

Research Notes

Assessment of drought and flood in Cauvery Delta Zone with a special reference to Tamil Nadu Rice Research Institute, Aduthurai

P. PARASURAMAN, R. PRAKASH, S.D. SIVAKUMAR, G. SUDHAKAR,
 A. AROKIARAJ AND B. CHANDRASEKARAN

Tamil Nadu Rice Research Institute (TRRI), Aduthurai- 612 101, Tamil Nadu.

In India for the past 120 years, drought occurred 425 times in 29 out of 35 meteorological observations. One fifth of the total geographical area are affected by severe drought once in 5 years, 1/3rd of the area are affected by moderate drought once in 10 years and 1/2 of the area are affected by less drought once in 50 years. The total rainfall received

out of 8670 available hours per year, in 100 hours only (or 50 rainy days). Hence nearly 30 per cent of country's total rain fall (400 m ha m of water) is being lost through runoff. The South-West monsoon is gross supplier of rainfall over North India, while in Southern Part of India, especially Tamil Nadu receive more than 60 per cent

Table 1. The rainfall for a month to be normal, abnormal or drought and the average rainfall of Cauvery Delta Zone (TRRI, Aduthurai) (1929 to 2003 - 75 years)

S. No.	Month	Rainfall (mm)			No. of months			Percentage of total years having the given months as		
		Average	Drought	Abnormal	Drought	Abnormal	Normal	D	A	N
1.	Jan	37.4	74.7	18.7	46	15	14	61.30	20.00	18.70
2.	Feb	19.4	9.7	38.8	51	11	13	68.00	14.70	17.30
3.	Mar	14.1	7.0	28.2	46	14	15	61.30	18.70	20.00
4.	Apr	33.2	16.6	66.3	37	9	29	49.30	12.00	38.70
5.	May							42.70	10.70	46.60
6.	June	37.4	18.7	74.7	31	9	35	41.30	12.00	46.70
7.	July	50.9	25.4	101.7	20	9	40	34.70	12.00	53.30
8.	Aug	88.0	44.9	176.0	21	5	49	28.00	6.70	65.30
9.	Sep	106.6	53.2	213.2	15	3	57	20.00	4.00	76.00
10.	Oct	193.7	96.8	387.3	15	2	58	20.00	2.70	77.30
11.	Nov	288.6	144.3	577.3	14	4	57	18.70	5.30	76.00
12.	Dec	185.8	92.9	371.5	30	10	35	40.00	13.30	46.70
	Total	1108.1			364	99	437			

Table 2. The rainfall for a season to be normal, abnormal, drought and average rainfall of Cauvery Delta Zone (TRRI, Aduthurai) - (1923 to 2003 - 75 years)

S. No.	Season	Rainfall (mm)			No. of months			Percentage of total years having the given months as		
		Average	Drought	Abnormal	Drought	Abnormal	Normal	D	A	N
1.	Winter	56.8	28.4	113.6	40	13	22	53.3	17.3	29.3
2.	Summer	100.4	50.1	200.7	23	6	46	30.7	8.0	61.3
3.	SWM	282.8	141.4	565	8	0	67	10.7	0.0	89.3
4.	NEM	668.1	334	1336.1	6	1	68	8.0	1.3	90.7

of the annual rainfall from North East monsoon. Which is otherwise called in post – monsoon in India, majority of the sub-continent is expected with the rain with an exception to part of East coast of India. Because of the variability of North East Monsoon rainfall, floods and droughts are common in most part of the Tamil Nadu. About 60% of total area is under dry condition.

Drought refers to the dryness of the atmosphere or storage of water over an extended period may be a season, a year, or several years. The severity of drought where to cause mild damage or even death calamities through famine depend on the intensity of rainfall deficiency, its duration of dry spell, size of the area inflicted and the nature and extend of available water resources.

Table 3. Drought years of Cauvery Delta Zone (TRRI, Aduthurai)

S.No.	Drought year	Annual Rainfall (mm)	Per cent of average rainfall	Time interval between drought years
1	1934	664.0	59.9	12
2	1942	650.4	59.2	8
3	1945	656.3	59.2	3
4	1948	615.5	55.6	3
5	1951	751.3	78.0	3
6	1953	704.4	63.6	2
7	1958	747.8	67.5	5
8	1964	766.6	69.2	6
9	1974	755.6	68.2	10
10	1980	438.1	39.5	6
11	1982	701.0	63.3	2
12	1994	727.8	65.7	12
13	1995	705.1	63.6	1

The present study was taken up to estimate the frequency of drought and flood occurrence in Cauvery Delta Zone with a special reference to Tamil Nadu Rice Research Institute (TRRI), Aduthurai and to suggest viable strategies to mitigate the effects of drought and flood.

The rainfall data for 75 years (1929-2003) recorded at Tamil Nadu Rice Research Institute observatory was used for the purpose. The following definitions given by Sharma *et al.* (1929) have been used in the present analysis.

Normal month is a month receiving precipitation in between 50 per cent and 200 per cent of the average monthly rainfall. Drought month is classified as a month receiving less than 50 per cent of the average monthly rainfall. Abnormal month is a month receiving more than twice (200%) average monthly rainfall.

If x is the mean annual rainfall then a year is said to be drought, normal and abnormal when the rainfall received is less than $(x-s)$, $(x-s)$ to $(x+s)$ and $(x+s)$ respectively. Where, S is the standard deviation of yearly rainfall. Similarly for the seasons normal, abnormal and drought values were worked out accordingly.

