

Aquaculture and Aquatic Resources Management (AARM) of AIT: Tilapia Research

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Background

- Although, historical evidence of fish culture dates back several centuries, global promotion of aquaculture is relatively recent
- The earlier academic programs in aquaculture started in the 60s and 70s with Auburn University's Department of Fisheries & Allied Aquaculture as one of the earliest lead institutions
- Over the last 40 years, aquaculture as a prominent discipline has become integral part of most large agricultural universities
- Curriculums and research have evolved to accommodate commercial and small-scale production systems



Background

In line with increasing interest and the need to bolster aquaculture production- research based on science was becoming important in Asia

The WFC and AIT were some of the earliest international institutions with a mission to improve production through science-based research





Although, the AARM was established in 1981, research in aquaculture (in tilapia) started in the 70s



➤ Since then AARM has produced

- Over 400 MSc and PhD grads
- 1,500 trainees in aquaculture

➤ AARM Research themes in tilapia

- Small-scale aquaculture
- Seed production and genetics
- Fish nutrition and feeding management



Since 1981, it has produced over 150 peer reviewed publications on tilapia

➤ An equal numbers of non-peer reviewed publications



Objectives

➤ This presentation

- Explores the historical accounting of some of the AARM publications related to tilapia research
- This parallels the development of tilapia culture in many Southeast Asian countries



Evolution of Tilapia studies at AIT

- Tilapia as a model species for the utilization of sewage and other forms of human waste
- Then the use of animal manure and in small-scale integrated farming system
- Tilapia as a species to combat rural poverty

The excitement over this species has been its low-input requirements for culture, its potential for rural farm consumption and its ability to recycle organic waste



1981-1985



- The earliest paper was authored by Peter Edwards- on the harvest and utilization of microalgae from sewage fed ponds using tilapia (1983)
- Two years later (1985), another paper was published on the application of compost for tilapia feed
- A third of the similar paper in 1985- in the Aquaculture and Fisheries Management journal- The use of locally available composted and dried water hyacinth in pelleted feed of tilapia

1986-1989



- About this time there were three parallel studies related to tilapia
 - Production optimization studies by improving primary production and husbandry practices (Diana, Lin)
 - Culture tilapia using human and animal wastes (Edwards)
 - Seed production and sex reversal tilapia using 17α – methyltestosterone and progesterone (Macintosh, Singh and Little)
- *The diversity of topics during this period reflects new entrants, diversification of interests and the changing focus for tilapia research*

1990-1992

- Direct or indirect reuse of septage for culture of Nile tilapia (Edwards)
- Tilapia as low cost species (Edward, Little)
- Integrated culture of tilapia (Lin).
- Tilapia and pond ecosystem, tilapia and primary production (Diana)
- Water quality using a recirculation system and the second paper on the culture of tilapia in saline waters (Lin and Suresh)
- Sex control of tilapia (Mair and Little)



1993-1995

- Design for wastewater-fed fishponds (Mara and Edwards)
- Established that supplemental feeding may be important to optimize production of tilapia in a fertilized pond (Diana)
- Co-culture of hybrid catfish and tilapia in ponds (Lin and Diana)
- Improve spawning synchrony in the Nile tilapia for egg collection purposes and commercial production of tilapia fry (Little)
- An interesting study on the microbiological and sensory quality of septage-raised Nile tilapia (Eves et al.)
- Multilocus DNA fingerprinting and RAPD revealed similar genetic relationships between strains of *Oreochromis niloticus* (Naish)



1996-1998 (1)



➤ Small scale aquaculture

- Various strategies for stocking Nile tilapia in fertilized ponds, and supplemental feeding (Knud-Hansen, Lin, Yi, and Diana)
- Tilapia culture in rain-fed rice fields and polyculture with carp (Little; Hassan and Edwards)

➤ Seed production

- Review of the hormonal sex reversal of tilapias (Abucay and Mair)
- Genetic manipulation of sex ratios for large-scale production of all-male tilapia (Abucay and Mair)
- Genotypic effects on comparative growth of all-male tilapia (Tuan, Little and Mair)
- Inhibition of spawning and associated suppression of sex steroid levels during confinement (Coward et al.)

1996-1998 (2)

➤ Development of the **GIFT** strain

- Yakupitiyage and Edwards on the difference in nutritional energetics between the Chitralada and an early GIFT strain
- Developed of **bioenergetics growth model** for tilapia (Yi, Lin and Diana)



1999-2001 (1)

- Explored ways to utilize pond environment- to optimize utilization of nutrients
 - Tilapia and common carp polyculture (Shrestha and Bhujel)
 - Growth prediction model of tilapia in a cage in pond (Yi)
 - Effects of biomass and aeration of tilapia in cages on growth and yield (Yi and Lin)
 - Best management strategy to minimize the environmental impact of pond effluent (Lin and Shrestha)



1999-2001 (2)



- Improve production of seed for stocking
 - Studies on broodfish nutrition and management (Bhujel)
 - Performance of Genetically Male Tilapia in the Thai-Chitralada strain (Tuan)
 - Performance of monosex and mixed-sex fry in three strains of Nile tilapia (Dan, Little)
 - Effect of a broodfish exchange strategy on spawning performance (Little)
 - Stress challenge testing method for assessment of Nile tilapia fry quality (MacNiven and Little)

2002-2003

- Seed production and genetics
 - Ultrasound and immersion to enhance reversal (Bart)
 - Nursed monosex tilapia fry and carps (Hossain)
 - Nursing mixed-sex and mono-sex tilapia fry (Little)
- Feeding and nutrition (Yakupitiyage, Patel, Li)
 - mixed feeding schedules and model for food nutrient dynamics of semi-intensive pond
- Pond nutrient and effluent (Yi, Lin and Diana)
 - Various techniques to fertilize earthen ponds to minimize environmental impact
 - Mitigate clay turbidity
 - Integrated pen-pond system



➤ Driven partly by regional research needs

- Studies have evolved from tilapia as a low-input aquaculture species to poly-culture with carps, catfish and shrimp and all the way from extensively fertilized to intensively used fertilized-fed ponds, and recirculating tanks



Conclusion

- Research focus and direction on tilapia from a model for studying waste recycling to a species of important commercial value
- Diversity in Studies over time ranged from the examination of the culture system to variation between strains, feed and feeding, and reproduction



A large number of published studies along with long and short-term education-training has, at least in a small part, added to the continued success of aquaculture in the region



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THANK
YOU!