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EFFECT OF DIFFERENT BORON CONCENTRATIONS ON GERMINATION AND SEEDLING STAGE OF SOYBEAN [Glycine max (L.) Merr]

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ABSTRACT

Boron (B) is a micro element needed by plants in small amounts and its deficiency and toxicity limits are very close to each other. The main goal of this study was to examine the effects of different boron applications on germination/emergence and seedling development parameters of soybean [Glycine max (L.) Merr]. Six different boron doses (0, 0.2, 0.4, 0.8, 1.6 and 3.2 ppm) were applied to seed for this purpose. Turksoy variety seeds were used as the plant material. In this study, germination rate, germination vigor, seedling rate, seedling percentage, root length, seedling length, root fresh weight, root dry weight, seedling fresh weight and seedling dry weight were investigated. According to the results of analysis of variance; the effect of B concentrations on germination rate, root length, stem length, root fresh weight, stem fresh weight was significant at 5 % probability level. As a result, the application of B at 3.2 ppm concentration showed a positive effect on the germination and characteristics of seedlings while, low concentrations of boron ($\leq$ 0.4 ppm) cause effects on average root length. Germination and seedling developments are positively affected by high levels boron.

Keywords: Germination, characteristics of seedlings, root length, seedling length

INTRODUCTION

Soybean is one of the main sources of edible oil and protein. Fertilization is a very important factor in increasing the yield and quality of the products. It is known that balanced

fertilization is very important in plant cultivation. However, in order to obtain high quality and abundant products, it is important to feed the plants properly. Boron element, which is required by plants in trace amounts, is an element whose toxicity limit is very close to each other (Brown et al., 2002). Boron has an important role in the durability of the cell wall of plants, membrane integrity, phenol metabolism, carbohydrate transport and the formation of generative organs, pollen germination and pollen tube growth (Marschner, 1995). It has been reported by many researchers that B deficiency occurs with an increasing prevalence in plant production (Brown and Shelp, 1997). Boron plays very crucial role in plant growth and development (Asad et al., 2003). Several reports have been indicated growth promoting effects of boron application on soybean (Ross et al., 2006)

MATERIAL AND METHODS

A laboratory experiment was conducted in November, 2014 at the TAGEM, to investigate the effect of boron on germination and seedling growth of soybean. The experiment was arranged in completely randomized design with three replications. Cultivar Turksoy was treated with six levels of boron (0, (control) 0.2, 0.4, 0.8, 1.6 and 3.2 ppm) for the experiment, deionized water was used for the control treatment. Boric acid (H_3BO_3) was used as a source of boron. Seeds were surface sterilized with 10% hydrogen peroxide solution for 5 min, and rinsed with deionized water. Thirty seeds were uniformly placed per Petri dish (12 cm diameter) using a forceps after the Petri dish were sterilized with 98% ethanol, and rinsed with deionized water. Filter papers were well soaked by adding 5 ml with the respective solutions. All the Petri dishes were covered with lids and kept at room temperature (25±1°C). In this study, germination rate, germination vigor, seedling rate, seedling percentage, root length, seedling length, root fresh weight, root dry weight, seedling fresh weight and seedling dry weight were investigated.

RESULT AND DISCUSSION

The germination rate increased significantly with the increase in boron concentration. However, germination vigor at 3.2 ppm showed no difference compared to the control (Figure1).

