RAINFALL VARIABILITY OF AKOLA IN VIDARBHA REGION OF MAHARASHTRA

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Abstract: *Rainfall is one of the most important natural recourse that directly influence our social life. Proper water management practices are the need of the day. The rainfall data of 47 years (1970-2016) of Akola station was statistically analysed to find variability of rainfall. The average annual rainfall is 796.65 mm in 44 rainy days. The standard deviation was 202.12 mm with 25.37 per cent coefficient of variation. July received highest average rainfall 204.42 mm and October lowest 48.58 mm. Akola station receives largest rainfall from south-west monsoon (June to September).The region falls under assured rainfall zone and receives approximately 75 per cent rainfall below 800 mm. The study of variations of the annual and monthly rainfall data useful for crop planning and water management.*

Keywords: *Rainfall, Akola, Variability, Standard deviation, Coefficient of variation.*

Introduction

India is an agriculture based country. Sixty five per cent of agriculture is heavily dependent on natural factors such as rainfall and temperature. Global climate changes may influence long-term rainfall patterns, impacting on availability of water, along with the danger of increasing occurrences of droughts and floods. (Deshmukh and Lunge, 2012).The rainfall received is an important factor for determining the availability of water for agriculture and other usages. Water resource has become a prime concern for any development and planning including food production, flood control and effective water resource management.

Maharashtra state is one of the important states from the point view of climate change impact. A highly variable rainfall ranging from 400 to 4500 mm occurs from 40 to 100 rainy days in the State (Anonymous, 2013).

Vidarbha region is situated in the eastern part of Maharashtra state. Geographically, it lies on the northern part of deccan plateau with Satpuda range at the north. It was mostly characterized by dryland farming. The climatic conditions of this region can be broadly described as semi-arid. One of the major challenges facing rainfed agriculture in the region today is its sustainable development.

Variability and trends in rainfall is one of the important aspects of climate change studies and several attempts have been made to study both spatial and temporal variation of the rainfall worldwide (Liu *et al.* 2008). The objective of this study is to analyse the variation of rainfall in Akola station of Vidarbha region.

Methodology

Location of Study

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola station is located in Eastern Maharashtra Plateau at 20°42'N Latitude, 77°02'E Longitude and elevation of 305 m above MSL. The region is classified as hot moist semi-arid climate with medium and deep clayey black soils. The normal annual rainfall of station was 825 mm in 43 rainy days.

Data Collection

The daily rainfall data for 47 years (1970-2016) at Akola station was obtained from AICRP on Agrometeorology, Dr. PDKV, Akola.

Rainfall Variation

The variation in rainfall has greater impact on agriculture and social life of human beings. Hence it is highly important to study rainfall in the low rainfall agro climatic zone in Vidarbha *i.e.,* Akola. The necessity of water requirement is determined by the amount of rainfall received during the period when the crops do need it to survive. The planning of crops depends on the rainfall during monsoon (Tadvi, 2016). Hence, to study the rainfall variation by using Statistical Parametric tests *viz.,* Mean, Standard deviation and Coefficient of variation was used. In the study the analysis of daily rainfall data was carried out for annual, monthly (for June, July, August, September and October months) and seasonal time series (south-west monsoon i.e., June to September) to study the rainfall variability.

1) Mean of rainfall ($\bar{X}$)

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

2) Standard deviation (S.D)

$$S.D(\sigma) = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}}$$

3) Coefficient of variation (C.V)

$$C.V = \frac{S.D(\sigma)}{Mean(\bar{X})} \times 100$$

Where,

X_i = Actual rainfall in (mm),

n = Total number of observation

$\bar{X}$ = Mean of rainfall in (mm),

σ = Standard deviation

Results and Discussion

Annual rainfall variability

The variations of annual rainfall of Akola station is presented in Table 1 and Fig.1. Akola station receives an average (1970-2016) annual rainfall of 796.65 mm in 44 rainy days. The minimum annual rainfall was observed as 360.3 mm in the year 2003 and maximum as 1336.6 mm in the year 1988. The standard deviation was 202.12 mm with 25.37 per cent coefficient of variation.

Table 1: Annual rainfall variation at selected study stations

Name of Station	Availability of data	Average Rainfall (mm)	Min. Rainfall (mm)	Max. Rainfall (mm)	SD (mm)	CV (%)
Akola	1970-2016	796.65	360.3	1336.6	202.12	25.37
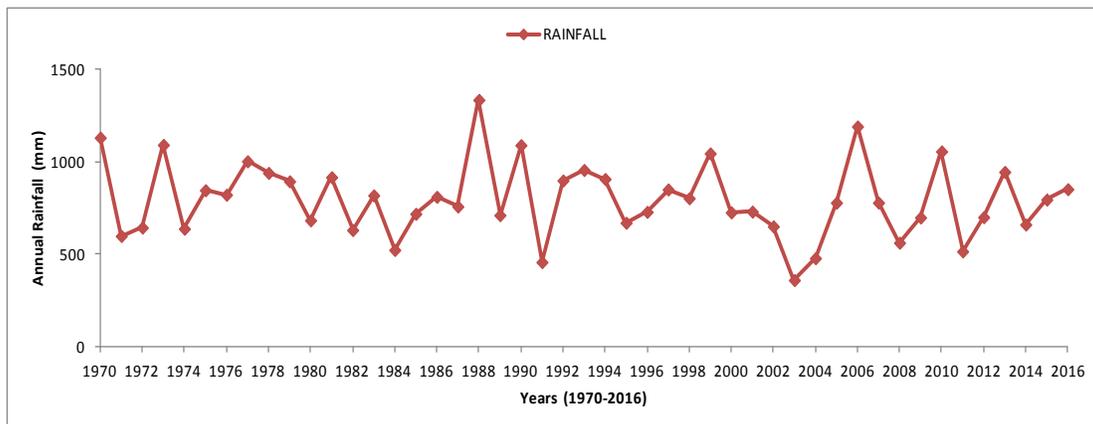
Figure 1: Annual Rainfall variations at Akola station for 47 years

Monthly rainfall variability

The average monthly rainfall contribution to the average annual rainfall for the Akola station for available data period was calculated and presented in Table 2. July and August month contributes highest amount of rainfall followed by June, September and October at study stations. October month contributes lowest amount of rainfall at all station.

Table 2: Monthly rainfall contribution to the total annual rainfall

Station	Yearly	June (%)	July (%)	August (%)	September (%)	October (%)
Akola	796.65	18.1	25.7	25.5	15.4	6.1

Monthly rainfall variation at Akola station during 1970-2016 (47 years) is shown in Table 3. From the Table 3, it is observed that July received highest average rainfall which varied from 204.42 ± 99.45 mm/year with 49 per cent coefficient of variation followed by August and June month. Minimum monthly rainfall was observed as 0.00 mm in October and maximum monthly rainfall 458.8 mm in August.

The highest variation observed in October followed by September, June and August. Monthly average rainfall received at Akola station in Vidarbha region during June to October was 144.52 ± 81.63 mm/year with 64 per cent coefficient of variation. All months of monsoon except October receive more than 100 mm rainfall at Akola station.

Table 3: Monthly rainfall variation at Akola station

Month	Average Rainfall (mm)	Min. Rainfall (mm)	Max. Rainfall (mm)	SD (mm)	CV (%)
June	143.97	24.2	339	80.63	56.00
July	204.42	42.2	398.8	99.45	49
August	203.24	14.9	458.1	100.87	50
September	122.41	0	301.2	77.45	63
October	48.58	0	157.3	49.77	102
Average	**144.52**			**81.63**	**64.00**

Conclusion

The present study concluded that the uneven distribution of rainfall in Akola station. Akola station recorded the lowest average annual rainfall as 796.65 mm,which varied from ± 202.12 mm/year with 25.27 per cent coefficient of variation. July and August month contributes highest amount of rainfall followed by June, September at Akola hence receives largest rainfall from south-west monsoon (June to September). It is useful for planning of crop at starting of monsoon and harvesting of water for water management in Akola station. The rainfall characteristics especially variability is necessary for the proper crop management, irrigation and water management for agriculture.

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