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To evaluate growth performance of Milkfish, *Chanos chanos* (Fingerling) applied range of food treatmentsin captivity

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Abstract

In the present study, wild caught early fingerlings Milkfish (*Chanos chanos*Forsskål, 1755*)* (length & weight between of 3.8-6.4cm / 3-8g) average weight 5.35g wereeared with different types of treatments for three months(15thNovember-15th February) and their performances in terms of growth and survival were determined. It is observed that upon the harvest the fish reached a weight between24-31g and a survival rate of 80.1±1%,thespecific growth rate was higher (82.8%) in fishes gatheredin the combination of soil & chicken manure (SC), followed bya combination of Urea & chicken manure (UC), and commercial pellets(CP) Control feeds. Survival rate was also higher in SC fishes, followed by UC and CP (control)feed. The size-frequency distribution shows that milkfish in the tank SC grew compared with tank CP specimens, their growth rate was lower. Tanks containing SC treatment had better specific growth rate than CP (control) treatment (p<0.05), although there was no significant differences between SC treatment and UC treatment in growth factors. Also, the number of surviving fish in UC treatment was simply higher than SC treatment and CP (control) (p<0.05).

Key Words: Milkfish, Chanos chanos, growth, fingerling

1 Introduction

Milkfishaquaculture and its propagation have been an important activity for many, which provide not only cheapest sources of protein, but also financial openings(FAO, 2009). The aquaculture, industrial development of fresh and brackish water ponds and pens has been hampered by the lack of suitable live feed for rearing the fish at the various production stages(Baluyut, 1989). Milkfish is the most popular of the domesticated variety of hardy and fast growing fish. The fingerlings of Milkfish readily fed on all small-sized live and artificial food(FAO, 2009).

Milkfish are acceptable to all socioeconomic sections in the world(Baliao, 1999).Over the years, production has enhanced from what is considered traditional into something furtherprogressive. It is not unusual anymore to hear fish farmers nowadays comments pH, salinity, temperature, feed conversion rate, days of culture. Fish farmers can simply relate these factors to fish production. Better still, fish farmers have found it a must to learn the biological nature of the cultured commodity. Milkfish have no teeth, but have fine gill rakers that concentrate micro plankton besideshatcherythey feed less at night. They can withstand extreme, but gradual salinity fluctuation (from 0 to100 ppt) but grow faster in natural waters of 0-40 ppt. They eat plant materials, and can easily digest plants owing to their long intestines. It can also adjust to artificial feeds like rice bran, trash fish, fish pellets and hence are also considered omnivorous. They do not prey on each other and are not easily affected by infectious diseases; hence, they can be grown in relatively high densities. Milkfish growth may be stunted under adverse conditions, but they can grow fast when conditions become favorable again.In light of the above facts, Milkfishas wellpopular choice in the worldwide aquaculture. Obviously Pakistani farmers will be taken benefit of it.

Milkfish has a little hatchery period, generally 18-21 days(Marte, 2003). The premetamorphic larvae are hardy and they can be directly stocked in culture ponds as well as they are not cannibalistic and have a high tolerance to salinity changes(Duenas, 1983). These characteristics make this fish popular worldwide for culture. While the farming operations for milkfish can take place the whole year round, the abundance of wild caught fry is seasonal. Moreover, hatchery operations also take place at definite times of the year, subject on the positions of the spawners. The problem of ensuringa continuous supply of seed stock for milkfish, aquaculture has resulted in the use of nursery systems for milkfish such that the fry are reared to juvenile sizes in ponds, then later re-stocked in grow-out ponds where they are reared until harvest(Jaspe Cecilia *et al*., 2012).