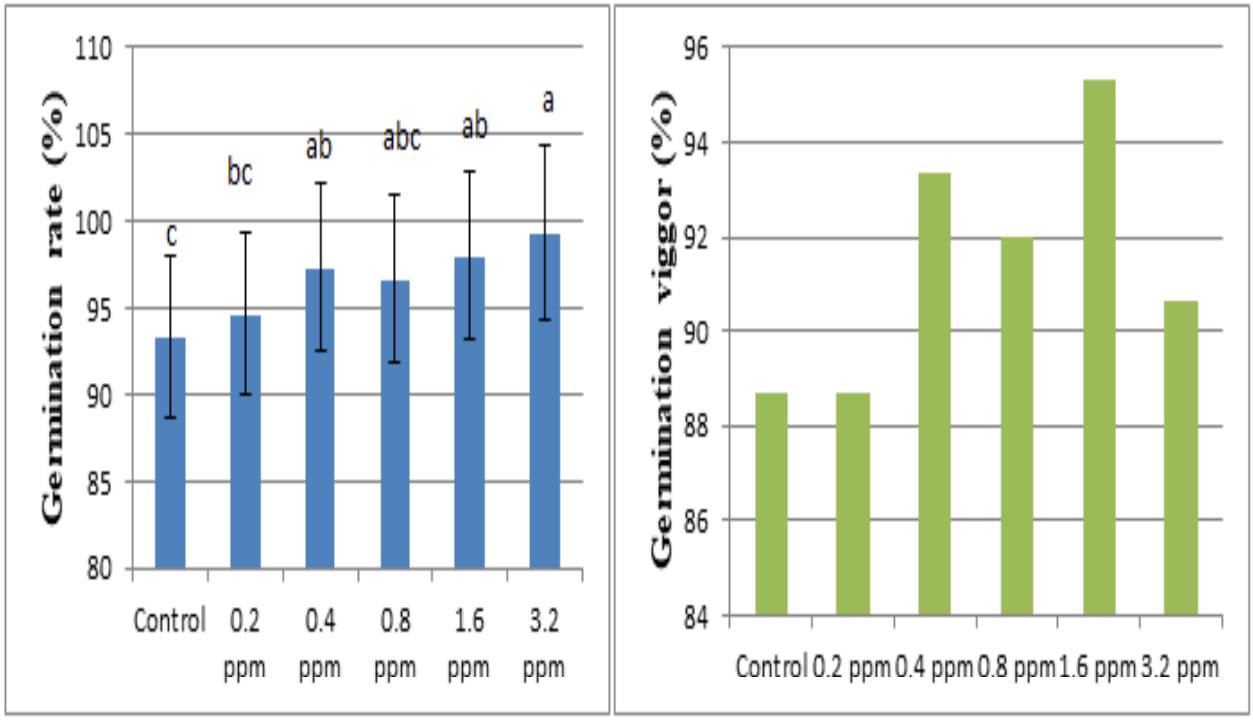

Figure 1. Influence of boron treatments on germination rate, germination vigor in soybean ± S.E.

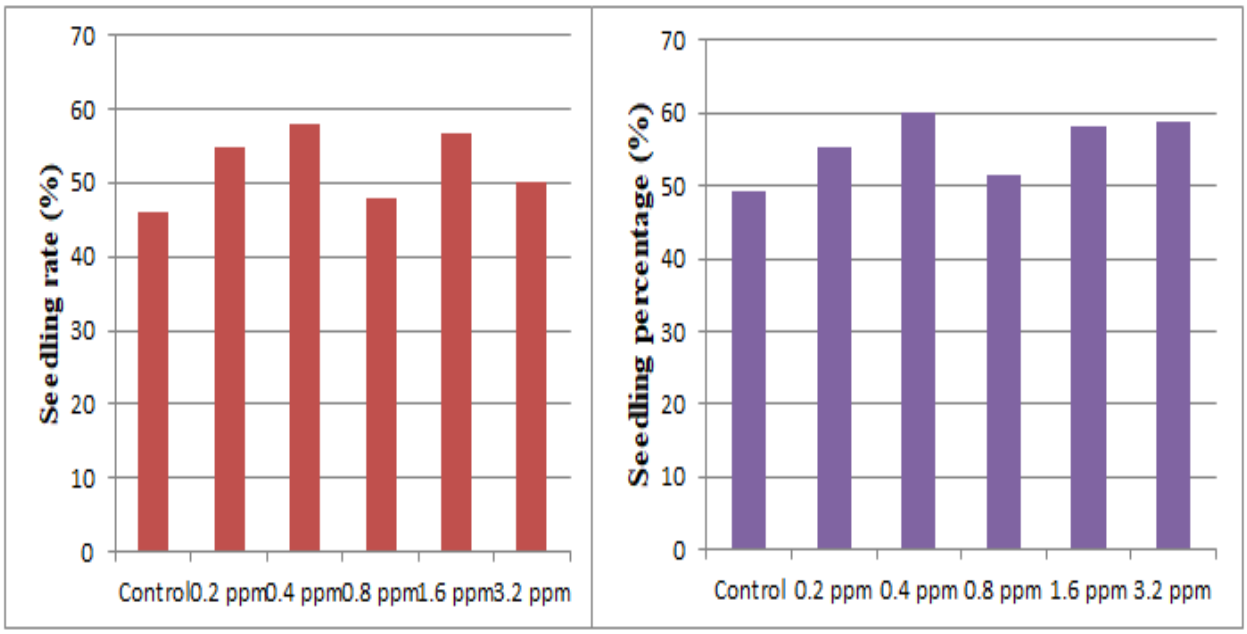

Figure 2. Influence of boron treatments on seedling rate, seedling percentage in soybean ± S.E.

The root and seedling lengths, root and seedling fresh and dry weights, increased significantly with the increase in boron concentration (Figure 3, 4, 5).

