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Research Article

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Seasonal weather behavior on cotton production in the Guntur district of Andhra Pradesh

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ABSTRACT

The main objective of this study is to assess the mean annual and seasonal rainfall behavior and also to basify the influence of weather parameters on the cotton production and productivity in the Guntur district of Andhra Pradesh. The seasonal rainfall distribution pattern was analyzed for four seasons viz., south west, north east, winter and summer. The annual and south west monsoon rainfall had significantly positive correlation in the production of cotton. Whereas north east monsoons has negative correlation on cotton production. Winter and summer rainfall has positive correlation on cotton production. The weather variables namely; mean maximum temperature, mean minimum temperature had negative correlation on cotton production. The information generated on seasonal weather behavior could give impact of seasonal weather on cotton production and productivity. This study will help us to know the seasonal behavior on cotton yield potentiality, yield gaps and impact f climate variability on cotton crop.

Key words*: Cotton kapas, rainfall behavior, weather parameters.*

INTRODUCTION

The production and productivity of cotton is sensitive to climate induced effects like temperature, rainfall, radiation, CO_2 concentration, changes in soil properties, pests and disease infestations. The potential of any crop variety is subjected to various environmental conditions and a large fraction of the potential yield is not attained. According to an estimate, crops less than 25 per cent of the potential yield due to the adverse environmental conditions, and low water availability affected crop productivity nearly as much as all the other environmental factors combined[1,2]. Stresses can occur at any stage of plant growth and development, thus illustrating the dynamic nature of crop plants and their productivity. Amongst the abiotic stresses, deficiency of soil water constitutes a primary limitation to crop productivity in many regions of the world[3,4]. Cotton is the most important commercial crop grown in Vertisols of Guntur district under rainfed situation. The yield is sensitive to weather, soil as well as management practices. Uncertainties in rainfall and other environmental hazards in dry land farming cause large year to year fluctuation in cotton production and productivity. Yield arrivals showed wide variability because of their inability to capture the indeterminate nature of the crop and its response to seasonal weather variables like rainfall, temperature, sunshine, relative humidity and evaporation etc.,. The unreliability in the rainfall is posing serious problem in cotton production. The study on influence of weather variables on production and productivity of cotton is greatly useful to know the impact weather and climate change on cotton production. The objective of this study is .to asses the mean annual and seasonal rainfall behavior on cotton production in the Guntur district of Andhra Pradesh.

MATERIALS AND METHODS

Regional Agricultural Research Station, Lam is zonal head quarter for Krishna Zone and it is located 10 KM way from Guntur town, It is located 64 km to the north and west of the Bay of Bengal. It is approximately 1,600 km to south of the national capital, New Delhi and 266 kilometers south east of state capital, Hyderabad. Guntur is located at $16^{01}22$ N $80^{0}162$ Ey'' p/ y'' p 16.20^{0}N 80.27 Ey'' p/ 16.20; 80.27. It has average elevation of 33 (108 ft) and situated on the plains. There are a few hills in the surrounding suburban areas. Additionally, the Guntur area economy has an agricultural component that is

internationally known for its exports of cotton, chillies and tobacco. The Guntur region is one of the most fertile areas in India. With the river Krishna flowing to the north of the district, the area has many farmlands. The climate is sub-tropical with major part of rainfall concentrated June to September (SW monsoon). The mean annual rainfall is around 921.6 mm. The soils in general are very fertile and they are broadly classified as Black cotton (70%), Red loamy (24%) and sandy loamy (6%). Soil are neutral to slightly alkaline in reaction (pH 7.8 to 8.2), low to medium in organic carbon content (0-0.51%), low in available N (220 kg/ha), medium to high in available P (10-120 kg/ha) and medium to high in available K (125-500 kg/ha). The monthly rainfall data of 35 years (1975-2010) was taken from Agricultural Meteorological Field Unit, RARS, Lam to assess the seasonal and annual rainfall and to study the rainfall behavior. Five weather variables *viz*., mean annual rainfall, maximum and minimum temperature, relative humidity and pan evaporation for last 35 years (1975-2010) were correlated with production and productivity of cotton.

RESULTS AND DISCUSSION

Seasonal rainfall behavior

The mean annual rainfall of Regional Agricultural Research Station, Lam is 916.2 mm with the mean distribution in 70 rainy days. The seasonal distribution of rainfall is 585.2 mm south west monsoon (63 %) 253.6 mm in north east monsoon (27 %) 16.9 mm in winter (2%) and 73.5 mm during summer (8 %). Out of 35 years of study, the seasonal distribution of rainfall data indicated that there was excess rainfall in seven years, normal rainfall in 35 years and deficit rainfall in three years. The maximum and minimum temperatures ranged from 31.8 to 36.4 ^{o}C and 20.3 to 23.7 ^{o}C respectively.

