Cairo University
Faculty of Veterinary Medicine
Department of Fish diseases & management

Assessment of using aqueous extract of the crude (*Balanites aegyptiaca*) on the health status of some freshwater fish

Thesis Presented by

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(B. V. Sc., 2003, Khartoum University)

For the degree of M. V. Sc in

(Fish Diseases and Management)

Under the supervision of

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For the master degree of Veterinary Medical Science (Fish Diseases and Management)

Under Supervision of
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Professor and Head of fish Diseases and Management Department
Prof.Dr. Mai Ibrahium Dossogei
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Abstract

In this study the toxic effect of the aqueous extract of *Balanites aegyptiaca* on freshwater fish general heath status. The results indicated that the acute half lethal concentration dose (LC50/96hrs) was was 69 ppm in *O. niloticus* while it was 117.5 ppm in *C. gariepinus* fish..The exposed *O.niloticus* and *C. gariepinus* in the short term exposure showed some clinical abnormalites in the form of abnormal swimming behaviour,congested gills with respiratory distress,losses of scales, fin rot in *O.niloticus* and severe skin ulceration with haemorrages and fin rot in *C. gariepinus* . The postmortum findings revealed congestion and enlargement liver. There were not such clinical abnormalites in chronic toxicity observed except of few cases of respiratory distress with congested gills and heamorragie at the vent. Hematological results during the short term and long term exposure revealed that the RBCs count, P.C.Vand Hb were significatly increased espically in long term exposure,while there were no significatly changed on the MCV,MCH,MCHC levels. Reults of leukocyte count were increased in short term exposure, while there were no change on the levels of WBC in the long term exposure.Serum enzymes levels in short and long term showed that the levels of ALT andAST were higher than the control group, while there were no significatly changed in Urea and Creatinine levels. .Histopathological investigation of liver and gills showed congention and hyperplasia of secondary gill lamellae in few cases in gills, while there were congestion and dilation of hepatoportal blood vessels and vacolated of hepatocytes. Resudiual investigation of Tilapia and Cat fish exposed to(1/10) (LC50) 96h for 8 weeks indicated that muscles are sites of accumulation which indicated it,s public health significance Evaluation of lyzozymes activity revealed lower mortality rate and high value of lysozyme activity in exposed groups than (-) control non exposed groups. The aqueous extract of Desert date show positive effect on fish health when fish exposed to aqueous extract of Desert date for long time but in low concentration.

DEDICATION

Dedicated to

My mother & Father

, My husband

, daughters

, My sisters

& my close friends

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My deepest praise and endless thanks to ALLAH for every gift I have been given in my life.

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1- INTRODUCTION

The importance of fishes as a source for good quality,healthy and palatable animal protein has been represented allover the world as a goal for compensation of the decrease in animal protien from live stocks. The shortage of fish production from the natural water resources, directed us to fish culture **(Mason, 1991).**

It is widely accepted that there is a severe problem with future global food security and large number of the wild fish stocks are currently depleted,due to illegal and unreported fishing. This creates significant environmental damage through the use of unsustainable fishing practices and has wider consequences for food supply**(Agnew *et al*.,2009).**

Diffrent ways and materials are used in illegall fishing in natural resources including the use of chemicals such as (potassium or sodium), cyanide,explosives,electeric currents,gases and using unsuitable nets**.** Macerated material of plant origin is thrown into rivers or streams and then the fish which are stupefied float to the surface and can be collected. (**Neuwinger, 2004).**

Balanites aegyptiaca is one of the most widely distributed trees, It makes up to one third of the total tree population in central region of the Sudan. In the west of sudan *B. aegyptiaca* fruits and stem bark are used for illegall fishing by local citizens because of its efficacy,effectiveness and costless due to lack of fishing gear and net **(NCR, 2008).**

The physical and chemical changes in aquatic environment due to illegall use of such chemicals and plants often cause negative drastic on

fish stocks, thus the water quality of an aquatic body is very crucial because it determines the productivity and other parameters necessary for the fish survival **(Fafioye, 2001)**.

The available information about the diffrent effects of *the crude B. aegyptiaca* stem bark extract on the general health status of freshwater fish are little, so the aim of this study:-

1- Assessment of the different toxic effects of the crude aqueous extract of stem bark of *B.aegyptiaca* to *Orechromis niloticus* and *Clarias gariepinus* fishes.
2- Determination of the 96hrs/LC50 of the aqueous extract of *B.aegyptiaca* to *O.niloticus* and *C. gariepinus* and study the different toxic effect on the two examined species (*Orechromis niloticus* and *Clarias gariepinus).*
3- Study the effect of the short and long term of exposure on the clinical signs,PM lesions haematological, serum biochemial, histopathological and immunlogical changes.

