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Production of Inulinase by *Bacillus* sp –recycling of agro waste using Banana peel, Garlic and Corn cob

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ABSTRACT

Inulinase production was evaluated by optimization of substrate and fermentation type. Two different fermentation with three different agro wastes were selected for this study. Inulinase producing bacteria was isolated and confirmed by qualitative congo red plate method. In order to determine the effect of agro waste such as corn cob, Garlic peel (GP) and banana peel (BP) on enzyme production substrate fermentation carried out and compared with submerged. Out of 5, higher extracellular inulinase was recorded in Bacillus sp and least inulainase activity noted in Pseudomonas sp. The production of enzyme by Bacillus sp under innulin enriched medium was less than (126U) banana peel (136 U) and garlic (130U) under submerged state. Compare to submerge substrate fermentation gave maximum innulinase activity and recorded as 146U and 122U respectively on BP and GP as substrate. The study on corn cob agro waste showed modrate enzyme activity at both state. The inulinase produced by the isolate have ability to withstand temperature up to 100°C. Hence the data concludes substrate fermentation (SuF) with banana peel is found to be ideal and good inulin substrate support for biotechnological production of inulinase enzymes under low cost. Further optimization of substrate concentration, pre treatments are needed to enhance the production of innulinase.

Keywords: Innulinase, Agrowaste, fructose, enzyme assay, fruit peel

INTRODUCTION

Agriculture creates huge amounts of waste, which poses a risk to human health, the environment, and animal health. To prevent and limit this danger, several waste treatment technologies are utilized. One of the primary goals of waste management strategies is to limit the amount of garbage disposed of in landfills and recycle organic stuff (Ahring, 2003). It comprises of mechanical pre-treatment, followed by an anaerobic or aerobic procedure to decrease waste effects. These procedures have received interest because they create stabilized waste that may be sold as fertilizer or disposed of in landfills, which will have the least impact on the environment (Adani *et al.,* 2003). Inulinases are enzymes that break down β-2,1glycosidic bonds, yielding fructose, inulo-oligosaccharides, and glucose. Exoinulinase extracts the terminal fructose units from inulin, yielding fructose as the primary product. Endoinulinase hydrolyzes inulin's intrinsic connections, resulting in inulo-oligosaccharides. Exoinulinases have both invertase and inulin hydrolytic activity, but endoinulinases do not (Vijayaraghavan *et al.,* 2009). Inulinases are often utilized in the manufacturing of ultra-high fructose syrup, ethanol, lactic acid, citric acid, and single-cell oil (Petrova *et al.,* 2015). Inulinase can also be used to produce bioethanol, citric acid, butanediol, and lactic acid. When the I/S ratio exceeds 10−2. It implies strong inulinase synthesis in culture, whereas it is less than 10−4 and indicates higher invertase production (Pessoni *et al.,* 2007).

Inulinase is produced by several bacterial and fungal species, including Streptococcus salivarius, Actinomyces viscosus, Kluyveromyces fragilis, Chrysosporium pannorum, Penicillium sp., and Aspergillus Niger (Chi *et al.,* 2009). A newly obtained Saccharomyces sp. from spontaneously fermented sugarcane produced inulinase when cultured on substrates such as banana peel, wheat bran, rice bran, orange peel, and bagasse (Onilude *et al.,* 2012). Coconut oil cake was utilized in a study to optimize the medium for inulinase synthesis using Pencillium rugulosum (Dilipkumar *et al.,* 2014). Sugarcane baggase and yacon have also been utilized as substrates for inulinase synthesis in several research (Chesini *et al.,* 2013, Mazutti *et al.,* 2006). Solid-state fermentation (SSF) mimics natural microbial processes such as composting and ensiling. Laboratory investigations are typically

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