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Full Text Book

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Merve KIDIRYUZ

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WHEAT GERMINATION AND EARLY SEEDLING PERIOD ARE AFFECTED BY DIFFERENT DOSES OF BORON FERTILIZER.

Assist. Prof. Negar Ebrahim Pour Mokhtari,
Department of Organic Farming, Gaziantep University, Gaziantep, Turkey
ORCID ID: 0000-0002-2307-5756
Assoc. Prof. Ferhat KIZILGEÇI
Department of Plant and Animal Production, Kızıltepe Vocational School, Mardin Artuklu University, Mardin, Turkey
ORCID ID: 0000-0002-7884-5463

ABSTRACT
Boron is a micronutrient that plants require to grow. Many vascular plants require this vital micronutrient. Boron is involved in a variety of structural, physiological, and metabolic processes in plants. The purpose of this study was to determine the effect of various doses of boron on the early germination period of bread wheat. The experiment was arranged in completely randomized design with three replications. Cultivar 'Tosunbey' was treated with six levels of boron (0, 0.2, 0.4, 0.8, 1.6 and 3.2 ppm) for the experiment. Germination rate, germination vigor, coleoptiles length, root length, seedling length, root fresh weight, root dry weight, seedling fresh weight, and seedling dry weight were investigated in this study. According to the results of analysis of variance; root length, seedling height, root fresh weight seedling fresh weight and germination rate were significantly affected by boron applications. As a result, the application of B at 0.8 ppm concentration showed a positive effect on the root length while, low concentrations of boron ($\leq$ 0.8 ppm) cause effects on average seedling height, root fresh weight and seedling fresh weight. Germination and early seedling stage was positively affected by 0.8 ppm levels boron.
Keywords: Germination, coleoptile, fresh weight, seedling length,

INTRODUCTION
Wheat, rice, and maize are the most important staple crops globally and contribute a significant part of daily calories and protein intake (Kizilgeci et al., 2021). Among these major cereals, wheat is ranked at the first position due to its domestication and contribution as the primary staple food crop globally (Iqbal et al., 2021). Currently, it is dominating the most of arable land (38.8%), with relatively higher grain protein (12–15%) than other cereals, but the productivity remains low (FAO, 2016). It was realized that boron (B) is required for plant growth in 1923 (Warington, 1923). The most commonly encountered micronutrient deficiency in the field is B deficiency (Gupta, 1979). However, wheat (*Triticum aestivum* L.), like other cereals, has been thought to have a low requirement for B. (Marten and Westermann, 1991) Boron deficiency in field grown wheat was first observed almost simultaneously on different sides of the world in the 1960s, following the spread of semi dwarf, 'green revolution' wheat. In 1962, grain set failure associated with male sterility was observed in wheat in Brazil (da Silva and de Andrade, 1980). Positive responses to B

application confirmed the diagnosis of B deficiency. The same situation occurred in Nepal in 1964, when high-yielding Mexican and Indian wheat germplasm was introduced (Misra et al., 1992). In higher plants, the most rapid response to B deficiency is a cessation of root elongation (Marschner, 1995; Dell and Huang, 1997), but this has rarely been observed in wheat. Boron deficiency is much more difficult to induce in wheat than in dicotyledons during early vegetative growth. Snowball and Robson (1983), for example, discovered that after transferring to a solution culture with no B, wheat root continued to grow normally for a long time, whereas root growth in subterranean clover (*Trifolium subterraneum* L.) stopped immediately. In the majority of previous studies, B deficiency was induced in wheat vegetative growth only after B in the nutrient solution had been depleted by plant uptake. Symptoms of B deficiency in young wheat plants include longitudinal splitting of the newer leaves close to the midrib and the development of a saw tooth effect on the margins of young leaves, indicating abnormal cellular development (Snowball and Robson, 1983).
The goal of this research is to determine the effects of different Boron applications on germination and early seedling stages of bread wheat (Tosunbey cv.).

