

Analysis Of Temporal Characteristics Of Winds At Kalar District

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Abstract:-

Studied area located at (25' 35°) - (' 46° 35) N. and (10' 45°) - (37' 45°) E., Since that it has a sub-tropical climate characters. Kalar surrounded by Darbandikhan's district, from east, Kalar borderd by Khanaqin district, from the west and south it has boundaries with Kifri district. The average height of the area above sea level reach to about 200-250 m. The region's climate is characterized by hot, dry summers and modrate rainy winter, studied time period (2010 - 2020) was chosen.

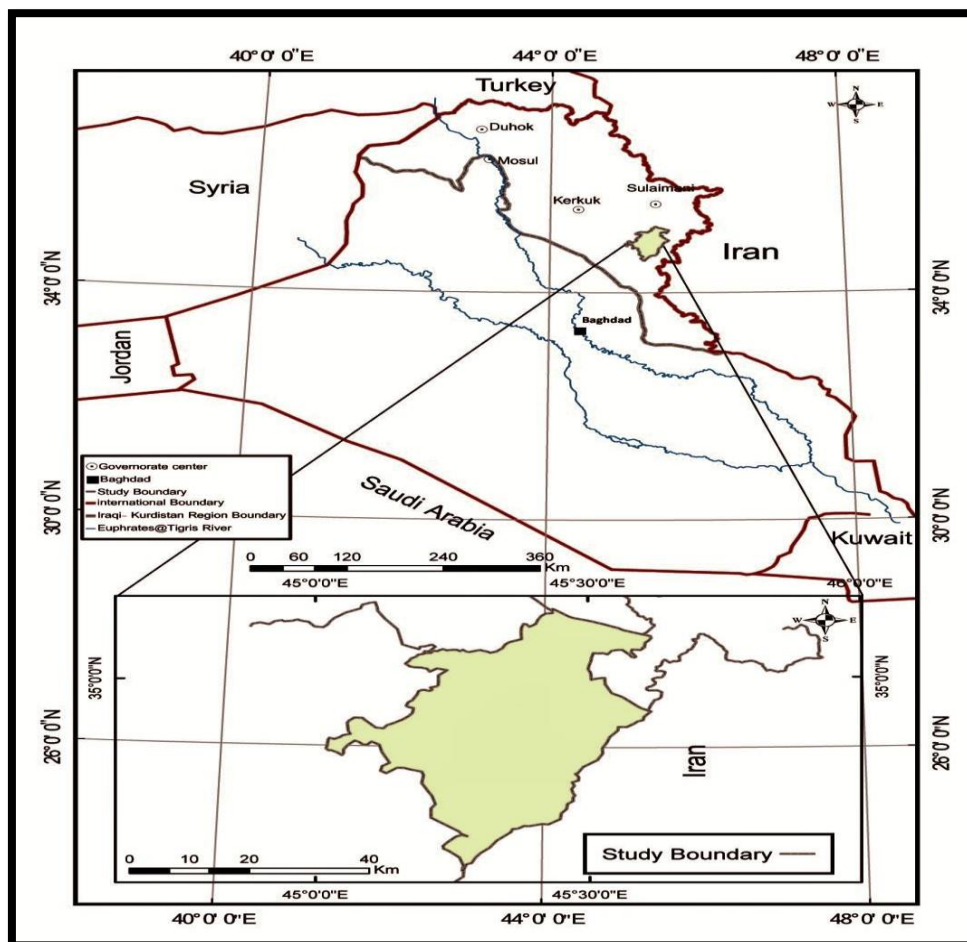
It is known that the winds represents as one of the climatic elements and takes its characteristics from the establishing area or as a result of its movement and getting its characteristics from the areas that passes through, as well as the terrain factor above sea level, except for the northeastern parts, which reach to about (1800) m above sea level at (Golan) mountain peack.

The researcher adopted the descriptive and analytical approaches in his study, and for each study a basis is the problem and the problem of the current study is that the winds vary in their characteristics (monthly, seasonaly and annually) and it is not clear what are the most frequent and dominant winds in the region compared to others, the winds varies temporally according to the month and the prevailing season, and the frequency of some of them varies from month to month, And, on the basis of variation, it turned out that the northwest wind recorded the highest rates. The study suffered from obstacles, due to equipment damage, and due to the fact that wind directions do not change, researcher used to analyzed direction data of (1991 - 1999) .

Keywords: Kalar, properties, wind .

