Egyptian Journal of Aquatic Research (2015) **41**, 353–358

HOSTED BY

ELSEVIER

National Institute of Oceanography and Fisheries

Egyptian Journal of Aquatic Research

http://ees.elsevier.com/ejar
www.sciencedirect.com

FULL LENGTH ARTICLE

Utilization of laserpuncture induction as spawning stimulation in catfish (*Clarias* spp.) crossbreeding toward egg quality

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Received 23 July 2015; revised 9 October 2015; accepted 13 October 2015
Available online 14 November 2015

KEYWORDS

Crossbreeding;
Fertilization rate;
Hatching rate;
Laserpuncture and survival rate

Abstract The induction of laserpuncture on the reproductive acupoint of catfish can accelerate gonadotropin hormone formation from the pituitary especially gonadotropin II (GTH-II) which has a role in the final stage of oocyte maturation, ovulation and spawning stimulation. The purpose of this study is to evaluate the effects of laserpuncture induction toward the egg quality from crossbreeding catfish male var. Paiton and female var. Sangkuriang. The egg quality was measured by the following parameters: fertilization rate (FR), egg hatching rate (HR), and larvae survival rate (SR). The research treatments were conducted using two levels along with eight repetitions. The results show that the crossbreed catfish using laserpuncture induction affected the parameters by increasing the mean value of fertilization rate, egg hatching rate and larvae survival rate significantly ($P < 0.05$) compared with mean value of fish without induction. This study concluded that laserpuncture induction on the crossbreeding between broodstock of male catfish var. Paiton and female var. Sangkuriang will increase FR, HR and SR.

Introduction

Catfish (*Clarias* sp.) has a promising potential in fish husbandry due to its ability to breed easily, relatively fast growth, be maintained at high density, and could be fed by various types of feed. If the broodstock is nurtured well and fed by nutritious feed, it might spawn throughout the year without any special requirements, but recently, the number of catfish in fishery production is decreasing and the management is unsustainable. The decrease in catfish production is the result of the bad quality of both broodstock and egg quality which are produced by fish farmers themselves and even the government of fish breeding centers. These are possibly due to the lack of occurrence inbreeding of the excellent catfish broodstock which exist in Indonesia, thereby if the productive capacity of catfish is reduced, it will lead to occurrence of very low population, small size, slow growth, and commercially less profit, so that the government target of 20.05 million tons catfish product in 2014 will be difficult to achieve. Otherwise, the catfish husbandry techniques are

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Peer review under responsibility of National Institute of Oceanography and Fisheries.

http://dx.doi.org/10.1016/j.ejar.2015.10.003

still carried out traditionally and have not reached optimal goals yet. Therefore, the supply of mature gonad broodstock in huge numbers simultaneously combined with laserpuncture technology is recommended , because it is the main key of success to fulfill the government target of catfish production.

Hybridization belongs to the important quality improvement program for fish as a cutting edge technology which is developed in order to improve and increase the genetic quality of produced fish for better offspring (Purdom, 1993; Rustidja, 1999). In some cases, hybrid fish has proven to have better growth rate than that of its broodstock (Purdom, 1993). Hybrid crossbreed fish between *Clarias batrachus* and *Clarias gariepinus* has proven well to produce offspring with better hatching capability, growth rate, and larvae survival rate than other similarly crossbreed offspring. Hybridization could produce excellent offspring which are sometimes sterile capable to produce new strains offspring (Rustidja, 1999).

In this study, crossbreed process of broodstock between male catfish var. Paiton and female var was performed. Sangkuriang has been done by laserpuncture technology. Laserpuncture is used to accelerate the provision of mature gonad and ready-to-spawn broodstock to produce good quality egg in huge numbers simultaneously.

