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Original Article

A Study On "Culturing Paramecium and Analyzing Their Impact on Guppies' Growth Rates" At GDC(A) Siddipet, Telangana

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ABSTRACT
Paramecium is, a unicellular ciliate, and its potential as a nutritional supplement in the diet of guppies (*Poecilia reticulata). Paramecium were cultured in a controlled environment using standard growth media to ensure optimal population density. Subsequently, the guppies were divided into experimental and control groups, with the former being fed Paramecium in addition to their regular diet, while the latter received only the standard fish feed. Over a period of six weeks, the growth rates of the guppies were monitored and analyzed, focusing on parameters such as weight gain, length increase, and overall health. The results demonstrated a significant enhancement in the growth rate of guppies fed with Paramecium, suggesting that the incorporation of Paramecium into their diet provides a high-quality protein source, thus promoting better growth. These findings highlight the potential of Paramecium as a sustainable live feed option in aquaculture, offering an alternative to traditional feeds that may contribute to improved growth performance in small fish species like guppies.
Keywords: Paramecium, Guppies

INTRODUCTION
Paramecium are single celled microorganisms classified within the kingdom Protista. They are well known for their complex structure and behavior. Paramecium are typically oval or slipper shaped and are covered with tiny hairlike structures called cilia. These cilia beat in coordinated patterns to propel the organism through water and help in capture food. The coordinated movement of the cilia allows paramecium to move in various directions, navigate their environment, and respond to stimuli. They are heterotrophic, meaning they obtain nutrients by ingesting other microorganisms and organic particles. They use their cilia to sweep food particles into an oral groove, which leads to a mouth- like structure called the cytostome. Paramecium reproduce primarily through a process called binary fission, where the cell divides into two genetically identical daughter cells. They can also exchange genetic material through conjugation, a form of sexual reproduction. They are commonly found in freshwater environments, such as ponds and lakes, but can also live in moist soil and other habitats. Overall, paramecium are an important subject of study in microbiology due to their relatively complex cellular structure and diverse behaviors. Paramecium are so named because their shape under the microscope is very reminiscent of the imprint of a primitive slipper. Paramecium are among the very few unicellular organisms that can be seen with the naked eye paramecium are visible as tiny whitish dots floating in water. There are about 40 species of paramecium in freshwater, but they all look more or less similar and also have comparable characteristics. Paramecium belongs to the ciliates. Their entire surface is covered with cilia, or eyelashes, which the paramecium uses to swirl food around and also to help it move around. Paramecium are amazingly agile and can squeeze through very small crevices and gaps this will be interesting for us later. By the way, paramecium do not form permanent stages or cysts. Paramecium feed mainly on bacteria and sometimes also on other unicellular microorganisms, such as unicellular fungi like yeasts and also unicellular algae. paramecium are single celled organisms. As a rule, paramecium reproduce asexually by cell division in the process, the paramecium splits once across. The individual parts grow into complete animals, which can then divide again. If the conditions (food supply,

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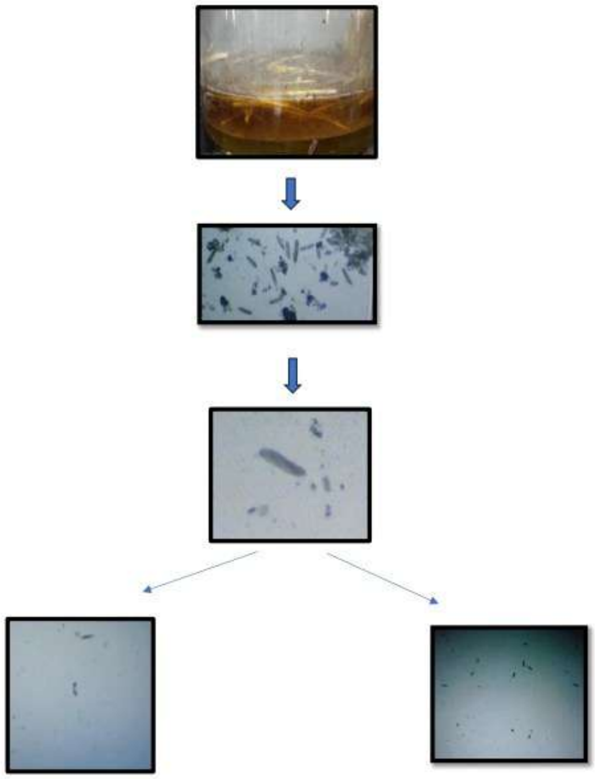
temperature, etc.) are favorable, paramecium can divide again every three to four hours, which means at the same time that they grow really rapidly if everything fits. Given certain environmental stimuli, paramecium can also reproduce sexually, but this is much less effective than asexual reproduction by division asexual reproduction by transverse division is therefore clearly preferred by the paramecium. In sexual reproduction, two paramecium exchange genetic information in the form of their nuclei and then subsequently divide. However, the paramecium often die during this process. Paramecia are excellent fish feeders and are especially eaten by nano fish such as guinea fowl, cross striped dwarf parrotfish, small rasboras, mosquito parrotfish and other Borar as species. For rearing small fish larvae that cannot yet handle Artemia nauplii, slipper lizards are a very good and substantial initial food. Shrimp and filter feeding snails also readily grab at the protozoa, as do mussels. Slipper lizards are also frequently preyed upon by other predatory protozoa such as amoebae, sunfish, predatory rotifers. These microbes are therefore not welcome in slipper animal culture. Specific cultivation of paramecium culture with milk or cream Paramecium are very easy to culture it is best to get a batch that is already running. This preparation of paramecium is then put into a container that holds about half a liter or more of water a jar, a small aquarium, a vase, the water values do not matter. The mixture is then fed with a drop of milk or cream. The milk causes bacteria to multiply in the water, which in turn are eaten by the paramecium. When the water is clear, it is fed again. As the number of paramecia increases, the protozoa can be seen as streaks or clouds in the water; those with particularly good eyes can see the individual animals as tiny white dots in the water. The feeding intervals now become shorter and shorter because the number of bacteria increases. Targeted breeding of paramecium culture with beet pulp. Another possibility besides the milk approach is an approach with beet pulp. For this purpose, approximately 5 to 10 mm large dried cubes or correspondingly large cuttings of kohlrabi, fodder beets, rutabagas or similar are used. The cubes can be easily dried in the oven at about 50 °C. As with the milk preparation, overdosing leads to oxygen starvation and the death of the slipper animals! After about two weeks, put in a new cube.