MATERIAL AND METHOD

A laboratory experiment was conducted in November, 2014 at the TAGEM, to investigate the effect of boron on germination and seedling growth of wheat. The experiment was arranged in completely randomized design with three replications. Cultivar Tosunbey was treated with six levels of boron (0, (control) 0.2, 0.4, 0.8, 1.6 and 3.2 ppm) for the experiment, deionised water was used for the control treatment. Boric acid (H3BO3) 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 deionised 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, coleoptiles length, root length, seedling length, root fresh weight, root dry weight, seedling fresh weight and seedling dry weight, germination rate, germination vigour, were investigated. The JMP 10th statistical package program was used to perform variance analyses on the obtained data.

RESULT AND DISCUSSION

Coleoptile length, root length and seedling height

According to the results of analysis of variance, there were statistically significant differences in root length and seedling height. Coleoptile length varied between 6.07 cm (control) and 8.09 cm (0.2 ppm). The lowest value for root length was 12.77 cm (control) and the highest value was 15.30 cm (1.6 ppm). Seedling height varied between 18.84 cm (control) and 23.30 cm (0.2 ppm) (Figure 1).

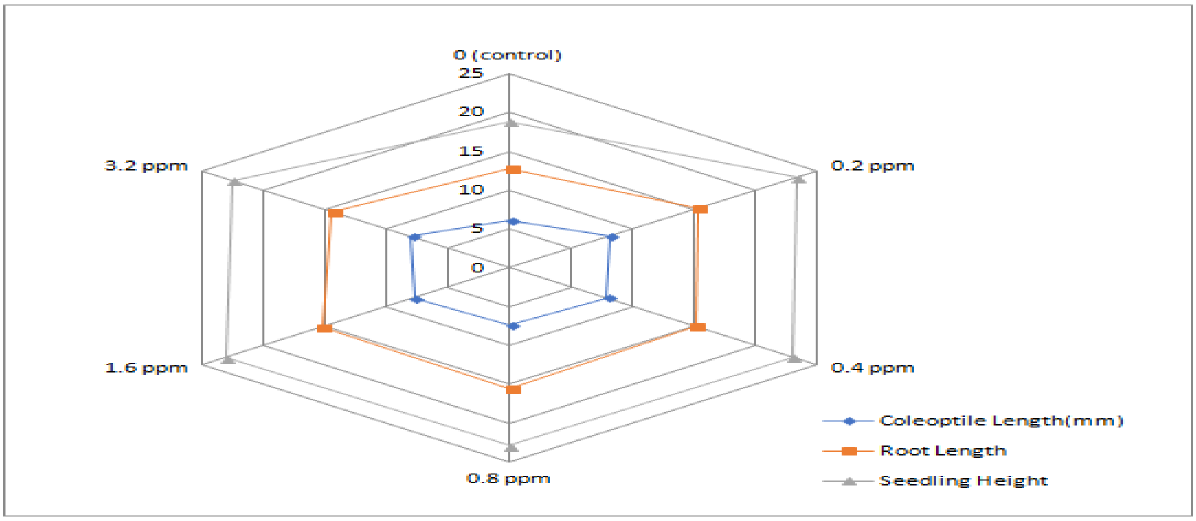

Figure 1. Radar graphic of average coleoptile, root length and seedling height.

Root Fresh and Dry Weight

According to the results of the analysis of variance, significant differences were determined for the root fresh weight feature. Root fresh weight ranged from 105.46 mg (1.6 ppm) to 260.33 mg (0.4 ppm). The lowest value for root dry weight was 30.5 mg (0.2 ppm) and the highest value was 35.56 mg (0.8 ppm) (Figure 2).

