

Techniques of Live Fish Transport

Several types of containers are used in the transport of fish seed. These are mud pots, round tin carriers, double tin carriers, oxygen tin carriers and tanks fitted on Lorries. The containers are transported by bicycles, carts, rickshaws, boats, Lorries, trains and aeroplanes.

Mudpots: Mudpots are commonly used in Assam, West Bengal and Orissa for transporting spawn, fry and fingerlings. This is a traditional method. Mud pots of about 15 litres capacity are used for transportation of fish seed. The pots are filled with water of spawning ground to about two thirds of their capacity. After filling the pot with water, about 50,000 spawn are introduced. It is better to condition the spawn in the hapas for about three days without feeding prior to transportation. Otherwise, due to feeding more excreta is produced which pollutes the water in the pot, leading to the death of fish seed. To avoid the mortality of fish seed due to asphyxiation, water is changed once in every five hours. The temperature of water in mudpots is not affected easily, which is an advantage in transport. This method, however, has several drawbacks, such as; the mudpots are liable to break in transit, which may result in the loss of the seed. Fish seed may be injured due to the shaking of pots. Possible for transportation only for short distances and short durations. Frequent changes of water may result in mortality of fish seed due to difference in water quality. Considering these factors modern methods of transportation have now been propounded.



Round Tin Carriers: Round tin carriers are used for transport of fish seed from several years. The tin is made up of galvanised iron sheet. It is a round container having a diameter of 18" and height 8". The lid has a number of small holes, which are useful to get oxygen. This container has a capacity of 9 gallons of water, but is filled up only with 8 gallons of water. The seed is introduced into it and transported to various places.

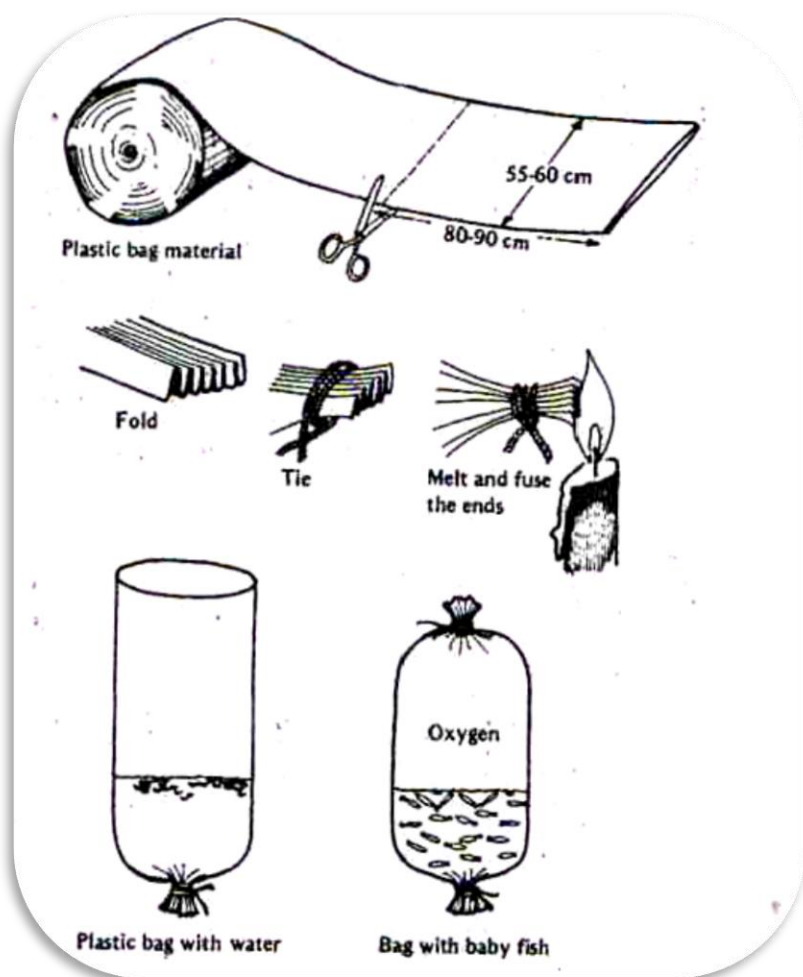
Double tin carriers:

