# Growth Improvement of Gurame Fish (Osphronemus gouramy) Due to Insulin Like Growth Factor-I (IGF-I) from Local Pregnant Mare Serum

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# Growth Improvement of Gurame Fish (*Osphronemus gouramy*) Due to Insulin Like Growth Factor-I (IGF-I) from Local Pregnant Mare Serum

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**Abstract**

Research aim was determine of IGF-I effect on gurame growth. 70 number of gurami, divided into 7 treatments, T0: without injection IGF-I (control), T1, T2, and T3: patented IGF-I recombinant mouse (RM) from Biolegend (San Diego CA-USA,) 10ng/mL, 20ng/mL, and 40ng/mL respectively, furthermore T4, T5 and T6: IGF-I from local pregnant mare serum (PMS) 10ng/mL, 20ng/mL, and 40ng/mL. The results indicated non significant differences ($p>0.05$) between the patented IGF-I (RM) with IGF-1 from local pregnant mare sera (PMS) effect on growth improvement in the weight and body length of gurame, but both were significantly better ($p<0.05$) than control.

**Key words** : Gurame fish, IGF-I, Pregnant mare serum, growth

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Gurame is a freshwater fish that has a lot of demand. The taste is delicious and the texture of the meat is not mushy makes gurame is very popular in Indonesia, but its growth is very slow (Fitriadi *et al.*, 2014). Gurame consumption increases year by year however their production does not commensurate with demand. Efforts to increase production have been carried out, through the utilization of hormone like growth factor-I (Maggio *et al.*, 2013) to increase the fish production.

## Materials and Methods

Seventy gurami fishes were divided into 7 treatments, T0: without injection IGF-I (control), T1, T2, and T3: patented IGF-I recombinant mouse (RM) from Biolegend (Cat #591406, San Diego CA-USA,) 10ng/mL, 20ng/mL, and 40ng/mL respectively, the T4, T5 and T6: (IGF-I) were treated with local pregnant mare serum (PMS) @ 10ng/mL, 20ng/mL and 40ng/mL. The parameters measured were body weight gain and body length. The weight gain was assessed in grams by substracting the initial weight from the final weight of the fishes at the end of the experiment in each treatment. The same procedure was followed to findout the body growth rate is centimeters (Lugert *et al.*, 2016). The research data was analyzed with one-way Anova, if there are differences, further analysis is performed with Tuckey, Statistical data processing using program facilities: IBM SPSS Statistics Version 21

## Results and Discussion

The results of weight and length growth of the gurame (*Osphronemus gouramy*) are presented in Table I

From Table I, the statistical analysis revealed significantly differences ($p<0.05$) between T0 and other treatments; T1, T2, T4, and T5 were significantly different ($p<0.05$) with T3 and T6; while T1, T2, T4, and T5 were not significantly different ($p>0.05$), also T3 and T5 did not differ significantly ($p>0.05$) in weight gain.

IGF-I is a hormone which has 70 amino acids which is structurally related to proinsulin. Among the other functions, IGF-I is involved in the regulation of proteins, lipids, carbohydrates, mineral metabolism in cells, cell differentiation and proliferation and body growth (Klement and Fink 2016). IGF-I itself can increase somatic growth which was demonstrated in goldfish and salmon (Hevroy *et al.*, 2015). Fish grow faster due to high IGF-I levels. Increasing plasma IGF-I levels with growth hormone treatment in vertebrates, including teleost, and in channel catfish has shown favourable results (Franz *et al.*, 2016). Exogenous treatment with IGF-I can also stimulate growth rate (Opazo *et al.*, 2017). The hormone treatment has improved the external appearance of fish i.e skin tones look better, brighter eye and more active movements.

Axis growth hormone (GH-IGF) has an effect in regulating somatic growth and metabolism in teleost fish. Axis GH-IGF secreted in the anterior pituitary gland which is controlled by hypothalamus hormone, including growth hormone releasing hormone (GHRH) (Peterson *et al.*, 2005). Insulin-like growth factor binding protein (IGFBP) plays a significant role in extending the half-life of IGF,also coordinates the transfers of IGF in to the circulation (Kement *et al.*, 2016). The extended IGFBP includes an IGFBP related protein (IGFBP-rP) which also

**Table I.** Weight Gain and Body Length Increment in Gurame Fish Treated with IGF-I RM and IGF-I PMS (Mean ± SD) g

| Treatment | Weight gain mean ± SD (g) | Length Increment mean ± SD (cm) |
|---|---|---|
| T0 (Control) 0 ng/mL | 7.23$^{a}$ ± 0.37 | 5.76$^{a}$ ± 0.38 |
| T1: IGF-I RM 10 ng/mL | 17.01$^{b}$ ± 0.42 | 5.88$^{a}$ ± 0.17 |
| T2: IGF-I RM 20 ng/mL | 18.22$^{b}$ ± 0.35 | 6.42$^{b}$ ± 0.08 |
| T3: IGF-I RM 40 ng/mL | 26.35$^{c}$ ± 1.89 | 7.93$^{c}$ ± 0.07 |
| T4: IGF-I PMS10 ng/mL | 15.23$^{b}$ ± 0.44 | 5.18$^{a}$ ± 0.25 |
| T5: IGF-I PMS 20 ng/mL | 19.82$^{b}$ ± 1.35 | 7.12$^{b}$ ± 0.48 |
| T6: IGF-I PMS 40 ng/Ml | 28.62$^{c}$ ± 0.75 | 8.90$^{c}$ ± 1.47 |

Different superscript in column was showed significant differences ($p<0.05$)

plays a role in regulating IGF activity. IGF evokes its biological response through receptors on the target tissue which results in the increased growth (Peterson *et al*., *loc cit*). The serum concentration of IGF-I stimulates or suppresses GH release from the anterior pituitary through feedback in mamals and lower vertebrates, as has been shown primarily in bony fish. In mammals and bony fish, the pituitary GH shaft / IGF-I liver involvement in endocrine regulation of important physiological processes seems to exist (Eppler, 2011).

Like other vertebrates, ingestion and energy accumulation in fishes are the key to survival, growth and reproduction, with normal lipt which act as an important energy reserve. Growth hormone (GH) displays pluripotention covering a wide range of effects of growth stimulation both in mammals and fish. However, most of the GH action acts through the production and stimulation of IGF-I expenditure (Kling *et al*., 2012).

Insulin-like growth factor-I is structurally and functionally associated with insulin and its biological actions in fish, including growth regulation, tissue differentiation, reproduction and osmoregulation. IGF-I is more effective than insulin in stimulating the absorption of glucose and amino acid in muscle cells in rainbow trout (*Oncorhynchus mykiss*). It indicates that this hormone is also involved in carbohydrate metabolism and even beyond the relevance of insulin (Enes *et al*., 2011).

In this research IGF-1 PMS from pregnant mare serum. Insulin-like growth factor-I in mamals is one of the important things in IGF signaling, and is involved in regulating the growth and skeletal muscle development. In most fish species, IGF-I in blood or tissue, at a positive mRNA level correlates with dietary ration, protein content, and growth rate. Injecting IGF-I implants accelerates fish growth. In many fish species, IGF-I levels of blood or tissue from mRNA are positively correlated with dietary ration, dietary protein content, and body growth rate (Yan *et al*., 2012).

**Summary**

The intramedullary injection of 40 ng/ml of either IGF-I recombinant mouse or IGF-I pregnant mare serum has given a better growth in Gurame fish.

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