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# Performance of orangefin labeo, *Labeo calbasu* (Hamilton 1822) as a component of polyculture system

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**Abstract**

This paper deals with the performance of orangefin labeo, *Labeo calbasu* (Hamilton, 1822) as a component of conventional composite carp culture system. The species was included as 50% substitution to common carp (*Cyprinus carpio*) in view of its omnivorous feeding habit and bottom dwelling nature. The total production was 0.55% higher in the experimental culture (with *L. calbasu* and *Cyprinus carpio*) than in the control (common carp only). The difference in the production was however not significant statistically. The comparative economics revealed 5.30% higher return from the experimental unit. Comparison of growth pattern and survival rates of other five species of carps indicated that inclusion of *L. calbasu* did not have any adverse impact on the other carps. Growth rate of other carps was observed to be higher in the experimental set by 0.05% on an average than the control. Calculated profit per hectare was found to be 9.2% higher in experimental plot than in the control. Although the gross production and return in the experimental unit was not significantly higher than the control, the data supported that *L. calbasu* is compatible to other component species in composite carp culture system and its inclusion will enhance the economic viability of the system.

**Keywords:** *Labeo calbasu,* polyculture, monoculture, compatibility, composite carp culture

## INTRODUCTION

India is often referred to as a carp cultivating country as the major component of country's aquaculture is the carps. Polyculture of carps with three Indian major carps (*Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*) and three exotic carps (*Hypopthalmichthys molitrix*, *Ctenopharyngodon idella*, and *Cyprinus carpio*) has gained tremendous momentum in the country with varying level of management, investment and productivity. The sub continent is however known as an abode of a large number of other fish species that have potential for domestic and export market. The culture potentiality of many of these indigenous species has remained unexplored. Unless aquaculture production is diversified through development of breeding and culture technologies for cultivable indigenous species, it is likely that alien species introduced illegally will find place in the industry to satisfy the needs of the market. Aquatic alien species introductions have been carried in India since nineteenth century. However, the concept of responsible fisheries has been realized only recently when various ecological, socio-economic and disease problems from alien species started cropping up (Lakra and Singh 2007). In view of the above it is high time to pay emphasis in screening out diversified indigenous candidates with high market value and aquaculture potential to meet the needs of farmers and the consumers.

One of the commercially important indigenous fish species is *Labeo calbasu* (Hamilton, 1822), that can be considered as a component for polyculture system. Locally known as *Mali* or *Kolia Jora* in Assam and commonly known as Orangefin labeo in English, *L. calbasu* is a highly favored fish with a greenish-grey colored pink tinged scales (Figure 1).

**Figure 1:** *Labeo calbasu* (Hamilton, 1822)

As a true bottom feeder its mouth protrudes downwards when open and has a distinct fringe on the upper lip. The species is highly preferred by the local population for its specific taste and is generally collected from natural resources. Due to high demand this species fetches a market price of Rs. 150-250 per kg (US$ 2.49-4.15) depending on the season in Assam. The conservation status of the species is determined to be LRnt (CAMP 1998). However the culture potentiality of the species has not been assessed as a component in polyculture system except few studies made by Sahu *et al.* (2006 and 2007), Faroogh and Siddiqui (1989) and Rahman *et al.* (2008). In view of the above the present study was conducted to assess the performance of *L. calbasu*, as a component in polyculture system.

## METHODOLOGY

The study was conducted at Fisheries Research Centre, Assam Agricultural. University, Jorhat (94°10'E; 26°44'N) (Figure 2), Assam during 2007-09.


**Figure 2:** Map of Assam showing Jorhat district

For polyculture trials, *L. calbasu* was incorporated (E) in the conventional six species polyculture of carps by replacing 50% of *C. carpio*. One control unit (C) was run as per conventional six species polyculture of carps (Anonymous 1997). The duration of culture was 330 days in all trials with three replications.

***Ponds:*** Four numbers of earthen ponds of uniform area (0.05 ha) and depth (3.0 m) were used which were prepared and maintained as per the package of practices for semi-intensive culture (Anonymous 1997). Three ponds were used as experimental unit and one as control.