Double tin carriers are made up of galvanised iron and have two parts - outer and inner tins. The outer tin is 13" x 13" x 8" and the inner one is slightly smaller than outer one and can be easily kept inside the outer tin. The outer tin is open and with a handle. The inner tin is closed with a lid and entire tin has

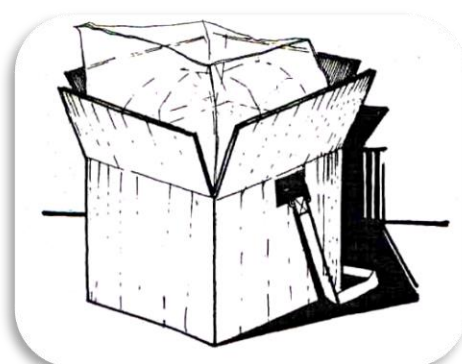
small openings. The inner tin is filled with water after keeping it in the outer tin, then fish seed is introduced into it. It holds about 6 gallons of water and is generally used for carrying a small number of fish seed by hand.

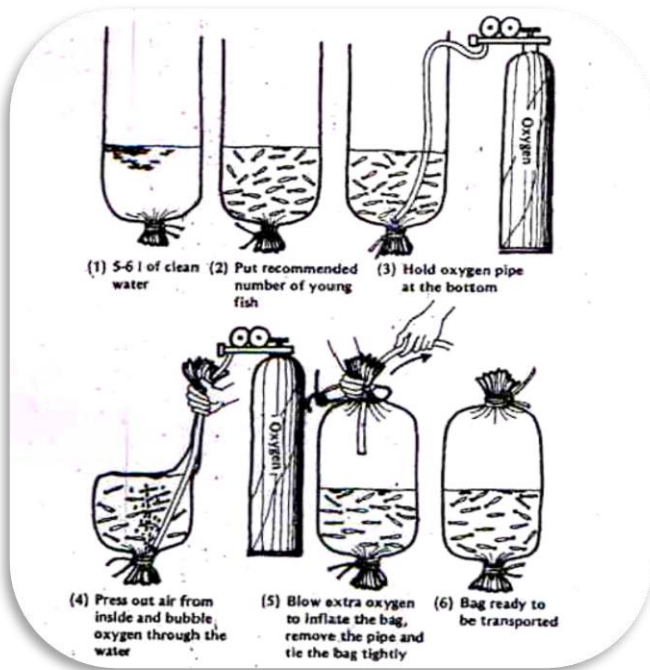
Oxygen tin carriers: Tins of 18" x 28" size and big polythene bags of 17" x 15" size are used in this method. In this technique, fish seed are transported by road,

train and air. The polythene bags are filled with water, seed and oxygen and packed in the tin, then transported. This is the most common method of fish seed transportation and the latest in technique of transporting the fish seed. After checking the damage, the good polythene bags are kept in a tin container and about 1/3 of its capacity is filled with aerated pond water. The fish seed, starved for one day and acclimatized are then



carefully introduced into the bag. 2,000 fry can be allowed into the bag and the portion of the bag, about 10 cm from the top, is twisted and a string is kept ready for tying. The oxygen is then drawn in from the cylinder through the tube until 2/3 of the bag is inflated or the top of the inflated bag is slightly below the top of the tin. The string is tied round and the tin is closed. The packed tins are kept in a cool place. To ensure a better survival rate, the tins should be transported during the morning or evening. Cardboard containers are used in place of tin containers.





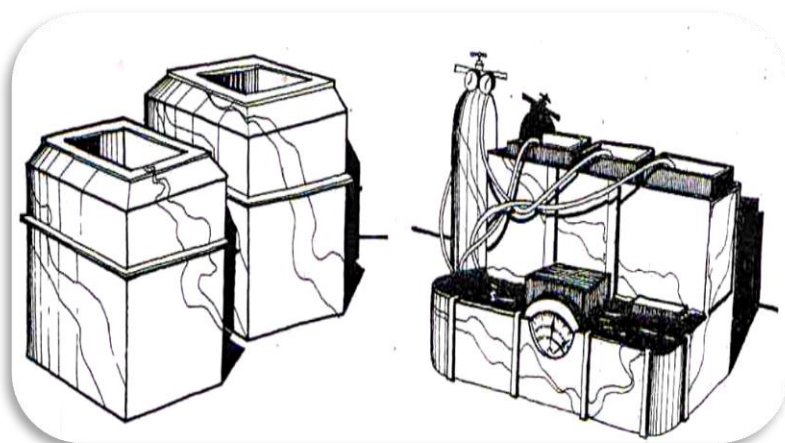
withstand packing in one bag for a journey of 12 hours. Similarly >200 fingerlings in one bag can withstand a journey of 12 hours. The number of fish seed to be packed in a bag has to be decided depending on the distance and size of the seed. A tube from the oxygen cylinder is then

