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**Araştırma Makalesi**

# Boron Status of Big Soil Groups in Van Lake Basin

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**Abstract**

This study was carried out in order to determination boron contents of soils in Van Lake Basin. For this aim analyses were done on the samples taken from different depths of big soil groups in the research area. According to analyses results boron contents were in tolerable levels in all big soil groups having Chestnut, Non-Calcareous Brown, Non-Calcareous Brown Forest, Brown, Regosol, Alluvial, Kolluvial and Hydromorphic soils respectively. The minimum boron contents were obtained as 0.5 mg $kg^{-1}$, 0.45 mg $kg^{-1}$, 0.38 mg $kg^{-1}$, 0.78 mg $kg^{-1}$, 1.80 mg $kg^{-1}$, 2.00 mg $kg^{-1}$, 1.93 mg $kg^{-1}$ and 0.73 mg $kg^{-1}$ while the maximum boron contents were found as 2.10 mg $kg^{-1}$, 2.68 mg $kg^{-1}$, 0.60 mg $kg^{-1}$, 2.60 mg $kg^{-1}$, 4.15, mg $kg^{-1}$, 4.10 mg $kg^{-1}$, 3.33 mg $kg^{-1}$, 4.08 mg $kg^{1}$ in Chestnut, Non-Calcareous Brown, Non-Calcareous Brown Forest, Brown, Regosol, Alluvial, Kolluvial and Hydromorphic big soil groups respectively.

**Keywords**: Boron, soil, big soil group

## INTRODUCTION

Boron is accepted an essential element in plant nutrition. Boron plays role in the cell division, use of carbonhydrates, sugar transport, movement of water and nutrients from the root to the plants (Nazır et al., 2016). Boron is needed for the production of nucleic acids and the development of reproductive structures (Kabu and Akosman, 2013). Soils having high native boron concentrations occur primarily in arid and semiarid environments where drainage and leaching are restricted (Peryea and Bingham,1984). There are differences in a narrow range in concentration of boron betweeen plant deficiency and plant toxicity (Goldberg et al., 2013). Therefore boron management in the soils is critical. If excessive levels in the root zone can cause toxic effects the plants. The present of appropriate boron concentration is necessary for obtaining better yields. Available boron contents of soils change 0.5-2.0 mg $kg^{-1}$ and a small part in 0.5-2.5 % ratio of available boron is available to plants. Available boron more than 5 mg $kg^{-1}$ can be toxic to many agronomic plants (Kelling,1999). Itwas reported that available B changeability can be affected by the interactions of topography, climate, parent material,soil property, as well as human disturbance (Adcock et al., 2007). The mobility, transport, and partitioning of boron changes as depend on some soil properties including pH level, salinity, and the contents of clay minerals, sesquioxides, carbonates, and organic matter (Chaudhary and Shukla, 2004; Niyaz et. al., 2016). In this study boron contents of soils in Van Lake Basin were investigated. It was thought that findings obtained in this study may be useful similar investigations about soil science and plant nutrition in future.

## MATERIALS and METHODS

Van Lake Basin placed in eastern of Turkey among 37 55’-39 24’ North and 42 05’44 22’ east coordinates. This basin have 1797 643 ha area with lake surface. This area is equel 2.3% of total Turkey area. The mean altitude is 1600 2500 m in Van Lake Basin. The relief having sharp andsheer slopes and big differences on altitudes is generally mountanious.The soils have no drainage problem in this basin. The parent materials are volcanious in north, sedimanter and methamorphic in south and alluvial in west and sedimanter and methamorphic in east.Sedimanter parent materials are generally marn, shale, calcite and conglomera. The meadow is natural vegetation of Van Lake is Basin. The continental climate is shown in this basin. The mean temperature and precipitation are 9.4 $^{0}$C and 387 mm respectively (Anonymous, 2019). There are eight big soil groups as chestnut, non-calcareous brown, non- calcareous brown forest, brown, regosol, alluvial, kolluvial and hydromorphic in this area. Sampling number of each big soil group were determined according to portion of covered area by them in basin. Soil samples taken from 0-20, 20-40, 40-60, 60-80 and 80-100 cm depth and total twenty five (6 samples in chestnut, 6 samples in non- calcareous brown, 4 samples in brown, 4 samples in regosol, 2 samples in alluvial, 1 samples in non-calcareous brown forest, 1 samples in kolluvial, 1 samples in hydromorphic) sampling points. Boron contents of soil samples were analysed according to curcumin method reported by Page et. al., (1982). The sampling places were given in Figure 1.