Astrological and geographical locations:=

Astronomically, Kalar District is located within the range of tropical and semi-tropical latitudes, because of its astronomical position between two latitudes ($21^{\circ} 30' 34'' - 31^{\circ} 50' 34''$) north and longitudes ($32^{\circ} 05' 45'' - 37^{\circ} 25' 45''$) east. Thus, the angle of incidence of solar radiation is close to the perpendicular to the region in summer, so it receives a greater amount of solar energy, and the length of the day reaches about (14-15 hours per day) in theory due to the clearness of the sky, but during the transitional seasons and formation of dust storms, the arriving solar radiation (hours of actual solar radiation brightness) It decreases according to the duration of the of dust storms, but during the summer, the sky in the region is clear for most of the period due to the control of high pressure on the atmosphere, while the hours of brightness duration at autumn, winter and spring, especially during winter, vary due to the varying cloud cover from stratigraphic clouds to accumulated one ,since that the impact of the location determining the amount of solar radiation and the other climatic elements starting from temperature to the other. Therefore, these characteristics will be reflected on the winter wind at studied area.¹ See map(1) which represents the location of Kalar district . Kalar district Geographically located at southeast of the Kurdistan Region, in the north of the central part of Iraq, thus administratively it belongs to Sulaymaniyah Governorate. Its associations with the district of Kifri and Jalawla, while others indicate that the name belongs to (Ka-L-Yar), meaning the homeland of the caribou, due to the large number of caribou in the region, while others believe that the origin of the word is taken from (Ka-Lat) and means The fortress is related to the ancient Shirwana castle located in the district.² The district is located at an average altitude between (200-250 m above sea level) when compared to the two cities of Baghdad which is located at an altitude of (31.7 m) , from sea level and Basra located at an altitude of (2.7 m) above sea level, Kalar is surround by Darbandikhan district from north , whose average height ranges between (400 m) above sea level in the southern parts and reaches in the northern and eastern parts to about (1800 m)above sea level at Gulan mountain , from the east Kalar's boundary extended with Khanaqin district, which is characterized by its height above sea level close to the level of elevation in Kalar. The same thing applies to Kifri district, which borderd Kalar from the west and south. Kalar consist of {(Rizgari / Al-Samoud previously), peabaz, Sheikh Toil}, what has related to the temperature rise of temperatures at studied area showed that the average temperature during winter increased through the seventies of twentieth century and early 2011 by 3°C .³



Map (1) astronomical and geographical locations of the Kalar district

- Unpublished data from the Garmian region administration and (Arc gis) program

Kalar's Geology &Geomorphology :-

In general, it can be said that the Kalar district represents the release of sediments dating back to the third period (Tertiary), specifically between the Eocene and the Quaternary era. In the concave parts, the formation of Bie Hassan is clear. In the Sherwana plain, the sediments of the Quaternary period are evident, taking an east-west direction, in addition to the sediments of the flood plain that surrounds the Sirwan River the main rocks are visible at a depth of (8-14 km) of the earth's surface forming a thick sedimentary band, generally the area is divided into (highlands, hills, and plains), the mounnous area is estimated to about (55,5 km²).⁴ thus this land form represents (8.5%) of the area The general direction of the area is northwest, northwest, southeast, representing Taimana High the highest elevation, reaches (838 m) above sea level. The second type of land surface forms in Kalar district, and its

area is estimated at (222 km²), meaning that it represents (34.1%) of the area, the region was clearly shown by the effects of weathering and erosion processes. Third form at the region is the plain, where its area estimated to about 374.5 km², this means that the plain range occupies an area of (57.4%) of the total area of the region. In general the area is characterized by being somewhat salty.⁵

Analysing Of Kalar's Climate :-

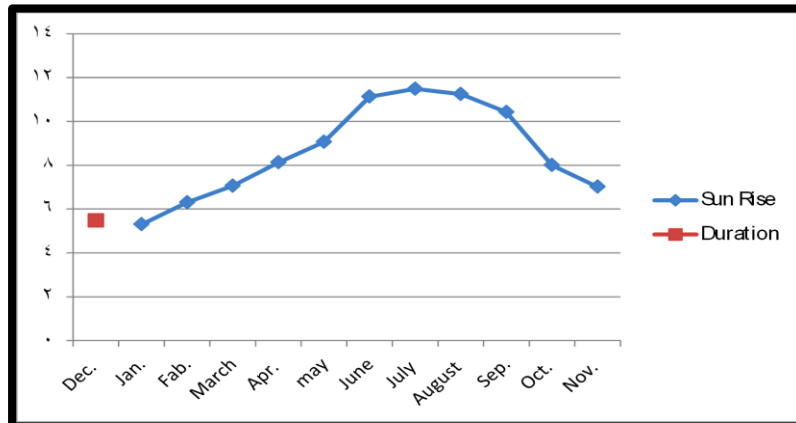
At any climatic study of any area it should be explaining the climate even if the study discuss one of climatic elements, like case study which try to determining winds at Kalar, depend on this table (1) shows the related climatic elements.

