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Comparative growth performance between monosex and natural XY male tilapia in Noakhali region, Bangladesh

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Abstract: The study was conducted to compare the growth and production performance of monosex and natural XY male tilapia of *Oreochromis niloticus* in Bismillah Agro production hatchery of Noakhali Sadar in Noakhali district, Bangladesh from September to November, 2014. The length, weight, average FCR value, Average SGR value, Daily weight gain, survival rate of fish were observed. Relationship between growth and physico-chemical parameter of water were also investigated for monosex and XY male tilapia. The finding of the study reveals that growth performance of naturally collected XY male tilapia is close to monosex tilapia. The SGR value was found better in monosex than XY male tilapia. . Among them, survival rate was found 95.06% in case of monosex whereas it was 93.67% for XY male. At the end of the experiment, average weight of monosex (179.5±1.32g) was found higher than XY male tilapia (167.8±1.10g). Average length of monosex (20.1±0.25cm) was also found higher than XY male tilapia (19.5±0.20 cm). Similarly, the average FCR value for monosex (1.39±0.185) was observed higher than XY male tilapia (1.71±0.233). Average SGR value for monosex (2.49±1.43) was also higher than the XY male tilapia (1.88±1.44). Daily weight gain of monosex (1.66±0.66g) was also experimental higher than XY male tilapia (1.53±0.611g) species. These findings will encourage the fish farmers to culture all XY male tilapia with minimal cost. Thus, the consumer and fish will be free from the risk of hormonal induction and farmers can able to maintain the sustainable production of tilapia and also their dependency on hatchery produced seed will be reduced.

Keywords: growth performance; monosextilapia; natural XY male tilapia

1. Introduction

The Nile tilapia, *Oreochromis niloticus* has been considered as one of the most important species of fish in tropical and sub-tropical aquaculture (FAO, 2014). In Bangladesh, Tilapia culture has been increased significantly during the last decades. Its' production was 0.4 lac MT in 2002 and 1.38 lac MT in 2012 and hopefully it will be 1.5 lac MT in 2015 (DoF, 2014). According to Fishery Statistical Yearbook of Bangladesh

(DoF, 2014), tilapia production in Noakhali district was about 1374 metric ton which were 3.2% of total tilapia production. Tilapia has become very popular because of its low price. This low price is achieved by converting the young females to males through the use of the hormone drug 17alpha-methyltestosterone (Abucay and Mair, 1999; Alam and Kawsar, 1998; Rahman and Sardar, 2010; Edwards and Karim, 2007). However, the use of testosterone for sex-reversal has a strong negative effect on the immune system of fish. Methyl testosterone (MT) treatment could be perceived as hazardous to tilapia consumers also if it is applied at higher dosage, or is used for longer period, i.e. beyond the fry treatment stage and into the grow out phase (Beardmore *et al.*, 2001; Bhandari *et al.*, 2006; Gamal *et al.*, 1997; Dan and Little, 2000; Scott *et al.*, 1991 and Pompa and Masser, 1999). Consumers have no idea about the fish they are eating which has undergone hormone-induced sex changes and the long term consequences of such changes to health and environment are as yet unknown. As a consequence, the use of Methyl Testosterone will be phased out and a threat to future ban on hormonal sex reversal. Therefore, it will be difficult to maintain the sustainable production of tilapia in near future. Tilapia is a serial spawner and breeds naturally several times in a year. Though, this efficiency of reproduction in tilapia has undesirable consequences. Problems common for many tilapia culture systems are the reduction of growth rates at the onset of sexual maturity and precocious and excessive reproduction, leading to various sizes of small fish production. There are a number of ways to control reproduction in mixed-sex population. One of these is the culture of all-male tilapia. All XY male tilapia can be selected from natural stocks instead of collecting the monosex seeds from the hatchery and can be cultured to maintain the tilapia production sustainable and also to remove the hazardous effects of hormone to the consumers (Razeim *et al.*, 2017; Ali *et al.*, 2016a; Ali *et al.*, 2016b; Shabuj *et al.*, 2016; Hossain *et al.*, 2016; Ali *et al.*, 2015; Islam *et al.*, 2016; Rahman *et al.*, 2015; Sharif and Asif, 2015; Chowdhury *et al.*, 2015; Asif *et al.*, 2014; Nahid *et al.*, 2010; Kohinoor, 2003; Tahoun *et al.*, 2002; Green *et al.*, 1997 and Khouraiha, 1997). This will also remove the dependency of fish farmers on hatchery produced seeds. The main objective of this study was to establish a sustainable aquaculture method for the production of a major animal protein source by comparing the growth pattern of monosex tilapia with XY male tilapias under pond culture systems.

