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Comparison of Current Year (2019) Meteorological Parameters on the Basis of Long Term Climate Data of Bastar District

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A B S T R A C T

In year 2019 may be sais as an unique year which registered rainfall of 2313 mm. Weather parameter trends of Jagdalpur (19.0854° N Latitude, 82.0183° E Longitude, elevation 552 m mean sea level) is analysed by MS – excel software package. Analysis of weather parameters *viz.* maximum and minimum temperature, rainfall, rainy days and relative humidity was done from 1980 to 2018 (39 years) and 2019. The results revealed that total annual rainfall and rainy days are comparatively more in 2019 as compared to past 39 years with a difference of 896 mm in rainfall with 8 more rainy days in year 2019. In case of mean maximum and mean minimum temperature, slight but effective changes are seen.

Introduction

Weather and climate play a vital role in agricultural production. In last few decades, the increased frequency of extreme climatic events has caused enormous damage to agriculture subsectors in general to India and particularly to Chhattisgarh. The 40 years 1980 to 2019 of available meteorological data shows that in year 2019 on 6th September there was a 290 mm of rainfall received in a single day at Bastar. Raising temperature and increased drought events induced by changing climate have increased the need for efficient use of natural resources producing sufficient food and fibre for the growing population with changing consumption patterns from ever decreasing resources base requires strategic plans for efficient use of natural resources such as water, nutrients and photosynthetically active radiation (PAR). Water is considered as the second most limiting factor after land to increase food and fibre production. The two natural miracle reaction cation exchange and photosynthesis are responsible for life on mother planet. The cation exchange took place within the soil while photosynthesis above the soil surface. Since when we put the seed in the soil, the role of temperature and moisture started. It is essential for various chemicals and physiological reactions in plant and provides

a medium where most cellular function take place. Soil water affects nutrients transformation from unavailable to available form or vice versa and thereby the total uptake amount. It also influences the availability of applied nutrients and efficiency through its effect on various nutrients and efficiency through its effect on various nutrients loss mechanisms such as volatilization, soil nutrients and PAR are also key factors in crop production. Plants usually suffer from nutrients deficiencies and more importantly a reduction in net photosynthetic assimilation rate under water stress. Better inception of PAR is needed for higher biomass production and grain yield, which is also hampered under water-limited environments.

The situation is expected to be further intensified in a future changing climate which urgently calls for efficient adaptation strategies to mitigate the negative impacts associated with these changes on crop production. Therefore, improving the efficiency of natural resources use continues to escalate as a topic of interest for crop and soil scientists.

In the recent years, priority is given to studies of climate change and climate fluctuations. The regional climate swings and variability have profound influence on the regional economy. Climate change impacts are being witnessed all over the world but the country like India is more vulnerable in view of its huge population, excessive pressure on natural resources and relatively weak coping mechanism. Expected effects of changes in global climate include warmer temperatures, rising sea levels, and potentially more frequent and extreme weather events such as hurricanes, tropical cyclones and heat waves. Climate change projections made for India indicate an overall increase in temperature by 1 to 4°C and change in precipitation by 9 to 16% toward 2050s (Kumar *et al.*, 2011). Another significant aspect of climate change is the increase in the frequency of occurrence of extreme events such as droughts, floods, and cyclones. All of these expected changes will have adverse impacts on climate sensitive sectors such as agriculture, forest, coastal ecosystems and also on availability of water for different uses and on human health.

In countries like India where about 51 per cent of agriculture is under rain fed conditions, such variations have direct impact on regional economy (Department of Agriculture, Cooperation and Farmers welfare, 2017). In account by keeping the present scenario of rain fed area, the study was conducted to find a correlation between average weather data of 39 years (1980 to 2018) and 2019.

Materials and Methods

The study was conducted with 39 years weather data *viz.* maximum and minimum temperature, rainfall, rainy days and relative humidity (7 AM and 2 PM) collected from SaheedGoondadhur College of Agriculture and Research Station, Jagdalpur, Bastar. Jagdalpur (19.0854° N, 82.0183° E and elevation of 552 m from sea level) has a tropical wet and dry climate (Köppen climate classification Aw) with three main seasons: summer, monsoon, and winter. Summers last from March to May and are hot, with the average maximum for May reaching 38.1 °C. The weather cools off somewhat for the monsoon season from June to September, which features very heavy rainfall. Winter remains warm and dry.

MS –Office

MS – Excel software package is used to find out the correlation between average weather data of 38 years (1980 to 2018) and 2019.

Results and Discussion

Maximum and minimum temperature

Average maximum and minimum temperature of 39 years (1980 – 2018) and 2019 is listed in table 1. After manipulating data in MS – Excel software package correlation between maximum temperatures shows 0.98207. Monthly mean maximum temperature of 2019 varies from 27.2 ºC to 38.1 ºC in comparison to 1980 to 2018 which was recorded as 27.0 ºC to 37.4 ºC (Table 1–3).

