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Effect of Relative humidity on Volumetric water content over Selected stations in Iraq

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Abstract:
Volumetric water content (VWC) is the ratio of the volume of water to a unit volume of soil. It can be expressed as a percentage or depth of water per soil depth, and it is one of the important factors in determining agricultural drought-related development of water present in soil and water in land surfaces not found in rivers, lakes or groundwater but rather than It resides in the pores of the soil, and relative humidity is the concentration of water vapor present in the air. Water vapor is the gaseous state of water and is generally invisible to the human eye. Humidity indicates the possibility of precipitation, dew or mist, the humidity depends on the temperature and pressure of the system in question. The same amount of water vapor produces more moisture in cold air than it does in warm air. The relevant variable is the degree of dew point. The amount of water vapor needed to achieve saturation increases with increasing temperature. As the temperature of a specific portion of the air decreases, it will eventually reach its saturation point without adding or losing mass of water.
The data was obtained from the European Center (ECMWF), which includes the average monthly and annual relative humidity and water content of soil, for a period of 30 years from (1988-2018) for four selected stations over Iraq. The lowest values of relative humidity were recorded in July and August. The highest value of relative humidity was in the months of December and January accompanied by a decrease in temperature and dew. We note from the results that there is a positive relationship between RH% and VSWC for soil. The highest value for the water content was in Mosul and the lowest in Basra, the reason is due to meteorological factors, and the results show that the strong correlation is in all study stations.

Keywords: Volumetric water Content (VSWC), Relative humidity, Iraq

1. Introduction

Volumetric Soil Water Content (VSWC) and soil temperature (ST) are important factors in determining agricultural desertification and drought, which play an important role in flower growth. Surface evaporation is also related to climate-related development in terms of precipitation production and in the evolution of weather patterns, as it can be linked to several variables to find the relationship between these variables and the water content of the Soil [1]. Relative humidity is one of the main factors through which the climatic changes that will occur in the future can be known. [2]. Agriculture is one of the sectors that directly affect weather factors such as drought and desertification, so many economic sectors depend on the factors that occur in the environment, which may have a role in affecting agriculture, which negatively affect on economic and agricultural aspect. [3] Many researchers have studied the effect of water in the soil

plants mainly and some elements of the atmosphere, including [4] where he analyzed the water content of the soil and compared it to the amount of the monthly and annual average of low clouds over Iraq. In several studies, where the research team searched and explored methodological data for the water content of the soil to simulate the evaporation process that occurs in the soil and the effect on the water loss in the soil as a result of the rapid evaporation that occurs in many areas [5]. As for the scientist [6], he studied the relationship between relative humidity and temperature through the use of multiple programs and models that include many tests, in which he concluded that the relationship between relative humidity and

temperatures is inverse (6). And the research team in a different study assessed the weakness that occurs in some buildings due to environmental relative humidity using modern techniques [7], and the researcher studied the effect of water content on agricultural crops through the increase and decrease that occur in agricultural crops through the influence of environmental factors on the soil [8]. And other studies included several models using artificial intelligence methods and studied the relationship between evaporation and wind speed and its impact on the water content of the soil, several results have been reached, including that wind speed is highly effective in transferring clouds to multiple places, which greatly affects agricultural crops related to precipitation amounts and temperatures. [9] for the purpose of this study is to find the relationship between the volumetric water content for soil and milk relative humidity over selected plants from Iraq.

