

POTENTIAL UTILIZATION OF *ALOE VERA* FOR FISH FARMING

Yuli Andriani, Rosidah and Rusky I. Pratama

¹⁾ Staff at Fisheries Department, Faculty of Fisheries and Marine Sciences, University of Padjadjaran
²⁾ E-mail: yuliyusep@yahoo.com

KeyWords

acemannan, Aloe vera, disease, immunostimulant, prevention

ABSTRACT

Antibiotics are routinely used in fish farming to prevent infections caused by bacteria. The downside of this strategy is that if the antibiotic is used to treat fish repeatedly, disease-causing bacteria will develop resistance. An immunostimulant material is frequently used in fish farming to prevent disease and raise fish resistance to disease as an alternate solution to this problem. The aloe vera plant is known to contain active chemicals that serve as immunostimulants and can benefit fish. Saponins, flavonoids, tannins, sterols, and acemannan are among the active ingredients found in aloe vera skin extract.

INTRODUCTION

The use of antibiotics can cause resistance effects on pathogenic bacteria and cause pollution to the environment [1]. Therefore, alternative medicines are needed that are more environmentally friendly and do not cause bacteria-resistant effects. Several phyto-pharmaca ingredients have been used to treat MAS, including betel leaf, papaya and katapang. Betel leaf extract, papaya and keta-pang each have the same antibacterial compounds, namely flavonoids, tannins, steroids and triterpenoids which are antibacterial [2], [3], [4]. Antibacterial compounds are also found in *Aloe vera*, according to [5], *Aloe vera* skin extract contains identified active substances such as saponins, flavonoids, tannins, sterols and acemannan.

The ability of *Aloe vera* as an antibacterial is because it contains 12 types of anthraquinone active compounds as potential anti-bacterial and antiviral agents [6]. In addition to anthraquinones, *Aloe vera* contains quinones, saponins, aminoglucosides, lupeol, salicylic acid, tannins, urea nitrogen, cinnamic acid, phenols, sulfur, flavonoids and essential oils that function as antimicrobials [7]. *Aloe vera* has several nutrients that play a role in the wound healing process. *Aloe vera* gel contains carbohydrates associated with therapeutic characteristics, such as wound healing and anti-inflammatory activity. *Aloe vera* also contains the active substances mannose, glucomannan, acetylated mannose (acemannan), flavonoids and saponins.

CLASSIFICATION AND MORPHOLOGY OF *ALOE VERA*

The *Aloe vera* plant (Figure 1) belongs to the Liliaceae family. This plant can grow in tropical and subtropical climates which is characterized by blade-like leaves with sharp serrated edges. *Aloe vera* leaves contain the main components, namely yellow latex on the outside and gel (mucilage) on the inside [8]. According to [9], *Aloe vera* plant is widely used as health food, cosmetic and medicine and is believed to function as antitumor, antidiabetic and moisturizer. According to [10] the taxonomy of *Aloe vera* is as follows:

¹⁾ Staff at Laboratory of Fisheries Processing Product, Faculty of Fisheries and Marine Sciences, University of Padjadjaran

¹⁾ Staff at Laboratory of Fisheries Processing Product, Faculty of Fisheries and Marine Sciences, University of Padjadjaran

Kingdom : Plantae
Phylum : Spermatophyta
Class : Monocotyledoneae
Order : Liliiflorae
Family : Liliaceae
Genus : Aloe
Species : *Aloe vera*



Figure 1. *Aloe vera*

Aloe vera, like other plants, has a root, stem, and flower structure, but what is often used in medicine is the flesh. *Aloe vera* is a single leaf lance-shaped with elongated strands in the form of a midrib with a length of 40–60 cm and a width of 8–13 cm at the bottom and 2–3 cm thick. The leaves are thick fleshy, boneless, grayish green and have a waxy coating on the surface and are succulent, i.e. they contain water, sap and mucus that dominate the leaves. The top of the leaf is flat and the bottom is rounded (convex). Early developed *Aloe vera* leaves have pale green to white patches. These spots will disappear when the *Aloe vera* leaves mature, but this is not the case with small or local types of *Aloe vera*. This is probably due to genetic factors. Along the edges of the leaves lined with serrations or spines that are dull and colorless [10].

