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Utilization of Roselle Flower Extract (Hibiscus Sabdariffa) to Enhance Immune Resistance in Catfish (Clarias Gariepinus) in Kesiut Village, Kerambitan, Tabanan, Bali

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A R T I C L E I N F O

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A B S T R A C T

The community partnership program was conducted with the Mertha Sari Werdhi women farmers' group in Bali, which faced high mortality in catfish (Clarias sp.) culture due to disease and poor water quality. The activity aimed to evaluate rosella (Hibiscus sabdariffa) flower extract as a natural feed supplement to enhance fish immunity and survival. Implementation involved training and demonstration of extract preparation and application using the coating method. A total of 3,000 catfish seeds were stocked, and survival increased from 64.44% in week two to 99% in week eight. Water quality parameters, including DO, temperature, and pH, remained within optimal ranges. The results indicate that rosella flower extract can improve survival rates and reduce dependence on antibiotics in catfish farming.

INTRODUCTION

The Merta Sari Werdhi Farmer Women Group consists of 30 members, chaired by I Nyoman Artini which is located in Banjar Br. Kesiut Tengah Kelod, Kesiut Village, The Merta Sari Werdhi Farmer Women Group consists of 30 members, chaired by I Nyoman Artini, which is located in Banjar Br. Kesiut Tengah Kelod, Kesiut Village, Kerambitan District, Tabanan Regency, Bali. This group was established in 2019 based on information from the chairperson of the Merta Farmer Women group, Sari Werdhi, this group had experienced failure and was inactive, but was active again starting in 2022 after receiving assistance from related agencies, namely in the form of 4 round ponds and 2000 catfish seeds. This group is engaged in catfish cultivation. In the implementation of catfish cultivation, the Merta Sari Werdhi Farmer Women group faces several problems, including the presence of diseases that affect catfish, the mass death of catfish due to declining environmental quality, and the challenge of maintaining fish health. The group applied to the MSDP study program to explore ways to manage diseases using natural ingredients. We provide solutions using natural ingredients that are easy to find around, for disease control in catfish, and increase the body's immunity to catfish under certain conditions. Disease prevention using antibiotics is now rampant among cultivators, who can have a serious impact on consumers and the environment. Consuming foodstuffs, including fish containing antibiotics, exceeding the maximum limit of residues can cause allergic reactions, poisoning, treatment failure due to resistance, disturbances in the number of microflora, and physiological disorders in humans (Adi et al., 2024; Pawestri et al., 2019). This has an impact on the rejection of fishery products that are suspected of still using antibiotics. For this reason, there needs to be natural ingredients that can replace the function of antibiotics effectively and efficiently.

Aquaculture is recognized as one of the major providers of protein sources for humans. Currently, intensive cultivation technology has been widely applied in various countries (Agus et al., 2021). However, under intensive cultivation systems, aquatic organisms are usually maintained at high stocking densities, which makes them highly susceptible to disease outbreaks (Agus et al., 2024; Samad et al., 2014). Disease remains the main constraint in aquaculture because it can hinder growth and cause significant mortality (Samad & Agustina, 2020; Santoso et al., 2013). Several herbal ingredients have been investigated for their antibacterial activity, including *Nyctanthes arbor-tristis*, *Astragalus radix* and *Ganoderma lucidum*, and *Allium sativum* (Kirubakaran et al., 2010).

Fish feed is a crucial factor in aquaculture because it supports growth, survival, and feed utilization efficiency. Previous studies have shown that commercial feed is commonly used as a base, with the addition of supplementary ingredients such as rosella flowers (*Hibiscus sabdariffa*), which has demonstrated significant improvements in fish performance. Nutritious, timely, and adequate feeding promotes optimal growth and enhances fish immunity (Jayadi, 2024). In general, fish feed should fulfill the nutritional requirements of fish, including proteins, vitamins, and minerals necessary for sustainable growth (Syakirin et al., 2024).

The use of rosella flowers (*Hibiscus sabdariffa*) in artificial fish feed, particularly for gourami and tilapia, has been shown to positively impact the fish's immune system (Mulyana, 2019). Previous research has demonstrated that rosella contains vitamin C, which contributes to enhancing fish immunity. In a study on gourami challenged with the bacterium *Aeromonas hydrophila* (Mustikhasary, 2015). The addition of rosella to the feed reduced the mortality rate, with a dosage of 30 g/kg of feed yielding the best results, resulting in a mortality reduction of up to 8.26%. Supplementation with rosella also improved several hematological parameters, including total leukocytes (white blood cells), erythrocytes (red blood cells), hemoglobin levels, hematocrit, and phagocytic index (Susandi et al., 2017). These findings suggest that rosella not only enhances the growth and survival of fish but also strengthens their immune response against bacterial infections. Feeding natural ingredients, such as rosella, can therefore provide additional benefits by improving fish immunity and increasing feed utilization efficiency.

IMPLEMENTATION AND METHODS

The implementation method of PKM activities for controlling diseases in catfish farming and maintaining pond water quality involved providing training and direct demonstrations to farmers on the preparation and application of rosella flower extract in catfish culture.

The activity was implemented in two stages (July 14, 2025, and August 2, 2025). In the first stage, information regarding rosella flower extract and its benefits for disease control in catfish was delivered, based on previous research findings, to provide a clearer understanding of fish health management. Training on the preparation of rosella flower extract was also conducted, and the extract was subsequently applied in the second stage during catfish cultivation practices. Presentations on the use of rosella flowers were provided by international collaborators, namely Ts. Dr. Aida Firdaus Bt. Muhammad Nurul Azmi (offline) and Prof. Dr. Murni Marlina Abd. Kari (online), both from Universiti Teknologi MARA, Malaysia.

