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Exploring Fish Varieties and Biofloc Technology

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ABSTRACT

Aquaculture is a fast-growing industry that requires efficient resources and space utilization. Various technologies have been developed to overcome challenges, with "Biofloc systems" being a recent innovation aiming to address water pollution, optimize water usage, and recycle nutrients through bacteria communities. By adopting this system, aquaculture farms can reduce or eliminate water exchange, while also benefiting from microbial by-products. Fish experience quicker response times due to elevated water respiration rates but may face seasonal performance issues in sunlight-exposed systems. Alkalinity supplements may be necessary, along with increased energy requirements for mixing and aeration, a startup period, and potential pollution risks from nitrate accumulation and notification instability.

Keywords: *Biofloc system, Fish farming efficiency, Biofloc nitrate management, Fish farming pollution reduction.*

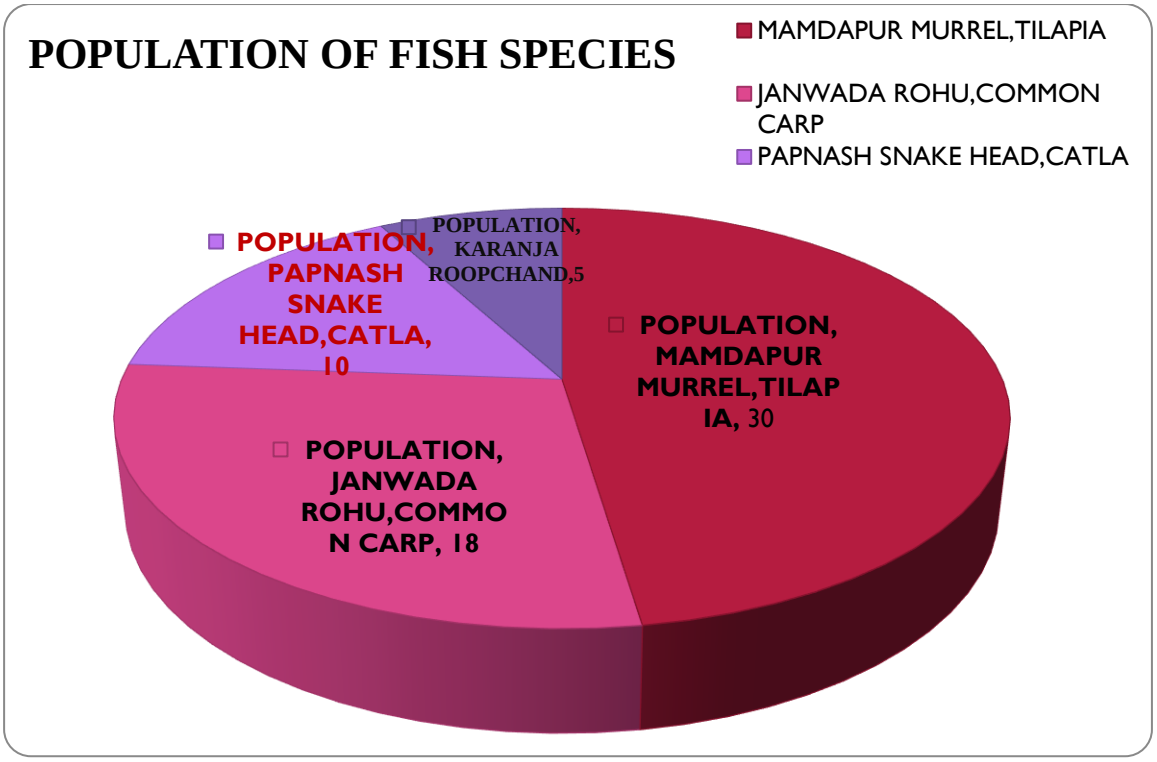
1. INTRODUCTION

India is the third largest fish producing country and the second largest aquaculture fish producer in the world. India contributes about 7% to the global fish production countries. Around 14 million people are engaged in fisheries and its allied activities. Andhra Pradesh is the largest fish producer in the country, followed by West Bengal and Gujarat. The total fish production during 2017-18 is estimated to be 12.60 million metric tons, of which nearly 70% is from the inland sector, and about 50% of the total production is from culture fisheries. More than 50 different types of fish and shellfish products are being exported to 75 countries around the world. Fish and fish products have presently emerged as the largest group in agricultural exports from India, with 13.77 lakh tonnes in terms of quantity and Rs. 45,106.89 crore in value. This accounts for around 10% of the total exports and nearly 20% of the agricultural exports, and contributes to about 0.91% of the GDP and 5.23% to the Agricultural GVA of the country.

