Influence addition of noni (*Morinda citrifolia*) in the commercial feed on protein and lipid retentions of sangkuriang catfish (*Clarias* sp.).

F Azizah\(^1\), M Arief\(^{2,4}\) and W P Lokapirnasari\(^3\)

\(^1\) Aquaculture, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya 60115
\(^2\) Department of Fish Health Management and Aquaculture, Faculty of Fisheries and Marine Universitas Airlangga, Surabaya 60115
\(^3\) Animal Husbandry Department, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya 60115

\(^4\) Corresponding author: m_arief_bp@yahoo.co.id

Abstract. Catfish (*Clarias* sp.) is a freshwater fish that have been grown commercially. One effort to improve feed efficiency is to use a feed additive. Noni (*Morinda citrifolia*) is a medicinal plant that can be used as a natural feed additive (fitobiotik). This study was purposed to study the influence of noni juice (addition on commercial feed on protein and fat retentions in catfish. This study used as an experimental method to completely randomized design consisting of five treatments and four replications. The number of doses of noni juice is added to the commercial feed is: P0 (0 ml / kg), P1 (5 ml / kg), P2 (10 ml / kg), P3 (15 ml / kg) and P4 (20 ml / kg). Analysis of the data using variant analysis (ANOVA) followed by Duncan’s multiple range test. The addition of noni juice on commercial diets significant effect on the retention of the protein in catfish and the addition of Noni juice on commercial diets do not provide a real impact on the retention of fat in catfish.

1. Introduction

Fish are good food commodities for consumption. That is because fish contains high protein when compared with some other agricultural products. According to [1], the consumption of fish products in Indonesia tends to increase by 5.51% annually. One type of farmed fish widely consumed today’s society is a fish catfish [2, 3, 4, 5]. Seeing the opportunity is so great, then during the period 2013-2014, the Directorate General of Aquaculture, Ministry of Maritime Affairs and Fisheries will strive to increase the production of catfish ie from 758.455 tonnes in 2013 menjadi 840,000 tons in 2014 [6].

The feed is one important element in farming activities that support the growth and survival of fish [7, 8, 9, 10, 11, 12]. Feed requirements during cultivation can reach about 60-70% of the operational costs of cultivation [13]. The feed given to the fish is considered good not only of the components of the feed but also of how the components contained in the feed can be absorbed and utilized by the fish in his life [14]. The quality of feed used greatly affects the growth of the seed catfish. This corresponds to the nutritional needs of catfish include protein, carbohydrates, fats, fiber, vitamins, and minerals. Protein constitutes the first component for the growth of fish as a source of energy and to repair damaged tissue. Fat is the first energy reserve for animals including fish. Fat reserves will be used during fish feed shortage. [15], stated that the growth of fish increases if the
feed can be digested well by the fish so that the energy obtained from the fish feed can be utilized optimally.

The addition of noni extract as a feed additive is one way to feed alternatives that can be used to improve feed efficiency. The use of the feed additive in feed intended to improve the health, productivity, and compliance with animal nutrition [16]. Noni (Morinda citrifolia) is a medicinal plant that can be used as a natural feed additive (fitobiotik). Noni fruit contains the enzyme protease that functions convert protein into amino acids [17]. Noni extract can also decrease effect on histopathological change [18]. Noni fruit also contains enzymes and alkaloid proxeronase proxeronine, the two substances can form the active substance xeronine in the body. Proxeronin included in the intestine by the enzyme proxeronase will turn proxeronine into xeronine. Xeronine serves to activate enzymes and regulate the formation of proteins, also helped widen the hole so as to facilitate fill small bowel intestine in the process of absorption of food [19, 20]. According to [21] retention of protein and fat retention is the amount of protein and fat that can absorbed by the body of the fish, if the fish can absorb more protein and fat many it will generate maximum growth for the fish to consume. Based on the background back on top, it is necessary to do research on the effect of the addition of noni juice on commercial diets on the retention of protein and fat retention fish catfish (Clarias sp.).

2. Material and methods

2.1. The place and time
The research was conducted between February and March 2017 in the Laboratory of the Faculty of Fisheries and Marine Education and the proximate analysis of feed in the Feed Laboratory of the Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya.

2.2. Material research

2.2.1. Research equipment
Equipment research is the size of 20 pieces aquarium 30×30×35 cm, hose aeration, aeration stone, aerators, cable olor, water tank, seser, analytical balance to the nearest 0.01g, rulers, measuring cup, scoop, digital thermometer, plastic hoses, sectio set, and the sample bottle.

