EFFECT OF BORON TREATMENTS ON BORON CONCENTRATION OF THE LEAVES UNDER THE HARVEST BASE OF TEA PLANT

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INTRODUCTION

In order to raise the quality of tea leaf, it is necessary to know the concentration of essential plant nutrients of tea plant and its soil, the optimal doses of the nutrients to be applied, their application methods, optimum forms, application times and frequency. Consequently, not only the rise of the quality and yield but also economical savings are achieved; furthermore, it might be able to prevent severe environmental and health problems caused by the accumulation of the fertilizers as a consequence of the usage of fertilizers in excess doses. Fertilizing with boron is a quite critical issue since the range between its deficiency and toxicity level is quite narrow (Marschner 1995, Goldberg 1997). Researches show that the first xylem transport and also the accumulation of boron occurs through the old leaves which have the highest transpiration rate but the lowest need (Shelp et al., 1992; Bell, 2016). Within the frame of the mentioned topics, the aim of this research is to determine the effect of the soil boron treatment on boron concentration of the old and young leaves and also the general boron concetration of the leaves under the harvest base.

MATERIAL and METHOD

The Establishment and Implementation of the Experiment

A two-year fixed field experiment was laid out with randomized block design with 5 replications in a tea garden in Arhavi, Artvin on 3 April 2014 and 25 March 2015 in the first and second year, respectively.

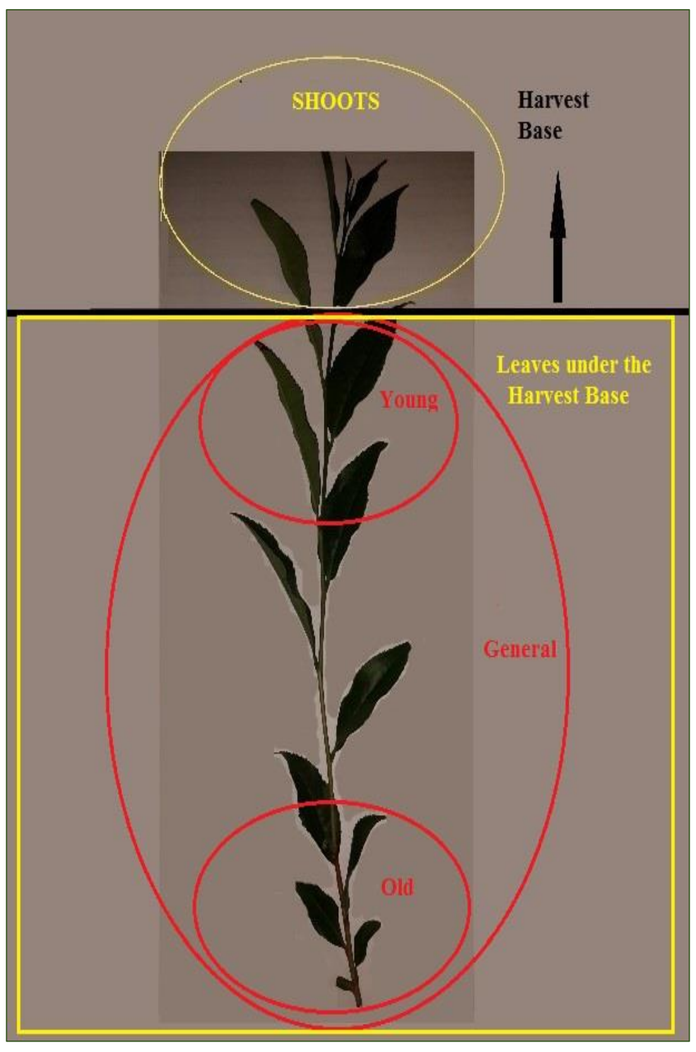
Fertilizing

Boron was applied to the soil in the form of DOT (Disodium Octaborate Tetrahydrate, $Na_2B_8O_{13}.4H_2O$) and trademark Etidot-67 (% 20,8 B) was used as a boron source.

