

EFFECTS OF *QUILLAJA* SAPONIN SUPPLEMENTATION ON THE GROWTH PERFORMANCE AND REPRODUCTIVE ACTIVITY OF SALINE TOLERANT TILAPIA *OREOCHROMIS NILOTICUS*

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The early maturation and frequent spawning attributes of tilapia *Oreochromis niloticus*, resulting in its production at unmarketable size, has prompted several workers to find ways of controlling reproduction in order to produce good-sized fish. The technique of using hormones to sexually inverse tilapia to an all male stock has become practice in farm production. The use of hormones however prompts apprehension among fish consumers due to its possible negative effect on human health and it is even prohibited in some countries. Saponin, a glycoside linked to hydrophobic aglycone (sapogenin) that may be a steroid in nature, can be an alternative to androgenic hormones used for tilapia sex inversion and sterility. Studies on the effect of saponin on the reproductive activity of tilapia recently showed possible infertility in females when fed with a diet containing 300 mg/kg saponin; sex inversion to all male population at 700 mg/kg saponin inclusion; and a higher number of males noted in those fish fed with 150-500 mg/kg saponin diet when reared under laboratory conditions. These positive results of saponin in aquaria experiments however required testing under pond production conditions to ascertain its benefit to commercial aquaculture.

The aim of the study was thus to monitor the fertility and virility of female and male tilapia fed diets with different levels of *Quillaja* saponin supplementation (I=0, II=300 and III=700 mg/kg) and reared in brackishwater ponds under field conditions. A commercially available tilapia feed, containing about 25-30% protein and 5-7 % fat, supplemented with 0, 300 and 700 mg/kg *Quillaja* saponin was fed to saline tolerant 22-25 day old tilapia reared in brackishwater ponds (pond size 500 m², 1 fish per m²) with three replicates in a randomized complete block design (RCBD) over a period of 120 days. Growth parameters (length, weight, specific growth rate) as well as reproductive parameters of tilapia (number of mature breeders, sex ratio, egg development stages and egg diameter) were determined.

After 120 days of culture period a significantly different mean length of treatments I and III compared to treatment II was found ($p < 0.001$), while the final weight did not differ significantly between treatments (75.3±1.4 g, 71.8±6.2 g and 72.4±1.5 g for I, II and III respectively). Survival was also not different between treatments. The first mature breeders were observed during day 75 of the pond culture period. On day 120, the mean number of mouth brooders in treatment I was significantly highest (12.3 fish per pond, $p < 0.05$) compared to treatments II and III (5.3 and 4.5 fish per pond respectively), which did not differ from each other. The sex ratio of treatment I tended to be higher than treatment II ($p < 0.1$), indicating more males than females in the latter. However, the sex ratio in treatment III did not differ significantly from that of either the control or treatment II. Egg diameter varied from 0.30 mm in treatment II to 0.43 mm and 0.47 mm for treatments I and III respectively, but without statistical significance. Histological analysis of a sub-sample of 21 female tilapia per treatment showed higher numbers of fish with eggs in the vitellogenic stage.

The results of this study showed lower length, but no differences in final weight, thus neither supporting reports of depressed growth nor agreeing with reports on growth promotion due to the application of *Quillaja* saponin. However, tilapia in this study indicated lower numbers of mature breeders and of females when fed with saponin-supplemented diets. This confirms the potential of *Quillaja* saponin as a substitute to hormones in the control of reproduction to produce good-sized fish and sex inversion of tilapia. The non-detection of significant effects on egg development may have been due to experimental error where sample sizes were too small. It is therefore suggested to repeat trials with saponin application in more than just one growth period.

Keywords: tilapia; *Quillaja* saponin; anti-nutrients; growth; reproduction