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# Use of hydrogen peroxide to improve potential redox land preparation of land towards increasing production of traditional shrimp vanname (*Litopenaeus vanname*) in Wringin Putih, Muncar, Banyuwangi

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**Abstract.** Land preparation in a traditional shrimp pond is one of the most important parts to do. Soil Redox Potential is an indispensable parameter to see the readiness of soil land or the level of fertility of cultivated land in carrying out activities. It is toxic to shrimp such as sulfide compounds (H<sub>2</sub>S), nitrites and ammonia. This research is descriptive in nature, by observing 5 traditional aquaculture ponds measuring 3500 m<sup>2</sup>, with shrimp densities of 100 individuals/m<sup>2</sup>. The use of Hydrogen Peroxide is pool 1 (0.5 ppm/m<sup>2</sup>), pool 2 (1 ppm/m<sup>2</sup>), pool 3 (1.5 ppm/m<sup>2</sup>), pool 4 (2 ppm/m<sup>2</sup>) and pool 5 as a control (0 ppm/m<sup>2</sup>). The basis for determining the use of Hydrogen Peroxide doses is from a minimum reference dose. The best results in pool 3 with a potential reduction value of 331 m/v, wherein one period the value of NH<sub>4</sub> ranged from 0-2 ppm with ADG (Average Daily Growth) every week an average of 0.3 grams.

## 1. Introduction

Hydrogen peroxide is a colorless, soluble solution in water and has a molecular weight of 34.01. It is antimicrobial because it has a broad spectrum of microorganisms including bacteria, yeast, mold, viruses and spore-forming microbes. Hydrogen peroxide is more effective against anaerobic bacteria because they do not produce catalase enzymes that can destroy peroxide. Hydrogen peroxide also has the advantage of being environmentally friendly because its decomposition produces only water and oxygen, so often hydrogen peroxide is often used as a strong oxidizing chemical in degrading anaerobic organic matter and reducing the pathogenicity of microorganisms.

The ratio of elements N and P is one of the chemical factors that influence water. Some microbes and phytoplankton in the waters are very dependent on the nutrient content in the environment [1]. The content of each element greatly influences the microorganisms that will anonymize water. The importance of monitoring nitrogen and phosphorus content for smooth cultivation [2]. Environmental conditions that always fluctuate will affect the organisms and biota in the waters. This can be understood because water quality is a critical success factor in aquaculture in ponds needed to support the life of aquatic organisms and microorganisms as food at each stage of maintenance [3]. Thus, aquaculture productivity in ponds can be maximized.

Based on research will be conducted to determine the relationship between the dynamics of the N: P ratio to the productivity of intensive shrimp farming. The relationship is the dynamics of the N: P



ratio that can affect environmental factors which also affect water quality. Good water quality is achieved to meet the carrying capacity of the environment for optimum productivity.

## 2. Material and methods

This research has been carried out in a traditional shrimp pond in Wringin Putih village, Muncar, Banyuwangi on 13 Oct 2018-4 December 2018. Land preparation is carried out as in general preparation, which includes land reversal, liming, and application of hydrogen peroxide to the soil. Phytoplankton observations were carried out in 3 ponds, each plot was taken 4 points at the corners of the pond as data clarification. The method used in the identification and observation of phytoplankton is a direct calculation method using a hemocytometer by taking 1 ml of sample water from a sample bottle, then covered with a glass cover. Observations were made by identifying phytoplankton and calculating phytoplankton density contained in the hemocytometer.

## 3. Result and discussion

Table 2. below in pond 1 shows that every time an N: P ratio increases, then a few days later, there is a decrease in growth. The increase in the N: P ratio on the 25th day to the 30th day and decreased on the 35th day causes the ADG range to also decrease from 0.3 gr/day to 0.1 gr/day. Besides ADG, there was also a drastic reduction in feed consumption from 100 kg to 30 kg. Until the FCR 60th cultivation age, it reaches 1.12.

