

ISSN - 2277 - 5730

**AN INTERNATIONAL MULTIDISCIPLINARY
QUARTERLY RESEARCH JOURNAL**

AJANTA

Volume - XIV

Issue - I

January - March - 2025

ENGLISH PART - II



**Peer Reviewed Referred and
UGC Listed Journal No. 40776**

Single Blind Review / Double Blind Review

Impact Factor / Indexing

2023 - 7.428

www.sjifactor.com

EDITOR

Dr. Vinay Shankarrao Hatole

Assistant Professor, International Center of Excellence in Engineering
& Management (ICEEM) College, Waluj, Chhatrapati Sambhajanagar. (MS)

PUBLISHED BY



AJANTA PRAKASHAN

Jaisingpura, Chhatrapati Sambhajanagar. (MS)

The information and views expressed and the research content published in this journal, the sole responsibility lies entirely with the author(s) and does not reflect the official opinion of the Editorial Board, Advisory Committee and the Editor in Chief of the Journal “AJANTA”. Owner, printer & publisher Vinay S. Hatole has printed this journal at Ajanta Computer and Printers, Jaisingpura, University Gate, Chhatrapati Sambhajinagar (Aurangabad), also Published the same at Chhatrapati Sambhajinagar (Aurangabad)

Printed by

Ajanta Computer,
Near University Gate, Jaisingpura,
Chhatrapati Sambhajinagar (Aurangabad), Maharashtra, India

Published by

Ajanta Prakashan,
Near University Gate, Jaisingpura,
Chhatrapati Sambhajinagar (Aurangabad), Maharashtra, India
Cell No. : 9579260877, 9822620877
E-mail : ajanta2023@gmail.com, www.ajantaprakashan.in

AJANTA - ISSN 2277 - 5730 - Impact Factor - 7.428 (www.sjifactor.com)



EDITORIAL BOARD

**Professor Kaiser Haq**

Dept. of English, University of Dhaka,
Dhaka 1000, Bangladesh.

Roderick McCulloch

University of the Sunshine Coast,
Locked Bag 4, Maroochydore DC,
Queensland, 4558 Australia.

Dr. Ashaf Fetoh Eata

College of Art's and Science
Salmau Bin Abdul Aziz University. KAS

Dr. Nicholas Loannides

Senior Lecturer & Cisco Networking Academy Instructor,
Faculty of Computing, North Campus,
London Metropolitan University, 166-220 Holloway Road,
London, N7 8DB, UK.

Muhammad Mezbah-ul-Islam

Ph.D. (NEHU, India) Assot. Prof. Dept. of
Information Science and Library Management
University of Dhaka, Dhaka - 1000, Bangladesh.

Dr. Meenu Maheshwari

Assit. Prof. & Former Head Dept.
of Commerce & Management
University of Kota, Kota.

Dr. S. Sampath

Prof. of Statistics University of Madras
Chennari 600005.

Dr. D. H. Malini Srinivasa Rao

M.B.A., Ph.D., FDP (IIMA)
Assit. Prof. Dept. of Management
Pondicherry University
Karaikal - 609605.

Dr. S. K. Omanwar

Professor and Head, Physics,
Sat Gadge Baba Amravati
University, Amravati.

Dr. Rana Pratap Singh

Professor & Dean, School for Environmental
Sciences, Dr. Babasaheb Bhimrao Ambedkar
University Raebareilly Road, Lucknow.

Dr. Shekhar Gungurwar

Hindi Dept. Vasantrao Naik
Mahavidyalaya Vasarni, Nanded.

Memon Sohail Md Yusuf

Dept. of Commerce, Nirzwa College
of Technology, Nizwa Oman.

Dr. S. Karunanidhi

Professor & Head,
Dept. of Psychology,
University of Madras.

Prof. Joyanta Borbora

Head Dept. of Sociology,
University, Dibrugarh.

Dr. Shrikrishna S. Bal

I/C Principal (Retd.),
Head, Department of Psychology,
D.B.J.College, Chiplun, Dist. Ratnagiri (M.S.)

