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In-Lab Trout Rearing

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Introduction:

Rainbow trout, *Oncorhynchus mykiss* is a cold water fish belonging to the family Salmonidae. The word, *Oncorhynchus* refers to distinctly hooked appearance of upper or lower jaw in mature males. The species was initially described in the Russian Far East in the late 1700s, and the name "mykiss" is a local term from that region. Rainbow trout share desirable characteristics (faster growth rate, disease resistance) that have contributed to their sustained culture for over a century.


Figures: Table size rainbow trout, Trout Fish Farm, Rangil, SKUAST-Kashmir

Habitat:

It is a cold water fish and flourishes well in snow-fed & glacier-fed streams with gravel bottoms and natural cover in its natural habitat, such as downed trees and boulders. It is a carnivorous and opportunistic feeder. It feeds on zooplanktons during the initial life stages, followed by aquatic and terrestrial insects, fish eggs, small fishes, to crustaceans and worms as it grows.

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Diverse culture systems, such as recirculatory aquaculture systems, intensive systems, and extensive systems are used for rearing practices. Clean, pathogen-free, and temperature-stable water that is typically obtained from streams, springs, or groundwater is necessary for rainbow trout rearing.

Research studies on nutrition, immune responses, diseases, physiology and genomics of rainbow trout in particular exceeds that of any other salmonid species making it a "logical surrogate" for other salmonid species. Moreover, the fish has been widely utilized as a prospect model for research in zoo-toxicology, carcinogenesis and comparative immunology.For conducting research on trout fry and/or fingerling stage, out-door tanks/troughs are widely used. The out-door facility although popular, tends to pose a real challenge as the stress caused by manual sampling tends to become a problem for ensuring survival of fish. A well-equipped aquarium set-up in an indoor lab facility is suitable for conducting any short-term study on rainbow trout. The presence of readily available laboratory equipments and testing tools provides an added advantage which in turn reduces the sampling stress.

However, confining an active fish presents a real challenge. Providing adequate space while simulating natural living conditions for trout is crucial for thriving fish in an aquarium. In order to corroborate survival and healthy living conditions for trout fry/fingerlings in an aquarium, general aspects would be to focus on acclimation, maintaining water-quality, adhering to stocking size and density with respect to space available, good aeration and water-flow, manual cleaning, timely siphoning and water-exchange.

Acclimation:

Taking the aspect of confinement under consideration, it is important to quarantine and acclimatize the fish before starting the experimental study. Acclimation is important because an abrupt change in environment could lead to stress, disease, or even mortality. The trout fry/fingerling can be acclimated over a period of two weeks in a separate quarantine tank and it is advisable to frequently change the water before feeding the fish.

Water quality maintenance:

It is important to analyze and maintain the basic water quality parameters (Water temperature, Dissolved Oxygen, pH, Carbon dioxide, Chlorinity, Total Hardness, Ammonia, Nitrite) under optimum levels for rearing trout fry or fingerling stage. In an aquarium tank,

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there is a greater possibility of decrease in Dissolved Oxygen levels and an increased concentration of Carbon dioxide (CO_2), Ammonia (NH_3) and Nitrite (NO_2) in particular which tends to accumulate at low flushing-rates. A general measure would be to use a power-head filter along with a good aeration supply. Since trout need fast flowing water for swimming against the current, a power-head filter can also help in simulating the natural flow of water required by the fish.

Figure 1: Checking water quality parameters in an aquarium set-up for trout fingerlings at Experiential Unit, College of Fisheries, SKUAST-Kashmir

Water exchange is inevitable to compensate for evaporation losses and to get rid of accumulated debris and waste in the water. Ideally, the frequency of water exchange should be once a day and it is advisable to only replace 50% of the tank's water volume to avoid disturbing the biological balance and stressing the fish.

Stocking density:

The stocking density in any trout rearing systems has shown to effect health, stress status and condition profile of the fish. Adhering to optimum stock-size and density with respect to the dimensions of an aquarium is important for preventing stressed conditions. Also, size heterogeneity among fry or fingerlings can result in cannibalism as trout is predatory in nature.

Feeding practices:

The physical characteristics such as feed size, structure and stability must be considered in addition to ingredient composition and nutrient level of experimental diets. The feed fed to trout in an aquarium should have high water stability and uneaten feed should be

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removed timely via siphoning to prevent leaching of nutrients and deterioration of water quality.

Miscellaneous measures:

As trout is a cold water fish, combining a temperature regulated aquarium chiller can be used to adjust the temperature as required by the fish. Fish getting stuck or sucked into filters is commonly encountered with small-sized fish**.** Several studies on fish behavior suggest that the fish have an instinct that the area where the current is strongest is where the food will be more readily available. Uneaten fish feed normally tends to end up near the filter because of constant flow. Even, respiration is easier for fish in the area of tanks where water is more oxygenated.

The simplest approach to prevent trout fry or fingerlings from getting stuck or sucked into filter is to use filter-guards or simply pieces of foam trimmed to size for filling the gap between filter and the tank's wall. A basket mesh for the filter could be advantageous as it can prevent the fish from being absorbed into the filter.

Another issue that may arise is jumping of fry or fingerlings out of the aquarium. If the water quality is compromised, such as low oxygen levels and improper pH, the fish might jump out to seek a more appropriate environment. Generally, using an aquarium lid with air holes or mesh net to cover the top portion can easily stop fish from jumping out of the water.

Conclusion:

It is easier to monitor and maintain trout fry or fingerlings in an aquarium. For a short-term study in Laboratory conditions, aquarium tanks can be considered as promising alternate to out-door rearing systems.