

Sustainability in the Production of Gellan Gum From *Sphingomonas* Species by Using the Best Optimum Conditions: Review

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Abstract. Multiple exo-polysaccharides derived from microorganisms have been documented within the previous decade, encompassing their distinct structural and functional characteristics. Gellan gum represents one of these emerging biopolymers, exhibiting versatile properties. However, the production of gellan gum is hindered by low yields, costly downstream procedures, and an overwhelmingly high market demand, rendering it a material of elevated expense. Consequently, it is advantageous to comprehend the diverse approaches available for the development of a cost-effective bioprocess specifically tailored for gellan gum. This comprehensive analysis centers on elucidating the intricacies of the upstream and downstream methodologies employed in gellan gum production, adopting an industrial standpoint. An exhaustive examination of the functional disparities between the two variants of gellan gum is undertaken, focusing on aspects such as hydration, gelation, stability, and texture. This research investigates the quantities of gellan gum generated from various species of *Sphingomonas* bacteria, while also examining the optimal conditions through the utilization of agricultural waste as substitutes for the production medium, with the aim of enhancing the output of the product and subsequently diminishing the production expenses.

Keywords. *Sphingomonas*, Gellan gum, Optimal condition, Agricultural waste.

1. Introduction

Microbial polysaccharides is a complex carbohydrate composed either of a combination of single sugar units belonging to the same type called homopolysaccharides such as curdlan [1,2] or of different sugar units called heteropolysaccharides such as xanthan [3]. Gellan gum is a polysaccharide produced outside the bacterial cell by secretion by various species of the genus *Sphingomonas* and is produced commercially by the fermentation process. Gellan gum is available in two forms: high acyl (HA) and low acyl (LA) [4]. The genus *Sphingomonas* belongs to the family Sphingomonadaceae, first diagnosed in 1990, it is a gram-negative bacillus bacterium, positive for catalase and oxidase test, it is an obligate aerobe that produces a yellow pigment and grows on blood agar medium, but it cannot grow on MacConkey agar medium, it has one central flagellum that it uses for movement, its outer wall differs from other types of Gram-negative bacteria, it has a hydrophobic surface, due to the presence of glycosphingolipids. In 2001, this genus included 20 species that differed in their