Dr. Manoj Dixit

Professor and Head,
Department of Public Administration Director,
Institute of Tourism Studies,
Lucknow University, Lucknow.

Prof. P. T. Srinivasan

Professor and Head,
Dept. of Management Studies,
University of Madras, Chennai.

Dr. P. Vitthal

School of Language and Literature
Marathi Dept. Swami Ramanand
Teerth Marathwada University, Nanded.



EDITORIAL BOARD

**Dr. B. R. Kamble**

Kirti M. Doongursee College,
Dadar, Mumbai-28.

Dr. Sadique Razaque

Univ. Department of Psychology,
Vinoba Bhawe University,
Hazaribagh, Jharkhand.

Prof. Ram Nandan Singh

Dept. of Buddhist Studies University of Jammu.

Dr. Safiqur Rahman

Assistant Professor, Dept. of Geography,
Guwahati College Bamunimaidam, Guwahati,
Assam.

Dr. Jagdish R. Baheti

H.O.D. S. N. J. B. College of Pharmacy,
Meminagar, A/P. Tal Chandwad, Dist. Nashik.

Dr. Vimal K. Lahari

Assistant Professor, Department of Sociology,
Banaras Hindu University, Varanasi, Uttar Pradesh.

Dr. Pandit Sheshrao Nalawade

I/C Principle,
Pandit Jawaharlal Neharu Mahavidyalay,
Aurangabad.

Dr. S. T. Salunkhe

Principal,
Dahiwadi College, Dahiwadi.

Prof. (Dr.) S. M. Khetre

Vice Principal,
Dahiwadi College, Dahiwadi.

Dr. A. N. Dadas

Vice Principal ,
Dahiwadi College, Dahiwadi.

Dr. Mrs. M. M. Dethe

Associate Professor, Department of Marathi,
Dahiwadi College, Dahiwadi.

Dr. V. P. Gaikwad

Assistant Professor, Department of Geography,
Dahiwadi College, Dahiwadi.

Dr. S. P. Divate

Assistant Professor, Department of Geography,
Dahiwadi College, Dahiwadi.

Mr. V. S. Waghare

Librarian,
Dahiwadi College, Dahiwadi.



PUBLISHED BY



Ajanta Prakashan

Aurangabad. (M.S.)



CONTENTS OF ENGLISH PART - II

S. No.	Title & Author	Page No.
1	The Challenges of Food Security in India Dr. Gaikwad D. S.	1-5
2	Assessment of Change in Vegetation Cover of Sahyadri Tiger Reserve Tourism Area using Gis Techniques Pandurang Sankpal Sambhaji Shinde	6-13
3	Spatio-Temporal Analysis Levels of Agricultural Development in Nandurbar Tribal District Dr. Bhagwan Satan Patil	14-22
4	Digitalization and Effect of Climate Change on Agriculture in Patan Tehsil Dr. Prof. Santosh Patil	23-30
5	Geographical Insights into Rural Settlement Growth in Nashik District from (1991-2011) Dr. P. C. Gangurde	31-41
6	Status of Women's in Politics in Maharashtra: Special Reference to Assembly Election 2024 Dr. Satish Jadhav	42-52
7	Domestic Cow Products and its Importance for Growing Economy in India Dr. Sandeep S. Tadakhe Dr. Pradnya B. Nikam	53-60
8	Spatial-Temporal Analysis of Seasonal Rainfall Variability in Maharashtra State Mr. Kale Pappu D. Dr. Kharat Dadasaheb N. Prof. Dr. Guldeokar Shalini M.	61-69
9	Agricultural Labour-to-Agricultural Land Ratio: Reasons for the Decreased Ratio and Implications in Tembhu Lift Irrigation Project Command Area of Sangli District Nilesh Ramchandra Mandle Dr. K. R. Jadhav	70-77

8. Spatial-Temporal Analysis of Seasonal Rainfall Variability in Maharashtra State

Mr. Kale Pappu D.

Research Student, S. P. College, Pune.

Dr. Kharat Dadasaheb N.

Assistant Professor Department of Geography, Balwant College, Vita.

Prof. Dr. Guldeokar Shalini M.

Professor Department of Geography, S. P. College, Pune.

