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Single nucleotide polymorphisms and haplotype analyses in tilapia fish inferred from mtDNA D-loop and Cyt-b regions

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Objective: The research was aimed at analysing single nucleotide polymorphisms and haplotypes on D-loop and Cyt-b regions of the mitochondrial DNA of tilapia fish.

Methods: Fifteen and thirteen tilapia fish were obtained from two populations, South-South (Domita farm) and South West (Odeda farm). DNA extraction from fish tissue was done using Quick-gDNA™ mini prep kit after which PCR amplification was carried out. Sequencing of the two mtDNA regions were done using forward primer 5'- GGATTYTAACCCYTRCCCC- 3' and reverse 3'-AGTAAGTCAGGACCAAGCC-5' for D-loop and 5'-GGATTTTAACCCCTTACCCC-3' and 3'-AGTAAAGTCAGGACCAAGCC-5' for Cyt-b region. Statistical analyses were carried out on the aligned sequenced data using MEGA version 6.06, DnaSP 5.1, Codon code aligner 6.06 as well as NETWORK 4.6.1.1.

Results: mtDNA polymorphism was highest in the D-loop of South-South (SS) population with 176 polymorphic sites, while South-West (SW) population had 162 polymorphic sites translating to 176, 162 and 144 SNPs with non-synonymous substitutions higher than synonymous substitutions. Haplotype diversities (Hd) were 1.00 ± 0.024 and 1.00 ± 0.030 while nucleotide diversities were 0.168 ± 0.086 and 0.161 ± 0.084 for D-loop of SS and SW populations, respectively. For Cyt b region, haplotype and nucleotide diversities were 0.91 ± 0.003 and 0.051 ± 0.016 . Positive selection was more on mtDNA D-loop of tilapia sampled from SS than those from the SW as well as Cyt-b region of tilapia fish from SS. 28 haplotypes were identified among the tilapia from SS and SW with no shared haplotypes while 9 haplotypes were identified from the Cyt-b region with haplotypes 4, 5, 6 and 7 shared between species. Median joining network analysis revealed population-based clustering pattern. Demographic expansion was not significant using Tajima's D and Fu's F statistics.

Conclusion: Higher SNPs were revealed in mtDNA D-loop when compared with mtDNA Cyt-b region of tilapia fish.

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