Groundwater Impact of Samarra city agriculture areas

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Abstract
The high population density and land wide variation use led to environmental problems in Samarra city, for this purpose the environmental assessment became an urgent need for underground water rising on some soils properties at study area. Experiment carried out to study effect of rising underground on some properties of soil in Samarra city. Five locations of outskirts in Samarra city , the samples were collected and analysed by standard methods of FAO (2000) and Atomic Absorption Spectrometer (AAS) according the Standard methods (APHA, 2005). The result showed higher percentage in location 5 with value reached (79 and 84 %) and (7.9 and 8.2) on depth 15 and 30cm of humidity and pH respectively. While lower values were (17 and 14) and (6.8 and 7) of humidity and pH with location number one(1) sequentially. Analysis results of EC and HCO3 in recorded high values with location 4 were (4.2 and 4.2 dS/m) and (22 and 20 ml/L) at 15 and 30cm depth, while location No.1 less values given (5 and 3.9 dS/m) and (21 and 16ml/L) for 15, 30 cm respectively.

Key word: Underground water, Agricultural land, Soil properties, Samarra city.

Introduction

Iraq’s environment has been subject to a number of converging pressures stemming from population growth, the impact of three wars, climate change, poor land use planning, and encroachment on fragile ecosystems Iraq faces serious environmental problems, ranging from poor water quality, soil salinity, deterioration of key ecosystems, climate change impacts [1]. The problem of rising sub-surface water levels in the cities is obvious because its location is not considered according to the topography of the surrounding areas and the construction of its facilities and buildings at a time when the problem has not yet been exacerbated [2]. Until now did the precautionary measures not be taken to avoid the problem and treat it and the resulting negative complications and suffer from this problem with the existence of nets ancient sewerage that made the problem more complicated with leak groundwater. Study of
[3] reported that, high rise in level of groundwater in samarra city which negatively impacted on building, construction facilities and soil properties in both

The soil in general and agricultural, especially impact on level of groundwater, negatively or positively depending on the type of soil and the amount of accumulated groundwater. In recent times, groundwater has become a big problem that, threatens the agricultural sector in all Iraqi territories [4] including the city of Samarra because it is of an agricultural nature [5, 6] . Many studies indicate that, the area of agricultural land has declined due to the rise in the groundwater level and the salinity that become direct of accumulation groundwater [7, 8]. Until now a few data available on the effects of groundwater on agricultural soil in the study area and, to understanding the problem of high groundwater level and their effect this study came to aim assessment rise effect of ground water on some physicochemical properties of planted soil in samarra city.

Methodology
Collection and Preparation of Soil Sample

Land with wheat crop planted, five sites selected collecting samples, north and south of the outskirts in Samarra city/Iraq (Table 1), which mostly recorded rise in levels of underground water. The samples depth (15-30)cm were collected with three replicate after that, stored in clean sterilise polyethylene bags and discharged for 2 days/40 C via electric oven and passed through 2 mm sieve before use to obtain soft powder forms of each sample. Preparing and test samples according [9] standard methods, analysis via Atomic Absorption Spectrometer(AAS) [10] in comparative with control.

Table.1 Location sites names using in soil samples collection.

| No | Name of site     | Location          |
|----|------------------|-------------------|
| 1  | Al-Jalam         | North of Samarra  |
| 2  | AL-Malah         | North of Samarra  |
| 3  | Sheak Mohamad    | North of Samarra  |
| 4  | Al-Ermok         | South of Samarra  |
| 5  | Al-Moatsam       | South of samarra  |
Result and Discussion

Humidity percentage and pH value

Result in table.2, showed different humidity percentage content of soil and exceeded value of control treatment. Humidity % in 5 sites were (79-84) % for (15-30) cm, respectively. The pH were (8.2-7.9) for (15-30) cm. Lower value were 6.8, 7 and 17, 14 of humidity and pH with location number one(1) sequentially.

