

## **Isolation and Characterization of Phosphate solubilizing bacteria from Corn stalk and its activity on soil**

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**Abstract:** Microbial inoculants or bio inoculants are directly used as biofertilizers. It is a product of selected, beneficial and live microorganism which help to improve plant growth and productivity or, mainly through supply of plant nutrients. Phosphate solubilizing organisms play an important role in growth of the plants. The bio inoculants improve the shelf life and survivability of microbes in soil and stimulate the growth of the plants. The present study was to extract the phosphate solubilizing bacteria from corn waste and its formulation in growth of pulses.

**Keywords:** Corn stalk, Phosphate solubilizing bacteria.

### **Introduction**

Soil microbes play a significant role in making the phosphorus available to plants by mineralizing the organic phosphorus in the soil[1]. The uptake of phosphorus by plants in tiny fraction was supplied in the form of fertilizer. This inorganic phosphorus is rapidly immobilized and unavailable to the plants[2].

There are so many phosphate solubilizing microbes have been isolated from rhizospheric soil of crops. The phosphate solubilizing bacteria and fungi have the maximum potential to be used as biofertilizer. This PSM application to the crop field has resulted in rapid yield of crops and disease resistant to the crops[3]. This PSM are capable of solubilizing insoluble inorganic phosphates into soluble organic phosphate[4]. PSM dissolves the phosphorus content in soil through the formation of organic acids mainly gluconic and ketogluconic acid and reduces the pH of the rhizosphere [5]. This PSM based biofertilizers improve the quality of fruits, vegetables and grain crops and increase their resistance to diseases and adverse condition ([6,])

Plants get phosphorus from the soil solution as phosphate anions .This anions are extremely reactive and may be immobilized through precipitation with calcium ions etc. The phosphate solubilizing efficiency of PSM can be checked by using different formulations such as carrier based coal dust , coconut husk and liquid formulations[7].

10gm of soil sample was dissolved in 100ml distilled water sterilized water and mix the sample well and considered the diluted the soil sample in sterilized distilled water up to  $10^{-7}$  dilution (each test tube containing 9ml of sterilized distilled water ) then  $10^{-5}$   $10^{-6}$   $10^{-7}$  dilutions taken for spread plate technique. Sterilized nutrient agar prepared and poured into petridishes after solidification of the medium 0.1MLsample was poured into agar medium plate by using L-Rod spread the sample evenly over the agar surface and then incubated at  $37^{\circ}\text{C}$  f or 24 hours.

### **Isolation of PSB**

Pikovskaya's agar medium was found to be as selective media for the isolation of phosphate solubilising bacteria. The composition of pikovskaya medium was maintained in11 . The sterilized pikovskaya medium was prepared and poured into Petri dishes .After solidification of the medium, 0.1ml sample was

poured into agar medium plate by using L-Rod spread the sample evenly over the agar surface and then incubated at 37°C for 24 hours[8].

### Detection of PSB

0.1 ml of PSB were isolated from each sample was subjected into pikovskaya agar medium containing insoluble tri calcium phosphate and incubated at 27-30°C for 7 days. Insoluble tri calcium phosphate is present in the medium used for halo zone formation at 37°C in two weeks. The morphological features of isolated bacteria via shape, size elevation, surface margins, surface texture and color were observed and characterized by gram staining[9].

### Solubilisation Index

10 ml of each PSB culture was preserved in sterile distilled water. This was placed in pikovskaya agar medium at 28°C for seven days. Solubilisation index was measured by Edi-premono [10].

### Physical parameters of soil

The pH, moisture, bulk density, specific gravity and water holding capacity of the soil, rhizosphere and corn stalk were analyzed. The nitrogen, phosphorus and nitrogen content of the samples were qualitatively assessed by soil testing kit.

### Preparation of liquid inoculants

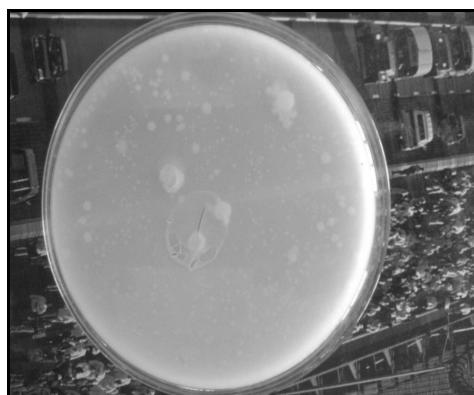
The pikovskaya 's broth incubated with water in 250ml conical flask . It was allowed to multiply by incubating at 32°C in a incubator cum shaker at 100 rpm for 72 hours. The broth containing approximately  $25 \times 10^{11}$  cfu/ ml was used as a starter culture for the production of liquid inoculants. This can be used as nutrient enhancer for growth of plants. Peat soil and saw dust can be used as carrier materials. The neutralized peats soil is to be better carrier material for bio fertilizer production[11,12].

## Results and Discussion

A Considerable number of bacteria species are able to exert a beneficial effect upon plant growth. Bacillus belongs to phosphate solubilising and mobilizing activity [13]. This show efficient solubilization of insoluble phosphate this organic secret organic acid that solubilize insoluble phosphate added to the soil which than becomes available for plant absorption

Microbes were isolated from corn waste by serial dulation. It was followed by spread plate technique. The isolate from media was examined microscopically and conformed as bacillus. Bacillus is a rod shaped and white colour colony formation on petridish

This culture bacillus was grown in media containing insoluble phosphate. The clear colonies observed in the media. The cultured bacteria were put in media containing insoluble tri-calcium phosphate incubated for week and observed the clear zone around the colonies[14]



**Figure 2: Halo zone formation**

This was due to the secretion of organic acids by soil microbes. Production of organic acid results in acidification of the microbial cell and its surrounding. Bacillus is the most powerful phosphate solubiliser[15].The pilot study was carried out to check the physico chemical characteristics of soil such as pH. The nitrogen content of fertile soil was found to be low .The amount of Potassium in soil was found to be high and phosphorus content was moderate. The pH of the soil was neutral. The physical properties of soil were significantly affected by the application of PSB mediated carriers.

## Conclusion

Microorganisms with plant growth promoters have been used to produce inoculants. Sweet corn materials are able to support good growth and agronomic use of agronomic as substrates cause changes in the soil affecting the physico chemical characteristics and microbial activity in rhizosphere. The breakdown of such materials to simple sugar provide energy source for heterotrophic microorganism such as p – solubilizing and nitrogen fixing bacteria.

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