Milkfish fry and fingerlings are abundant in coastal and brackish water areas in Sindh-Baluchistan, yet the industry remains in a state of underdevelopment. The main seed collection centers are Garho and Hawks bay the season is from March to June. The government policy is clear in support to farmers that should wait and watch till our success. Government hatchery setup still on the research side, it will take some time to switch on a commercial scale. If the industry boost up the supply of milkfish fry from the wild is not able to cope with the requirements, hence, seed stock must be produced in the hatcheries. An attempt was made to determine the influence of a range of foods on the growth of this fingerling fish just an upcoming scenario planning.

2 Material and Methods

2.1 *A source of fish and stocking*

One hundred eightywild caught early fingerlings Milkfish witha body weight of approximately 3-8g, were obtained from the landing site at Sumar khan Goth, Hawkes Bay, Karachi Sindh Pakistan (25° 4' 21N; 66° 43' 11E) (Fig. 1).Stocking of fish was done at 8 AM and the different water quality parameters suchas salinity, temperature and dissolved oxygen from the source and the nursery tank were checked prior to stocking.

2.2 *Feeding management*

The fingerlings treat on combination of soil & chicken manure (SC), followed by a combination of Urea & chicken manure (UC), and commercial pellets (CP) Control feeds due to SC and UC the benthic and filamentous algae grew in the nursery tank for threemonths. CP feedfloating commercial pellets, was given at a rate of 3-4% of fish body weight.The fish were fed twicedaily at 8 AM and 4 PM.

2.3 *Water management*

The water depth in the nursery tank wasmaintained at 90cm during the stocking untilharvest. Water in the nursery tank was changed every week. The water volumewas reduced to 50-70% and replenished thereafter. Water quality parameters including temperature, dissolved oxygen, salinity, pHand ammonia-N (NH3-N) were sampled once a week at 8:30 AM. Dissolved oxygen andtemperature was measured using DO meter. Salinity was determined using aRefractometer, water pH using pH pen and ammonia was determinedusing regularmeasures(Strickland and Parsons, 1972).

2.4 *Fish sampling*

The fish were sampled for growth before stocking. The different parameters including specific growth rate (SGR %), the survival rate (%) were also computed.

2.5 *Survival Rate*

Initial density of fingerlings in each treatment tank was calculated. After the treatments for three months and initial stages of the fingerlings, the density left was calculated as the final number. The survival rate (%) at particular treatment was met by dividing the final stocking density with initial stocking density. Each treatment was replicated 3 times to get the mean value. The following formula was used to calculate the survival rate.

$$\text{Survival Rate} = \frac{\text{Final density}}{\text{Initial density}} \times 100$$

2.6 *Specific Growth Rate (SGR)*

Sampled fingerlings of each treatment (SC),(UC) and (CP Control) weight under the microbalance,the mean BW of fingerling for each treatment were used for calculating as a specific growth rate (%). The data recorded and express as anSGR. The following formula was used to calculate the SGR(Memon*et al.*, 2012).

$$\text{SGR} = \frac{\text{In (Final body weight) - In (Initial body weight)}}{\text{Culture period (day)}} \times 100$$

2.7 *Statistical analysis*

Data were analyzed by one-way analysis of variance (ANOVA) using the statistical software SPSS. Significant difference among groups was determined by Duncan's Multiple Range Tests. Data are presented as treatment mean± SD. The values of $p<0.05$ were considered significantly different.

3 Results

The tanks were stocked with milkfish at a stocking density of 20/m^2 (Table1). The early fingerlings of milkfish length & weights prior initiations of the treatment were (3.8-6.4 cm / 3-8 g) average weight 5.35g for SC, UC and CP Control feed respectively. Though, at the end of the third month, weights increased to 31.16±2.9, 28.6±2.4 and 24.68±1.6g, with weight gain percentages of 82.83, 81.29 and 78.32% for SC, UC and CP Control treatment respectively (Table 2). SC treatment had the highest SGR (82.8%) compared to the other treatment.

Table 3 shows the survival rate of fingerlings of milkfish reared with different treatment and the control. The survival rate in fingerlings of milkfish UC treatment was (80.6±10.9%) it was significantly higher as compared to the control (80±5%), higher than the SC (79.5±11.1%).

