

CHAPTER ONE

INTRODUCTION

The demand for animal protein has gone far beyond supply as a result of the rapid growth of human population in the many countries of the world, especially in the developing countries. An urgent need is necessary to increase the production of protein sources. Nowadays, aquaculture is one of the fastest growing food production sectors and an increasingly important option in animal protein sources in the world (FAO, 2010).

Farmed tilapia has been an important global commodity since the 1990s. The global production of farmed tilapia reached approximately 3.5 million tons in 2012, second only to farmed carps (FAO, 2012). In Egypt, tilapia aquaculture production reached 768752 tons in 2012; which represents 75.55% of total aquaculture production and 56.03% of total local fish production (GAFRD, 2012).

Nile tilapia, *Oreochromis niloticus*, have unique mix of the tilapia's physiology, reproductive biology, genetic plasticity, development of domesticated strains, and ready marketability, and with more improvement tilapia is likely to be the most important of all aquaculture fish in the 21st century (Fitzsimmons, 2000). Despite of tilapia have many good characteristic, one of the major drawbacks in commercial tilapia production is its precocious maturity and the following over populations, resulting in increasing competition for feed followed by stunted growth and low commercial value (Wassermann and Afonso, 2003).

Moreover, in populations of tilapia, males grow faster and more uniform in size than females (Tariq-Ezaz *et al.*, 2004). Consequently, the commercial culture of tilapia performed using monosex, which achieved via 17 α -methyl testosterone (MT) treatment (Owusu-frimpong and Nijjhar, 1981). All over the world MT treatment was the most popular and successful practice (Shelton *et al.*, 1999).

The synthetic hormones have been reported to have the potential to accumulate in the sediment, water (Contreras-Sanchez *et al.*, 2001) and aquatic biota (Çek *et al.*, 2004). Farthermost, MT is considered to be carcinogenic (Velazquez and Alter, 2004). Therefore, alternative methods and safe chemicals to produce mono sex populations should be considered.

The high quality fish diets should contain not only high quality nutrients in the correct balance but also additives to keep fish healthy and improve growth. Synthetic chemicals, hormones and antibiotics are very cost effective and efficient in improving animal performance and health (Xiang and Zhou, 2000). Due to the consumer concerns and strict regulations in many countries, the use of synthetic chemicals, hormones and

antibiotics is becoming unviable and natural compounds are more acceptable to the public (Chakraborty *et al.*, 2013). Therefore, alternative strategies can be used to effectively replace antibiotics in animal diets without loss of performance (Xiang and Zhou, 2000).

Massive amounts of information indicate that plant secondary compounds (Phytochemicals) have many functional and nutritional properties that may have application for animal nutrition and can replace the used of synthetic chemicals. The beneficial effects of phytochemicals include growth activation, immune stimulation, testosterone augmentation and antioxidant characteristics that may help to improve the general physiological condition of fish (Lin *et al.*, 2006; Chakraborty *et al.*, 2013). a wide range of herbs are available for inclusion in animal diets (Xiang and Zhou, 2000) but studies still explore about new natural and more effective feed additives.

Ginseng root is one of several herbs species of the *Araliaceae* family. The most important active extracts in ginseng root are the saponins called ginsenoside. Ginseng helps regulate body functions, specifically improve adaptability and is believed to help build muscle and endurance (Francis *et al.*, 2002). Also, Tsai *et al.*, (2003) reported that ginsenoside-Rb1 increases luteinizing hormone secretion. Goda (2008) studied the effect of low levels of dietary ginseng extract on Nile tilapia, *O. niloticus*, and found that growth performance and feed utilization efficiency were significantly higher in all treatments receiving ginseng supplemented diets than the control diet. Moreover, *ginseng* extract increased the activities of antioxidant enzymes in rat (Ramesh *et al.*, 2012).

The plant tribulus popularly known as Al-Kutub or Al-Hassage is a common plant known to elevate the testosterone levels in humans and animals. It has been used to treat impotence and was found to increase testosterone levels and improve athletic performance as well (Gauthaman *et al.*, 2002). tribulus extract showed scavenging action of reactive oxygen species, also showed protection against oxidative stress (Pandey *et al.*, 2007). Recently, tribulus extract found to increase growth performance of fish (Gültepe *et al.*, 2014).

Date palm is native to the Middle East region over centuries ago (Copley *et al.*, 2001). Pollens are the male reproductive cells of flowers (Hassan, 2011). The early Egyptians and ancient Chinese used pollen as a rejuvenating medicinal agent. It has been called a “fountain of youth” (Kroyer and Hegedus, 2001). Date palm pollen was found to increase serum testosterone and body weight of rat (Iftikhar *et al.*, 2011). Also, improve the antioxidant systems in normal and toxicated rats (El-Neweshy *et al.*, 2013). There is scarce data about utilization of ginseng, and date palm pollen in fish diet.

Therefore, the present study was aimed to:

1. Evaluate the effect of some dietary natural phytochemicals (ginseng extract, tribulus extract, and date palm pollen) on growth performance, feed and nutrients utilization of Nile tilapia, *O. niloticus*, fingerlings.
2. Determine the effect of these phytochemicals on anabolic steroid hormone level and its relation with growth performance of treated Nile tilapia, *O. niloticus*, fingerlings.
3. Investigate the effects of these phytochemicals on oxidative stress and antioxidant enzymes activity, also blood hematology and plasma biochemical of Nile tilapia, *O. niloticus*, fingerlings.
4. Examine the ability of the used phytochemicals as masculinization agents for Nile tilapia, *O. niloticus*, fry.