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THE EFFECT OF USING CLOVE POWDER AS A FEED ADDITIVE IN FEED ON THE GROWTH AND SURVIVAL OF TILAPIA (*Oreochromis niloticus*) RED STRAIN FINGERLINGS

Pengaruh Penggunaan Serbuk Cengkeh Sebagai Feed Additive Dalam Pakan Terhadap Pertumbuhan dan Kelangsungan Hidup Benih Ikan Nila (*Oreochromis niloticus*) Strain Merah

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ABSTRACT

Feed additives or feed additives are now starting to become a necessity as additional feed in fish feed that can increase fish growth. This research aims to determine the effect of using clove powder as a feed additive in feed on the growth rate and survival rate of red tilapia fingerlings. The research was carried out at the Aquaculture Laboratory Building 4, Faculty of Fisheries and Marine Sciences, Padjadjaran University, Jatinangor from June to August 2023. The research method used is an experimental method using a complete randomized design consisting of four treatments and four repeats. The treatment used is the use of clove powder at doses of 0% (control), 0.5%, 1%, and 1.5% as feed additives in commercial feed. The observation parameters consist of specific growth rate, survival rate, and water quality. The results showed that the use of clove powder as a feed additive in commercial feed with a dose of 0.5-1.5% tended to increase the growth rate of red tilapia fry with specific growth rate values ranging from 1.17 ± 0.30%/day - 1.27 ± 0.12%/day. The survival rate of red tilapia fry with a dose of clove powder use of 1.5% tended to give the best results (97.50 ± 5.00%). The water quality of red tilapia fry maintenance during the study met the requirements of water quality standards for tilapia farming.

Keywords: Feed Additive, Red Tilapia, Growth Rate, Clove Powder, Survival Rate

ABSTRAK

Penggunaan bahan tambahan dalam pakan ikan adalah penting dalam pemanfaatan pakan, Bahan fitobiotik dari tanaman rempah yang mengandung bahan aktif dan ramah lingkungan dapat menjadi altrenatif bahan tambahan pengganti antibiotik growth promotor. Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan serbuk cengkeh sebagai *feed additive* pada pakan terhadap pertumbuhan dan kelangsungan hidup benih nila merah. Penelitian dilaksanakan di Laboratorium Akuakultur Fakultas Perikanan dan Ilmu Kelautan, Universitas Padjadjaran, Jatinangor. Penelitian dilakukan secara eksperimental dengan Rancangan acak

lengkap (4×4) dengan perlakuan serbuk cengkeh dengan dosis 0% (kontrol), 0,5%, 1%, dan 1,5% sebagai *feed additive* pada pakan komersial. Parameter pengamatan terdiri atas laju pertumbuhan spesifik, tingkat kelangsungan hidup, dan kualitas air. Hasil penelitian menunjukkan bahwa penggunaan serbuk cengkeh sebagai *feed additive* pada pakan komersial dengan dosis 0,5-1,5% cenderung meningkatkan laju pertumbuhan benih ikan nila merah dengan nilai laju pertumbuhan spesifik berkisar antara 1,17 ± 0,30%/hari-1,27 ± 0,12%/hari. Tingkat kelangsungan hidup benih ikan nila merah dengan dosis penggunaan serbuk cengkeh 1,5% cenderung memberikan hasil terbaik (97,50 ± 5,00%). Kualitas air pemeliharaan benih ikan nila merah selama penelitian memenuhi syarat baku mutu kualitas air untuk budidaya ikan nila.

Kata Kunci: *Feed Additive*, Ikan Nila Merah, Laju Pertumbuhan, Serbuk Cengkeh, Tingkat Kelangsungan Hidup

INTRODUCTION

Tilapia is one of the leading commodities in the aquaculture sector. Apart from the easy cultivation method, tilapia is famous for its savory meat taste, relatively affordable selling price, and a fairly high level of tolerance to environmental changes. The fish is a highly economical freshwater fish that is widely cultivated in Indonesia. In 2018, tilapia production in Indonesia reached 1,169,144.54 tons. This amount decreased by 9.28% from the previous year's production which reached 1,288,735.03 tons. This occurred due to a decrease in production in production center areas such as West Java, West Sumatra, South Sumatra, Central Java, and North Sulawesi (KKP, 2019). One type of tilapia that is widely cultivated in Indonesia is red tilapia.

