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**Archives of Applied Science Research, 2015, 7 (2):5-8**
*(http://scholarsresearchlibrary.com/archive.html)*

**ISSN 0975-508X**
**CODEN (USA) AASRC9**

# Boron concentration measurements in Thiqar Governorate rivers by using curcumin methodb

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**ABSTRACT**

*A curcumin method has been used to measure the Boron concentration in water. Forty samples has been taken from Euphrates and Tigris rivers in Thiqar Governorate (southern of Iraq).The Boron levels for Euphrates river ranging between 1.729 mg/l and 0.476 mg/l with average value 0.794 mg/l , while for Tigris river ranging from 0.410 mg/l to 0.171 mg/l with average value 0.244 mg/l. The results shows that Boron concentration in Euphrates river is larger than that's of Tigris river in general. Al Nasriya(2) shows the maximum Boron concentration with 1.729 mg/l. All samples of water were collected during Jun 2014 .*

**Key words:** Boron, Curcumin, Drinking water.

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## INTODUCTION

Boron (B) is a non-metal element in Group 13 of the Periodic Table. Properties of B are very close to carbon and silicon. This element has one less valence electron in valence orbital . Due to small size and high ionization energies, boron results in covalent bonding rather than metallic bonding [1]. . Boron is actually a mixture of two stable isotopes, 10B (19.8%) and 11B (80.2%)[2].It's a rare element in the Earth, representing only 0.001%. It is estimated that worldwide commercial borate deposits are 10 million tones [3].

In the Earth, B is not present in the elemental form. It is found in the form of borax, boric acid, colemanite, kernite, ulexite and borates [4]. There are two forms for elemental boron, namely amorphous boron, which is a brown powder, and crystalline boron, dark grey in color and a semiconductor at room temperature. Crystalinity, particle size, purity and the medium temperature are some of the factors that affect the oxidation of boron. For example, B does not react with air at room temperature, however it forms B2O3 (s) at high temperatures. In 1824, the first boron compound was synthesized by Jöns Jakob Berzelius [5, 6]. Many boron compounds with different metals and nonmetals are used in industry, such as detergent production, glass and ceramic manufacture, agriculture and textile. It also has application in the semiconductor industry [7].

## MATERIALS AND METHODS

Boron in water can be determined by several methods, but in this study we use curcumin method which consist of acidification and evaporation in the presence of curcumin to produce rosocyanine, which is taken up with ethanol and compared photometrically with standards.When a sample of water containing boron is acidified and evaporated in the presence of curcumin,a red-colored product called rosocyanine is formed. The rosocyanine is taken up in a suitable solvent and the red color is compared with standards visually or photometrically at ($\lambda$=450 nm).

For the calibration graph, the boron concentration as a function of the absorption was used of which a calibration solution. A linear calibration was observed, followed by the calculation of the slope factor. The results are experimented in mg B/l. Regression equation: $y = 8.24 x + 0.064$, $R^2 = 0.989$ (see fig.2).