Abstract

This research works has been analyzed seasonal rainfall variation over the last Twenty-Five years (2000 to 2024) in divisions of Maharashtra state. Such as Konkan, Nashik, Pune, Chhatrapati Sambhaji nagar, Amravati and Nagpur Division of Maharashtra. Seasonal rainfall data was obtained from the Department of Agriculture, Maharashtra State. (<https://maharain.maharashtra.gov.in/>). Rainfall data was analyzed using a PCI method and some statistical methods. To examine rainfall variability of seasonal rainfall data were determined. The amount of rainfall received in Maharashtra is uneven all over the period of study. Except the year of 2001, 2002, 2015 and 2020 the month of July received maximum seasonal rainfall between 25 years (2000 to 2024) in divisions of Maharashtra State. In the division of Maharashtra state Konkan has received maximum Rainfall during monsoon period. And the lowest rainfall occurs in Chhatrapati Sambhaji Nagar division followed by Nasik and Amravati Division.

Keywords: Spatial- Temporal, Seasonal Rainfall, Rainfall Variability, Monsoon Period.

1. Introduction

Rainfall is a major atmospheric component which is play vital role in agricultural and other activities of man related to socio-economic development. The rainfall is varied temporally and spatially all over the world. Rainfall variability in Maharashtra state is influenced by a variety of climatic and geographical factors. The state experiences a tropical monsoon climate, with distinct wet and dry seasons, but there is considerable variability in rainfall across different regions due to various factors such as elevation, proximity to the coast, and prevailing wind patterns.

This research works has been analyzed seasonal rainfall variation over the last 25 years (2000 to 2024) in divisions of Maharashtra state. Such as Konkan, Nashik, Pune, Chhatrapati

Sambhaji nagar, Amravati and Nagpur Division of Maharashtra. Maharashtra primarily receives rainfall from the southwest monsoon, which lasts from June to September. Rainfall in Maharashtra shows significant interannual variability. Years with below-average rainfall can lead to droughts, particularly in the rain-fed agricultural areas of the state, while years with excess rainfall may lead to floods. Droughts are a recurring issue in Maharashtra, particularly in regions like Vidarbha and Marathwada, which are more susceptible to rainfall deficits.

The variability of rainfall in Maharashtra has a direct impact on agriculture, as many regions depend heavily on rain-fed farming. Droughts or erratic rainfall can lead to crop failures, especially for water-intensive crops like sugarcane, rice, and cotton. On the other hand, excessive rainfall can cause waterlogging, crop damage, and soil erosion.

2. Objective of the Study

The aim of studying rainfall variability is to gain a comprehensive understanding of how rainfall patterns change over time and space. The study has done to fulfil the following objectives.

To study spatial-temporal distribution of the seasonal rainfall in the study region.

To analyze rainfall variability among the divisions of Maharashtra state.

3. Study Region

Maharashtra is a prominent state in western India, known for its rich history, diverse physiography, vibrant culture, and economic importance. Maharashtra state share bordered with six state of India that is Gujarat, Madhya Pradesh, Chhattisgarh, Telangana, Karnataka, Goa, and the Arabian Sea. The coordinates of a state Between 15°40'N to 22°00'N latitude and 72°30'E to 80°30'E longitude. The area of a state is 307,713 sq. km it is third largest state in India followed by Rajasthan and Madhya Pradesh.

Maharashtra has uneven topographic features, Western Ghats (Sahyadri Hills) and Konkan Region to West, Deccan Plateau to the east and Sapura Mountain Range to the north. Alluvial plain observed on deccan plateau in the river basin of Godavari, Bhima and Krushna basin.

4. Methodology

This research paper based on the secondary source of information is the Department of Agriculture, Maharashtra State. (<https://maharain.maharashtra.gov.in/>). The study is related to the spatial temporal distribution of rainfall and rainfall variability in Maharashtra. In this research work, we have taken rainfall data for twenty-five years i.e. from 2000 to 2024 in the regional

division of Maharashtra from June to September. The regional division of Maharashtra state is Konkan, Nasik, Pune, Chhatrapati Sambhaji Nagar, Amravati and Nagpur.

