

SOME BIOFACTORS INFLUENCING ROOT GROWTH IN HORSEGRAM (*DOLICHUS BIFLORUS L.*) SEEDLINGS

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The effects of vitamins, minerals and their combination on root growth in terms of root elongation were studied in horsegram (*Dolichus biflorus L.*) seedlings. The combination of folic acid and molybdenum significantly increased the root length by 125% followed by zinc and thiamine (118%) and riboflavin and iron (112%). The present work showed that proper combination of vitamins with minerals is highly useful for healthy root growth and for water absorption particularly in plants growing in arid and semi-arid regions where water deficits are common.

Keywords : Horsegram ; Length; Mineral; Root; Vitamin.

Introduction

Roots are dependent on shoots for carbohydrates, growth regulators and organic substances such as thiamine and niacin¹. Not enough is known about the effects of specific ions. Information available indicates that phosphorous stimulates root growth whereas deficiency of boron, calcium in root environment results in short stubby branched roots and leads to death of the root tips². Bio-factors aim to identify and understand the precise roles of trace substances that are required by living organisms. These bio-factors include vitamins, trace elements, growth factors and regulatory substances made by themselves³. Attempts were scanty to examine if a harmonious combination of biofactors can improve root growth and the factors that are necessary for proper growth are still not known. The present study is an attempt to understand in this direction.

Materials and Methods

Seeds of Horsegram (*Dolichus biflorus L.*) Var. Local variety; were surface sterilized with 0.1% mercuric chloride for 15 minutes and subjected to pre-sowing soaking in solutions of folic acid, thiamine, pyridoxine, riboflavin, molybdenum (Na molybdate), zinc (ZnSO₄. 7H₂O), manganese (MnCl₂), iron (FeCl₂) and their combinations at 30 ppm (30 mg/l) concentration for 24 hours (other lower concentrations i.e. 5, 10 and 20 ppm were found to be ineffective). After soaking, they were allowed to grow in distilled water in test tubes with cotton plugs for 8 days under laboratory conditions of diffused light at 28 ± 2°C.

Ten replicates were maintained for each treatment. Growth in terms of root and shoot length of seedlings were measured at two days intervals i.e. 2, 4, 6 and 8th day.

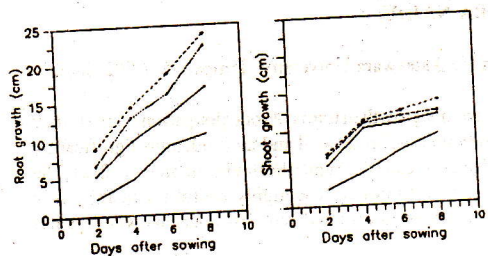


FIGURE 1
 — CONTROL
 — FOLIC ACID 30 ppm
 — MOLYBDENUM 30 ppm
 - - FOLIC ACID + MOLYBDENUM 30 ppm + 30 ppm

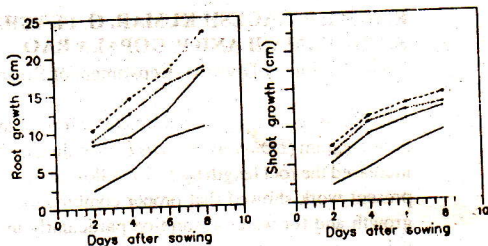


FIGURE 2
 — CONTROL
 — THIAMINE 30 ppm
 — ZINC 30 ppm
 - - THIAMINE + ZINC 30 ppm + 30 ppm

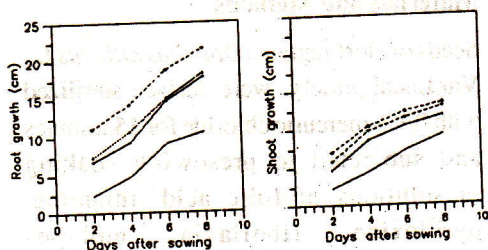


FIGURE 3
 — CONTROL
 — PYRIDOXINE 30 ppm
 — Mn 30 ppm
 - - PYRIDOXINE + Mn 30 ppm + 30 ppm

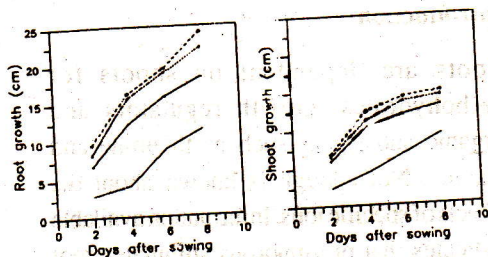


FIGURE 4
 — CONTROL
 — RIBOFLAVIN 30 ppm
 — Fe 30 ppm
 - - RIBOFLAVIN + Fe 30 ppm + 30 ppm

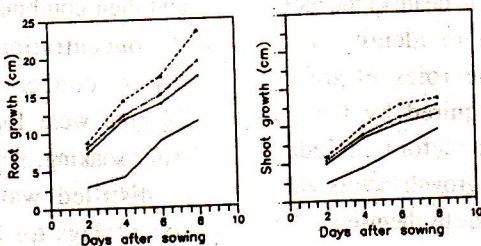


FIGURE 5
 — CONTROL
 — NIACIN 30 ppm
 — Cu 30 ppm
 - - NIACIN + Cu 30 ppm + 30 ppm

Fig. 1-5. Influence of folic acid, thiamine, pyridoxin, riboflavin, niacin and molybdenum, zinc, manganese, iron and copper and their combinations on root and shoot growth of Horsegram (*Dolichus biflorus*) seedlings.

Results and Discussion

The results indicate that root length increased significantly with folic acid and molybdenum by 58.9% and 110% respectively, over control. Combination of folic acid and molybdenum enhanced the root length by about 125% (Fig.1). Folic acid and molybdenum combination increased shoot length by about 46%. Thiamine and zinc caused an increase of 68.8% and 74% respectively, in root growth over the control. Their combination increased the root growth by 118% (Fig.2). The increase in shoot growth with zinc and thiamine combination was only 53%. Pyridoxine caused an increase of 67% while manganese caused 73% and their combination increased about 103% (Fig.3). The shoot growth promotion was only 44%. Riboflavin enhanced root growth by 59% and iron resulted an increase of 65% while their combination recorded an increase of 112% (Fig.4). Shoot growth was promoted by 62% with their combination. Niacin and copper treatments caused an increase of 52% and 70% respectively and their combination increased root growth by 105%. The rise in shoot growth was only 45% with their combination (Fig.5).

Thiamine among the B-group vitamins and molybdenum in minerals caused maximum increase in root growth. Folic acid and molybdenum combination produced best result. Thiamin (B₁) and Pyridoxine (B₆) are the established plant growth hormones produced by leaves and are essential for plant growth⁴. However, the

present study revealed that other B-group vitamins are also required for proper growth. The importance of sugars and amino acids for root elongation has also been stressed⁵⁻⁷. Particularly in intact plants, the requirement and participation of specific minerals for root growth promotion has seldom been emphasized.

It appears from the present study that the minerals are needed more for root growth than that of vitamins. Proper combination of vitamins and minerals appears to be highly beneficial for healthy root growth. It may be possible to regulate such balanced ratio within the plant cell. Nevertheless exogenous application of these bio-factors would be beneficial to crop plants in arid and semi-arid regions where a deep root system is required to absorb water from deep layers of the earth.

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