Nesrin YILDIZ *et al*, International Journal of Advances in Agricultural Science and Technology,
Vol.5 Issue.12, December- 2018, pg. 7-12 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

Suitability of Sequential Extraction (Step.1) Method for Used to Determine Plant Available Boron (B) of Erzurum Plain and Oltu District Agricultural Soils

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Abstract: The purpose of this study was to studied suitablity of sequential extraction method (step.1) for determining plant available boron content of Erzurum Plain and Oltu District agricultural soils. Representative total 32 of soils samples were collected from different soil locations of Erzurum (19) and Oltu district (13). In order to determining suitability sequential extraction method (step1) as related to of the test plant (potato) was taken as the standart (biological) index.

However, the correlation analysis for both Erzurum Plain and Oltu location showed non-significant correlation(not show any significant differences between plant availlable boron and leaf boron content, (biological index /boron uptake of plant) so; based on these result and because sequential extraction (first step) method was not comparable, sequential extraction (first step) method is not recommended for plant available Boron extraction. Results showed that the step1 chemical exraction methods might not be used for plant available Boron at least in this conditions growing potato in this Erzurum Plain and Oltu location.

Keywords: Sequential extraction method, boron, soil test, plant available, leaf

1. İntroduction

Plants require macro and micro nutrients, each of which is essential for a plant to complete its life cycle**.** Minerals are taken up by plant roots from the soil solution in ionic forms (Maathuis 2013) . Elements considered essential for plants include carbon (C), oxygen (O), and hydrogen (H) available from carbon dioxide (COJ in the air, through the leaves and water (HiO) from either rainfall andlor irrigation absorbed by plant roots from the soil; the mineral elements, nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S), known as the majör elements; and boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn), known as the micronutrients. All these elements are available from the soil andor are applied as soil amendments, such as lime and fertilizers, and then taken up through the plant roots (Munson ,1992)

Boron is an essential element needed for the growth and development of plants (vascular, fungi, andbacteria). However, there are also reports that B is not essential for some fungi and algae, although it stimulates the N fi xation by bacteria. Its defi ciency in crop plants is widespread. On the other hand, in arid and semiarid (especially irrigated) regions the B toxicity does also ocur .The water-soluble B pool is readily available to plants . The critical level for various plants is established for B-water soluble in soils as 0.5 mg/kg. However, for some legumes (e.g., lentils) a bit lower value, 0.4 mg/kg, is given for hot-water soluble B emphasized that the Ca:B ratio control plant reaction to B levels in growth media (Kabata-Pendias, 2011).

Boron is relatively immobile in plants; but because it is translocated mainly through the xylem, it is largely accumulated in old leaves in which the highest B content is in tips and margins. The critical B levels for most plants range at 5–30 mg/kg .Forms and Principal Functions of Boron that are Essential for Plant ; Boron (B) is Constituent of Phosphogluconates , and Boron is Involved in Metabolism and transport of carbohydrates, fl avonoid synthesis, nucleic acid synthesis, phosphate utilization, and polyphenol production (Kabata-Pendias, 2011)

Levels of total B reported for soils of the United States seem to be fairly stable, with calculated means from 20 to 55 mg/kg219,706 High B contents, up to 1622 mg/kg (at average 65 mg/kg), are reported for some top soils of the Slovak Republic (Cˇ urlik and Šefcˇik, 1999).

For Boron ; Soil Test Methods; Hot-water soluble commonly Interacting factors or soil f actors : Crop yield goal, pH, soil moisture, texture, organic matter, soil type Range in critical level; 1-2 $mg.kg^{-1}$. The aim of this research investigation suitability of sequential exraction method 1.step (Fraction 1. Water soluble forms . 0.5 g soil and 10 ml pure water, vortex 3 hour. And filtrated. After centrifuged.distiled water extraction, Tessier et all.1979 ; Cheng, 2005)

2. Material and Method

Soils (19 soil samples from Erzurum plain and 13 samples from Oltu distrcit) representative were sampled from potato grown fields in early April. 2010 with the aim of defining the nutrient potential in potato plants cultivated in Erzurum plain and Oltu district. Soil samples from 0-40 cm depth in selected particular stations were taken and sieved with a 2mm mesh screen to analyse the different chemical properties and soil nutrient status. Leaf tissue was oven dried at 68 °C for 48 hours and ground to pass through a 1 mm mesh screen. The potato plant leaf sampled in start flowering from the 4th leaf plant leaf sample was taken June 2010 (Yildiz and Dizikisa, 2016). Sequential Extraction Procedure for the Speciation of Particulate Trace Metals (Tessier et all.1979 ; Cheng, 2005)In defining the desired partitioning of trace metals, care was taken to choose fractions likely to be affected by various environmental conditions; the following six fractions were selected.

