

Correlation Between Nitrogen Fixation Rate and Alginate Productivity of an Indigenous *Azotobacter vinelandii*

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Background & Objectives: *Azotobacter vinelandii*, a gamma-proteobacterium, is an obligate aerobic free-living gram-negative soil bacterium capable of fixing nitrogen. Oxygen transfer rate into the cell is reduced by the increase of alginate concentrations during the course of *A. vinelandii* cultivation. This phenomenon provides a low intracellular oxygen concentration needed for nitrogenase activity. This study aims at designing a simple strategy to explain the alginate production, cell growth, nitrogenase activity correlation in *A. vinelandii* under aerobic conditions.

Methods: 35 different soil samples were taken from the rhizosphere of agricultural crop of Iran. Enrichment and isolation strategies were employed for microbial isolation. Physiological and biochemical characteristics were determined. Molecular identification was performed using selective nifH-g1 primers. Alginate production and nitrogenase activity assay by each isolate of *Azotobacter* were carried out. Bacterial growth, alginate production and Nitrogenase activity were conducted by time-coursed quantitative measurements.

Results: Total of 26 isolates were selected after enrichment, isolation, and screening. The isolate was identified by molecular tests as *A. vinelandii*. The highest alginate productions of 1.02 g/l and 0.91g/l were noted after 4 days in 8 isolates.

Conclusion: Nitrogen fixation and alginate production yielded significant and positive Pearson's correlation coefficient of $R^2 = 0.760$, $p \sim 0.02$. Finally two *A. vinelandii* isolates viz, A3 and A21 with the highest alginate production were chosen with significant and positive Pearson's correlation coefficient of $R^2 = 0.723$, $p \sim 0.04$.

Keywords: Alginate; *Azotobacter vinelandii*; Nitrogenase; Nitrogen Fixation