**Table 1. Redox Potensial of Preparation**

Tanggal	Redoks Potensial					
	Pond 1		Pond 3		Pond 7	
	06.00	14.00	06.00	14.00	06.00	14.00
15-10-18	-35	-28	-41	-38	-35	-25
16-10-18	-36	-10	-35	-12	-35	-15
17-10-18	28	64	10	59	-10	0
19-10-18	115	138	90	125	-10	18
20-10-18	129	197	101	149	0	40
21-10-18	189	215	158	201	35	89
22-10-18	201	224	160	211	78	90

The productivity data pond 4 presented in Table 3 below shows the relationship between the two factors. On the 25th day until the 50th day, there was an increase and a decrease in the value of the N: P ratio, so that it could result in disruption of feed consumption. This can be seen by the reduction in feed consumption on the 35th day from 100 kg to 60 kg. The reduction in feed consumption has an impact on ADG and MBW, while the FCR obtained reaches 1.1. However, when compared to plot 7 it can be seen that the increase in the N: P ratio which results in a decrease in feed consumption only occurs once on the 30th day. After that day the N: P ratio tends not to increase or decrease too much so that the FCR in plot 7 is the highest among other plots, which is 0.99. Data on productivity and ratio of N: P plot 7 can be seen in Table 4.

**Table 2. Productivity and N: P ratio in pond 1 (562,770 shrimp; 148 shrimp / m<sup>2</sup>)**

DOC	Ammonium	Nitrite	Nitrate	Fosfat	N:P	MBW	ADG	Konsumsi Pakan	FCR
1	0	0.05	1	0.2	3.7			1	
5	0.4	0.1	0	0.25	4.2			6	
10	0.2	0.05	1	0.25	4.9			19	
15								31	
20	0.4	0.05	1	0.3	5.6			45	
25	0.2	0.05	1	0.3	4.1	2.27		85	
30	2.3	0.05	1	0.6	10.4	3.8	0.3	106	
35	1.6	0.1	3	0.75	8.0	4.28	0.1	30	
40	0.8	0.15	3	0.6	6.9	6.07	0.36	50	
45	2.5	0.4	3	1.5	5.6	6.8	0.15	140	
50	3.2	1.5	5	1.75	7.1	7.5	0.15	200	
55	6.4	2.5	5	1.75	12.0	8.6	0.22	225	
60	4.6	5	15	2.5	10.4	9.7	0.22	225	
Total pakan								5504.5	1.12
Biomass								4912.98	
SR								89.9 %	

Fluctuation in each plot has a significant difference. The dominance of several types of plankton is also different in each plot. Phytoplankton observations began on the 24th day. In plot 1 in the first week shows that almost all types of plankton have the same percentage. On the other hand, plot 4 and plot 7 have shown dominance in one type, namely green algae in plot 4 and plot 7, Bluegreen algae. On the 31st day to the 40th day, there was a very large spike in plot 1 and plot 7 with the dominance of golden-brown algae. Whereas in plot 4, there began to be dominance by dinoflagellates even though other types of plankton were the same. On day 40 to day 52, there was a sharp decline in brown algae in plot 1, while in plot 4 it was dominated by Bluegreen algae. In plot 7, the dominance of green algae has sharp fluctuations but still dominates and is followed by Bluegreen algae. After day 52 to day 61 the dominance of plot 1 was replaced by Bluegreen algae because the amount of green algae decreased dramatically compared to the previous day, whereas in plot 4 it was dominated by blue-green algae followed by brown algae and plot 7 remained dominated by brown algae followed by bluegreen algae.

**Tabel 3. Productivity and N: P ratio in pond 4 (562.770 shrimp; 148 shrimp / m<sup>2</sup>)**

DOC	Ammonium	Nitrite	Nitrate	Phosphate	N:P	MBW	ADG	Feed Consumption	FCR
1	0	0.05	1	0.3	2.5			1	
5	0.4	0	2	0.25	9.4			6	
10	0	0.05	1	0				19	
15	0.2	0.05	0	0.2	2.3			31	
20	0	0	1	0.25	2.8			45	
25	0	0.05	2	0.25	5.7	2.05		85	
30	1	0	3	0.3	14.9	3.43	0.28	100	
35	1.6	0	3	0.75	7.9	4.4	0.2	60	
40	1.6	0.05	5	0.4	18.3	5.6	0.24	100	
45	3.9	0.3	3	2.5	4.7	6.2	0.12	120	
50	4.6	3	5	1.75	9.8	6.75	0.12	160	
55	4.6	5	5	1.75	10.9	7.9	0.23	170	
60	3.2	15	30	1.75	24.2	8.86	0.23	185	
Total feed								4948.5	1.1
Biomass								4487.5	
SR								84,5%	

