

**RICE – GOLDFISH INTEGRATION PERFORMANCE OF GOLDFISH
(CARASSIAS AURATUS) IN AN IRRIGATED RICE FIELD AND
DEVELOPMENT OF SUITABLE CULTURE SYSTEMS FOR POST LARVAE
AND FRY**

BY

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ABSTRACT

Rice is the predominant crop both in terms of land use and dietary importance in Sri Lanka. Paddy farmers face difficulties in getting satisfactory yields and sufficient profits from paddy cultivation in Sri Lanka. Diversification of paddy lands to upland crops have marginally resolved the poor income but affected the paddy production. Rice-fish integration is a solution to increase paddy production, improve productivity of irrigation water and secure satisfactory income to the farmer with minimum environmental problems. Since consumer preference is low towards small size fresh water fish, rice-fish integration should not be intended for the production of cheap table fish species such as tilapia (*Oreochromis spp.*). Production of export oriented ornamental fish as well as rearing of post larvae to fry or fry to fingerling with rice-fish integration will be economical and culturally acceptable. Therefore, this study was carried out to evaluate the performance and to develop suitable culture systems for goldfish (*Carassius auratus* Linnaeus, 1758.) post larvae and fry in irrigated paddy cultivation.

Five different Experimental Series were conducted in six paddy plots (49 m² each) and four indoor tanks (0.75m² each). Chicken manure was the only fertilizer used and 1000 kg/ha of basal dressing and four split doses of 400 kg/ha/fortnight were applied as the top dressing. Paddy varieties BG 379\2 and BG 300 were selected for integration. Experimental Series 1 was conducted to develop a water filtration system and suitable culture environment for ornamental fish in paddy plots. In Experimental Series 2 and 3, performance of goldfish post larvae and fry in plots having two paddy varieties was compared with the fish performance in an indoor system. Methods to increase productivity and recycling of paddy by-products in the rice-fish system were evaluated in Experiment Series 4. Economics of paddy production and ornamental fish production under rice-fish integration was evaluated in Experiment Series 5.

Experiment Series 1 was conducted to evaluate, three low cost water filters for efficiency in eliminating wild fish and predators present in the water source. A Bag filter of 20 x 20 x 40 cm (2 mm pore size), a screen type filter with a diameter of 15 cm (2 mm mesh size) and a Cartridge type filter (hollow cone) with an inner 2 mm mesh and perforated (3 mm pore size) outer casing were found to be equally effective in preventing the entry of wild fish and predators. Turnover rate of the Screen type filter and Bag filter decreased rapidly with continuous use compared to the Cartridge type filter.

Experimental Series 2 was conducted to evaluate the performance of ten day old post larvae in a 12-week culture cycle in paddy plots with a complete net cover and pond refuge cover. Performance was compared with the fish in the indoor system. Post larvae in paddy plots with complete net canopy had reached a total length of 4.9 ± 0.8 cm and recorded $18\% \pm 2.9$ survival rates in a 12-week culture cycle, while a total length of 4.5 ± 0.8 cm and $27\% \pm 2.4$ survival rates were recorded in the eight week culture cycle. Post larvae in paddy plots with only the pond refuge cover recorded 100% mortality. Post larvae in the indoor system recorded a total length of 2.1 ± 0.2 cm and a survival rate of $47\% \pm 2.1$.

Fry stocked in paddy plots at four-weeks and six-week of age recorded mean lengths of 8.3 ± 0.7 cm and 9.4 ± 0.9 cm and survival rates of $58\% \pm 2.8$ and $63\% \pm 3.8$ respectively, in twelve-week culture cycle. Four-week old fry recorded a total length of 7.5 ± 0.6 cm and a percentage survival of $55\% \pm 2.7$ in an eight-week culture cycle. Fry in indoor tanks have shown higher survival rates and lower total lengths compared to fry in paddy plots. The percentage of bright coloured fish in paddy plots was 71 ± 1.4 while it was 46 ± 0.7 in the indoor system.

Paddy yields in the plots under complete net cover were higher compared to yields in the open paddy plots. Paddy yields could be increased by recycling paddy straw and paddy husk ash in the rice-ornamental fish system. Paddy straw application at 3000 kg/ha and paddy husk ash application at 2000 kg/ha resulted in higher yields of 3891 kg/ha \pm 155 and 3457 kg/ha \pm 111 respectively, compared to 2963 kg/ha \pm 74 in the control.

The highest profit have been earned by stocking four-week old fry in paddy plots at 4.08 fish/m² in twelve-week culture period and highest Return on Investment was recorded when stocking six-week old fry in paddy plots at 2.04 fish/m² in a twelve-week culture period. Return on Investment which was significantly higher in rice-ornamental fish system compared to sole paddy cultivation showed that rice-ornamental fish integration can be used as a method to improve the income of the farmer.

Keywords: Goldfish, rice, integration, organic farming