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Addition of Bean Sprout Extract (*Vigna radiata*) in Feed for Rematuration of Female Tilapia Fish (*Oreochromis niloticus*)

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ABSTRACT

The availability of protein, vitamins, minerals and calcium in feed are also very important in the process of gonad development of tilapia. This research aims to examine the reproduction of tilapia fish that add bean sprout extract to feed at different doses. Addition of bean sprout extract to feed at different doses for rematuring female tilapia fish that are kept for 18 days. The feed used in the research was CPP floating feed with a protein content of 31%, mixed with bean sprout extract according to the treatment: A (control without bean sprout extract), B (10% bean sprout extract), C (30% bean sprout extract), and D (50 % bean sprout extract). Data were analyzed based on the parameters of gonad maturity level, gonad maturity index, and fecundity. Gonad maturity level IV, ready to spawn. Bean sprout extract did not have a significant effect on the gonad maturity index, with the highest gonad maturity index at a dose of 10% (3.96%) compared to the control (3.29%). The highest fecundity was also found at a dose of 10% (3,380 grains), decreasing at higher doses, but still higher than the control (1,824 grains). The addition of bean sprout extract increased fecundity but did not significantly affect the gonad maturity index.

Keywords: *Tilapia, Feed, Bean Sprouts, Rematuration*

INTRODUCTION

Tilapia fish is one of the freshwater fish eries commodities that has received quite a lot of attention from farmers, apart from being easy to maintain, has a fast growth and breeding rate and is resistant to the environment and disease (Saputry, 2022). One of the absolute efforts needed to develop it is the provision of quality seeds that have high, sustainable, and timely cultivation productivity (Nainggolan et al., 2015).

Broodstock productivity can be calculated based on the ability of the broodstock per unit weight to produce a certain number of seeds per unit of time. The number of seeds produced depends on the fecundity of the broodstock. According to Harianti (2013), fish fecundity is affected by size, age, fish species, and environmental influences such as habitat and nutrient availability. The amount of fecundity is determined by the size of the parent and the longer or larger the size of the parent is usually followed by the size of the gonads (Yudasmara, 2014). In addition to increasing broodstock fecundity, increasing productivity can also be done by accelerating broodstock rematuration. The faster the female broodstock refills her eggs after spawning, the more seeds can be

produced per unit of time. Accelerating maturation can be done by manipulating the environment and feed (Migaud et al. 2013).

Protein content in feed is a very important factor to support the process of gonad development and maturity in fish and is needed in large quantities. In addition to the availability of protein, the availability of vitamins, minerals and calcium in feed is also very important in the development of tilapia fish gonads (Marnani, 2017). Ingredients that can be used to provide vitamins, minerals and calcium in fish feed include bean sprouts. Bean sprouts contain calcium, vitamins and minerals which are beneficial for gonad development and embryo development. In addition, the content of vitamins, minerals and calcium also functions to improve egg quality (Iskandar, 2021).

Benefits of using bean sprouts as a feed ingredient are that by adding bean sprouts, many important substances are obtained as stated by Amilah and Astuti (2006). The vitamins found in bean sprouts are vitamin C, thiamine, riboflavin, niacin, pantothenic acid, vitamin B6, folate, choline, ß-carotene, vitamin A, vitamin E (a-tocopherol), and vitamin K. The minerals found in bean sprouts are calcium (Ca), iron (Fe), magnesium (Mg), phosphorus (P), potassium (K), sodium (Na), zinc (Zn), copper (Cu), manganese (Mn), and selenium (Se). The essential amino acids contained in bean sprouts include: tryptophan, threonine, phenylalanine, methionine, lysine, leucine, isoleucine, and valine.

This research aims to examine the reproduction of tilapia fish that add bean sprout extract to feed at different doses.

MATERIALS & METHODS

This research was conducted at the Hatchery Unit of PT. Central Protein Prima (CPP) in Lihung Village, Karang Intan District, Banjar Regency, South Kalimantan Province, with a research period of 18 days.

