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## POTENTIALITY FISH HYBRIDS IN AQUAFARMING

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### Introduction

Genetic improvement attributes to the better performance of the new generation over the parental stock. There are several approaches towards this goal contributing hybridization, selective breeding and other population manipulation techniques. Hybridization is a rapid method of genetic improvement and method of animal improvement, in which two or more species of unlike genetically constitution, differing in one or more characters are crossed together. The crossing of distant genetically variable stocks can produce increased performance termed heterosis or hybrid vigor. Through hybridization uniform products (monosex hybrids) can be produced, by hybridizing two species depending upon the sex-determined mechanism present in two species e.g. *Tilapia mossambica* (male) x *Tilapia nilotica* (female). Hybridization is one of the methods employed for combining desirable qualities of selected fishes, which would interbreed and also raised strains superior to those to which the parents belong. Fish hybrids generally tend to be intermediate in taxonomic characters pertaining to the parents but may show desirable qualities like phenotypic growth, better food conversion, higher survival, resistance against disease and tolerant to unfavorable environmental conditions.



### Role of hybridization in aqua farming

The progress from traditional system to modern intensive farming a capital oriented that can be qualified by the use of expensive inputs. Till now, the investigation have been undertaken to evolve proper feed, water quality control and health management to carps for getting high yield with low input cost. Selection in breeding stocks is adopted to upgrade and improve the genetic status of a particular species. The use of several biotechnological tools in aquaculture has resulted into higher fish production. The technique of hybridization in several ways to improve fish productivity in selection programs when strains are selected with the knowledge that their hybrids are good. The use of hybridization technique is wider spread and practical all over the world in terms of culture and management of the fish experimental and commercial levels.

The main aim of hybridization is to improve the existing stock and to develop the hybrids having desired traits over the parents with high production potential and disease resistance. All the Indian major carps are the esteemed for their excellent growth and quality of fish flesh and flavor. For obtaining still higher yield from ponds and to produce disease resistant varieties, the production of hybrids with desirable culture qualities including faster growth rates, higher fish flesh yield etc. The selection of carp species to be hybridized depend on the purpose i.e. production of fertile or sterile hybrids. In recent years, hybrids produced from crossing female of

common carp and male rohu or mrigal, and vice versa have proved to viable but sterile. They can be used for stocking such water where common carp creat problems because of its prolific breeding habit.

### **Types of hybrids**

The fish hybrids may be categorized into two groups, as follows:

#### **1. Interspecies hybrids**

Interspecies hybrids are produced by the crossing the same genera of different species. In crossing of *Labeo rohita* and *Labeo calbasu* over 90 % fertilization was obtained. These hybrids were extremely viable, looked more like the male parents and faster growth rates than that of parents. In the *L. bata* X *L. rohita*, *L. bata* X *L. calbasu* and *L. calbasu* X *L. gonius* crosses, the percentage of hatching was poor and showed no distinct promise. The first produced by cross of *L. rohita* X *L. calbasu* achieve maturity in two to three years and was induced bred, producing F<sub>2</sub> generation possessing a very rang of characters.

#### **2. Intergeneric hybrids**

Crossing the fishes belonging to different genera produces intergeneric hybrids. Hybridization amongst the member of the Indian major carps, Chinese carp and Common carps have been attempted to obtain hybrids having superior qualities the parental species for culture than.

##### **(A) Hybrids among the Indian major carps**

There have been many hybridization trials among Indian major carps. Intergenetic hybrids were produced between Catla, Rohu, Mrigal, Calbasu, Fimbriatus and Reba. Catla is fastest growing carp with high body girth and excellent flesh quality but proportionately less among of flesh due to large size of the head. It does not readily accept antifical feed and is easily harvested from ponds. It has been found that hybrids by the crosses between catla with other Indian major carps are viable and mature in 1 – 2 years. The most promising amongst them are Rohu – Catla, Catla – Rohu followed by *Catla – Mrigal*, *Catla – Calbasu*, *Calbasu – Catla* and *Catla – Fimbriatus*. The carp hybrids produced *Catla – Rohu* and *Rohu – Catla* are very much important in terms of growth. F<sub>1</sub> hybrids are again either artificially propagate to produce F<sub>2</sub> or back cross with parent to establish new characters. Rohu – Catla, hybrids is very promising in terms of growth, food and feeding habits, variability and good flesh contents. Both hybrids are intermediate in various morphometric characters. In both hybrids head is smaller than catla and flesh more than the parents. Unlike catla, the hybrids readily accept artificial feed. Both hybrids are faster in growth compare to parents and fertile in nature.