2. Methodology:

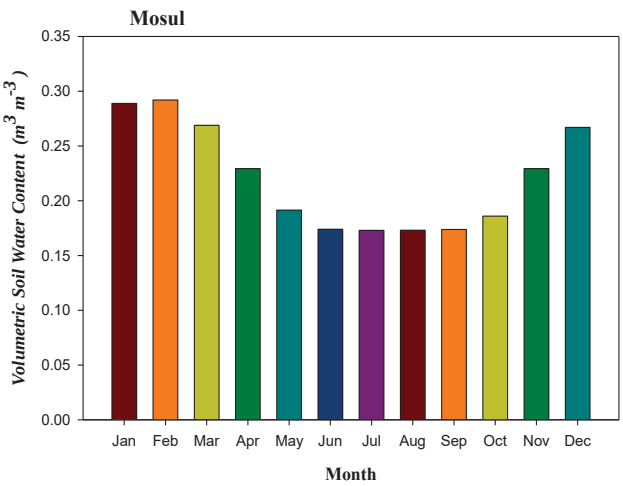
2.1 . Data source and study stations:

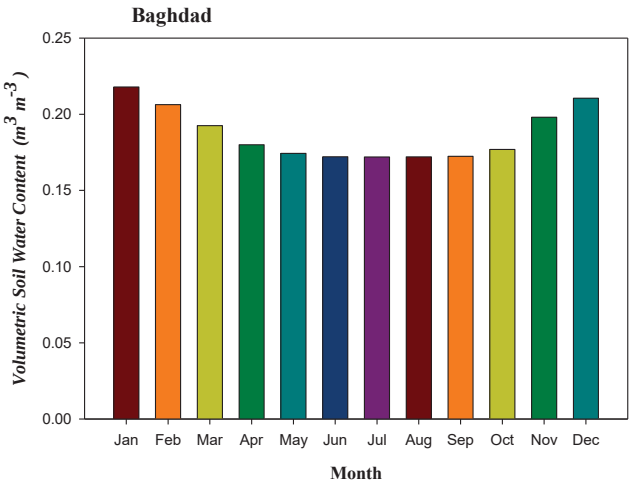
The work was carried out using monthly mean relative humidity and Volumetric water content (VWC), taken from the European Center for Medium Term Weather Forecast (ECMWF) [10]. This data has been converted into an annual average for an integrated group, the aim of which is to know the effect of the annual change on the different stations. Where used in this study (Mosul, Baghdad, Rutba, Basra) respectively to show the extent of climatic changes from one region to another. [11].

3. Results:

3.1. Analysis of the monthly behave of VSWC) for selected stations over Iraq:

Figure 1 shows the monthly average of the water content of four selected stations over Iraq, where it was found that the highest value was in the Mosul station over a period of 30 years. The water content increased in December and January, followed by the Baghdad and Al-Rutba station, while the Basra station was characterized by a decrease in the water content of the soil as a result of high temperatures and an increase in evaporation.