2.2.2. Materials research
Materials used in a seed-sized catfish 6-8cm fish with an average weight of 4-5g as many as 200 individuals obtained from fish farmers in Sidoarjo, commercial feed, egg white, calico, Noni juice, liquid soap, plastic bags, the paper pH, dissolved oxygen test kit, ammonia, and chlorine test kit. This study uses a completely randomized design (CRD), 5 treatments, and 4 replications. Treatments were:

- P0: commercial Feed + Noni juice 0 ml/kg diet (control)
- P1: commercial Feed + Noni juice 5 ml/kg of feed
- P2: commercial Feed + Noni juice 10 ml/kg of feed
- P3: commercial Feed + Noni juice 15 ml/kg of feed
- P4: commercial Feed + Noni juice 20 ml/kg of feed

2.3. Working procedures

2.3.1. Preparation of noni fruit extract
Fruithalf-baked fresh noni was washed to clean after that wait until dry. Noni then peeled and separated the seed then blended until smooth, water result from the blender is called noni juice.

2.3.2. Feed production treatment
Making processed treatment begins with a commercial feed supply as much as 1 kg for each treatment, followed by a corresponding noni juice dosage of a treatment that is 0 ml/kg (P1), 5 ml/kg (T2), 10
ml/kg (T3), 15 ml/kg (T4), and 20 ml/kg (T4). Noni juice will be mixed to the feed and added 10 ml white egg as glue, and then sprayed on the feed gradually while stirring. The feed is then dried with aerated, then put into the oven for 10 minutes to ensuring feed dry completely. After dry feed immediately packed in plastic bags differ according to the number of treatments.

2.3.3. Preparation containers and fish test
Preparation container performed by cleaning the aquarium by washing the aquarium using liquid soap then continued dengam Award chlorine as a disinfectant and dried in the sun. Water to be used as the medium of live fish must first be treated by way of first deposited in the water reservoir during the night.

Aquarium filled with water as much as 27 liters and fitted aeration for 24 hours to increase the DO. Test fish fasted for 24 hours to eliminate the influence of feed given before. A total of 200 test fishtail for 20 aquariums. Each aquarium stocked with 10 fish tested in 27 liters of water. Before placing in the aquarium catfish weighed beforehand to determine the initial weight of the test fish.

2.3.4. Stage research
The research will one by catfish for 30 days with a dosage of noni juice at 0 ml/kg of feed, 5 ml/kg of feed, 10 ml/kg of feed, 15 ml/kg of feed, and 20 ml/kg of feed. The maintenance period begins with the test fish acclimatization to the new environment for 7 days so that the total maintenance is for 37 days. The amount of feed given by 10% of the weight of the fish body mass and is given three times a day at 09:00, 12:00, and 16:00. Mention food remains and the excrement result of metabolism present in the aquarium is done every 3-4 days in the morning before feeding. The amount of feed given is determined every 7 days, with the calculation of biomass. Take measurements of water quality parameters once a week.

2.3.5. Taking data
A proximate analysis test was done to determine the nutrient content of the feed, as well as the treatment of fish meat, replicates for each treatment and retention proximate analysis of protein and fat retention. The proximate analysis of protein and fat catfish fish meat is done at the beginning and end of the study. The initial proximate analysis aimed to find out the levels of protein and fat content of the fish early, before giving treatment. While the end of the proximate analysis aims to determine levels of protein and fat content catfish after giving treatment. The purpose of the proximate analysis is as one way to determine the increase retention in catfish before being given treatment and after treatment is given. Parameters of this study are the main protein and fat retentions. Protein retention (PR) and fat retention (FR) are formulated by [22] as follows:

Calculation of retention protein:

\[
\begin{align*}
BP_{\text{catfish initial}} &= \text{catfish initial protein content (%) x initial fish weight (g)} \\
BP_{\text{catfish end}} &= \text{catfish final protein content (%) x weight of fish end (g)} \\
TPP_{\text{protein content of feed consumed}} &= \text{(% x amount of feed consumed (g)} \\
PR &= \frac{(\text{Weight of the final body protein - initial body weight proteins})}{\text{Total protein feed consumed (g)}} \\
\end{align*}
\]

Information:

BP : Weight Protein (g)
RP : retention Protein (%)
TPP : Total Feed Protein (g)

Calculation of retention fat
BL catfish initial  $\quad$ = Fat content catfish beginning (%) $\times$ initial fish weight (g) $\times 100\%$

