https://doi.org/10.29321/MAJ.10.A02616

Madras agric. J. 70. (5): 293 297 May 1983

EFFECT OF CERTAIN METEOROLOGICAL CONDITIONS ON YIELD OF PEARL MILLET

A. R. SUBRAMANIAM[1] and M. RAJHAVENDRA RAO[2]

Pearl millet (*Pennisetum typhoides* S & H) is a poor man's food crop in dry tracts of coastal Andhra, whose yields vary in different climates. The population Visakha composite and hybrid H B. 3 are investigated during 1974 to 1976 monsoon and summer 1976 to examine the impact of weather elements on pearl millet. The yields of composite are high compared with hybrid even under summer due to genotypic and phenotypic adjustability of the population under different meteorological conditions.

The bajra Pearl millet) is very popular crop among the dryland tracts of Andhra Pradesh specially in the north coastal Andhra. Many crop improvement programmes are taken up to raise the yield levels, suited to the local conditions through breeding. However crop production programmes have other constraints to cross, and to reach higher yield levels, such as cyclones and droughts. Hence an attempt was made to assess the response of hybrids and populations under different atmospheric conditions at Millet Research Station, Vizianagaram (26° E longitude; 18°.07 N latitude). The soils are red sandy loams with a pH range of 6.0 to 7.5. It has an average annual rainfall of 1000 mm. The maximum and minimum temperature ranges are 40° C to 29°C and 23°C to 29°C respectively. Due to the development of photoinsensitive variants (hybrids and composites) the possibility of extending the cultivation of the crop in other seasons than kharif for (1) general cultivation (feed for poultry and other livestock), (2) to take up breeding programmes and (3) to isolate the varied impact of temperature and rain on crop growth cycle, this study is made. Similarly lewin and Homes (1974) observed that the amount of rain is the most critical factor in determining crop yield Raghavendra Rao (1976) indicated populations under dry farming, hybrid for the high input areas are better in performance. Rahavendra Rao (1979) expressed that by improving populations for higher yield, resistance to diseases and droughts is a suitable way to cross the thresholds for high yields. Subramaniam and Raghavendra Rao reported that it is of no doubt the populations of bajra developed under present yield improvement programmes can per form in a better way than the existing hybrids under dry farming conditions.

MATERIAL AND METHODS

The yield evaluation trials with HB. 3 and Visakha composite bajra are conducted, during 1974 to 1976 kharif (June to September) and 1976 Summer (February to May) seasons. The data

Department of Meteorology & Oceanography, Andhra University, Waltair.
* Junior Breeder, (*sorghum*) A. P. A. U., Rajendranagar, Hyderabad.

utilized of temperatures and rainfall was collected from Millet Research Station, Vizianagaram. Weekly averages are taken to construct graphs for rainfall and temperature against crop-growth cycle. Biometrical data on various yield components were collected.

RESULTS AND DISCUSSION

The analysis of data collected from 1974 to 1976 kharif and summer of 1976 yield trials having HB. 3 and Visakha composite as variants are presented in Tables I & II. The seasonwise precipitation during the growth cycle of HB. 3 and Visakha for (1) 1974 kharif was 365 mm and 389 mm, (2) 1975 kharif was 619 mm and 626 mm and (3) 1975 kharif, it was 549.6 mm. There are no rains during 1976 summer. The ranges for maximum and minimum temperature during the seasons for (1) 1974 kharif was 39°C to 29°C and 27°C to 25°C, (2) 1976 kharif was 37.7°C to 30.5°C and 27.2°C to 25.1°C and (3) 1976 summer it was 40°C to 28°C and 28°C to 23°C are noted. The weather data for 1976 kharif is not available. The weekly precipitation and temperature data of 1974 and 1975 are considered to examine the crop growth and yields of summer 1976.

The investigation in respect to precipitation indicated that the soil moisture supply is normal for the crop growth and grain yield. For duration to 50 per cent bloom, and total maturity Visakha composite is late by one week to HB.3. Thus at the time of flowering Visakha had more adverse effect compared with HB. 3 due to pollen wash off effect with rains to record low yields. The expanded flowering and grain formation periods (10 to 15 days) in Visakha composite are the reasons for recording better yields in summer 1976 in addition to genetic attributions.

The study of temperature effect on crop cycle indicates the high temperature ranges for maximum and minimum are noticed at early vegetative phase and decreasing gradually till the crop maturity. This trend of decrease in temperatures are congenial for crop growth and inturn for better yields. But where the increasing march of temperatures during summer (February to May) the flowering and grain fjlling periods passed through high ranges of maximum and minimum temperatures compared with Kharif season. Hence, these high temperatures might have adverse effect on yield during summer compard with the normal season irrespective of varieties tried in general. Further as noted from the biodata of summer, the absence of rain, in spite of other congenial conditions, surely the temperature swiftly acted adversely on crop growth and other yield components to reduce the yields. But the hybrid HB. 3 had marginal wedge over composite for yielding ability in normal season. In addition there is yield improvement from 1974 to 1976 Southwest monsoon period, up to 500 kgs/ha. in Visakha and stood on par with hybrid HB. 3, during Kharif 1976. However the summer season is an abnormal season

to raise bajra crop along the tract. But to fit in the crop in other mixed cropping programmes as noticed through the economical crop response in summer and the positive clue to prefer composites in Summer. The observations of Iewin and Homes (1974), Raghavendra Rao (1976, 1977) and Subramaniam and Raghavendra Rao (1977) support the present study.

