

Parujee Phumklai 2013: The Optimum Conditions for Growth of *Azotobacter vinelandii* TISTR 1094 in the Production of Biofertilizer for Improvement of Nitrogen Fixation in Sugar Cane Cultivation. Master of Science (Biotechnology), Major Field: Biotechnology, Department of Biotechnology. Thesis Advisor: Associate Professor Wirat Vanichsriratanana, Ph.D. 94 pages

The problem of soil degradation resulting from using of chemical fertilizers caused the bio-fertilizers to receive attention for improving soil quality. This research is to study the optimal conditions to increase the biomass yield of *Azotobacter vinelandii* TISTR 1094 biofertilizer inoculum, the bacteria which are capable of nitrogen fixation in the rhizosphere of plants and to reduce production costs by using molasses byproduct of sugar factory as a raw material. From the study to find the optimum parameters for the growth of bacteria in a 50 L fermentor, the result showed that the bacteria could grow at maximum at the molasses concentration of 4 percent (w/v), agitation rate 150 rpm, aeration rate at 2 vvm and control the pH to 7.0. By these conditions, the amount of bacteria can produce 7.50×10^9 CFU / ml at 24 h.

To study the effect of the produced inoculums to the sugarcane growth in lab scale, Experimentation on stem cane preparation, soil and using liquid biofertilizer were carried out. It was found that in the experiment 12 (cane stem soaked fertilizer-Wan Dee Soil+filter cake-liquid fertilizer), the sugarcane had the highest at 136.35 cm, while in the experiment 1 (non cane soaked-Wan Dee Soil-watering) the sugarcane had lowest at 74.80 cm. After testing for 3 months, the roots and soil around were collected to determine the efficiency of nitrogen fixation of *A. vinelandii* TISTR 1094. The experiment 10 (cane soaked water – Wan Dee Soil + filter cake – liquid fertilizer) showed the highest nitrogenase activity (nitrogen fixation) at $37.70 \text{ mmolC}_2\text{H}_2/\text{g/h}$. While the experiment 7 (non cane soaked – Wan Dee Soil + filter cane - watering) showed lowest nitrogenase activity ($14.86 \text{ mmolC}_2\text{H}_2/\text{g/hr}$). Moreover, it can also be concluded that the roots and soil watering with a liquid biofertilizer, offered higher nitrogenase activity than watering with only water. This suggested that biofertilizer with *A. vinelandii* TISTR 1094 enhances nitrogen fixation around cane root and promote the growth of sugarcane. Therefore, the application of biofertilizers in agriculture is an interesting alternative. It also can reduces the amount of chemical fertilizers and reduce the production cost for farmers.

Student's signature

Thesis Advisor's signature