The utilization of phenol in betel leaf (*piper betle*) as feed to reduce *Aeromonas hydrophyllla* infection in dumbo catfish (*Clarias gariepinus*) and gourami (*Ospronemus gouramy* Lac.) fish cultivation

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The utilization of phenol in betel leaf (*piper betle*) as feed to reduce *Aeromonas hydrophylla* infection in dumbo catfish (*Clarias gariepinus*) and gourami (*Ospronemus gouramy Lac.*) fish cultivation

H Soeprapto¹ and P Syarif²

¹Faculty of Fisheries, University of Pekalongan, Indonesia
²Faculty of Agriculture, University of Pekalongan, Indonesia

E-mail: hayatisoeprapto@gmail.com

Abstract. *Aeromonas hydrophylla* was one of pathogenic bacteria in fresh and brackish water fish that reduced fish production. Betel leaf contains phenol active substances (carvacrol, betel phenol and chavicol), which act as anti-septic, kill microorganisms and prevent bacterial infection. This research aimed to know the effect of betel leaf flour feed supplement in different concentrations namely 2, 4 and 6 % applied to catfish and gourami. The design used in this research was completely randomized design, each treatment repeated three times. Results showed that the weight of catfish was not affected by the concentration of betel leaf concentration in feed. In contrast, gourami fed with higher concentration of betel leaf, gained more weight. The survival percentage of catfish 82.2, 96, 80 % and gourami was 93.0, 88.8, and 93.3 % for treatment one, two and three respectively

1. Introduction

Feed an important factor in intensive fish cultivation. The feed cost ranged from 50 to 70% of the total production cost. The feed contained nutrients such as proteins, carbohydrates, fats, vitamins, and minerals which were needed to support fish growth and reproduction. Herbivore fishes, such as gourami, fed on plant-based feed, and carnivore fishes, such as catfish, fed on animal-based feed.

The good feed will support fish growth in reproduction (gonad maturation). Fish feed created using fish, shrimp, crab, and clam flour [1]. Vitamin E was added to prevent EPA (eicosapentae noneic acid) oxidation. EPA when converted into prostaglandin accelerates gonad maturation. Vitamin A in feed act as antioxidant. Lecithin was added as fats’ stabilizer in digestive system to make the feed easier to digest by fish [2].

The protein given to each cultivated fish will be different. In this research using catfish and gourami fish, the protein given will be 25% - 35% [3,4]. Cultivated gourami fish consumed water plant and organic materials suspended in the cultivation pond [5,6].

Fats in fishes is needed as sources of fatty acid or energy. The fish feed needs to contain 4 - 8% fats. Carbohydrate is the source of energy. Vitamins are essential for fish because it is important for growth, reproduction, and fish health. The deficiency of vitamins will cause fish prone to disease. Minerals are needed in fishes for skin, bone, teeth, and scale formation, respiration, and osmoregulation process [4].
The natural feed is microorganism living in the water body phytoplankton and zooplankton or bigger organism such as water plants and animal (grasses, leaves, worms). The natural feed is an important factor in fish cultivation especially in juvenile stage of fish. The natural feed is good because it is highly nutritional, easy to cultivate, small in size so easy to eat by fish juveniles, stimulate fish, multiply rapidly, cheap, and environmentally friendly [4].

The artificial feed is created based on characteristics of the cultivated fish. Good artificial feed is good protein source, based on fish’s characteristics cultivated, easy to digest, easy to absorb, less ash, liked by the fish, and has high effectivity level [4]. The material that usually used in fish feed namely, sambiloto leaves, fish flour, corn, bran, snail, worm, and starch [1].

Betel leaves flour was used in the feed as antiseptic. The recent research using Sambiloto (Andrographis paniculataeens) plant [7]. The sambiloto leaves contain antibacterial compound that kill bacteria and bacteriostatic (bacteria growth inhibitor) [8].