Rao *et al.* (1986) developed a methodology by evaluation, the normalized deviation (ND) as the drought index, where $ND = (x - x \text{ mean}) / x \text{ mean}$, whereas ' x ' is the total precipitation for each year and ' $x \text{ mean}$ ' is the average of the sum total of years precipitation. Drought based on ND index is as follows.

Classification	ND index
Mild drought	0 to - 0.29
Moderate to severe drought	- 0.29 to - 0.57
Severe drought	>-0.57

Table 4. Classification of Drought years of Cauvery Delta Zone (TRRI, Aduthurai) based on Normalized deviation index.

Year	ND	Classification	Year	ND	Classification
1929	0.05		1966	0.48	
1930	0.33		1967	0.03	
1931	0.45		1968	-0.15	Mild
1932	0.20		1969	-0.03	Mild
1933	-0.21	Mild	1970	0.50	
1934	-0.40	Moderate	1971	0.30	
1935	0.14		1972	0.13	
1936	-0.05	Mild	1973	-0.19	Mild
1937	0.07		1974	-0.32	
1938	-0.19	Mild	1975	0.-24	
1939	0.29		1976	-0.01	Mild
1940	0.15		1977	0.39	
1941	-0.04	Mild	1978	0.12	
1942	-0.41	Moderate	1979	0.26	
1943	0.19		1980	-0.60	Severe
1944	0.27		1981	0.16	
1945	-0.41	Moderate	1982	-0.37	Moderate
1946	0.19		1983	0.25	
1947	-0.20	Mild	1984	0.05	
1948	-0.44	Moderate	1985	-0.01	Mild
1949	-0.24	Mild	1986	-0.03	Mild
1950	-0.12	Mild	1987	0.02	
1951	-0.32	Moderate	1988	-0.18	Mild
1952	-0.24	Mild	1989	-0.23	Mild
1953	,-0.36	Moderate	1990	- 0:20	Mild
1954	0.07		1991	-0.13	Mild
1955	0.16		1992	-0.07	Mild
1956	0.17		1993	0.40	
1957	0.13		1994	-0.34	Moderate
1958	-0.33	Moderate	1995	-0.36	Moderate
1959	-0.22	Mild	1996	0.39	
1960	0.12		1997	0.25	
1961	-0.01	Mild	1998	0.14	
1962	0.10		1999	-0.17	Mild
1963	0.60		2000	0.25	
1964	-0.31	Moderate	2001	-0.16	Mild
1965	0.10		2002	0.08	
			2003	-0.20	Mild

The data (Table 1) represents the month wise rainfall values of average, drought, normal and abnormal and also the number of months in each category. It is found that the maximum average rainfall (288.6 mm) was received in the month of November followed by October (193.7 mm), December (185.8 mm) and September (106.6 mm) and the minimum (14.1 mm) during March. The maximum number of drought (51) was occurred in February month out of 75 years and the minimum number of drought was occurred during November at 14 times out of 75 years. The very minimum number of normal also falls on February, only 13 times out of 75 years. Therefore, February month having higher chance of drought occurrence. The highest number of normal month of 58 was recorded in October followed by September (57) and November (57) indicating the effective rainy periods of the zone.

The month October recorded higher percentage of (77.30) normal months followed by September and November (76.0). These months are assured rainy season to cauvery delta. While the highest percentage of (68.0) drought months were recorded in February followed by January (61.3) and March (61.3), otherwise these are rainfree periods to Tamil Nadu, winter period. More than 2/3 of the years received no rain or very little rain. The average rain in this period is due to unusual rains that occurred either due to drought periods in the preceeding North East Monsoon or due to sudden disturbance in the Bay of Bengal.

The rainfall data on season wise (*i.e.*) Winter, Summer, South West Monsoon and North East Monsoon is presented in Table 2. The North East Monsoon contributes 60 per cent of total annual rainfall. The number

of drought season is higher in winter season, which occurred 40 times out of 75 years a period not expected with rain. The abnormal season was also higher in winter season was due to disturbance in the preceeding NEM. The abnormal season was also higher in winter season. More than 90% of the North East Monsoon in this zone was observed normal while only 8% of the years were drought.

Cauvery Delta Zone experienced drought (Table 3) in 13 years out of 75 years *i.e.*, 1934, 1942, 1945, 1948, 1951, 1953, 1958, 1964, 1974, 1980, 1982, 1994 and 1995. The drought was more pronounced in between 1942 & 1964, six times occurring frequently, but after 1964 the drought occurred of 5 times with relatively at longer interval. After 1964, next drought occurred one in 1974, exactly a decade later. The frequent drought in between 1942 and 1964 may be due to sudden changes in the global weather, the period is related to second world war post war periods. This has to be verified with Indian and Asian weather for the period. While classification of drought years based on normalized deviation (ND) index (Table 4) revealed that 36 years come under the category of drought and the remaining 39 years as normal. Among the drought years 24 years are in mild drought and 11 years are in the category of moderate and only one year (1980) come under the category of severe drought.

References

- Rao, C.R., Senapathi, P.C. and Lai, R. (1986). Investigation of drought from rainfall data at Gopalpur, Orissa. *Indian Soil Conser.*, **15** : 15-19
- Sharma, H.C., Chauhan, H.S. and Ram, S. (1979). Probability analysis of rainfall for crop planning. *J. Agrl. Engg.*, **XVI** : 3.