

**Effects of *Aloe vera* (Liliaceae) on the
Development of Gonads in Nile Tilapia
(*Oreochromis niloticus*)
(Linnaeus 1758) Fingerlings**

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Aloe vera Plant



Introduction

- *Aloe vera* is frequently used in herbal medicine and can be grown as an ornamental plant. Preliminary evidences have shown that *Aloe vera* extracts (bitter yellow *Aloe vera* latex) are useful in the treatment of fungi and bacterial infections in humans and as laxative (Boudreau and Beland 2006). Also compounds extracted from *Aloe vera* have been used as an immunostimulant that aids in fighting cancers in cats and dogs (King *et al* 1995).

Active Compounds in *Aloe vera*

- polysaccharides, mannans, anthraquinones, lectins, salicylic acid, urea, nitrogen, cinnamic acid, phenol and sulfur. It also contains amino acids, lipids, sterols tannin and enzyme.

Active ingredients in *Aloe vera* latex

- Though many scientific studies on the use of *Aloe vera* have been undertaken, some of them are said to be conflicting (Ernst 2000 and Vogler and Ernst 1999) and this include the fact that the bitter yellow latex from *Aloe vera* leaf (which active ingredients are aloe-emodin, aloin and barbaloin) can cause abdominal cramps, impair fertility or cause miscarriage in humans and animals during overdose or misuse. Active ingredients from *Aloe vera* latex are used extensively in commercial laxative preparation, though its use has been banned.

Introduction Cont.

- Tilapias constitute one of the most productive and internationally traded food fish in the world (Modadugu and Belen 2004). However, Tilapias are yet to reach their full aquaculture potential because of the problem of precocious maturity and uncontrolled reproduction, which often results in the overpopulation of production ponds with young (stunted) fish.

Introduction Cont.

- Population control in farmed tilapias has been reviewed (Guerrero, 1982; Mair and Little, 1991); such control methods include monosex culture, sex reversal by androgenic hormones, cage culture, tank culture, the use of predators, high density stocking, sterilization, intermittent/selective harvesting, and the use of slow maturing tilapia species, among others

Introduction Cont.

- However, these population control methods have their limitations; e.g. the use of reproductive inhibitors, such as irradiation, chemosterilants has disadvantages which are: expensive technology, hatchery facilities and skilled labour are required and hormones are expensive and difficult to obtain. Hence there is need to examine less expensive and appropriate technology to control tilapia recruitment in ponds using natural reproductive inhibitory agents in some plants.

The objective of this study was:

- to investigate the effects of varying dietary inclusion levels *Aloe vera* latex on some reproduction traits (gonad development stages, fecundity, egg size (length and diameter), histology of gonads)in *O. niloticus* fed for 60 days.

Cultivated Tilapia

Oreochromis niloticus

- Mouth brooder



Tilapia culture systems



Stunting problems in Tilapias



Tilapia population control methods

- Cage/Tank culture
- Monosex culture
 - a. Manual sexing
 - b. Hybridisation
 - c. Sex reversal
- Use of predators
- Periodic harvesting of fry/fingerlings
- High stocking densities
- Use of reproductive inhibitors
 - a. Irradiation
 - b. Chemosterilants
 - c. Light, salinity, temperature, photoperiod manipulation
 - d. Use of anti-fertility agents

Materials and methods

- *Aloe vera* leaves were obtained from *Aloe vera* plant in southwest Nigeria, where they are planted as medicinal and ornamental plant. The leaves were cut with the aid of a sharp, clean knife and the bitter yellow latex were collected and stored in a dry, clean, air-tight transparent plastic container, labelled and refrigerated at -20° . Feedstuffs were purchased from a local feedstuff market and were separately milled to small particle size ($< 250 \mu\text{m}$). A basal diet (D1, 350g crude protein and 18.5MJ gross energy/kg diet) was prepared as formulated in Table 1. Four test diets (D2, D3, D4, D5) were formulated by adding 0.5, 1.0, 1.5, or 2.0ml of *Aloe vera* latex (AL) to 1 kg of basal diet, respectively. The feedstuffs were thoroughly mixed in a Hobart A-200T mixer. Hot water was added at intervals to gelatinize starch. The five diets were pelletized using a die of 8 mm diameter and air-dried at ambient temperature for 72 hours; broken, sieved into small pellet sizes, packed in air-tight containers, labelled and stored.