MATERIAL & METHODS

Hay infusion or dried grass • Distilled or dechlorinated water • Large beaker • Wheat grass powder and wheat grains • Dry yeast and milk • Universal pH indicator • Water quality testing kits.

PARAMECIUM CULTURE MEDIA



Measure out 2.5g of wheat grass powder and 3/4 of a gram of sodium phosphate and add to water Bring mixture to a boil Allow mixture to cool to room temperature Filter cooled mixture through cotton or nitex to filter out wheat grass particles Autoclave cooled and filtered mixture Inoculate mixture with klebsiella medium (cut off a chunk of the bacteria rich agar and add straight to the mixture; the piece of agar should be about the size of your thumbnail) Incubate inoculated mixture overnight (8-12 hours) @ 37 degrees. The high temperature is necessary for proper bacterial bloom Pour mix into the large jar and add paramecium culture; or add mix directly to existing paramecium culture for continued rapid growth Allow paramecium population to expand for 13 day

Ripe culture should have a paramecium population visible as a "cloud" in the jar. Sufficient population size can be confirmed with a dissection microscope where paramecium presence should be very strongly evident. Replenish culture with new food every 14 weeks as needed

Paramecium

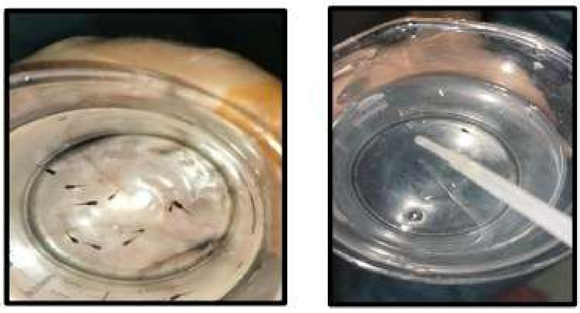
Common media include hay infusion, proteose peptone, or a similar nutrient rich solution. Steep dried hay in distilled water for 12 weeks. Filter the solution to remove particulate matter. Dissolve proteose peptone in distilled water according to the manufacturer's instructions. Introduce a small amount of Paramecium culture into the prepared medium. This can be from an existing culture or a commercial stock. Maintain cultures at 20-22°C with gentle aeration to prevent settling and promote even growth. Ensure the pH remains between 6.5 to 7.5. Adjust as necessary using acid or base solutions. Regularly transfer a portion of the culture to fresh medium to avoid overcrowding and nutrient depletion. I Used a microscope to observe Paramecium and monitor for growth, health, and any contamination.

Employ aseptic techniques to prevent contamination and ensure the culture remains pure. Collect Paramecium when the culture reaches the desired density. Use a pipette or other sterile instrument for collection. Divide guppies into control and experimental groups. The experimental group will be fed Paramecium, while the control group will receive a standard diet. Ensure a sufficient number of guppies in each group to obtain statistically significant results. Provide Paramecium to the experimental group at a consistent daily amount. Adjust the quantity based on initial findings to ensure it is sufficient but not excessive Feed both groups at the same time and frequency to ensure consistency. Measure and record key growth metrics, such as weight, length, and overall health, at regular intervals. Monitor for any signs of disease or abnormal behavior, and document observations. Analyze the growth data of guppies fed with Paramecium versus those fed with the control diet. Use statistical methods to determine if there are significant differences. Assess any differences in health and survival rates between the groups to understand the impact of the diet on overall wellbeing.

