FAO/China Intensive Training Course on Tilapia Lake Virus (TiLV)
Sun Yat Sen University, Guangzhou, China
18-24 June 2018

TRAINING COURSE SESSION MODULES

SESSION 1: Tilapia Farming

1.1 Tilapia biology and culture status worldwide

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1.2 The Control Strategy of Cultured Tilapia Diseases in China

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1.3 Research & application of tilapia industry technologies in China

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Session 1.1
The biology and culture status worldwide of tilapia

Introduction
Tilapia has become the second most important fish in world aquaculture after carps. Several species or varieties of tilapia (such as Nile tilapia, Blue Tilapia, Mozambique tilapia and red tilapia) are cultured commercially. This lecture reviews the taxonomy, life history, physiological parameters of tilapia and addresses the characteristics of important commercial species or lines and the challenges facing in tilapia aquaculture.

Learning objectives
This session will assist workshop participants to understand and gain knowledge on the biology, physiology and current culture status of tilapia worldwide.

Learning outcomes
At the end of the course module, participants will:
- gain knowledge on the biology, physiology and current culture status of tilapia worldwide
- master the key biological factors of tilapia
- understand the challenges facing in the tilapia aquaculture

Module duration
Day 1 (6/18): 9:30~10:15

Lectures: (40 min)
- Biological factors in tilapia
- Overview of important commercial tilapia species or lines
- Challenges facing in tilapia culture

Working group activity: (5 min)
- Exercise on hand sexing of tilapia

Background documents
- PPT presentations
- Exercise steps

Session 1.2
The Control Strategy of Cultured Tilapia Diseases in China

Introduction

China is the largest producer in tilapia farming, and accounting for almost 60% of the world's tilapia production. However, in recent years, the large scale and frequent disease outbreaks has brought a great economic loss in tilapia culture industry. Tilapia has many kinds of disease, mainly caused by virus, bacteria and parasite infection. But the disease caused by bacteria is serious, especially tilapia streptococcusis. In China, the overall outbreak of tilapia streptococcusis begin in the summer of 2009, and the economic loss in aquaculture industry is more than 100 million RMB every year. In addition to streptococcosis, there are some other diseases caused by *Francisella noatunensis* subsp. *orientalis*, *Iridovirus*, *Flavobacterium columnare*, and diseases caused by nutritional problems such as hepatobiliary syndrome (fatty liver) and so on. This lecture will discuss the occurrence and development of these diseases from the aspects of etiology, symptoms, epidemiology, diagnosis, prevention and control.

1. Tilapia streptococcosis:

Streptococcus is a kind of gram-positive bacterium and widely distribute in nature. It is one of the most important pathogens of humans and can cause diseases such as septicemia, pneumonia and meningitis. At the same time, it also is the important pathogen in a variety of other vertebrates including pig, cattle, fish and so on. In present, several countries have reported the outbreak and epidemic of fish streptococcosis. In 1957, fish streptococcosis was first found in cultured *Oncorhychumikiss* in Japan. Since the 1980s, streptococcosis is emerging globally in a diverse range of fish species, including many kinds of sea water and fresh water fish, and it is especially serious in warm water fish. Streptococcosis infection is responsible for major economic losses in the world aquaculture industry, and annual economic losses caused by *Streptococcus iniae* is more than 150 million dollars. Streptococcosis not only causes a great harm to fishery production, but also makes a serious threat to food safety and human health. In recent years, the reports of tilapia streptococcosis has increased in China. Streptococcus is mainly harmful to parent fish, juvenile and adult fish of over 100 g, and the high infectivity can lead to 10-30% morbidity and 25-80% mortality.

2. *Francisella* infection in Tilapia

Francisella sp. is an emergent bacterial pathogen that causes acute to chronic disease in warm and cold water cultured and wild fish species. In the last ten years, the bacterium has been detected in tilapia (*Oreochromis niloticus*), with non-specific clinical signs, such as erratic swimming, anorexia, anaemia, and high mortality. Several internal organs (mainly spleen and kidney) were enlarged and contained white nodules with. multifocal granulomatous lesions, and numerous small, pleomorphic, cocco-bacilli,histologically. Specific PCR primers to the *Francisella* genus were used to confirm the preliminary diagnoses.

