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Growth, Physiological, Biochemical, and Ionic Responses of *Morus alba* L. Seedlings to Various Salinity Levels

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Abstract: Mulberry (*Morus alba* L.), a moderately salt-tolerant tree species, is considered to be economically important. In this study, 1-year-old mulberry seedlings cultivated in soil under greenhouse conditions were treated with five concentrations of sodium chloride (NaCl; 0%, 0.1%, 0.2%, 0.3%, and 0.5%) for 3 and 21 days. Plant growth parameters were not affected by 0.1% NaCl, but significant reductions were observed after treatment with 0.2%, 0.3%, and 0.5% NaCl. The malondialdehyde content and cell membrane stability of mulberry seedlings exposed to 0.1% NaCl did not change, indicating that mulberry is not significantly affected by low-salinity conditions. The Na contents of various organs did not increase significantly in response to 0.1% NaCl, but the K:Na, Mg:Na, and Ca:Na ratios of various organs were affected by NaCl. Marked changes in the levels of major compatible solutes (proline, soluble sugars, and soluble proteins) occurred in both the leaves and roots of NaCl-treated seedlings relative to control seedlings. Under severe saline conditions (0.5% NaCl), the ability of mulberry to synthesize enzymatic antioxidants may be impaired.

Keywords: salinity; mulberry; gas exchange; ion homeostasis; organic osmolytes; enzymatic antioxidants

1. Introduction

Plants are exposed to multiple abiotic stresses in their natural surroundings. Abiotic stress conditions such as high or low temperature, drought, and salinity are common unfavorable conditions that have negative effects on tree growth and production. Among these stresses, soil salinity imposes a major constraint on forestry production because it not only restricts growth but also limits the use of uncultivated land [1]. Salt stress exerts multiple adverse effects on plants, including reduced photosynthetic efficiency, ion toxicity due mainly to sodium (Na) and chlorine (Cl), and osmotic stress [2]. High-salt environments can also interfere with the ion homeostasis of plant cells, disrupt the