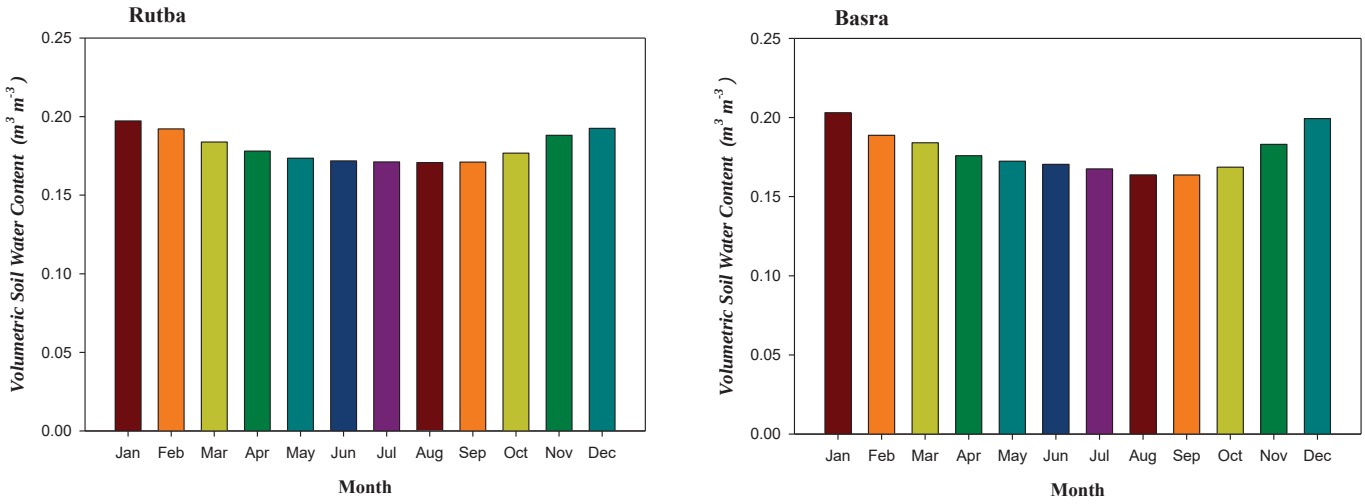
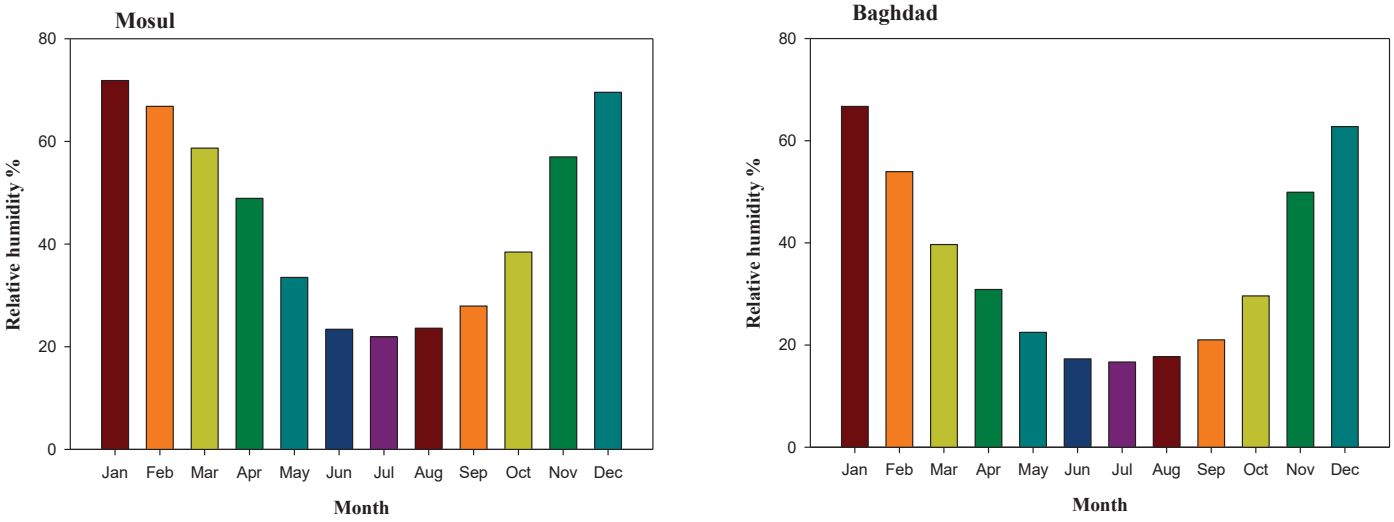


Fig .1. Analysis Monthly (VSWC) for the period (1988-2018) on selected stations over Iraq

4.2. The analysis Monthly Relative humidity %for selected stations over Iraq

Figure 1 shows the monthly mean relative humidity of four selected stations over Iraq, Where the highest percentage was found in Mosul station over 30 years. The highest value of relative humidity in December, December and January in the winter season was 65%, followed by the Baghdad and Al-Rutba stations with a rate of 61%, while the Basra station ws characterized by a 17% decrease in relative humidity due to the lack of evaporation.