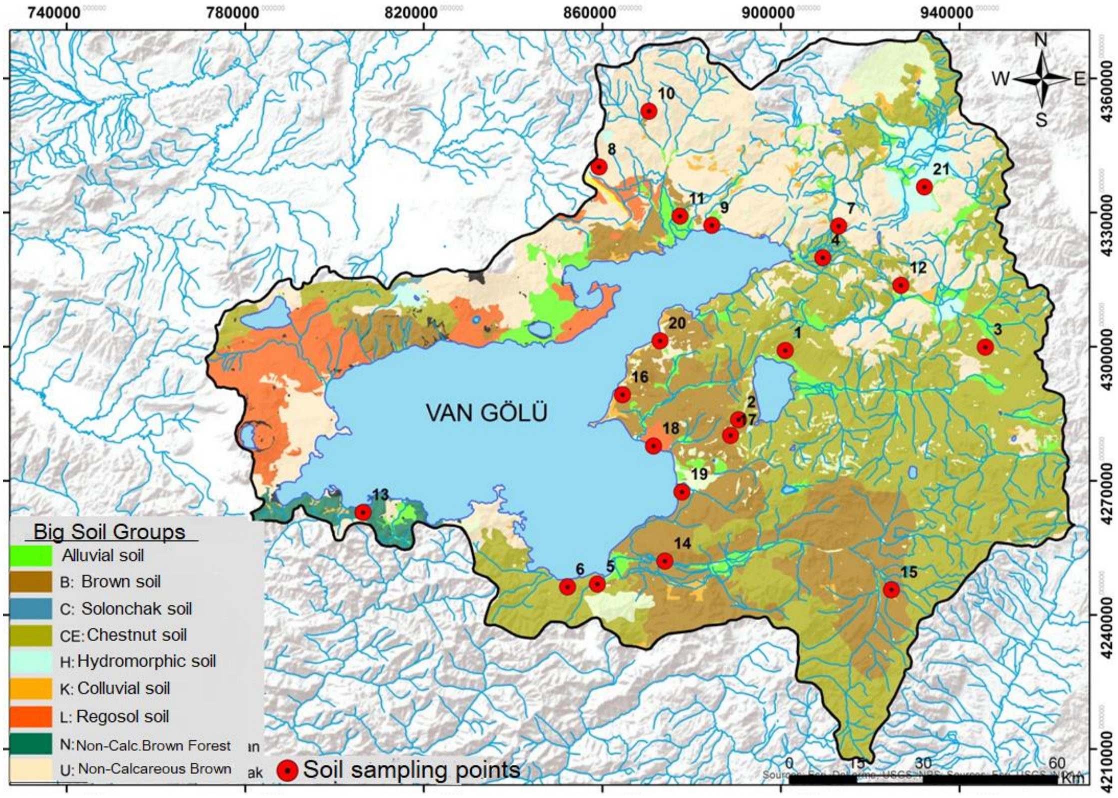


**Figure 1**. Sampling points

**RESULTS AND DISCUSSIONS**

Boron contents of soil samples obtained in this study were given in Table 1. Boron distributions by depth in big soil groups are given in Figures 2, 3, 4, 5, 6, 7, 8, and 9.

**Table 1**. Boron contents of big soil groups

| Big Soil Groups | Boron Contents, mg kg$^{-1}$ | |
|---|---|---|
| | Min. | Max. |
| chestnut soils | 0.50 | 2.10 |
| non-calcareous brown soils | 0.45 | 2.68 |
| non-calcareous brown forest soils | 0.38 | 0.60 |
| brown soils | 0.78 | 2.60 |
| regosol soils | 1.80 | 4.15 |
| alluvial soils | 2.00 | 4.10 |
| kolluvial soils | 1.93 | 3.33 |
| hydromorphic soils | 0.73 | 4.08 |

