5. SUMMARY

Phosphorus is one of the essential plant nutrients, which is required in optimum amounts for proper growth of plants and soil biota. The problem of phosphate fertilization may become serious in coming years because of the fact that manufacture of phosphatic fertilizers requires the use of non-renewable resources. The situation is further aggravated by the fact that phosphate is readily fixed in the soil and the average utilization efficiency of added fertilizer phosphate by plants ranges from 15-25% only. Several heterotrophic and chemotrophic bacteria have capacity to solubilize insoluble mineral phosphates. Fungi are a strong group of phosphate-solubilizing microorganisms which also solubilize hardly soluble rock phosphate, bone meal etc besides $\text{Ca}_3(\text{PO}_4)_2$, $\text{FePO}_4$, or $\text{AlPO}_4$. Due to the above reasons it is clear that the use of biofertilizers is the best alternative to overcome the present problem being faced in agriculture. Moreover, entry of agrochemicals, that are extensively applied on various agricultural crops, into soils has far-reaching consequences as it disturbs the delicate equilibrium between microorganisms and its environment. However, the interaction effects of pesticides are not consistent. For a meaningful and more acceptable generalization regarding the non-target effects of a group of pesticides towards any biochemical process in soil mediated by microorganisms, a large number of chemicals are to be included in such studies.

In an attempt to provide an insight into the details of occurrence and abundance of phosphate solubilizers, the extent of solubilization of tricalcium phosphate mediated by soil microorganisms, and the influence of agrochemicals on isolated strains of phosphate-solubilizing fungi, following are objectives of the present study.
• Isolation of phosphate-solubilizing microorganisms from non-rhizosphere and rhizosphere soils of foxtail millet and groundnut.

• Identification of efficient strains of soil isolates in phosphate solubilization.

• Selection of suitable medium for phosphate solubilization.

• Isolation of acid phosphatase from selected strains of Aspergillus spp.

• Finally, assessing the impact of endosulfan, mancozeb and neem oil on phosphate solubilization by Aspergillus spp. in pure cultures.

The rhizosphere of both foxtail millet and groundnut plants harbored significantly larger population of phosphate solubilizers than the corresponding non-rhizosphere soil samples. Auxenic cultures of phosphobacteria were obtained and these isolates were further screened for their efficiency in phosphate solubilization. The observations of the present study revealed that in some cases there have been contradictory results between plate halo detection and phosphate solubilization in liquid cultures. However, the method employed could be regarded as generally reliable for isolation and preliminary characterization of phosphate-solubilizing microorganisms.

When the isolated fungi and bacteria were screened for their efficiency in phosphate solubilization in broth cultures, the fungal strains proved to be more effective phosphate solubilizers compared to the bacterial isolates. Of the three growth media employed in the present study, growth and phosphatase activity were in the increasing order: Pikovskaya’s medium > phosphate growth medium > minimal salts medium. An attempt made for the isolation of acid phosphatase resulted in enrichment
of acid phosphatase in the fractions collected from ion-exchange chromatography followed by gel filtration chromatography. However, the acid phosphatase from the Aspergillus spp. could not be isolated to homogeneity. Using SDS-PAGE, the relative molecular weight of the enriched protein was found to be 62 kDa. The phosphate-solubilizing efficiency of the selected strains of Aspergillus spp. was significantly inhibited by all the three concentrations (10, 25 and 50 μg/ml) of endosulfan, mancozeb and neem oil. This inhibitory effect lasted even up to 12 days after addition of pesticide to the Pikovskaya’s medium. This observation clearly suggests that the inhibition of phosphate solubilization mediated by soil microorganisms under the influence of agrochemicals could be beneficial in securing large gains in the efficiency of phosphatic fertilizers that are applied in modern agriculture.