Koppen Climatic Classification: A Case Study Of Ahmednagar

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Abstract: Weather and Climate are two important aspects in the agriculture economy of the world. After introduction of new technological known how new discoveries invention emerge in various sectors. The effects of adverse in climate and weather condition noticed in the 21th century very seriously. Climate study got importance due to global warming, green house effect and the spread of industrialization all over the world. Climate study belongs to physical geography as a separate discipline. Climate is a sum of various variables that is temperature, rainfall, air pressure, wind, humidity etc.

Keyword: Koppen Climatic , physical geography , Agriculture , phenomena .

INTRODUCTION:

India is from tropical zone as well as agro-base economy. Agriculture is prime sector of Indian economy enjoys all type of climatic condition, But adverse effects took place at least 20 years ago. Therefore micro level study got importance for all sectors. Wellbeing of human society, i.e. healthy climate, proper rainfall, accurate seasonal cycle and agriculture productions are associated with climatic condition.

Ahmednagar district lies in drought prone area of the state of Maharashtra. Drought is comparatively regular phenomena of lee world side of the Sahyadri Mountain. Here attempt has been made to exchange to get scientific knowledge.

STUDY AREA

The Ahmednagar district from the state of Maharashtra lies in the rain shadow area. For the present study of Ahmednagar is situated partly in the upper Godavari basin and partly in the Bhima river basin occupying a somewhat central position in Maharashtra state. Ahmednagar is the largest district of Maharashtra in respect of area. It is extending between 1802' and 1909' North latitudes and 7309' and 7505' East Longitudes and is bounded by Nashik district on the North, Aurangabad district to the North-East and Bid district to the East. Thane district to the North-west, Pune district to the West and Osmanabad and Solapur to the South. The district has an area of 17412 sq.km. This is 5.5 % of the total area of the state and divided into 14 talukas. The Ahmednagar city is situated in central part of the Deccan Plateau,on the eastern flank of Harischandra hill range in the upper basin on the left bank of Sina river. Ahmednagar city is situated between   1904'N to 190 8'N latitudes and 740 44' E to 74046' E Longitudes at the height of 656.54 meters from the mean sea level. Climate of the district is hot and dry, the average of the temperature 90c to 410c. The average of annual rainfall in 425.6 mm. (2011)
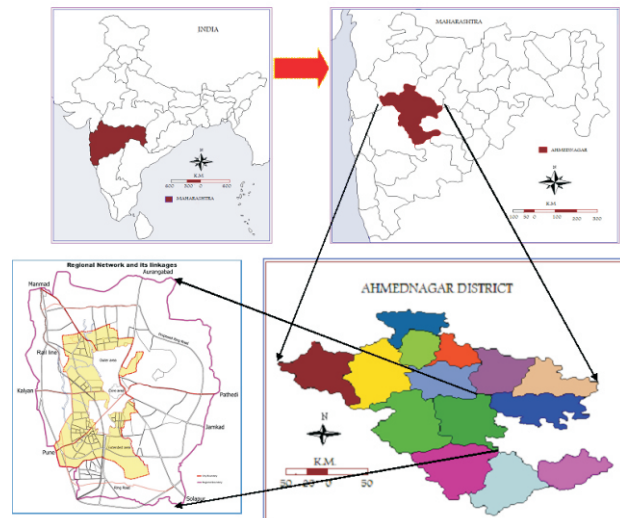
AHMEDNAGAR CITY

OBJECTIVES

1. To study Koppens climatic classification in reference to Ahmednagar station.
2. To measure the temperature and rainfall amount of study area and identify climatic type of Ahmednagar city.

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DATABASE AND METHODOLOGY

The present study is based on the rainfall and temperature data collected from Indian Metrological Department, Ahmednagar for 10 years from 2002 to 2011.Which have been taken into consideration for analyzing long term mean monthly, seasonal and yearly average annual temperature and rainfall data. By the using of Koppen climatic classification and identified the climatic group of Ahmednagar. It has been calculated and represented along with statistical analysis have been performed on data and shows the presentation of result with the help of charts, maps and diagrams.