Feed used during the research was floating feed from the CPP manufacturer with a protein content of 31% mixed with bean sprout extract according to the treatment.

- Treatment A was not added with bean sprout extract (control).
- Treatment B was added with bean sprout extract as much as 10% of the total daily feed.
- Treatment C was added with bean sprout extract as much as 30% of the total daily feed.
- Treatment D was added with bean sprout extract as much as 50% of the total daily feed.

Data obtained from observations will be analyzed using the following parameters:

1. Gonad Maturity Level:

Observation of Gonad Maturity Level Observations were carried out by dissecting the test fish to observe the gonad characteristics. Determination of the gonad maturity level of the test fish was carried out by referring to the division of fish gonad maturity levels according to Nikolsky, 1963 in (Effendie, 1995)

2. Gonad Maturity Index

Nikolsky (1969) in Effendie, (1995) uses signs to differentiate gonad maturity based on gonad weight, because it is naturally related to the size and body weight of the fish as a whole or without gonad weight. Furthermore, it is said that the comparison between gonad weight and body weight is called the "Maturity Coefficient" which is expressed in percent (%).

3. Fecundity

Fecundity is calculated based on the number of eggs in the gonads of the test fish at the end of the research. Fecundity in this experiment was calculated using the gravimetric method, with the formula (Effendie, 1979).

RESULT

The addition of bean sprout extract in feed with different doses for the rematuration of female tilapia fish maintained for 18 days in hapa media.

1. Gonad Maturity Level

The results of observations of the gonad maturity level by looking at its characteristic features are presented in Table 1:

Table 1. Observation Results Characteristics of gonad maturity levels

Information		Haracteristics			Gonad Maturity Level
Treatment	Test	Genital Papillae	Gonad	Egg	
A	1				IV (Four)
	2				IV (Four)
	3				IV (Four)
B	1				IV (Four)
	2				IV (Four)
	3				IV (Four)
C	1				IV (Four)
	2				IV (Four)
	3				IV (Four)
D	1				IV (Four)
	2				IV (Four)
	3				IV (Four)

Gonad development is part of fish reproduction before spawning. The basis for determining the level of gonad maturity is by observing gonad morphology, including gonad shape, gonad weight, and development of gonad contents. Based on the results of observations of the level of gonad maturity that have been presented in the table above, all treatments, namely A (0% control), B (10% bean sprout extract), C (30% bean sprout extract) and D (50% bean sprout extract) can be concluded to

have reached stage IV. The results of the research are in accordance with the characteristic features that have been presented by Nikolsky, 1963 in (Effendie, 1995), namely the level of gonad maturity at stage IV of Cooking.

Sexual products are ripe. Sexual products reach maximum weight. But the product has not come out if the stomach is given a little pressure. The development of the IV ovary (mature) is characterized by the ovaries getting bigger, filling two-thirds of the abdominal cavity and pushing the intestines to the front. The shape of the ovary is round oval with a clear curve in the anterior and middle parts, indicating that the pair of organs are fused. The color becomes brownish yellow and darker. The eggs are visible because the gonad membrane is transparent with a diameter ranging from 0.30 to 1.225 mm. (Nagahama et al., 1995 in (Subardja et al., 2008).

Characteristics of the gonads observed in each gonad are oocytes from several stages. This is in line with what Zairin (2003) said that tilapia fish has an asynchronous reproduction pattern because in one gonad that he observed there was a diversity of egg diameter sizes. This type of asynchronous reproduction means that in the ovaries there are oocytes from various stages, so that the process of egg formation and maturation in each parent varies depending on the quality of the parent and the influence of environmental conditions.

The results of observing the level of gonad maturity with the addition of bean sprout extract in the feed of female tilapia fish broodstock showed characteristic features of the level of gonad maturity that were suitable for spawning. The factor that supports gonad development is thought to be the nutritional content in bean sprout extract mixed in the feed for the rematuration of tilapia fish broodstock. Results of research (Syahrizal et al., 2023) on the reproductive performance of full platinum albino guppy fish parents given bean sprout flour in feed, A. Without 0% bean sprout flour, B 2% bean sprout flour, C 4% bean sprout flour, D 6% bean sprout flour. Gonad growth for all treatments ranged between 0.61% - 0.68%, gonad maturity index ranged from 0.61 g - 0.81 grams.

