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Effects of Compost Application on Growth and Nodulation of Kidney Bean, Soybean and Alfalfa Under Salt Stress

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Abstract

The effects of two commercially prepared composts, Bark and Tenporon, on the growth and nodulation of kidney bean, soybean and alfalfa under salt stress were investigated in the greenhouse. Growth and nodulation of the legumes were improved by the composts. The inhibitory effect of NaCl and Na₂SO₄ at high concentration was also alleviated by the composts, especially in plants treated with Bark compost. The results suggest that application of some organic materials to salt-affected soils may enhance plant growth and nodulation of legumes, without desalinization with expensive chemical substances.

Introduction

Continuous irrigation with water loaded with soluble salts results in salination of arable soils and reduces crop yield in the field. According to Ben-Zioni *et al.* (1967) and Itai *et al.* (1968), crops grown under saline environment exhibit disturbed metabolism culminating in stunted growth and poor productivity. Rains (1979) outlined three basic problems encountered by plants exposed to saline environments. These are reduction in water potential of the surrounding environment making water less available, interference of toxic ions with the physiological and biochemical processes, and predominance of other ions over nutrient ions.

One way to reduce salinity is the application of compost. During composting, labile carbon compounds are lost, while more complex substances, such as humic acids, are synthesized (Riffaldi *et al.*, 1992). Besides, during decomposition of compost

material in the soil, different substances are released into the soil solution. Some of these substances are leached out of the plant root absorption zone, while others remain and result in changes in the soil biological and chemical status. The substances remaining within the root absorption zone, especially cations, play a role in legume growth and nutrition under saline condition. For instance, increasing external Ca concentration has been shown to inhibit Na absorption in beans (LaHaye & Epstein, 1971), soybean (Wieneke & Lauchli, 1980), and increasing germination percentage and early seedling growth of *Phaseolus vulgaris* (Cachorro *et al.*, 1994).

In the present study, two experiments were conducted to investigate the effects of two commercially-prepared composts, Bark and Tenporon (commonly used in Japan), on the growth and nodulation of kidney bean, soybean and alfalfa at salt