ARTIKEL REVIEW

Pemanfaatan tanaman obat untuk pengendalian penyakit dalam usaha budidaya

(Utilization of medicinal plants to control disease in aquaculture)

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Abstract

Production of global and national aquaculture often fails due to outbreaks of fish diseases caused by viruses, bacteria, fungi and parasites. Moreover, as a tropical country, Indonesia has a climate that strongly supports the development of pathogens. The occurrence of disease outbreak is basically as a result of disturbance of the balance interaction between fish, the unfavorable environment and pathogens. Medicinal plants are rich of antimicrobial compounds such as naphthoquinone, coumarin derivatives, tannins, flavonoids, and steroids, which are effective for inhibiting the growth of bacteria and fungi. Oleoresin compounds, i.e. essential oils that act as antibacterial and antifungal are also present in medicinal plants. Medicinal plants also serve to stop the bleeding, because there are anti-inflammatory compounds (anti-inflammatory). This compound is found in several medicinal plants that have been tested to cope with fish diseases such as rose balsam, guava leaf, garlic, betel leaf and ginger. Some of the advantages of using traditional medicinal plants are relatively safe, easy to obtain, cheap, not resistant, and relatively harmless to the surrounding environment and do not create antibiotic-resistant pathogens. Thus, it is more adviseable to use medicinal plants in controlling fish diseases.

Keywords: medicinal plants, aquaculture, aquaculture, fish diseases

INTRODUCTION

Today, demand for aquaculture products is increasing in line with the need for community protein. In addition, the food crisis caused by the explosive population growth. Capture fisheries that have been difficult to increase production due to overfishing or fully exploited, we cannot rely anymore to be a top priority in meeting the needs of fishery products, both domestic and international needs. Thus, efforts should be made to cover the crisis, namely by conducting aquaculture activities. Potential development of aquaculture fishery has and will continue to grow in the area of fisheries potential in the territory of Indonesia.

However, global and national problems related to the sustainability of aquaculture fisheries are, among others, production failure due to fish disease outbreaks caused by viruses, bacteria, fungi and parasites. Parasitic and non-parasitic diseases are common diseases in aquaculture business which can cause

significant economic losses for both farmers and businessmen. Another problem is the degradation of culture environment quality is getting worse, caused by the cultivation activity itself or from outside the culture environment.

As a tropical country, Indonesia has a climate that strongly supports the development of parasites and fungi. Coupled with the high mobility of fish from one central production other production central to accelerate spread of diseases and parasites in fish. The occurrence of the outbreak of the disease is basically as a result of disturbance of the balance on the interaction between fish, the unfavorable environment of fish and disease-causing pathogens. Another possibility is the presence or inclusion of ferocious obligate fish disease agents (virulent) despite relatively good environmental conditions (Sugianti, 2005). Disease attacks also cause consumer rejection of fish due to the deterioration of fish quality. This becomes a major challenge and task in the field of fish health to prevent, detect and counter the entry of parasitic diseases in the cultivation environment (Sartijo *et al*., 2013)

In overcoming the problem of infectious diseases, several methods that are often used are vaccinations and the use of antibiotic ingredients. Research results have proven that the use of vaccines is very effective in preventing disease attacks in aquaculture. However, the vaccine works specifically on certain pathogens so that the efficacy is very limited. Vaccines are also not widely available in the market so the price is still expensive. Cultivators also use a lot of chemicals and antibiotics in treating infectious diseases mainly caused by bacteria. On the other hand, the use of antibiotics is not recommended anymore because the use of antibiotics or chemicals intensively or repeatedly has caused various problems such as bioaccumulation, pollution, pathogen resistance (antibiotic-resistant pathogens) as well as suppression of immune system fish (immunosuppression) (Biswas et al ., 2012; Babu *et al* ., 2013) . In addition, antibiotic residues can be accumulated in the fish body, environmentally and harmful to human health (Wu *et al*., 2013).

The use of medicinal plants is an alternative to avoid the negative impacts caused by the use of synthetic chemicals / antibiotics. Research results have shown that Medicinal plants contain many bioactive ingredients that can stimulate growth, antioxidant, antimicrobial, immune modulator and others. According to Citarasu (2010), many medicinal plants contain phenolics, polyphenols, alkaloids, quinones, terpenoids, lectins, and polypeptides that are very effective in place of antibiotics and other synthetic ingredients. Currently the use of medicinal plants in the control of fish diseases has received increasing attention.