2. Gonad Maturity Index

The results of the average gonad maturity index data from observations of tilapia fish are shown in Table 2 as follows:

Table 2. Results of average gonad maturity index values for parent tilapia fish

Treatment		Gonad Maturity Index (%)
A	0%	3,29
B	10%	3,96
C	30%	2,92
D	50%	2,66

The table above shows the highest average value of gonad maturity index in treatment B with 10% addition of bean sprout extract, namely the average gonad maturity index of 3.96% and the lowest gonad maturity index in treatment D (50% bean sprout extract) which is 2.66%. The gonad maturity index value tended to decrease with the addition of the dose of bean sprout extract, namely in treatment C (30% bean sprout extract) 2.92% and D (50% bean sprout extract) 2.66% lower than treatment A (control without adding bean sprout extract). The estimated error value carried out and the results of the normality test show a significance value of sig 0.200 > sig p (0.05), so it can be concluded that the hypothesis Hi: the data variance is normally distributed, and the homogeneity test results obtained a significance value of 0.067 > sig p (0, 05), so accept the hypothesis Hi: homogeneous data variance. The results of the Anava test illustrate that the sig value is 0.393 > sig p (0.05) and Fcount is 1,130 > Ftable 5% so that Ho is accepted. Varying doses of bean sprout extract has no effect on the gonad maturity index of parent tilapia fish between treatments A (0% control). B (10% bean sprout extract), C (30% bean sprout extract) and D (50% bean sprout extract).

The gonad maturity index value is closely related to vitellogenesis, where the process of vitellogenin formation begins with signals from environmental factors such as photoperiod, temperature, eating activity, and other factors, all of which will stimulate the hypothalamus to secrete Gonadotropin releasing hormone (GnRH). GnRH which is secreted into the blood will stimulate the pituitary to secrete gonadotropin hormones (Mommsen and Walsh, 1988). An increase in the somatic gonad index value can be caused by oocyte development. Vitellogenin is the yolk granule which is the main component of growing oocytes (Tyler, 1991). During the vitellogenesis process, the yolk granules increase in number and size so that the volume of the oocyte enlarges and will eventually cause an increase in the somatic gonad index value (Yaron, 1995).

The addition of bean sprout extract in the Anova test was stated to have no effect on the gonad maturity index value where the number tended to decrease as the dose of bean sprout extract increased. The gonad maturity index value obtained from the observation of the addition of bean sprout extract in the feed is directly proportional to the protein content in the feed. The results of the proximate test at the laboratory of nutrition and animal feed at Lambung Mangkurat University showed that treatment B (10% bean sprout extract) was the best treatment because it got the highest protein content, namely 34.51%. Treatment C (30% bean sprout extract) obtained a protein content of 34.22% and treatment D (50% bean sprout extract) obtained a protein content of 32.81%.

The addition of bean sprout extract is not directly proportional to the increase in protein content but is directly proportional to the increase in ash content, namely in treatments B (8.22%), C (8.34%), and D (12.71%). It is suspected that the high ash content factor contained in the test feed is due to the high crude fiber in bean sprouts, this is in accordance with the statement of the research results (Arum et al., 2018). Fermentation of bean sprout waste using 6% Trichoderma harzianum with a curing time of 6 days was able to reduce the crude fiber content of bean sprout waste by 8.90% from 50.89% to 46.36%.

Suspected that the factor that affects the gonad maturity index value in this observation is the protein content added to the bean sprout extract. Aryani, (2013), stated that providing a high amount of feed protein affects the time to achieve gonad maturity in fish. Fish fed 38% protein matured faster at 6 months, while those fed 28% and 16% only matured after 8 months. Furthermore, the percentage of mature gonad broodstock increased with increasing age and protein content (Alawi, 2012). Total ash is defined as the residue produced during the combustion process of organic material, in the form of inorganic compounds in the form of oxides, salts and also minerals. A feed product limits the ash content because the ash content in the feed represents the mineral content of the feed, the appropriate level is 3-7% (Winarno, 1997 in Iskandar & Fitriadi, 2017). The ash content in the test feed ranged from 8.22% - 12.71%. This shows that the ash content is very high, not in accordance with the needs of fish because it has excessive mineral content.