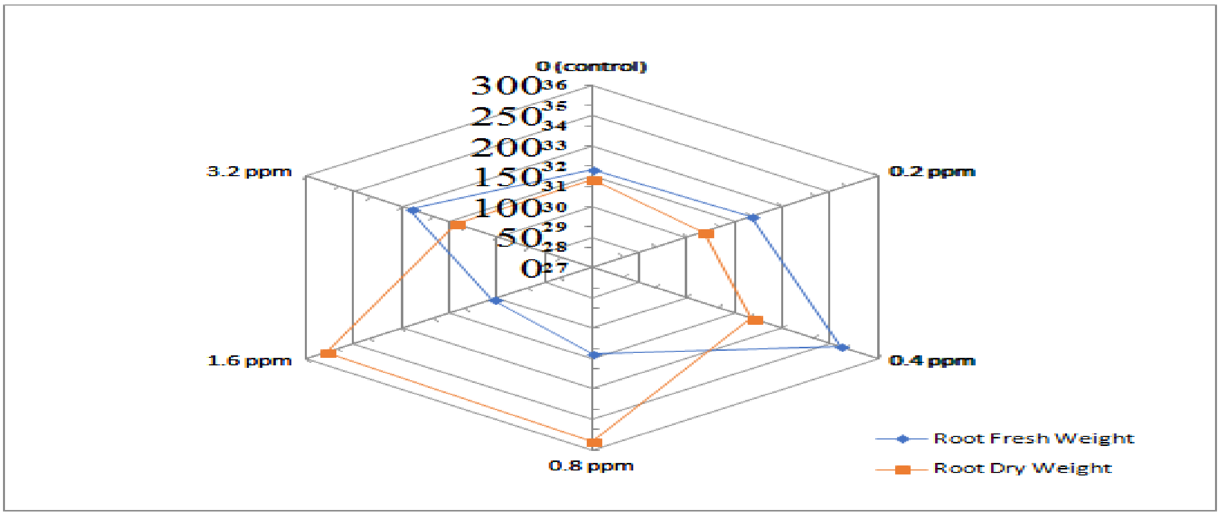

Figure 2. Radar graphic of average root fresh and dry weight

Seedling Fresh and Dry Weight

According to the analysis of variance results, significant differences were determined for the seedling fresh weight trait. The seedling fresh weight varied between 569 mg (0.4 ppm) and 351.13 mg (control). The lowest value for seedling dry weight was 57.66 mg (control) and the highest value was 67.23 mg (1.6 ppm) (Figure 3).

