Global Scientific JOURNALS

GSJ: Volume 9, Issue 11, November 2021, Online: ISSN 2320-9186
www.globalscientificjournal.com

REVIEW ARTICLES; APPLICATION OF PROBIOTICS AND EXTRACT IN INTENSIVE VANNAMEI SHRIMP (LITOPENAES VANNAMEI) CULTURE

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Abstract

This article aims to examine the application of probiotics and noni fruit extract in an effort to increase growth and resistance to disease of vannamei shrimp (Litopenaes Vannamei) in intensive culture systems. Based on a literature study, information was obtained that the application of probiotics at a dose of 2-5 ml/L significantly increased the growth of vannamei shrimp at a dose of 2-5 ml/L very significantly increased the growth of vannamei shrimp in an intensive aquaculture system. The use of noni fruit extract at a dose of 0.5 m/L was effective in preventing disease in vannamei shrimp, especially those caused by the bacterium V. harveyi. The application of a combination of probiotics with noni fruit extract is highly recommended for the growth and endurance of vannamei shrimp.

Keywords: disease, growth, nutrition, bacteria.

Preliminary

Vaname Shrimp (Litopenaeus vannamei, Boone, 1931) is an introduced shrimp which has high economic value as an export commodity because it is in demand by the world market. Another name for this vaname shrimp is Penaus vannamei. Vaname shrimp in the Asian region is called Hawaiian shrimp, Mexican or Ecuadorian shrimp, in Indonesia it is called Vaname shrimp, in Malaysia it is called Puteh Shrimp and in Thailand it is called Khung Kao. Vannamei shrimp entered Indonesia in 2001 and began to be cultivated in ponds in Banyuwangi and Sitobondo, East Java.

Vannamei shrimp have market opportunities and potential to continue to be developed. To respond to world market demand, aquaculture has been intensified by utilizing marine waters, because

the marine potential is very large, dissolved oxygen in seawater is relatively high and constant, and shrimp cultured is of higher quality (Effendi, 2016).

Vannamei shrimp production in the last quarter of 2015 reached around 400,000 tons. Vannamei shrimp production is targeted by the Ministry of Maritime Affairs and Fisheries (KKP) in 2016 of 600,000 tons. Efforts can be made to increase production by implementing an intensive cultivation system.

Vannamei shrimp cultivation techniques intensively have an impact on the high content of organic matter in the culture media. The high content of organic matter can cause an increase in oxygen consumption for the biodecomposition process, resulting in a decrease in dissolved oxygen levels and the formation of anaerobic breakdown products of organic matter which are toxic to shrimp (Setyati et al., 2016).

Cultivation efforts to overcome this problem is to apply probiotics. According to Susianingsih et al., (2016), probiotics can decompose organic matter from feed residues and shrimp manure quickly into nutrients that are useful for growth. Applications of probiotics containing beneficial bacteria are able to degrade organic matter, reduce disease and accelerate the nutrient cycle process (Herdianti et al., 2015). Devaraja et al. (2013) suggested that the types of bacteria that are often used in cultivation media are Saccharomyces, Lactobacillus, Bacillus, Clostridium, Enterococcus, Shewanella, Leuconostoc, Lactococcus, Carnobacterium, aeromonas and several other species.

Then to maintain the immune system of vannamei shrimp, the use of probiotics is combined with the addition of noni fruit extract. Noni fruit (Morinda citrifolia L.) is thought to contain scopoletin, anthraquinone, acubin, and alizarin which are phytochemical and antibacterial substances (Djauhariya, et., al. 2006). Noni fruit extraction with ethanol solvent was able to inhibit and kill Aeromonas hydrophila bacteria (Djauhariyah, E. 2003). This article aims to examine the application of probiotics and noni extract in an effort to increase the growth of vannamei shrimp (Litopenaes Vannamei) in intensive cultivation systems.