Soil Boron Treatments	Doses	Foliar Boron Treatments	Doses
S0	0 g B da^{-1}	L0	0 mg B L^{-1}
		L1	400 mg B L^{-1}
S1	400 g B da^{-1}	L0	0 mg B L^{-1}
		L1	400 mg B L^{-1}

Sampling of the leaves

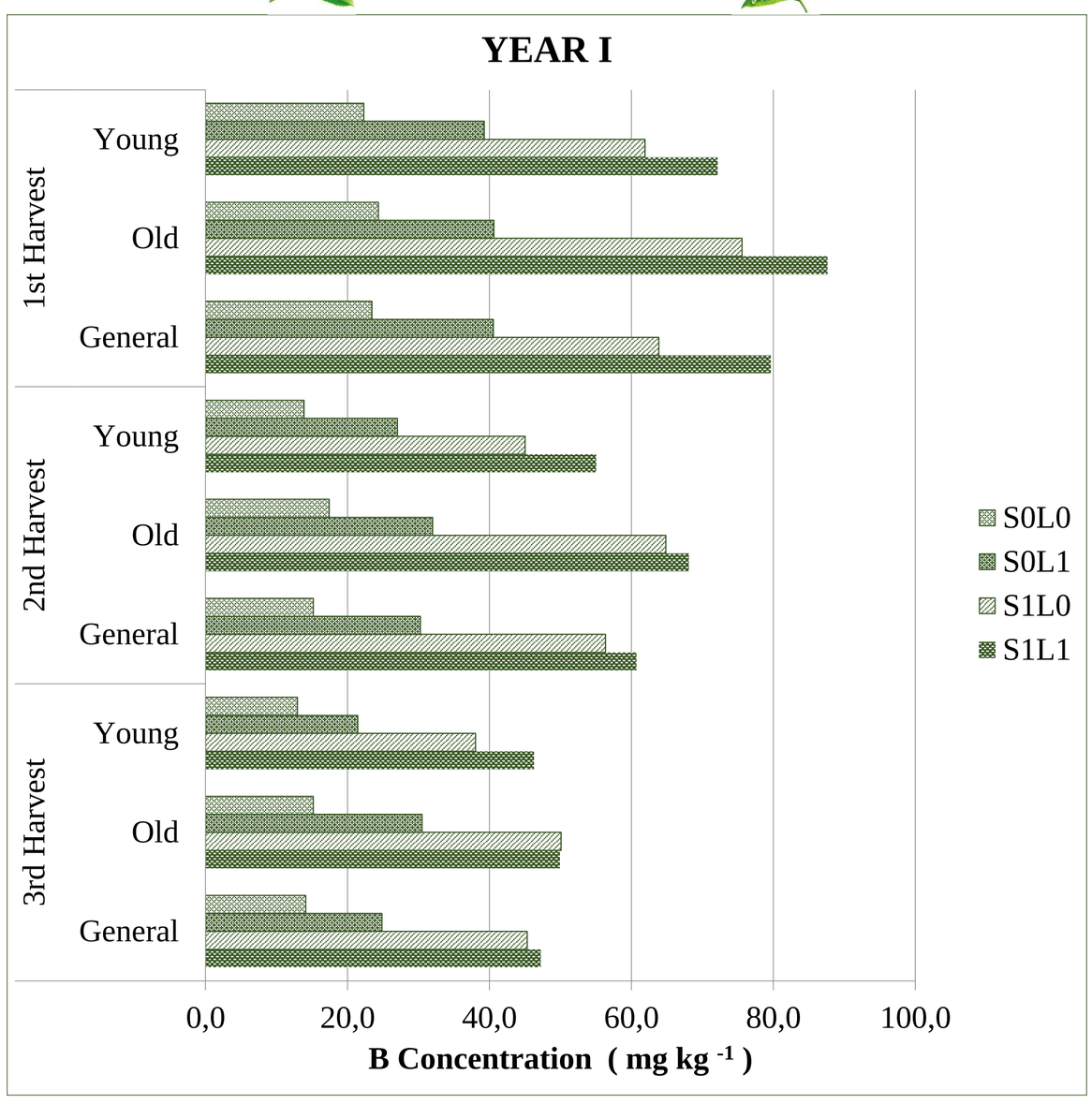
Soil boron fertilization fertilizers were applied was conducted on 4 April 2014 in the first year and on 26 March 2015 in the second year, and foliar boron on 4 April, 16 May, 10 July in 2014; and on 26 March, 31 May and 25 July in 2015.