Various efforts can be made to increase fish production and productivity in aquaculture activities, namely using superior fish broodstock, carrying out correct broodstock management, improving the fish fry production system, and improving feed quality. Good feed quality will have a positive effect on fish growth. Apart from the high protein content, the use of feed additives is known to increase fish growth and feed efficiency, thereby shortening the production period (Fajri et al., 2016). Feed additives are feed ingredients that are added in small quantities to rations with a specific purpose (Samadi et al, 2021). Feed additives function as appetite enhancers, feed digestibility, immunity, reduce stress levels, and stimulate growth (Fujaya, 2004).

One of the feed additives that can be used is clove powder. Cloves have many benefits, namely as antiviral, antifungal, antibacterial, antiplatelet, anticancer, and antioxidant (Kumar et al., 2011). Cloves are known to be the best antioxidant and antibacterial among other spices (Shan et al., 2005). Indonesia is one of the main producers of cloves in the world (Kamatou et al., 2012). Clove production in Indonesia in 2018 reached 131,014 tons (Directorate General of Plantations, 2019). The center of clove production in Indonesia, West Java, to be precise, is in Sukabumi.

Cloves with the Latin name Syzygium aromaticum are aromatic medicinal plants of the Myrtaceae family. The chemical content contained in cloves is alkaloids, glycosides, flavonoids, saponins, tannins, and essential oils (Mustapa, 2020). The parts of the clove plant that can be used are petioles, leaves, and clove flowers (Nurdjannah, 2004). Cloves have the main compound, namely eugenol compounds that cause cloves to have a very distinctive aroma and taste. Eugenol compounds contained in cloves range from 72-90% (Risitiansyah, 2018). In the flower section, the content of essential oils ranges from 14-21% with a eugenol content of 78-95%. The highest eugenol content in clove plants is found in flowers, then petioles, and finally clove leaves (Hadi, 2012).

The active compounds of essential oils contained in cloves are a type of antioxidants that can block cell oxidation activity caused by free radicals so as to minimize cell damage, including proteins that affect the increase in meat protein mass. Essential oils can increase relaxation and accelerate the peristaltic movement of the small intestine so that the absorption of nutrients for growth is better (Mentari et al., 2014). As an antibacterial, cloves can suppress pathogenic bacteria in the digestive tract which is suspected to have an impact on increasing the absorption of nutrients in the digestive tract (Tahir *et al*., 2022).

The content of essential oils and eugenol in cloves is also suspected to increase appetite (Sandana et al., 2020). This is based on the statement that essential oil compounds in temulawak can increase appetite (Rukmana, 1995) and eugenol compounds in cinnamon can also increase appetite (Utami and Puspaningtyas, 2013). Increased fish appetite can increase fish weight so that it affects fish growth. Based on this information, it is necessary to conduct research on the effect of the use of clove powder as a feed additive in feed on the growth rate and survival rate of red tilapia fry.

METHODS

Place and Time

This research was carried out at the Aquaculture Laboratory Building 4, Faculty of Fisheries and Marine Sciences, Padjadjaran University, Jatinangor from June to August 2023.

Toold and Materials

The tools used in the research were 16 aquariums with a size of 25 cm x 25 cm x 39.5 cm, aeration equipment including LP-100 aerators, faucets, hoses, and aeration stones, RECENT AA 103 aquarium dip water pumps, 16 Atman 50 W and 100 W heaters, water hoses, dishwashing sponges, shovels, pH meters HANNA HI 98107, LUTRON DO-5510 DO meter, scissors, digital scale with 0.1 g accuracy, ruler, plastic jar, grinder, potato ricer, plastic basin, plastic strainer, oven, plastic ziplock, label paper, mobile phone camera, and stationery. The materials used in the study were red tilapia seeds with a length of 7.9 ± 0.3 cm and a weight of 8.6 ± 1.2 g as many as 160 fish obtained from fish seed sales in Soreang, Bandung, West Java, HI-PRO-VITE 781-1 commercial feed, clove powder, progol, methylene blue, and fish salt.

