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The effects of tropical almond *Terminalia catappa* L., leaf extract on breeding activity of Siamese Gourami, *Trichogaster pectoralis*

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Abstract

This paper described the effect of tropical almond, *Terminalia catappa* leaf extract on breeding activity of Siamese Gourami, *Trichogaster pectoralis*. Tropical almond leaf extract was widely used in breeding Siamese Gourami in commercial farm. However, there is no documentation on the mechanism of the plant extract in influencing Siamese Gourami breeding activity. Furthermore, the study of breeding activity of *T. pectoralis* is lacking in the literature. Therefore, method of breeding *T. pectoralis* is not well established yet. Fish farmer have no option to continue to exploit and harvest *T. pectoralis* seed from wild in order to carry out farming activity. Hence, this study is an attempt to breed *T. pectoralis* by manipulating the water pH using tropical almond, *T. catappa* leaf extract. In the present study, sexually matured fish were cultured in fiber glass tank (water volume 50 L) equipped with PVC pipe as substrate for the male fish to build nest. Fish were exposed to *T. catappa* leaf extract at pH 5.5, 6.0, 6.5 and 7.0. The water pH was adjusted using *T. catappa* leaf extract. The finding of the present study showed *T. catappa* leaf extract at pH 6.5 was the best environment to breed Siamese Gourami.

Keywords: *Trichogaster pectoralis*; tropical almond leaf; *Terminalia catappa*; breeding

1. Introduction

Siamese Gourami, *Trichogaster pectoralis*, is a member of air breathing anabantoids that can be widely found in Asia as ornamental and food fish. Some reports claimed that *T. pectoralis* was found in USA [9] and Brazil [11]. However, the origin of *T. pectoralis* is distributed at Southeast Asia. The sudden demand of Siamese Gourami as food fish led to the shortage supply of *T. pectoralis* in the market. *T. pectoralis* was process as pickled fish and it was became famous and popular as its taste was good and accepted for the most Asian countries. Subsequently, wild population of Gourami in the natural habitat became over exploited in order to fulfill market demand. The market price of Siamese Gourami reached USD 5/kg and it is increasing due to the lacking of stock in the market [5]. The scenario is even getting worst when the population of Siamese Gourami is declining due to agriculture and development activities that destroyed the habitat of the fish. Hence, it is a must to establish Siamese Gourami breeding technique in order to improve the production of Siamese Gourami as the supply of the fish is very limited and costly

Tropical almond, *Terminalia catappa* has been widely used in aquaculture. The leaf extract is used to promote breeding activity of some fish that prefer acidic environment. Hence, in the present study, we attempt to reveal the potential of *T. catappa* leaf extract in promoting breeding of *T. pectoralis*. Information of the early stages of the fish such as (i) yolk absorption and (ii) starvation period of the larvae is very important for the large scale culture of the species [3]. However, the information of breeding habit of this species is still lacking. Hence, studies are required on *T. pectoralis* breeding and its early stage development. This study will lead to the baseline information on breeding and larvae development of this species for large scale farming.

2. Materials and Methods

2.1 Broodstock of Siamese Gourami, *Trichogaster pectoralis*

This study was carried out from June 2014 to May 2015. Fifty pairs of matured Siamese Gourami, *T. pectoralis* were purchased from commercial farm and maintained in the holding

tank for four weeks before experiment started. The fish were fed with commercial pellet (Star Feed, Malaysia) at the rate of 5% of body weight everyday.

2.2 Plant material and Tropical almond, *Terminalia catappa* L., leaves extract preparation

Tropical almond, *Terminalia catappa* L., leaves were collected from wild tree in Jeli, Kelantan, Malaysia. Only fresh and tender leaves were selected and shade dried at room temperature. The dried leaves were then ground till in powder form and packed into sachet. The sachet was soaked into water at the concentration of 1g/L for three days consecutively before the treated water was used for experiment. pH value of the water in the experimental tank was adjusted and maintained ranged from 5.5 to 7.

2.3 Application of Tropical almond, *Terminalia catappa* L., leaf extract and the induced breeding of *Trichogaster pectoralis*

A pair of matured *T. pectoralis* was placed in an aquarium with total water volume 10 L treated with Tropical almond, *Terminalia catappa* L., leaf extract. The aquarium was equipped with PVC pipe as substrate to allow male fish to build its bubble nest. The fish were fed with commercial feed (Star Feed, Malaysia) with the crude protein content 40%. The male fish was not given feed once it started to produce bubble nest. Three replicates were applied for each treatment in the present study.

2.4 Determination egg yolk absorption duration

The duration of egg yolk absorption of the fish larvae was monitored using a profile mini projector (Dino eyes, Taiwan) attached with microscope (Leica, USA). Ten fish larvae were randomly selected from nursery tank at hourly intervals until the egg yolk sacs were fully absorbed.

2.5 Starvation period determination

100 larvae of *T. pectoralis* were maintained in an experimental tank with the water total volume 5 L equipped with mild aeration with no feed given throughout the experiment. The mortality number of fish larvae was recorded at every hour until all larvae were dead. The experiment was carried out in triplicate.

2.6 Data collection

In the present study, data collection such as successful rate of breeding of each treatment and the larvae development of *T. pectoralis* were monitored and recorded. Data of larvae development such as (i) yolk absorption and (ii) starvation period were also recorded.