3. *Flavobacterium columnare* in Tilapia

Flavobacterium columnare is a kind of worldwide pathogenic bacterium in aquatic animal. It can lead to gill rot in crprinids, including grass carp, carp, silver carp, crucian carp, siniperca chuatsi, channel catfish and tilapia, and causes serious economic losses. *Flavobacterium columnare* is widely distributed in fresh water and soil environments and can break down organic matters. The virulence can be affected by many environmental factors, such as water temperature, salinity and other stress factors, because *Flavobacterium columnare* is a kind of conditional pathogen. It is a kind of strict

aerobic gram-negative bacterium, and shows slender and curved, as well as it has sliding ability and reunion characteristic. After infection, *Flavobacterium columnare* can cause acute, subacute and chronic diseases. For example, the gill of sick fish is yellow and gradually died completely. In chronic infection, the symptoms begin with the changes in the color of the fish body surface, which means the body color is light in some areas and surrounded by a reddish circle, and partial discoloration can be found on the back skin. The lesions begin in the dorsal fin, and then the fin begins to decay and spread around slowly. The discoloration focus on the skin of some sick fish gradually expand to pale gray ulceration and looks like a saddle, so this disease also named as “Saddle disease”.

Learning objectives

This lecture will help trainers to understand the status quo of tilapia aquaculture in China and the major diseases, especially the Occuring, diagnosis, prevention and control of streptococcosis. At the same time, some of potential diseases which may threaten tilapia aquaculture will be introduced, including the harmful, prevention and control strategies of e.g. *Francisella* infection.

Learning outcomes

At the end of the course module, participants will:

- understand the status of tilapia cultured industry in China.
- gain knowledge on the main diseases of cultured tilapia.
- how to diagnose and identify the diseases of cultured tilapia and to prevent and control the outbreak of tilapia streptococcosis.

Module duration

Day 1 (6/18): 11:15-12:00

Lectures: (45 min)

 The control of streptococcusis of Tilapia
 Introduction to *Francisella* infection and other diseases of Tilapia

Session 1.3
Research & application of tilapia industry technologies in China

Introduction

Tilapia is one of the most important kinds of economical fish worldwide, especially in China. The annual yield in China accounts for almost 50% of global production. In 1957, *Oreochromis mossambica* was introduced in China as a signal of the start of the tilapia breeding industry. In 1983, *O. aureus* was introduced as the male parent of the hybrid tilapia (*O. aureus* ♂×*O. niloticus* ♀) , suggesting the tilapia seed industry was set up. Since 2000, the tilapia industry has entered a rapid development period with mature seed production, compound feed, pond transformation, processing tech, etc. The product exportation also present a situation of high speed growth.

Current status of tilapia industry technologies in China:

(1) All levels of breed centers were established, the system of seed conservation and seedling production was basically established and perfected.
(2) Over-winter tilapia farms have gradually developed and expanded tilapia breeding areas.
(3) Various culture modes were developed such as pond, cage, flowing water, reservoir, industrialized, etc..
(4) The feed formulation of brooders, seedlings, grow-out and other different breeding stages is more reasonable. The floating and sinking feed is coexist, with the floating increasing.
(5) Processing products have been diversified such as whole frozen, fillet, microwave food, instant food.
(6) Logistic and cold chain were improved.
(7) The social division of labor including seed rearing, seedling culture, grow-out culture, harvest, transportation, has been gradually opened up
(8) Cooperatives and associations have been set up in succession

Learning objectives

This session will assist workshop participants to gain comprehensive knowledge and interpretation of the current situation in Research and application of tilapia industry technologies in China.

Learning outcomes

At the end of the course module, participants will:

- be able to elaborate the history of tilapia industry in China.
- gain deep and systematic knowledge on the current status of the industrial technology, the key technology of Tilapia Industry development.
- understand the future direction of tilapia industry development

Module duration

Day 1 (6/18): 10:30~11:15

Lectures: (45 min)

Background documents

 PPT presentations