There are several factors that are related to the dynamics of the N: P ratio to shrimp growth. One of them is the high fluctuation of the N: P ratio which can disturb the chemical balance of the waters which is one of the important parameters of water quality, thus causing an adaptation process that can reduce water productivity [4]. In addition, the decrease in feeding also had an impact on decreasing growth per day. This is in accordance with [5], which states that lack of nutrition will affect growth. When looked more specifically at the value of the N: P ratio, at the time of a significant increase in the average element N which was originally replaced by nitrous ammonium. Several studies have shown that shrimp that live in waters with ammonium and nitrite accumulations that change significantly will inhibit the physiological processes associated with weight gain. That is because high exposure to ammonium will result in more energy requirements for osmotic regulation and ionic stress [6]. High ammonium comes from the rest of the feed, feces or other waste that is not degraded by bacteria [7].

**Tabel 4. Productivity and N: P ratio in 7 (441.558 shrimp; 147 shrimp /m<sup>2</sup>)**

DOC	Ammonium	Nitrite	Nitrate	Fosfat	N:P	MBW	ADG	Konsumsi Pakan	FCR
1	0	0.05	1	0.2	3.7			1	
5	0.5	0.05	1	0.4	4.8			5	
10	0	0.05	0	0.2	0.2			17	
15	0.4	0.05	0	0.25	2.3			28	
20	0	0.05	1	0.25	3.0			40	
25	0	0	1	0.25	2.8	1.88		70	
30	0.4	0	5	0.2	22.1	3.05	0.24	70	
35	2.3	0	2	1.25	5.5	4.7	0.33	110	
40	2.3	0.05	2	1.75	4.0	5.6	0.18	75	
45	3.5	0.25	3	1.75	6.1	6.8	0.24	85	
50	5.4	2	5	2.5	7.3	8	0.24	140	
55	7.8	4	5	1.75	14.7	9.1	0.22	150	
60	7	13.5	45	3	20.1	9.94	0.22	150	
Total pakan								3949	
Biomass								3950.17	0.99
SR								89,9%	

Ammonium value obtained has exceeded the eligibility limit that is equal to 0.93-1.54 mg/L. Ammonium concentration that is safe for the life of the organism is less than 0.1 mg/L [8]. Ammonium concentrations that cannot be tolerated can also disrupt the performance of shrimp hemolymph and enzyme synthesis until oxygen respiration is mixed with ammonia [9]. While the ammonium concentration in each plot can reach more than 5 mg / l. Ammonium is a compound which at certain concentrations of its presence in water will be toxic to shrimp. Ammonium contained in pond water is as a result of an overhaul of organic nitrogen compounds by bacteria. Ammonium compounds present in the maintenance media are derived from the remainder of the feed, shrimp droppings and an overhaul of organic material through the nitrification process. Ammonium up to 0.2 ppm can inhibit shrimp growth and ammonium up to 1.29 ppm can be deadly [10].

Ponds have a different plankton dominance. Phytoplankton can be a biological parameter of water quality. Phytoplankton dynamics occur when the supporting factors of the environment can no longer support the growth of phytoplankton. Plots 1 and plot 7 with dominance by brown algae had the highest growth, while in plot 4 the lowest growth. This is in accordance with [11] who explained that generally phytoplankton species from the diatom class have high nutritional value, are easily digested and diatoms are better phytoplankton communities and respond more quickly to nutrient increases

compared to other phytoplankton communities. Whereas in grid 4, which was dominated by green and blue matches, the growth was lower. This can be possible because the blue-green algae contained in these plots are in poor condition or can cause toxins in the waters [12].

#### 4. Conclusion

The conclusion obtained from this study is the administration of hydrogen peroxide affects the quality of land preparation for cultivation. Soil fertility will have a positive impact on the quality of aquaculture. Parameters to the dynamics of the N:P ratio that change significantly can cause disturbed shrimp productivity. Changes in the N: P ratio can be seen dynamically for each constituent of N ( $\text{NH}_4$ ,  $\text{NO}_2$ , and  $\text{NO}_3$ ) as well as P ( $\text{PO}_4$ ), which are very important because each constituent element can describe the state of waters more specifically. Growth rates decline when the N constituent is dominant by ammonium, which can be toxic and require energy for higher adaptation at certain concentrations.

#### 5. References

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