THE CONTENT AND BENEFITS OF ALOE VERA

According to [11] the beneficial properties of *Aloe vera*, such as bioactive polysaccharides, in particular the storage polymer known as acemannan, and different phenolic compounds, appear to be key components to explain most of the pharmacological properties attributed to the *Aloe vera* plant. According to [12], *Aloe vera* is able to stimulate immunity. This is due to *Aloe vera* characteristics which contains the active compound acemannan which is able to activate immune cells [13]. *Aloe vera* also contains saponins that function as antiseptics and the quinone compound in *Aloe vera* is used as an antibacterial. Alkaloid compounds in *Aloe vera* can increase endurance [14]. *Aloe vera* also contains tannin compounds as antibacterial. Tannins have antibacterial power by precipitating protein. In general, the antibacterial effects of tannins include reactions with cell membranes, inactivation of enzymes and inactivation of the function of bacterial genetic material [15].

Aloe polysaccharides have also been linked to direct bacterial activity through stimulation of phagocytic leukocytes, which destroy bacteria [16]. According to [17] all parts of the extracted *Aloe vera* contain polysaccharides and flavonoids. According to [18], flavonoids have the potential as antibacterial, anti-cancer and antibiotic compounds. Flavonoid compounds are synthesized by plants as a defense system and in response to infection by microorganisms, so it is not surprising that these compounds are effective as antimicrobial compounds against a number of microorganisms. Flavonoids are one of the polyphenolic compounds that have various effects, including antioxidant, anti-tumor, anti-inflammatory, antibacterial and anti-viral effects. Flavonoids work by damaging the cytoplasm so that bacterial cells will be damaged and die. Flavonoids are also anti-inflammatory so they can reduce inflammation and help reduce pain when bleeding or inflammation occurs in the wound [19].

According to [10], the specialty of *Aloe vera* lies in its nutritional content (especially glucomannan) in collaboration with essential and secondary amino acids, oxidase enzymes, catalase and lipase, especially protein-breaking enzymes (proteases). *Aloe vera* contains a glycoside group which is an aminoglycoside group which is an antibiotic. These compounds will diffuse in the bacterial cell wall and this process lasts long and continuously in an aerobic atmosphere. After entering the cell, it is then passed on to the ribosome which produces protein, so that it will cause interference with the protein synthesis process and will then cause the breakdown of bacterial cell protein bonds. Saponins can cause saponification reactions. This compound will cause damage to the fatty structure of the bacterial membrane so that the bacterial cell wall will rupture, lysis and subsequently die. While acemannan is a carbohydrate compound that will activate macrophages causing phagocytosis.

According to [20] acemannan stimulation of macrophages occurs through mannose receptors on the surface of macrophage cells.

Acemannan increases the activity of macrophages of the systemic immune system, especially in the blood and spleen and increases the production of N_6 macrophages. This is confirmed by the statement of [21] that the polysaccharide acemannan has been considered as the main factor of the immunomodulatory properties shown by *Aloe vera* for macrophages and monocytes, with minimal systemic toxicity.

The healing component relates to a compound called glucomannan, which is enriched with polysaccharides. Glucomannan affects fibroblast growth factor and stimulates cell activity and proliferation and increases collagen production and secretion. *Aloe vera* mucus not only increases the amount of collagen at the wound site, but also increases the transverse connections between the bonds, thereby accelerating wound repair [22].

SOURCE OF IMMUNOSTIMULANT FOR FISH DISEASE PREVENTION

Another use of *Aloe vera* is as a source of immunostimulants that help prevent disease in fish. The use of *Aloe vera* as an immunostimulant is highly recommended considering the compounds contained in it can be used as immunostimulants, some of which are Flavonoids, Acemannan and Aloe emodin which function as immunostimulants, anti-inflammatory and anti-microbial. Several studies have shown the ability of *Aloe vera* as a source of immunostimulants in several types of fish.