3. Results & Discussion

In the present study, the size of sexual maturity of *Trichogaster pectoralis* were 11.07 ± 0.68 cm (mean \pm standard deviation) in average total length and 155.20 ± 1.02 g for both male and female. 100% successful breeding rate was observed for the treatment of application of Tropical almond, *Terminalia catappa* L, leaf extract at pH 6.5 whereas other treatments showed 66.6% successful breeding rate (Table 1). Fertilized eggs of *T. pectoralis* were round and crystal clear in appearance when placed in the bubble nest formed at the substrate near the water surface. The eggs were released by female fish once they mate. The fertilised eggs were released

by female fish and dropped on the bottom of aquaria. At the meantime, male fish was collected the fertilised eggs and deposited into bubble nest. The broodstock were separated from newly hatched larvae once the eggs were hatched in 26 h (s) 18 min (s). The hatching rates for all replicates ranged from 85.8% to 87.1% at water temperature ranged 26.1 -28.3 °C. The egg yolk was completely absorbed within 98 h (s) and the fish larvae started to die at 72 h (s) without feeding. All larvae in the experiment were dead after 148 h (s) without feeding.

Artificial breeding of *T. pectoralis* using Tropical almond was found success in the present study. In the literature, there is a little information of using Tropical almond leaf extract for fish breeding. However, there is a lot of products available in the market that derived from Tropical almond leaf for aquaculture uses. For example, a product known as black water which derived from Tropical almond leaf was used for fish diseases treatment. Traditionally, Tropical almond leaf extract was used to adjust water pH to become acidic in order to create acidic environment to the fish that prefer to stay in. *T. pectoralis* is a primitive fish which can live in low oxygen and acidic water bodies. Therefore in the present study, *T. pectoralis* was found to breed well in acidic water treated with tropical almond leaf extract. Other freshwater fish that prefer in acidic environment includes *Betta* sp. Mode of operation of tropical almond leaf extract in the present study was lowering water pH to 6.5 and promote breeding activity of *T. pectoralis*. pH is playing an important role in fish early development. For instance, pH can influence sex ratio and morphology appearance of West African cichlid fish, *Pelvicachromis pulcher* [1]. This is also agreed by Bhatt *et al.* where they proved that pH can influence the sex organ of fish that led to the successfully breeding [8].

Male to female 1 : 1 is the best ratio to breed *T. pectoralis*. Male *T. pectoralis* prefer to have huge space in producing bubble nest and promote breeding activity. Therefore, only one male is needed in an experimental tank to avoid fighting incidence. The presence of many female *T. pectoralis* in an experimental tank is also creating trouble and destroy the bubble nest that built by male. Many studies revealed that sex ratio can influence breeding successful rate of fish. This was supported by the study of Chong *et al.* where they claimed sex ratio of swordtails, *Xiphophorus helleri* can determine breeding successful rate [8]. Khalfalla *et al.* also reported that the ideal ratio is 1 : 1 but in term of economic wise male to female ratio is 1 : 3 [10].

In the present study result showed that *T. pectoralis* is a high fecundity freshwater fish. This is also agreed in the study of Amornsakun *et al.* where highlighted that Siamese Gourami, *T. pectoralis* possess high fecundity [4]. Other tropical freshwater fish such as red tail catfish, *Mystus wykioides*, shared similar characteristic [2]. *T. pectoralis* eggs were hatched within 26 h (s) 18 min (s) averagely at the water temperature was ranged 26.1 -28.3 °C. Previous studies showed other freshwater fish egg hatching period was ranged within 24 h (s). For instance, Amornsakun claimed that egg hatching period of green catfish, red tail catfish and climbing perch was 18 h (s), 23 h (s) 40 min (s) and 21 h (s), respectively [2]. Egg yolk absorption of fish fry of the present study was recorded as 108 h (s) at temperature ranged from 27 – 30.8 °C. Further study of Amornsakun *et al.* showed egg yolk absorption of Siamese gourami was 110 h (s) at temperature 27 – 30.8 °C [4]. Another study of Amornsakun *et al.* showed that green catfish, *Mystus nemurus*, egg yolk absorption period was 72 h (s) at 25 – 30 °C, red tail catfish, *Mystus wykioides* was 103.2 h (s) at 28 – 30.5 °C and sand

goby, *Oxyeleotris marmoratus* was 81.6 h (s) at 27 – 30.5 °C [4].

Temperature plays an important role in determining fish egg hatching rate, egg yolk absorption and etc [6]. At higher temperature, egg hatching rate of egg tropical fish will be increased so as the egg yolk absorption duration will be shorten. By manipulating temperature, fish farmer may control the production of fish fry.

Table 1: The effects of tropical almond *Terminalia catappa* L., leaf extract on breeding activity of Gourami, Siamese Gourami, *Trichogaster pectoralis*.

Treatment, pH	Breeding successful rate
5.5	66.6%
6.0	66.6%
6.5	100%
7.0	66.6%

4. Conclusion

The conclusion of the present study showed Tropical Almond leaf extract can be used to adjust pH to create acidic environmental in order to promote breeding activity of *T. pectoralis* and the best pH of *T. pectoralis* to breed is 6.5.

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