KOPPEN CLIMATIC CLASSIFICATION

Of the several schemes of climatic classification, the one devised by Waldimir Koppen, a German botanist and climatologist, still remain the most widely known descriptive system. It is a quantitative as well as empirical classification of climate classification. Koppen proposed his first classification in 1990, using the world vegetation map of de Candole, a French plant physiologist. This classification scheme uses certain critical values of temperature of the warmest and the coldest months and precipitation of the wettest and the direst months. Koppen revised his classification first in 1918, when he paid greater attention to the monthly and annual averages of temperature and precipitation, and their seasonal distribution. Thereafter several modifications were incorporated in his classification by the author himself. The latest world map by the author himself appeared in1931 in his book, Grundriss der klimakunde, Berlin. Even after this the koppen classification continued to be modified. Koppen-Geiger world climatic map was published in 1936. However, a further modified version of koppen's original classification was published in 1953, which is known as koppen-Geiger-Pohl's classification of world climate.

In classifying climate koppen placed reliance on his belief that the distribution of natural vegetation was the best expression of the totality of climate. Consequently, many of the climatic boundaries he selected were based on vegetation limits.

The koppen system recognizes five principal categories of climate; each category is designated by a capital letter as follows.

A.Humid tropical climates.
Winterless climates; it is hot all seasons; all months have a mean temperature above 180 C.

B.Dry climates.
In these climates evaporation exceeds precipitation; there is a constant water deficiency.

C.Humid Mesothermal climates or warm temperate rainy climates.
These climates have mild winters; the average temperature of the coldest month is below 180C but above -30C; the average temperature of the warmest month over 100 C. In this group of climate both the seasons winter and summer, are found.

D.Humid micro thermal climates or cold snow-forest climates.
These climates have server winters; the average temperature of the coldest month is below -30 C and that of the warmest month exceeds 100C.

E.Polar climates.
These are summer less climates; the warmest monthly mean is below 100C.

It may be noticed that four of the principal categories of climatic group (A, C, D, and E) are based on temperature characteristics, while the fifth, the B category, has precipitation as its fundamental criterion. Each of the five categories of climatic groups has been subdivided on the basis of precipitation and temperature characteristics.

The Ahmednagar weather station having following data. The identification of Koppen Climatic Classification.
Ahmednagar station recorded average data of Temperature (0c) and Rainfall (mm)

