Implementation of The Response Surface Method (RSM) on Essence Dosage to Increase Web-Based Nile Tilapia Catch Yields

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ABSTRACT

This research is motivated by the critical importance of dosage accuracy in attractant combinations for fishing bait to optimize the catch yields of Nile tilapia (Oreochromis niloticus) in public fishing ponds. Conventionally, determining the dosage of bait ingredients such as essence, moringa leaf powder, and Monosodium Glutamate (MSG) relies heavily on speculative methods, often leading to inconsistent outcomes due to olfactory fatigue in fish. To address this issue, this study designs and develops a dynamic bait formula optimization web application. The system integrates a second-order Response Surface Methodology (RSM) with an Ordinary Least Squares (OLS) linear algebra algorithm implemented within a pure PHP backend to process mathematical modeling in real-time. The database architecture utilizes a flat table approach in a MySQL RDBMS via a Laragon local server, effectively reducing row-scanning time complexity to O(1) to accelerate the Grid Search loop in mapping the optimal parameter space. The functional evaluation of the system using actual field experiment data demonstrates that the application can validly extract model regression coefficients with an intercept constant of 2,678. The application proves highly reliable in automating prediction calculations, yielding a low and acceptable average Margin Error ranging from 0.01 to 2.5 fish during validation. The development of this system successfully provides a practical and adaptive digital solution to assist anglers and fisheries management in determining precise bait formulas.

Keywords*: Bait Attractants, Laragon, Nile Tilapia, Ordinary Least Squares, Response Surface Methodology.*