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Utilization of herbal ingredients on Vannamei (*Litopenaeus vannamei*) in Instalasi Budidaya Laut, Tasikmadu Village, Sub-District Watulimo, Trenggalek Regency, East Java, Indonesia

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ABSTRACT

The purpose of this study was to conduct a technical analysis on vannamei (*L. vannamei*) rearing activities that utilize herbal ingredients including cultivation systems, preparation, fry stocking, feed management, water quality management, harvesting and post-harvesting in Instalasi Budidaya Laut (IBL), Trenggalek, East Java, Indonesia. Data analysis using descriptive analysis. In this study, the pond preparation process included washing tubs, drying for 3 days, liming at a dose of 30 ppm on the walls and bottom of the pond, filling water with a height of 80 cm and stocking with 300 ppm of Organic Fertilizer (POT). Shrimps acclimatized by adding 1 ml of Bionutren. The stocking density is 800 post larvae/m^2 with a total stocking of 5,500 individuals. The feed was fermented for 3 days with the addition of Liquid Organic Fertilizer (POC). Feed management uses an acceleration system, which is feeding 24 hours non-stop according to anco control. The results of water quality monitoring obtained are temperature 28◦C – 32◦C, salinity 12 – 28 ppt, DO 3 – 5 mg/l, pH 6.2 – 7.1. Water quality control is carried out by spreading water POC at a dose of 60 ppm and siphoning is carried out every day starting from DOC 17. Herbal ingredients from temulawak and ginger in bionutren products produced FCR 1.3, SGR 10.42%, shrimp tonnage 60 kg/pond, and the survival rate 53.57%.

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1. Introduction

White shrimp *Penaeus vannamei* farming has been practiced in Indonesia for decades due to high growth performance, high intensification, and have promising prospects and profits (Supono et al. 2019). Increasing of intensive management system of shrimp farming such as application of high stocking density, high aeration, and extra commercial feed has increased the disease outbreak (Juanda, 2018). When it comes to food safety, antibiotic that used to treat the infectious disease of shrimp farm has spread on antibiotics resistance which is caused the failures of treatment and consequently more severe and longer lasting diseases. Moreover, the use of antibiotics in the shrimp culture has resulted residual in shrimp products and led to biomagnifications that in turn leads to rejection of the total consignment during export (Citarasu, 2010).

Feed is one of the biggest factors (80%) that consumes the highest cost in shrimp farming production and as the key component in the success or failure of shrimp farming (Ihsanario and Ridwan, 2021). Application of high quality and quantity of commercial feed had effect on water quality and increasing the production cost of the farmer. Shrimp need a high protein (30 – 55%) in their feed as energy sources and increasing the immune system (Craig et al. 2002). Herbal ingredients are all types of plants (roots, stem, leaves, fruit, seeds, flower) that can be used as medicinal herbs, both singly or in combination, or even in a mixture with other immunostimulants (Tanand & Vanitha, 2004). Herbal ingredients can be administered by injection (intramuscular and intraperitoneal), through water routine or oral administration as feed additives and enrichment that is considered and believed to cure a disease or improve the fish health and disease management in aquaculture (Ji et al. 2012; Putra et al. 2013).

Herbal ingredients as aquatic feed additives and immunostimulants on fish aquaculture have become a focus of research and development (Apines and Amar, 2015; Citarasu, 2010; Zhu, 2020) due to easy to prepare, cheap, and have few side effects on animals and the environment (Van, 2015). The high content of alkaloids, terpenoids, tannins, saponins, and flavonoids on plants have been reported to produce various effects such as antistress, growth promotion, appetite stimulation, and antipathogen properties in fish and shrimp (Citarasu, 2010). The application of herbal ingredients has been reported increase the growth performance, feed utilization, survival rate, and immune system of greasy groupers (Sivaram et al. 2004), Nile tilapia (Abdel-Tawwab, 2015), Whiteleg prawns (Lin et al. 2006), and Penaeus monodon (Islam et al. 2008).

The purpose of this study was to conduct a technical analysis on vannamei (L. vannamei) rearing activities that utilize herbal ingredients including cultivation systems, preparation, fry stocking, feed management, water quality management, harvesting and post-harvesting in Instalasi Budidaya Laut (IBL), Trenggalek, East Java, Indonesia.

2. Material and methods

This study was carried out in March 2020 in Instalasi Budidaya Laut (IBL), Trenggalek, East Java, Indonesia. Medicinal plants in this study are used as ingredients in fermented organic fertilizer that apply in shrimp culture as water treatment, producing natural food (phytoplankton), and feed additives. The compounds that used to make liquid organic fertilization as water treatment including Molase 1L, skimmed milk 200gr, ZA 1kg, SP36 250gr, yakult 1btl, yeast 2tb, herbal ingredients 3tsp, bionutrient 65mL, biolizer 65mL, hormonic 65mL, and water. The compounds then fermented 10 days in 30 L of clonical tank. The liquid organic fertilizer (POC) was applied since D-2 to D-14 and applied for 13 days in a row before shrimp seed stocking in 60ppm of doses. The application of liquid organic fertilizer was applied in twice a week.