Vannamei (Litopenaeus Vannamei)

Vannamei shrimp (Litopenaeus vannamei) comes from subtropical areas of the west coast of America, from the Gulf of California in northern Mexico to the west coast of Guatemala, El Salvador, Nicaragua, Costa Rica in Central America to Peru in South America. Vannamei shrimp are officially allowed to enter Indonesia through the Decree of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia. No.41/2001, where tiger shrimp production has decreased since 1996 due to disease attacks and environmental degradation. The government then conducted a study on other types of marine shrimp commodities that could increase shrimp production besides tiger prawns in Indonesia. Vannamei shrimp is one of the main commodities in the aquaculture industry because it has high

economic value and high market demand (high demand product). The Ministry of Maritime Affairs and Fisheries (KKP) is that domestic shrimp production in 2013 can reach up to more than 600,000 tons, so synergy from various related parties is needed to realize this target. In 2013, the achievement of national shrimp production is projected at 608,000 tons (KKP, 2013).

Vannamei shrimp body is transparent white so it is more commonly known as "white shrimp". However, there is also a bluish color due to the dominance of blue chromatophores. Body length can reach 23 cm. Vannamei shrimp body is divided into two parts, namely the head (thorax) and abdomen (abdomen). Vannamei shrimp head consists of antennae, antennae, mandible, and two pairs of maxillae. The vannamei shrimp head is also equipped with three pairs of maxillipeds and five pairs of walking legs (periopods) or ten legs (decapoda). While in the abdomen (abdomen) vannamei shrimp consists of six segments and on the abdomen there are five pairs of swimming legs and a pair of uropuds (like tails) that form a fan together with telson (Yuliati, 2009). Haliman and Adijaya (2005) suggested that the important characteristics of vannamei shrimp are active in the dark (nocturnal), can live in a wide salinity range (euryhaline), generally grow optimally at 15-30 ppt salinity, like to prey on same-sex (cannibals).), the type of slow but continuous feeder (continuous feeder), likes to live at the bottom (benthic) and forage through sensory organs (chemoreceptors).

Vannamei shrimp are omnivores and scavengers (scavengers). The diet is usually small crustaceans and plychaetes (sea worms). Shrimp have limited movement in search of food and have the ability to adapt to the food available in their environment (Wyban & Sweeney, 1991). Vannamei shrimp belongs to the Penaeid shrimp group. So it is nocturnal in nature, meaning that it is actively looking for food at night or when the light intensity is reduced. Meanwhile, during sunny days they are more passive, staying silent on FADs in pond water or immersing themselves in mud (Effendie, 2000). Feed containing organic compounds, such as protein, amino acids, and fatty acids, the shrimp will respond by approaching the feed source. When approaching the food source, the shrimp will swim using walking legs that have claws. The feed is immediately clamped using tongs, then put into the mouth. Furthermore, the feed consumed is larger, it will be chemically digested first by the maxilliped in the mouth (Ghufron, 2007).

Probiotics

Probiotics are food supplements in the form of live bacteria that are non-pathogenic, non-toxic, resistant to gastric acid and can colonize the large intestine. The most well-known types of probiotic bacteria are lactic acid bacteria and bifidobacteria. Commercially produced probiotics are usually a mixture of lactobacilli and bifidobacteria, although yeasts such as Saccharomiyces are sometimes used. However, bifidobacteria are more in demand. These bacteria can break down undigested carbohydrates in the digestive tract (Feliatra, 2018). Kusriningrum (2008), assumes that the provision of probiotics in

aquaculture can be given through commercial feed, water or through live feed intermediaries such as rotifers or artemia. Provision of probiotics in feed affects the digestive tract, so it will greatly assist the process of absorption of food in the digestion of fish is a food supplement in the form of live bacteria that are non-pathogenic, non-toxic, resistant to stomach acid and can colonize the large intestine. The most well-known types of probiotic bacteria are lactic acid bacteria and bifidobacteria. Kusriningrum (2008), assumes that the provision of probiotics in aquaculture can be given through commercial feed, water or through live feed intermediaries such as rotifers or artemia. Provision of probiotics in feed affects the digestive tract, so it will greatly assist the process of absorption of food in the digestion of fish. Giving probiotics to fish aims to improve fish health, accelerate growth and improve water quality. Here are three working mechanisms of probiotics According to Irianto (2003).

1. Suppress microbial populations through competition by producing antimicrobial compounds or through competition for nutrients and attachment sites in the intestinal wall

2. Changing microbial metabolism by increasing or decreasing the activity of decomposing enzymes (cellulase, protease, and amylase)

3. Stimulate immunity by increasing the antibody levels of aquatic organisms or the activity of microphages.

Based on the definition of WHO (2001) in Feliatra (2018), probiotics are live microorganisms which if given in certain amounts can have a healthy impact on the host. In digestion, probiotics are intended to increase resistance to exogenous intestinal pathogens, control diseases caused by intestinal pathogenic microbiota, reduce toxigenic metabolism of microbes in the intestine and modulate the host immune system.