Some of the advantages of using traditional medicinal plants are relatively safe, easy to obtain, cheap, not resistant, and relatively harmless to the surrounding environment. Some medicinal plants that are known contain antimicrobial ingredients such as soursop leaves (Nurjannah et al ., 2013) , guava leaf (Rosida, 2012), tumbuhan pacar air and leaves sambiloto (Lukistyowati & Kurniasih, 2012).

Medicinal Plants

Medicinal plants are plants that have medicinal properties and are used as medicine in the healing and prevention of

disease. Understanding nutritious medicine is to contain active substances that function to treat certain diseases (Puspitasari, 2016). Medicinal plants have been exploited in the field of pharmacology to be used as a cure for some diseases. Medicinal plants have several advantages, such as side effects that relatively smaller and more environmentally friendly. Already many modern medicines used today are derived and developed from medicinal plants.

The parts used as ingredients of the drug are called simplicia. Each use of different types of medicinal plants, the simplicity is also different. The parts that can be utilized include the skin (cortex), wood (lignum), leaves (folium), flower (flos), roots (radix), bulbus, and seeds (cement).

Types of medicinal plants

Rose Balsam

Rose Balsam (*I. balsamina* L) is introduced from South Asia and Southeast Asia, there is also a mention from India. This plant was introduced in America in the 19th century. In Indonesia more known as the name of tanaman pacar air. This plant has flowers with a variety of colors, such as pink, red, white, orange, peach, or salmon. At first glance, the shape of the flowers resemble orchids in small size, with toothed leaves. Water henna plant is quite popular as an ornamental plant and is often found in the highlands, for example Puncak, West Java (Maulidah, 2009). The height of this water boyfriend plant reaches 30-80 cm, usually the part used as extracts are stems, leaves, and flowers.

The classification of rose balsam is as follows (Aninomous, 2012):

Division : Magnoliophyta
Subclass : Rosidae
Order : Geraniales
Family : Balsaminaceae
Genus : Impatiens
Spesies : *Impatiens balsamina* L

In Indonesia rose balsam has different regional names as follows: lahine (Nias), paruinai or pacar kayu (Jawa), kimbong (Jakarta), bunga taho (Sulawesi), inai anyar (Maluku), pacar foya (Nusa tenggara) (Hariana, 2008). In Minangkabau (Sumater Barat), as known as Paruinai. Pacar Cai (Sunda), Kimbong (Jakarta), Pacar Banyu (Jawa), Pacar Foya (Bali), Bunga Jabelu (Halmahera Selatan) (Utami, 2008).

This rose balsam is a crop of wet stems, soft, round, branched. Water boyfriends are usually grown as ornamental plants with a height of 30-80 cm. The direction of growth is upright, the branches are monopodial, and single, scattered, confronted, or in the form of essays, elongated lanceolate leaves, edges of toothed leaves, pointed tip, pinnate leaf bone, light green leaf color without leaf, the bottom form a root rosette, pinnate leaf bone. The area of the leaves is about 2 to 4 inches, the base of the pointed teeth leaves, this plant has a fiber roots, will be a fruit ride, bear 4-5, in one fruit chamber there are two or more seeds, the fruit opens chewy and includes fruit with 5 core, the shape of elliptic fruit, split according to the space is chewy, the seed endospermi, embryo will experience differentiation (Nuzul, 2012).

Guava Leaf

Guava or more popularly known as “jambu batu” has the Latin name Psidium guajava . This plant has several regional names in each region, including glima breueun (Sumetera), koyawas, tugala

(Sulawesi) and kayawese and gayawa (Maluku).

The classification of guava leaf is as follows (Rismunandar 1986; Christiani 1992).