Table (1) shows climatic characteristics of the district, thus it could be seen that sun duration has temporal differences through the year from month to the other, generally sun's duration at winter is less than summer, lowest value of sun rise duration has been recorded at January, which reached to about (5.30 hour) gradually increasing toward spring which it recorded a value to about (8.12 hour) at April, highest value recorded at summer at July which was (11.48 hour), then the duration decreased see shape (1).

Table (1) some of climatic elements at studied area through time period (2009 – 2020)

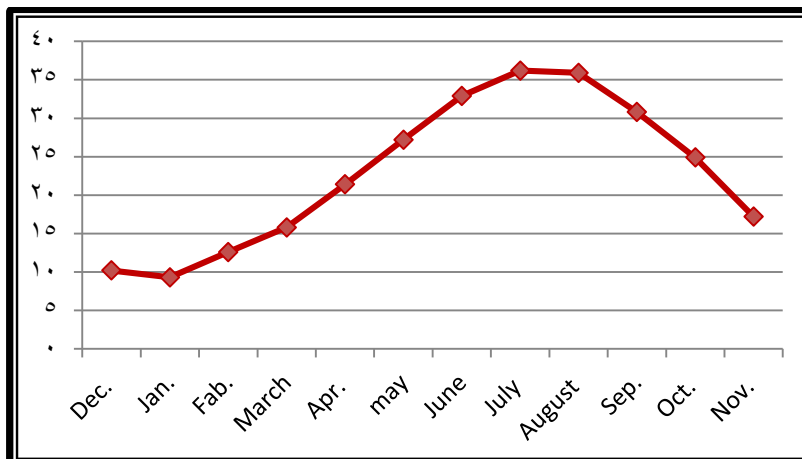
| Year / Month | Dec. | Jan. | Feb. | Mar ch | Apr. | may | June | July | Aug ust | Sep. | Oct. | Nov. | Ann ual Sum & Ra te |
|---------------------------|------|------|------|--------|------|------|-------|-------|---------|-------|------|------|---------------------|
| Sun Rise Duration | 5.48 | 5.3 | 6.3 | 7.06 | 8.12 | 9.06 | 11.12 | 11.48 | 11.24 | 10.42 | 8 | 7.01 | 8.43 |
| Annually temperature rate | 10.2 | 9.3 | 12.6 | 15.8 | 21.4 | 27.2 | 32.9 | 36.2 | 35.9 | 30.8 | 24.9 | 17.2 | 22.9 |
| Relative humidity | 70,4 | 70,2 | 63 | 60,2 | 47,2 | 31,9 | 18,8 | 17 | 18,1 | 21,1 | 34,2 | 56,1 | 42.35 |
| Rainfalls (mm) | 64.2 | 41.6 | 55.6 | 62 | 24.6 | 7.8 | | | 0 | 0 | 36.4 | 54.7 | 346.9 |

- General agricultural directorate of Garmyan, climate dep., unpublished data. at autumn as it shown from table one recorded (7.01) at November, the average of sun rise duration was (8.43 hour).



- Shape (1) path of sun rise through time period (2009 – 2020)