General Characherstics of fish:

- They have separate sexes
- They may be either oviparous or ovoviviparous
- They are found in freshwater, saltwater, marine, and brackish water

VARITIES OF FISHES FOUND IN BIDAR: Tilapia fish, Catla fish, Snakehead, murrel fish, Rohu fish, Common carp fish, Catfish, Salmon fish, Goldfish, Tuna fish.



Objectives:

1. Habitat
2. Behaviour and reproduction
4. Biofloc technology
5. Threats
6. Disease of fish

Fishes and Biofloc technology: Study sites

1. Mamdapur: Biofloc technology.
2. Papnash Lake: Varieties of Fishes.
3. Janwada: Varieties of fish & Natural method of fish forming.
4. Karanja Back water: Varieties of fish.
5. Kadwad: Biofloc technology.

Materials Methods and:

- The following methods are used in fish forming and Bio-Flock method.
    1. Survey Method.
    2. Lecture Method.
    3. Project Method.
    4. Observation Method.
    5. Articles.

Materials:

- The following materials are used in fish forming and Bio-Flock method:
    1. Mobile Phone
    2. Notebook & Pen
    3. DSLR Camera
    4. Fish food
    5. Fishing nets

2. RESULTS AND DISCUSSION

Fig: Common Carp Fish

Fig: Tilapia Fish

Fig: Catla Fish

Fig: Snakehead Fish

Site: 1 Mamdapur near Sai Mandir main road Aurad

Sl .no	Date of visit	Time of visit	Varieties of fishes	Observation
1 2	15/02/2023 25/07/2023	11 am To 3pm	1.Murrel 2.Gift tilapia 3.Rohu 4.Catla 5.Common crap	We observed varieties of fishes with the new technology of fish forming that is Biofloc technology

Site: 2

Place: Papnash Lake

Locality: Near Basvagiri Road, Bidar

Observation: Varieties of Fishes.

Site: 2: Place: Papnash Lake near Basavagiri road, Bidar

Sl.no	DATE OF VISIT	TIME OF VISIT	VARIETIES OF FISHES	OBSERVATION
1 2	25/02/2023 07/07/2023	10 am to 2 pm	1. Snakehead 2. tilapia 3. Catla 4. Rohu	Varieties of fishes &scales of fishes, larva fishes &Fishing.

Observation:

- Varieties of fishes and their care and handling
- Biofloc technology
- Management of Biofloc technology.
- Scope of Biofloc technology.
- Uses of Biofloc technology

Habitat:

Fish habitat includes coral reefs, kelp forests, bays, wetlands, rivers, and even areas of the deep ocean that are necessary for fish reproduction, growth shelter. Marine fish could not survive without these vital, healthy habitats

1. Fishes are aquatic organisms.
2. They are found in water bodies like the sea, lake, river, pond, etc. Fishes are aquatic organisms.
3. They are found in water bodies like the sea, lake, river, pond, etc.
4. They are also grown in artificial environments like an aquarium.
5. There are freshwater fishes and saltwater fishes.
6. They are also grown in an artificial environment like an aquarium.
7. There are freshwater fishes and saltwater fishes.

Behaviour and reproduction:

The reproductive behaviour of fishes is remarkably diversified; they may be oviparous (lay eggs), ovoviviparous (retain the eggs in the body until they hatch), or viviparous (have a direct tissue connection with the developing embryos and give birth to live young).