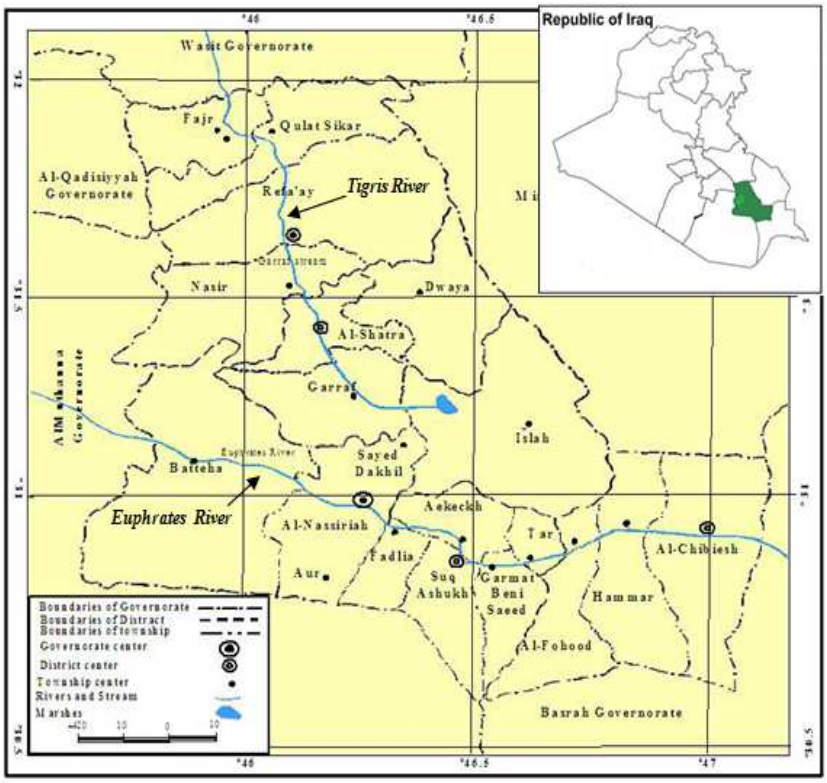


**Fig. 1 Thiqar Governorate map**

## RESULTS AND DISCUTION

In Thiqar Governorate (see fig.1), the drinking water is supplied from two sources; one form (Euphrates River) and the other from (Tigris River). Samples from 40 locations were collected (20 from Euphrates and 20 from Tigris) during Jun 2014.The main aim is to measure the Boron concentration in the rivers water and compared the results between them.

Table(1) show the results of 20 samples taken from Tigris river. The data varying from 0.410 mg/l to 0.171 mg/l with average value 0.224 mg/l, while Table(2) show the results of 20 samples from Euphrates river. The results varying from 1.729 mg/l to 0.476 mg/l with average value 0.794 mg/l. According to the WHO,2009 [8] , most fresh water contains less than 0.5 mg/l of boron.

Al shatrah shows the maximum Boron concentration in Tigris river with 0.410mg/l ,while Al Nasriya (2) shows the maximum Boron concentration in Euphrates river, (and in all Thiqar Governorate) with 1.729 mg/l because of waste water station located in the south of Al Nasriya city.

