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Effect of microbial inoculants on the yield of beet-root (*Beta vulgaris*)

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Comparative performance of *Azotobacter chroococcum, Glucanobacter diazotrophicus* tested both at 50 per cent and 75 per cent recommended N showed that *Glucanobacter diazotrophicus* was more effective than *Azotobacter chroococcum* in improving the tuber yield. The total tuber yield per plot and per hectare in plants was maximum in combined inoculation of microbial inoculants *viz., Azotobacter chroococcum, Glucanobacter diazotrophicus, Bacillus megaterium* and *Trichoderma harzianum,* with 75 per cent N, P with full dose of K compared to control plants (FYM alone T_{14}).

Key words : Microbial inoculants, Yield, Beet-root

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INTRODUCTION

Nutrient management is most important in beet-root to obtain good growth and higher yield of root crops. The crop benefiting microbial inoculants generally called as biofertilizers, help in augmenting the crop productivity through effective mobilization of major plant nutrients like N, P and K and other minor nutrients needed by the crop. These beneficial microorganisms are also known to secrete plant growth promoting substances like IAA, GA, cytokinins, vitamins for the improvement of crop growth, yield and for quality produce.

India is the leading vegetable producing country in the world. Presently vegetable cultivation occupies an area of 6.09 million hectares with an annual production of 84.8 million tons accounting to a productivity of 13.90 tons per hectare (The Hindu Survey of Indian Agriculture 2004). India being blessed with the unique gift of nature with diverse climates and distinct seasons, it makes it possible to grow an array of vegetables whose number exceeds more than hundred types.

Beet-root or garden beet (*Beta vulgaris* L.) is an important root vegetable crop (root modification) belonging to the botanical family Chenopodiaceae. It is indigenous to Southern Europe. The chromosome number of cultivated beet-root types is 2n=2x=18. It is a popular root vegetable grown mainly for its fleshy enlarged roots in almost all the states of India but not as common as radish, carrot and turnip. The garden beet is eaten boiled or as salad, cooked with other vegetables and it is also used in pickles, chutneys and in canned food products. The garden beet is rich in proteins, carbohydrates, calcium, phosphorus, iron and vitamin C (Aykroyd, 1963). The beet tops are also rich in iron, vitamin A, vitamin C and protein. Apart from these, it also contains traces of minerals, fat, potassium, vitamin B_1 and B_2. The red colour of beet-root is due to β-cyanin, a nitrogen containing compound, with chemical properties similar to anthocyanin. Beet-root also contains a yellow pigment *viz.,* β- xanthin. The ratio of these two pigments varies with cultivation and changes during the growth and environmental conditions (Nilsson, 1973).

The area under beet-root in India is about 5000 ha with an annual production of 90,000 tons (Anonymous, 2001). It is essentially a cool weather crop. It grows best in winter with bit warm climate in the plains of India. Good quality roots, rich in sugar and intense red colour are obtained always in cool weather with a temperature range between 18.3^{0}C to 21.1^{0}C. At a temperature range below 10^{0}C, plants start wilting before