3. Fecundity

The results of the average fecundity data from observations of tilapia fish are shown in Table 3 as follows:

Table 3. Results of Average Fecundity Values for Parent Tilapia Fish

Treatment		Fecundity (grain)
A	0%	1.824
B	10%	3.380
C	30%	3.053
D	50%	2.419

The table above shows that the highest fecundity was found in treatment B, which was 3,380 grains with the addition of 10% bean sprout extract. As the dose of bean sprout extract given increased, the fecundity rate tended to decrease, namely in treatment C (30% bean sprout extract) the fecundity

rate was 3,053 grains and treatment D (50% bean sprout extract) was 2,419 grains. The addition of bean sprout extract in feed for female tilapia fish rematuration resulted in a higher fecundity rate than the control treatment without the addition of bean sprout extract.

The error value carried out and the results of the normality test show a significance value of sig 0.200 > sig p (0.05), so it can be concluded that the hypothesis Hi: the data variance is normally distributed, and the results of the homogeneity test obtained a significance value of 0.118 > sig p (0.05), so accept the hypothesis Hi: homogeneous data variance. The results of the Anova test illustrate that the sig value of 0.000 < sig p (0.05) and F count 20.249> F table 5% so that Hi is accepted, namely the variation of bean sprout extract doses has a very significant effect on the fecundity of tilapia fish broodstock between treatments A (control 0%), B (10% bean sprout extract), C (30% bean sprout extract) and D (50% bean sprout extract). The results of the Lantantan test using the Duncan area test on fecundity in parent tilapia fish , the value of sig > sig p (0.05) so that Ho = not significantly different, shows that treatment B is not different from treatment C but is different from treatments D and A with a value sig > sig p (0.05) so accept Ho = very significantly different. Treatment C shows differences from treatment D and A, Treatment D also shows differences from treatment A.

The factor of decreasing fecundity rate along with increasing levels of bean sprout extract added to the feed is due to decreasing protein levels and increasing ash levels in the feed based on the proximate test. Ash content in feed is a number of inorganic compounds in the form of salts and minerals. The ash content in the treatment feed showed a high value ranging from 8.22% - 12.71%. according to (Winarno, 1997 in Iskandar & Fitriadi, 2017) the appropriate ash content is 3-7%. In addition, high ash content in feed is also thought to cause an imbalance of minerals in the feed, one of which is the high calcium content in the feed.

According to Kaligis (2015), along with high levels of protein in feed, high levels of calcium can inhibit protein retention, so that protein in feed cannot be absorbed optimally by the body and growth rate becomes slow. In addition to protein levels, fecundity is also influenced by the content of vitamin a-tocopherol. Vitamin E or a-tocopherol derived from bean sprouts can maintain unsaturated fatty acids that synthesize prostaglandins enzymatically (Yulfiperius, 2009). The higher level of bean sprout extract containing Vitamin E results in faster gonad maturity in goldfish (Fajrin, 2012). Sutjarit Vongsanon (1987) in Mehrad et al (2011), that goldfish that were given additional vitamin E in their feed had better gonad development compared to controls.

CONCLUSION

This research examined the effect of bean sprout extract in feed on the reproduction of female tilapia fish, all treatments reached gonad maturity level IV, ready to be spawned. Bean sprout extract did not significantly affect the gonad maturity index, with the highest gonad maturity index at a dose of 10% (3.96%) compared to control (3.29%). The highest fecundity was also found at a dose of 10% (3,380 eggs), decreasing at higher doses, but still higher than the control (1,824 eggs). The addition of bean sprouts extract increased fecundity but did not significantly influence the gonad maturity index.

Declaration by Authors
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