Tanks Fitted on Lorries:For

road transport lorries with one or two large tanks of suitable dimensions fitted at the rear can be advantageously used. This will facilitate seed transport problem to a large extent.

Use of Anesthetics in Transportation

Recent investigations have shown that the fish seed could be anesthetized for



transportation for ensuring better survival rate. The purpose of this is to ensure that the fish seed survives for a longer period of time, and also to minimize the concentration of toxic gases like ammonia and carbon dioxide in the

medium by lowering the metabolic rate of the fish seed. Anesthetized fish seed have been found to survive for double the time of anaesthetized seed, besides ensuring a better survival rate, which is about 90%. Carbonic acid has been found to be the best anesthetic compared to others such as quinaldine, sodium amytal, urathane, veronalchloroabutanal and TMS-222 (Tricaine MethanSulphonate). Carbonic acid is not only cheap but also safe and easy to use. To about 8 litres of water in bag containing fry, 8 ml of 7%, sodium

bicarbonate solution and 8 ml of 4% sulphuric acid are added so as to produce 500 ppm concentration of carbonic acid. This anesthetized bag should be immediately filled with oxygen. absorbents are added to the medium during transportation to eliminate toxic ammonia from the medium and safeguard the fish seed from mortality. These absorbents are permuted, synthetic amerlite resin, pulverised earth and clinoptilolite. Addition of sodium phosphate, which acts as a buffer, at a rate of 2 gm/lit. of the medium may bring about a favourable pH of the medium for fish seed during transit. Due to the non-availability of some anesthetics and the risk involved in the improper use by laymen, the method has remained at the level of a scientist only.

Estimation of Quantity of Fish Seed for Transportation

The number of fish seed to be transported in closed and oxygen packed containers may vary according to the type and size of the fish seed, mode of transport, duration of transport and the environmental temperature, etc. The number of fish seed for transportation in containers can be calculated using the following formula

$$N = (D-2)Xv/RxH$$

Where :

D is dissolved oxygen in ambient water in ppm.

V is volume of water in litres.

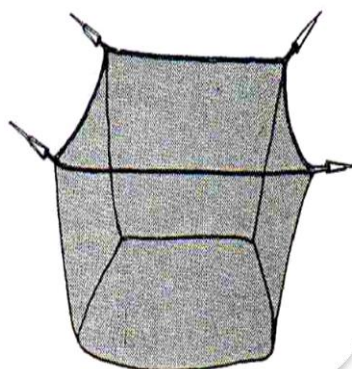
R is the rate of oxygen consumption by individual fish seed in mg/kg/hr.

H is period of transportation in hours.

N is number of seed to be introduced.

Transport of Breeders

Necessity of transporting adult fish and breeders has been greatly increased



with the advantage of induced breeding. Breeders have to be transported without shock and injury. Metal containers, 200 litre vessels, plastic pools, open canvas carriers (1 x 1.25 m), splashless, closed and foam-lined containers are used for

transportation of breeders and adult fish with compressed air. The wrapping of breeders carefully with a cloth allowing free movement of gill cover will keep them less active during transport. Splashless tanks are used for transportation for long distances. These tanks are elliptical metal tanks of about 1200 litres capacity mounted on a trailer or dragged by jeep or van. Inside the tank a foam cushion lining is provided. The atmospheric air is supplied through a compressor fitted to the engine of the vehicle. This air is pumped through a pipe which passes through pressure tanks which eliminate oil vapours, carbon dioxide, etc. This is diffused through fine capillaries to give maximum efficiency to oxygen dilution. These are found to be excellent to transport fish. It is always better to give a dip bath to the breeders in any of the antiseptic or antibiotics, such as methylene blue (2 ppm), acriflavin (10ppm), copper sulphate (0.5 ppm), potassium permanganate (3 ppm), chloromycetin (10ppm), sodium chloride (3%) so as to protect them against infectious bacteria, fungi, etc. Before transport, the breeders have to be tranquilised using any one of the anesthetics like sodium amytal (100 ppm), TMS (0.1 ppm), m-aminobenzonate methane sulphonate (0.1 ppm), quinaldine (0.04%), veronal (50 ppm), urathan (50 ppm), tertiary amyl alcohol (0.05%) and phenoxy ethanol (0.04%).