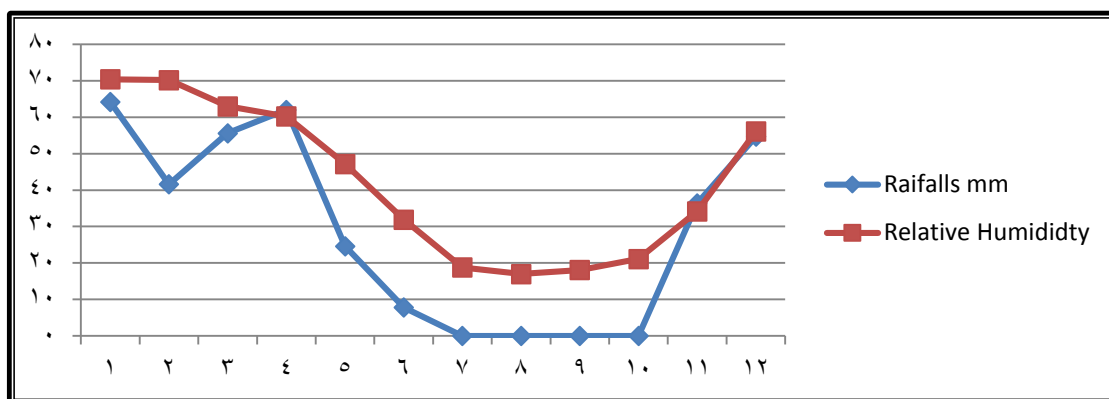
Temperature take same path like sun rise duration, increased from winter toward summer, if get attention of table one it could be seen that Januaries temperature record (9.3°C), while this value increased toward July which it was (36.2°C), thus the range between these two months reaches to about (26.9°C), this differences between winter and summer temperature has a different role determined winds effect at the seasons when the climatic effect analyzed see shape (2).



- Shape (2) path of temprature through time period (2009 – 2020)

In contrast with sun rise duration and temperature, table (1) shows that relative humidity and rainfalls take a different path comparing with sun rise duration and temperature, it's clear that relative humidity and rainfalls record highest value at winter (humidity value at january record (70.4 %)), while rainfalls amount reach to about (64.2 mm) and it comes to decrease toward summer which it record (humidity 17 % and rainfalls zero mm), but at equinox relative humidity reaches to about (60.2 %) rainfalls record (62 mm) at March, continuing with analyzing

Autumn especially at October relative humidity recording value to about (34.2 %) and rainfalls reach to (36.4mm), see shape (3) .



Shape (3) path of relative humidity and rainfalls at Kalar through time period (2009 – 2020)

Wind's Characteristics :-

Winds is a parallel motion to earth surface, wind,winds play a significant role in determining and controlling climate and weather, Wind is a result of a horizontal and vertical pressure gradient's, winds distribution has a close relationship with pressure's distribution on earth surface , wind rotate counterclockwise around lows at northern hemisphere and clockwise around low at southern hemisphere, while it rotates around the highs opposite direction.⁶

To understand wind's characteristics at Kalar district table (2) shows wind speed at the year, table (2) also gives us a view about annual rate of wind speed at Kalar, thus by giving table(2)attention it will be clear that wind speed at winter record speed less than other seasons, it could be seen that wind speed at December/2010 at kalar record (1.5m/s), this value increased gradually toward spring for example wind speed at march record (2.8m/s) this speed oscillated between (2.2 – 2.8m/s) for all other months at2010, this path still same at 2015, wind speed at January reach to about (2.3m/s) while its increased at April andreach to (2.7m/s), at July wind speed increased to about (3.3m/s), then the speed decreased gradually toward Autumn and reach to about (2.2m/s), same base of wind's path is true for year 2020, or specifically the analysis of table (2) shows that wind path at Kalar could be arranged starting from the highest to the lowest value considered speed at seasons to :-

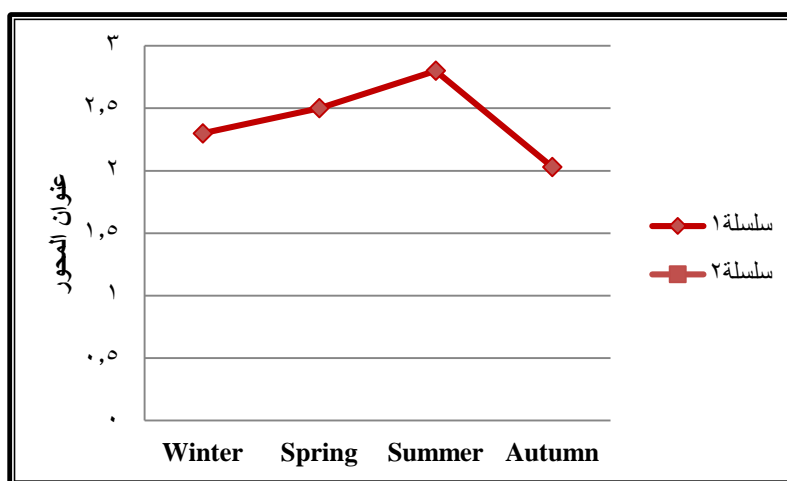
1. The highest wind speed season which take first rank is summer with a value if (2.8m/s).
2. Second rank for spring .
3. Third rank for spring with wind speed (2.5m/s)

4. Fourth rank with a lowest wind speed was autumn with wind speed reach to about (2.03m/s), see table (2) and shape (4) .

