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Seed production and culture techniques of Genetically Improved Farmed Tilapia (GIFT) in brackishwater environment

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Abstract
Effects of different levels of salinity on survival, growth and gonadal development of Genetically Improved Farmed Tilapia (GIFT) were studied under laboratory conditions in glass aquarium, for a period of ten weeks. The initial individual size of the GIFT was 20.23±4.45 and the salinity levels tested were 0, 5, 10, 15 and 20 ppt. The highest survival of 87.5% was found in 0 ppt and the lowest 60.5% in 20 ppt. Though the survival decreased progressively with increased salinity, there were no significant differences ($P>0.05$) among 0, 5, and 10 ppt (Table 1). Similar to what has been observed in survival, the specific growth rate (SGR %/day) also decreased as of 1.30, 1.24, 1.08, 0.90 and 0.71, respectively, with the increased salinity of 0, 5, 10, 15 and 20 ppt. The gonadal development was highest in 0 ppt with a GSI value of 3.75 and lowest of 2.01 in 20 ppt. In the second experiment, gonadal development and seed production performance of GIFT in brackishwater condition were investigated for a period of three months. Each of the three fine meshed hapas of 20 m^2 made from nylon net was placed in a freshwater (0 ppt) and in a brackish water (10-15 ppt) pond of the Brackishwater Station (BS). GIFT of 65 g average weight from a single cohort were stocked into three hapas at a rate of 2 m^{-2}. The male vs female ratio was 1:3. The development of gonad was faster with the higher gonadosomatic index (GSI %) of 3.85 % in freshwater condition than that of 2.73 % in brackish water. Within three months of the study period, a total of 70,510 and 44,250 GIFT fry were produced respectively, in freshwater and brackishwater conditions. Finally under third experiment, a participatory on-farm trial was carried out to evaluate the production performance of GIFT in monoculture and in polyculture with silver barb in coastal freshwater pond conditions. Nine ponds were selected for three treatment combinations of GIFT monoculture (T_1), GIFT and silver barb polyculture (T_2), and silver barb monoculture (T_3). The ponds have been stocked in April, 05 at a density of 25,000 fry ha^{-1}. Fishes were fed with rice bran at the rate of 6% bw day^{-1}. In one month culture period, GIFT attained an average weight of 16.27 g in monoculture and 17.23 g in polyculture, against an average stocking weight of 0.37 g. Silver barb reached an average weight of 16.62 g in polyculture with GIFT and 10.01 g in monoculture, against an average stocking weight of 3.79 g.

Key words: GIFT, Brackishwater, Survival, Growth, Gonadal development

Table 1. Mean weight gain, survival and GSI of GIFT under different salinity levels

Treatments/ salinity (ppt)	Initial weight (g)	Final weight (g)	Survival (%)	SGR (% day^{-1})	GSI (%)
0		50.0 ± 8.5	87.5	1.30	3.75
5		48.0 ± 1.4	75.0	1.24	3.62
10	20.23 ± 4.45	43.0 ± 6.1	62.5	1.08	3.25
15		38.8 ± 7.9	61.0	0.90	2.51
20		33.3 ± 6.8	60.5	0.71	2.01

Research findings

- GIFT can tolerate salinity level of 20 ppt with a survival rate of 61%.
- The specific growth rate of GIFT in a salinity of 15 ppt is similar to that of it in freshwater (0 ppt) condition.
- The GSI values of GIFT also do not vary significantly within the salinity levels of 0 to 15 ppt.
- GIFT can survive, grow, mature and breed well in brackishwater environment with a salinity level up to15 ppt.
- About 0.11 million GIFT fingerlings have been distributed among the fish farmers in Paikgacha region for stocking in household rain-fed ponds and shrimpghers.

Policy implications

- As GIFT can survive, grow, mature and breed in 15 ppt salinity as it does in freshwater (0 ppt) and has a shorter culture period (4-5 months), it could be one of the potential aquaculture candidate in coastal region.
- If GIFT could be introduced in shrimp ghers, either concurrently or alternately, it may not only compensate the severe and sudden loss of shrimp due to disease but also act as a biological mean of disease prevention through its role in minimizing soil and water quality degradation.
- Mass awareness is needed for introducing GIFT in coastal areas as a single aquaculture species or as a co-species in crop diversification in shrimp culture.
- Further research and development activities should be undertaken towards maintaining the pure strain and improvement of stock and in assessing the role of GIFT in shrimp culture.

Livelihood implications

Fisheries are the main livelihood option for the majority of the coastal poor people. Coastal aquaculture, mainly shrimp farming, has emerged as an industry playing a vital role in employment generation and poverty alleviation in coastal region. However, the present state of less abundance of fishes in coastal waters and out-break of disease in shrimp ghers is pushing the coastal people below the poverty level. This situation could be minimized to some extent through species diversification and bringing a huge number of household brackishwater ponds/ditches in coastal region under aquaculture. The results of the present study indicates that GIFT could not only be introduced in brackishwater aquaculture, but also be cultured in household ponds/ditches with economic significance from the point of aquaculture concept. If GIFT seed supply and technological back up are ensured with a mass awareness, rural farmers in the coastal region would be immensely benefited with nutritional upliftment and sustainable livelihood.