Noni

Noni plants include perennial plants (parenials), small trunks, and broad leaves. Noni plant parts consist of roots, stems, leaves, fruit, and seeds. The root (radix) of the noni plant has a taproot structure that penetrates deep into the soil. Branch roots and root hairs grow in all directions. The trunk (caulis) and branches (ramus) are elliptical, generally bent, rough-skinned, and dark brown in color. Naturally the height of the plant can reach approximately 6 meters. The branch of the plant is 0.5 cm in diameter, with nodes, and from each book comes a pair of leaves measuring 12 cm x 28 cm. Noni leaves (folium) grow in pairs on each book or branch. The leaves are dark green, hairless, and oval in shape with pinnate veins. Some noni fruit produces seeds and some do not. Noni which has medicinal properties is noni which has seeds. There are two types of noni, the first type is Morinda citrifolia, this noni has oval leaves and is shiny green. The second type is Morinda elliptica, which has oblong or elliptical leaves. Leaf length is generally 1.5-2 times the width of the first type of leaf. Both types of noni are included in the family Rubiaceae or Kopi-kopian, the genus Morinda consists of 80 species.

Spread from India to small islands in the Pacific Ocean. Morinda citrifolia has another name for Morinda braceata. This species is the most popular noni in the wider community, including the people of Indonesia (Tadjoedin and Iswanto, 2002). Noni fruit contains various compounds that are important for health. The results showed that noni fruit contains secondary metabolites that are very beneficial for health, in addition to its diverse nutritional content such as vitamins A, C, niacin, thiamine and riboflavin, as well as minerals such as iron, calcium, sodium, and potassium. Several types of phytochemical compounds in noni fruit are terpenes, acubin, lasperuloside, alizarin, anthraquinone substances, ascorbic acid, caproic acid, caprylic acid, scopoletin substances, damnakantal, and alkaloids. (Anon 1997 in Antara and Pohan, 2001).

A. Nutritional Value of Noni Fruit

The content of nutritional value in noni fruit as follows:

Table 1. Chemical composition of noni fruit in 100 grams of edible parts.

Component	Rate %
Water	89,10
Protein	2,90
Fat	0,60
Carbohydrate	2,20
Fiber	3
Ash	1,20
Etc	1

Sumber: Jones (2000).

B. Nutrient content of noni fruit

Nutrition Type	Amount %
Calories	167 Kalori
Vitamin A	295,83 IU
Vitamin C	175 mg
Niacin	2,50 mg
Tamin	0,70 mg
Riboflafin	0,33 mg
Iron	9,17 mg
Calcium	325 mg
Sodium	335 mg
Potassium	1,12 mg
Protein	0,75 mg

Fat	1,50 mg
Carbohydrate	51,67 mg

Sumber: Jones (2000).

Table 3. Types of Phytochemical Compounds in Noni

Plant parts	Compound Type	Benefit
Fruit	Alkaloids (xeronin)	Increase enzyme activity and protein structure, activate immune function
	Polisakarida (asam glukoronat, glikksida), Skopoletin.	Immunostimulant, anticancer, antibacterial, dilate blood vessels, analgesic, antibacterial, antifungal, anti-inflammatory, antihistamine.
	Vitamin C	Antioxidant
	Food fiber	Lowers cholesterol, binds fat, regulates blood sugar levels
Leaf	Glycosides (flavonolv glycosides)	Worm medicine, tuberculosis
Root	Anthraquinone (damnacantal)	Anticancer, antibacterial, antiseptic.