2. Materials and Methods

2.1. Experimental site, species and periods of study

The study was conducted in Bismillah Agro production hatchery of Noakhalisadar in Noakhali district, Bangladesh. Two different strains of tilapia –Monosex and natural XY male tilapia were experimental species. The study was conducted from September to November, 2014.

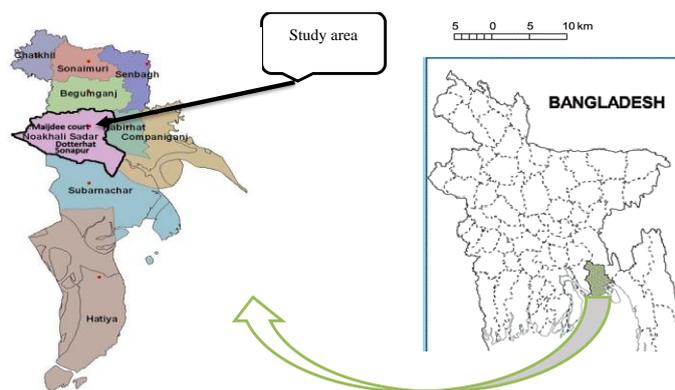


Figure 1. Map showing the study area.

2.2. Experimental design

Two different strains of tilapia such as: Monosex and naturally male XY tilapia were selected for the experiment. Monosex tilapia was collected from Bismillah hatchery. Monosex tilapia was (25-30) gm and there length was (9-10) cm. Natural XY male tilapia was collected from Bismillah hatchery. Natural XY male tilapia was identified by genital papilla whereas XY male contain Urogenital aperture and anus on the other side Female (XX) contain Urogenital aperture, anus and oviduct. Tilapia was collected that was naturally male (XY) contain Urogenital aperture and anus. Six Experimental hapas were used communal stocking of the three strains were similar in shape and size, with a area of 5m x 6m x 2 m hapas of 1.5-mm mesh size. The two different types of fish were stocked on six different hapas. Hapa 1, 2, 3 for monosex tilapia and Hapa 4, 5, 6 for natural

XY male tilapia. Comparative studies were carried out these six hapa. Every hapathere was 81 species. The total number of the monosex was 243 and the total number of natural XY male tilapia was 243.

2.3. Feed and feeding schedule for monosex and XY male tilapia

In a pond environment, natural food production may not be sufficient for the parent stock. So, supplementary feeds were supplied regularly to the tilapia stock. Mega feed use as supplementary feeds in every hapa. The nutritional composition of feed was Moisture (12%), Crude protein (35%), Crude fat (6%), Fiber 5(%), Metabolic power (85%). Feed was applied as per total body, Three/ four times daily at 08:00 am, 11:00 pm, 02:00pm and 5:00 pm respectively.

2.4. Data collection

During the experiment water quality parameters viz.; temperature, Dissolve oxygen, Transference and salinity were observed. Sampling was conducted every 15 days after stock fish in hapa. When sampling randomly 10 more species collected from each hapa. After collecting measured their weight and length by weight machine and scale.