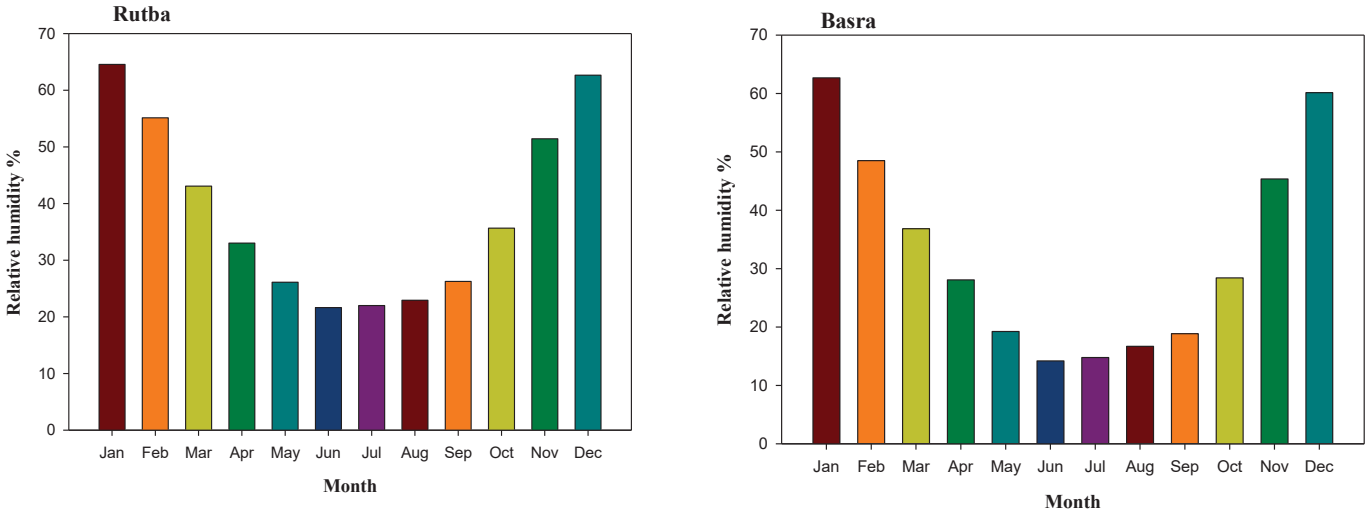
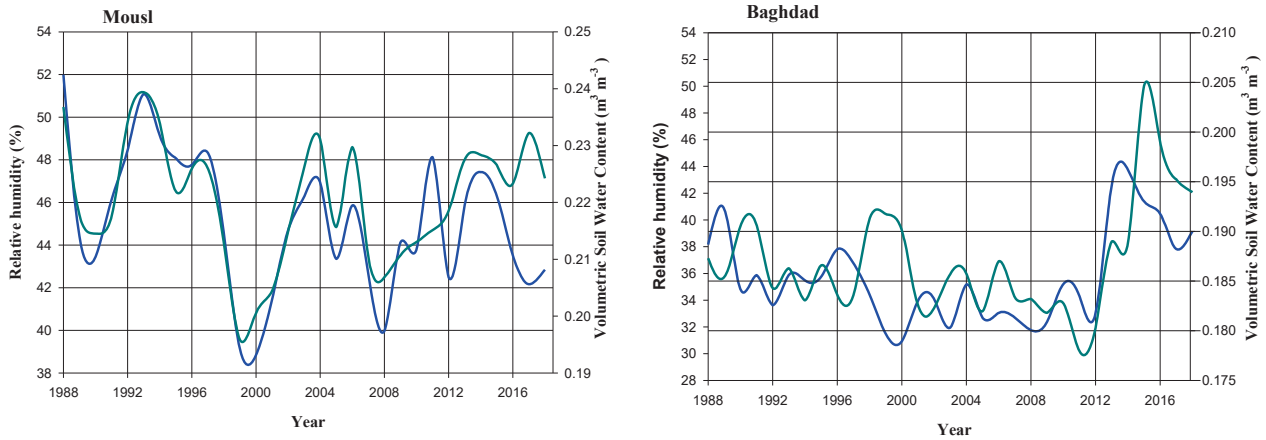