Sambiloto leaves extracted and added to fish feed. The feed can reduce bacteria such as Aeromonas sp, Pseudomonas sp, Staphylococcus sp, and Streptococcus sp. In 1980 Aeromonas hydrophila caused death to 82,288 fishes in West Java. The additional betel leaves flour is expected to give better survival rate and growth to the fish [7].

The feed made was expected to have good nutrients sources for fish, easy to digest, easy to absorb, the fish like the feed, and it has high ratio of body weight to feed. The feed must fulfil its quantity and quantity to prevent disease and support growth. Body resistance will create immunity, and will affect hormonal system [2,9].

Sachlan stated there are other factor that affect fish growth and reproduction beside feed such as environmental condition, competition, density, predation, parasite, fishing, fish age, and genetic [10]. Aminah stated that herbal medicine usage did not have side effect on water, fishes and humans. A chemical antibiotic will decrease the quality of fishes and leaving residues in fishes and environment. The alternative for this problem is using betel leaves flour as an antibiotic to prevent Aeromonas hydrophila infection that usually attack catfish and gourami. Betel leaves flour contain phenol (betel phenol and chavicol) that act as an antiseptic to inhibit and kill bacteria [11].

The aim of this study is to determine feed composition using antiseptic to give the best effect on fish’s growth and survival rate and to determine the effect of betel leaves flour as an antiseptic. The benefit of this research is to give information to fish cultivator about feed making technique based on it is antimicrobial purposes and nutrients.

2. Materials and methods

Feed was made from local bran, flour, corn starch, fish starch, vitamin C, eggs, and fish oil, supplemented with phenol from betel leaves flour (Piper betle). The fish species used for this experiment were Clarias gariepinus and and Ospronemus gouramy.

This was a non-factorial experiment. The treatments were concentration of betel leaves flour in the feed formula namely 2, 4, and 6%. Each treatment was repeated three times. The units of the experiment were arranged in completely randomized design. There were 15 fish in each unit. The selected fish for this experiment was 30 g each and the length ranged from 6 – 8 cm. The fish were maintained for two months, samples were taken every ten days to measure fish weight. The weight gain was measured by formula [12]:

\[ W = W_t - W_o.\]

Information:
W: Average weight growth of each fish (g)
Wt: Average weight at the end of treatment
Wo: Average weight at the start of treatment

The fish were cultivated in 15 litre water in tanks and were fed two times a day with 5% feed weight from fish total weight [13]. The survival percentage of fish was counted for assessing the effect of the
treatments on preventing *Aeromonas hydrophilla* infection. The data obtained was analysed using DSTAT software. ANOVA was used to determine the effect of the treatment. LSD test was used if there were differences among treatments.

3. Results and discussions

Table 1. showed the compositions of each feed formula. Based on the data, the feed could be used as feeding for herbivore, carnivore, and omnivore fish since the requirement of nutrition in feed is 25-35 % proteins, 4 – 16 % fats, 30 – 40 % maximum crude fiber needed for herbivores. This composition can fulfill needed crude fiber for omnivores 25 – 35% and carnivores 15 -25 % [1]

| Betel Leaf Flour Concentration | Water Content (%) | Dry Weight (%) | Protein (%) | Fat (%) | Carbohydrate (%) | Ash (%) | Crude Fiber (%) |
|-------------------------------|-------------------|---------------|------------|--------|------------------|--------|----------------|
| 2 %                           | 7.75              | 93.25         | 36.75      | 4.55   | 24.55            | 4.50   | 29.65          |
| 4 %                           | 8.05              | 91.95         | 35.50      | 4.75   | 25.68            | 4.54   | 29.53          |
| 6 %                           | 8.10              | 91.90         | 35.78      | 5.50   | 27.25            | 4.58   | 26.89          |

