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Nutrient Management for Enhanced Growth of *Catharanthus roseus* L.

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Abstract

Plants absorb nutrients through the roots and through the foliage. When soil conditions are unfavorable or when micronutrients are needed, it may be desirable to make foliar applications of the plant nutrients. Foliar fertilization entails the application - via spraying of nutrients to plant leaves and stems and their absorption at those sites. The ability of plant leaves to absorb water and nutrients was recognized approximately three centuries ago. Present study shows the effect of foliar application of Boron and Manganese on the growth of *Catharanthus roseus* L. Boric acid and Manganese sulphate were applied as a foliar spray at different concentrations. Plant height, Root weight, Shoot weight and Number of leaves were monitored during plant development. Results clearly show that foliar application of boric acid and manganese sulphate mixture solution is beneficial for *Catharanthus roseus* L.

Key words: Micronutrients; Foliar fertilization; *Catharanthus roseus* L.

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Introduction

The micronutrients or trace elements are Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Molybdenum (Mo), Chlorine (Cl) and Boron (B). They are the key substances in plant growth and are comparable with the vitamins in human nutrition. Being taken up in small amounts, their range of optimal supply is very minute (*FAO ROME*., 2000). Boron (B) is an essential micronutrient required for normal plant growth and development. It is a very sensitive element, and plants differ widely in its requirements. Boron plays also an important role in cell-wall synthesis, sugar transport, cell division, differentiation, membrane functioning, root elongation, regulation of plant hormone levels, and generative growth of plants (Marschner, 1995). Manganese (Mn) is an essential micronutrient in most organisms. In plants, it participates in the structure of photosynthetic proteins and enzymes. Its deficit is dangerous for chloroplasts because it affects the water-splitting system of photosystem II (PSII), which provides the necessary electrons for photosynthesis (Buchanan, 2000). Mn has two roles in the plant metabolic processes: as an essential micronutrient and as a toxic element when it is in excess (Kochian *et al.,* 2004; Ducic and Polle, 2005). Mn^{2+} form is available for plants and can be readily transported into the root cells and translocate to the shoots, where it is finally accumulated *(*Marschner, 1995).

Catharanthus roseus L. is a renowned medicinal plant, belonging to the family Apocynaceae; commonly known as Madagascar periwinkle and is a rich source of alkaloids, which are distributed in all parts of the plant. It is a perennial, evergreen herb with 30-100 cm height that was originally native to the Island of Madagascar. The alkaloid content of *C. roseus* varies considerably in various parts; the maximum being in the root bark which ranges from 0.15 to 1.34 % and even up to 1.79 in some strains. The plant contains about 130 alkaloids of the indole group out of which 25 are dimeric in nature. Two of the dimeric alkaloids vinblastine and vincristine are mainly present in the aerial parts (Aslam J *et al.* 2010).

Materials and Methodology

Catharanthus roseus L was selected for the study. Effect of boric acid and manganese sulphate was observed on various level. Seeds were grown in different pots for different micronutrient treatment. Foliar spray of boric acid (100 ppm), Manganese Sulphate (80 ppm), and a mixture of boric acid (100 ppm) and Manganese Sulphate (80 ppm) were given to the plants. Tween-80 (0.1%) was used as wetting agent for each treatment. Foliar spray was given to plants every day in the evening.

Plant growth data was collected at the end of every week, to get the week wise changes in the growth of the plants. For the study of plant growth certain parameters such as shoot weight, leaves weight, root weight were examined and recorded.

Result and Discussion

A) Control and boric acid

Present application shows that weight of whole plant, leaves and shoot decreased (Fig 1.1, 1.2). Study shows the foliar application of boric acid had impact on Vinca plants as compared to control plants. These results were in line with (Noguchi *et al* 2003) who had seen lower shoot boric acid levels. A reduced plant growth with increased B concentration in plant tissues has been observed in tomato (Gunes *et al*., 1999), sunflower (Ruiz *et al*., 2003) and barley (Karabal *et al*., 2003).

B) Control and Manganese sulphate

Foliar application of manganese affected growth of Vinca plants. Present study shows that weight of whole plant, leaves, shoot and root decreased (Fig 2.1, 2.2). Manganese generally tends to accumulate predominantly in the plant shoot than in roots (page & feller 2005). Same results were seen in the Spring-Rush leaves from trees treated twice with manganese sulfate, in 1959 and again in 1960, contained significantly higher manganese concentrations than leaves from control plants (*LABANAUSKAS C. K*. 1963).

C) Control and (Boric acid + Manganese sulphate)

Foliar application of boric acid and manganese sulphate mixture significantly affected the vegetative growth parameters of Vinca plants. Plants sprayed with the mixture of the two revealed the highest increase in root weight, shoot weight, leaf weight and number of leaves as compared to control plants (Fig 3.1, 3.2). Foliar sprays of boric acid and manganese chloride shows significant increase in seed number, seed weight, oil content of seeds (N. Jabeen *et al.*2012).

