

Microworm Culture for Aquarium Fish Producers ¹

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Live food is considered to be a necessity for raising fish fry, especially during the first weeks of feeding. Most fish fry require a food item that shows independent movement. This live food must also be appropriate for the mouth size of the fry and must provide a nutritionally complete diet. Fish culturists have historically used newly hatched brine shrimp almost exclusively as the initial food for fry.

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, power outages can cause complete failure. Brine shrimp in fresh water die within a few hours because of osmotic stress. In addition, the cost of brine shrimp cysts is substantial.

Biology

The nematode *Panagrellus* sp., commonly known as "microworms" to tropical fish hobbyists are an alternate live food for fry. Microworms are one of the simplest live foods to culture. They produce a dependable harvest and are tolerant of environmental variables. These nematodes are small (usually less than 1/16" long), white, unsegmented worms that

move 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 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 nematodes are 76% water and 24% dry matter; 40% of the dry matter is protein and 20% is fat.

Microworm Cultures

Starter cultures are available from biological supply houses, mail order companies that advertise in aquarium magazines, or other fish culturists. A starter culture can be stored for over six months at slightly above 32°F.

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Microworms can be cultured in almost any shallow, flat, water tight container; 8" x 12" plastic refrigerator boxes with snap on lids are especially convenient for large-scale production. Approximately ten 1/16 if holes are drilled in the top for air.

The culture media can be prepared from almost any cereal grain, yeast, and water. My experience has shown that 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" container. The oats are cooked 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, mold and insect infestation from spores and eggs in the oats may be a problem. The mixture should have a very thick paste-like consistency. The media is spooned into the culture container (Figure 1) 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 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 tank. The mixture will decay rapidly in water and may cause water quality problems for the fry.

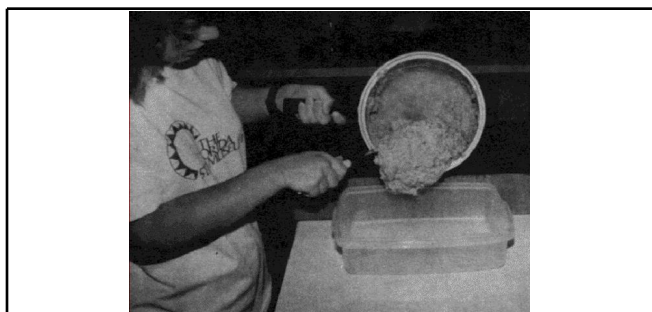


Figure 1 .

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, 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 (Figure 2). 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.



Figure 2 .

Maintaining the Culture

The surface of the culture should be stirred every week 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

Other 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. My experience has been that 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 hatchery production.

The microworms can be fed alone or in combination with other foods such as brine shrimp, rotifers, zooplankton, egg yolk, dry diet, etc. Studies at our laboratory 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 meet nutritional requirements of the fish fry.