

**Role of Surfactant-Extracellular Polymeric Substances in the removal of
Listeria monocytogenes biofilm from Spinach leaves**

ABSTRACT

The attachment of bacteria to surfaces and consequent biofilm formation has serious implications in the food, environmental, and medical fields. *Listeria monocytogenes* can cause serious and possibly fatal illness in humans and animals when ingested. Spinach can become contaminated by *L. monocytogenes* during harvest. The goal of this study was to evaluate the effectiveness of six nonionic surfactants (Pluronic F68, Pluronic F127, Tween 20, Tween 40, Tween 80, and Brij 58) to disrupt *L. monocytogenes* biofilms on the surface of spinach leaves. The wells were washed with surfactants after an incubation period then mixed on a platform shaker for (1, 5, 15, and 30) min. Then, the wells were rinsed with distilled water to remove dead cells and fixation was conducted at 30 min at 60 °C. The findings established that Brij 58 most effectively reduced the *L. monocytogenes* biofilm on spinach, followed by Pluronic F127, Tween 80, Tween 40, Tween 20, and Pluronic F68. The amount of both polysaccharides and proteins secreted by listeria increased with time. Moreover, addition of extracellular polymeric substances (EPSs) changed the hydrophobic properties of the leaves, which was necessary for adhesion and biofilm formation on the surfaces of spinach leaves.