To growth the natural feed such as phytoplankton, 90L of liquid organic fertlizer (POC), 25kg of commercial feed, 4Kg of ZA, 1Kg of SP36, 10L of Molase, and water was fermented in 150L of conical tank for 10 days.

The herbal ingredients also used as feed additives to increasing the amino acid content and enhanced the immune system of shrimp. About 30L of Molase, 15Kg of skimmed milk, 1 Kg of ZA,

0.3Kg of Sp36, 1btl of yakult, 2tbl of yeast, 0.2Kg of herbal ingredients, 70mL of bionutrient, 70mL of biolizer, 70mL of hormonic, and water was fermented in 10 days in 30L of conical tank. One liter of fermented liquid organic fertilizer (feed POC) used as feed additives and mixed with 25Kg of commercial feeds, 35mL of Bionutrient, 35 mL of Biolizer, 35mL of Hormonic, 35mL of amino+, 5gr of vitamin C, 3 tbsp of Herbal ingredients, 250mL of Molase, and 3L of water. This feed are applied on days 3 after 2 – 7 days of fermentation.

2.1 Analysis Data

This study used a case study method with a descriptive approach by observing and collecting data including yields, survival rate (SR), specific growth rate (SGR), and water quality (Temperature, salinity, DO, and pH). The data was carried out from 3,4m × 2m × 1.5 m of concrete tank which obtained an average stocking density of 800 individuals/m^2 or 5.500 individuals per pond area.

3. Results and Discussion

3.1. *Constructioin*

The system of *L. vannamei* farming in IBL Prigi, consist of 40 rectangular concrete ponds in 3.2 × 2 × 1.5 m and 10ton capacity are used for *L. vannamei* culture. Stocking density of each concrete tanks is 800 individuals per m^2. There are 3-phase electrical systems and standby generator, Hi-blow, and syphon systems. The water system in IBL Prigi are used IPAL systems.

3.2. *Concrete tanks preparation*

The concrete tanks is cleaned by brushing the walls and the bottom of the tanks, the aeration, and anco using scouring pad followed by rinsed with water to the central drain. The concrete tanks is dried for 1 – 2 days. When the tank bottom is fully dried, 30ppm of CaO were applied in all of the surface of concrete tanks for 1 days to prevent entry of unwanted organisms. A water depth of 1m is maintained. Dikes and gates are checked for leaks and these are immediately repaired. Salinity of water in tanks are 20 – 25 ppt.

3.3. *Bloom development of Natural feed*

After filled with brackish water 20 – 25 ppt of salinity, the tanks were enriched with organic fertilizer in liquid (POC) and spread (POT). The application of POC and POT is divided in two phases. The first phase, about 60ppm of POC were applied in the concrete tanks since D-2 to D-14 before stocking to growth the natural food. The second phase, once the bloom get stabilized, POC and POT are applied two or three times per week in 60ppm of doses to help for better water quality. This organic fertilizer (POT) contained C organic, N, K_2O, and P_2O_5 that increasing the water fertility.

3.4. *Shrimp Seed Stocking*

Postlarvae of shrimp supplied by PT. Summa Benur Situbondo which is F1 postlarvae and has been tested by PCR and fry health with SPF certified. The suitable stocking density for concrete tanks is 800 ind/m^2. Good quality of shrimp larvae can be noticed as follows SNI (2006) which is no crinkled on the rostrum or head, free from transparent color larvae, active swimming against current and towards light, the uropod or tail is well spread while swimming, and the larva size is particle even. The larvae should be strong enough and acclimatized before stocking which should be done in the early morning so that the water temperature fluctuation is minimal (Gunalan, 2015).

Acclimation is a challenging process due to the survival rate of the postlarvae (Sukumaran et al. 2018). There are several variations methods has been adopted by farmers to minimize the stress of transported larvae. The acclimatization process in IBL Prigi including open the bag into the

styrofoam and add 0.5mL of SGB Bionutrien and slowly adding water from the concrete tanks for 15 – 20 min to be stocked in order to equalize various parameters. SGB Bionutrient as organic disinfectant contains red ginger and curcuma. Curcuma contains atsiri essential oils which is have been reported to favor various activities like anti-inflamation, anti-microba, and appetite stimulation (Farida et al. 2018). Red ginger contains oleoresin as anti-emetik, and diuretic (Rahmadani et al. 2018).

3.5. Feed Management

IBL Prigi add some supplementary herbal ingredients of pellet feed to ensure a higher survival rate, nutrient absorption, increasing amino acids contains, and immunostimulant of shrimp. The POC feed that used as feed additive in IBL Prigi, contains herbal ingredients such as curcuma for appetite stimulation Farida et al. (2a018), white turmeric, and bratawali. White turmeric and curcuma contain flavonoid to increase the activity of edikson hormone to prevent molting (Wirato et al. 2019). The POC feed also contain bionutrient dan biolizer to increasing the metabolism process as shrimp growth rate promotor, reduce the accumulation of metal contamination and feed efficiency.