Table 1: Mean weather variable and seasonal distribution of rainfall and cotton kas production and productivity

Years	Weather parameters				Seasonal distribution of Rain Fall (mm)				Cotton kapas	
	Max	Min	Rainfall	S S	S W M	N E M	Winter	Summer	Production "000" (Bales)	Productivity kg/ha
	T. ^{0}C	T. ^{0}C	mm	hrs/day						
1975-76	33.2	22.1	906.2	7.2	641.1	195.5	0.0	69.6	104	341
1976-77	35.4	23.3	818.8	6.5	382.6	297.6	0.0	138.6	119	255
1977-78	34.9	24.0	851.6	7.0	415.4	401.4	11.6	23.2	50	103
1978-79	34.4	24.1	829.8	6.8	620.8	75.5	37.0	96.5	117	365
1979-80	36.4	24.1	395.6	7.9	239.2	141.2	0.0	15.2	168	432
1980-81	34.6	22.7	902.5	7.4	713	123.8	9.3	56.4	244	467
1981-82	32.4	21.8	712.0	7.3	491.6	189.2	0.0	31.2	302	463
1982-83	35.6	22.7	895.1	6.2	536.6	332.5	0.0	26.0	324	463
1983-84	34.2	23.3	1288.9	7.2	1098.6	149.8	4.0	36.5	567	593
1984-85	33.2	22.3	654.0	7.0	480	92.4	52.6	29.0	496	495
1985-86	32.2	20.3	834.9	6.9	478.4	198.9	77.4	80.2	294	270
1986-87	32.9	21.3	834.2	7.0	666.9	116.7	1.8	48.8	350	455
1987-88	34.8	22.9	914.4	7.2	342.4	523.1	4.0	44.9	224	208
1988-89	34.0	23.2	676.8	7.4	537.8	55.4	0.0	83.6	260	155
1989-90	33.9	23.7	1437.1	7.1	894.7	76.8	24.4	441.2	383	412
1990-91	32.2	20.3	781.4	6.7	447.8	253.4	5.0	75.2	509	537
1991-92	34.0	22.8	991.8	6.9	733.8	211.3	8.0	38.7	546	555
1992-93	34.5	22.7	753.1	7.1	404.5	259.3	0.0	89.3	407	377
1993-94	35.1	22.2	999.5	7.4	400.9	532.2	27.4	39.0	489	454
1994-95	35.0	22.9	1403.4	6.7	434	805.3	80.7	83.4	445	394
1995-96	34.3	22.8	952.4	7.0	578	334.4	2.2	37.8	429	379
1996-97	34.5	22.7	1154.7	8.5	838.8	198.9	35.0	82	506	499
1997-98	35.4	23.1	775.3	6.5	525.6	183.9	3.4	62.4	433	453
1998-99	34.9	23.5	1163.3	6.6	718.4	436.6	0.0	8.3	120	105
1999-00	34.6	22.7	914.7	7.4	668.3	98.1	83.4	64.9	253	308
2000-01	34.3	22.4	997.6	6.1	823.4	144	0.0	30.2	253	343
2001-02	34.4	23.0	1019.8	7.1	668.8	220	27.5	103.5	378	508
2002-03	34.7	22.7	534.1	6.6	285.1	202.9	0.0	46.1	187	322
2003-04	34.2	23.3	1271.2	7.0	735.1	393.6	0.0	142.5	485	694
2004-05	33.4	22.8	746.9	6.4	608.8	76.7	8.2	53.2	593	567
2005-06	33.9	23.2	1046.5	6.7	655.1	232	0.0	159.4	463	514
2006-07	31.8	21.8	744.0	6.6	450.2	241.6	1.0	51.2	469	601
2007-08	33.4	22.7	1224.2	6.0	848.1	162.4	85.3	128.4	689	783
2008-09	35.6	22.7	893.9	6.1	696.4	128.6	0.0	68.9	644	658
2009-10	33.1	22.5	746.1	5.9	421.1	160.8	2.0	162.2	515	578

Seasonal influence on cotton production and productivity

The annual rainfall had significantly positive influence on the production and productivity of cotton in the Guntur district of Andhra Pradesh (r=0.303 & 0.194). Among the rainfall seasons, South West monsoons had positive influence on production but negative influence on the productivity of cotton yield, where as North East monsoons had significant negatively influenced on production and productivity of cotton yield (r=.-0.070 & -0.224). South West Monsoon, winter and summer rainfall seasons are havening positive correlation with cotton production and productivity but South west monsoons had negative correlation with productivity. The influence of rainfall received during the north east monsoon period on cotton production and productivity was well expressed as the north east monsoon rainfall is having significant and negative correlation with cotton production (r= -0.070) and productivity (r= -0.224). The continuous distribution of annual rainfall during the crop growth period increased the cotton yield (Table: 2).

Table 2: Correlation between weather parameters and cotton kapas production and productivity in Guntur district of Andhra Pradesh

Weather parameter	Cotton Production "000"(Bales)
South west monsoon rainfall	0.346
North east monsoon rainfall	-0.070
Winter rainfall	0.167
Summer rainfall	0.153
Annual rainfall	0.303
Maximum temperature (^{0}C)	-0.197
Minimum temperature (^{0}C)	-0.254

The mean maximum temperature and mean minimum temperature had negative correlation with cotton production (bales/ha/anum) and productivity (lint kgs/ha/anum) in the Guntur district of Andhra Pradesh. Mean maximum and mean minimum temperature had significantly negative impact on cotton production (r= -0.197 and -0.254) and productivity (r= -0.250 &-0.176) respectively. High temperature and low temperatures might have caused the square and boll dropping

CONCLUSION

It is evident that this study will help us to know the seasonal behavior on cotton yield potentiality, yield gaps and impact of climate variability on cotton crop.

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