

## Diversity and antimicrobial resistance of *Salmonella enterica* isolated from fresh produce and environmental samples

### ABSTRACT

In Nigeria, as in most developing countries, vegetable farmers depend largely on wastewater for irrigation and on untreated manure for soil enrichment. *Salmonella* is among the most important foodborne pathogens worldwide with fresh vegetables as major route of transmission to man. A total of 440 samples comprising vegetables and environmental samples (irrigation water and manure treated soil) were analyzed for the presence of *Salmonella*, resistance and virulence genes and diversity of isolates by genotyping. Samples were obtained from five irrigation fields in Kano and Plateau States and cultured using selective isolation with prior enrichment method. Presumptive isolates were identified and characterized using conventional biochemical methods and Microbact 24E (Oxoid, UK) identification kit. Amplification of virulence (invasive A and enterotoxin) genes by polymerase chain reaction (PCR) further confirmed *Salmonella* and its virulence potential. Enterobacterial repetitive intergenic consensus (ERIC) fingerprinting PCR showed genetic diversity of confirmed isolates. Confirmed isolates were evaluated for susceptibilities to eight commonly used antimicrobial agents. Sixty-one (13.9%) samples were positive for *Salmonella*. The distribution of serotypes included; *Salmonella typhi* (7.7%), *Salmonella paratyphi* (2.0%) and *Salmonella typhimurium* (4.1%). *S. typhi* had the highest isolation rate and was most commonly detected in vegetables. Simultaneous resistance to all antibiotics assayed was found amongst the salmonellae. Fingerprinting pattern of the *Salmonella* strains from the different samples showed marked similarities and close genetic relatedness. Cluster analysis at a coefficient of similarity of 0.82 grouped the fifteen strains of *Salmonella* assayed into five different groups. Our results indicate that irrigated vegetables are vehicles of transmission of potentially pathogenic *Salmonella* isolates that can contribute to the development of salmonellosis and other *Salmonella* related infections in Nigeria. This study provides data that support the potential transmission strains of *Salmonella* harboring virulence and resistance factors from vegetables and environmental sources to cause infections in humans.

**Keyword:** *Salmonella*; ERIC–PCR; Vegetables; Irrigation water; Manure treated soil