Aeromonas hydrophila is the cause of Motile Aeromonad Sepsicemia (MAS). In the [23] study, feed containing *Aloe vera* powder was applied as an immunostimulant to treat MAS in Biawan fish (*Helostoma teminckii*). The research method used was an experiment with 5 treatments with 3 replications, namely treatment A (KN 0 g/kg powdered feed), B (KP 0 g/kg powdered feed), C (20 g/kg powdered feed), D (30 g/kg feed powder) kg of powdered feed) and E (40 g/kg of powdered feed). The test feed was given for 7 days before the challenge test and 14 days after the challenge test. The challenge test was carried out by injecting the suspension of *Aeromonas hydrophila* bacteria with a dose of 108 cells/cfu as much as 0.1 ml intramuscularly. Observational variables included feeding response, weight gain, erythrocytes, leukocytes, hematocrit, hemoglobin and survival. The results obtained showed that the KP treatment had the lowest number of erythrocytes, leukocytes, hematocrit and hemoglobin and the 40 g dose of *Aloe vera* powder was almost close to the amount in the KN treatment as a comparison to other treatments. Feeding containing *Aloe vera* powder as much as 20, 30, and 40 g/kg can reduce the mortality rate compared to negative control and positive control. *Aloe vera* powder through feed has a significant effect on the survival of Biawan fish after infection. *Aloe vera* powder dose of 40 g/kg showed the best results compared to other doses.

Aloe vera extract can also be applied as an immunostimulant to treat MAS in African catfish *Clarias* sp. The doses of *Aloe vera* extract added to the feed were 10, 20, and 40 g/kg dry weight. The studied fish were given treatment feed for 7 days after the challenge test. Clinical symptoms were observed every day after the challenge test, while the hematological test was observed on days 3, 5, and 8 after the challenge. The results obtained showed that the feed containing *Aloe vera* extract as much as 10, 20, and 40 g/kg could reduce the mortality rate and clinical symptoms when compared to negative control and positive control. The dose of 40 g/kg showed the best results and was significantly different from other doses. The blood description shows a non-specific trend between doses of 10, 20, 40 g/kg which is represented by the number of erythrocytes, total leukocytes, hematocrit values, and hemoglobin levels [24].

Another study was conducted to determine the effect and how much influence the administration of *Aloe vera* powder as an immunostimulant on the histopathological profile of carp kidney organs tested against *Aeromonas hydrophila* bacteria. The results obtained were that the administration of *Aloe vera* powder had a significant effect on the kidney histopathology of carp (*Cyprinus carpio*) as evidenced by congestion and necrosis damage. From the results of this study, it can be concluded that the administration of *Aloe vera* powder as an immunostimulant tested against *A. hydrophila* bacteria affects tissue damage with necrosis and congestion parameters. It is evident from the confidence interval of giving *Aloe vera* powder as an immunostimulant for carp that was challenged with *A. hydrophila*, it can be said to be very close because the results are close to 100% [25].

The applying of *Aloe vera* as an immunostimulant can also be given in liquid preparations, in the form of juice. Treatment using *Aloe vera* juice on carp (*Cyprinus carpio*), consisted of doses of 0 ml/kg, 200 ml/kg, 400 ml/kg, 600 ml/kg, 800 ml/kg and 1000 ml/kg. The results showed that the average value of the phagocytic index of carp in the treatment increased compared to the control. Treatment with *Aloe vera* dose of 600 ml/kg averaged the highest phagocytic index value of 61%, while the lowest phagocytic index value was shown in the control (0 ml/kg) which was 35%. The value of the phagocytic rate or the number of phagocytic cells that phagocytize *Aeromonas hydrophila* bacteria increased after treatment, namely control (0 ml/kg) = 26.31%, 200 ml/kg = 30.76%. 400 ml/kg = 33.56%, 600 ml/kg = 52.18%, 800 ml/kg = 40.74% and 1000 ml/kg = 33.83%. Survival Rate (SR) or the survival rate of goldfish increased after being challenged with *Aeromonas hydrophila*. The highest increase at a dose of 600 ml/kg was 87.5%. The clinical symptoms of goldfish after being challenged with *Aeromonas hydrophila* were inflammation of the skin and fins, slow movement, weakness, decreased feeding response and a bulging stomach. Based on the results of the study, it can be concluded that the administration of *Aloe vera* juice mixed with artificial feed can increase the non-specific immune response and survival rate (SR) of carp (*Cyprinus carpio* L). The optimum dose of *Aloe vera* in artificial feed is 600 ml/kg [26].

Conclusion

Based on the results of research and testing on several fish that have been described above, it can be seen that *Aloe vera* has great potential to be used as a source of immunostimulants in cheap and efficient fish feed.

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