Table 4 shows the levels of the different physico-chemical parameters of the water duringthe nursery production phase. There were no wide variations in the evaluations forsalinity, pH, and water temperature and ammonia levels during the production period. Therewere occasional levels of low dissolved oxygen in the tanks, but the levels were stillwithin the tolerable levels for milkfish that are reared in modified extensive systems.In this study, wild caught early fingerlings Milkfish were stocked in a nursery tankand reared for three months until they reached the post fingerling stage.

4 Discussion

During the nursing SC and UC, the fish relied mainly on the natural food that is present in the tank. These weremainly periphyton (benthic organisms) and filamentous algae. Milkfish are known to exhibit compensatory growth and this was observed in thehigh SGR (82.8%) that was noted in the present study when SC treatmentwas offered. Previously, shown that milkfish exhibited such growth patternwhen fed solely with natural food throughout the nursery production phase(Jaspe and Caipang, 2011). Natural food in the tanks plays an important role during the initial months of nursing milkfish because the stock is heavily dependent on these food organisms (Kühlmann *et al*., 2009). The natural food in milkfish ponds is predominantly composed of greenish algalmats with unicellular organisms and crustaceans(Fortes and Pinosa, 2007). (Jana *et al*.,2006) showed that the level of natural food, particularly the concentration of periphyton inmilkfish ponds step by stepdrop after the first month. In this study, the natural food was quite rich until harvest.

There was a high survival rate of the early fingerlings milkfish in the nursery tank duringthe raising phase. This was similar to a previous study on the nurseryproduction of this fish fed wholly with natural food (Jaspe and Caipang, 2011). The studywas done during the three months (15thNovember- 15th February) and for the period of this time natural foodproduction in tanks in terms of quality and quantity is better compared during the drymonths (Kühlmann *et al*., 2009; Fortes and Pinosa, 2007).

All physico-chemical parameters that were monitored in the water during nurseryproduction were within the desired levels of milkfish culture. The low dissolvedoxygen reading during the two-month nursery production was 0.9-0.8 mg/L, but this wastemporary because the levels of dissolved oxygen increase during intense photosyntheticactivity at daytime. Milkfish can survive in a dissolved oxygen concentration of 1 ppm(Cecilia *et al*., 2012), but stop feeding at this level (Cecilia *et al*., 2012). However, they canstart feeding before sunrise and will continue even after sunset as long as dissolvedoxygen in the water is at least 3 ppm (Cecilia *et al*., 2012). Dissolved oxygen has a crucialrole in the holding capacity of milkfish ponds (Sumagaysay, 1998). This limit of holding capacity was not reached in our present study because the milkfishwere reared only in the nursery phase. Hence, if the level of dissolved oxygen in thenursery tanks goes lowerserious levels, these may not badlydistress the survival rateof the stock.

The optimum temperature for milkfish culture is 20-43^{o}C (Villaluz and Unggui, 1983), and our readings were within this range. Milkfish are able to tolerate hypersalineconditions (Crear, 1980). Their tolerance limits are at salinities ranging from 0 to 158 ppt(Crear, 1980). The salinity readings that we obtained in the nursery tank were within thetolerance limits of the fish.

Fishthat have those conditions were segregated from the normal fish during harvest to ensure that the grow-out ponds stocked with these milkfish arefree of these abnormalities. Thus, it results in better survival and high growth ratesduring the later stages of culture.

5 Conclusion

In an instant, we described an innovative approach in the nursery production of wild caught early fingerling Milkfish in nursery tanks. Using early fingerling (5.35g average body weight), they were stocked in a tank at a stocking density of 20 pcs'/m^2 and reared for three months. The Nursery production of the fish resulted in higher survival and good growth at the end of the cycle. The nursery of milkfish in tanks during the 15th November- 15thFebruary months ensures sufficient supply of varieties of food and stable water quality during the whole phase in the nursery production.However, there are other innovations in the nursery production of milkfish. These include supplemental feeding and keeping the fish longer in the nursery tanks in order to attain bigger sizes. Thus, in this study described another approach in the nursery production of milkfish. Instead of using pre-metamorphic larvae, we used early fingerling of milkfish and reared them in a nursery tank through a combination of natural food and supplemental feeds.