Table (2) shows wind speed characteristics studied area (m/s)

| year/month | .dec | .jan | .fab | .mar | .apr | may | june | july | august | .sep | .oct | .nov | Annual rate |
|---------------|--------|------|------|--------|------|-----|--------|------|--------|--------|------|------|-------------|
| 2010 | 1.5 | 1.8 | 1.8 | 2.8 | 3.1 | 2.9 | 2.8 | 2.2 | 2.8 | 2.2 | 2.8 | 2.7 | 2.5 |
| 2011 | 2.4 | 1.9 | 2.7 | 2.1 | 2.1 | 2.8 | 2.8 | 3 | 2.8 | 2.2 | 2.6 | 2.7 | 2.5 |
| 2012 | 2.5 | 1.9 | 2.7 | 2.1 | 2.1 | 2 | 3.9 | 3 | 2.8 | 2.1 | 2.7 | 1.7 | 2.5 |
| 2013 | 2.5 | 1.8 | 2.6 | 2.8 | 2.8 | 2.8 | 3.5 | 3.3 | 3.1 | 2.2 | 2.9 | 2.8 | 2.8 |
| 2014 | 2.6 | 1.8 | 2.6 | 3 | 2.5 | 2.6 | 3.6 | 3.5 | 2.3 | 2.1 | 2.8 | 0.8 | 2.5 |
| 2015 | 2.8 | 2.3 | 2.5 | 3 | 2.7 | 2.4 | 3 | 3.3 | 2.2 | 2.4 | 2.2 | 0.6 | 2.5 |
| 2016 | 2.4 | 2.2 | 2 | 2.2 | 2.4 | 2.4 | 2.4 | 3.2 | 2.7 | 0.9 | 2.7 | 1 | 2.2 |
| 2017 | 2.5 | 2.4 | 1.7 | 2.1 | 2.3 | 2.7 | 2.2 | 3.2 | 0.9 | 2.3 | 0.7 | 1.7 | 2.1 |
| 2018 | 2.4 | 2.8 | 2.7 | 2.9 | 2.5 | 2.2 | 2.4 | 3.4 | 2.9 | 0.7 | 1.4 | 1.6 | 2.3 |
| 2019 | 2.5 | 2.6 | 2.6 | 2 | 2.1 | 2.5 | 2.3 | 3.1 | 2.1 | 2.6 | 2.8 | 1.9 | 2.4 |
| 2020 | 2.5 | 2.1 | 2.3 | 2.5 | 2.4 | 2.3 | 2.2 | 3 | 2.7 | 2.5 | 2.6 | 1.7 | 2.4 |
| monthely rate | 2.4 | 2.1 | 2.4 | 2.5 | 2.5 | 2.5 | 2.8 | 3.1 | 2.6 | 2 | 2.4 | 1.7 | 2.4 |
| seasons | Winter | | | Spring | | | Summer | | | Autumn | | | |
| seasonal rate | 2.3 | | | 2.5 | | | 2.8 | | | 2.03 | | | |

- General agricultural directorate of Garmyan, climate dep., un published data



Shape (4) path of seasonal wind speed at Kalar district

Analysis Of Wind's Direction :-

Table (3) shows characteristics of wind direction's frequencies ratio, because determining these ratio shows the differences of winds type through the months, since that it could be clear which one of the winds dominate the climate at that month, for example (north eastern winds) didn't recorded any observation at the

station case study from(Dec. to April)while at may recorded (36.4%), north eastern wind disappeared from (June to Sep.), since that it better to classify winds at Kalar district into two ways, first monthly classifying, second yearly classifying .

