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**Research Paper**

# Importance of infusoria as live feed for fish larvae and its cultivation techniques

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**ABSTRACT**

Aquaculture has been hampered, for instance, by a shortage of live feeds that are appropriate for feeding fish at different stages of larval development. The first feeding stage is the most crucial time in the lives of cultivable aquatic animals, it is extremely necessary to offer the right feed that they require for proper sustenance for improved growth and survival. As a result, live food organisms are also referred to as "living capsules of nutrition" for fish and prawn larvae. One of the essential elements for the efficient operation of aqua-hatcheries, which specialize in prawns and shrimp, is live feed. Both intensive and small-scale aqua-hatchery operations benefit from the availability of high-quality and plentiful live feeds. The production of Artemia cltures rely on imported cysts, the pure strains have become the main area of concern. As a result, several alternative live feeds are available, including those from ciliates (infusoria). Infusoria are the only protozoans large enough to be seen with the unaided eye are the largest ones. Small aquatic organisms like ciliates, euglenoids, protozoa, unicellular algae, and invertebrates are together referred to as infusoria. Infusoria is a simple and beneficial cultural practice that can boost fish output in the aquaculture sector. It is used as a larval feed for both marine and freshwater finfish larvae. Infusoria culture can be used for small-scale hatcheries and larval culture because it doesn't call for elaborate structures. Live food benefits fish larvae because it is available in a live state in the facilities used for fish rising. When necessary, larvae ingest food to suit their nutritional demands.

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## 1. INTRODUCTION

The crucial link between endogenous nutrition and exogenous feeding of aquaculture aquatic animals is live food. It is essential for the growth of fish, crustaceans, and mollusk larvae as well as for keeping animals alive until they can consume formulated feed. Despite the fact that this area of aquatic systems fish food organisms makes up a relatively small portion, the growing commercial interest in the hatchery development of aquatic fin fish and shellfish for human consumption has created an urgent need for more live feed research and development to meet the needs of fish larval stages. Many aquatic organisms require fish feeding items during their embryonic phases. For enhanced survival and growth, they are crucial during the finfish and shellfish critical stages. Depending on the size of their mouths and their preference for a particular food, fin fishes that are in the initial feeding phase ingest them directly. They are abundant in vital fatty acids, carbohydrates and proteins. Since the first feeding stage is the most crucial time in the lives of cultivable aquatic animals, it is extremely necessary to offer the right feed that they require for proper sustenance for improved growth and survival. As a result, live food organisms are also referred to as "living capsules of nutrition" for fish and prawn larvae. One of the essential elements for the efficient operation of aqua-hatcheries, which specialize in prawns and shrimp, is live feed. Both intensive and small-scale aqua-hatchery operations benefit from the availability of high-quality and plentiful live feeds.

Live feed continues to be the most practical use for larval culture in many species, taking into account a number of factors. However, it is difficult to maintain intense larval culture systems with the proper amounts of live feeds at the proper periods. The cost of production is one aspect that has an impact on the production of live feeds, particularly in smaller hatcheries where the majority of live feed is raised.

The new live feed enrichment method ought to be more suited to small-scale farmers and low-cost production. Since the production of Artemia cultures rely on imported cysts, the pure strains have become the main area of concern. As a result, several alternative live feeds are available, including those from ciliates (infusoria). The nutritional value of the live feeds must be evaluated for the feeding chart at various stages of the fish's life. Research on the viability of live feeds is required for potential use [1].

### 1.1. Infusoria

Antony Van Leeuwenhoek published the first description of these "animalcules" in his Philosophical Transactions in 1677. The term "infusoria" refers to the process of steeping materials (often hay) in water by soaking at temperatures below boiling. The only protozoans large enough to be seen with the unaided eye are the largest ones (infusoria) [2]. The presence of excessive infusoria, which can result from overfeeding, can occasionally be detected in aquarium water by the appearance of "green water" or cloudiness. The usage of infusoria as fry food highlights their significance to pisciculturists. They are the perfect live meal for young fry that have just finished their yolk sac due to their small size, which ranges from 25 m to 300 m. Small aquatic organisms like ciliates, euglenoids, protozoa, unicellular algae, and invertebrates are together referred to as infusoria. Freshwater, brackish, and freshwater bodies of water are where it is typically found. It mostly consumes bacteria, algae, flagellates, and trash. It can reproduce both sexually and asexually by binary fission. The larval stages of freshwater ornamental fish are raised with freshwater infusorians.

Important freshwater infusoria: - Paramecium and Stylonychia

Marine species: Fabrea salina and Euplotes spp."

## 2. METHODOLOGY

### 2.1. Using Banana Peels

1. Place two to three banana peels in a large glass jar or aquarium that is filled with filtered freshwater for a fish tank with roughly 50 liters of water.
2. Place a cloth over the container. It will enable air to enter but will keep out mosquitoes and other pests.

3. Keep the container in a cool location with access to natural light.
4. The water will become milky and possibly smell bad in a day or two. This is brought on by a vast number of bacteria that are multiplying and causing the deterioration of banana peels. The water's surface will develop a slime coating. The water will become clear and translucent with a little yellowish color in around 4 to 5 days.
5. The reason for this is the infusoria spores which are circling in the air have fallen to the water, where they are feeding on the bacteria and proliferating in vast numbers. The slime coating on the water's surface then breaks apart and disintegrates. Now that the culture is prepared, fish larvae in their early stages can be fed. The culture must be harvested as soon as it reaches its maximal density because if it isn't, the density will abruptly drop due to a lack of room and oxygen depletion. If regular milk additions are made and the culture is regularly harvested, it can last for up to 2 to 3 weeks.



Figure 1. Experimental Setup and Placement of Banana Peel Samples in the Water Tank

### 2.2. By Utilizing Hay Infusion

1. Place dry hay (straw) in a pan and cover it with boiling water.
2. Transfer the hay and water to a container or aquarium. Repeat the procedure as outlined in the method for peeling bananas above.

### 2.3. By Utilizing Lettuce Leaves

1. Infusoria can be growing without requiring hay by using lettuce leaves in its place. However, in this instance, simple water will suffice; pouring hot water is not necessary. After that, proceed as described above for banana pealing.

### 2.4. Using milk

1. Fill the culture tank with 50 liters of water, then add a teaspoon of skim milk or two pinches of milk powder. Following that, proceed as directed for using banana pealings.

### 2.5. Using Apple Snails

1. Keep Ampullaria globosa snails in aquariums and feed them lettuce leaves or aquatic plants like Hydrilla. When introduced to water, the snail's feces (droppings), which contain partially digested leaves, will breed a large colony of infusoria.

## 3. CONCLUSION

Aquaculture has been hampered, for instance, by a shortage of live feeds that are appropriate for feeding fish at different stages of larval development. Infusoria is a simple and beneficial cultural practice that can boost fish output in the aquaculture sector. It is used as a larval feed for both marine and freshwater finfish larvae. Infusoria culture can be used for small-scale hatcheries and larval culture because it doesn't call for elaborate structures. Live food benefits fish larvae because it is available in a live state in the facilities used for fish raising. When necessary, larvae ingest food to suit their nutritional demands.

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### Author Contributions Statement

| Name of Author | C | M | So | Va | Fo | I | R | D | O | E | Vi | Su | P | Fu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jadhav Amit | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | |

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

### Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

### Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and approved by the relevant institutional authorities.

### Data Availability

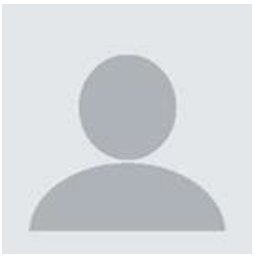
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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[2] P. Das, Sagar, Sarada, M. S. Akhtar, and S. Singh, IMPORTANT LIVE FOOD ORGANISMS AND THEIR ROLE IN AQUACULTURE. 2012.

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