

Antimicrobial Resistance and Integron Diversity of *Pseudomonas* spp. Isolated from Freshwater Aquarium Fish and Their Environment

Bandara R.M.P.A., Jayawardana N.U. and Jagoda S.S.S. de S.^{1*}

Department of Agricultural Biology,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

Pseudomonas spp. are Gram-negative bacteria widespread in aquatic environments. They are well-known pathogens of fish, terrestrial animals and humans. The objectives of this study were to characterize *Pseudomonas* spp. from freshwater ornamental fish and their farming environment and to determine the antimicrobial susceptibility and presence of integrons. Ten freshwater ornamental fish farms located in the Kurunegala and Puttalam districts (5 each) were visited during the period of August-September 2022. Samples were collected from the skin mucus of apparently-healthy ornamental fish and their farming environment (i.e. tank water, tank sediment and biofilms) and cultured on trypticase soy agar and glutamate starch phenol red agar. *Pseudomonas* spp. were identified using morphological characteristics and conventional biochemical tests. Genetic confirmation at the genus level was done by PCR using *Pseudomonas* genus-specific primers targeting the *16S rRNA* gene. Susceptibility against 5 antimicrobials was determined by the Kirby-Bauer disc diffusion method. The presence of integrons, their class and resistant gene cassettes was determined by PCR. A total of 41 *Pseudomonas* spp. were isolated and characterized. The antimicrobial resistance frequencies of the isolated *Pseudomonas* spp. were; erythromycin (82.93%), amoxicillin (78%), chloramphenicol (56.10%), enrofloxacin (14.63%) and tetracycline (9.76%). Among them, 53.66% isolates were multidrug-resistant (MDR) and 73.17% had multiple antibiotic resistance (MAR) indices of > 0.2, suggesting they originate from high-risk sources of contamination where antibiotics are used frequently. However, only 2 isolates (4.87%) carried integrons of class 1 and one of them had a class 1 gene cassette. Our findings revealed that freshwater aquarium fish and their farming environment act as reservoirs of MDR *Pseudomonas* spp. They may disseminate directly or indirectly via ornamental fish and cause difficult-to-treat infections in humans. Our findings highlight the importance of the judicious use of antimicrobials in aquaculture and responsible fish ownership.

Keywords: Antimicrobial resistance, Integron, Ornamental fish, *Pseudomonas*

¹Centre for Aquatic Animal Disease Diagnosis and Research (CAADDR), Department of Veterinary Pathobiology, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, Sri Lanka

*samanthika@vet.pdn.ac.lk