2.5. Data analysis

All fish were harvested at the end of culture period, counted, and measured individually for weight and length. Growth parameters such as specific growth rate (SGR), daily weight gain (DWG), food conversion ratio (FCR) and survival rate were calculated as follows (Phelps and Popma, 2005).

$$\text{SGR (\% day}^{-1}\text{)} = [(\ln \text{ final weight} - \ln \text{ initial weight}) / \text{time (days)}] \times 100$$

$$\text{DWG (g day}^{-1}\text{)} = \text{mean final weight (g)} - \text{mean initial weight (g)} / \text{days}$$

$$\text{FCR} = \text{total amount of dry feed consumed (g)} / \text{wet weight gain of fish (g)}$$

$$\text{Survival rate (\%)} = (\text{final number of fish} / \text{initial number of fish}) \times 100$$

3. Results and Discussion

3.1. Comparative larval growth observation

The weight of monosex was observed comparatively better than XY male tilapia and found (179.5 ± 1.32) g and (167.8 ± 1.32) g for monosex and XY male tilapia respectively (Figure 2). This result is similar to the findings of Sultana *et al.* (1997). They found the initial mean weight of GIFT and existing strains of tilapia were 1.03 g and 1.12g respectively final cumulative mean weight of GIFT and existing strain were 8.38 gm and 5.51 gm respectively.

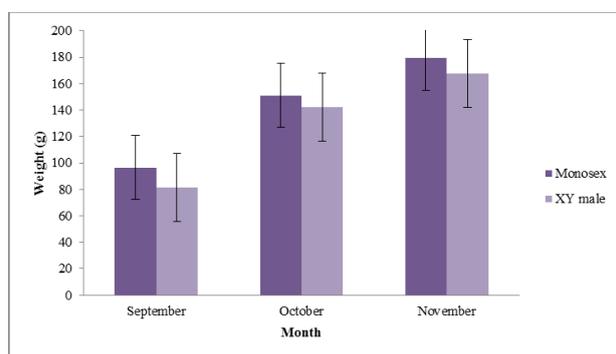


Figure 2. Comparative weight gained of monosex and XY male tilapia.

3.2. Comparative length observation

Similarly Final Length of monosex was found comparatively better than XY male tilapia throughout the study period and found (20.1 ± 0.25) cm and (19.5 ± 0.20) cm for monosex and XY male tilapia respectively (Figure 3). This result is similar to the findings of Sultana *et al.* (1997). The similar study was found in banded gourami by Akter *et al.* (2016).

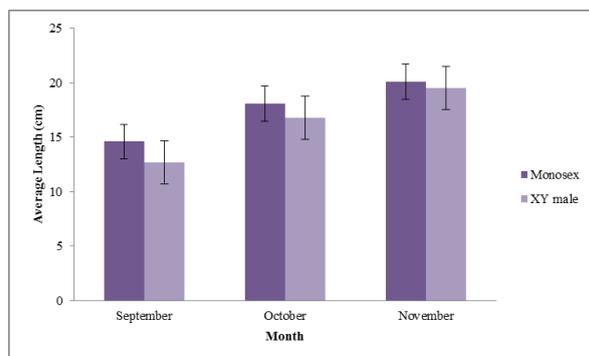


Figure 3. Comparative average length gained of monosex and XY male tilapia.

3.3. Comparative FCR value observation

Throughout the study period, FCR value of monosex and XY male tilapia was found variable FCR value (Table 1). Highest FCR value (1.9 ± 0.24) was found in XY male tilapia in November while lowest FCR value (1.21 ± 0.066) was found in monosex in October (Figure 4). The average FCR value (1.39 ± 0.185) for monosex and (1.71 ± 0.233) for XY male tilapia. VeraCruz and Mair (1994) also concluded a similar result.

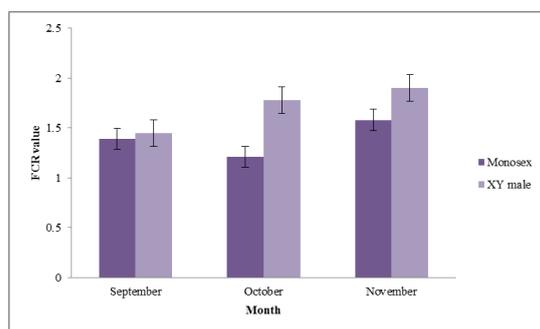


Figure 4. Comparative FCR value of monosex and XY male tilapia.