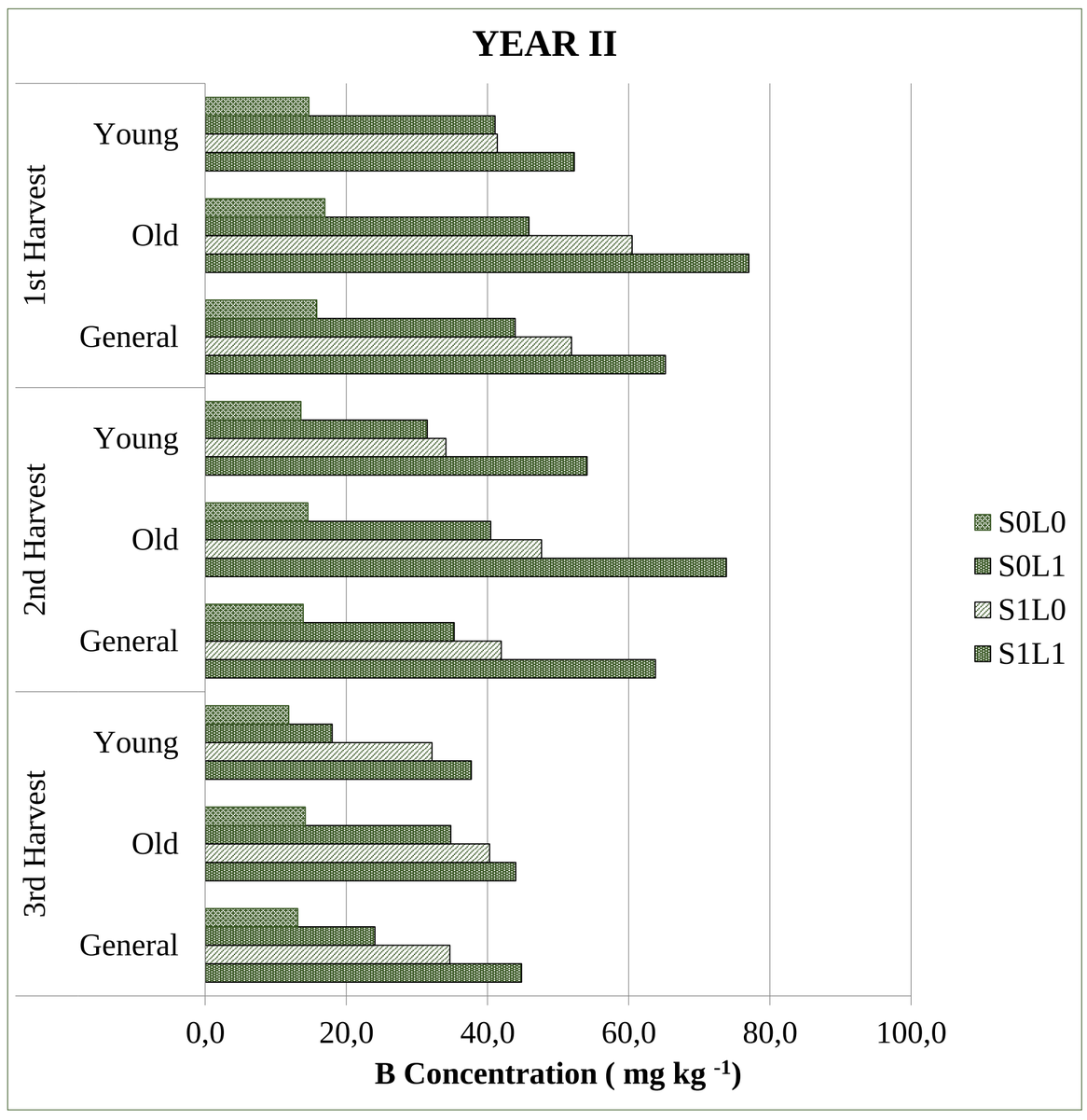


The Analysis of the Leaf Samples

Microwave wet digestion method was used to determine the total boron concentration of the samples and the solution extracted from the leaves was read by ICP-OES (Boss and Fredeen, 2004).

RESULTS





DISCUSSION

After the soil and foliar boron treatment, the boron concentration of the leaves under the harvest base increased, and managed to bring the boron concentration above the critical level (>30 mg kg^{-1}) needed for a healthy growth of a tea plant; in other words, tea plant deprived of boron gave a positive reaction to the boron fertilization. The deficiency of boron concentration in tea cultivated lands has been reported by a number of different researchers who conducted experimentation in Eastern Black Sea region (Kacar et al., 1979; Ozyazıcı et al. 2015; Taban et al., 2015; Ozkutlu et al., 2016). Foliar treatment alone (S0L1) bring the boron concentration of the leaves above the desired value in most harvest season. This result shows that during the times when the soil treatment is difficult to conduct, boron deficiency can be eliminated with a foliar treatment. On the other hand, although its symptoms was not observed in the experimental field, some critical values which cause toxicity in tea plant (>50 mg kg^{-1}) were obtained during some harvest seasons, especially in the old leaves. As a result of the water loss which occurs in the plant organs during the day, the plant needs water uptake and boron is carried to the upper organs with the help of it (Shelp et al. 1992). The first xylem transport of the boron occurs through the old leaves which have the highest transpiration rate but the lowest need. Bell (2016) reported that the highest accumulation of boron in the plant occurs in the old leaves; more specifically, on their tips and edges.

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