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INFLUENCE OF RAINFALL AND ITS DISTRIBUTION ON CROP YIELDS OF RAINFED COTTON AND SORGHUM

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A Study was carried out to determine the influence of rainfall during the crop season on the yields of rainfed cotton and sorghum. Rainfall during the crop growth had a significant negative association with Kapas yield (r = -0.56*) in an early american cotton var. NA 247 (*Gossypium hirsutum* L.) while it had little influence on late variety Laxmi. Among different months, rainfall and number of rainy days in September month alone had a strong negative effect on kapas yields in American cotton var. NA 247. There was no clear response to rainfall for kapas yield in rainfed desi cotton (*Gossypium arboreum* L.) varieties viz, Pandaripur Mungari and Srisailam.

In Sorghum no distinct relationship exists between rainfall and grain yield of CSH-1, CSH-5, and N-13. However, stover yields were significantly correlated with rainfall during crop growth in hybrids CSH-1 and CSH-5.

Agriculture in rainfed areas is subjected to high degree of risk mainly due to erratic rainfall. Extremes of weather have extensive and definite effects on limiting crop production. Proper understanding of the pattern of variation of climatic parameters would go a long way in bringing dryland agriculture in tune with the climate (Ratnam and Hegde, 1977). Sundaresan (1980) studied the distribution pattern of rainfall and its impact on crop yields of bajra, Cotton and Sorghum and concluded that bajra exhibited the highest variation in yield followed by cotton and sorghum.

In the present paper an attempt was made to evaluate effect of rainfall and its distribution during growing season on crop yields of rainfed cotton and sorghum.

MATERIAL AND METHODS

Cotton varieties viz., NA 247, Laxmi (*Gossypium hirsutum*) Srisailam and Pandaripur Mungari (*Gossypium arboreum*) grown under rainfed conditions are generally sown in June/July in red and light soils and July/August in black soils during *Kharif* season. Sorghum varieties N-13, CSH-1 and CSH-5 are grown under ranifed conditions in black soils in second fortnight of September during *rabi* season.

Yield data of cotton and sorghum in different years were obtained from the basic records of the Regional Agricultural Research Station,. Rainfal data during the crop season were also collected monthwise in respective years from the records of Meterological Observatory of the station. The extent of relation between rainfall data and yields of cotton and sorghum were estimated following the method described by Snedecor and Cochran (1967).

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RESULTS AND DISCUSSION

The variation in crop yields of rainfed cotton and sorghum were presented in Table 1. In American cotton variety NA 247 (*Gossypium hirsutum*) rainfall during the crop growth had a significant negative association with kapas yield (r = — 0.56*) and the relationship is depicted in It is evident from the illustration that normal yields can be obtained if the rainfall received during crop period (June to December) ranges from 400 to 600 mm and anything above this would reduce the yield of seed cotton. In constrast Laxmi, a late american variety had a very low correlation coefficient (r = 0.197) indicating that rainfall during the crop growth had little influence on the kapas yield.

Mean monthly data of rainfall were also analysed and it was found that rainfall of individual months viz., June, July, August, November and December had no significant association with the kapas yield of rainfed american cottons. But rainfall received in September month alone had a significant negative effect (r = —0.535*) on kapas yield of american cottons of early duration such as var. NA 247. It is seen from the that kapas yield of NA 247 was reduced drastically when the rainfall received during September month reached 200 mm or above. It seems that variety Laxmi escapes the effect of excess rains in September and October months due to its long duration. During these months early varieties like NA 247 will be in peak flowering and boll formation stage and at this stage excess moisture by water-logging and cloudy weather favour shedding of buds and developing bolls resulting in yield reduction.

Our study also revealed that total number of rainy days during crop period had a negative effect on kapas yield of American cotton var. NA-247 (r = —0.412); however, it was found to be non-signifcant. But the number of rainy days in September month alone had a strong negative association with kapas yield (r = —0.643**) and it is depicted in Normal yields can be expected when the number of rainy days in September month does not exceed five above which there will be a steep reduction in kapas yield of american cottons. During rains and cloudy weather, light is the limiting factor for growth, inducing boll shedding in cotton (Bhatt, 1978). Cloudy weather, especially in cool season, decreases stomatal ppening in most species that are of native sunny habits (Wilson, 1948). Canney (1924) listed abundent sunshine as a third important factor assential for high yield of cotton after water and temperature. Several workers have observed an association between period of cloudy or rainy weather and high rates of shedding of young bolls occurring a few days later (Mason, 1922, King and Loomis, 1932 and Iloyds, 1920). In rainfed areas, under water-logged condition, the roots surrounded by excess moisture may not die, but their functional activities are sufficiently impaired due to lack of aeration. Thus a temporary check in root growth by water-logging for a week during flowering could results in enormous loss in cotton yields (Bhatt, 1978).

Table 1. Variation in crop yields of rainfed cotton and sorghum

	Mean	Standard deviation	Co-efficient of variation (%)	Range Min.	Range Max.	% over Mean	No. of years
I. Kapas Yield in Cotton (Kg/ha)							
NA 247	823	398.75	48.43	275	1750	179.15	13
Laxmi	580	187.37	32.25	308	877	98.10	17
Pandaripur Mungari	665	251.62	37.88	245	964	106.63	11
Srisailam	949	427.72	45.07	267	1043	81.77	11
II. a) Grain Yield in Sorghum (Kg/ha)							
N-13	2538	1019.44	40.15	820	4820	157.60	16
DSH-1	2668	1013.65	37.99	1156	4910	140.69	16
CSH-5	2882	933.71	33.07	1461	5423	140.39	16
b) Stover Yield in Sorghum (Kg/ha)							
N-13	6240	2283.31	36.59	2347	10010	122.80	16
CSH-1	3852	1200.77	31.16	2123	6510	113.88	16
CSH-5	5029	1672.34	33.25	2478	8512	119.98	16

Our study also indicate that there was no clear response to rainfall for kapas yield in rainfed dies cotton (*Gossypium arboreum*) varieties viz., Pandaripur Mungari and Srisailam.

Analysis was also made to study the influence of rainfall on grain and stover yields in rainfed sorghum. This included sixteen years and three entries viz., CSH-1, CSH-5 and N-13 Results indicated that on distinct relationship exists between rainfall and grain yields of all the entries tested. However, stover yields were highly significant and correlated with total rainfall during the crop growth in hybrids CSH-1 and CSH-5 Similarfindings were reported by de Andrade Lira (1982) from the analysis which included nine environments and there varieties in each of two locations semi-arid pernambuco of in Brazil.

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