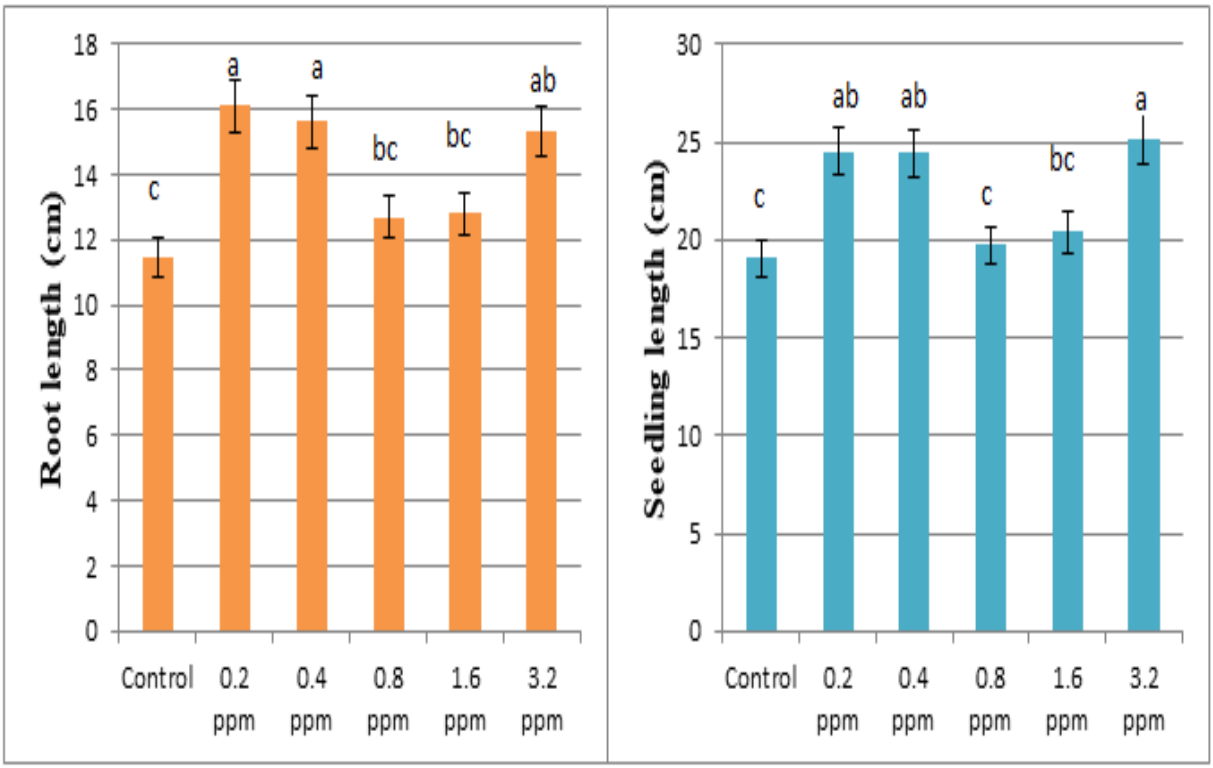

Figure 3. Influence of boron treatments on root length, seedling length in soybean ± S.E.