As that shown in Table1 boron contents were found in acceptable level (<5 mg kg$^{-1}$) according to literature knowledge (Kelling, 1999) in all soil groups at research area. At the study the lowest boron contents were obtained (0.38 mg kg$^{-1}$-0.60 mg kg$^{-1}$) in soil samples taken from 0-20 cm to 100 cm in Reşadiye Koyluca (13. sampling point) sampling point belong to non-calcareous brown forest big soil group. It was determined that boron contents obtained in non-calcareous brown forest were in lower levels compaire with the other big soil groups. Boron contents generally increased with increasing depth in some sampling points belong to chestnut, non-calcareous brown and brown big soil groups. The boron values of soil samples taken from 20 cm, 40 cm, 60 cm depths were obtained in ranges of 1.78-2.10 mg $kg^{-1}$ and 2.03-2.68 mg $kg^{-1}$ in Muradiye-Köşk (4. sampling point), Muradiye-Center (7. sampling point) sampling points belong to chestnut, non-calcerous brown big soil groups respectively. Similarly boron contents of soil samples taken from 40 cm, 60 cm, 80 cm depths also inceased with increasing depth and were obtained in range of 2.38-2.60 mg $kg^{-1}$ in Gürpınar-Murataldı (15. sampling point) sampling points belong to brown big soil group. The highest inreases in boron levels up to 80 cm depth were determined in hydromorphic (25. sampling point) big soil group in range of 0.73 - 4.08 mg $kg^{-1}$. It was thought that the changes among boron levels determined in different big soil groups and depths were caused by interactions of topography, climate, parent material,soil property, human disturbance which may show change in different sampling area (Adcock et al. 2007). For instance, Arora and Chahal (2010) repoted that boron adsorption and desorption reactions are affected by soil pH, temperature, water, clay, and soil organic matter content. Das et al. (2019) reported that removal of boron after harvest can increase deficiency and irrigation with high boron water and application of boron fertilization can cause toxicity. Shireen et al. (2018) determined that highly water-soluble available boron can loss by leaching in shallow or coarse-textured soils