Design

The research method was carried out experimentally through feed experiments in the laboratory (Gomez & Gomez, 1984). The design used was a complete randomization (RAL) directed on four treatments and four replicates. The treatment used was the use of clove powder as a feed additive in commercial feed with doses of 0% (control), 0.5%, 1%, and 1.5% (Adeshima, 2018).

Procedurs

The manufacture of clove powder is based on the method of Utami et al., (2010), namely cleaning, roasting, smoothing and filtering clove powder. The implementation stage includes the maintenance of test fish, water quality management, and data collection by weighing the weight of test fish, observing the number of test fish per aquarium, weighing dead fish, and measuring water quality.

The test feed uses repelleted commercial feed, with progol adhesive, clove powder, and water. Aquarium containers and fiber tubs that have been cleaned, filled with water and given disinfectant, left for two days and washed thoroughly. During maintenance, the aquarium is equipped with an aerator and heater and 50% of the water is replaced.

Red tilapia fry that have been acclimatized in fiber tubs are then sorted and stocked in aquariums as many as 10 fish per container, with a feeding rate of 3% per biomass and a frequency of twice a day.

The study was conducted for 42 days with biomass and weight data taken once a week and the amount of daily rations was adjusted (Yanti et al., 2013). Water quality data collection including pH, DO, and temperature was carried out at the beginning and end of the study.

The parameters measured include: (1) specific growth rate (De Silva and Anderson, 1995), and (2) survival rate (Goddard, 1996), calculated using the following formula: i.e.:

$$(1)\ SGR = \frac{\ln(Wt) - \ln(W0)}{t} \times 100\%$$

Information:
SGR : Specific growth rate (%/day)
W0 : The average weight of the fish at the beginning of the study (grams)
Wt : The average weight of the fish at the end of the study (grams)
t : Time of study (days)

$$(2)\ SR = \frac{Nt}{N0} \times 100\%$$

Information:
SR : Survival rate (%)
Nt : Number of fish at the end of the study (tail)
N0 : Number of fish at the beginning of the study (tail)

Data Analysis

The specific growth rate and survival rate data obtained were analyzed using a variety fingerprint analysis with a confidence level of 95%. If there is a noticeable difference, then it is followed by the Duncan test to determine the best treatment. Water quality data was analyzed descriptively.

RESULT

Specific Growth Rate

The results of the study on the use of clove powder as a feed additive in commercial feed on the specific growth rate of red tilapia fry can be seen in Figure 1. Based on the research that has been conducted for 42 days, the results obtained are the use of clove powder at doses of 0%, 0.5%, 1.0%, and 1.5% as feed additives in commercial feed, showing no significant difference ($P>0.05$) to the specific growth rate parameters. Although the results were not significantly different, the use of clove powder feed additive at a dose of 0.5-1.5% resulted in the specific growth rate value of red tilapia seeds that tended to increase.

