

Research Sudan University of Science and Technology
Scientific Research Council
Research Proposal Form Proposal

Date of submission	Research area	Serial number
<u>27/8/2008</u>	Sudan University of Science and Technology Depart. Of fisheries and wildlife. Khartoum North ,Sudan	

Section One: General information

Title of the Research Project: Genetic Improvement of cultured Nile Tilapia (*Oreochromis niloticus*) in Sudan.

Title in Arabic: التحسين الجيني لأسماك البلطي النيلي المستزرع

College: College of Veterinary Medicine and Animal Production

Department: Fisheries and Wildlife Science

Project Language	Project Duration	Project Budget
English	12 month	SP 91300

Principle Researcher:

Name: Dr. Hassan Mohammed Adam (PhD. MSc. Dip.and BSc. Fishery science)

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Date:

Participant Researchers:

	Name	Institution
1	Dr Mohammed Tag El Din	Sudan University of Science and Tech.
2	Dr. Hamid Agab Mohammed	Sudan University of Science and Tech.
3	Dr. Galal Mostafa yousif	El-Rabat University.
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Section Two: Project Description

1/ Summary:

The World Fish centre has established that simple selection for faster growing fish can yield significant increases in the growth of tilapia in Asia and these improved fish are now being used widely there.

As a result it is believed that substantial improvements in aquaculture production in Africa and Sudan can be achieved through similar treatments for faster growing fish.

So, with some modified approach of the above procedure of genetic improvement adopted in Asia could be use in genetics improvement of tilapia in Africa, and study the potential environmental consequences of genetically modified stocks.

This procedure could be summarized as follows:

1-The field study will be conducted on experimental tanks and earthen ponds at Sudan university of science and technology, college of Veterinary medicine and animal production, department of fisheries and wildlife..

- The duration of the study is 12 months.
- Mass selection (**objective i & iii**) from first generation of tilapia (males + females) will be reproduced and the performance of their progeny will be tested in earthen ponds and tanks (the testing will be monitoring the growth rate of selected fish).
- This procedure will be repeated at least two to three times (replication system), and the performance of their progenies will currently be evaluated in earthen ponds. The data will be collected and compared to control populations.

2- Blood samples (**objective i & iii**) will be collected during the study period from experimental fish for DNA analysis and identification of markers.

3- Water parameters (**objective ii**) will be measured daily for (NH₄, NH₃, NO₃, NH₂ DO, and H₂S) to ensure the quality of water.

2/ Justification:

The genetics problems of cultured tilapia are classified in to four kinds:

- i- Firstly, loss of pure species through mismanagement of inter-specific hybridization (Mc Andrew, 1993).
- ii- Secondly, problems of the high levels of inbreeding depression (Thomas *et al.*, 1997).
- iii- Thirdly, there is evidence for contamination of genetically improved strains by introgression from feral species (Mc Caranas *et al.*, 1986).
- Vi- Fourthly, effect of captive system on fish (Adam, 2004).

In recent years, the focus on fish farming in freshwater has moved to a single species (Nile tilapia), Thomas *et al.*, 1997) and research has begun overcome some of the main problems associated with farming this species (Pullin and Capili, 1988; Tave, 1988). Large scale genetic improvement programmes have been demonstrated for cultured tilapia in Asia, and genetic methodologies to control sex have now resulted in the reliable production of all-male fry to help overcome the problems associated with excessive fry production in on- growing ponds (Mair *et al.*, 1995). The World Fish centre has established that simple selection for faster growing fish can yield significant increases in the growth of tilapia in Asia and these improved fish are now being used widely there.

As a result it is believed that substantial improvements in aquaculture production in Africa and Sudan can be achieved through similar treatments for faster growing fish.

Transfer of the improved strains from Asia has not been undertaken, because of concern about the potential adverse impact on native germplasm in Africa and unknown effects of gene-environment interactions (Kamel, 2001).

To avoid this problem the same, or with some modified approach of the procedure of genetic improvement adopted in Asia could be use in genetics improvement of tilapia in Africa, and study the potential environmental consequences of genetically modified stocks.

3/ Goals:

- i- Produce genetically improved tilapias for aquaculture in Sudan.
- ii- Improve the performance and expand the environmental tolerance of this species in earthen ponds in Sudan.
- iii- Identify appropriate methods of tilapia breeding for Africa, notably by comparing mass selection and marker-assisted selection procedures to produce improved fish for aquaculture.
- iv- Determine complete hematological and clinical chemistry results for tilapia, and to report the values as reference intervals suitable for diagnostic use.