Binary Fission – A Mode of Asexual Reproduction Binary fission in Paramecium is a form of asexual reproduction where the organism divides into two identical daughter cells. The Paramecium undergoes growth, and its internal structures, including the micronucleus and macronucleus, replicate. The macronucleus controls daily functions, while the micronucleus is involved in reproduction. The micronucleus undergoes mitosis, producing two identical micronuclei. The macronucleus also divides through a process called amitotic division, where it splits without forming a distinct mitotic spindle.

Using Paramecium as a food source for guppies

"Using Paramecium as a food source for guppies has several implications for their health and well-being. Paramecium, being a heterotrophic organism, provides essential nutrients that can enhance the growth and vitality of guppies, potentially improving their overall health. Research indicates that Paramecium can serve as a model for assessing the digestibility and energy costs of various food sources, which may inform optimal feeding strategies for guppies.



Feeding guppy fishes with paramecium

Additionally, studies on the toxicity of substances like C-phycocyanin in Paramecium and guppies suggest that Paramecium can be safely integrated into guppy diets without adverse effects, indicating its suitability as a non-toxic food source. However, while Paramecium can support guppy health, exposure to environmental stressors, such as microplastics, can negatively impact both organisms, highlighting the need for careful management of their aquatic environments. Overall, incorporating Paramecium into guppy diets appears beneficial, provided environmental conditions are maintained. The feeding of Paramecium has significant implications for the growth rate of guppies and their ecosystem. Paramecium serves as a food source for guppies, and its health and population dynamics can directly influence guppy growth.

RESULT & DISCUSSIONS

"Using Paramecium as a food source for guppies did not cause any deaths in the study, indicating it is safe and does not harm the overall health and well-being of guppies". Paramecium culture exhibited robust growth under optimal conditions of pH (7.5-8.5), Temperature (20-22°C), and Dissolved oxygen (5-8 mg/L). Growth rates were highest when these conditions were maintained consistently. Guppies on a Paramecium diet exhibited improved health, higher activity levels, and better coloration, indicating that Paramecium not only enhance growth but also support overall well-being. The results affirm that Paramecium are a highly effective and nutritious food source for guppies, offering a practical alternative or supplement to commercial fish diets. Proper management of Paramecium cultures is crucial for maximizing their benefits as a food source. Optimal environmental conditions are key to ensuring the quality and effectiveness of Paramecium in feeding experiments. Using Paramecium as a high-quality food source for guppies and underscores the importance of maintaining optimal culture conditions to support their health and productivity. Regular subculturing every 1-2 weeks prevented overcrowding and nutrient depletion, ensuring a healthy and dense Paramecium population. Cultures were largely free from contamination due to strict aseptic techniques, although occasional contamination required corrective action, such as re-inoculating with fresh media. The improved growth rates of guppies fed Paramecium suggest that Paramecium provide high nutritional value, possibly due to their rich protein content and balanced micronutrients. This aligns with studies indicating that Paramecium are a nutritious food source for small aquatic organisms. The superior growth in the experimental group indicates that Paramecium may be more efficiently utilized by guppies compared to commercial fish food. This could be due to better digestibility or a more balanced nutrient profile (Prescott, 1997). Paramecium, a genus of unicellular ciliated protozoa, is often used as a model organism in biological research and educational projects. Culturing Paramecium is a common practice in laboratories and classrooms because these organisms are relatively easy to maintain, observe, and manipulate. Paramecium cultures typically thrive in a nutrient-rich environment. A common medium used is 'hay infusion', which is created by boiling hay in water and allowing it to ferment. The infusion provides bacteria, which serve as the primary food source for Paramecium

CONCLUSION

I hereby conclude that the present study helps to the aqua culturists and zoologist to know the steps of paramecium culture and ornamental fishes are most prefer live feeds which has Higher nutritional value compared to the artificial formulated feed. This live culture can reduce the cost efficiency and these live feeds helps to maintain water quality in Aquarium. Paramecium thrive best under controlled conditions with a pH of 7.5-8.5, a temperature of 20-22°C, and dissolved oxygen levels of 5-8 mg/L. Adhering to these parameters ensures robust growth and health of the cultures. Regular subculturing and strict aseptic techniques are essential for preventing contamination and sustaining high-density Paramecium populations. Guppies fed Paramecium demonstrated significantly better growth rates compared to those fed standard commercial fish food. This suggests that Paramecium provide superior nutritional benefits, contributing to increased weight and length gains in guppies.

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