

MINERAL ANALYSIS, AND MICROBIOLOGICAL TEST OF WATER SAMPLES FROM TAIF CITY, SAUDI ARABIA

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ABSTRACT

Water samples were collected from Taif city, Saudi Arabia, analysis for their mineral content, physical properties such as colour, turbidity, odour, and taste and also for microbiological tests. The tested water samples are equal to Saudi Arabia Standard Organization (SASO) and suitable for drinking and human consumption.

Key words: Mineral analysis, microbiological, water and SASO.

INTRODUCTION

Arabic gulf region located in an arid and semi arid region and ground water only natural source of relatively fresh water to meet the increasing demand of water, heavy reliance on ground water, particular by the agricultural and municipal sector, and it is prolonged over exploitation over the late four decades have led to serve deterioration of its water quality, because of the decrease in water tables of mostly all ground water aquifers, all Arabian Gulf countries had turn to sea water desalination, to compensate for increase in water demands^{1,2}.

Deteriorating water quality has become a threat water resources in many parts of the gulf region, especially the high concentrate of heavy metals such as boron, copper, cadmium, many anise and lead³.

The potentially hazardous materials that may occur in drinking water reservoirs due to various human and natural causes, such as

environmental pollution, waste materials both industrial and domestic or even by recreational activities⁴⁻⁶.

Contamination of water by trace elements or change of colour and turbidity, odour and taste or microbial contamination may be caused by natural processes or through human activities in the environment, so current and future plans are very important for preservation of the water resources and achievement of water security in Saudi Arabia.

Most trace elements, especially heavy metals such as boron, cadmium, copper, lead and manganese do not exist in soluble forms for long time in water, they are present mainly as suspended colloid or are fixed by organic substances.

The objective of the present study was to investigate the elemental concentrations, colour, turbidity, odour, taste and microbial contamination of the water samples and to compare the results with Saudi Standard Organization.

MATERIAL AND METHODS

The methods for sampling of water were similar to those described by Saudi Arabian Standard Organization⁷. Samples of water from Taif city, were collected in 100ml polyethylene plastic bottles with screw washed thoroughly with distilled water and dried prior to collection of samples, by the same procedure⁸. Determination of colour, turbidity, odour and taste were determined according to SASO⁷. For microbiological tests, water samples preserved in the refrigerator for 24hr. and examined for coliform bacteria to which 1ml of water samples added to test tube contain 10ml of lactose broth with Durham tube (up side down) and incubated at 37°C for 24-48 hr, then examined for acid and gas formation⁹, so if there is a gas and acid within 24 hr, water samples contaminated with coliform bacteria, but if there is a gas only after 48 hr, then water samples contained another microorganism, if there are no gas or acid after 48 hr., water samples are clear and not contaminated with any microorganisms^{10,11}.

RESULTS AND DISCUSSION

The results of mineral analysis of water samples are summarized in Table-1. The concentration of the element measured in the present study are at level similar to previous observations^{10,12-15}, and similar to those of the unbottled drinking water according to SASO (Table-2). Water samples are clear, no turbidity or odour or taste. Microbiological tests of the water samples shows that no gas or acid formation after 48 hr. during incubation period. The results indicated that the water samples are suitable for drinking and for human consumption. The concentrations of the elements measured in the present study are in the levels similar to previous observations¹⁴⁻¹⁶. Although the total dissolved solids on the tested samples were lower according to Saudi Arabian Standard Organization (SASO), n, evidence of health effects due to using water with total dissolved solids (T.D.S.) in excess of 1000 ppm^{17,18} was reported. However, high T.D.S. is important because of its economic effect due to its associations with corrosion damage to the water system.

Table - 1: Mineral analysis of water samples (ppm)

Element	Concentration (ppm)
Boron	0.006
Cadmium	0.09
Calcium	75
Copper	1.01
Iron	0.865
Lead	0.008
Magnesium	15
Manganese	0.09
Zinc	0.03
Total Dissolved Solids	88
pH	7.5

Table - 2: Limits of mineral concentration of unbottled drinking water^{7,8}

Element	Optimum (ppm)	Maximum (ppm)
Boron	-	1.0
Cadmium	-	0.01
Calcium	75	200
Copper	0.05	1.5
Iron	0.1	1.0
Lead	-	0.05
Magnesium	30	150
Manganese	0.05	5.0
Zinc	5.0	15.0
T.D.S.	300	1200
pH	7.00	9.2

The pH values reported in the present study show that the tested samples were slightly alkaline. Although the results of the present study show no health hazards exist on using these water

samples but periodical analysis of these water is necessary where various factors might increased microbial contamination in there water that moist pose hazard to human consumption^{4,19,20}.

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