

Effect of micro-nutrients on the seedling growth of selected medicinal plants cultivated under nursery conditions

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ABSTRACT

Since the beginning of human civilization, plants have been a significant source of medicines. India is regarded as the world's botanical garden due to its rich biodiversity and potential for economic growth. The primary component influencing a plant's growth and development is its nutrients. An inadequate supply of nutrients to plants stunts their growth and reduces their yield. Thus, optimal nutrient levels might result in the highest possible production. For plants to thrive, yield, and have higher quality, micronutrients are nearly as crucial as macronutrients. Plants only require trace amounts of it. The primary micronutrients needed in varying amounts by various crops include boron, iron, copper, zinc, manganese, magnesium, and molybdenum. The effect of nutrient elements at different level on the properties of medicinal plants was reviewed. Hence, the investigation was carried out showed that effect of micronutrients in the way of increasing the number of traits such as plant height, root length, no. of leaves per plant, leaf area index and no. of nodes per plant. From present investigation, this was concluded that the selected medicinal plants cultivated under nursery conditions *Withania somnifera*, *Ocimum gratissimum* and *Ocimum tenuiflorum* shows significant increase in the growth of the seedlings with the application of foliar spray of micronutrient as compared to the untested seedlings grown under same nursery conditions.

Key words: Micro-nutrients, Ashwagandha, Rama Tulsi, and Krishna Tulsi, Nursery and medicinal plants.

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INTRODUCTION

Medicinal plants form a numerically large group of economically important plants which provide basic raw materials for medicines, perfumes, flavors and cosmetics. These plants and their products not only serve as valuable source of income for small holders and entrepreneurs but also help the country to earn valuable foreign exchange by way of export. It is estimated that, about 3000 plants were recognized in India for their medicinal value and of them, 200 species are in wide use for their curative properties. According to World Health Organization, the global market for plant-based medicines will hit 5 trillion US dollar by 2030 [1]. However, problems arising from cultivation of medicinal plants also need to be addressed to avoid a setback in such traditional practices. Also, the conservation and management plans for medicinal plants should be based on empirical data rather than the estimates. Plant nutrition is the major factor which influences the growth and development of plant. The seed treatment with bio-fertilizers also helps in getting good yield and quality. Plant nutrition is a term that takes into account the interrelationships of mineral elements in the soil or soilless solution as well as their role in plant growth. This interrelationship involves a complex balance of mineral elements essential and beneficial for optimum plant growth. Nutrient deficiencies in plants are often made most evident by plant physiological responses.

There are seventeen essential mineral nutrients are classified as macronutrients and micronutrients based on their plant requirements. There are nine macronutrients: Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S) and the micronutrients include boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), nickel (Ni) and zinc (Zn). Each nutrient is essential for the growth and development of medicinal plants, deficiency of any mineral causing physiological disorder in the plants. Micronutrient deficiency is severing problem in soil and plants worldwide [2] while appropriate quality of micronutrients is

necessary for better growth, better flowering, higher fruit set, higher yield, quality and post-harvest life of various medicinal plant products, while its deficiency leads in lowering the productivity.

Keeping in view of the need for medicinal values of the plants, during present investigation the *Withania somnifera*, *Ocimum gratissimum* and *Ocimum tenuiflorum* medicinal plants were selected to cultivate under the nursery conditions with the objective of conservation and evaluate the effect of micronutrients on the growth and development of the seedlings stage.

Nurseries are places where seedlings are raised for planting purposes. In the nursery the young seedlings are tended from sowing to develop in such a way as to be able to endure the hard field conditions.

MATERIAL AND METHODS

The Nursery of selected medicinal plants was developed at the Hasanpur field of School of Agricultural Studies, Quantum University, Roorkee to evaluate the effect of micronutrient on the growth of the seedlings. The Sumitomo lattu fertilizer contain (38% humic acid, 28% sea weed extract 10% amino acid, 5% myo-inositol, 19% vitamin c,b,e and 2% microbial fermented extract) was uses as a source of micronutrient. The experiment was tested against a control in randomized block design replicated thrice. The Sumitomo lattu fertilizer was used at the concentration of 0.1% (V/V) and sprayed on foliage of all the medicinal plants.