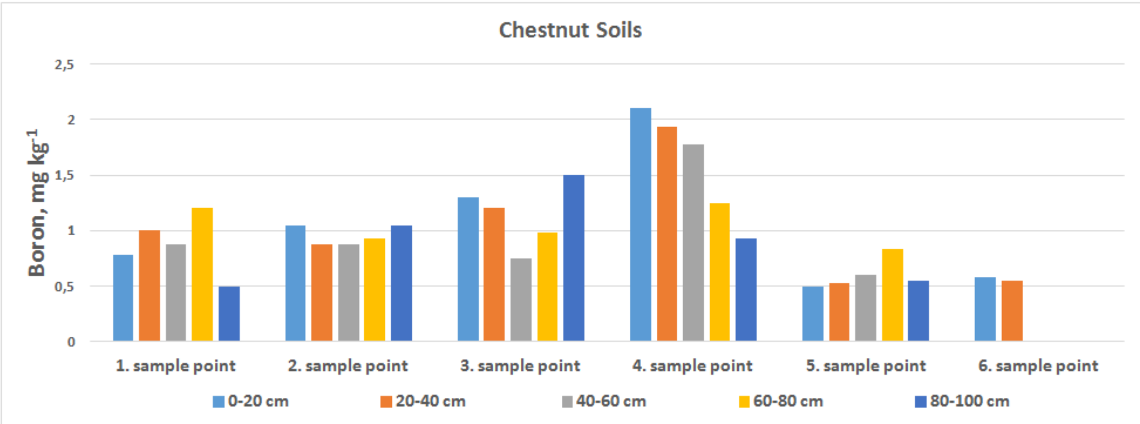


**Figure 2**. Boron contents of Chestnut soils in different sampling points and depths

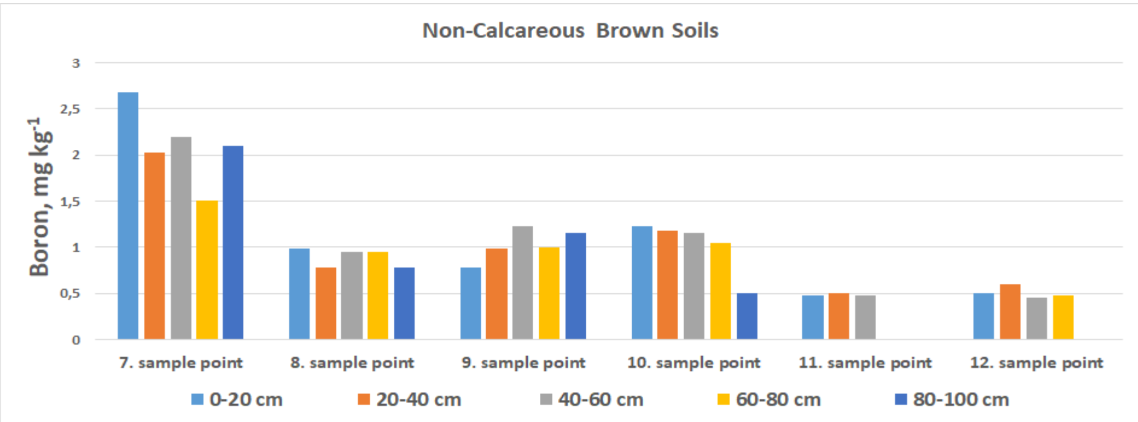


**Figure 3**. Boron contents of Non-Calcareous Brown soils in different sampling points and depths

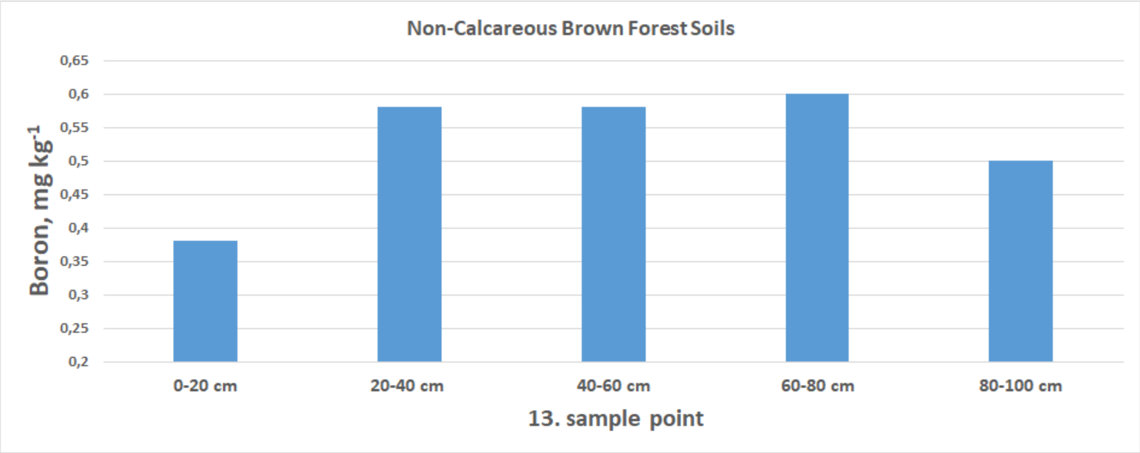


**Figure 4**. Boron contents of Non-Calcareous Brown Forest soils in different depths

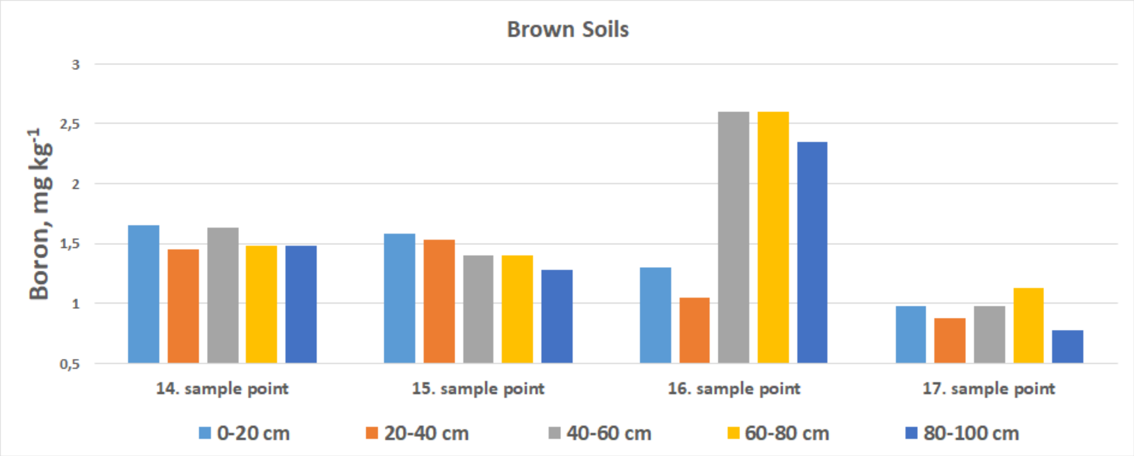