Fig .2. Analysis Monthly Relative humidity % for the period (1988-2018) for selected stations over Iraq

4.3. Relationship between average monthly volumetric water content (VWC) and relative humidity

Figure 3: The results showed that the relationship is positive for all study stations. Where the highest value of relative humidity reached 70% in December, January and January of Mosul, while the relative humidity covered the relative humidity in Basra by 13%. It is the lowest among the study stations in June, July and August, as for the Baghdad station, it was the highest 66% in the months of December and December, and the highest relative humidity was 62% in the months of December and January. at the wet station. The highest value of soil water content in Mosul station was greater than 0.3, and the lowest value of water content was less than 0.2 m in Basra station. These climatic factors change in conjunction with changes in the atmosphere.



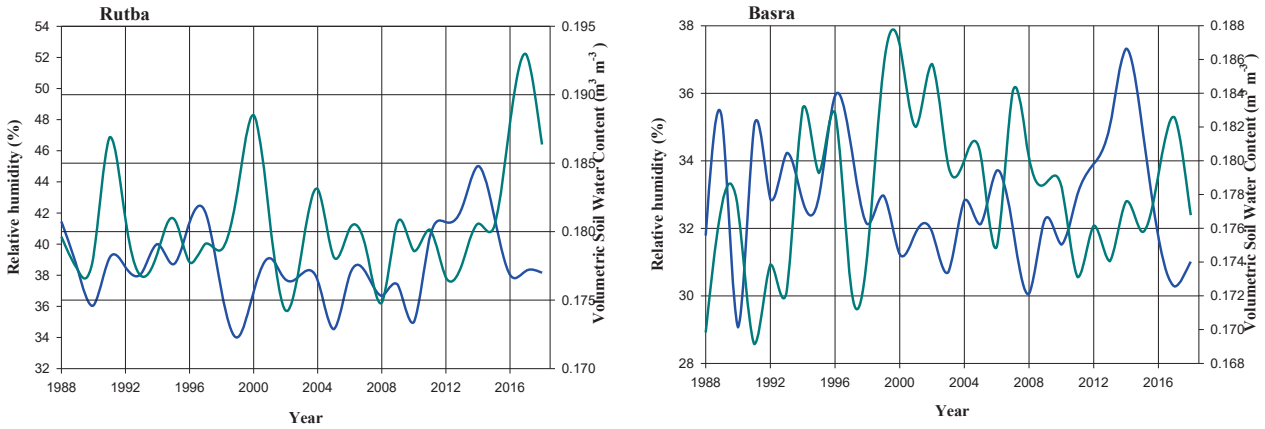


FIG 3. The relationship between of the annual mean Volumetric water content (VSWC) ^{0}and Relative humidity for the period (1988-2018)

5. The Relationship between The Yearly Mean 30 years of , RH%,TC^{0}, and VSWC over Iraq Station

In this Figure 4, it is shown that the relationship of RH with VSWC is positive in all study stations. . Table 1 shows that the highest positive correlation coefficient is 0.8 between VSWC and RH which represents a high correlation. The rates of soil water content increase as the relative humidity increases, and this is what was reached through the Pearson test.

