

### EFFECT OF PHOSPHOBACTERIA ON THE YIELD AND PHOSPHATE UPTAKE OF POTATO CROP

SEED bacterization with *Bacillus polymyxa* and *Pseudomonas striata* was found to increase the yield and phosphate uptake of potato crop when used as single and mixed inoculant. The effect was better with the composite culture than with the single culture.

There are substantial deposits of low grade rock phosphate in India which are not available as such for plant growth, particularly in non-acidic soils. The microbial solubilisation of these insoluble phosphates should be exploited for improving crop productivity. Reports are available on the positive influence of phosphate solubilising microorganisms with and without organic and inorganic fertilizers<sup>1-3</sup>. However, there are some workers who could not get encouraging results due to inoculations<sup>4,5</sup>. The reports are scanty on the use of composite cultures for better crop production<sup>6</sup>.

The present communication deals with the effect of phosphobacteria as single and mixed inoculants on the yield and phosphate uptake of potato crop in soils which are rich in organic matter and insoluble phosphates.

Field trials were conducted at Kufri (Simla) with potato crop (*Solanum tuberosum*) var. Kufri Nav Jyoti. The experimental area was selected for its uniformity as far as soil composition was concerned. The soil analysis showed that it had pH 6.50, organic carbon 1.05%, total nitrogen, 0.23% and available P<sub>2</sub>O<sub>5</sub>, 59.5 ppm. Spacing between row to row and seed to seed was 50 cm and 20 cm respectively. Since the soil was rich in native phosphates, no phosphate fertilizer was applied. Recommended N and K was added.

For inoculation of tubers, culture suspensions of *B. polymyxa* and *P. striata* were prepared by growing them in Pikovskaya's triacalcium phosphate medium. The inoculation was done by dipping the seeds in the suspension of bacteria in the following combinations—Uninoculated (Control), *B. polymyxa*, *P. striata*, *B. polymyxa* + *P. striata*.

The seeds were then dried in shade for each treatment and four replications were kept in randomized block design. The crop was harvested after 180 days and the weight of the potato tubers was recorded replication-wise. Tubers were dried at 75°C for 3 days, powdered and their phosphorus content estimated<sup>7</sup>.

The results (Table I) showed positive effect of phospho-bacteria on the yield and phosphate uptake by potato tubers. Increase in yield of potato tubers was maximum when both the phospho-bacteria were inoculated together (35.2%) followed by *P. striata* (30.8%) and *B. polymyxa* (22.9%). The yield of

potato tubers was increased about 24–31 q/ha and 36 q/ha due to inoculation with single and mixed inoculants respectively. However, trend of phosphate uptake did not follow the same trend since highest was found with *B. polymyxa* (6.46 kg/ha) and next in order were *B. polymyxa* + *P. striata* (6.27 kg/ha) and *P. striata* (5.92 kg/ha). The present studies indicate the feasibility of using phosphate solubilising bacteria for increasing potato yield and particularly as mixed inoculants.

TABLE I  
Effect of bacterization on tuber [yield and phosphate uptake

Treatments	Tuber yield Q/ha.	P <sub>2</sub> O <sub>5</sub> %	P <sub>2</sub> O <sub>5</sub> uptake Kg/ha
Uninoculated	103.6	0.179	4.43
<i>B. polymyxa</i>	127.4	0.217	6.46
<i>P. striata</i>	135.4	0.182	5.92
<i>B. polymyxa</i> + <i>P. striata</i>	139.9	0.196	6.27
C.D. at 5% level	6.2	..	0.28

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1. Arora, D., *Ph.D. Thesis*, P.G. School, IARI, New Delhi, 1975.
2. Gaur, A. C. and Ostwal, K. P., *Indian J. Expt. Biol.*, 1972, 10, 393.
3. Sundara Rao, W. V. B., "Bacterial fertilisers," In *Hand Book of Manures and Fertilizers*, ICAR Publication, 1965, Chapter 9, p. 186.
4. Arao, I., Kan, Y. S. and Sihe, T. L., *Adv. Pedol. Sin.*, 1956, 4, 179.
5. Sundara Rao, W. V. B. and Sinha, M. K., *Indian J. Agric. Sci.*, 1963, 33, 272.
6. Srivastava, L. L., *Ph.D. Thesis*, P.G. School, I.A.R.I., New Delhi, 1963.
7. Jackson, M. L., *Soil Chemical Analysis*, Prentice Hall, Inc., New Jersey, 1958.