Table (3) shows monthly percentage(%) of wind's frequencies through (1991 – 1999)

| Month Type | Dec. | Jan. | Feb. | March | April | May | June | July | August | Sep. | Oct. | Nov. | Rate |
|------------|------|------|------|-------|-------|------|------|------|--------|------|------|------|-------|
| N. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| NE. | - | - | - | - | - | 36.4 | - | - | - | - | 16.7 | 7.7 | 15.2 |
| E. | 14.3 | 33.3 | 33.3 | 25 | 30.8 | 18.2 | - | - | - | - | 16.7 | 23.1 | 24.3 |
| SE. | 35.7 | 41.7 | 41.7 | 31.5 | - | - | - | - | - | - | 8.3 | 15.4 | 29.05 |
| S. | 14.3 | 8.3 | 8.3 | - | - | - | - | - | - | - | - | 7.7 | 9.7 |
| SW. | - | - | - | - | - | - | - | - | - | - | - | - | - |
| W. | - | - | - | 12.5 | 15.4 | - | 20 | 10 | - | - | - | - | 14.5 |
| NW. | 35.7 | 16.7 | 16.7 | 31.25 | 53.8 | 45.4 | 80 | 90 | 100 | 100 | 58.3 | 46.2 | 54.8 |

General Manager Of Garmyan Agriculture, Data Recording Dep., Unpublished Data

Monthly winds direction classifying at Kalar :-

As it shown from table (4) south eastern and north western wind dominated Kalar's atmosphere through winter it took the first rank, which they record (31.7%) percentage at December , the south eastern one still at the first rank at (Jan., Feb., March) .

At second rank it's clear that at December both of (Southern and Eastern) wind sharing this second rank see(table 4), at (January, February, Oct. and November) it could be seen that eastern wind is the dominated wind at Kalar's atmosphere, for same second rank at March we could see that north western wind were the prevailing one, but at April the eastern wind controlling the atmosphere, at May North Eastern winds controlling Kalar's atmosphere, same second rank indicate Western wind as prevailing one at(June and July) , at October both wind (North east and East one sharing the control, at November it could be seen that Eastern wind is the prevailing one .

Table (4) shows wind monthly path at Kalar,

| Month Rank | Dec. | Jan. | Feb. | March | April | May | June | July | August | Sep. | Oct. | Nov. |
|------------|-------|------|------|-------|-------|-----|------|------|--------|------|------|--------|
| first | Se+Nw | SE. | SE. | SE. | NW. | NW. | NW. | NW. | NW. | NW. | NW. | NW. |
| second | E+S | E. | E. | NW. | E. | NE. | W. | W. | - | - | NE+E | E. |
| third | - | NW. | NW. | E | W. | E. | - | - | - | - | SE. | SE. |
| fourth | - | S. | S. | W. | - | - | - | - | - | - | - | NE.+S. |

- Researcher .

At third rank North west wind dominate the atmosphere at (January and February), at March the Eastern wind take an essential role, at April the Western, while at May the Eastern one takes the role, at both (October and November) the South eastern takes place the control table (4) .

Annual winds direction classifying at Kalar :-

The second method of analysis is the annual method, refer to table(5)shows that there are differences from one type of wind to another, in fact the general characteristics of winds annual analyses can appear as follows :-

Table (5) shows annually arranged differences of winds dominance

| Month Type | Rate |
|---------------|-------|
| NW. | 54.8 |
| SE. | 29.05 |
| E. | 24.5 |
| NE. | 15.2 |
| W. | 14.5 |
| S. | 9.7 |
| N. | ZERO |
| SW. | ZERO |

1. At first rank North west wind comes which has the heighest rate of occurrence frequency with (54.8 %) .
2. At second rank the South east winds comes with (29.05 %) .
3. Third rank were for the Eastern winds with (24.5 %) .
4. The North east winds comes at fourth rank with (15.2 %) .
5. The fifth rank come to Western winds with (14.5 %) .
6. Sixth rank for the Southern winds with (9.7 %) .
7. Last rank for both of winds (Northern and South western) one with (zero %) of frequency occurrence .

Results :-

1. The highest wind speed season which take first rank is summer with a value if (2.8m/s).
2. Second rank for spring .
3. Third rank for spring with wind speed (2.5m/s)
4. Fourth rank with a lowest wind speed was autumn with wind speed reach to about (2.03m/s) .
5. At first rank North west wind comes which has the heighest rate of occurrence frequency with (54.8 %) .
6. At second rank the South east winds comes with (29.05 %) .

7. Third rank were for the Eastern winds with (24.5 %).
8. The North east winds comes at fourth rank with (15.2 %).
9. The fifth rank come to Western winds with (14.5 %).
10. Sixth rank for the Southern winds with (9.7 %).
11. Last rank for both of winds (Northern and South western) one with (zero %) of frequency occurrence.

Recommendations :-

1. Establishing more climate and meteorological stations at Kalar.
2. Increasing wind studies especially the applied one .
3. Encouraging the winds compared studies .
4. Encouraging joining between geography and other sciences .

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