"The methods of reproduction in fishes are varied, but most fishes lay a large number of small eggs, fertilized and scattered outside of the body. The eggs of pelagic fishes usually remain suspended in the open water. Many shore and freshwater fishes lay eggs on the bottom or among plants. Some have adhesive eggs. The mortality of the young and especially of the eggs is very high, and often only a few individuals grow to maturity out of hundreds, thousands, and in some cases millions of eggs are laid.

In females, the eggs are formed in two ovaries (sometimes only one) and pass through the ovaries to the urogenital opening and to the outside. In some fishes, the eggs are fertilized internally but are shed before development takes place. Members of about a dozen families each of bony fishes (teleosts) and sharks, live young. Many skates and rays also bear live young. In some bony fishes, the eggs simply develop within the female, the young emerging when the eggs hatch (ovoviviparous). Others develop within the ovary and are nourished by ovarian tissues after hatching (viviparous). There are also other methods utilized by fishes to nourish young within the female. In all live bearers, the young are born at a relatively large size and are few in number. In one family of primarily marine fishes, the surfperches from the Pacific coast of North America, Japan, and Korea, the males of at least one species are born sexually mature, although they are not fully grown.

Some fishes are hermaphroditic—an individual producing both sperm and eggs, usually at different stages of its life. Self-fertilization, however, is probably rare.

Successful reproduction and, in many cases, defence of the eggs and the young are assured by rather stereotypical but often elaborate courtship and parental behaviour, either by the male or the female or both. Some fishes prepare nests by hollowing out depressions in the sand bottom (cichlids, for example), build nests with plant materials and sticky threads excreted by the kidneys (sticklebacks), or blow a cluster of mucus-covered bubbles at the water surface (gouramis). The eggs are laid in these structures. Some varieties of cichlids and catfishes incubate eggs in their mouths.

Some fishes, such as salmon, undergo long migrations from the ocean and up large rivers to spawn in the gravel beds where they themselves hatched (Anadromous fishes). Some, such as the freshwater eels (family Anguillidae), live and grow to maturity in freshwater and migrate to the sea to spawn (Catadromous fishes). Other fishes undertake shorter migrations from lakes into streams, within the ocean, or enter spawning habitats that they do not ordinarily occupy in other ways.

Biofloc technology:

Biofloc technology (BT) is defined as 'the use of aggregates of bacteria, algae, or protozoa, held together in a matrix along with particulate organic matter for the purpose of improving water quality, waste treatment and disease prevention in intensive aquaculture systems'.

"Biofloc technology is a technique of enhancing water quality through the addition of extra carbon to the aquaculture system, through an external carbon source or elevated carbon content of the feed. This promoted nitrogen uptake by bacterial growth, decreasing the ammonium concentration more rapidly than nitrification. Immobilization of ammonium by heterotrophic bacteria occurs much more rapidly because the growth rate and microbial biomass yield per unit substrate of heterotrophs are a factor 10 higher than that of nitrifying bacteria. Biofloc technology makes it possible to minimize water exchange and water usage in aquaculture systems through maintaining adequate water quality within the culture unit, while producing low-cost Biofloc rich in protein, which in turn can serve as a feed for aquatic organisms. Compared to conventional water treatment technologies used in aquaculture, Biofloc technology provides a more economical alternative (decrease of water treatment expenses in the order of 30%), and additionally, a potential gain on feed expenses (the efficiency of protein

utilization is twice as high in Biofloc technology systems when compared to conventional ponds), making it a low-cost sustainable constituent to future aquaculture development Biofloc technology in comparison to the conventional technologies to manage and remove nitrogen compound is robust, economical, and easy in operation. The key to minimizing possible negative impacts of climate change on aquaculture and maximizing opportunities will be through understanding and promoting a wide range of inventive adaptive new technologies, such as the Biofloc technology combined with greenhouse ponds.

Farmed aquatic animals are much more sensitive to their immediate environment than land animals. The water in which they depend for oxygen and a range of other important chemicals also takes up their waste products and may carry pollution from the nearby environment. The process of disease in aquaculture species is thus much more strongly connected to environmental factors than would be the case, say, with cattle. A further biotechnology field that has developed in aquaculture, because of the nature of this relationship, is that of bioremediation. This refers to the use of friendly bacteria or "probiotics" to treat water or feeds and, by natural processes, discourages the development of "unfriendly" bacteria that potentially would cause disease.

