CHAPTER 1

Introduction

Nile tilapia has become the second most important fish in aquaculture (after carp) with global production exceeding 3 million tons in 2010 (FAO, 2012). Nile tilapia is a mouth-brooding species. Females don't feed while incubating the eggs in their mouth. Furthermore, males have an intrinsic growth advantage compared to the females, which can lead to weight differences of 20-30%. Thus, all-male tilapia is preferred in aquaculture because of their faster growth. This has placed a demand on the fish breeding industry to produce all-male tilapia. All-male tilapia can be obtained from tilapia breeders that using various techniques, such as hybridization hormonal sex-reversal and the YY-male technology, to achieve a skewed sex ratio in fish. Hybridization of two species of tilapia that produce either all-male progeny, or at least lead to a high percentage of males in offspring. However, the percentage of males in the offspring heavily depends on particular strains within a species and can therefore produce very variable results (Wohlfarth, 1990). Moreover, the success or failure in production of all-male tilapia populations depends on the genetic integrity of broodstocks (Wohlfarth, 1994) and the environment of culture. The YY-male technology, is termed genetically male tilapia (GMT), produces YY "supermale" genotypes, which sire "only" genetically male (XY) progeny 95% male in *O. niloticus* when mated with normal females (XX) (Mair *et.al.*, 1997). This genetically male tilapia (GMT) were developed from a pure Egyptian strain of *O. niloticus* in the Philippines and first produced in commercial quantities in 1995. The YY-male technology is of environmental friendly nature because the genetically male tilapias are populations of untreated, normal genetic males, which are not considered genetically modified organisms. Thus, they should not face legislative constraints or problems of consumer acceptance. However, the genetically male Nile tilapia is not always 100% phenotypic male, due to the action of rare sex-modifying genes, autosomal factors, and/or environmental factors that can give up to 5% females in the progeny produced from

YY-males. Otherwise, the YY-male technology is time consuming, requires large testing facilities, and management skills. The most common technique to produce all-male tilapia is a hormone treatment conducted during sex differentiation of the fry. It is an efficient method of making female offspring (XX) turn into male offspring (ΔXX).The most commonly used androgen to redirect the phenotypic sex of tilapia towards maleness is 17α-methyltestosterone (Guerrero and Guerrero 1988). The study of Marjani *et.al. (*2009) described that all 17α-methyltestosterone (MT) receiving treatment, showed a significantly higher male proportion than the control groups. Dose rate of 75 mg kg-1 MT of feed resulted in maximum male proportion (98.09%). It is important to keep in mind that the use of hormones in fish farms is restricted or even prohibited in several parts of the world. Although it show that residues of hormone does not accumulate in fish tissues (Abucay and Mair, 1997). Organic production schemes do not permit any use of hormones during the production cycle. However, Hormone residues in farm run offs might accumulate in the soil and in natural water bodies, posing a threat to feral fish communities, wild and domestic animals as well as to human health. More sustainable protocols for sex control in Nile tilapia are required, especially for organic production. One innovative approach to obtain all-male progenies could be the use of specified temperature regimes applied during a defined thermo-sensitive stage of the fry, converting genetic females into the desired fast growing functional males. Thus, the increasing of rearing temperature also could be used as an alternative technique of sex reversal. This study aim to analyze the *amh* gene polymorphism which is a candidate gene in temperature-dependent sex reversal and analyze association between *amh* gene polymorphism and sex traits for temperature-dependent sex reversal in Nile tilapia.

1.1 Objections

1.1.1 To analyze the *amh* gene polymorphism in temperature-dependent sex reversal in Nile tilapia

1.1.2 To analysis association between *amh* gene polymorphism and sex traits for temperature-dependent sex reversal in Nile tilapia

1.2 Education/application Advantages

1.2.1 *Amh* can be the candidate gene which could use as a new knowledge of temperature sex reversal improvement.

1.2.2 The variation of *amh* might indicate the difference between male and female tilapia.