To analyze data, various appropriate temporal variability analysis tool has been used like Precipitation Concentration Index (PCI). The maps and diagrams are prepared by adopting various cartographic techniques it includes bar and line graphs for better comprehension.

The PCI (precipitation concentration Index) method is applied to identify the rainfall variability; it is most widely used method.

This method propounded by Oliver in 1980. Michaels and other scholars applied this method in 1992 and calculated its annual and seasonal values. The following formula is used to statistical measures of precipitation concentration.

$$\text{Annual PCI} = 100 * (\sum P_i^2) / (\sum P_i)^2$$

$$\text{Seasonal PCI} = 33.33 * (\sum P_i^2) / (\sum P_i)^2$$

Whereas P_i = Rainfall amount of i th month,

Σ = summation over the number of months being assessed

Table no. 1 : Interpretation of PCI value

PCI values	Interpretation
<10	Uniform Distribution
10-15	Moderate Distribution
16-20	Irregular precipitation
>20	Strong Irregular precipitation concentration

5. Result and Discussion

The following table number 2 has been shown the values of Precipitation concentration index which is computed for monsoon seasonal period for 2000 to 2024 years of regional division of Maharashtra state.

The above table no. 3 and 4 shows the division wise Distribution of rainfall variability in Maharashtra with the concentration of precipitation of monsoon season (June to September). According to the calculation of Precipitation concentration index of twenty- five years from 2000 to 2024 in various divisions such as Konkan, Nasik, Pune, Chhatrapati Sambhaji nagar, Amravati and Nagpur of Maharashtra state observed only two categories of PCI that is Uniform distribution and Moderate distribution of Rainfall all over the state.

Table No. 2: Monsoon Seasonal Precipitation Concentration Index (PCI Values)

Years	Regional Division of Maharashtra					
	Konkan	Nasik	Pune	Chh. Sambhaji Nagar	Amravati	Nagpur
2000	11.08	9.76	8.8	10.07	11.17	11
2001	9.69	8.84	8.61	11.12	11.38	10.87
2002	10.23	9.75	10	10.09	10.11	10.82
2003	9.51	8.6	9.27	9.75	9.69	10.37
2004	9.96	9.33	9.26	9.41	8.82	9.51
2005	9	8.62	8.79	12.07	10.17	8.94
2006	9.49	9.61	9.24	9.59	10.22	10.52
2007	8.6	8.69	8.77	8.82	8.89	8.46
2008	8.57	10.81	9.12	10.32	8.96	9.42
2009	13.34	10.51	11.49	9.09	9.71	12.19
2010	9.67	8.88	8.79	9.65	10.15	9.5
2011	9.5	10.14	8.63	10.44	9.24	9.05
2012	8.78	9.73	9.26	8.95	8.86	9.9
2013	10.82	8.59	9.39	9.22	9.21	10.38
2014	11.85	10.6	11.63	10.71	10.29	11.4
2015	9.85	9.24	10.16	9.97	9.73	8.92
2016	9.3	9.37	9.97	9.97	10.96	10.74
2017	8.9	8.76	8.85	9.34	8.48	9.39
2018	11.27	9.86	10.66	10.59	9.78	9.97
2019	9.23	9.36	9.31	9.06	8.99	9.68
2020	9.59	8.35	9.03	8.64	8.59	9.92
2021	9.85	9.31	10.49	9.14	8.68	8.8
2022	9.75	9.28	9.8	10.53	10.27	10.66
2023	13.03	11.06	11.89	11.82	12.97	10.16
2024	10.94	8.77	9.73	8.52	9.06	11.7

Source

Department of Agriculture, Govt. of Maharashtra (Maharain) Compiled by Author

In the monsoon season out of twenty- five years from 2000 to 2024 there are six years (2004,2007, 2012, 2017,2019,2020.) are uniform distribution of rainfall (below 10 PCI values) in all divisions of Maharashtra (Konkan, Nasik, Pune, Chhatrapati sambhaji nagar, Amravati and Nagpur). Except Nagpur division in 2003, Amravati division in 2010 and Pune division in 2015 and 2021 remaining division in same years' experience uniform distribution of rainfall throughout the monsoon season (from June to September). It means that there is no significant seasonal variation and these divisions of Maharashtra Regions with PCI below 10 often experience stable climatic conditions, where rainfall is fairly predictable.