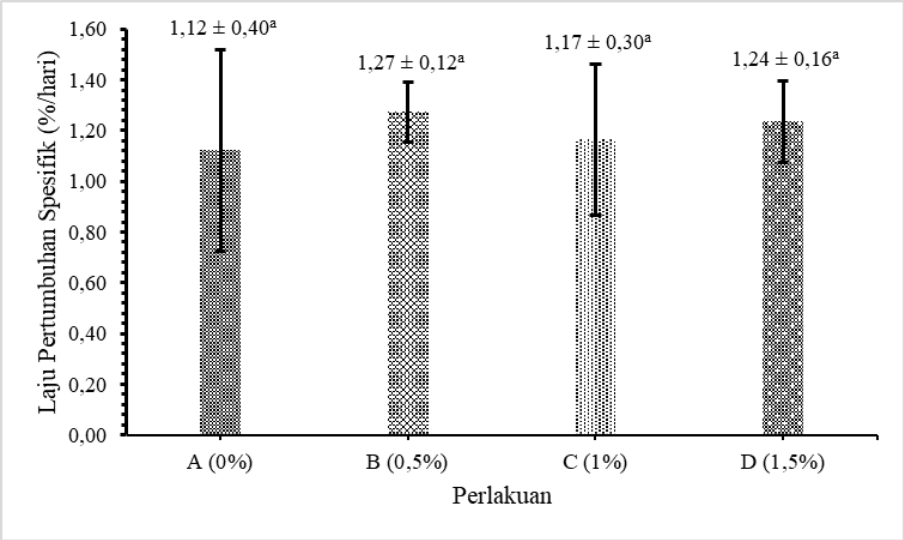

Fig 1. Graph of Specific Growth Rate of Red Tilapia Seeds

Survival Rate

The results of the study on the use of clove powder as a feed additive in commercial feed on the survival rate of red tilapia fry can be seen in Figure 3. Based on the research that has been conducted for 42 days, the results obtained are the use of clove powder with doses of 0%, 0.5%, 1.0%, and 1.5% as feed additives in commercial feed, showing no significant difference (P>0.05) on survival rate parameters. Although the results were not significantly different, the use of clove powder feed additive with a dose of 0.5-1.5% resulted in the survival rate of red tilapia seeds that tended to increase.

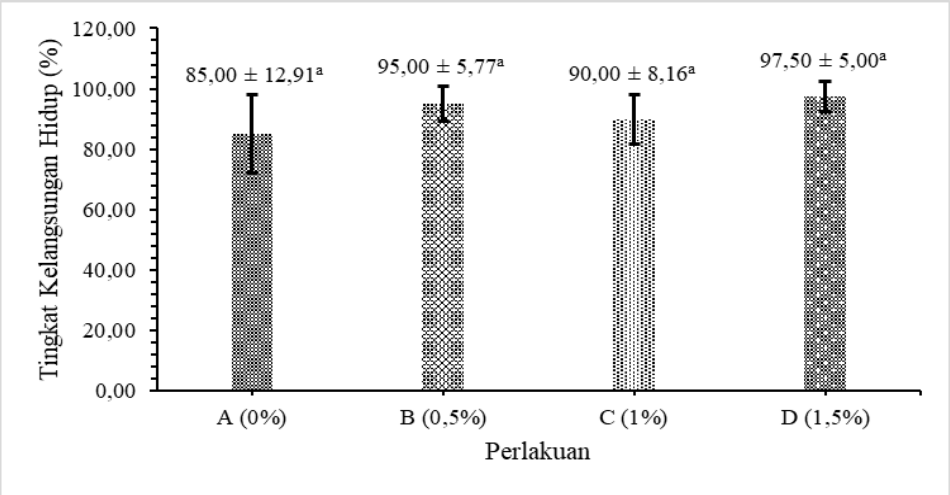

Fig 2. Graph of Red Tilapia Seed Survival Rate

Water Quality

The range of water quality values for maintaining red tilapia fry during the study can be seen in Table 1. Based on Table 1, it can be seen that the water quality during the maintenance of red tilapia fry in the study is in accordance with the water quality standards in tilapia cultivation based on BSN (2009).

Table 1. Water Quality of Red Tilapia Seed Maintenance

Treatment	Observation Parameters		
	pH	DO (mg/L)	Suhu (ºC)
A	7,3 - 7,7	6,0 - 6,8	27,3 - 30,3
B	7,4 - 7,7	6,2 - 6,9	27,2 - 28,5
C	7,3 - 7,7	6,0 - 7,1	26,1 - 29,8
D	7,3 - 7,7	5,8 - 6,7	26,7 - 31,8
Water Quality Standards (BSN, 2009)	6,5 - 8,5	> 3	25 - 32

DISCUSSION

Specific Growth Rate

The use of clove powder at doses of 0% (control), 0.5%, 1.0%, and 1.5% as feed additives in commercial feed showed no significant difference (P>0.05) on the specific growth rate parameters of red tilapia fry. This is suspected because the commercial feed used has a good enough protein content to support fish growth. However, the specific growth rate value of red tilapia fry tends to increase with the use of clove powder feed additives. The highest specific growth rate value of red tilapia fry was found in treatment B of 1.27 ± 0.12%/day, namely the use of clove powder feed additive in commercial feed with a dose of 0.5%, while the lowest specific growth rate value of red tilapia fry was found in treatment A of 1.12 ± 0.40%/day, namely the use of commercial feed without the use of clove powder feed additive.