Noni contains an important alkaloid, namely Proxeronin (a type of colloid acid that does not contain sugar, amino acids or nucleic acids with a molecular weight of more than 16,000), in large quantities. This xeronine helps expand the small intestinal opening so that it facilitates the absorption of food, improves the work of the thyroid and thymus glands which are important for immunity and resistance to external infections, activates enzymes and regulates the function of proteins in cells (Se, Fe) Noni contains alkaloids important, namely Proxeronin (a type of colloid acid that does not contain sugar, amino acids or nucleic acids with a molecular weight of more than 16,000), in large quantities. This xeronine helps expand the small intestinal opening so as to facilitate the process of absorption of food, improve the work of the thyroid and thymus glands which are important for immunity and resistance to infection from outside, activate enzymes and regulate protein function in cells (Djauhariya, et., al. 2006) Noni leaves contain anthraquinones, glycosides as anti-cancer (Djauhariya, et., al. 2006).

Application of probiotics and noni extract in various research on vannamei shrimp culture

According to Muhaimin (2019), research conducted for 40 days showed that white vaname shrimp cultured with a biofloc system with the addition of probiotics affected survival, average absolute growth, specific growth rate, feed efficiency, feed conversion ratio, protein retention and flock volume . vannamei shrimp. Survival in treatment D (biofloc + Probiotic 1010CFU/mL), had the highest survival value compared to other treatments. This is presumably because in the biofloc media there are microorganisms such as protozoa, rotifers and probiotic bacteria that can be a source of feed for shrimp, so as to suppress cannibalism, besides that the addition of probiotics can also improve water quality and increase growth. Apriyanti and Widanarni (2016) stated that the addition of probiotic bacteria to biofloc media could increase the viability of tiger shrimp by 86.67 - 89.33%. Meanwhile, Suryanto and Mangampa (2010) who conducted research on the application of probiotics with different concentrations in the maintenance of vaname shrimp, found that the survival rate of vaname shrimp ranged from 71.55 - 99.78%.

In treatment D (biofloc + Probiotic 1010 CFU/mL), the highest absolute growth value was 2.7 g. This is presumably because biofloc contains protein (amino acids), unsaturated fatty acids, vitamins, and minerals which are good for the growth of vaname shrimp. Napitupulu (2012) stated that feeding vaname shrimp juveniles gave the highest average absolute growth of 2.64 g.

According to Adi (2019), the highest absolute weight growth in vanamei shrimp was obtained at a dose of 2 ml/l, this is thought to be caused by more optimal probiotics entering the shrimp's digestion and also a lot of natural feed available due to low levels of ammonia which causes natural feed to grow. properly caused by ammonia that has been nitrified by nitrobacter bacteria, and natural feed can optimize the digestive performance of vanamei shrimp and facilitate the absorption of feed. According to Irianto (2007) bacteria in probiotics are able to secrete digestive enzymes such as proteases and amylase so as to optimize feed digestibility. Supported by the opinion of Macey and Coyne (2005) which states that supplementation with probiotic bacteria increases the digestibility and absorption of probiotics in the digestive tract due to increased activity of protease enzymes in the intestine. Bacteria that have the ability to secrete protease, amylase and cellulase enzymes are bacteria from the genus Bacillus sp. The presence of pretease and amylase enzymes produced by Bacillus sp bacteria will increase the digestibility of shrimp so that the food essence can be digested optimally by the body.

According to Wijayanto (2020) The addition of fermented probiotics to feed has been shown to increase the number of the highest specific length growth of 3.17 and weight growth of 0.26% and provide a 93% vaname shrimp survival rate. Furthermore, the best dose of fermented probiotics applied to rearing juvenile vaname shrimp with a stocking density of 100 fish/m2 is 1.5 liters/kg of feed.

From the results of research by Sarida (2012), it can be concluded that noni fruit extract (Morinda cirtifolia L.) has a significant effect in inhibiting the growth of V. harveyi bacteria in vitro. Treatment with 0.50 ml of noni fruit extract (Morinda citrifolia L.) was the optimum dose in inhibiting

the growth of V. harveyi bacteria in vitro because it formed a maximum inhibition zone of 5.25 ± 0.85 mm and inhibition for 48 hours of incubation time.

Conclusion.

Based on a literature study, information was obtained that the application of probiotics at a dose of 2-5 ml/L significantly increased the growth of vannamei shrimp at a dose of 2-5 ml/L very significantly increased the growth of vannamei shrimp in an intensive aquaculture system. The use of noni fruit extract at a dose of 0.5 m/L was effective in preventing disease in vannamei shrimp, especially those caused by the bacterium V. harveyi. The application of a combination of probiotics with noni fruit extract is highly recommended for the growth and endurance of vannamei shrimp.

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