Low saline aquaponics system with Silver Pompano as a candidate species

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Introduction

Aquaponics is a sustainable food production system that integrates hydroponics and aquaculture practices in order to attain optimum utilization of nutrients by re-cycling. Aquaponics facilitates the symbiotic production of vegetables and fishes with minimum inputs, organic farming like management and higher control on production. Aquaponics system is extremely water efficient, does not require soil and does not use fertilizers or chemical pesticides. Silver pompano *Trachinotus blochii* is a preferred candidate species for mariculture due to the availability of hatchery produced seed, adaptability to commercial pellet feeds, good market demand and excellent meat quality. The species has proven good for farming in both marine as well as low saline water bodies. Adopting the principles of nutrient utilization in aquaponics and the ability of silver pompano to grow in low saline conditions, a prototype of a low saline aquaponics system integrating one month reared fingerlings of silver pompano *T. blochii*, with a common, leafy vegetable *Amaranthus* by employing a 0.25 hp submersible pump for recirculation was developed.

Fig.1 Low saline aquaponics system

Fig. 2. (a) Amaranthus (b) stocking size of fingerlings of Silver Pompano (c) Fingerling after one month culture in aquaponics system.

Aquaponics system

The model aquaponics system consists of a 500 litre square FRP tank, a 20 litre plastic basin mounted on a 1.5 m height wooden stand. The FRP tank was filled with 400 litres of 5 ppt saline water. Thirty fingerlings of silver pompano were stocked in the tank. The fishes were fed with an artificial diet (Nutrila, Growel India Pvt. Ltd; 45% crude protein 1.2 mm size) @ 10% of body weight. The basin was filled with fine sand at the bottom and coarse gravel at top. 30 number of Amaranthus plants were planted in the basin. Recirculation of water was carried out using a small submersible pump (with 2 m head, flow rate 2800 litre per hour, 50 hp). The flow rate of the aquaponics system was maintained as 10 litre per minute.

Water quality parameters observed in the aquaponics system such as temperature (28-29^{O}C), pH (7-7.5), Dissolved oxygen (5-6 ppm) were optimum for the growth of the fishes. Salinity was maintained little lower (6.7 ppt) than the recommended optimum level (15-25 ppt) for silver pompano culture systems, in order to reduce the negative impact of salinity on plant growth. Other parameters included NH_4^+ (0.04-0.075 ppm), NH_4-N (0.03-0.06 ppm), No_2 (0.05-0.07 ppm), No_2-N (0.01-0.021 ppm) and PO_4^- (1.2-1.5 ppm).

Details of the production obtained from the integrated aquaponics system after 30 days indicated growth rate of pompano was higher than their reported growth in conventional tanks. Even though FCR was slightly higher than the recommended (1:1.8) level, 100% survival was observed in the system. An additional production of a leafy vegetable could also be obtained through the system although the plant growth was slightly slower compared to normal farming. Damage due to pests was minimum. Since the present system is a prototype there is ample scope for the enhancement of production using bigger systems.