Cont.

- *O. niloticus* fingerlings, obtained from a single spawn, were acclimated for 14 days in concrete tanks during which they were fed with a commercial diet. After acclimation, 5 male and 5 female *O. niloticus* (mean wt., 30.38 ± 0.16 g) were stocked in each of 15 glass tanks (75cm x 40cm x 40cm) supplied with 60 litres of fresh water (water temperature, 27 °C; pH, 7.3; alkalinity, 50 ppm; dissolved oxygen, 7.6-7.9 mg/L). Continuous aeration was provided using a blower and air stones (Tecas air pump AP-3,000; 2 ways). The treatments were replicated thrice. Fish were fed at 4% body weight/day of the basal diet in two instalments at 0900-0930 h and 1700-1730 h for 60 days; after which they were removed, sorted by sex and weighed. Sex determination was done through visual examination of the gonad. Fish mortality was monitored daily.

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Cont.

- Six male and six female *O. niloticus* samples were randomly taken from each treatment, dissected, and the testes and ovaries removed and weighed. Gonad development stages in male and female *O. niloticus* were classified according to Kronert *et al.* (1989) and Oldorf *et al.* (1989), respectively. Fecundity was estimated from gonads of six fish from each treatment in the final maturation stage from a sample representing at least 50% of ovary weight then reported to the total weight of the ovary. Thirty (30) eggs were measured using a microscope eye-piece graticule for length (L) and width (H) (Rana, 1985). The gonads were sectioned, fixed for 24 hours in formalin-saline solution made of equal volumes of 10% formalin and 0.9% NaCl solution. Histological sections of 8 μ thickness were prepared following standard procedures. Photomicrographs were taken with Leitz (Ortholux) microscope and camera.

Cont.

- Statistical comparisons of the results were made using the one-way Analysis of Variance (ANOVA) test. Duncan's New Multiple Range Test was used to evaluate the differences between means for treatments at the 0.05 significance level (Zar, 1996).



Table 1: Ingredient composition of basal diet

	g/kg diet
Menhaden fish meal	280
Soybean meal	370
Corn meal	250
Cod liver oil	30
Corn oil	20
Vitamin-mineral mix ¹	30
Corn starch	20

Table 3: Egg sizes (mm) of *Oreochromis niloticus* fed ALM diets

ALM diet treatments (ml/kg)

	0	0.5	1.0	1.5	2.0
<i>O. niloticus</i>	2.33 ± 1.77	2.20 ± 0.00	2.20 ± 0.00	2.13 ± 3.54	2.18 ± 3.54

*The mean difference is significant to control at the 0.05 level

Table 4: Fecundities of *Oreochromis niloticus* fed ALM diets.

	ALM diet treatments (ml/kg)				
	0	0.5	1.0	1.5	2.0
<i>O. niloticus</i>	258.0 \pm	228.0* \pm	218.0* \pm	203.0* \pm	198.0* \pm
	2.12	4.24	2.12	1.41	2.12

*The mean difference is significant to control at the 0.05 level

Table 5: Histological description of male Oreochromis niloticus fed Aloe vera latex (AL) diets.

Treatments (ml AL/kg diet)	Histological description
0	normal testicular tissue architecture and normal spermatids distribution
0.5	no visible alterations in the testis architecture and cystic seminiferous tubules
1.0	atrophy
1.5	cystic seminiferous tubules and atrophy
2.0	severe tissue atrophy, spermatids disintegration and necrosis

Table 6: Histological description of female Oreochromis niloticus fed Aloe vera latex (AL) diets.

Treatments (ml AL/kg diet)	Histological description
0	normal histology and less visible atretic follicles
1.0	ovary histology was similar to that of the control except for few pockets of lesions; normal ovarian colour was maintained;
2.0	change in colour of ovaries was noticed, ruptured follicles, inflammation of the granulomatous in the interstitium, evidences of abnormal gonadal development and necrosis.

CONCLUSION



- Appropriate technology
- Less expensive
- Effective
- Practical

Thank you all for listening
attentively!