Fig showing comparative data of various treatment of first and eighth week

Fig 1.1

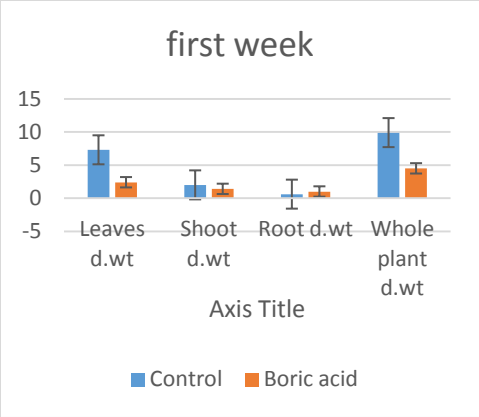


Fig 1.2

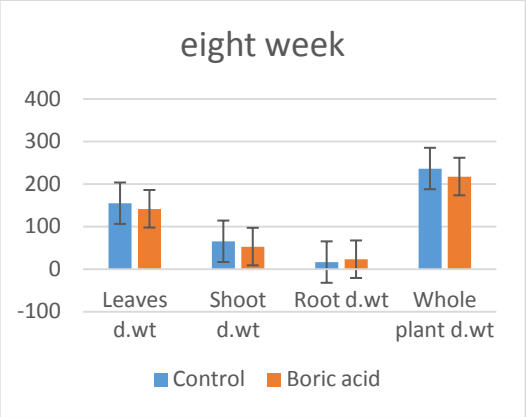


Fig 2.1

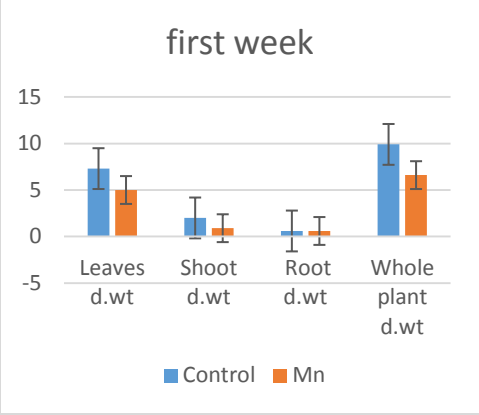


Fig 2.2

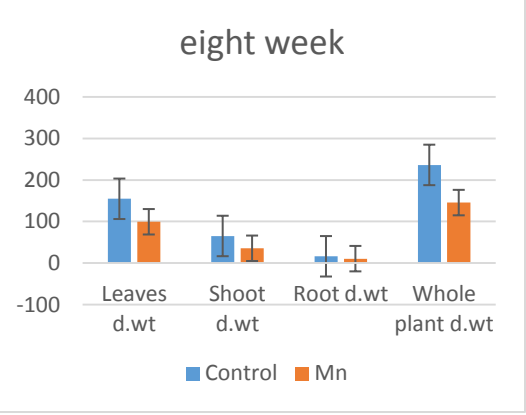


Fig 3.1

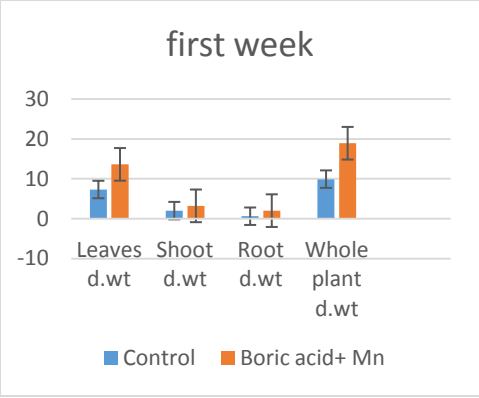
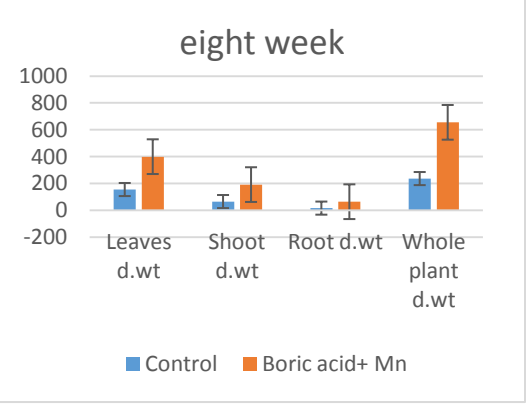


Fig 3.2



From these experimented results the following conclusions can be derived i.e., when foliar spray of Boric acid was done plant growth is reduced. When foliar spray of Manganese sulphate was done that time also plant growth is reduced. But when mixture of Boric acid and Manganese sulphate was given these was significant increase in plant growth.

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