***Stocking:*** Pond raised advance fry (80-100 mm) of *L. calbasu* and fingerlings (100-150 mm) of cultivable carps were stocked as per the standard rate (5000 per ha) in the month of August (Table 1).

**Table 1:** Percentage composition and stocking density for seven species composite culture of major and minor carps

| Sl. No. | Species | % composition | | Nos/0.05 ha | |
|---|---|---|---|---|---|
| | | E | C | E | C |
| 1 | Silver carp | 20 | 20 | 55 | 55 |
| 2 | Catla | 15 | 15 | 41 | 41 |
| 3 | Rohu | 15 | 15 | 41 | 41 |
| 4 | Grass carp | 10 | 10 | 27 | 27 |
| 5 | *L. calbasu* | 10 | - | 28 | - |
| 6 | Mrigal | 20 | 20 | 55 | 55 |
| 7 | Common carp | 10 | 20 | 28 | 56 |
| | **Total** | **100** | **100** | **275** | **275** |

*E, Experiment; C, control*

***Supplementary feeding:*** Supplementary feeding was done with rice bran and mustard oil cake (MOC) at 1:1 ratio by weight at the rate of 3% body weight of fish daily. For grass carps (*Ctenopharyngodon idella*), vegetable waste and aquatic vegetation were provided (Anonymous 1997).

***Growth record and limnological parameters:*** Species wise growth record and analysis of limnological parameters *viz.* pH, DO, free $CO_2$, plankton and total alkalinity was done at monthly interval in both experimental and control units as per standard methods (APHA 1989).

***Harvesting:*** Harvesting (Figure 3) was done after 330 days of culture by complete dewatering of ponds. Species wise recovery, gross weight gain and production were recorded at harvesting.

***Economic analysis:*** Cost and return of experimental and control polyculture units were computed and compared. Data on production and profit were analyzed statistically by subjecting to one-way analysis of variance (ANOVA) and were compared for significance with Duncan Multiple Range Test (Duncan 1955).

**Figure 3:** Harvest of *Labeo calbasu* from polyculture system

## RESULTS AND DISCUSSION

The depth of water was found to vary from 1.5-2.45 m in different seasons, highest during June and August (2.45 m) and lowest during January (1.5-1.55 m). Highest water temperature (30-33 °C) was recorded during May-June in both the experimental and control ponds. There was a decreasing trend of water temperature from August to January. From February onwards temperature increased reaching the peak during May-June. The water depth and temperature in the present study although exhibited a fairly wide range of fluctuation, the range was within the favorable limit for major carps (Jhingran 1985). Range of other parameters was as follows: pH was maintained between 6.5 to 7.5 in both sets of ponds, DO concentration 5.00-7.20 mg/l, $CO_2$: 1.60-3.20 mg/l, total alkalinity 33-79.00 mg/l and. plankton population 3.00-5.85 ml/50 liter. The range of pH, free $CO_2$ , DO, total alkalinity and plankton population did not exhibit any well defined seasonal trend and were found to be within productive range as laid down for fish culture (Swingle 1967, Anonymous 1997).

Growth record percentage of survival, gross weight gained by component species in experimental and control unit are depicted in Table 2. Data reveals that the rate of growth for different species is at par in both experimental and control. No significant variation was recorded in survival percentage of different species in between the two units. This indicates that inclusion of *L. calbasu* in the conventional six species polyculture system; do not have any negative impact on the growth rate and survival of other carps. Hence this species can be considered compatible to other cultivable carps.