Fig: Discussing about Biofloc

Fig: Observation of Fishes

Fig: Biofloc layout design.

Fig: Biofloc Cross section Design.

Growth performance in the Biofloc system:

The performance of aquatic animals in the Biofloc system is analyzed by the following parameters, such as the growth of fishes based on length and weight at intervals of every 15 days. You can analyze by weighing 10 fish from each treatment that replicates randomly. Fishes have to starve overnight before checking their weight.

Fish nutrition:

There are usually two types of food available to the fish; natural and supplementary. Natural fish food consists of phytoplankton, zooplankton, periphyton, water plants, etc., produced in the pond itself. Supplementary fish feed is produced outside the pond and supplied to the fish regularly to the further increase the amount of nutrients in the pond.

Fish health:

Fish are vulnerable to diseases when environmental conditions, such as water quality and food availability, are poor. Once the disease has entered the fish pond, it will be very difficult to eradicate it. This is because infected fish are difficult to pick out and treat separately. Water is a perfect agent for spreading diseases. The diseases from which fish may suffer are many and varied. Sick fish do not grow, so the farmer loses money as harvest is delayed. If fish are near market size when they die from disease, losses are very severe.

Preventing fish diseases:

Good nutrition and proper water quality (plenty of dissolved oxygen) are the most important factors for good fish health. Many of the potential pathogens (organisms which can cause disease) of fish species are normally present in the water, waiting to attack when environmental conditions become bad. Under such conditions, the fish become stressed and their resistance to diseases is lowered. There are some basic rules to be observed in order to prevent or control, disease outbreaks.

1. Ponds most have separate water supplies. It is not advisable to supply a pond with water from another pond, since this water many carry diseases and the level of dissolved oxygen many below. It is therefore wise not to design ponds in series.

2. Fish must be kept in water with optimum conditions at all times; water with plenty of oxygen, with the correct PH and with allow ammonia content.

Harvesting the fish:

As in any other type of farming, the final phase in the fish farming cycle is the harvest and possible sale of the fish. When most of the fish are big enough to be eaten or sold, harvest can start, but harvest only what can be eaten or sold within one day. At harvest, start emptying the pond a few hours before dawn while it is still cool. There are two ways to harvest fish: either take out all fish in the pond at the same time or selectively cull fish from the pond throughout the whole year. In the latter method, usually the larger fish are taken out and the smaller fish are left in the pond to grow on. It is, of course, possible to combine these two methods, taking out large fish as required and finally removing all the remaining fish at one time. There are different kinds of nets with which you can harvest the fish.

Post-harvesting:

After harvesting, the pond is dried until the pond bottom cracks and limed (reducing pond bottom acidity) thereby killing unwanted animals and plants on the pond bottom. Some simpler, and therefore cheaper, nets are A lift net made of seine netting material. It can be of any shape and size and is set on the pond bottom. When the fish swims over it, it is lifted, capturing the fish. A scoop net is a small net with a handle that is held in one hand. It is often used when counting and weighing fish and fingerlings. A cast net is a round net that is thrown into the pond from the shore and pulled back to capture the fish.

Threats:

"Aquatic ecosystems face numerous threats, from human activities in or near water, land use in the broader watershed, and even natural events. The fish and fish habitat protection policy statement 2019 lists the following broad threats that threaten the health and sustainability of fish and their habitat:

1. Modification or degradation of habitat

2. Aquatic invasive species (AIS)

3. Overexploitation of fish

4. Pollution.

5. Climate change.

Disease of fish

Fish disease includes abnormalities and symptoms such as fish not feeding, ulcers on the body, or cloudy eyes. The most common indicators of disease are fish coming to the surface and gasping for oxygen, or higher than usual levels of sickness or death in an aquaculture system.