MONTH / YEAR		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	AVER AGE
2002	Temp(⁰C)	20.1	24.8	26.3	30.5	32.3	28.9	26.5	24.8	25.7	25.8	22.7	22.1	25.9
	ppt(mm)	0.0	0.0	0.0	0.0	0.0	231.4	12.8	14.2	17.8	0.0	0.0	0.0	276.2
2003	Temp(⁰C)	21.9	24.3	26.7	30.3	31.4	12.8	27.0	26.5	26.3	26.3	22.7	22.3	26.2
	ppt(mm)	0.0	2.5	0.0	0.0	0.0	114.0	31.9	32.2	30.5	25.6	0.0	0.0	236.7
2004	Temp(⁰C)	21.3	25.1	28.6	30.5	30.5	17.8	25.5	24.5	25.8	26.3	22.7	22.3	25.9
	ppt(mm)	0.0	0.0	0.0	0.2	102.9	150.4	106.1	33.9	214.4	35.9	0.0	0.0	643.8
2005	Temp(⁰C)	20.8	22.5	26.1	29.7	29.7	28.6	24.3	22.8	24.4	24.1	20.3	19.9	24.4
	ppt(mm)	0.0	0.0	0.0	5.0	0.0	37.3	119.7	53.3	186.6	123.5	0.0	0.0	525.4
2006	Temp(⁰C)	20.4	24.0	25.9	29.4	31.7	28.5	24.9	24.1	20.7	24.2	19.9	19.8	24.5
	ppt(mm)	0.0	0.0	0.0	15.4	4.8	261.2	60.5	130.3	346.3	10.6	46.0	0.0	875.1
2007	Temp(⁰C)	20.4	21.3	25.2	24.9	31.6	27.9	25.7	25.4	25.4	25.1	22.6	23.6	24.9
	ppt(mm)	0.0	0.0	0.0	3.1	1.8	218.3	92.9	236.5	212.9	0.0	24.6	0.0	790.1
2008	Temp(⁰C)	20.5	22.1	27.0	29.4	30.5	28.4	26.7	24.9	24.7	24.7	23.4	23.6	25.5
	ppt(mm)	0.0	0.0	58.9	14.7	0.7	45.2	32.1	126.2	392.1	159.7	0.8	0.0	830.4
2009	Temp(⁰C)	22.0	24.3	26.5	29.8	30.6	29.1	25.0	25.4	26.6	29.3	22.7	20.8	26.0
	ppt(mm)	0.0	0.0	11.6	17.2	0.7	81.7	63.2	183.3	174.2	80.7	77.0	0.0	689.6
2010	Temp(⁰C)	20.5	23.6	27.3	30.0	31.9	27.8	25.4	24.8	24.9	23.9	23.8	18.9	25.2
	ppt(mm)	1.7	0.0	4.3	0.0	0.2	251.0	152.8	273.0	233.9	23.2	19.7	0.0	959.8
2011	Temp(⁰C)	19.1	22.3	26.8	28.7	21.0	27.6	26.0	25.4	25.2	25.3	22.6	21.1	24.3
	ppt(mm)	0.0	6.0	0.0	10.1	0.0	31.9	131.5	101.5	120.5	24.1	0.0	0.0	425.6
Ave rge	Temp(⁰C)	20.7	23.4	26.6	29.3	30.1	28.3	25.7	24.9	25.0	25.5	22.3	21.4	25.3
	ppt(mm)	0.17	0.85	7.48	6.57	11.11	142.2	80.35	118.4	192.92	48.33	16.81	0	625.27
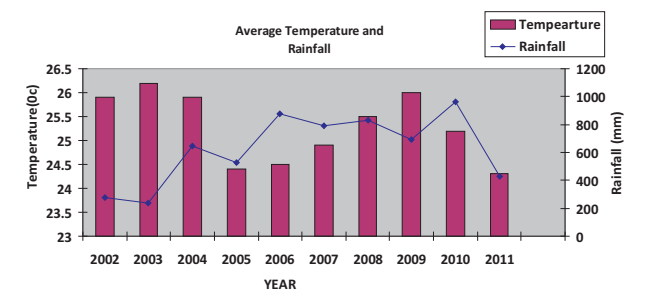
Average Temperature and Rainfall

The Ahmednagar weather station having following data. The identification of Koppen Climatic Classification.

Month	J	F	M	A	M	J	J	A	S	O	N	D	AVERAGE
Temp. (⁰c)	20.7	23.4	26.6	29.3	30.1	28.3	25.7	24.9	25.0	25.5	22.3	21.4	25.3
Ppt. (cm)	0.02	0.03	0.88	0.44	1.15	14.41	10.84	13.63	19.97	5.18	1.95	00	68.50

1. Identification of season:
a) Winter season-
The temperature range between group of six month is less and precipitation is also less those
month are winter season.

b) Summer season-

The temperature range between group of six month is high and precipitation is also high those month are summer season.

In the Ahmednagar weather station:
Winter season-(From October to March) - This six month is less temperature range between 20.70C to 26.60C for another six month.
Summer season- (From April to September) – This six month is high temperature range between 25.0C to 30.10C for another month.

In the Ahmednagar weather station:
The summer season from April to September and winter season from October to March which condition in north hemisphere therefore the Ahmednagar station is located in north hemisphere.

