DECONTAMINATION OF ADHERED CELLS WITH ALTERNATIVE CLEANING STRATEGIES: METAL COLLOIDS, ELECTROLYZED OXIDIZING WATER AND ULTRASOUND

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ABSTRACT

The reduction of contamination to ensure food safety and quality is still a goal in the freshcut food industries. Another ecological goal is the reduction of the chlorine consumption, because in many countries salad is washed with chlorine to reduce contaminations. Therefore the search for alternative decontamination strategies becomes more and more important. The decontamination of adhered cells on salad, as a Fresh-cut Food product, and of biofilms are tested with a metal colloid solution, with sodium hypochlorite and ultrasound and compared to their effectiveness. Furthermore the effect of the different decontamination strategies on planktonic cells is analyzed. The salad is washed by putting it in a glass tube and purged with cooled water and the cleaning solutions. The tested concentrations are 5 % of the metal colloid solution (7170 mg/L silver and 1690 mg/L copper) and 5 ppm of free chlorine in the hypochlorite solution. For the decontamination with ultrasound short impulses of sonication with frequencies of 20 kHz were used. For the determination of the contaminations on the salad, the salad is put in a swing mill with 2 mL 0.9 % sodium chloride solution. The sodium chloride solution with the bacteria from the salad is plated on agar plates. The reduction of yeast and fungi, of gram negative bacteria, especially E. coli, and aerobic microorganisms in general is analyzed. The values for the assessment of the effectiveness are the total number of cells, determined by microscopy, and the viable cells, determined by the colony forming units (CFU). The effect of the cleaning solutions on biofilms is measured by the decrease of the fouling resistance. For these experiments an experimental set-up for the cultivation of reproducible biofilms with a flow channel was developed. The flow channel is heated from underneath and thermal elements can detect the heat transfer. Because of the low heat conductivity of biofilms, the growing and removal of them can be detected. The same concentrations of the cleaning solutions were used and the ultrasound settings were equal to the salad experiments. The hypochlorite solution, as expected, decontaminates very effective. The colloid solution needs more time till it works and the ultrasound removes the biofilms from its surface.