1. Ammonia poisoning.

2. Cotton mouth.

3. Dropsy.

4. Fin/tail rot.

5. Fungal infections**.**

Marketing:

Marketing of fish involves all the activities in the flow of fish or fish products from the former to consumers. The target of marketing is usually to close the gap between the areas of fish scarcity and abundance with profit.

Fish marketing includes assemblage, storage, sorting, grading, packaging, labelling, storage and transportation. These operations are carried out by marketing agents like producers, fishermen, cooperative societies, wholesalers, Retailers, Vendors, and Consumers who are the key players in the marketing channels.

Methods of fish marketing: Products, Price, Place, and Promotion.

Fig: Rohu fish

The marketing of fish is important in the following ways:

- It helps in determination of the price for the fish products.
- It is a means of earning income for the farmer. Marketing makes it possible for a farmer or marketer to recover the money spent on both fixed and floating capital during the production or purchasing process.
- Marketing of fish prevents glut by locating and transporting them from areas of surplus to the areas of shortage. This process encourages farmers to sustain and expand their production as much as they can.
- It makes the taste of the consumers known to the farmers or marketers about the fish to produce or purchase for sale. During marketing, one can research into the types of fish highly preferred by the consumers to embark on the species.
- It facilitates exportation of fish products to provide foreign exchange earnings and conservation for the farmers and the nation. In addition, it establishes international relationships with other countries of the world.
- Marketing determines the forms in which fish should be processed, stored, sorted, graded and sold to consumers.
- Through packaging, it makes fish attractive and appetizing to consumers to enhance sales.

Benefits and outcomes of Biofloc technology:

- Eco-friendly culture system.
- It reduces environmental impact.
- It improves land and water use efficiency
- Limited or zero water exchange.
- High productivity (It enhances survival rate, growth performance, and feed conversion in the culture systems of fish).
- Fish reduce water pollution and the risk of introduction and spread of pathogens.
- Cost-effective feed production.
- Fish reduces the pressure on capture fisheries, i.e., the use of cheaper food fish and trash for fish feed formulation.
- Employment generation amongst unemployed youths.

3. DISCUSSION AND RESULT

Forming a Reliable and profitable method of farming. Minimize water exchange and water usage in the aquaculture system. Fish produce low-cost Biofloc rich in protein. And it provides more economical alternatives and additionally a potential gain on feed expenses, making it less expensive Biofloc systems maintain water quality by reducing water pollution and reducing the introduction and spread of pathogen. Limited or zero water exchange.

Biofloc system uses cheaper food fish and trash fish feed formulation. Biofloc system is an eco-friendly culture system that reduces the environmental impact on aquatic culture. Fish improves land and water efficiency.

Fish reduce response time due to water respiration rates are elevated. Seasonal and inconsistent performance for sunlight-exposed systems. Alkalinity supplement required. Increase the energy requirement for mixing and aeration. Start-up period required. Increased pollution potential from nitrate accumulation. Increased instability of notification.

Scope of project:

Fishes generated a number of commercially valuable by products, fish oil, fish meat, fertilizer, fish glue & so on are these by products. In paintings, soap oils, and medicines, these by-products are widely used.

Economic importance

It provides good job opportunities & self-employment to many people. Fishes are the source of nutritious food, fishes yield a number of by-products, which are commercial value these by-products are fish oil, fish meat, fertilizer fish glue, etc.

Mrigal is a popular as a food fish & important aquaculture freshwater species throughout South Asia. It is widely formed as a component polyculture system of three carps, along with Rohu Labeo fish and the catla.

Conclusion:

Biofloc can be considered as a budget-friendly innovative technology where the toxic material is converted into the proteinaceous feed. Biofloc technology application does offer good benefits in improving aquaculture production that could contribute to the achievement of sustainable development goals. Although Biofloc technolo.gy is stilled in its infant stage, it may be developed & performed in integration with other food production, & does promote productive integrated systems, aiming and producing food & feed from the same area of land with fever inputs. This technology could result in higher productivity with less impact on the environment.

Biofloc technology is a green approach in aquaculture known in different names, such as zero exchange autotrophic, single-cell protein production system.

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