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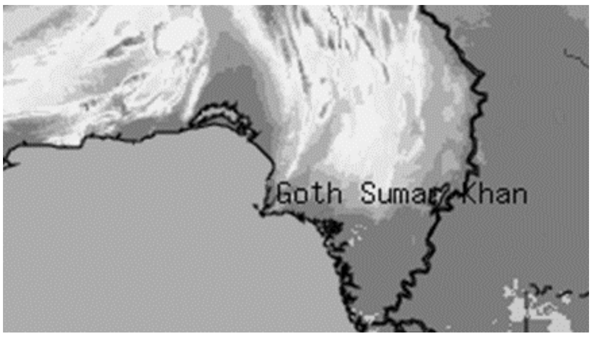

Figure 1: the sampling site at Sumar khan Goth,
Hawkes Bay, Karachi Sindh Pakistan

Table 1. Parameters for Fingerlings of milkfish during the different treatment

Parameter	Measurement unit
Initial average size	3.8-6.4cm
Final average size	16cm – 20cm
Initial average body weight	3-8g
Final average body weight	24-31g
Stocking density (SD)	20/m2
Survival rate	80%
Specific growth rate (SGR)	78.3-82.8%
Duration of culture	120 d

Table 2. Specific growth rate of milkfish fingerling at end with different treatments (n=180).

Treatments	Average weight of fingerlings (g)		SGR%
	Initial mean SD	Final mean SD	
SC	5.35±1.9	31.16±2.9	82.83[a]
UC	5.35±1.9	28.6±2.4	81.29[ab]
CP (control)	5.35±1.9	24.68±1.6	78.32[bc]

SGR% means in the same column with different superscripts are significantly different ($p<0.05$).Soil & chicken manure (SC), Urea & chicken manure (UC), and commercial pellets (CP) Control feeds offered for three months

Table 3. Survival rates (%) at third month Fingerlings of milkfish in a nurseryTank with different treatments (n=180)Means with different superscripts are significantly different ($p<0.05$).

Treatments	Survival rate(%) month wise				
	1st mean SD	2nd mean SD	3rd mean SD	average%	final%
SC	91.7±10.4	76.7±5.8	70±8.7	79.5±11.1[ab]	80.1±1
UC	91.7±2.9	80±5	70±5	80.6±10.9[a]	
CP (control)	85±5	80±8.7	75±10	80±5[a]	

Table 4: The different physico-chemical parameters of the water in a nurseryTank in different treatments

Parameters	Month			
	1st mean SD	2nd mean SD	3rd mean SD	Averagemean SD
Salinity ppt	30.1±10.6	29.4±12.9	39.4±2.6	32.9±5.6
PH	12.9±18.7	8.4±0.3	8.4±0.1	9.9±2.6
Ammonia mg/L	0.97±1.3	0±0	0.1±0.2	0.4±0.5
Nitrate (mg/L)	12.2±4.1	13.9±6.1	6±8.9	10.7±4.2
Temp	20±7.6	28±0.8	24±13.1	24±4.1
DO (mg/L)	3.9±2.7	0.9±1.7	0.8±1.7	1.9±1.8
Nitrite (mg/L)	1.4±1.9	0.4±0.8	0.05±0.1	0.6±0.7
Carbonate hardness	3.1±0	0.9±1.3	0.62±1.4	1.5±1.4
Turbidity	44.9±59.9	24.2±49.7	2.2±4.9	23.8±21.4

15th November-15th February total three months Physico-chemical parameters of the water in the nursery tankwere determined