Table No. 3: Division wise Distribution of rainfall variability in Maharashtra. (PCI Values)

Years	Divisions of MH in Uniform Distribution (Below 10 PCI)					
2000	Nasik	Pune.	-	-	-	-
2001	Konkan	Nasik	Pune.	-	-	-
2002	Nasik	Pune.	-	-	-	-
2003	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	
2004	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	Nagpur
2005	Konkan	Nasik	Pune	Nagpur	-	-
2006	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	-	-
2007	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	Nagpur
2008	Konkan	Pune	Amravati,	Nagpur	-	-
2009	Chh. Sambhaji nagar,	Amravati,	-	-	-	-
2010	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Nagpur	
2011	Konkan	Pune	Amravati,	Nagpur		
2012	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	Nagpur
2013	Nasik	Pune	Chh. Sambhaji nagar,	Amravati,	-	-
2014	-	-	-	-	-	-
2015	Konkan	Nasik	Chh. Sambhaji nagar,	Amravati	Nagpur	
2016	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	-	-
2017	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	Nagpur
2018	-	-	-	-	-	-
2019	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	Nagpur
2020	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati	Nagpur
2021	Konkan	Nasik	Chh. Sambhaji nagar,	Amravati,	Nagpur	
2022	Konkan	Nasik	Pune	-	-	-
2023	-	-	-	-	-	-
2024	Nasik	Pune	Chh. Sambhaji nagar,	Amravati,	-	-

Source: Compiled by Author

Table No.4: Division wise Distribution of rainfall variability in Maharashtra (PCI Values)

Years	Divisions of MH in Moderate Distribution (10 to 15 PCI)					
2000	Konkan	Chh. Sambhaji nagar,	Amravati,	Nagpur	-	-
2001	Chh. Sambhaji nagar,	Amravati,	Nagpur	-	-	-
2002	Konkan	Chh. Sambhaji nagar,	Amravati,	Nagpur		
2003	Nagpur	-	-	-	-	-
2004		-	-	-	-	-
2005	Chh. Sambhaji nagar,	Amravati,	-	-	-	-
2006	Amravati,	Nagpur	-	-	-	-
2007	-	-	-	-	-	-
2008	Nasik	Chh. Sambhaji nagar,	-	-	-	-
2009	Nasik	Pune	Konkan	Nagpur	-	-
2010	Amravati,	-	-	-	-	-
2011	Nasik	Chh. Sambhaji nagar,	-	-	-	-
2012	-	-	-	-	-	-
2013	Konkan	Nagpur	-	-	-	-
2014	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati,	Nagpur

2015	Pune	-	-	-	-	-
2016	Amravati	Nagpur	-	-	-	-
2017	-	-	-	-	-	-
2018	Konkan	Pune	Chh.Sambhaji nagar	-	-	-
2019	-	-	-	-	-	-
2020	-	-	-	-	-	-
2021	Pune	-	-	-	-	-
2022	Chh. Sambhaji nagar,	Amravati,	Nagpur	-	-	-
2023	Konkan	Nasik	Pune	Chh. Sambhaji nagar,	Amravati,	Nagpur
2024	Konkan	Nagpur	-	-	-	-