**Figure 5**. Boron contents of Brown soils in different sampling points and depths

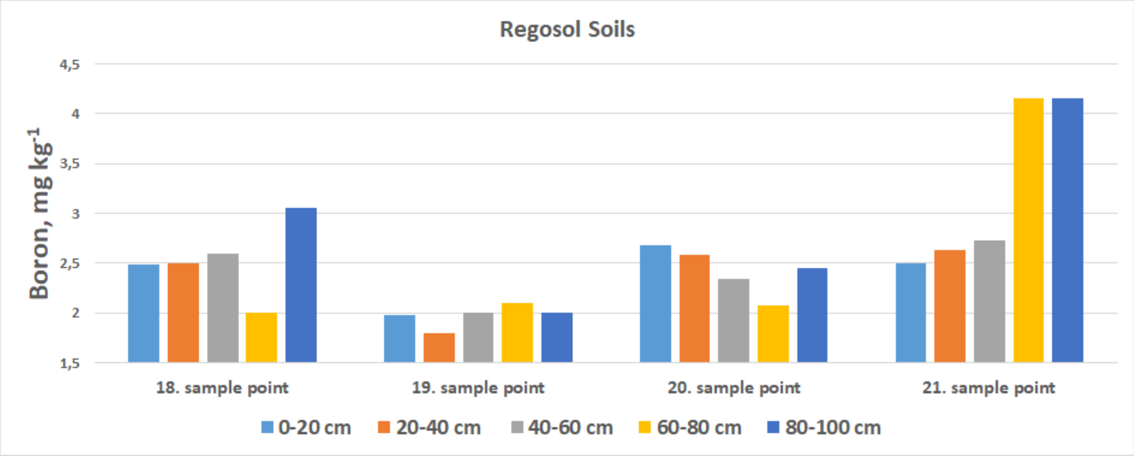


**Figure 6**. Boron contents of Regosol soils in different sampling points and depths

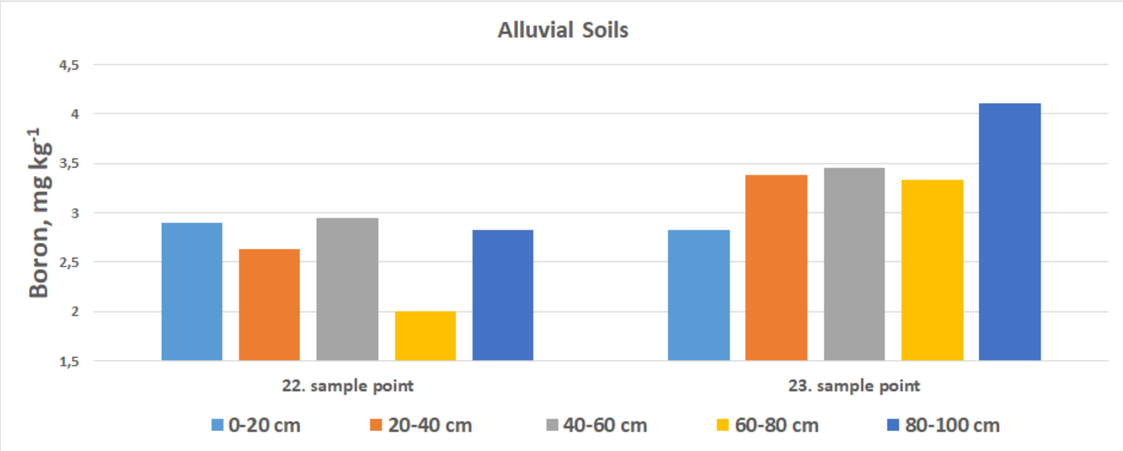


**Figure 7**. Boron contents of Alluvial soils in different sampling points and depths.

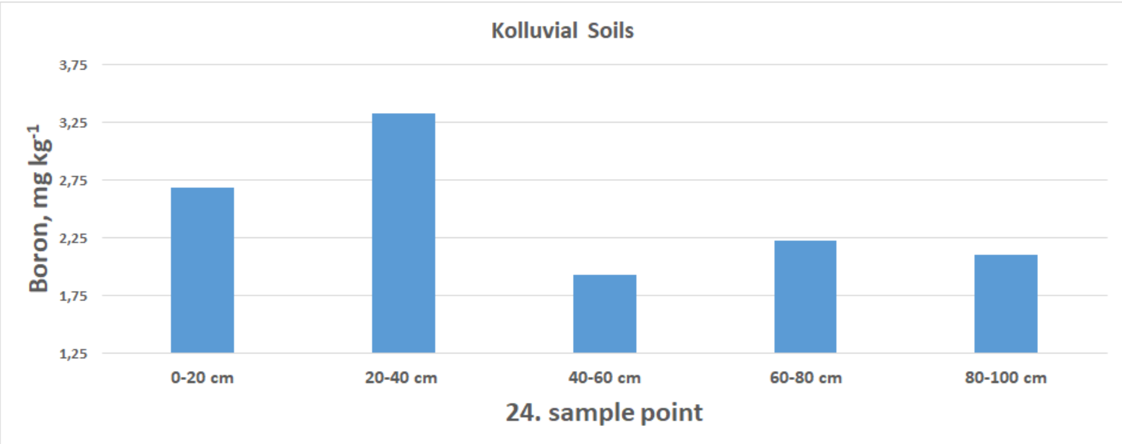


**Figure 8**. Boron contents of Kolluvial soils in different depths.

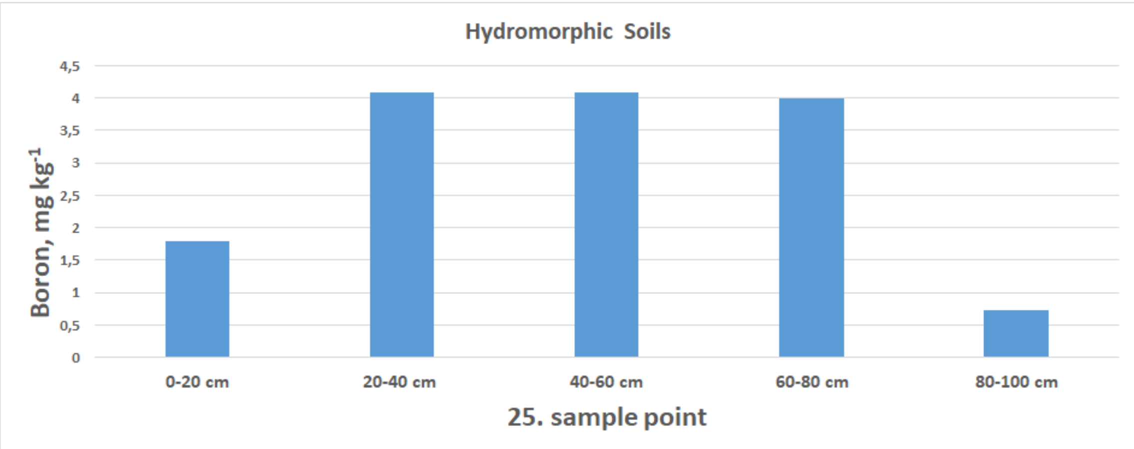


**Figure 9**. Boron contents of Hydromorphic soils in different depths.

## CONCLUSION

Boron contents obtained in this study were found corresspond with reported (Kacar and Fox, 1967) values about boron status of Turkey's some soils. As a result, ıt was thought that similar researches in agricultural soils having boron contents in Van Lake Basin may be useful to plant growth and applications about soil management studies in future.

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