Family : Myrtaceae
Class : Dictyledoneae
Genus : *Psidium*
Spesies: *P. guajava*

This plant has a lot of branching, height of about 2 - 10 m, comes from tropical America. Many are grown as fruit trees, often growing wild and from lowlands up to 1200 meters above sea level growing on loose and clay, in the open and in plenty of water. The trunk is hard, the skin of the surface trunk is smooth brown and peeled off. The young leaves are fine-haired, the old leaves of the top surface become slippery. The shape of oval leaves slightly pushy, or somewhat round until tapered with a length of 6 - 14 cm, width 3-6 cm, short stem about 3 - 7 mm. The edge of the flat leaves slightly curved upward, bony pinnate, the color green, located opposite. Flowers out of the leaf armpits, 1-3 egg flowers inverted, yellowish green (Wijayakusuma et al., 1994; Sugianti 2005).

Ginger

The name 'zingiber' derived from the Sanskrit word 'singibera' which has a horn-shaped meaning. That is because the form of rhizome branches that resemble deer antlers. Usually this plant grows in the yard of the house and in the garden. The presence of spicy flavor generated by ginger is quite dominant and caused ketone compound 'zingeron'.

Ginger is classified as follows (Setyaningrum and Saparinto, 2013):

Order : Zingiberales
Family : Zingiberaceae
Genus : Zingiber
Species: *Zingiber officinale*

Needs of ginger demand from Indonesia to the country of importing ginger in recent years is quite increasing. The volume of domestic demand also continues to increase along with the growing food and beverage industry that uses raw materials of ginger. Ginger is suitable as one of the leading commodities in agribusiness and agribusiness development. In addition, ginger also has considerable opportunities to develop. That's because in addition to climate, soil conditions, and the geographical location of Indonesia is perfect for growing ginger. Thus, Indonesia can be one of the largest suppliers of ginger in the world. (Payung and Manoppo, 2015).

Garlic

Garlic (Allium sativum) is a spice plant originating from Central Asia, China and Japan with subtropical subtropics, then garlic spread throughout Asia, Europe and eventually to the whole world (Wibowo, 2006). In Indonesia, garlic enters through international trade channels since centuries ago, starting from the coastal areas and increasingly extending into the interior.

Garlic including spice plants had high economic value because it has a variety of uses. Garlic is not only used as a cooking spice, but can be used as a live pharmacy plant. Traditionally various countries in the world have used garlic in a variety of medicinal herbs. Its use is still largely empirical, meaning it is used for generations based on mere experience. In modern times, the efficacy of garlic has been scientifically demonstrated (Samadi, 2000).

Chemical Compound

Antimicrobial Compounds

Efficacy from medicinal plants as a natural ingredient to cure diseases hereditary is closely related to the chemicals it contains. These chemicals contain naphtoquinone compounds, coumarin derivatives, tannins, flavanoids, and steroids. These active compounds have the ability as an effective antimicrobial to inhibit the growth of bacteria and fungi.

According to Gaby (2007), tanaman pacar air (I. balsamina L) contains an effective antimicrobial compound to inhibit bacterial and fungal growth. The result of examination of secondary metabolite content of its leaves which has been done at Herbarium University of Andalas Padang showed the presence of compound of kumarin, kuionon, flavonoid, steroid, triterpenoid, phenolic and saponin (Adfa, 2007). The same thing was obtained in the study based on phytochemical screening test conducted by Utari (2011) which showed that the leaves of pacar air contain flavonoida compounds, saponins, steroids, glycosides that function as antibacterial and fungi.

Pharmacologic benefits of leaves of pacar air for human body, it can be used as anti-inflammatory, treatment of ulcers and inflammation of the skin, reduce pain (analgesic) and chronic appendicitis (Nuraini, 2014). Traditionally used as a wound wash, menstrual pain, vaginal discharge and infection of the skin. The extract of tanaman pacar air also has antibacterial activity.

Ginger is a domestic drug known for its effication as an anti-infective (Setyaningrum and Saparinto, 2013). The most common anti-microbial ingredient found in ginger oil is a citral that has been found to inhibit the bacteria Rhizoctonia solani. It has also been found that ginger Ethanol extract is able to inhibit the growth of gram-negative and gram-positive bacteria such as gram-negative Pseudomonas aeruginosa. One of the anti-fungal ingredients found in ginger is Dehydrozingerone. Ginger also has ingredients such as anti-microbial, apetizer and immunostimulant.

