Control of Salmonella Enteritidis on ready-to-eat fresh produce using a lytic bacteriophage

Bacteriophages can prevent the spread of foodborne pathogens. *Salmonella* is a foodborne pathogen posing a global public health risk, evidenced by frequent outbreaks due to ready-to-eat (RTE) produce consumption. Using tomato as a model crop, this study aimed to isolate and characterize a lytic bacteriophage against *Salmonella* Enteritidis and its biofilm (ATCC13076) (SE), one of the major serovars linked to salmonellosis in Sub-Saharan Africa.
Salmonella phage SCF was isolated from chicken faeces. The isolated *Salmonella* phage SCF, classified within the tequintavirus genus, is closely related to *Salmonella* phage SE11 (Genbank: NC048786). It had a genome size of 108.56 kb and a G+C% of 39.02, while notably lacking virulence or lysogenic genes. Notably, virulence or lysogenic genes were not detected. It lysed *Salmonella* Typhimurium (ATCC14028) but not other γ-Proteobacteria (e.g., *E. coli, S. marcescens, E. cloacae, P. aeruginosa, K. pneumoniae*). The one-step growth curve revealed a burst size of around 72 virus particles/host cell and a latency time of ~20 minutes. The phage SCF was stable between 8˚C-50˚C and pH 4-8. Phage SCF prevented biofilm formation and significantly decreased existing 72 h biofilms generated by SE.
In practical application, it successfully controlled SE on the tomato surface achieving up to 5.3 $\log_{10}$ unit reduction in SE counts after a 2-hour treatment at ambient temperature. These findings demonstrate that *Salmonella* phage SCF could be employed as a biocontrol agent to tackle SE and improve the safety of RTE produce such as tomatoes.

Keywords Bacteriophage;*Salmonella*;Biocontrol;Biofilm;Fresh-produce;Tomatoes, food safety