INFLUENCE OF SODIUM HUMATE ON THE CROP PLANTS INOCULATED WITH BACTERIA OF AGRICULTURAL IMPORTANCE

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SUMMARY

The dry-matter yield and nitrogen uptake of berseem (*Trifolium alexandrinum*), yield, nitrogen uptake, nodulation and leghaemoglobin content of dhaincha (*Sesbania aculeata*) inoculated with specific rhizobia were appreciably influenced by the application of sodium humate to soil under green house conditions. Even the application of sodium humate alone without bacterial inoculation had good growth stimulating influence on both the crops, and this effect was further improved by the application of inorganic nitrogen to dhaincha plants. A fair increase in the yield and phosphorus uptake of wheat (*Triticum vulgare*) inoculated with *Azotobacter* and/or *Bacillus* spp. was also recorded with the addition of the humic material to the soil. The greatest effect was observed on the plants inoculated with *Azotobacter* and *Bacillus* spp. together.

INTRODUCTION

The studies on the role of specific humus substances in the growth and development of plants have received considerable attention during the last two decades. It has been reported that these substances extracted from soil, organic manures, peat, and even coal, exert favourable influence on the growth, nutrient uptake and health of plants. Although there is no agreement as yet with regard to the mechanism of action of humus substances on plants, the growth-promoting effects are usually attributed to their being biologically active components of organic matter which play a multisided role in the physiology of plants.

Substantial growth-stimulating effects have also been observed on many soil micro-organisms. Although information is
available on the effects of humus substances on plants and microorganisms when cultivated independently, little is known about the influence of these substances on the plants inoculated with bacteria of agronomic importance. This communication deals with the influence of sodium humate on the growth and nutrient uptake of berseem (*Trifolium alexandrinum*) wheat (*Triticum vulgare*) and dhaincha (*Sesbania aculeata*) inoculated with specific *Rhizobium*, *Azotobacter chroococcum* or mixed culture of phosphate solubilizing bacteria.

**MATERIALS AND METHODS**

Humic acid was extracted from well decomposed farmyard manure by the method described earlier. The purified humic acid gel was converted into sodium humate by neutralizing it with NaOH; dialysed in cellophane bags and air dried.

Alluvial sandy loam soil was collected from a cultivated field and passed through 2-mm sieve. It was analysed for carbon (0.36%), nitrogen (0.04%), available phosphorus (0.001%), humic acid (0.04%) and its pH (7.8) was determined. Humic acid was determined by the method employed by Chaminade.

The soil used for growing berseem and wheat in earthen pots of 10 kg capacity received the basal dressing of superphosphate at the rate of 90 kg P₂O₅ per hectare and rock phosphate at the rate of 70 kg per hectare respectively, and was treated with sodium humate so as to add 0.03% of the same to the soil. Berseem (*Trifolium alexandrinum*) seeds were inoculated with freshly grown cultures of *Rhizobium trifolii* and those of wheat were inoculated with *Azobacter chroococcum* and/or strains of phosphate-solubilising bacteria which included *Bacillus megaterium* var. *phosphaticum*, *Bacillus circulans* and *Bacillus polymyxa*. The pots, after sowing the seeds were arranged in randomised-block design in the greenhouse. Each treatment was quadruplicated. Frequent irrigation was provided to maintain proper moisture conditions in the soil. Each experiment was accompanied by a control treatment in which case the soil was neither amended with sodium humate nor the seeds were inoculated with the bacterial cultures.

Berseem crop was harvested in five cuttings. The dry-matter yield from each cutting was recorded and the material was analysed for nitrogen percentage and total nitrogen uptake by the crop was calculated. Nitrogen was estimated by the conventional Kjeldahl method. Wheat crop was grown to maturity to obtain straw as well as grain yield. The dry-matter yield of both straw and seed was recorded, analysed for phosphorus content and the total phosphorus uptake was calculated. Phosphorus was determined by the yellow colour method described by Jackson. Dhaincha (*Sesbania aculeata*) was grown in earthen pots each containing 2 kg soil. The soil was given a basal dressing of superphosphate at the rate of 90 kg P₂O₅ per hectare and was