POTENTIAL OF HERBAL PLANTS AS SUPPLEMENTS IN FISH FEED

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ABSTRACT

The use of herbal plants as additives in fish feed has recently been the subject of extensive research. The materials used for fish supplements are leftovers from companies that create herbal foods, drinks, and supplements for humans. As a result, their price is lower and their use as an ingredient in feed supplements. Turmeric, ginger, curcuma, aromatic ginger, noni, catappa leaves, betel leaf, and others are herbal plants that are frequently used as supplements. The primary advantages of providing fish herbal supplements are that they have a better digestive system, need less feed, have increased appetites, and develop faster each day. Studies that have been done employing herbal plants as supplements in fish feed have produced positive outcomes. This may serve as the foundation for the use of herbal plants in fish feed in the creation of aquaculture systems to improve the production, endurance, and health of fish. The potential and application of herbal plants as supplements in fish feed are reviewed in this paper.

Keyword: *aquaculture, additives, feed, fish, herba*

1. INTRODUCTION

Indonesia is a tropical country that is rich in abundant and quality biological resources, including high plant diversity. Several plants in Indonesia have been widely used as supplements for humans, which have been proven to increase endurance and health levels. These plants are usually categorized as herbal plants. The use of herbal plants has now been widely studied for use as supplements in fish feed. The ingredients used for fish supplements are waste from herbal or herbal factories that produce supplements, herbal foods and drinks for humans, hence that their utilization will not compete and the price is more affordable as a feed supplement ingredient.

Some herbal plants that are widely used as supplements are: turmeric, ginger, curcuma, aromatic ginger, noni, *ketapang* (catappa) leaves, betel leaf, and others. The main benefits obtained by giving herbal supplements for fish include improving the digestive system, saving in the use of feed, increasing fish appetite and increasing the daily growth rate of fish [1]. In addition, several other advantages in the use of natural materials are relatively safer, easy to obtain, relatively economical prices and do not spoil the surrounding environment [2]. This paper is a review of the potential and utilization of herbal plants as supplements in fish feed.

2. HERBAL PLANTS SOURCE OF FISH FEED SUPPLEMENTS

Turmeric (*Curcuma longa*)

Turmeric (Figure 1) is a type of turmeric rhizome-producing plant that thrives in Indonesia. The chemical content of turmeric includes: volatile oil (volatile oil) 1-3%, turmeron, zingiberen, 8% protein, 30% carbohydrates, 3% fat and the rest consist of vitamin C, mineral salts such as iron, phosphorus and magnesium [3]. Turmeric also contains 9.61% curcumin compounds.

Figure 1. Turmeric (*Curcuma longa*)[1]

Turmeric increases the digestibility of food substances in the digestive tract, because curcumin can stimulate the gallbladder wall to secrete bile and essential oils prevent excessive gastric acid secretion. Bile contains a number of salts as a result of mixing sodium and potassium with bile acids. The content of curcumin in turmeric functions as an antioxidant and can increase palatability. The essential oils contained in turmeric, aromatic ginger and curcuma are antibacterial against pathogenic bacteria [4].

Ginger (*Zingiber officinale*)

The ginger plant belongs to the Zingiberaceae family which is a year-round herbal plant, has fibrous roots and belongs to the monocot class or one piece. Ginger thrives at an altitude of 10-1500 m above sea level, except for the type of elephant ginger at an altitude of 500-950 m above sea level. The temperature required for optimal ginger growth is 25-30°C [5].

Figure 2. Ginger (*Zingiber officinale*)[2]

Ginger (Figure 2) is a plant that has been widely known as a medicinal plant because it contains alkaloids, flavonoids, polyphenols, saponins, steroids, tannins, fiber, carbohydrates, vitamins, carotenoids and minerals, natural antioxidants such as gingerols, shogaols and essential oils [6]. According to [7] research, ginger has a protective ability on the cellular and humoral immune systems, stimulates growth and suppresses fish mortality.

Curcuma (*Curcuma zanthorrhiza*)

Curcuma or *temulawak* in bahasa (Figure 3) contains antibacterial properties that can lyse toxins attached to the intestinal wall, hence that the absorption of nutrients is better and can trigger growth [8]. In addition to the antibacterial content, temulawak contains essential oils and curcumin. Curcumin in addition to functioning to increase appetite, also plays a role in improving the work of the digestive organs, stimulates the bile wall to secrete fluid and stimulates the release of pancreatic juice which contains amylase, lipase and protease enzymes to improve digestion of carbohydrate, fat and protein feed ingredients [9].

[1] https://st4.depositphotos.com/1024979/41041/i/600/depositphotos_410411096-stock-photo-close-up-turmeric-curcuma-longa.jpg
[2] https://www.exotic-seeds.store/6037-large_default/ginger-seeds-zingiber-officinale.jpg

Figure 3. Curcuma (*Curcuma zanthorrhiza*)[3]

Aromatic Ginger (*Kaempferia galanga* L.)