Feeding program in IBL Prigi using acceleration system based on stocking density per 100.000 individuals of shrimp. Feeding program in IBL Prigi followed by:

1. 1 time of ½ Kg feed for the first 4 days
2. 2 times of 1 Kg feed for the second 4 days
3. 3 times of 0,5 Kg feed for the third 4 days
4. 4 times of 2 Kg feed for the fourth 4 days and followed by anco monitoring in 1%
5. Control with anco based on the remaining feed still 2 Kg of feed
6. 24/7 hours by acceleration system based on the anco control.

The process of feeding in the concrete tanks is carried out by spread the feed evenly on the edge of the tanks. 6.8 m^2 of tanks so the shrimp could get the feed equally.

3.6. Water quality management

After stocking, periodical observation on the water quality of shrimp was measured. 60 ppm doses of liquid POC were applied in culture tanks two or three times per week to established the water quality in IBL Prigi. Herbal Ingredients contained in liquid POC have favor various activity as anti-inflammation, anti-microbe, appetite stimulation, boosted metabolisme and urine production (Rahmadani et al. 2019; Farida et al.2018).

The result of water quality parameter is showed in Table 1.

Table 1. Water quality parameters

Parameters	Range
Temperature (°C)	28 – 32
Salinity (ppt)	22 – 28
Dissolved oxygen (ppm)	3 – 5
pH	6.2 – 7

Water exchange is essential for the removal of the biological wastes and maintenance of adequate dissolved oxygen level. The oxygen content and water transparency are also factors to help farmers decide to change the tanks water. IBL Prigi also have Hi-blow pipe to distributing the oxygen into the concrete tanks so the dissolved oxygen of tanks was established. If the oxygen content is lower than 3 ppm, more water volume is added.

The use of artificial feed ingredients risk of accumulation of organic material derived from shrimp feed residue or other material organic that sink into the bottom of tanks. This residue can

be harmful to animals farmed. To clean the waste in the bottom of tanks, IBL prigi use conventional methods which is siphon. Siphon is a technique used for desludging the aquaculture basic wastes and carried out by using a hose as a media to dispose fisheries wastes to the disposal center (Seto et al. 2020). Syphoning process starts in DOC 17 every morning use 2in of pipe.

3.7. Specific Growth Rate

The specific growth rate of the vannamei shrimp after 95 Days of culture is 10.42% per day which is higher than have been reported by Martini (2017), the specific growth rate of *L.vannamei* culture is 0.11 – 3.28% per day and Hadi et al. (2018) reported that specific growth rate of *L.vannamei* cultured in low salinity was 1.99 – 2.45% per day. Herbal ingredients such as coconut contain active compounds such as zeatin to increase the growth rate for animals (Setiana et al. 2018). *Rhizobium leguminosarum* bacteria in SGB Bionutrien plays a role in binding free nitrogen in water tanks and arranged into amino acid and polipeptide as anti-bacteria and increasing shrimp metabolisme (Sari and Prayudyaningsih, 2015).

3.8. Survival rate (SR)

The survival rate of the Vannamei shrimp after 95 Days of culture is 53.57%. This number is higher that have been reported in other vannamei culture. Lailiyah et al (2018) reported the survival rate of *L.vannamei* in superintensif pond is 40%, while the survival rate of *L.vannamei* that reported by Hidayat et al (2019) is 85.05%. The difference SR values was due to the fact that total shrimp at the end of rearing was less than the total shrimp at the beginning of rearing. During the cultivation process in DOC 32, the pipe used to distribute oxygen from the aerator tanks is loose and cause almost 50% of death shrimp.

3.9. Harvest

Harvesting was be done after 5 – 6 days of changing water to ensure that the majority of shrimps have molted and the shells hardened. The shrimp was partially harvest in DOC 101 – 104 to thin the biomass, supply small quantities of shrimp to local markets, and to enhance the total yield by improving individual growth and survival via reducing the competitive pressure. Total harvesting was done in 125 – 126 days of culture. After harvest, the shrimp are loaded into bins with ice at pond side. There are 3000 individuals of total shrimp from 5600 individuals of initial stocking with 53.57% of survival rate. The total weight is 60Kg and the amount of feed consumption is 80.8Kg and FCR is 1.3.

4. Conclusion

Herbal ingredients in the form of Liquid Organic Fertilizer (POC) in the media, Liquid Organic Fertilizer (POC) in feed and Spreader Organic Fertilizer (POT) in the cultivation process can increase the productivity of vannamei in IBL, Prigi, with FCR 1.3, tonnage of productivity is 60 kg/pond. Usage of these natural materials does not produce residue and does not pollute the surrounding environment.

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