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Rainfall and dry Spell analysis for Mahabubnagar district

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ABSTRACT
The important characteristics of rainfall influencing agricultural production from rainfed areas are the date of onset of effective monsoon, the duration of dry spells, the time of occurrence of dry spells, the duration of wet spells and number of rainy days. The study of rainfall analysis in Mahabubnagar district was undertaken with specific objective of finding the onset of effective monsoon (OEM), withdrawal of effective monsoon and dry spells in Mahabubnagar district according to Ashok Raj (1979) criteria. The daily rainfall data of 29 years (1988 to 2016) at Mahabubnagar was used for this study. The annual rainfall of Mahabubnagar district ranges from 438.1 to 1316 mm with 29 percent of coefficient of variation. The mean dates of onset and withdrawal of effective monsoon was 7th July and 07th September. The average date of starting of CDS was 19th June, 22nd July, 18th August and 13th September respectively in different monsoon months. The study of onset and withdrawal of effective monsoon as well as critical dry spell is useful for selection of suitable crops, crop planning and deciding contingent measures to be undertaken during dry spell.
Key words : Onset and withdrawal of effective monsoon, Dry spell

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INTRODUCTION

Dryland agriculture has its distinct importance in the sphere of agriculture production. About 70 per cent of the total cultivated area in the country is rainfed contributing 42 per cent of the total food grain production. The dryland areas suffer due to frequent weather aberration resulting in crop failure. The important characteristics of rainfall influencing agricultural production from rainfed areas are the date of onset of effective monsoon, the duration of dry spells, the time of occurrence of dry spells, the duration of wet spells and number of rainy days. Rainfall during the monsoon is not uniform occurrence of frequent dry spells is a common phenomena during the monsoon season. In rainfed agriculture, the adequate rainfall to meet the water requirements of crops and other consumptive and non-consumptive water needs is a basic requirement.

MATERIALS AND METHODS

Daily rainfall data and evaporation data from 1988 to 2016 were obtained from the Regional Agricultural Research Station, Palem.

Determination of onset of effective monsoon (OEM)

The date of onset and end of effective monsoon was estimated by using daily rainfall data. The concept developed by Ashok Raj (1979), for onset of effective monsoon and dry spells was adopted.

i. The first day's rain in the seven day spell should be more than the average daily evaporation (e) mm of the place.
ii. The total rain during the seven days spell should be at least 5e + 10 mm.
iii. At least four out of these seven days should be rainy day(s) having rainfall more than or equal to 2.5 mm.

Determination of dry spells

The interval between the end of onset effective monsoon and another rainy day with 5e mm or more of rain or the commencement of another 7 day rainy spell satisfying the third criteria stated earlier, with a total rainfall of 5e mm or more during this spell is called as the first dry spell. If the duration of this dry spell exceeds a certain value depending on the crop-soil complex of the region, this dry spell is called as the first critical dry spell.The withdrawal of monsoon was decided as the end of last wet spell in the last week of September, which may sometimes extend upto middle of October.

RESULTS AND DISCUSSION

The daily rainfall data of Mahabubnagar for 29 years (1988 to 2016) were analyzed to determine dates of onset of effective monsoon (OEM) and dates of withdrawal of effective monsoon in different years using the criterion suggested by Ashok Raj (1979). The average annual rainfall in ranges from 438.1 to 1316 mm with an average of 728.9 mm with the coefficient of variation of 29 %.

Table 1: Variation in annual rainfall and number of rainy days

Sr. No.	Year	Total rainfall (mm)	Number of rainy days
1	1988	802.2	53
2	1989	590.3	47
3	1990	438.1	35
4	1991	801.3	45
5	1992	596.2	47
6	1993	735.6	46
7	1994	632.9	42
8	1995	763.5	52
9	1996	781.7	44
10	1997	869.6	46
11	1998	665.7	47
12	1999	604.6	49
13	2000	657.3	55
14	2001	732.5	48
15	2002	488.7	45
16	2003	632.9	44
17	2004	491.6	34
18	2005	1158	63
19	2006	604.4	38
20	2007	1316	51
21	2008	594.7	41
22	2009	773.2	37
23	2010	933.8	53
24	2011	693.7	45
25	2012	738.4	53
26	2013	1053	60
27	2014	704.3	46
28	2015	539.2	35
29	2016	744.8	42
Avg		**728.9**	**46**
S. d.		**194.7**	
Cv		**26**	

The number of rainy days varied from a minimum of 34 days during 2004 to a maximum of days during 2005 with annual average of 46 days for 29 years (1988-2016).

