

The measurements of boron concentration rate in soil samples of Basrah Governorate (in Iraq) using ICP/OES Techniques

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Abstract: Boron is none uniformly distributed, ubiquitous essential micronutrient element for plant as well as human beings. The aim of this study is to measure the Boron, ^{10}B , concentration in soil in Basrah governorate in Iraq. The measurements were performed by analyzing the soil samples collected from 75 location using ICP/OES Techniques. The Boron concentration which is obtained ranged from 0.38192 ppm in Al-leheise1to 5.139ppm in Almaeber in soils. The results are presented and compared with other studies. The results could be utilized to make distinctive supplementary contributions when contamination event occurs and to implement soil quality standards by concerned authorities to maintain radioactive contamination-free soils samples which are needing for the people. The study further reveals that 75 surface soil samples have boron more than detection limit. It may be due to higher leaching of boron during monsoon rains from surface soils beyond the root zone. Thus, there is possibility of severe pollution problem with boron in near future.

Keywords: Boron, Soil samples, Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES), Basrah Governorate

I. Introduction

Boron is a nonmetallic element that belongs to Group IIIA of the periodic table and has an oxidation state of +3. I has an atomic number of 5 and atomic weight of 10.81. Boron is actually a mixture of two stable isotopes, ^{10}B (19.8%) and ^{11}B (80.2%) [1]. Boron is a naturally-occurring element found in rocks, soil, and water. The concentration of boron in the earth's crust has been estimated to be <10 ppm, but concentrations as high as 100 ppm can be found in boron-rich areas [2]. It does not appear on the earth in elemental form but is found in combined state as borax, boric acid, tourmaline, colemanite, kernite, ulexite and borates [3-6]. Boron deficiency is much more common in crops that are grown in soil that have higher amount of free carbonates, low organic matter, and high pH [7]. Boric acid, borates and per borates can introduced to environment as these have been used in mild antiseptics, cosmetics, pharmaceuticals [8]. Boric acid and borates are used in glass manufacture, soaps and detergents, flame retardants, and neutron absorbers for nuclear installations can cause boron toxicity in environment. Borates have various agricultural uses as fertilizer, insecticide and herbicide because they are not carcinogenic to mammalian and lack of insect resistance compared with organic insecticides [9,10]. Boron occurs as borosilicate in igneous, metamorphic, sedimentary rocks which are resistant to weathering and not readily available to plants. The chemical structure of some boron compounds is found in Figure 1.

Figure 1: Chemical Structures of some boron compounds [11] (Chemfinder.com2006).