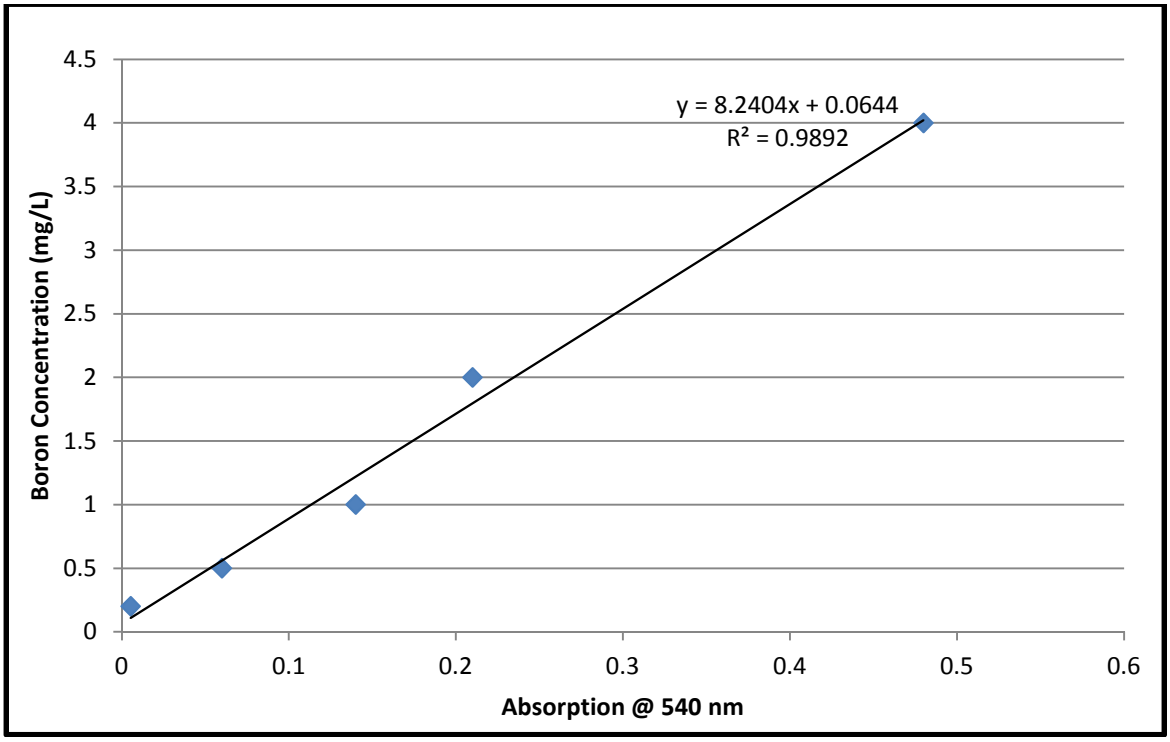


**Fig. 2 The calibration graph – Boron**

**Table No (1) Tigris River Boron measurements**

| No. | Location | Absorption At 540nm | B . Concentration (mg/l) |
|---|---|---|---|
| 1 | Qalat Sukkar | 0.021 | 0.237 |
| 2 | Al mahdi | 0.033 | 0.336 |
| 3 | Al Rifai | 0.014 | 0.179 |
| 4 | Al suabel | 0.015 | 0.188 |
| 5 | Al sharwa | 0.026 | 0.278 |
| 6 | Al Naser | 0.021 | 0.237 |
| 7 | Abo Helala | 0.023 | 0.253 |
| 8 | Al Hatam | 0.025 | 0.270 |
| 9 | Al Gharraf | 0.019 | 0.221 |
| 10 | Said Dikhil | 0.017 | 0.204 |
| 11 | Kurbeet | 0.013 | 0.171 |
| 12 | Al Eslah | 0.014 | 0.179 |
| 13 | Al Rezaqaih | 0.012 | 0.163 |
| 14 | Al Hammar | 0.019 | 0.221 |
| 15 | Al Bo Shama | 0.023 | 0.253 |
| 16 | Al fouhod | 0.015 | 0.188 |
| 17 | Al Bo Auesh | 0.015 | 0.188 |
| 18 | Al Shatrah * | 0.042 | 0.410 |
| 19 | Al habibia | 0.041 | 0.407 |
| 20 | Al Kawaneia | 0.029 | 0.303 |
| ***average*** | | | ***0.244*** |
| ***max*** | | | ***0.410*** |
| ***min*** | | | ***0.171*** |

**District center*

**Table No (2) Euphrates River Boron measurements**

| No. | Location | Absorption At 540nm | B . Concentration (mg/l) |
|---|---|---|---|
| 1 | Suq Al Shyouk* | 0.094 | 0.838 |
| 2 | Al Nuwashy | 0.073 | 0.665 |
| 3 | Al Sayeh | 0.093 | 0.830 |
| 4 | Al Bou jemaa | 0.072 | 0.657 |
| 5 | Am Al Toboul | 0.083 | 0.748 |
| 6 | Al Etabea | 0.075 | 0.682 |
| 7 | Al yaseriea | 0.061 | 0.566 |
| 8 | Al Toman | 0.0809 | 0.797 |
| 9 | Al Kurmasheia | 0.062 | 0.575 |
| 10 | Al Shwaleesh | 0.071 | 0.649 |
| 11 | Al Karma | 0.05 | 0.476 |
| 12 | Al Battat | 0.071 | 0.649 |
| 13 | Al Ekeaka | 0.102 | 0.904 |
| 14 | Al Banderiat | 0.072 | 0.657 |
| 15 | Al Esakera | 0.0809 | 0.731 |
| 16 | Al Fadeleia | 0.0701 | 0.642 |
| 17 | Al Masub Al Aam | 0.093 | 0.830 |
| 18 | Al Bo soufa | 0.11 | 0.970 |
| 19 | Al Nasiriya** (1) | 0.149 | 1.292 |
| 20 | Al Nasiriya (2) | 0.202 | 1.729 |
| ***average*** | | | ***0.794*** |
| ***max*** | | | ***1.729*** |
| ***min*** | | | ***0.476*** |

**District center **Government center*

## CONCLUSION

In the present work most of the boron concentration in Tigris river aren't higher than the world wide back ground <0.5 mg/l (WHO,2009) and hence the boron concentration doesn't pose any serious threat to the population round it. By comparison between the two rivers results shown that Euphrates river is more polluted with boron element, because its pass in highly occupied region and meager factories ,facilities lay on it. In general Euphrates river results are higher than 0.5mg/l but it's still in the low concentration level for boron where the European Union established a value of 1.0 mg/L for boron in 1998 for the quality of water intended for human consumption [9]. New Zealand has established a drinking water standard for boron of 1.4 mg/L [10].

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