Table 2: Dates of onset and end of effective monsoon for Mahabubnagar district

Year	Effective monsoon date	
	Onset	Withdrawal
1988	05-Jul	27-Sep
1989	12-Jul	26-Sep
1990	08-Jul	02-Oct
1991	06-Jun	23-Sep
1992	05-Aug	11-Oct
1993	01-Jul	19-Oct
1994	03-Jul	24-Oct
1995	24-Jun	19-Oct
1996	09-Jun	26-Oct
1997	02-Jul	01-Oct
1998	29-Jun	15-Oct
1999	13-Jun	30-Sep
2000	02-Jun	19-Oct
2001	13-Aug	17-Oct
2002	01-Aug	16-Oct
2003	06-Jul	03-Oct
2004	29-Jul	10-Oct
2005	18-Jul	21-Oct
2006	14-Jun	27-Sep
2007	07-Jun	04-Oct
2008	02-Aug	07-Oct
2009	26-Aug	04-Oct
2010	12-Jun	18-Oct
2011	19-Jul	03-Sep
2012	15-Jul	08-Oct
2013	12-Jun	12-Oct
2014	10-Jul	21-Sep
2015	27-Aug	05-Oct
2016	07-Jul	01-Oct
Mean	**07-Jul**	**07-Oct**

The results of rainfall analysis for Mahabubnagar district are shown in Table 2 and 3, it is seen that onset of effective monsoon vary in between 2nd June to 27th August. The mean date of onset of effective monsoon was 7th July with a standard deviation of 24 days. The earliest and delayed probable (p=0.68) OEM date is 13th June and 31st July respectively. The withdrawal date of monsoon was observed between 21st September to 26th October. The mean date of withdrawal of monsoon was 07th September. The earliest and delayed probable (p=0.68) withdrawal date is 25th September and 19th October respectively.

Table 3 Average date of earliest, mean and delayed onset and withdrawal of effective monsoon

Date of effective monsoon	Standard deviation (days)	Earliest	Mean	Delayed
Onset	24	13-Jun	07-Jul	25-Sep
Withdrawal	12	31-Jul	07-Oct	19-Oct

Table 4: Critical dry spell distribution during different years in Mahabubnagar district

Year	Critical dry spells(CDS)								No. of CDS
	June		July		August		September		
	Date	Days	Date	Days	Date	Days	Date	Days	
1988					05-Aug	11	05-Sep	11	2
1989			25-Jul	25	27-Aug	24			2
1990			25-Jul	13	16-Aug	45			2
1991	13-Jun	8	11-Jul	21	10-Aug	8			4
					23-Aug	22			
1992					18-Aug	14	12-Sep	17	2
1993			24-Jul	12	26-Aug	9			2
1994			29-Jul	13	18-Aug	8			3
					31-Aug	34			
1995	30-Jun	8	29-Jul	29			03-Sep	8	4
							22-Sep	17	
1996	17-Jun	19	10-Jul	8	18-Aug	8			5
			28-Jul	14	30-Aug	17			
1997					10-Aug	18			2
					29-Aug	8			
1998			07-Jul	21	11-Aug	9			4
			31-Jul	10	20-Aug	8			
1999	21-Jun	25	24-Jul	27	26-Aug	12	13-Sep	17	4
2000	09-Jun	21	02-Jul	31	31-Aug	18			3
2001					20-Aug	7			2
					28-Aug	12			
2002					14-Aug	18	08-Sep	33	2
2003			21-Jul	12	12-Aug	9	21-Sep	12	4
					25-Aug	20			
2004					06-Aug	29	07-Sep	17	3
							25-Sep	9	
2005			27-Jul	13	25-Aug	7	09-Sep	11	4
							22-Sep	27	
2006	21-Jun	8							1
	30-Jun	21	29-Jul	46					2
2007	09-Jun	13							5
	29-Jun	24	24-Jul	9	06-Aug	18	06-Sep	8	
2008					20-Aug	17	13-Sep	8	3
							22-Sep	16	
2009							07-Sep	21	1
2010	19-Jun	15			01-Aug	12	09-Sep	10	4
							20-Sep	29	
2011					09-Aug	10			1
2012			23-Jul	11	13-Aug	11	07-Sep	23	3
2013	16-Jun	22	25-Jul	19	21-Aug	12	22-Sep	16	4
2014			30-Jul	19			02-Sep	10	2
2015							01-Sep	8	2
							19-Sep	10	
2016			22-Jul	11	08-Aug	20			2
					31-Aug	11			1
Avg	**19-Jun**	**17**	**22-Jul**	**18**	**18-Aug**	**15**	**13-Sep**	**15**	**3**

On an average the CDS during different monsoon months starts from June,19 having mean duration of 17 days, July, 22 having mean duration of 18 days, August, 18 having mean duration of 15 days and September, 13 having mean duration of 15 days.

This information on dry spell duration and its time of occurrence which is presented in Table 5 also can be used for planning of different contingency intercultural operations for moisture conservation and rain water harvesting or as moisture conservation techniques. Farmers can plan in advance for procurement of different equipment's and machinery for lifting of water from water storage structures and applying that with optimum efficiency to different rainfed crops.

CONCLUSION

The average annual rainfall in Mahabubnagar district ranges from 438.1 to 1316 mm with an average of 728.9 mm with the coefficient of variation of 29 %. The mean date of onset and withdrawal of effective monsoon was 7th June and 7th September respectively. On an average the CDS during different monsoon months starts from June, 19 having mean duration of 17 days, July, 22 having mean duration of 18 days, August, 18 having mean duration of 15 days and September, 13 having mean duration of 15 days.

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