Kert and Rose (1989) has proven that if an induction dose counts 0.5–1 J/cm^2 induced by low power laser of 5 mW with wavelength 632.8 nm improve the nerve regeneration ability located both in central and peripheral sides will be produced to increase the cellular activities, and the ability to produce hormones and enzymes. Our previous study showed that laserpuncture induction in reproduction acupoint of these broodstock catfish will accelerate the growth, development and maturation of gonad (Kusuma, 2013). It indicated that the induction of laserpuncture could increase the performances of the hormones activity which takes part in reproduction control system to accelerate the provision of growth, development, and gonad maturation of catfish. Therefore the desired objective result which is a crossbreed catfish between var. Paiton broodstock and var. Sangkuriang broodstock using laserpuncture will accelerate the provision of mature gonad broodstock and ready-spawning broodstock to produce good quality egg in huge numbers simultaneously.

Materials and methods

This study was conducted from January to March 2015 at Freshwater Aquaculture Management Unit (UPBAT), Kepanjen, Malang, Indonesia.

Laserpuncture

This study was using soft-fervency laser He–Ne which has 632.8 nm length, 0.2 cm^2 of light output area, and the 5 mW/cm^2 of output power of laser beam is equivalent to 0.375 J/cm^2 as the photobiomodulation laserpuncture. This laser has safe wavelength as photobiomodulation organ (Karu, 2000).

Table 1 Average mean FR (%) of crossbreed male catfish var. Paiton and female var. Sangkuriang.

Treatment	Crossbreed	*N*	Means FR (%) ± SD
Without laser	PT male vs SK female	8	96.21 ± 0.91
Laser	PT male vs SK female	8	98.22 ± 0.60

Description: PT = Paiton; SK = Sangkuriang.

Sample preparation

The 8–9 month old broodstock fish samples were collected from UPBAT Kepanjen, Malang. 16 male catfishes var. Paiton weighted 1010–1690 g and 16 female catfishes var. Sangkuriang which never had spawn with weighted 1140–1750 g.

Broodstock selection

The selected crossbreeds male catfish var. Paiton and female var. Sangkuriang were adapted in the separated cement pond sized 2 × 2 × 1 m for 14 days in order to avoid spawning before treatment. During the maintenance, the broodstock were given nutritious commercial food (Pokphan 781-3) in the morning and evening in order to allow the maturation of the broodstock gonads and added with 35% dose of protein produced by CP Prima as much as 5% of their body weight. Furthermore, the control treatments and laserpuncture inductions were executed on the selected broodstocks.

Laserpuncture induction

This study used experimental method using control and laserpuncture induction treatments. According to the previous study (Kusuma et al., 2012), the optimum dose to stimulate the reproduction acupoint laserpuncture induction was conducted at the reproduction acupoint exactly in 2/3 parts of ventral body for 15 s. The non-treatment control was conducted as a comparison for induction treatments. Both of non-treatment control and induction treatment used 8 pairs of mature gonad crossbreeds male catfish var. Paiton and female var. Sangkuriang. Afterward, the broodstocks were maintained in the grouped tarp pond sized 1.75 × 2 × 0.6 m which have been coded before and each section was filled by a pair of gonad-matured crossbreed male catfish var. Paiton and female var. Sangkuriang.

Spawning broodstock and the maintenance of the egg and larvae

The selected male and female broodstock have been induced by laserpuncture at the acupoint of reproduction for 15 s to stimulate spawning process. Then, the induced broodstocks were placed into a traditional *kakaban* sampling pond whose width is 10 × 10 cm as the attachment place of egg. After 8 h, the broodstock had already finished the spawning process, the *kakaban* were taken in order to calculate the fertilization manually. Then, the *kakaban* were put in the aerated aquarium filled by temperature and pH controlled water. The egg quality could be assessed from the fertilization rate (FR), hatching rate (HR) and larvae survival rate (SR).

Calculation of total egg and fertilization rate (FR)

The number of fertilized egg in the 10 × 10 cm sized *kakaban* sampling pond was manually counted and compared to the total number of eggs in *kakaban* the sampling pond. The