Hybridization of female catla with male calbasu was attempted since calbasu has a small head and Spindale shape body. It readily accepts artificial feed. Harvesting of this fish is difficult as it easily escape the net by burrowing into the mud. The hybrids *Catla – Calbasu* shows faster growth than then that of calbasu. The head size is smaller than the catla. The body girth is higher than that of calbasu and the fish flesh is more than both parents.

The first attempt to produce hybrids of male mrigal and female rohu did in 1958. The fertile hybrid between male rohu and female mrigal has a deeper body girth than either of its parents while head is bigger than mrigal but smaller than rohu. These hybrids are intermediate between their parents in certain morphometric characters.

##### **(B) Hybrids between Indian major carps and Chinese carps**

Most of the hybrids produced between Indian major carps and Chinese carps do not show any promising results, as they are generally non-viable. Hybrids between rohu and Chinese carps die

before or on first day, the longest survival (for two week) was seen in grass carp hybrids. Catla – Silver carp (*Catla catla X Hypophthalmichthys molitrix*) is more viable and could be reared for more than four months. Growth rate of this hybrid is faster than that of catla and in early stage is at par with silver carp. The hybrid has a body girth comparable to catla and size of head and scale nearer to silver carp.

### **(C) Hybrids between Indian major carp and common carp**

Common carp is highly domesticated species and plays an important role in fish production. The work on hybridization of Indian major carp and common carp was done in 1959. Hybrids produced by female common carp and male rohu have been observed to be most viable. Common carp is an omnivorous feeder and a prolific breeder in ponds. Whereas, rohu is fast growing Indian major carps and esteemed for its quality fish flesh, which is, free from off flavor often encountered in common carp raised in ponds. Thus the hybrids produced between these two species would be of considerable interest if it could combine the pond breeding and omnivorous feeding habit of common carp and at the same time retain the valuable qualities of rohu. Thus the production of Indian major carps and common carp hybrids point out a convenient method of obtaining sterile hybrids with a better fish flesh quality than the common carp and omnivorous feeding habits raised in Indian ponds.

#### **Common carp – Rohu (*Cyprinus carpio X Labeo rohita*)**

Hybrids of female common carp and male rohu were produced in 1984. Hybrids possess various morphometric characters intermediate of both the parents but have a greater resemblance with common carp. Like common carp it is omnivorous, bottom feeder and its growth rate is also comparable with common carp and it is sterile. It contains more flesh than common carps but less than rohu. Its higher flesh contents, bottom feeding habit, infertility and high growth rate as against common carp suggest the possibility of its use in fish culture as a substitute for common carp.

#### **Mrigal – Common carp (*Cirrhinus mrigala X Cyprinus carpio*)**

Hybrid between female mrigal and male common carp were produced for first time in India at CIFRI Barrakpore, (WB). The hybrids have greater body girth than mrigal and the head small than the common carps, and did not show any sign of maturity even at the end of 14 months of rearing.

### **(D) Hybrids amongst Chinese carp**

Crosses and reciprocal crosses of silver carp and grass carp with common carp were successfully carried out. Common carp x silver carp and common carp x grass carp hybrids survive for 10 months. Hybrids between female grass carp and male Silver carp were observed to consist a mixture of two different types of individual. Some of them are resembled grass carp while other were intermediate to grass carp and silver carp.

### **Conclusion**

Hybrids contribute towards the management and higher fish production of fish in ponds. The crosses between various species or strains are usually considered as selective breeding. Both sterile and fertile hybrids have been produced and this variation has been taken full advantage in fish culture and general fisheries development. The sterile hybrids are very valuable for certain specific purpose in fish culture where fertile may not be a desirable feature as regards population control.

Since both fertility as well as induced sterility in hybrids is of vital importance in fish culture, most stress should be given to the study of genetic causes of sterility and reduced fertility in hybrids. Sterile hybrids between major carps and common carps are considered to be the demand of today. They give rise to the more flesh contents at the cost of gonadal development. Secondly, unlike common carp, they being sterile do not disturb the stocking density and ecological conditions of an aquatic ecosystem through natural breeding especially in tropical areas. On the other hand, fertile hybrids are also important and valuable to obtaining new hybridogenic forms with improved qualities in sorting out combining and selecting various desirable characters through successive generation and back crossing etc. Therefore, hybridization can be considered as a tool for the development of inland aquaculture.