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# A More Efficient Method For Soil Microbial DNA Extraction For Metagenomics Investigation

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**Abstract**

The most affordable and plentiful phosphoric fertiliser is rock phosphate, however due to its limited solubility, it is not always agronomically beneficial. A reasonable solution to this problem has been found to be the use of rock phosphate along with phosphate solubilizing bacteria. In the current study, fungal strains that can dissolve rock phosphate were isolated from soil samples taken at random from locations in and around Vadodara. Thirty distinct fungal strains were chosen to solubilize rock phosphate in Pikovskayas' medium, which contains 5% Senegal rock phosphate as a source of phosphorus. Three isolates out of these showed the greatest rock phosphate solubilization, with 92 ppm, 381 ppm, and 297 ppm in seven days and a marked drop in pH.Additionally, each isolate's bio-fertilizer potential was tested separately on Pennisetum glaucum (bajra) in pots in a natural habitat using rock phosphate. After this treatment, the majority of the biometric markers increased. The outcomes show a beneficial impact on plant growth from the simultaneous application of rock phosphate and phosphate-solubilizing fungus.

**Keywords:**
Fungi, Biofertilizers, Rock Phosphate Solubilization, Pot Studies

**Introduction**

One of the fundamental macronutrients that plants need is phosphorus (P). When used as a soluble fertiliser, it quickly becomes immobilised [1]. Immobilization reduces the amount of P that is available to plants, necessitating frequent reapplication, which is expensive and not good for the environment [2]. Sustainable agricultural methods are encouraged to use less expensive sources of phosphorus [3,4]. Rock phosphate (RP) is currently used mostly to maintain the soil's P level in a form that plants can use [5]. The main problem to using RP as a phosphatic fertiliser is its poor solubility. Such rocks are typically transformed into more valuable products by physical and chemical processes such particle size reduction and partial acidification [6].According to reports, phosphate induced microbial solubilization can increase a soil's P availability [7, 8]. By solubilizing inorganic and organic phosphates in the soil, several bacteria and fungi can enhance plant growth [9,10]. According to certain reports, fungi are better at solubilizing RP than bacteria [11]. One of the main groups of soil microflora engaged in P cycling is thought to be this one. Two of them, Penicillium and Aspergillus, are frequently utilised for the solubilization of phosphate [12].

According to research, the application of RP as a phosphate fertiliser in conjunction with the activity of soil microorganisms can be successful[13]. It has become more crucial to use phosphate solubilizing microorganisms (PSM) and RP in combination as a biofertilizer to prevent the depletion of high-grade RP stocks [14]. In the current investigation, RP solubilizing fungi were isolated from crop areas in and around Vadodara that had rhizosphere soil. The strains were evaluated for their ability to solubilize Senegal RP, a raw material used in the manufacture of phosphoric acid. In a modified Pikovaskaya's (PVK) medium, the phosphate solubilization activity of the fungal isolates was evaluated qualitatively and quantitatively. Using Pennisetum glaucum (bajra), isolates with the greatest inorganic phosphate solubilizing activity were assessed in pot experiments under natural environment

The current investigation reveals that common soil fungus species have a high capacity for phosphate solubilization.

**Discussion**

Aspergillus and Penicillium strains [22–24]. These isolates produced 45–50% RP in seven days throughout the investigation, which is consistent with other observations [3,25,26]. Here, RP solubilization was accompanied by a pH decrease, which suggested fungi were producing organic acids. This was confirmed by HPLC examination of the sample data.

In studies, Aspergillus produced a large amount of citric acid, which is thought to be the key to maximising RP solubilization.
These data are supported by earlier studies that found a connection between Aspergillus' synthesis of citric acid and its solubilization of RP [25, 27].

In studies, Aspergillus also produced a good amount of oxalic acid from citric, which is already known to be crucial for the solubilization of RP [28]. According to data that have been published [29–31], gluconic, glycolic, and malic acids are here accountable for Penicillium's RP solubilization. Numerous authors have found that Aspergillus and Penicillium have the ability to promote plant growth in pot and field trials in addition to solubilizing phosphate under laboratory settings [10,32,33]. When these isolates were used alone or in conjunction with RP powder during this trial, similar benefits were seen.

This study confirmed previous findings [31,34,35] by showing that soil amendment with RP and phosphate-solubilizing fungus can boost plant growth.Furthermore, these isolates caused These isolates also produced a variety of altered physical, biological, and chemical soil characteristics. After treatment, the soil became neutral, which improves its electrical conductivity. After this treatment, the soil's overall nutritional value also rises, and these outcomes are consistent with previous findings [36]. These findings confirm that RP solubilizing fungal isolates used in conjunction with RP have a beneficial impact on plant growth [37]. In light of sustainable agriculture methods, it might offer phosphorus fertiliser as an environmentally preferable substitute.

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