Source: Compiled by Author

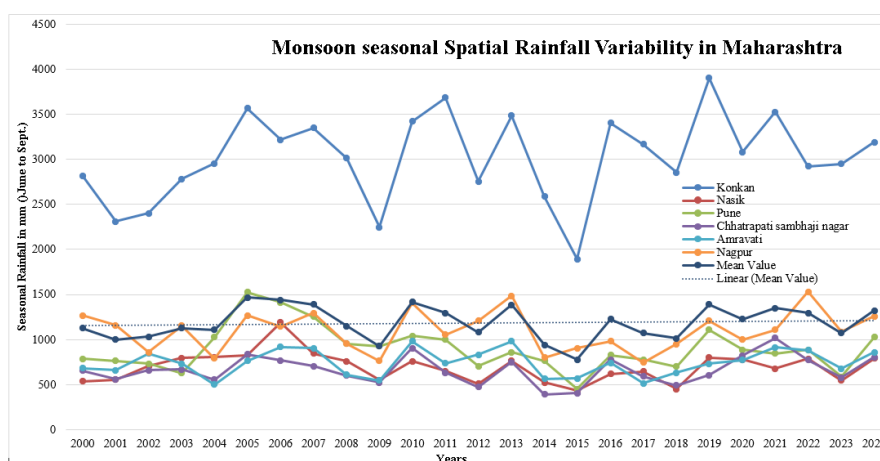


Fig.No.01

On the other hand, in the monsoon season out of twenty-five years from 2000 to 2024 there are only two years i.e. 2014 and 2023 are observed Moderate distribution of rainfall (between 10 to 15 PCI values) in all divisions of Maharashtra i.e. Konkan, Nasik, Pune, Chhatrapati sambhaji nagar, Amravati and Nagpur. It is representing a slightly uneven distribution of rainfall with some months receiving more precipitation than others. In simple words it indicates that precipitation is somewhat uneven but not highly concentrated in a few months.

Above figure number 1 shows the spatial variability in seasonal rainfall over the regional division of Maharashtra for twenty-five years from 2000 to 2024. In the point of view Konkan Division has received maximum rainfall throughout the monsoon season than other divisions of Maharashtra state. Konkan has received maximum monsoon seasonal rainfall 2019 within the twenty-five years and minimum rainfall received in 2015 within the study period.

Nagpur has second maximum rainfall experience regional division of Maharashtra state. Nagpur has received maximum monsoon seasonal rainfall 2022(1527.3 mm) followed by 2013 (1485 mm) within the twenty-five years and minimum rainfall received in 2017(745.8 mm) within the study period.

On the other hand, the minimum rainfall received in Chhatrapati sambhaji nagar throughout the monsoon season in twenty-five years than other regional divisions of Maharashtra state. Minimum rainfall received in 2014 year i.e. 392.6 mm. because of the Chhatrapati sambhaji nagar lies in the rain shadow region of the Western Ghats.

As well as in Fig. No. 1 shows mean value of Monsoon Seasonal Rainfall distribution in Maharashtra. The mean value in a rainfall distribution represents the average rainfall over a specified time period or spatial area it helps in understanding whether the rainfall is normal, above average, or below average. The regional division of Maharashtra has received more rainfall in twelve years out of the twenty-five-year average rainfall value (1184.47 mm) from 2000 to 2024.

6. Conclusion

In the point of view the patio-temporal distribution of rainfall variability in Maharashtra, focusing on the monsoon season (June to September) from 2000 to 2024, there were only two categories of precipitation concentration index (PCI) has found out i.e. uniform distribution and moderate distribution. So, within twenty-five years of studied period, six years from 2000 to 2024 had experience uniform distribution of rainfall (below 10 PCI values) in all divisions of Maharashtra, indicating no significant seasonal variation. However, only two years that is 2014 and 2023 showed moderate distribution (between 10 to 15 PCI values), indicating a slightly uneven distribution of rainfall. Finally, Rainfall in Maharashtra is mostly stable, with limited significant variation during the monsoon season.

Konkan Division has received maximum rainfall throughout the monsoon season than other divisions of Maharashtra state. Konkan has received maximum monsoon seasonal rainfall 2019 within the twenty-five years and minimum rainfall received in 2015 within the study period because of the Konkan region lies along the western coastline of India and is adjacent to the Arabian Sea.

Nagpur has second maximum rainfall experience regional division of Maharashtra state. Nagpur has received maximum monsoon seasonal rainfall 2022 (1527.3 mm) followed by 2013 (1485 mm) within the twenty-five years and minimum rainfall received in 2017(745.8 mm) within the study period.