Sequential Extraction Procedure for the Speciation of Particulate Trace Metals (Tessier et all.1979 ; Cheng, 2005)In defining the desired partitioning of trace metals, care was taken to choose fractions likely to be affected by various environmental conditions; the following six fractions were selected.

Fraction 1(Step.1). Water soluble forms; 05 g soil and 10 ml pure water, vortex 3 hour. And filtrated. After centrifuged.

3. Results And Dıscussıon

Determining of plant available Boron contents of Erzurum plain and Oltu soil samples sequential extraction first step were used and results shown in Table.1 and Table.2 (see appendix). Plant available B content of potato leaf were determined as a results of Biological indexes (Yildiz and Dizikisa,2016).

Results showed that the step1. chemical exraction methods might not be used for plant available boron in this conditions growing potato in this location. The results of this study showed that plant available boron obtained with sequentaly extraction (step1) method were not interrelated with B content of potato leaf (biological index) in Erzurum Plain and Oltu district soils (Table. 3)

4. Acknowledgements

We would like to thank the DAYTAM (East Anatolia High technology Research Center) at Ataturk University

Table.1. Plant available Boron extraction results and Leaf Boron content (Boron uptake of plant) for Erzurum Plain soil samples

Sample.No	Plant Boron uptake Biological İndex (digestion with Nitric Percloric Acid) (mg.kg^{-1})	Sequential Extraction 1. Step Plant available Boron Conc. (mg.kg-1)
1	11,46	2,9
2	11,46	2,9
3	10,53	4,63
4	13,98	3,56

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5	10,08	2,60
6	10,27	3,13
7	16,2	1,76
8	16,59	2,17
9	17,75	2,93
10	17,5	1,82
11	13,36	2,54
12	15,75	2,20
13	13,09	2,29
14	10,62	1,53
15	10,92	2,07
16	10,96	1,38
17	12,52	3,02
18	10,56	2,97
19	11,44	2,99

Table.2 Plant available Boron extraction results and Leaf Boron content (Boron uptake of plant) for Oltu district soil samples

Sample.no	Plant Boron uptake Biological İndex (with Nitric Perkloric Acid digestion) (mg.kg-1)	Sequential Extraction 1. Step Plant available Boron conc. in soil samples (mg.kg-1)
1	13,91	4,78
2	14,35	3,39
3	18,4	5,73
4	15,14	4,37
5	16,57	8,01
6	36,16	11,40
7	16,85	4,27
8	19,54	3,21
9	15,54	7,51
10	18,11	8,30

11	10,55	8,52
12	13,35	8,56
13	16,7	5,62

Table 3. Correlations analysis result of Erzurum Plain and Oltu locations Agricultural soils

	Plant Boron uptake Biological İndex (Nitric Perkloric Acid)	Sequential Exttraction 1. Step İn soil samples	Plant Boron uptake Biological İndex (Nitric Perkloric Acid)	Sequential Exttraction 1. Step İn soil samples
Plant Boron uptake Biological İndex (Nitric Perkloric Acid)	1			
Sequential Exttraction 1. Step İn soil samples	-0.256	1		
Plant Boron uptake Biological İndex (Nitric Perkloric Acid)	-0.270	0.151	1	
Sequential Ekstraction 1. step	-0.116	-0.035	0.451	1

However, the correlation analysis for both Erzurum Plain and Oltu location showed non-significant correlation so; based on these result and because sequential extraction (first stage) was not comparable, sequential extraction (first step) method is not recommended for plant available Bor extraction for this soil samples and this conditions..

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ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

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