Garlic has a very sharp smell when crushed or crushed as a result of alisin substances, which are suspected as antibacterial. The substance contained in the whole garlic plant is an alicine substance. When garlic is destroyed, the alicine substances will split into alisin, ammonia and pyruvad. In addition to being antibacterial, garlic can suppress harmful bacteria and provide opportunities for growth of beneficial microorganisms in the digestive tract optimally so that food utilization for growth can be maximum (Samadi, 2000). According to Fazlolahzadeh et al. (2011), garlic contains allicin which has a positive influence on the flora intestine thus improving digestion, nutrient supply and energy use so as to affect the growth of fish.

Allicin is one of the active substances that can kill germs (antibacterial). Allicin plays a role in killing bacteria, Gram positive bacteria or Gram negative because it has amino groups amino benzoat (Wibowo, 2006). According to Barnes et al ., (2002) in Sholikhah (2009) , in vitro garlic test results of some sensitive bacteria have shown significant results. The bacteria tested were Staphylococcus aureus, S. Faecalis, Escherichia coli, Proteus mirabilis, Salmonella typhi, Aeromonas, Vibri cholerae and Bacilus subtilis. In

addition, garlic also has activity as an anti-fungi against Microporum, Epidermophyton, Trichophyton, Rhodotorula, Eryptococcus neoformans and Candida.

Samadi (2000) stated that 1 mg allicin has a capability proportional to 15 standard units of penicillin. Allicin can also join the protein and change its structure to make it easy to digest. The ability of allicin to attack microbial protein and eventually kill the microbes (Wibowo, 2006).

Essential Oil

Oleoresin compounds are also present in some medicinal plants, comprising essential oils and non-volatile oils. Essential oils can be used as perfumes, flavoring, antibacterial and anti-fungal. Essential oils of some plants are biologically active as anti-bacterial and anti-fungal so it can be used as a preservative in food and as a natural antibiotic. According to Dewi and Parwata (2008) essential oils that are active as antibacterials generally contain hydroxyl (-OH) and carbonyl functional groups.

The ginger rhizome contains vitamin A, B, C, fat, protein, starch, resin, organic acid, oleoresin (gingering), and fly oil (zingeron, zingerol, zingeberol, zingiberin, borneol, sineol, and feladren.) Ginger also contains oil asirin, and oleoresin. Oleoresin is a mixture of resins and oils derived from organic solvent. Based on the content of the original oil, red ginger is the highest level, then followed by a small white ginger and elephant ginger. However, elephant ginger is better known than red ginger.

Essential oil is a component that causes the smell typical of ginger. Dry ginger contains 1-3% essential oil, while fresh ginger is not skinned more essential oil content of dried ginger. Non-volatile oil is composed of components that cause spicy and bitter taste, also called fixed oil (zingerol, zingerone, shogoal, and resin). Ginger emprit contains essential oil as much as 6.67% (ml / 100g). The emprit of ginger rhizome smelling very sharp and feels spicy (hot).

Phenol Compound

Phenol compounds that can inhibit mold growth. Anti-fungal compounds contained in ginger rhizome extract allegedly damaging the permeability of cell membranes and disrupt the enzymatic process of the fungus so that its growth becomes obstructed. Sineol compounds and phenylpropane derivatives derived from ginger are aromatic compounds that have the power of toxins that can function as a fungicide. Ginger rhizome produces phenol compounds that can inhibit the growth of fungi.

Phenol derivatives interact with bacterial cells through an adsorption process involving hydrogen bonds. At low levels form a complex of phenol proteins with weak bonds and immediately decomposes, followed by penetration of phenol into cells and causes protein precipitation and denaturation. At high levels of phenol causes coagulation of proteins and membrane cells undergo lysis.

The active content in the ginger can reduce population density Brugia malayi microfilariae were infected at Felis catus. Ginger rhizome extract at various concentration able to suppress growth and production of spore fungus Pythium sp. causing the disease to sprout sprouts on cucumbers in vitro. The higher concentration of ginger rhizome extract, the more effective in suppressing growth

and production of spore fungus Pythium sp (Setyaningrum and Saparinto, 2013).