Table. 2 Humidity percentage(%) and pH value of five locations samples.

| Location | Hum15cm | pH15cm | Hum30cm | pH30cm |
|----------|---------|--------|---------|--------|
| 1        | 17a     | 6.8b   | 14a     | 7b     |
| 2        | 25b     | 7.3d   | 22b     | 7.5c   |
| 3        | 40c     | 7.1c   | 43c     | 7.6c   |
| 4        | 64d     | 7.3d   | 68d     | 8.0c   |
| 5        | 79e     | 7.9c   | 84f     | 8.2d   |
| Control  | 65d     | 6.2a   | 80e     | 6.2a   |

*Means sharing the same letters do not differ significantly, at 5% probability level.

From figure.1 and.2 noted rise of percentage and pH as result to accumulation underground water up surface of soil. Groundwater may have a slight impact on soil moisture in deep groundwater areas, groundwater can act as a source of soil water and has significant impacts in areas where the water level is near or within the soil column of the model [11] . The changes of pH with different locations may be as result a soil has the ability to resist changes in pH, but there are situations where pH can cause water changes. Soil and water contain their and negatively charged ions that affect the chemical composition and therefore the pH of the soil. Some soil is more resistant to change, while other species can change rapidly if the pH of water differs significantly from the soil matrix [12]. Also ability of the soil to be affected by the acidity of water in its fabric. Smaller soil particles, such as mud and clay mud, are affected by coarse sandy soils. These colloids are sites called so-called soil capacity to carry out ions. The ions in the soil solution are replaced with negative ions in the soil [13, 14].
**Fig 1.** Value of Humidity and in agricultural soil collection of five site under rise groundwater conditions at 15 cm.

**Fig 2.** Value of Humidity and in agricultural soil collection of five site under rise groundwater conditions at 30 cm.
EC value and HCO$_3$ percentage

The results showed that, the location No:4 recorded up in value were EC (4.2 and 4.2) dS/m and HCO$_3$ (22 and 20) ml/L for (15-30) cm depth, respectively. Location No:1 given less values compared with other location with means reached EC (5 and 3.9 dS/m) and HCO$_3$ (21 and 16 ml/L) on for (15 and 30) cm consecutively Table.3.

Table.3 Value of EC(dS/m) and HCO$_3$(ml/L) percentage of samples collection from five locations

| Location | Depth | Location | Depth |
|----------|-------|----------|-------|
|          | 15cm  |          | 30cm  |
|          | EC    | HCO$_3$  | EC    | HCO$_3$ |
| 1        | 5b    | 21c      | 3.9 b | 16b     |
| 2        | 5b    | 20c      | 4.0 b | 18c     |
| 3        | 4 c   | 20c      | 4.0 b | 18c     |
| 4        | 4.2d  | 22dc     | 4.2c  | 20d     |
| 5        | 4c    | 18b      | 4b    | 16b     |
| Control  | 2.5a  | 16a      | 2a    | 13a     |

*Means sharing the same letters do not differ significantly, at 5% probability level.

In Figure (3 and 4) recorded significant rise in value in EC and HCO$_3$ compared with control treatment. High-evaporation bare soil with high cold water can increase the accumulation of enhanced salt on the soil surface, so that the value of EC is high in different locations (Table.3). The results indicate that soil EC and HCO$_3$ may be affected by groundwater. In arid zones, groundwater depth can be impact on the physical properties of soil, such as density of soil, increase the water depth in the furnace, resulting in minimal organic matter in the soil; increase the virtual density of the soil [15, 16]. On the other hand, it was easily observed that the level of HCO$_3$ in the soil had increased significantly. In the three locations after the use of groundwater, this may be due to increased soil salinity, which reduces carbon input from plants as mentioned in [17, 18]. Finding of current study are in agreement with study [19] that, dry and hot zones with hight evaporation which lead to induces and accumulation salts in the surface soil layers, some soil properties may be altered.
due to accumulation of such salts in soils, including soil structure, porosity and hydraulic conductivity.

Fig 3. EC and HCO3 of five sites under rise of groundwater conditions at depth 15 cm.

Figure 4. EC and HCO3 of five sites under rise of groundwater conditions at depth 30 cm.
Conclusion
The soil sample that collected from the different locations in samarra city impacted with rise of underground water. The mostly properties of cultivated soil have been negatively affected with recorded increase in value pH (8.2), moisture (83%), EC (4.2dS/m) and HCO3 (22 dS/m). The rise of underground water may be become big problem threatens future of agriculture in the city if not found solutions in nearby future.

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