Data on following physiological parameters were recorded as per procedure given below:

Leaf area index (55 days after sowing): Leaf area index (m²) was measured at 55 days after sowing in the nursery stage by using the following formula:

$$\text{Leaf Area Index} = \frac{\text{Total leaf area}}{\text{Ground Area}}$$

Leaf Length: Leaf length was measured at 45 days after sowing in the nursery stage.

Plant Height: Plant height was measured at 55 days after sowing in the nursery stage.

Root length: Root length was measured before transplanting the seedlings from nursery.

RESULT AND DISCUSSION

From the present investigation it is clear that, all the selected medicinal plants *Withania somnifera*, *Ocimum gratissimum* and *Ocimum tenuiflorum* shows significant increase in the growth of the seedling with the application of foliar spray of micronutrients compared to the seedlings grown under controlled conditions (Table: 1). The significant increase in the Leaf Area Index 2.02 was measured in *Withania somnifera* after the application of micronutrient as compared to untreated seedlings of medicinal plants.

Similarly, increase in the no. Of leaves per plant was observed in *Withania somnifera* and *Ocimum tenuiflorum* followed by *Ocimum gratissimum*. The other physiological parameters Plant Height, Leaf length, Root length and no. of nodes per plant shows same pattern of increase in the growth in all the selected medicinal plants after foliar spray of micronutrient in comparison of untreated seedlings of these medicinal plants (Table: 1).

The aforementioned results of micro-nutrients are in conformity with those obtained by Goma [3] on *Hibiscus sabdariffa* rosemary plant, Nasiri [4] on chamomile plant, Ajay [5] on *Mentha arvensis* L., Shitole and Dhupal [6] on *Cassia angustifolia*, Amran [7] on *Pelargonium graveolens* studied the number of leaves per plant in three sample seedlings of Ashwagandha after raising the mint nursery after pre-soaking treatments and Vermicompost supplementation first after 45 days after sowing and then after 60 days after transplanting. In comparison to control, V com supplementation caused a significant increase in leaf number regardless of pre-soaking treatments shows significant increase in the Plant Height of *Majorana hortensis*, M. even at low conc. of mixture of micronutrient and also observed significant increase in the root parameters. Similar results were obtained by El-Khateeb [8] on *Majorana hortensis* as they reported that application of humic acid at the low concentration gave the higher values for plant height and root parameters compared with the high one. Increasing plant height due to foliar application of mixture of micro nutrient treatments are in agreement with findings of Said-Al Ahl and Mahmoud [9] on *Ocimum basilicum* and Mazaheri [10] on *Cuminum cyminum*. Ameri [11] found that application of humic acid at 5g/l increased root length of *Ocimum basilicum*.

Table 1. Comparison of untreated seedlings of various medicinal plants after foliar spray of micronutrient

Medicinal Plants	Leaf Area Index		Leaves per plant		Plant Height		Leaf Length		Root length		No. of nodes per plant	
	Control	Treated	Control	Treated	Control	Treated	Control	Treated	Control	Treated	Control	Treated
<i>Withania Somnifera</i>	1.78	2.02	23.41	34.09	21.43	24.89	4	5	10.34	12	3	4
<i>Ocimum Gratissimum</i>	1.01	1.06	49	54	25	27.4	3	4	6.1	7.56	5	7
<i>Ocimum Tenuiflorum</i>	1.02	1.06	61.56	69	24	27	3	4	18.33	20.12	10	13

CONCLUSION

Application of balanced level of essential nutrients to plants will increase the growth and yield of the plant. Along with the macronutrients micronutrients are also essential to support the growth of medicinal plants. From the obtained results it can be concluded that, foliar spraying of micro-elements mixture enhanced the growth in medicinal plants. Based on the trial results, it is possible recommended that treating medicinal plants monthly with micronutrients mixture for high growth production and high yield.

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