**Table 2:** Performance of *Labeo calbasu* as 50% substitution of *Cyprinus carpio*, (pond area 500 sq m)

| ***Species*** | ***Growth rate (g/day)*** | | ***Survival (%)*** | | ***Gross weight gain (g/fish)*** | | ***Total production (kg)*** | |
|---|---|---|---|---|---|---|---|---|
| | ***E*** | ***C*** | ***E*** | ***C*** | ***E*** | ***C*** | ***E*** | ***C*** |
| *Catla catla* | 2.86 | 2.71 | 86.5 | 83.8 | 950 | 968 | 30.4 | 30.0 |
| *Hypopthalmichthys molitrix* | 2.91 | 2.89 | 80 | 82 | 990 | 975 | 39.6 | 39.9 |
| *Labeo rohita* | 1.84 | 1.92 | 81.6 | 84 | 750 | 745 | 23.3 | 23.84 |
| *Ctenopharyngodon idellla* | 3.39 | 3.45 | 88 | 85 | 1089 | 1120 | 23.98 | 24.64 |
| *Cirrhinus mrigala* | 2.47 | 2.54 | 86 | 88 | 888 | 842 | 38.18 | 37.0 |
| *Cyprinus carpio* | 1.73 | 1.88 | 92 | 88 | 630 | 586 | 14.49 | 25.78 |
| *Labeo calbasu* | 1.43 | -- | 88 | -- | 555 | -- | 13.32 | -- |
| *Total* | | | | | | | *183.27* | *181.16* |
| *Calculated per ha production* | | | | | | | *3665.4* | *3623.2* |

Comparison of growth of *L. calbasu* and *C. carpio* reveals that growth rate of *L. calbasu* is lower (1.43 g/fish/day) than *C. carpio* (1.88 g/fish/day) in control and 1.73 g/fish/day in the experimental). This is because of the fact that being a minor carp, *L. calbasu* possesses a low natural growth rate in comparison to, major carps. The difference in growth rate of common carp between experimental and control may be indicative of the competition between *L. calbasu* and *C. carpio*, as both the species are bottom dwellers and omnivorous in feeding habit. The total production is 1.16% higher in the experimental than in the control. The difference is however not statistically significant.

The comparative economics of both the unit is given in the Table 3. The profit from the experimental unit is 10.9% higher than the control. The percentage of profit to investment is 14.78% higher in the experimental. Similarly, the percentage profit to turnover is 2.96% higher in the experimental than the control. This was due to the higher market price of *L. calbasu* in comparison to *C. carpio*.

From the above discussion, it can be concluded that inclusion of *L. calbasu* is an economically suitable option. There is possibility for hundred percent replacement of *C. carpio* with *L. calbasu* in the polyculture system, as both the species are bottom dwelling and omnivorous in food habit. From the view point of consumer's preference also, *L. calbasu*, stands ahead of *C. carpio*. Further, common carp, owing to its early maturing and pond breeding habit, may upset the population balance, thereby resulting in poor growth of other component species (Sinha *et al.* 1985). Incorporation of *L. calbasu* in place of common carp may be a better strategy to avoid this problem.

 

**Table 3:** Comparative economics of polyculture units (0.05 ha)

| *Sl.* | *Issues* | *Experiment* | *Control* |
|---|---|---|---|
| 01. | Gross fish production (kg/unit) | 183.27 | 181.16 |
| 02. | Calculated fish production (kg/ha) | 3665.4 | 3623.2 |
| 03. | Production from different (kg/ha) | | |
| | i. *Labeo calbasu* | 266.4 | |
| | ii. Common carp | 289.8 | 515.6 |
| | iii. Other carps | 3109.2 | 3107.6 |
| 04. | Return from fish sale (Rs./ha) | | |
| | i. *L. calbasu* (at Rs. 80/kg) | 21312.00 | - |
| | ii. Common carp (at Rs. 45/kg) | 13041.00 | 23202.00 |
| | iii. Other carps (at Rs. 50/kg | 155460.00 | 155380.00 |
| | Total return (Rs./ha) | 189813.00 | 178582.00 |
| 05. | Total operational cost per ha | 76,000.00 | 76,000.00 |
| 06. | Profit per ha (Rs.) | 1,13,813.00 | 1,02,582.00 |
| 07. | % profit to investment | 149.75 | 134.97 |
| 08. | % profit to turnover | 59.96 | 57 |

The seed production of *L. calbasu* through induced breeding with hormone administration is now commonly practiced by the fish seed producers. Hence availability of seed of this species will not be a constraint in this endeavor.

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