Table.1 Table of comparison of 1980 – 2018 (39 years) and 2019 maximum and minimum temperature data

Months	Maximum Temperature		Minimum Temperature	
	1980 –2018	2019	1980 – 2018	2019
JAN	27.9	27.2	10.3	8.8
FEB	31.2	31.4	13.1	13.6
MAR	34.2	34.9	17.5	18.6
APR	36.7	37.6	21.6	21.2
MAY	37.4	38.1	23.8	23.7
JUN	32.5	34.8	23.4	24.6
JUL	28.5	28.9	22.4	22.6
AUG	27.9	28.7	22.3	22.4
SEP	29.4	29.4	21.9	22.5
OCT	29.7	30.2	18.8	20.9
NOV	28.3	29.5	13.9	14.8
DEC	27.0	28.1	9.8	12.5
Mean	**30.9**	**31.6**	**18.2**	**18.8**

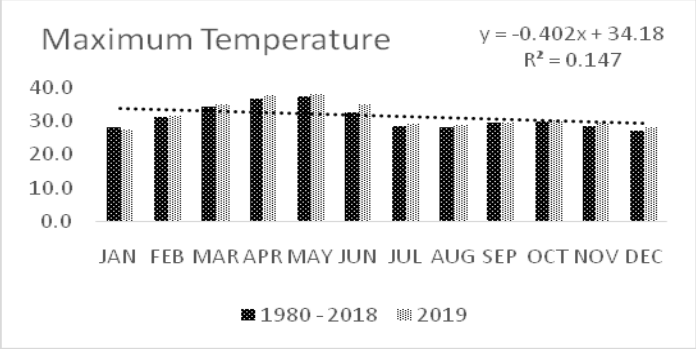
Table.2 Table of comparison mean rainfall and rainy day values between 1980 – 2018 (39 year) and 2019

	Rainfall		Rainy days	
Months	1980-2018	2019	1980-2018	2019
JAN	10	13	0.846	1
FEB	7	0.2	0.974	0
MAR	21	0.0	1.74	0
APR	45	41.5	3.871	3
MAY	76	89.8	5.205	5
JUN	239	221.0	11.02	9
JUL	338	622.5	16.84	21
AUG	359	582.2	17.53	22
SEP	211	499.0	11.79	16
OCT	87	237.8	8.674	11
NOV	18	0	1.153	0
DEC	6	6	0.421	0
Mean	**1416.8**	**2313**	**80.095**	**88**

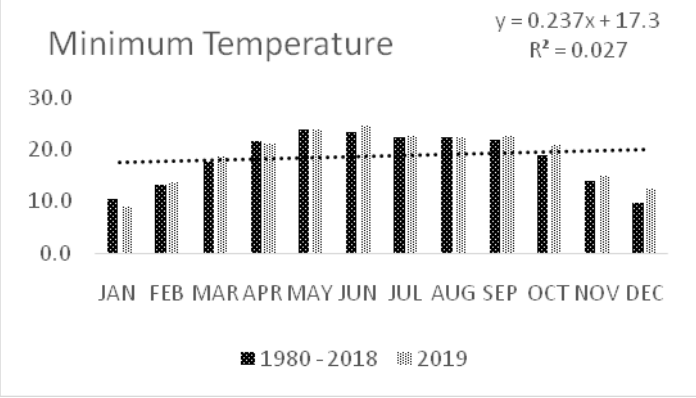
Table.3 Table of comparison of relative humidity between 1980 – 2018 (39 year) and 2019

	RH I		RH II	
Months	**1980 – 2018**	**2019**	**1980 – 2018**	**2019**
JAN	87	93	41	31
FEB	81	87	35	32
MAR	71	81	29	31
APR	66	69	30	30
MAY	65	72	35	37
JUN	78	80	59	55
JUL	89	93	76	78
AUG	89	94	78	77
SEP	89	94	71	75
OCT	87	96	61	67
NOV	86	97	52	46
DEC	86	97	46	42
Mean	**81.2**	**87.7**	**51.1**	**50.0**

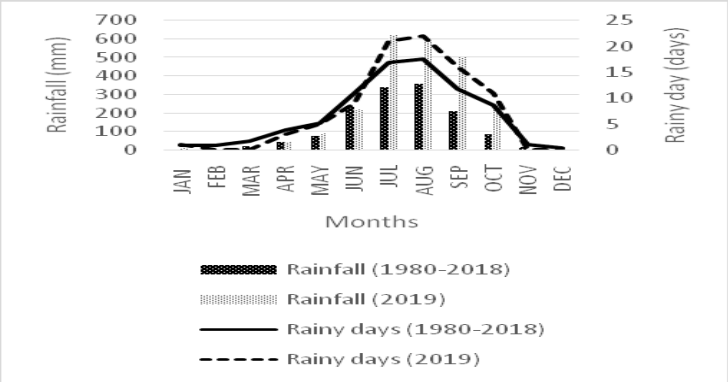
Graph.1 Plotted graph of comparison between maximum temperature 1980 – 2018 (39 years) and 2019