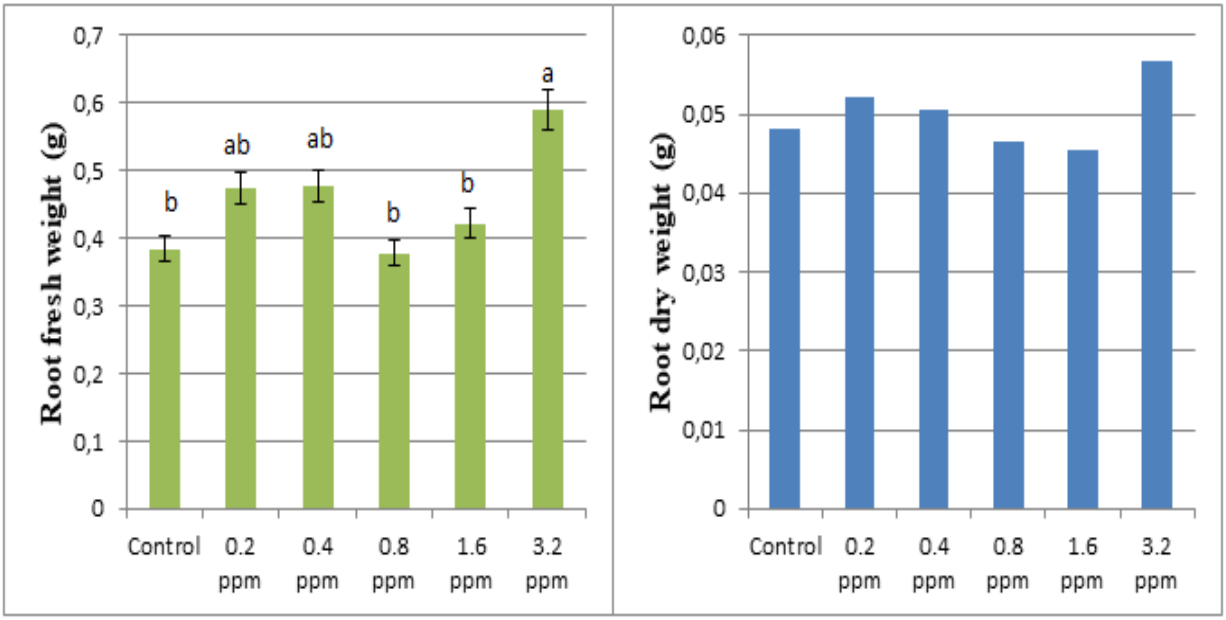

Figure 4. Influence of boron treatments on root fresh weight, root dry weight in soybean ± S.E.

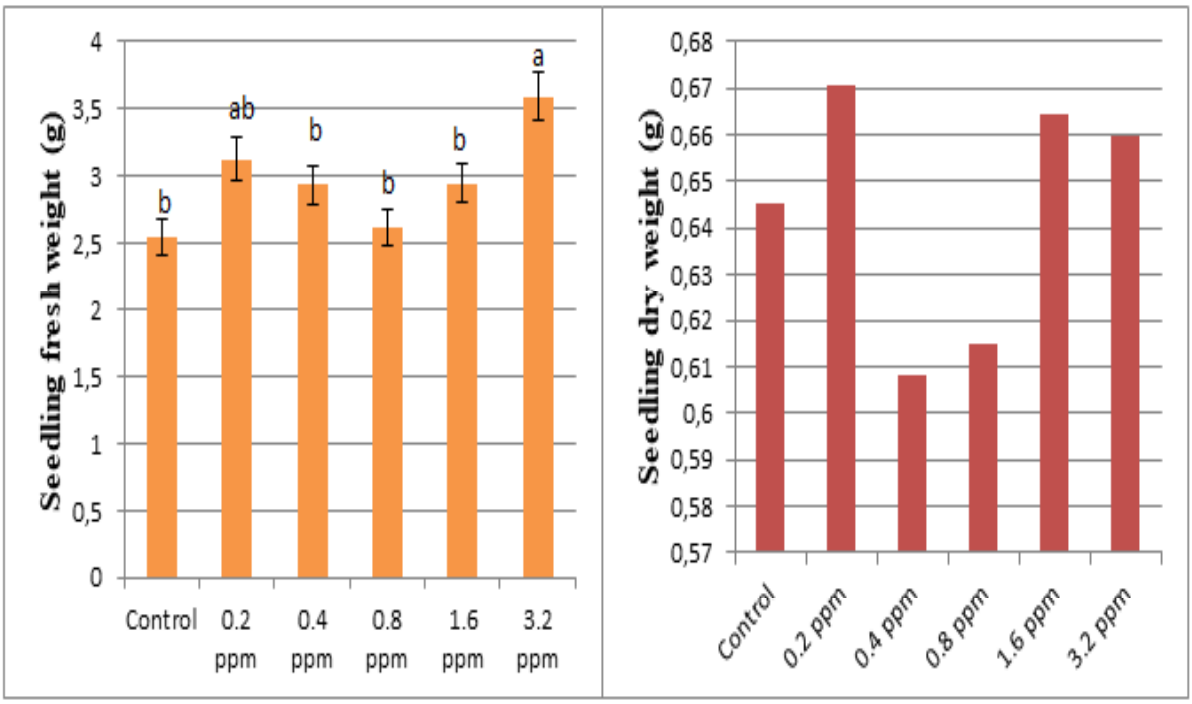

Figure 5. Influence of boron treatments on seedling fresh weight, seedling dry weight in soybean ± S.E.

CONCLUSION

High boron concentrations caused an increase in germination and germination rate, seedling and root lengths, root and seedling fresh weight in soybean. High boron concentration (3.2 ppm) showed the highest germination rate, seedling length and root fresh weight. As a result, the application of B at 3.2 ppm concentration showed a positive effect on the germination and characteristics of seedlings while, low concentrations of boron (≤ 0.4 ppm) cause effects on average root length. Germination and seedling developments are positively affected by high levels boron.

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