New Guide to Farming Tilapia: Breeding and Hatchery

A new guide looks at breeding and hatchery techniques including stocking densities for Nile tilapia.

Breeding of tilapia is conducted in ponds, tanks or hapas. The stocking ratio for females to males is 1-4:1 with 2 or 3:1 being the most common.

The brood fish stocking rate is variable, ranging from 0.3-0.7 kg/m^2 in small tanks to 0.2-0.3 kg/m^2 in ponds. The popular hapa-in-pond spawning system in Southeast Asia uses 100 g brood fish stocked at 0.7 kg/m^2. Spawning ponds are generally 2000 m^2 or smaller. In Southeast Asia, a common hapa size is 120 m^2.

Brood fish are given high quality feed at 0.5-2 per cent of body weight daily. Swim-up fry gather at the edge of a tank or pond and can be collected with fine-mesh nets. Fry collection can begin 10 to 15 days after stocking.

Multiple harvests (six times per day at five day intervals) are conducted up to a maximum of eight to 10 weeks before pond drainage and a complete harvest is necessary.

Tanks must be drained and recycled every one to two months because escaped fry are very predaceous on fry from subsequent spawns. Alternatively tanks or ponds are harvested completely after a 2-4 week spawning period. Production of optimum-sized (<14 mm) fry ranges from 1.5 to 2.5 fry/m2/day (20 to 60 fry/kg female/day).

In the South East Asian hapa method, fish are examined individually every five days to collect eggs.

This system is much more productive, but it is labour intensive. Brood fish are more productive if they are separated by sex and rested after spawning.

Sex-reversal

Commercial tilapia production generally requires the use of male monosex populations. Male tilapia grow approximately twice as fast as females. Therefore, mixed-sex populations develop a large size disparity among harvested fish, which affects marketability.

Moreover, the presence of female tilapia leads to uncontrolled reproduction, excessive recruitment of fingerlings, competition for food, and stunting of the original stock, which may not reach marketable size. In mixed-sexed populations, the weight of recruits may constitute up to 70 per cent of the total harvest weight. It is therefore necessary to reverse the sex of female fry.

This is possible because tilapia do become sexually differentiated for several days after yolk sac absorption. If female tilapia receive a male sex hormone (17 a methyltestosterone, MT) in their feed, they will develop as phenotypic males.

Fry collected from breeding facilities need to be graded through 3.2 mm mesh material to remove fish that are >14 mm, which are too old for successful sex reversal. Swim-up fry are generally <9 mm.

MT is added to a powdered commercial feed or powdered fish meal, containing >40 per cent protein, by dissolving it in 95-100 per cent ethanol, which is mixed with the feed to create a concentration of 60 mg MT/kg feed after the alcohol has evaporated.

The alcohol carrier is usually added at 200 ml/kg feed and mixed thoroughly until all the feed is moist. The moist feed is air dried out of direct sunlight, or stirred in a mixer until dried, and then stored under dark, dry conditions.

Androgens break down when exposed to sunlight or high temperatures. Fry are stocked at 3000 to 4000/m^2 in hapas or tanks with water exchange. Stocking densities as high as 20,000/m^2 have been used if good water quality can be maintained.

An initial feeding rate of 20-30 per cent body weight per day is gradually decreased to 10-20 per cent by the end of a three to four week sex-reversal period. Rations are adjusted daily, and feed is administered four or more times per day.

If sex-reversal is conducted in hapas, the feed must be of a consistency that allows it to float.

Otherwise a considerable amount of feed would be lost as it settles through the bottom of the hapa.

Sex-reversed fry reach an average of 0.2 g after three weeks and 0.4 g after four weeks. The average efficacy of sex-reversal ranges from 95 to 100 per cent depending on the intensity of management.

Hatchery

After sex-reversal, fingerlings are generally nursed to an advanced size before they are stocked into grow-out facilities. This procedure increases survival in the grow-out stage and utilises growing space more efficiently.

Sex-reversed fingerlings are stocked at approximately 20-25 fish/m^2 in small ponds and cultured for two to three months to an average size of 30-40 g.

The ponds should be filled immediately before stocking to prevent the build-up of predaceous aquatic insects. Final biomass at harvest should not exceed 6000 kg/ha. In ponds, fingerlings are given extruded feed (30 per cent protein) at an initial rate of 8-15 per cent of biomass per day, which is gradually decreased to a final rate of four to nine per cent per day.

A series of small cages (<4 m^3) with increasing mesh size can be used to rear advanced fingerlings.

Sex-reversed fingerlings can be stocked at a rate of 3000 fish/m^3 and grown for six weeks until they average 10 g.

Fish of this size can be restocked at 2500 fish/m^3 to produce 25-30 g fingerlings in four weeks. These fish can be stocked at 1,500 fish/m3 to produce 50-60 g fingerlings in four weeks.

A recirculation system stocked at 1 000 fish/m3 will produce 50 g fingerlings in 12 weeks. Fingerlings should be fed three to four times daily.

You can view the full FAO Guide by clicking here.

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