Table 1. Comparative growth performance between monosex and XY male tilapia.

Growth parameters	Monosex tilapia	XY male tilapia
Initial body length(cm)	9.5±0.05	9.5±0.07
Initial body weight(gm)	29.6±0.25	29.6±0.35
Final body length(cm)	20.1±0.25	19.5±0.20
Final body weight(gm)	179.5±1.32	167.8±1.10
Average FCR	1.39±0.185	1.71±0.233
Average SGR	2.49±1.43	1.88±1.44
Average DWG	1.66±0.66	1.53±0.611
Survival rate (%)	95.06	93.67

3.4. Comparative DWG value observation

At the same way DWG (daily weight gain) value was found highest (2.23 ± 0.16) in monosex tilapia in September and lowest (0.85 ± 0.04) in XY male tilapia in November. The average DWG value (1.66 ± 0.66) for monosex and (1.53 ± 0.611) for XY male tilapia (Figure 5). Chakraborty *et al.* (2010) was found same result.

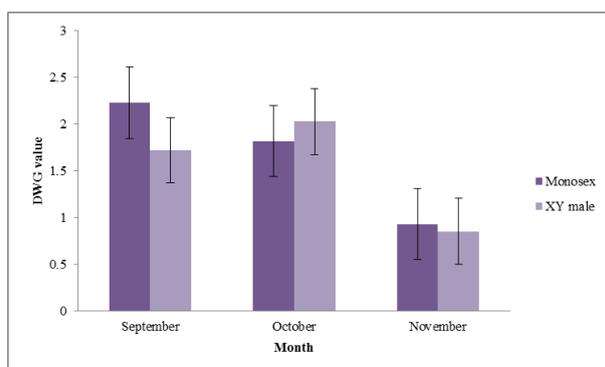


Figure 5. Comparative DWG value of monosex and XY male tilapia.

3.5. Comparative SGR value observation

SGR value was measured for both monosex tilapia and XY male tilapia during the experiment and found variable. Highest SGR value (3.573 ± 0.10) was found in monosex tilapia in September that was and lowest SGR value (0.61 ± 0.040) found in XY male tilapia in November. (Figure 6). The average SGR value (2.49 ± 1.43) for monosex and (1.88 ± 1.44) for XY male tilapia. It indicates that specific growth rate was higher in monosex than XY male tilapia. That was similar to the findings of Chakraborty *et al.* (2010). They found SGR value 5.25 and 4.6 for monosex and mixed sex respectively.

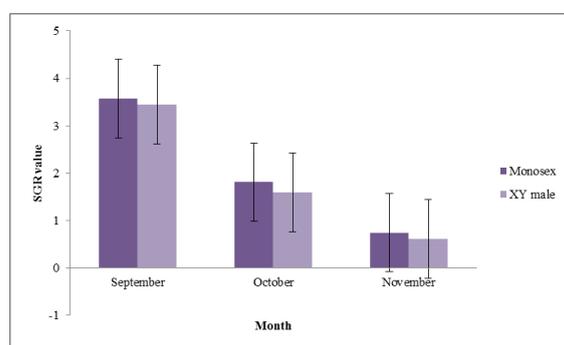


Figure 6. Comparative SGR value of monosex and XY male tilapia.

4. Conclusions

The finding of the study reveals that growth performance of naturally collected XY male tilapia is close to monosex tilapia. These findings will encourage the fish farmers to culture all XY male tilapia with minimal cost. Thus, the consumer and fish will be free from the risk of hormonal induction and farmers can able to maintain the sustainable production of tilapia and also their dependency on hatchery produced seed will be reduced.

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Conflict of Interest

None to declare.

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