The authors gratefully acknowledge the thanks to the authorities of Andhra Pradesh Agricultural University for permitting us to work in co-ordination.

REFERENCES

IEWIN J. and J. HOMES (1974) Comparison of statistical and soil moisture modelling techniques in a long term study of wheat yield performance under semi-arid conditions, Journal of applied Ecology. Vol. II.

RAGHAVENDRA RAO, M. 1976 Composite bajra breeding. All India Coordinated Millet Improvement Progress report (1976-76), P. No 36-40.

RAGHAVENDRA RAO, M. (1977) Pearl millet populations (*Pennisetum typhoides* S & H) Paper presented at Annual Millet Workshop 1976-77 at Gwalior

SUBRAMANIAM, A. R. and M. RAGHAVENDRA RAO (1977) Effect of certain meteorological conditions on yields of pearl millet (Pennisetum typhoides S & H), International Conf. on meteorology of the Semi-arid zones Tel Aviv, Israel, November 1977.

Table: 1 Weekly Rainfall and Temperatures at Millet Research Station vizianagaram

Month	Weeks	1974			1975			1976		
		Rain in mm	Temperature Max. °C	Min. °C	Rain in mm	Temporature Max. °C	Min. °C	Rain in mm	Temperature Max °C	Min. °C
June	10-16	69.8	35.9	27.0	16.5	37.7	28.2	20.5	37.7	27.2
	17-23	37.9	36.1	88.6	28.4	35.8	26.0	33.7	36.9	25.2
	24-30	36.6	34.1	27.2	145.5	29.9	24.8	27.4	32.0	25.2
July	1-7	37.2	37.0	27.2	12.2	30.6	27.0	86.0	33.2	25.1
	8-14	9.2	31.8	26.2	77.6	—	—	14.0	32.7	26.0
	15-21	8.1	32.1	23.6	6.8	—	—	30.0	31.0	25.2
	22-28	40.6	33.5	23.7	—	—	—	72 0	33.0	25.5
	29-4	37.8	31.5	26.0	64.2	—	—	66.5	31.0	26.0
August	5-11	19.4	31.7	26.7	6.0	—	—	11.5	33.4	25.8
	12-18	10.8	32.1	26.5	27.2	—	—	2.5	33.0	26.1
	19-25	—	36.4	26.4	118.0	—	—	16.0	32.8	25.7
	26-1	39.5	34.0	26.0	99.8	—	—	70.5	30.5	25.8
September	2-8	106.2	33.5	27.1	48.6	—	—	35.0	29 2	26.1
	9-15	14.8	32.2	26.0	112.4	—	—	46.0	34.0	25.5
	10-22	18.5	32r0	26.0	—	—	—	41.0	32.0	25 7
		Summer 1976			*Mean of 1974 and 75*					
February	12-18	—	28.8	18.9	—	32.7	22.5	—	—	—
	19-25	—	34.0	20.0	10.0	32.0	21.5	—	—	—
	26-4	—	35.7	21.7	—	33.4	21.5	—	—	—
March	5-11	—	37.1	23.2	—	33.1	20.6	—	—	—
	12-18	—	38.6	22.8	—	33.9	22.4	—	—	—
	19-25		37.0	25.2	—	35.6	24.4	—	—	—
April	2-8	20.5	37.1	26.3	—	37.4	23.0	—	—	—
	9-15	—	38.3	26.5	—	39.4	24.2	—	—	—
	16-22		38.0	27.8	—	37.1	27.1	—	—	—
	23-29	1.6	38.3	27.8	—	40.4	29.0	—	—	—

Kharif crop period : (1) 24-6-74 to 21-9-74, (ii) 22-6-75, (iii) 11-6-76 to 7-9-76.
Summer crop period : ta 4-9-75 18-2-76 to 28-4-76

Table 2: Biodata of Visakha Composite & HB. 3

Season	Varieties	Height in cms	Panicle lenth in cms	Panicle width in cms	Number of productive tillers	Days to 50% bloom	Total crop duration	Grain yield per hectare in Kgs.
1974 Monsoon	Visakha composite	244	–	–	2.6	49	75	1703
	HB. 3	218	–	–	2.4	43	69	2160
1975 Mansoon	Visakha composite	248	31.1	1.9	1.7	48	76	1862
	HB.3	173	22.4	1.4	2.6	45	73	2189
1976 Monsoon	Visakha composite	232	30.2	2.3	2.4	52	80	2217
	HB.3	176	23.2	2.1	2.9	47	75	2012
1976 Summer	Visakha composite	170	26.7	1.7	2.1	47	75	900
	HB.3	130	21.7	1.4	2.9	48	76	663
Average of Monsoon seasons	Visakha composite	241	30.0	2.1	2.2	50	77	1927
	HB.3	189	23.0	1.7	2.6	43	72	2120