USE OF *BACILLUS CIRCULANS* AS BIO-ACCELERATOR ENRICHING COMPOSTED AGRICULTURAL WASTES

I- Identification and utilization of the microorganism for compost production

ABSTRACT

A hundred and twenty eight *Bacillus circulans* like isolates were collected from soil apart or the rhizosphere of a range of host plants grown in seven Egyptian governorates. All isolates were examined for qualitative enzymatic expression of amylase, pectinase, cellulase and phosphatase. The six most expressive isolates were subjected to further examination of chitinase production and then identified by Biolog identification system. Quantification of cellulose production along with P and K mobilization capacity as well as nitrogenase activities were then determined for the four isolates identified as *Bacillus circulans*. Those strains were used as bio-accelerating mixture in composting of broad bean stalks, maize stalks and rice straw. The physical, chemical and microbiological changes during composting of the 3 wastes were compared under the application of individual and variable combinations of biological, organic and inorganic accelerators. Data of this study showed that densities of total fungi, total bacteria and K mobilizers were gradually increased up to the 6th week of composting where they gave maximum records in maize stalks and rice straw received the inorganic + organic accelerator, the 3 mixed accelerators and the organic accelerator, respectively. Spore forming bacteria, however, showed similar response but up to the 3rd week in rice straw amended with the 3 accelerators. In all treatments, the peaks of microbial densities were followed by pronounced decreases at the 9th week of composting. Temperature, on the other hand, showed a maximum increase during the 2nd to 4th week of composting and then gradually decreased up to maturity (20°C). C/N ratios also showed a gradual decrease with time, and gave the lowest records at maturity. On the other hand, available P and K were gradually increased particularly with the application of mixed accelerators.

Key words: *Bacillus circulans*, Enzymatic production Agricultural wastes, composting, Inorganic, organic and bio accelerator.

INTRODUCTION

As the potential of plant growth promoting rhizobacteria (PGPR) is realized, researches into their applications have increased dramatically over the last few decades. A diverse array of bacterial species including *Azotobacter, Azospirillum*, *Bacillus*, *Pseudomonas*, *Klebsiella* and *Enterobacter* has been shown to enhance growth and plant productivity by different mechanisms. **(Bertrand *et al.*, 2001, Mayak *et al.*, 2004, Tilak *et al.*, 2005)**

Bacteria of the genus *Bacillus* are one of the most diverse and also useful group of microorganisms. Many species of this genus are widely distributed in soil, air and water. The metabolic diversity of *B. circulans* in particular together with its low reported incidence of pathogenicity, has led to the fact that many representatives of this group are being used in a wide range of applications. Among the pronounced metabolic activities of *B. circulans* are the ability to (1) produce a range of enzymes, **(Travino, *et al.* 1989; Kim and Kim, 1993; Kyu, *et al.*1994; Wiwat, *et al.* 1999)**, (2) solubilize pounded nutrients e.g. silicate **(Savostin, 1972)**, tricalcium phosphate

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