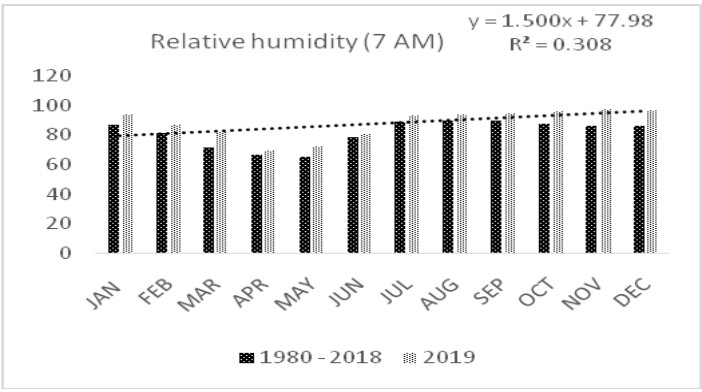
Graph.2 Plotted graph of comparison between minimum temperature 1980 – 2018 (39 years) and 2019



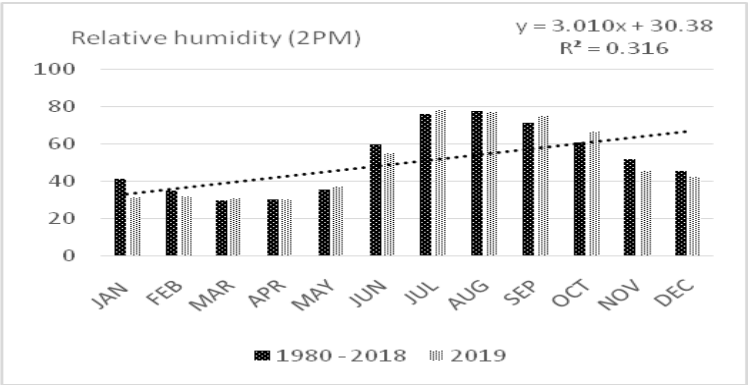
Graph.3 Plotted graph comparison mean rainfall and rainy day values between 1980 – 2018 (39 year) and 2019



Graph.4 Trend analysis of comparison of relative humidity (7 AM) between 1980 – 2018 (39 year) and 2019



Graph.5 Trend analysis of comparison of relative humidity (2 PM) between 1980 – 2018 (39 year) and 2019



Highest maximum temperature is recorded in the month of May in both the years and lowest maximum temperature is recorded in month of December in 1980 to 2018 and in January in 2019. Likewise monthly mean minimum temperature ranges from 8.8 ºC to

24.6 ºC in year 2019 and 9.8 ºC to 23.8 ºC in 1980 to 2018. Mean minimum temperature slightly increases (0.6 ºC) in 2019 as compared to mean minimum temperature of 1980 – 2018 and correlation between them shows 0.9771. Highest temperature is recorded in May – July and lowest is recorded in December – January.

Both maximum and minimum temperature shows an increasing change in year 2019 from previous years.

Rainfall and rainy days

Long-term analysis of rainfall data (1980-2018) indicated that Jagdalpur receives a mean annual rainfall of 1416.8 mm during past 39 years and as low as 994 mm during 1997 to as high as 2285.9 mm during 1990. Maximum mean rainfall in last 39 years is recorded in month of August with 359 mm, but in 2019 maximum mean rainfall is recorded in month of July with 623 mm. The rainfall is recorded more in 2019 as compared to previous years (1980 – 2018) with mean values of 2313 mm and 1416.8 mm respectively. The correlation values between them was 0.9446. Mean rainfall for the year 2019 is recorded more.

Annual rainy days (rainfall > 2.5 mm in a day) varied widely from 58 (in 2002) to as high as 116 (in 2012). Also maximum rainy day was seen in month of August for both the years i.e. 17.53 (~18) days in past 39 years (1980-2018) and 22 days in 2019.

Mean relative humidity of 1980 to 2018 ranges from 51.1 to 81.2 as compared to mean relative humidity of 2019 which was recorded 50.0 to 87.7. Correlation between RH I was shown 0.9505 and RH II was 0.9739.

In conclusion the result of above experiment shows that all the weather parameters are in increasing trend in year 2019 except evening relative humidity (RH II) which shows a nominal decreasing trend, as compared to previous 38 years. This study shows that required precautions should be done to overcome from the fluctuation of weather parameters.

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