Few major component need to the classification:

1. Total temperature = 303.20C
2. Average temperature = 25.3 0 C
3. Total precipitation = 68.50 cm
4. Summer month = April to September
5. Winter month = October to March
6. Summer precipitation = 60.44 cm – 88.23 %
7. Winter precipitation = 08.06 cm – 11.77 %
8. Warmest month = May-30.10C
9. Coldest month = January-20.70C
10. Wettest month = September-19.97 cm
11. Driest month = December-00 cm

2. Hemispherical Location:
North hemisphere-   South hemisphere-
Summer- April to September Summer - October to March.
Winter - October to March.
Winter - April to September.

3. Identification of climatic group:
a) Climatic group 'B'- Dry climate

Criteria-
1. Concentration of ppt. in summer / warmer six month When 70% or more ppt. in summer / warmer six month & R<2T+28(cm) or r<0.44t-3(inch)
2. Concentration of ppt. in winter / colder six month When 70% or more ppt. in winter / colder six months & R<2T (cm) or r<0.44t-14(inch)
3. Even Distribution through the year neither half of the year with more than 70% of annual ppt. & R<2T+14 (cm) or r<0.44t-8.5(inch)

In the Ahmednagar weather station:

1. Concentration of precipitation in warmest six month having 60.44 cm as well as 88.23 % and

$$R < 2T \ (cm)$$

Hear, T=25.3, R=68.50
Therefore 2*25.3+28 =78.6
            68.50 < 78.6
Therefore   R < 2T (cm)

Climatic group 'B' – Dry climate, is Present

4. Identification of climatic type
a) Climatic type 'W'-Arid desert climate.
Criteria-
1. Annual ppt. usually less than 15 inches/ 40 cm
2. R< half upper limit of applicable requirement.
a) R< (2T+28)/2(cm) or r < (0.44t-3)/2(inches)
b) R< (2T)/2(cm) or r < (0.44t-14)/2(inches)
c) R< (2T+14)/2(cm) or r < (0.44t-8.5)/2(inches)

In the Ahmednagar weather station:
The annual precipitation is 68.50 cm which is higher than 40 cm therefore this climatic type is absent.

Climatic Type 'W' – Arid/desert climate is absent.

b) Climatic type 'S' – Semi Arid/Steppe climate
Criteria-
R/r is less than upper limit for B but more than half that amount.
a) R< (2T+28)/2 (cm) or r < (0.44t-3)/2(inches)
b) R < (2T)/2(cm) or r < (0.44t-14)/2(inches).
c) R< (2T+14)/2(cm) or r < (0.44t-8.5)/2(inches)
In the Ahmednagar weather station:
R < than upper limit of 'B'
R = 68.50
Upper limit of 'B'= 78.6
But, more than half that amount
= R < (2T+28) / 2
= 2*25.3+28/2 = 29.30   Half amount=29.30
The 'R' value as well as precipitation is in between upper limit of 'B' and
Half value therefore this climatic type is present.

Climatic Type 'S' – Semi Arid/Steppe climate, is present

5. Identification of climatic sub type:
a) Climatic sub type 'h' – Hot
Criteria-
Average annual Temperature is over 180C/64.40F.
In the Ahmednagar weather station:
The average annual temperature is 25.30C which is over 180C therefore this climatic sub type is present.

Climatic sub Type 'h' – Hot climate is present.

6. Result:

BSh= Dry Arid hot climate

CONCLUSION

The weather and climate influence on our day to day life. Analysis of any weather data is most important. They are gives and identified appropriate condition of the given station. To using the various data man has aclimization to particular climatic position. Many methods are helps to declaration of the weather conditions. With the help of the climatic data we are able to find out climatic classification. With the help of koppen's classification we are able to understand that the climate of Ahmednagar city is semi arid, hot and dry climate is found. The concentration of ppt. in summer / warmer six month is more than70% Precipitation that is 88.23% in summer / warmer six month at the Ahmednagar city therefore the dry climate is present. Rainfall is less than upper limit for B but more than half that amount that's why semi arid climate is present. And Average annual Temperature is over 180c therefore hot climate is present. In an all criteria fulfilled therefore in Ahmednagar city having dry Arid Hot type climate according to koppen classification.

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