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Optimizing environmental parameters for *in vitro* phosphate solubilization by *Aspergillus aculeatus*

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Rock phosphate is the cheapest fertilizer and the most abundant, but its direct application in the soils is not always agronomically effective due to its low solubility in water. The fertilizer value of rock phosphate can be substantially increased by the exogenous introduction of phosphate solubilizing microorganisms (PSM). Fungi such as *Aspergillus sp. and Penicillium sp.* have been reported to possess a greater ability to solubilize rock phosphate. The purpose of this study was to investigate the optimum growth conditions needed for the native *Aspergillus aculeatus* to efficiently solubilize insoluble mineral P forms into soluble P.Pikovskaya medium modified by replacing $Ca_3(PO_4)_2$ quantitatively with Eppawala Rock Phosphate (termed PVK-ERP) was used for the studies. Effect of time, aeration, concentrations of carbon and nitrogen sources, and the type of nitrogen source $(NH_4)_2SO_4$ and urea) were determined. To determine the time needed for effective solubilization, 1 ml of spore suspension containing approximately 1 x 10^7 spores of *A. aculeatus* was inoculated into 50 ml of PVK-ERP(0.36g of ERP contained 50ml of medium) liquid medium. Soluble phosphate (Pi) content was measured daily up to 4 days by using Murphy and Riley method. The same procedure was followed by changing the concentrations of glucose and $(NH_4)_2SO_4$ and replacing $(NH_4)_2SO_4$ in the modified PVK medium with urea. For all the above simulations two sets were prepared and the medium with added sterile distilled water was taken as the control. One set was kept in the shaker at 100 rpm oscillations and other set as still cultures to determine the effect of aeration. Three replicates were maintained. After incubating for 72 hours at room temperature the samples were filtered and the solubilized phosphate content was measured spectrophotometrically (Murphy and Riely method). The gathered data were analysed statistically using SPSS 16.0 version.It has been noted that in all the simulations, the amount soluble in still cultures is very low compared to its aerated counterpart. Mean solubilized phosphate concentrations were significantly different among the different glucose, $(NH_4)_2SO_4$ and urea combinations in PVK medium. In aerated media, *A. aculeatus* showed the highest solubilized Pi 176.983 mg/L in C1N1 combination ($C_{glucose}$ = 10 g/L, N_{urea} = 0.214 g/L), which actually contains the C and N combinations of the standard PVK medium. However, phosphate solubilization was significantly low in all the other stimulations compared to that of the standard medium. Mean phosphate solubilization was 166.73 mg P/l in the standard PVK medium. Statistical analysis revealed that phosphate solubilization decreased with increasing urea concentration for a particular C concentration. However, when glucose concentration increases in parallel with the urea concentration,solubilization showed an increasing trend. However, no correlation was found between the amount of urea added and the phosphate solubilization efficiency of *A. aculeatus*.

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