4/ Specific Objectives:

Produce genetically improved tilapias for aquaculture in Sudan.

5/ Literature Review:

Fish can contribute much cheaper and better of animal protein which was regarded from ancient time as excellent relatively cheap and available source of animal protein currently; over 5000 species of fin fish are used by human as sources of protein (ICLARM, 1997).

Fisheries rank first among the most important resources of food security programmes in the World. This is because other meat resources have been diminishing due to unfavorable environmental conditions and diseases such as Avian flow or civil war as in the Sudan.

African people are generally less fish flesh eaters and the national average fish consumption is lower (7 kg/person/year in Africa, 1.2 kg/person/year in Sudan, as reported by General Administration of Fisheries of the Sudan, 2004) by comparison with that of the World. Therefore, the best ways for increasing of fish production is to raise the consumption of fish meat in terms of quantity and quality.

Studies of the problems, which hinder production of fish through culture of fish, are basic processes in increasing fish production. Therefore, study of the constraints of fish culture and how to overcome these constraints are deemed to be of paramount importance.

Tilapia is the common name for 70 species of perch-like fish (family *Cichlidae*) native to the fresh waters of tropical Africa (Trewaves, 1983; Stiasany, 1991), and considered as a unique cultured fish in the African continent.

Culture of tilapia in Africa and Sudan is based mostly upon unimproved populations of Nile Tilapia (*Oreochromis niloticus*) (Kamel, 2001). The genetic resources of tilapia have been poorly managed (Thomas *et al.*, 1997). Introduction of wild stock frequently consisted of a small numbers of individuals. They serially distributed so that genetic problems have been transferred from farm to farm.

Therefore, a clear cut strategy for development of aquaculture resources is required. In Sudan there is considerable scope for development of large-scale fish culture in land waters which, unlike in many parts of the world, are still free from pollution (George, *et al* 2006). Thus, fish culture practices should be perfected and popularized. This is best achieved by initiating an experimental project for large-scale fish farming through international and/ or bilateral assistance, outside assistance is required due to shortage of technical manpower and operation funds.

6/ Key Words: *Fish; Genetics; Culture; Tilapia.*

7/ Methodology:

The research will base on analytical methodological approach that links the environment of fish and policy frame works for analysis and testing the stated hypothesis. This involves collection of primary and secondary data on the various parameters involved.

Research Plan:

1-The field study will be conducted on experimental tanks and earthen ponds.

- The duration of the study is 18 months (three life cycles of tilapia).
- Mass selection (**objective i & iii**) from first generation of tilapia (males + females) will be reproduced and the performance of their progeny will be tested in earthen ponds and tanks (the testing will be monitoring the growth rate of selected fish).
- This procedure will be repeated at least two to three times (replication system), and the performance of their progenies will currently be evaluated in earthen ponds. The data will be collected and compared to control populations.

2- Blood samples (**objective i & iii**) will be collected during the study period from experimental fish for DNA analysis and identification of markers.

3- Water parameters (**objective ii**) will be measured daily for (NH₄, NH₃, NO₃, NH₂ DO, and H₂S) to ensure the quality of water.

3- Each earthen pond or tank fishes (**objective iv**) will be sampled at least 2 times per month, with 10 fish per pond or tank bled for biochemical analysis and 10 fish bled for hematological analysis and the same procedure will be applied for control fish.

8/ References:

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Section Three: Researchers and their Responsibilities:

Researchers	Qualification	Academic Status	Main Speciality	Responsibilities
1. Dr. Hassan Mohammed Adam	Ph.D.	Assistant Professor	Fisheries Science	Team leader
2/. Dr. Mohamed Tag El Din	Ph.D.	Associate professor	Genetics and Breeding	Genetics lab. work
3/ Dr. Galal Mostafa Yousif.	Ph.D.	Associate professor	Molecular biology.	Molecular biology Lab. work
4-Dr. Hamid Agab Mohamed	Ph.D.	Associate professor	Fish Diseases	Management

Research Council Decision:

Council Secretary:

Name:

Signature:

Date:

Council Vice President:

Name:

Signature:

Date: