Culture Of Microworms (*Panagrellus* sp.) As An Alternative to Brine Shrimp for Larval Fish Forage

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Live forage is considered to be the critical element for successful captive or hatchery culture of larval fish, especially during the first weeks of feeding. Most larval fish at the first few days of feeding require a food item that moves independently. This live food must also be appropriately sized for the mouth of the fry and ideally must provide a strong nutritional package for development of healthy fry. Fish culturists have traditionally used newly hatched brine shrimp nauplii almost exclusively as the initial food for fry that could ingest it. Brine shrimp, however, have some disadvantages as a fry food. For many fish species, newly hatched brine shrimp are much too large to be ingested. Hatching procedures for brine shrimp require aeration, and as a result, sometimes power outages can cause complete failure. Brine shrimp die in fresh water within a few hours due to physiological or osmotic stress. The most significant drawback is the cost of brine shrimp cysts. In some years it is prohibitive for rearing some species. The largest advantage- if they are affordable and available- is that it requires very little effort to consistently produce brine shrimp nauplii.

Biology

The nematode Panagrellus sp., commonly known as "Microworms" to fish culturists is an attractive alternate live food for some fry. Microworms are one of the simplest live foods to culture. They produce a dependable harvest and are reasonably tolerant of environmental variables. These nematodes are small (usually less than l/16" long), white, unsegmented worms that move almost continuously. The tail end is pointed while the mouth end is more rounded. They are approximately 15 times as long as they are wide. Because of their size and shape, they can be successfully fed to fish that are too small to take a brine shrimp nauplii. Microworms remain alive in fresh water for twelve hours or more. Microworms reproduce sexually. The males have a curved tail, are smaller, more slender, and less numerous than the females. Microworms are live bearing, releasing 10 to 40 young every 1 to 1.5 days for a 20 to 25 day life span. Therefore, each female produces approximately 300 young. The young reach sexual maturity in approximately three days. Their size increases by three times during the first day and five to six times during the next three days. The live nematodes are 76% water and 24% dry matter; 40% of the dry matter is protein and 20% is fat.

Managing Microworm Cultures

Starter cultures are available from biological supply houses, mail order companies that advertise in aquarium magazines, or from other fish culturists or hatcheries. A starter culture can be stored for over six months at slightly above 32°F. Microworms can be cultured in almost any shallow, flat, water tight container; of 10" x 10" or 8" x 12" or similar dimension plastic refrigerator boxes with tight fitting, snap-on lids are especially convenient for small-scale production or research needs (or much larger sized units can

be effectively used for commercial scale production). Approximately ten 1/16 if holes are drilled in the top for air exchange. The culture media can be prepared from almost any cereal grain, yeast, and water. Rolled oats, available from livestock feed stores in 50-pound bags, is one of the best choices for maximum production and economy. Use approximately 1 to 1-1/2 pints of rolled oats with one quart water for each 8" x 12" sized container. The oats need to be boiled for 5 to 7 minutes, covered, and allowed to cool. If the mixture is not cooked, only approximately 2/3 as much water is needed, however, molds and insect infestation from spores and eggs in the oats may become a contamination problem. The mixture should have a very thick paste-like consistency. The media should be transferred into the culture container and spread to a thickness of 1/2" to 3/4". A tablespoon or more of baker's yeast is sprinkled over the oatmeal and mixed in. The starter culture of nematodes is then spread evenly over the surface. Any media on the sides of the container should be removed with a damp cloth, to prevent it from being introduced into the fry culture vessel.

The culture should be kept in a well-lighted area at room temperature, 68-85°F. Microworms can withstand temperatures below 32°F but greater daily production can be expected at higher temperatures; however, cultures last longer at lower temperatures. The Microworms feed on the yeast and bacteria produced from the oatmeal. After 3 to 7 days, the surface of the media will appear to shimmer with the movement of the Microworms produced and they will start climbing up the sides of the container.

The Microworms are harvested by simply scraping them from the sides and top of the container. A paint-stirring stick laid on the media provides additional surface from which to harvest The 8" x 12" culture will provide a harvest of approximately 1 to 1-1/2 teaspoons of Microworms daily for three weeks or more.

Maintaining the Culture

The surface of the culture should be stirred weekly to maintain production. As the yeast utilizes the oatmeal, the mixture will become thin and soupy, although the production of the worms will remain the same. A piece of sponge can be placed on the media to soak up the excess moisture. Eventually, as the oatmeal is exhausted, reducing the nutrient supply for the yeast, the harvest of Microworms diminishes and a new culture should be started.

Additional Microworm Cultures

Alternative media or recipes for Microworm cultures include (1) cornmeal, baker's yeast, and water; (2) baby oatmeal cereal, baker's yeast, and water; (3) Instant Ralston cereal, brewers yeast, baker's yeast and beer; and (4) baker's yeast and water. Typically, cornmeal produces fewer Microworms than rolled oats. The other recipes use ingredients that are much more expensive than the rolled oats used for livestock feed and are therefore less economical for the large scale or hatchery production user.

Using the Worms

The Microworms can be fed alone or in combination with other foods such as brine shrimp, rotifers, zooplankton, egg yolk, dry diet, etc. Studies have shown that growth and survival of fish fry fed Microworms is not significantly different from those fed brine

shrimp. Microworms are especially useful for species of fish whose fry are too small to initially take a newly hatched brine shrimp nauplii. However, a feeding program utilizing a combination of food items is probably the best option because it provides for a back-up food supply in case of production failures and is better able to approximate the nutritional requirements of the fish fry.