Reasons for Fish Mortality during Transportation

Effect of CO₂ and Dissolved Oxygen:

Mortality of fish seed may be expected during transportation. It is mainly due to the depletion of dissolved oxygen and accumulation of gases like ammonia and carbon dioxide in the medium of fish seed carriers. These gases are lethal as they may reduce the oxygen carrying capacity of fish blood. However, the lethal limits owing to carbon dioxide in fish depend on the level of dissolved oxygen. It has been reported that fry of more than 40 mm in size may die at 15 ppm of carbon dioxide at a dissolved oxygen level of less than 1 ppm. Such fry may die only at 200 ppm, if the dissolved oxygen is around 2 ppm. Carbon dioxide given out during respiration dissolves in water and renders it more and more acidic which is injurious to fish. In transport of fish the shortage of oxygen has to be tackled either by replenishing the oxygen which is used up or by economising its use by regulating the number of fish seed and by reducing its oxygen demand. The oxygen utilisation of fish in transport is dependent upon a number of factors like the condition of the fish - normal, active and excited condition of fish, temperature, size and species. The oxygen

consumption of different species of the same size or weight varies considerably. For example, 400 common carp fingerlings of 40-50 mm size can be transported for two days in seven litres of water under oxygen packing. Only half of the number of other major carps and 1/8 of number of milk fish fingerlings of the same size can be transported under same conditions. Low to moderate temperatures are preferred for fish transport, since the amount of oxygen in water increases with the decrease of temperature and keep the fish less active. Increase of CO₂ depresses the active metabolic rate. Further increase proves fatal. In an oxygen packed closed system CO₂ forms a limiting factor. Mortality of seed in such a system is mainly due to bacterial load in the medium. With the death of a few seed, bacteria increase enormously and utilize more oxygen. Bacteria increase from 250/ml in the beginning to over 110 million/ml in 24 hours. CO₂ is found toxic to seed at 2.5-5 ppm concentration.

Effect of Ammonia:

A large amount of NH₃ is excreted by fishes. If ammonia concentration is 20 ppm, total mortality of fish occurs in oxygen packed packets. As NH₃ increases in water, the oxygen content of blood decreases and its CO₂ content increases. NH₃ interferes with O₂ -CO₂ exchange capacity of blood with the outside medium. The rate of NH₃ excretion increases 10 times with a rise in water temperature from 8- 150 C. Increase in water temperature and decrease of dissolved oxygen reduce the tolerance of fish to NH₃.

Effect of temperature:

Temperature has a distinct effect on oxygen utilized by the fish. Metabolism increases continuously with increased temperature till the attainment of lethal temperature limit. Each species displays its own characteristic rate of increase at a given range of temperature. Fish, prawn and their seed face hyperactivity during transportation. As a result, lactic acid tends to accumulate in their tissues and severe oxygen debts are created. Fish take a long time to overcome this oxygen debt even in their natural life in ponds and other habitats. This may be due to the death of fish after few hours after handling, transport and liberation even in oxygen-rich water. Hence, the use of sedatives is most important in modern live-fish transport technology. Due to hyperactivity the bigger fish often suffer injuries which may cause death or severe external infection. If the fish and their seed are of different sizes, the smaller ones are

very much affected and die. This risk may be avoided by selecting for transport fish of uniform size, and by sedating the fish.

By taking the above factors in to account, suitable steps are to be taken in tackling these problems and deciding the number of individuals to be put in the containers depending upon the time and duration of transport. The fish seed to be transported is kept under conditioning so that their bellies are empty and excretion during transport is limited. Further, the conditioning will help in acclimatizing the fish to limited space in the containers. If the fish is brought directly from the pond into the container it is very active and hits to the sides of the container thus getting injured. The transport medium, water, should be filtered through a plankton net so as to make it free from phytoplankton and zooplankton which are present in the water and consume some oxygen themselves.