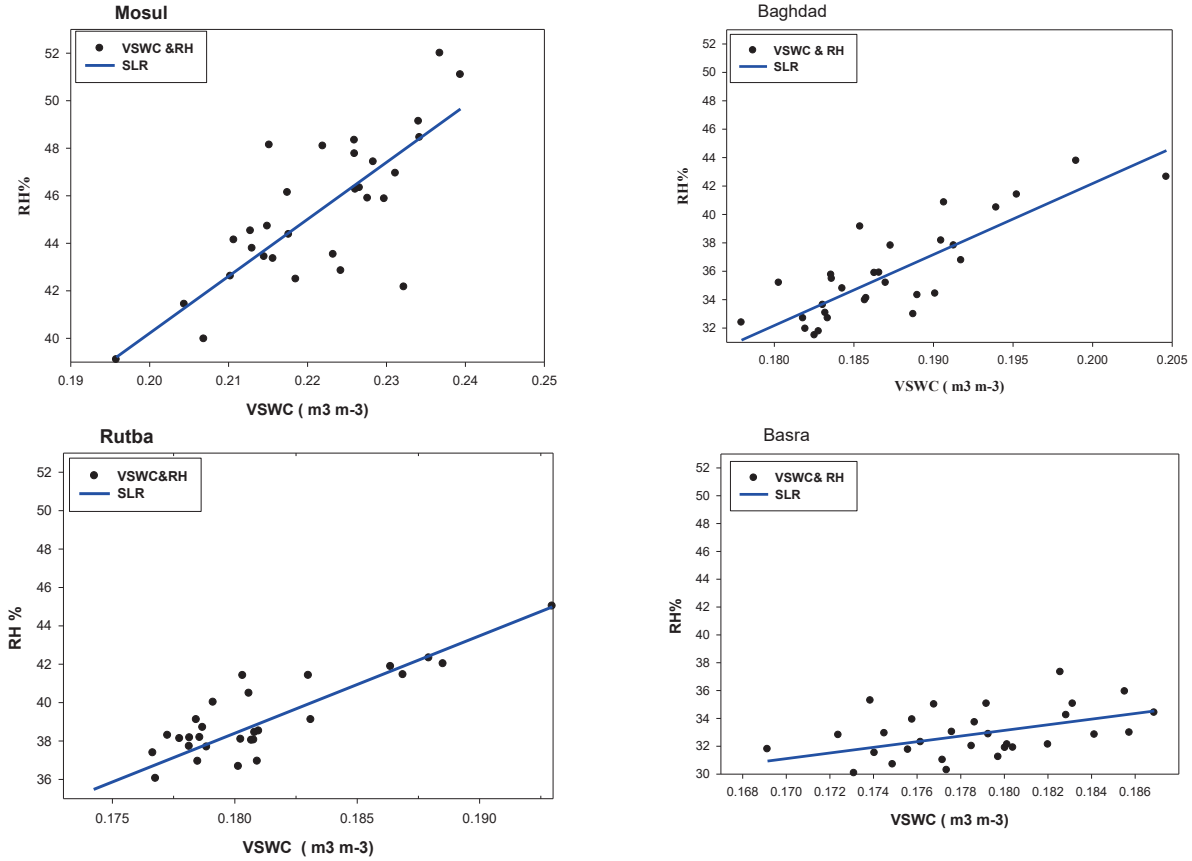


Fig . 4. The Relationship between the Yearly Mean of RH and VSWC over Iraq station

Table 1. Relationship and correlation coefficient between VSWC and %RH for four selected stations in Iraq

Stations	Relationship	Pearson's correlation coefficient		Simple Linear Regression (SLR)	
		Correlation coefficient (r)	Correlation degree	P-Value	Interpret the relationship
Mosul	RH&VSWC	0.8	V. High positive	0.0001	Linear
Baghdad	RH&VSWC	0.8	V. High positive	0.5	Linear
Rutba	RH&VSWC	0.8	V. High positive	0.8	Non Linear
Basrah	RH&VSWC	0.5	Media positive	0.8	Non Linear

CONCLUSIONS

1. THE HIGHEST MONTHLY AVERAGE RELATIVE HUMIDITY WAS 78% IN MOSUL STATION.
2. The highest value of Volumetric water content (VSWC) during the study period in the station.
3. The Positive relationship between water content and relative humidity
4. The greatest value of the volumetric soil water content was recorded in Mosul, and the lowest value was recorded in Basrah.

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