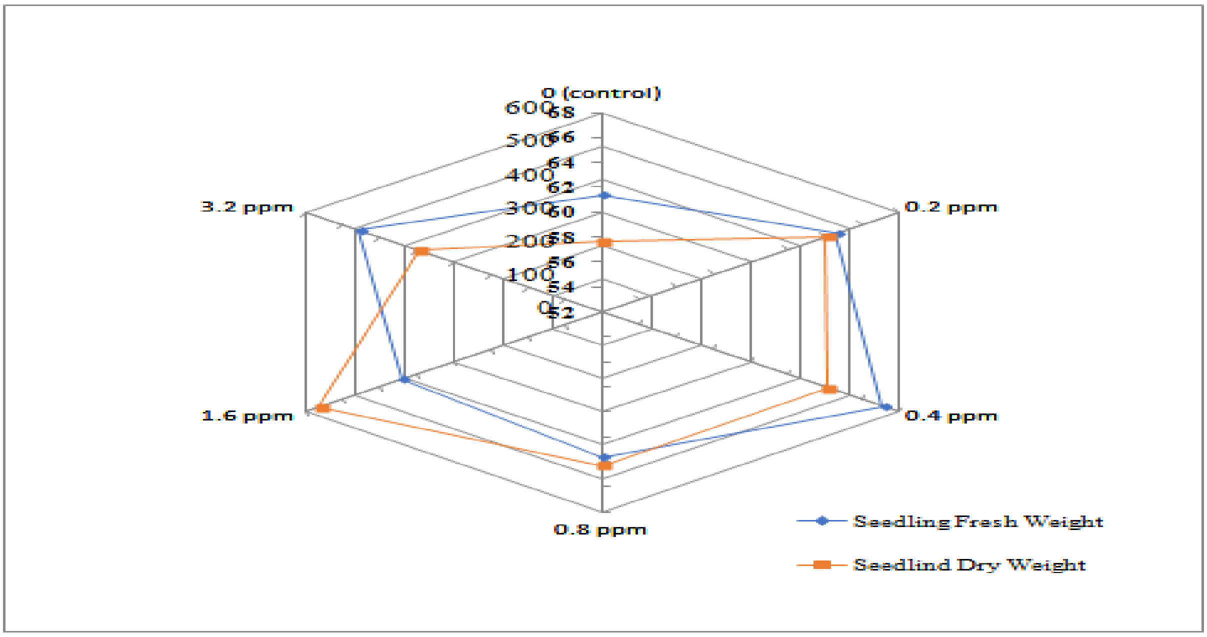

Figure 3. Radar graphic of average seedling fresh and dry weight.

Germination Rate and Vigour

According to the results of the analysis of variance, significant differences were determined for the germination rate feature. The germination rate varied between 84.66% (1.6 ppm) and 72.66% (control). The lowest value for germination vigour was 92% (control) and the highest value was 94.66 % (0.4 and 3.2 ppm) (Figure 4).

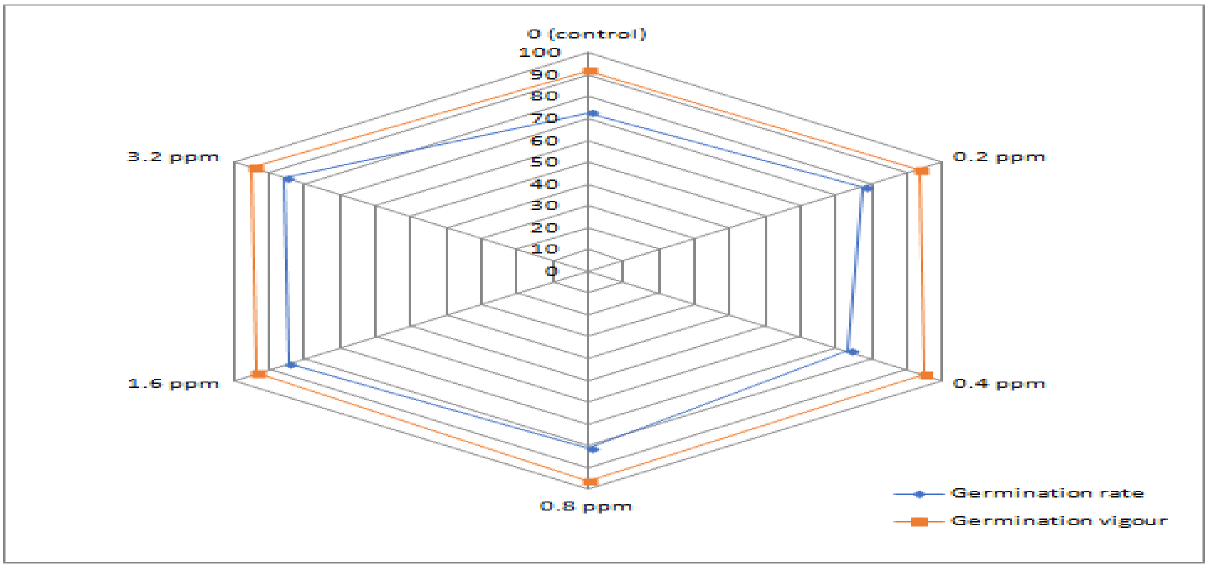

Figure 4. Radar graphic of average germination rate and germination vigour

CONCLUSION

As a result, the application of B at 0.8 ppm concentration showed a positive effect on the root length while, low concentrations of boron (≤ 0.8 ppm) cause effects on average seedling height, root fresh weight and seedling fresh weight. Germination and early seedling stage was positively affected by 0.8 ppm levels boron.

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