2- REVIEW OF LITERATURE

2.1. Illegall fishing& poisonous plants:

Okwuosa *et al*., (1993) reported the toxicity of an aqueous extract of bark of *Balanites aegyptiaca* to *Oreochromis niloticus* and snail *Biomphalaria pfeifferi*. Fry of the fish and snail were exposed to acute and sublethal concentrations of the extract in 96h .The 96hrs/LC50 of the lethal concentrations of the extract on the fish and the snails were 1.12 g/L and 0.02 g /L respectively.

Neuwinger (1996) reported that plant extracts when poisonous to fish are called piscicides,such piscicidal plants contain different active ingredients known as alkaloids, rotenone, resin,akuammine, tannins and saponins. Saponin causes respiratory depression in fish, forcing them to gasp for breath with wide open gills at the water surface.

Ibrahim *et al.*, (2000) reported that toxicity of the saponin from tested leaf extract of *Tephrosia vogelii* and *Justicia extensa* (both used for fishing poison in Gabon) to *Tilapia nilotica* in vivo was dose-dependent and fish dead at high dose (625 mg/L).

Fafioye (2001) reported that saponins are extremely toxic to cold-blooded animals, their oral toxicity to mammals is low. Also the varied toxicity may be due to different active ingredients and different method of usage of each botanical and decreasing dissolved oxygen content may be due to the continuous oxidative bio degradation of the pollutants.

Agbon *et al.*, (2002) studied the acute toxicity of tobacco leaf dust on *Oreochromis niloticus* and founded the 48hrs/LC50 was 109.6mg/L This value is far lower than that estimated in this study in which *Clarias gariepinus* was found to have 626mg/L, and this due to accessory air breathing organs of *Clarias gariepinus* which enable them to tolerate

adverse aquatic condition where other cultivable fish species cannot survive.

Caguan *et al*., (2004) reported the (LC50/96h) of neem to Nile tilapia *(Oreochromis niloticus*),was 12.4 ml/L and were 8.31 ml/L and 3.0 ml/L to mosquito fish *Gambusia affinis* Baird and Girard respectively.

Fafioye *et al.*, (2004) reported soaking of some plants piscicides (e.g. *Balanites aegyptiaca*, *T. Vogelii* and *K. africana*) in rivers at the upper segment for 4 days before cropping fish downstream allows fermentation and so increasing their potency on target organisms.

Jonathan *et al.*, (2004) reported that the use as piscicides is of serious concern this is because of the adverse effects on both target and non target organism in the water ecosystem. The increasing use of plant fish poison or piscicides in fish harvest coupled with run-off of synthetic pesticides, domestic and industrial effluents in to aquatic ecosystem leads to physiological dysfunction in aquatic organisms .

Neuwinger (2004) reported that fishing with aid of poisonous plants was formerly very common in Africa and today this easy and simple method of fishing is forbidden but still practised in remote areas,also catalogued 284 fish poisoning plants171 genera and 62 families found in tropical areas of Africa. *Carassius auratus* in mali when exposed to 20 g bark /L (*Balanites aegyptiaca*), after 2 h all fish were floating in the lateral position on the water surface and after 3.5 h they were all dead.

Bagalwa and Chifundera (2007) reporeted that Several tribes use local plants for fishing purposes. *Maesa lanceolata* stem bark (Myrsinaceae) is one of the common plants used in the indigenous fishing techniques and saponin fraction is a powerful at 1 mg/L for snail control

in the Democratic Republic of Congo, but it is harmful to aquatic biota. Attention must be paid to avoid the ecological disturbance in the environment, especially during the dry season.

Agnew *et al*., (2009) reported that the lower and upper estimates of the total current losses due to illegall and fishing worldwide between US$ 9 billion and US$ 24 billion annually, representing between 11 and 26 million tonnes of fish. Developing countries with poor governance and poor performance was to blame for illegal fishing which creates significant collateral damage to ecosystems.

Adewoye (2010) recorded that *Tephrosia vogelii* saponin used for a long time in fishing by artisanal fishermen,twenty gram of the leaves of *Tephrosia vogelii* macerated for 1 h in 1 liter of water paralysed the fish within one hour and killed them in 3 h, under the same conditions (20 g/L) the leaves of *Mundelea sericea* produced paralysis after 45 minutes and death after 3 h.

Preeti and Satyawati (2011) recorded that *Balanites aegyptiaca's* active component was saponin and had a pesticidal value against *Tribolium castaneum* (Red flour beetle or Bran bugs).in 17.5% concentration showed 100% mortality in the period of 24hours.

Adesina *et al*., (2013) assessed the acute-lethal toxicity 96hrs/LC50 effect of *Moringa oleifera* fresh bark extract on fresh water fish, *Oreochromis niloticus* juveniles was 97.61 mg/L.

Daya and Vaghasiya (2011) reported that *Balanites aegyptiaca* rich in saponins, it contains at least 19 different saponins fractionation of saponins by flash-chromatography,and had hemolytic and moluscicidal activities and there was correlation between molecular structure and bio-activity. Saponins permeabilize the gill epithelial cells of fish allowing essential electrolytes to escape.