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SEWAGE WATER IRRIGATION EFFECTS ON GROUND WATER QUALITY IN SEMEL AREA (IRAQ)

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ABSTRACT

Field study was conducted in Semel area, Duhok government, to evaluate the effects of using sewage water to irrigate the fields near ground water wells in this region. Many quality parameters like pH, EC, total alkalinity, total hardness, Ca^{+2}, Mg^{+2}, Cl^{-1}, So_4^{-2}, Na^{+1} and Potassium. The analysis of samples showed alkaline nature of the water in research area. Also the results refer to high salt water levels compared with classifications of WHO. The concentrations of other parameters were under the permissible limits except some values.

Keyword: ground water, irrigation, sewage water, Semel.

INTRODUCTION

Waste water is a complex resource, with both advantages and inconveniences for its use. To the extent that waste water and its nutrient contents can be used for crop production, it provides significant benefits to the farming communities and society in general. However, waste water use can also impose negative impacts on communities and on ecosystems. The widespread use of wastewater containing toxic wastes and the lack of adequate finances for treatment is likely to cause an increase in the incidence of waster water-borne diseases as well as more rapid degradation of the environment. Along with hazardous concentration of soluble salts and heavy metals, all the sewage waters do contain plant nutrients and organic matter (Ghafoor *et al*., 1995). Farmers using sewage water for irrigation save a lot of fertilizer expenditure (Ibrahim and Salmon, 1992). Harmful effects of saline and metal contaminated effluent could be delayed for several years using intensive and heavy irrigations. The health risk arising from environmental contaminants depends on many factors including absorption and toxity of the substance, t s level in food. In humans, the intake of poor quality drinking water has been implicated in the incidence of motor neuron disease (Smith *et al*. 1996), reproductive disorders and cardiovascular disease (Clayton, 1976). The monitoring of drinking water quality has been widely practiced and reported (Tiwana *et al*., 1992). The quality monitoring of drinking water in Ibadan has been documented (Onianwa *et al*., 1999).

LOCATION OF RESEARCH AREA

The area under investigation is centrally situated city of Semel lies in 36° 51´ N latitudes and 42° 51´ E longitudes. With elevation 2216ft. Climate features of Semel area are characterized by dry climate. Rainfall in the area is erratic and major rainfall varied from 400-500 mm, type of soil in this area ranged between silty clay and clayey soil.
Figure-1 shows plan of research area.

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Figure-1. Plan of research area (Semel).

MATERIALS AND METHODS

In this study eight ground water samples were tested in the period of July 2011. These samples were taken from the wells near sewage water irrigation lands. Some of samples were tested in Duhok Environmental Directorate and others in the central laboratory in Faculty of Agriculture and Forests in University of Duhok. The collected samples were analyzed for pH, EC using pH meter and EC meter, whereas, the other parameters were determined through the standard laboratory methods (APHA, 1992). The concentration of calcium and magnesium are measured by using EDTA titrimetric method whereas the concentration of sodium and potassium are measured by using flame photometric method. Concentration of sulphate is measured by gravimetric method with ignition of residue whereas the concentration of chloride is measured by using argent metric method. The obtained results were compared with the standard prescribed by WHO. Figure-2 shows one of the fields in Semel area which is irrigated by sewage water.

Figure-2. One of the fields in research area, irrigated with untreated sewage water.

RESULTS AND DISCUSSIONS

The range of various tests was analyzed by ground water samples are presented in Table-1.

Table-1. Results of tests for ground water samples for research area.

Well No.	PH	EC d.c/m	ALKAL-INITY	TOTAL HARDNESS	Ca^{+2} Mg/L	Mg^{+2} Mg/L	CL^{-1} Mg/L	So_4^{-2} Mg/L	Na^{+1} Mg/L	K^{+1} Mg/L
1	7.5	1.01	420	512	121.6	50.7	25.7	52.2	37	1
2	8.02	1.65	422	472	120	41.9	29.4	18	44	2
3	7.4	0.87	380	470.35	74	64.08	26.98	65.76	25.76	1.17
4	7.52	0.5	350	575.61	78.8	74.64	89.10	177.6	34.5	0.78
5	7.39	0.48	401	447.36	91.6	59.4	33.37	118.84	14.72	3.51
6	7.45	1.01	332	458.88	57	34.08	25.91	16.32	3.45	1.56
7	7.60	0.95	405	291.1.	53.3	32.28	23.07	118.84	7.82	1.17
8	7.31	1.03	310	529.31	87.4	52.08	25.91	82.08	3.22	0.78
Mean value	7.52	0.937	377.5	469.57	86.65	51.14	34.93	91.35	21.31	1.49

a) pH

pH is an important factor, used to appoint the nature of ground water. According to data in Table-1, the minimum and maximum range of pH was 7.31 to 8.02 with mean value 7.52. This result indicates that slightly variation in pH at different sites. The mean values of pH refer to slightly alkaline nature of the ground water in this region.

b) Electrical conductivity (EC)

EC is also an important factor to determine the total soluble salts in the ground water. Minimum value 0.48 and maximum value 1.65 with mean value equal to 0.973. According to American Salt classification, most of ground water in this region lies in the third class C3, which refer to high salt water levels.

c) Total alkalinity

The value of alkalinity depends on pH value. Maximum permissible level of total alkalinity ranged between 125 and 200 according to WHO levels. Tests shoe a high level of total alkalinity whereas the mean value 377.5 is out of the permissible level.

d) Total harness (TH)

TH is used as a major factor for test drinking water. Max. Permissible level of total hardness ranged between 100 and 500 according to WHO levels. The values of total hardness for all the samples are within the permissible range except one value above the level. Higher degree of hardness is due to dispose of sewage and untreated industrial effluents (haniffa *et al*., 1994).

e) Calcium Ca^{+2}

The mean value of calcium is 86.65. This value is under the maximum permissible limit which is ranged between 75 and 200.

f) Chloride (Cl^{-1})

The content of chloride at the different sites ranged between 23.07 and 89.10 mg/l, thus all the values of samples were within the permissible limit of 250 mg/l. High chloride concentrations indicates organic pollution (Batheja *et al*., 2007).

g) Sulphate (So_4^{-2})

The concentrations of sulphate begin with low levels in surface waters and increase in the deep ground waters. Permission level of sulphate is about 250 mg/l according to WHO levels. In this research, the minimum value is 18 mg/l and maximum value is 177.6 mg/l with mean value 91.35 mg/l, so all the values of sulphate were within the allowed levels.

h) Potassium K^{+1}

The mean value of the tests is 1.49 mg/l. This value refers to low levels for all samples compared with the permission level of potassium which is about 2-3 mg/l.

i) Sodium Na^{+1}

Sodium contents of the ground water for the study area range between 3.22 and 44mg/l with mean value equal to 21.31 mg/l. These values are within the permissible levels.

j) Magnesium Mg^{+2}

The permissible levels of magnesium content must be within 30-150 according to WHO levels. So if we looked to the values of magnesium, in this study, these values are within the allowed levels.

CONCLUSIONS

Some of the parameters for the ground water samples in this study are higher than the permissible limits, established by WHO organization. This may causing deterioration of ground water quality, making it unfit for irrigation use. The sewage water needs to treated before used in irrigate the fields.

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