Anti Inflammatory Compounds

Anti-inflammatory compounds (anti-inflammatory) are found in the leaves and fruits of guava. The leaves and fruits of guava are often used as medicines. This plant is antidiarrheal, and stops bleeding (hemostatics). Usually fresh leaves are often used for external drugs in wounds due to accidents, bleeding due to sharp objects, ulcers (ulcus) around the bone. Guava leaves contain tannins, essential oils (eugenol, fatty oils, resins, tannins, triterpinoids, apfelic acid, and fruits contain amino acids (tryptophan, lysine), calcium, phosphorus, iron, sulfur, vitamins A, B1 and C (Wijayakusuma et al., 1994).

The use of medicinal plants

The control of various fish diseases caused by pathogenic agents using a variety of traditional medicinal plants, is now widely practiced and provides fairly effective results. Garlic is one example of medicinal plants that contain anti-parasitic compounds and make tilapia resistant to infection Trichodina sp. In addition, garlic can also be used for soaking goldfish that attacked Koi Herpes Virus (KHV). Garlic contains allicin and essential oils to treat bacterial attack Aeromonas hydrophilla (Putri and Widyaiswara, 2013).

The effectiveness of garlic has been studied by several researchers, including Normalina (2007) which states that garlic extract with 25 mg / m concentration given by injection has the ability to prevent and treat catfish infected with Aeromonas hydrophila. Sholikhah (2009) states that garlic added in a dose of 20 ppt effectively prevents bacterial infection of Aeromonas hydrophila in dumbo catfish (Clarias sp).

Research has been done by testing ginger plants to improve the non-specific immune response of fish (Payung and Manoppo, 2015). This is because ginger contains ingredients that function as immunostimulants. Ginger is one of the most widely used medicinal plants in Indonesia.

Benefits of betel is used as a styptic (blood barrier) and vulnerary (medicinal wound on the skin) is also useful as an antioxidant, antiseptic, fungicide and bactericidal. Betel leaf containing essential oil is inhibiting the growth of parasites and in research conducted by Herawati (2003) proves that volatile betel leaves can inhibit the growth of protozoan parasites in botia fish. However, in its application should pay attention to the resilience of fish to boil water betel leaf. Excessively high concentrations can negatively affect not only the parasite but also the fish. The results Herawati (2003) showed treatment by immersion using natural ingredients betel leaves can inhibit the proliferation of parasites *Ichthyophthirius multifilis* .

Several other researchers (Evans, 1984; Chou, 1984), also reported that the betel is anti-fungal. Essential oils and betel leaf extract show anti-fungal activity against Aspergillus niger fungus, Curvularea lemata, Fusarium oxysporum, Phyticum ullimum, Candida albicans, Candida prusei, Candida parakrusei, Candida tropicalis, and Candida pseudotropicalis (Sadeli, 1982; Oehadian, 1987).

Giving ethanol extract of tanaman pacar air 2% given through injection can increase fish resistance this is proved by increasing the life span on catfish seeds that attacked by bacteria A. hydrophila..

Beside, that was also a positive influence on clinical symptoms with demonstrated results are quite effective in suppressing infections caused by A. hydrophila with milder clinical symptoms, the healing process is faster so as to reduce the fishing mortality rate (hidayah et al.,)

Anti-bacterial essential oil content is also present in guava leaf (*Psidium guajava* L.). the content of felonic compounds in guava leaves can inhibit the growth of pathogenic bacteria in fish (Wijayakusuma et al., 1994). Through research conducted by Giyarti (2000) it is known that the feed containing guava leaf extract to catfish that have been infected with Aeromonas hydrophila, indicating the process of healing ulcer until the shrink increasingly smaller. This healing process is relatively faster when compared to the control. This is presumably because the guava leaf has anti-inflammatory properties and can stop bleeding (hemostatik) and the presence of anti-bacterial essential oil (Wijayakusuma *et al*., 1994).

CONCLUSION

Traditional medicinal plants such as tanaman pacar air, guava leaves, ginger, garlic and betel leaves can be utilized in the control of fish diseases. Medicinal plants contain chemical compounds that are useful as antimicrobials such as flavonoids, steroids, phenolic, and anti-inflammatory (anti-inflammatory). In addition, flavonoid compounds and polyphenols are also efficacious as antioxidants. The use of traditional medicinal plants in the prevention and treatment of fish diseases has advantages, among others, easily obtained, cheap, effective to prevent and treat fish diseases, and relatively safe for fish, environment, and humans who consume them. In addition, other advantages are not to cause resistance from disease-causing pathogenic agents.

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