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ISOLATION AND CHARACTERIZATION OF CELLULOLYTIC BACTERIA FROM DECOMPOSING RICE STRAW

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Abstract: Three cellulolytic bacterial strains were isolated from decomposing rice straw. They were able to utilize cellulose, rice straw powder and carboxymethylcellulose as substrates. Two of these strains, *Listeria* sp. and *Enterobacter* sp., were abundant during initial stages of decomposition whereas the other strain, *Pseudomonas* sp., became dominant towards the late stages of the process. Comparison of their endo-1, 4-β-glucanase (carboxymethylcellulase) activity by indirect methods indicated a higher level of enzymatic activity in the *Pseudomonas* sp. than in the other two strains. Release of glucose by saccharification of cellulose and carboxymethylcellulose was also higher with *Pseudomonas* sp. compared with *Listeria* sp.

Key words: Cellulase, cellulolytic bacteria, lignocellulose, rice straw.

INTRODUCTION

Most agricultural residues of crop plants, particularly cereals, are rich in lignocellulosic materials.[1,2] Cellulose, a long-chain polysaccharide made of β(1,4)-linked glucose units, is the principal constituent of lignocelluloses. Association of cellulose with lignin, another complex polymeric molecule composed of phenylpropanoid units, forms the lignocelluloses. Hemicellulose is the other major component of lignocelluloses. It is a heterogeneous group of long-chain polysaccharides of which basic units are arabinose, xylose, mannose or galactose. Degradation of lignocellulosic material is a slow process and only a relatively narrow taxonomic range of bacteria and fungi are able to degrade such material. The ability of microorganisms to degrade cellulosic material is of considerable interest both in terms of microbial ecology and biotechnology.

Degradation of cellulosic material requires the cooperative action of a family of cellulolytic enzymes that have been classified into three major groups: endoglucanases (EC3.2.1.4), exoglucanases (EC 3.2.1.91) and β-glucosidases (EC 3.2.1.21).[3] Cellulolytic properties of these enzymes have been studied mostly in fungi.[4] The bacterial cellulase system has only recently become a focus of investigation. Due to high cellulolytic activity of some bacteria and their short generation time they are a more promising group of organisms in degrading lignocellulosic wastes.[5] In this paper we report isolation and characterization of three cellulolytic bacterial strains involved in the degradation of rice straw, a widely available agricultural residue in Sri Lanka.

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