Table 2. showed the survival percentage and weight gain of catfish and gourami. The survival of catfish treated with 2, 4, or 6% betel flour was 82.2, 96 or 80 % respectively. The weight gain of catfish treated with 2, 4, or 6% betel flour was not significantly different. In contrast, the survival of gourami treated with 2, 4, or 6% betel flour was 93.3, 88.8, or 93.3% respectively. The weight gain of gourami treated with 2% betel flour was lower than that of gourami treated with 4, or 6% betel flour.

| Betel Leaf Flour Concentration | Catfish | Gourami |
|-------------------------------|---------|---------|
|                               | Survival (%) | Weight Gain (g) | Survival (%) | Weight Gain (g) |
| 2 %                           | 82.22   | 9.00    | 93.33    | 2.49    |
| 4 %                           | 96.26   | 10.80   | 88.88    | 1.90    |
| 6 %                           | 80.00   | 7.98    | 93.33    | 3.60    |

Remark: a value in same column followed by similar letter means no different

The weight gain of catfish, which is carnivore, was not affected by the betel leaf flour supplement. This indicated that the supplement was not consumed, digested and adsorbed by the catfish as expected. This was supported by the survival percentage of the catfish which was also not affected by the supplement. In contrast the feed supplement increased the weight gain of the gourami, which was herbivore. This indicated that the feed was consumed, was digested, and was absorb by the gourami.

Actually, the feed formula has a good nutrition source for supporting both catfish and gourami growth. A good feed for catfish is a feed which have enough EPA to support fish growth and prevent fish disease [14].

The amount of EPA needed in catfish feed is 36.75 %, then it will support metabolic process and amino acid synthesis. In addition, there was possibility that the catfish refuse to eat feed which was supplemented by betel leaf flour. In contrast gourami naturally ate plants materials, and fed with taro leaves, cassava leaves, and papaya leaves. Then, the gourami did not refuse to eat feed formula supplemented with betel leaves flour up to 6%. In addition, the supplement could be digested and absorbed by the gourami. This resulted that the anti-bacterial substances of the betel leaves can prevent *Aeromonas hydrophilla* infection. The survival percentage of gourami increased as the percentage of the supplement increased.
References
[1]  Firdaus S 1999 Pakan Ikan dan Udang (Jakarta: Penebar Swadaya)
[2]  Watanabe T 1988 Fish Nutrition and Mariculture. In: The General Aquaculture Course (Tokyo) p 132-145
[3]  Kordi G 2011 Pemeliharaan Ikan Nila Intensif (Jakarta: Media Kembangan)
[4]  Khairuman A K 2003 Membuat Pakan Ikan Konsumsi (Jakarta: Agromedia Pustaka)
[5]  Susanto H 2008 Budidaya Ikan di Pekarangan Edisi Revisi (Jakarta: Penebar Swadaya)
[6]  Khairuman A K 2003 Pembenihan dan Pembesaran Gurami secara Intensif (Jakarta: Agromedia Pustaka)
[7]  Anonim 2011 No Title [Internet] Available from: www.pokdakan-klayar.blogspot.com
[8]  Anonim No Title [Internet] Available from: www.sdi.kkp.go.id/index.php/arsip/c/334/Atasi-Bakteri-Ikan-Dengan-Tanaman-Obat/
[9]  Yuwono E 2011 Fisiologi Hewan I (Purwokerto: Fakultas Biologi. UNSOED)
[10]  Sachlan M P 1975 Fakultas Peternakan dan Perikanan
[11]  Aminah S, Muhammad and Anita 2010 Fish Sci 1 190 1020527/fs.v1i21188. 2010;
[12]  Effendie 1979 Metede Biologi Perikanan (Bogor: Yayasan Dewi Sri)
[13]  Hernowo S R 2010 Pembenihan dan pembesaran Lele (Jakarta: Penebar swadaya)
[14]  Sukardi P and Yuwono E 2010 Nutrisi ikan (Purwokerto: Universitas Jenderal Soedirman)