The specific growth rate value in treatment A tends to be lower than in other treatments allegedly due to the poor performance of red tilapia seeds with the presence of fish dominating in the aquarium so that it affects the appetite of other fish in the aquarium which results in inhibition of weight gain. This is because if the feed consumed is small, the less energy is used for its growth.

The specific growth rate value of red tilapia fry tends to increase with the use of clove powder feed additive with a dose of 0.5-1.5% is suspected to occur due to the good condition of red tilapia seeds, fish appetite that tends to increase, and the use of clove powder as a feed additive is thought to help increase the benefit value of the formulated artificial feed. The good condition of red tilapia fry is suspected to be caused by the quality of controlled maintenance water and the influence of the use of cloves as antioxidants. According to Shan et al., (2005), cloves are a spice that is known as the best antioxidant. As an antioxidant, the eugenol content in cloves can ward off various free radicals in cells (Nam & Kim, 2013). One form of free radicals that come from outside the body is bacterial infection (Yanuhar, 2009). Therefore, the use of clove powder as a feed additive is thought to be able to maintain the fish's immune system so as to avoid bacterial infections. In addition, the taste and smell of eugenol compounds in cloves can stimulate the central nervous system to stimulate the production of digestive juices thereby increasing the activity of digestive enzymes that increase appetite (Sandana et al., 2020). An increased appetite of fish can increase the amount of feed consumed by fish so that it is possible to increase their growth.

Survival Rate

The highest survival rate of red tilapia fry was found in treatment D of 97.50 ± 5.00%, namely the use of clove powder feed additive at a dose of 1.5% in commercial feed, while the lowest survival rate of red tilapia fry was found in treatment A of 85.00 ± 12.91%, namely the use of commercial feed without the use of clove powder feed additive. The survival rate in

treatment A tends to be lower than in other treatments because of the death of red tilapia fry which is suspected to be caused by a fungal infection in the body parts of red tilapia fry, diseases with symptoms of a sunken stomach of the fish, fish do not want to eat, passive fish movements, weakness, silence at the bottom of the aquarium, and isolation, competition, and diseases that cause fish bile to burst when the fish die.

Based on BSN (2009), the survival rate of tilapia in calm water ponds is ≥ 75%. From the results of the data obtained, the value of the survival rate of red tilapia fry is in accordance with the reference. The survival of red tilapia fry is classified as good during maintenance both without the use of clove powder feed additive and with the use of clove powder feed additive is suspected because the number of red tilapia seeds in one aquarium as many as 10 is able to support fish life activities. In addition, another factor is the existence of water quality that is still able to support the survival of fish (Panggabean et al., 2016). This proves that the dosage of the use of clove powder feed additive in commercial feed is still in the safe range for the survival of red tilapia seeds.

Water Quality

Water quality is one of the external factors that can affect the growth and survival of fish. Based on BSN (2009), the water quality requirements for tilapia cultivation are pH values of 6.5 - 8.5, DO > 3 mg/L, and temperature 25 - 32ºC. From the results of the water quality data obtained for the maintenance of red tilapia fry, the pH value range is 7.3 - 7.7, DO 5.8 - 7.1 mgL-1, and the temperature is 26.1 - 31.8ºC is proven to be still within the normal value range of water quality for fish to live and grow well. The use of clove powder feed additive treatment did not have a significant effect on the difference in the range of water quality values in each treatment. This is allegedly caused by aeration, heating installation, and the provision of fish salt in each research aquarium. Aeration can increase oxygen levels in the water, heaters with a temperature of 28ºC installed can stabilize the water temperature, and fish salt can normalize and maintain the pH level of the water. In addition, the aquarium water is replenished and replaced every day so that the quality of maintenance water is maintained.

CONCLUSION

The use of clove powder as a feed additive in commercial feed with doses of 0% (control), 0.5%, 1.0%, and 1.5% did not have a real effect (P>0.05) on the specific growth rate and survival rate of red tilapia fry. The use of clove powder as a feed additive in commercial feed up to a dose of 1.5% tends to give good results in improving feed quality.

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