The second stage was conducted to test and train the application of rosella flower extract as a disease control measure and to support the immunity of catfish. The activity was implemented with one group member under a mentoring system. The trial was performed by incorporating rosella flower extract into fish feed using the coating method in a single cultivation pond. Application began when environmental conditions declined and fish appetite decreased. At the end of the cultivation cycle, results from the pond treated with rosella flower extract were compared with those from untreated ponds. This procedure enabled farmers to directly observe the application of rosella flower extract and evaluate its impact on catfish culture.

Figure 1. Presentation on Rosella Flower Material (Online and Offline) By International Collaborators

Figure 2. Tools and Materials for Fish Feed Preparation Using the Coating Method

Figure 3. Rosella Flower Application Training Session

RESULTS AND DISCUSSION

In the Mertha Sari Werdhi women farmers' group, catfish cultivation initially resulted in losses, with 5,000 stocked seeds experiencing 100% mortality. To address this issue, rosella flower extract was applied as a feed supplement to enhance the immunity of catfish seeds reared in round ponds. A total of 3,000 seeds were subsequently stocked for testing. The survival rate was recorded at 64.44% in week two, 70.80% in week four, 80.00% in week six, and 99.00% in week eight. These findings demonstrate that supplementation with rosella flower extract effectively improved the survival and immunity of catfish seeds, thereby reducing mortality.

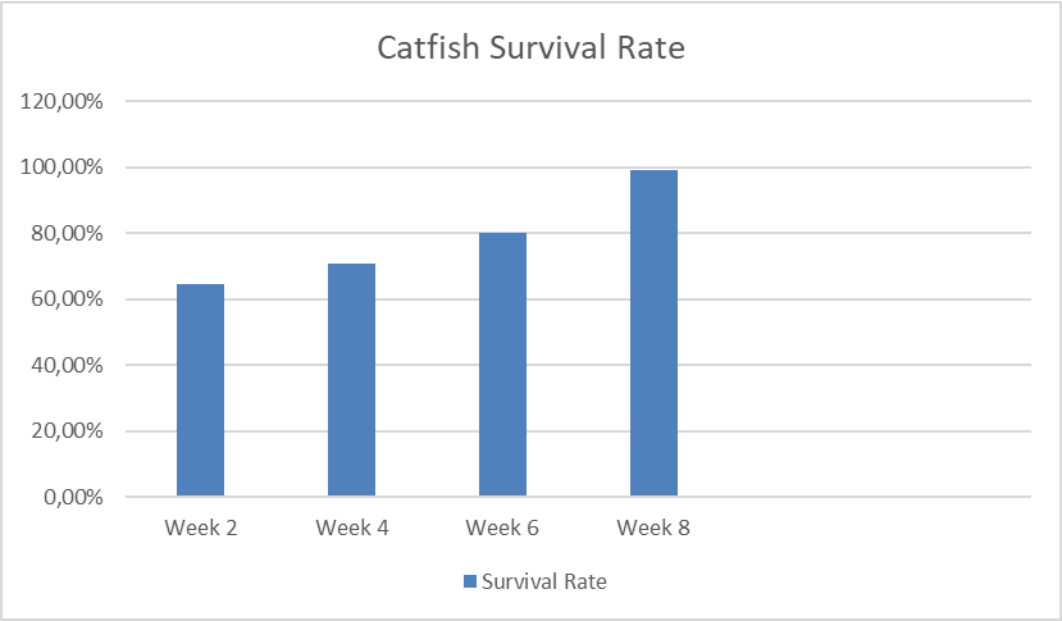

Figure 4. Graph of Catfish Survival Rate

The survival rate is closely related to water quality, which must remain adequate to support the growth of catfish (Clarias sp.). Survival is generally influenced by biotic factors, such as competition (cannibalism), parasites, age, predators, stocking density, and human handling, as well as abiotic factors, including the chemical and physical properties of the water (Effendie, 2002). A survival rate of ≥50% is considered relatively good, 30–50% is moderate, and <30% is poor (Wijayanti & Pebriani, 2021). A high survival rate is often achieved when the feed provided is properly utilized, meeting the nutritional needs of the fish, thereby preventing hunger and reducing cannibalistic behavior (Haryasakti & Wahyudi, 2023). High stocking density, however, can reduce water quality, particularly by decreasing dissolved oxygen levels and increasing ammonia concentration. Deterioration in water quality can cause stress in fish, and if it exceeds the tolerance limit, mortality may occur. Furthermore, declining water quality may reduce appetite, leading to insufficient feed intake and inadequate energy for maintenance and growth. If this condition persists, it can ultimately result in death. Mortality during rearing may also be caused by stress during adaptation to new environments and the vulnerability of younger fish to survive.

Water quality during the study remained within the optimal range for catfish seed culture. Dissolved oxygen (DO) ranged from 4.75 to 8.00 ppm, which is sufficient to support respiration and metabolic processes in fish; however, levels below the optimum threshold may reduce vitality, growth, and reproduction (Scabra et al., 2022). Water temperature ranged from 26.70 to 27.00 °C, falling within the optimal range of 20–30 °C for seed growth. The pH values ranged from 7.0 to 8.0, which are within the recommended range of 7.0–8.5 (Barus, 2002). These results indicate that water quality parameters were generally favorable and did not negatively affect the survival and growth of catfish seeds.

CONCLUSIONS AND RECOMMENDATIONS

To achieve a high survival rate in catfish culture, it is important to maintain water quality, provide sufficient and nutritious feed, and control other factors such as stocking density and potential cannibalism. The survival rate of catfish seeds in the Mertha Sari Werdhi women farmers' group ranged from 64.44% to 99%. The water quality parameters measured in this study were within the optimal range to support the growth and survival of catfish seeds.

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