

Dietary organic acids as feed additive for tilapia (*Oreochromis niloticus*) culture

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Growing awareness from consumers and producers of aquaculture species has resulted in a demand for responsible and sustainable aquaculture. The regulatory authorities in most exporting countries now focus on the misuse of antibiotic growth promoters (AGP) in aquaculture, while public attention has shifted towards sustainable production methods. As a result, alternatives to AGP have had to be found. Several feed additives, including acidifiers consisting of organic acids and their salts may be promising alternatives to the use of antibiotics in aquaculture feeds. Acid preservation of fish and fish viscera to produce fish silage has long been common practice and the final product has been widely used in fish feeds with beneficial effects reported. The beneficial effects of acid preserved products prompted the scientific community to investigate the effects of applying these short-chain acids directly onto fish feed.

In recent trials, the inclusion of different organic acid salts in fish diets was tested in tilapia, *Oreochromis niloticus*, under laboratory conditions in cooperation with the Khon Kaen University, Thailand and the Bogor Agriculture University, Indonesia. In Thailand, a total of 300 tilapia, weighing approximately 7 g, were divided equally between 5 different treatments with 3 replicates each. The acidifier treatments (0.5%, 1.0% and 1.5%), containing Ca-formate, Ca-propionate, Ca-lactate, Ca-phosphate and citric acid, were tested against a negative control and a positive control containing an AGP (0.5% oxytetracycline). Fish were fed to satiation two times a day on a pelletized basal diet containing 31% crude protein for a period of 63 days. Although no statistically significant differences were observed, fish fed the 1.5% acidified diet had a numerically increased body weight gain (33.56 g) by more than 11% and 2% compared to the negative (30.18 g) and positive controls (32.98 g) respectively, while the 0.5% and 1.0% acidified diets had slightly poorer growth compared to the negative control. Tilapia which received the 1.5% acidifier dosage had furthermore an FCR improved by 3.5% compared to the negative control and by 1.4% compared to the AGP-treated fish.

In the second experiment in Indonesia, 320 male hybrid tilapia were randomly allocated into 4 treatment groups (negative control and 3 acidifier groups, containing 0.2%, 0.3% and 0.5% potassium diformate, respectively). Fish were fed 6 times a day over an 85-day trial period. Beginning on day 10, all fish were orally challenged with *Vibrio anguillarum* (10^5 CFU/d) once a day for 20 days. Significant improvements ($P < 0.05$) could be monitored in all treated groups. The 0.2% application of potassium diformate in tilapia led to a significantly increased feed intake (8.6%), weight gain (18.6%) and a significantly improved feed conversion ratio (8.2%). Furthermore, mortality rates due to the *Vibrio* infection were significantly reduced.

With the results shown above, it may be stated that the use of organic acid salts in tilapia aquaculture can improve the grow-out period in terms of performance and sustainability. More trials to validate these results are suggested.