"Kencur" rhizome or aromatic ginger (Figure 4) is a plant that is widely cultivated by Indonesian people and is used as traditional medicine, in the beverage industry, herbs and spices." Kencur" rhizome contains essential oil, cinnamic acid and ethyl ester [10].

Figure 4. Aromatic Ginger (*Kaempferia galanga* L.)[4]

The content of essential oil in kencur rhizome ranges from 2.4 to 3.9%. The content of essential oil in kencur is antibacterial against pathogenic bacteria [4]. Essential oils function to prevent the release of excessive stomach acid hence that the condition of the stomach is not excessively acidic and facilitates the absorption of food substances by the small intestine [11].

Betel (*Piper betle*)

[12] stated that betel leaf (Figure 5) contains essential oils that inhibit microbial growth. Essential oil and betel leaf extract have activity against several gram-positive and gram-negative bacteria [11].

Figure 5. Betel (*Piper betle*)[5]

The main chemical content that gives betel leaf characteristics is essential oil. In addition to essential oils, other compounds that determine the quality of betel leaf are vitamins, organic acids, amino acids, sugars, tannins, fats, starch and carbohydrates. *Piper betle* Linn (betel) leaf extract also contains tannin compounds. Tannins are astringents, polyphenols in plants that taste bitter and can bind as well as precipitate proteins [13]. Tannins can

[3] https://asset.kompas.com/crops/ZBpPhs5GLonI8ib-or8BGeHBMqU=/0x55:1000x722/750x500/data/photo/2020/06/13/5ee4b01b2ced6.jpg
[4] https://thumbs.dreamstime.com/b/kencur-kaempferia-galanga-isolated-white-background-free-royalty-stock-photo-193685655.jpg
[5] http://1.bp.blogspot.com/-uV47IM9RAew/U1JlYgWwugI/AAAAAAAAAkY/WSApKcIA9UI/s1600/kandungan+daun+sirih.jpg

interfere with cell permeability by shrinking their cell walls. This can cause bacterial cells to experience growth disorders or even perish [14].

Noni (*Morinda citrifolia* L.)

Noni (Figure 6) belongs to the Rubiaceae family. This plant grows in the lowlands to an altitude of 1500 meters and is a tropical plant. Noni tree height reaches 3-8 meters, has white flower heads. The fruit is a compound fruit, which is still young, shiny green and has spots and when it is old it is white with black spots [15].

Figure 6. Noni (*Morinda citrifolia* L.)[6]

The compounds contained in the noni fruit include xeronine, proxeronine, proxeronase, serotonin, dammacantal, (anti-cancer substances), scopoletin, vitamin C, anti-oxidants, minerals, proteins, carbohydrates, enzymes, alkaloids, plant cofactors and other phytonutrients. which is very active and potent in strengthening the immune system, improving cell function and accelerating the regeneration of damaged cells. The chemical content of noni leaves and fruit in general contains alkaloids, saponins, flavonoids, terpenoids and anthraquin ones, besides that the leaves also contain polyphenols. Terpenoid compounds function to assist in the process of organic synthesis and restoration of body cells and are bacterial [16], while anthraquinone compounds in noni fruit function to increase body resistance [17].

3. ROLE OF HERBAL PLANTS AS FISH FEED SUPPLEMENTS

Several studies have been conducted using various types of herbal plants in fish feed (Table 1). This can be the basis for the use of herbal plants for supplements in fish feed, whether given alone or a mixture of several types of plants.

Table 1. Studies concerning herbal plants for fish feed

Reference	Results
[18]	The addition of 20 mL of turmeric solution can increase the average body weight growth of 130 g/fish in African catfish (*Clarias gariepinus*).
[19]	The use of turmeric extract on vannamei shrimp (*Litopenaeus vannamei*), of 15 g/kg can increase survival by 74% after being challenged with Vibrio spp.
[20]	The addition of herbal supplements from turmeric, aromatic ginger, curcuma and ginger as well as containing the bacteria *Bacillus* sp. and tempeh yeast (*Rhizopus oligosporus*) gave a specific growth rate of 2.33% red tilapia at a concentration of 25 ml/kg of feed.
[1]	Feed that was added with herbal supplements from turmeric, tamarind, kencur, rice, temulawak, molasses and probiotics was effective in increasing the daily weight gain of catfish fry by 0.20 grams with a dose of 200 ml/kg of feed.
[21]	The addition of herbs to the *Clarias gariepinus* feed at a dose of 200 ml/kg of feed produced the highest specific

[6] http://1.bp.blogspot.com/-HsJrCFgs17Y/Tfj3O4f-TfI/AAAAAAAAAWs/MMlHEjG9U7k/s1600/morinda+buah.jpg

	growth rate and the lowest feed conversion ratio, each of 4.75% and 0.62
[22]	The addition of the optimal fish herbs on the feed is 200 ml/kg feed and give effect to the growth of catfish, i.e. 29.2 g.

4. CONCLUSIONS

The results of studies that have been carried out using herbal plants as supplements in fish feed show good results. This can be the basis for the development of the use of herbal plants in fish feed, to increase the productivity, endurance and health of fish in aquaculture systems.

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