A Comparison of the Biofilm Forming Potential of Native Microbiota of Various Leafy Greens on Different Food Contact Surfaces

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Twelve multistate foodborne outbreaks recently occurred in the United States involving leafy greens. Salad vegetables are a potential threat to public health since they are consumed raw. Bacteria form biofilms as a stress response and can spread to contaminate the entire processing facility. Biofilms comprise of layers, where microorganisms adhere to one another in an extracellular matrix, which protects the biofilm from various antimicrobials. Bacteria in biofilms spread from leafy greens to contact surfaces in food processing facilities, leading to widespread contamination and outbreaks. This study aims to establish the variability in native microbiota of 9 commonly consumed leafy greens and quantify their biofilm forming potential (BFP) on 6 food contact surfaces commonly found in produce processing facilities. BFP was quantified using a crystal violet assay. Comparative genomics and standardized methods for microbial enumeration were used to understand variation among microbiota. The most diverse microbiome was present on 50/50 mix and least diverse on chard, baby spinach, and cilantro. Aeromonas, Pseudomonas, Vibrio, Lactobacillus, Proteus, and other genera were identified using Analytical Profiling Index (API) strips and comparative genomics. Different microbiota had varying BFPs on various contact surfaces, but generally had higher affinity for Buna-N rubber, stainless steel 316, and polyvinyl chloride. Furthermore, higher initial bacterial population on the leafy green did not correlate with more biofilm formation. Native microbiota are known to aid pathogens in biofilm formation and hence, these results help us understand the leafy greens and surfaces that may pose a food safety risk to public health.

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