

ABSTRACT
THE EFFECTS OF BORON TOXICITY AND HUMIC SUBSTANCE ON
COTTON (*Gossypium hirsutum* L.)
Mustafa Ali KAPTAN

Ph.D. Thesis, Department of Soil Science and Plant Nutrition
Supervisor: Prof. Dr. Mehmet AYDIN
2013, 191 pages

This research was carried out to determine the effect of irrigation water contains different boron concentrations (0.6–1.8–5.4–16.2 mg l⁻¹) and humic substances (0–20–40 kg da⁻¹) on the growth, nutrients concentrations and uptake, yield, yield components and lint quality properties of cotton (*Gossypium hirsutum* L.), soil nutrient composition and to define the potential of phytoremediation capacity of cotton in the Research and Application Farm of Adnan Menderes University Agricultural Faculty during the 2011 and 2012 years. The experiment was a split plot design with four replications.

The boron applications caused the available boron contents of soil reach to the toxic level and boron toxicity symptoms were appeared on the plant. It was determined that B toxicity limit in the irrigation water for cotton plant was between 1.8-5.4 mg B l⁻¹. Effect of boron toxicity on all of the measured parameters was more severe in the second year. Comparing with the control (0.6 mg B l⁻¹), the seed cotton yield decreased at the high level B application (16.2 mg B l⁻¹) by 13.75 % and 73.32 % in 2011 and 2012 respectively. Comparing with the control (0.6 mg B l⁻¹), the plant boron concentration increased at the high level B application (16.2 mg B l⁻¹) by 468.56 % and 1152.08 % in 2011 and 2012 respectively. The boron accumulation was identified especially in leaves and in the generative organs of the plant. The highest boron concentration was obtained from the 16.2 mg B l⁻¹ application as 1020 mg B l⁻¹ for the first year and 2048 mg B l⁻¹ for the second year. As a result of the two years experimental study, the phytoremediation capacity of cotton was found approximately 0.23 kg B da⁻¹ and the phytoremediation potential as approximately 1/57, the second year phytoremediation capacity increased compared to the first year results. But, the phytoremediation capacity decreased with increasing boron toxicity conditions. The humic substance application into soil showed any significant effect on the observed properties.

Keywords: boron, toxicity, humic substance, cotton, phytoremediation