On the other hand, the minimum rainfall received in Chhatrapati sambhaji nagar throughout the monsoon season in twenty-five years than other regional divisions of Maharashtra state. Minimum rainfall received in 2014 year i.e. 392.6 mm. because of the Chhatrapati sambhaji nagar

lies in the rain shadow region of the Western Ghats. The regional division of Maharashtra has received more rainfall in twelve years out of the twenty-five year average rainfall value (1184.47 mm) from 2000 to 2024 and Maharashtra has received less rainfall in thirteen years out of the twenty-five year average rainfall value (1184.47 mm) from 2000 to 2024.

References

1. Abhijit M. Zende¹, Dr. R. Nagarajan, Kamalkishor R. Atal (July 2012): Rainfall Trend in Semi-Arid Region – Yerala River Basin of Western Maharashtra, India. International Journal of Advancements in Technology <http://ijict.org/> ISSN 0976-4860 Vol. 3 No. 3.
2. Arvind P., Ashok Kumar P., Girish Karthi S., and Surbibahu C R. (2017): Statistical Analysis of 30 years Rainfall Data : A Case Study, Conf. Series: Earth and Environmental Sciences 8(012067).
3. Duhan D and Pandey A (2013); Statistical Analysis of long term spatial and temporal trend of precipitation during 1901-2002 at Madhya Pradesh, India, Atmospheric Research, 122, 136-149.
4. Gadekar Deepak Janardhan, Soniya Sonkar (September-October-2020): Statistical Analysis of Seasonal Rainfall Variability and Characteristics in Ahmednagar District of Maharashtra, India. International Journal of Scientific Research in Science and Technology Print ISSN: 2395-6011 | Online ISSN: 2395-602X Volume 7, Issue 5 Page Number: 125-136.
5. JYOTI P PATIL, A. SARANGI, D. K. SINGH, D. CHAKRABORTY, M. S. RAO and S. DAHIYA (5 January 2013): Rainfall trend analysis: A case study of Pune district in western Maharashtra region. Journal of Soil and Water Conservation 12(1): 35-43, January-March 2013 ISSN: 022-457X 30 November 2012; Accepted: 5 January 2013.
6. Krishnakumar K.N. Rao G.P. and Gopal kumar C.S. (2009); Rainfall Trend in Twentieth Century Over Kerala, Indian Atmosphere Environment 43 (11), 1940-1944.
7. Kishor B. Shinde Parag A. Khadke (January-2020): Rainfall Variability in Marathwada Region Through PCI. 'RESEARCH JOURNEY' International Multidisciplinary E-Research Journal Impact Factor - (SJIF) – 6.625, Special Issue 236 ISSN : 2348-7143
8. K.A. Ahire, R.C. Kothawale, P.D. Hange, Bhagyashri R. Jalgaonkar, A.D. Patil, J.P. Shewale (2021): Rainfall trends in the Satara district of Maharashtra over the last two

- decades. Journal of Natural Resource Conservation and Management Vol. 2, No. 2, pp 146-150, 2021.
9. Mohopatra M. and Mohanty U.C. (2006); Spatio Temporal Variability of Summer Monsoon Rainfall Over Orissa in Relation to Low Pressure System, Journal of Earth System Science 115 (2), 203-218.
 10. Nagesh W. Goel N.K. Jain M.K. (2013); Temporal and spatial Variability of annual and seasonal rainfall over Ethiopia, Hydrol. Sci. Journal, 58 (2), 11, 354-373.
 11. Oliver J. E. (1980); Monthly Precipitation distribution; A comparative Index, prof. Geography, 32 (3), 300-309.
 12. Rasmita Kumari Sahu and Deepak Khare (2015); Spatial and Temporal Analysis of Rainfall Trend for 30 Districts of Coastal State (Odisha) of India, Int. jour. Of Geology, Earth and Env. Science, 5 (1), 40-53.
 13. Singh S.K. Singh K.M., Singh RKP, Abhay Kumar and Ujjwal Kumar (2014); Impact of rainfall on Agricultural Production in Bihar: A Zone wise Analysis, Environment and Ecology 32 (4A0), 1571-1576.
 14. Sumit M. Dhak (July 2021): Statistical Analysis of Rainfall Variability for Tehsils of Palghar District, Maharashtra State, India. International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429 Volume 9 Issue VII July 2021.