BL catfish end  $\quad$ = Fat content catfish end (%) $\times$ weight of fish end (g) $\times 100\%$

TLP  Fat content of feed consumed  $\quad$ = (%) $\times$ amount of feed consumed (g) $\times 100\%$

RL  $\quad$ = (Weight of the final body fat - the initial body fat weight) $\times 100\%$ Total fat feed consumed (g)

Information:
BL  : Fat Thickness (G)
RL  : Retention Fat (%)
TLP  : Total Fat Feed (g)

Parameter investigations in this study are water quality include temperature, pH, dissolved oxygen (DO), and ammonia. Measurement of water quality parameters once a week. Temperature measurement is done using a thermometer, pH measurement is done by using pH paper, measuring DO done using DO meter and measurements carried out by using an ammonia test kit.

2.4. Analysis of data
Data processing is done by calculating using a statistical method ANOVA (Analysis of Variance) to determine the treatment given if there is a real difference distance test followed by Duncan’s multiple range test.

3. Result and discussion
3.1. Protein retention
The result showed protein retention value ranging from 5.28 to 6.49% / day. Data on the average retention of proteins contained in Table 1.

| Treatment | Protein retention (%) ± SD     | Transformation (%) ± SD |
|-----------|--------------------------------|-------------------------|
| PO        | 5.28a ± 0.20                   | 2.79a ± 0.04            |
| P1        | 5.39a ± 0.45                   | 2.82a ± 0.09            |
| P2        | 5.74a ± 0.21                   | 2.89a ± 0.04            |
| P3        | 5.64a ± 0.25                   | 2.87a ± 0.05            |
| P4        | 0.73 ± 6.49b                   | 0.14 ± 3.04b            |

Information:
SD  = Standard Deviation
PO  = Feed without the addition of Noni juice
P1  = woof Noni juice with the addition of 5 ml
P2  = woof Noni juice with the addition of 10 ml
P3  = woof with the addition of Noni juice 15 ml
P4  = woof with the addition of Noni juice 20 ml

Result from statistical tests show that the administration of Noni juice on commercial diets showed significantly different results between treatments ($p> 0.05$) on the retention of fish protein catfish, based on data, Table 1 shows that there is an increase in protein retention in treatment P2 P3 and P4. Protein retention is highest in treatment P4 (6.49%), treatment no different from P0 P1 and protein retention was lowest for the P0 (5.28%).

Protein retention is a picture from the number of a given protein, which can be absorbed and used to build or repair damaged body cells, and utilized the body of fish for daily metabolism [23].
Statistical analysis showed that the administration of Noni juice via commercial diets had a significant effect on the protein in catfish (p> 0.05). Table 1 shows that there is an increase in protein retention in treatment P2 P3 and P4. Protein retention is highest in treatment P4 (6.49%), treatment no different from P0 P1 and protein retention was lowest for the P0 (5.28%).

Administration of Noni juice in treatment P4 (20 ml/kg) of feed gives the best results and can increase the value retention of the protein compared to feed without the administration of noni juice, it is presumably because of the high level of absorption in the gastrointestinal tract caused by the activity of xeronine. Xeronine serves to activate enzymes and regulate the formation of proteins, also helps expand the hole of the small intestine, making it easier fill intestine in the process of absorption of food [19, 20] The statement is in accordance with xeronine can enable multiple enzymes and regulate the formation of proteins [19, 24]. P3 treatment retention of high value,

Treatment P1, P2, P3, and P4 indicates that the value retention of the protein in catfish has increased, it is shown that fish can utilize the feed so that the optimal body weight may increase because the feed can be digested optimally and the feed is absorbed in the body and can be changed became flesh.

3.2. Fat retention

The results, the retention values ranging from 11.19-15.71% fat. Data retention can be seen in Appendix 3. Data on the average retention of fat contained in Table 2.

| Treatment | Fat retention (%) ± SD | Transformation ± SD |
|-----------|------------------------|---------------------|
| P0        | 11.19 ± 2.62           | 3.32 ± 0.39         |
| P1        | 12.75 ± 1.77           | 3.56 ± 0.25         |
| P2        | 13.76 ± 2.52           | 3.69 ± 0.33         |
| P3        | 12.27 ± 2.71           | 3.48 ± 0.38         |
| P4        | 15.71 ± 1.74           | 3.95 ± 0.21         |

Information :
SD = Standard Deviation
PO = Feed without the addition of Noni juice
P1 = feed Noni juice with the addition of 5 ml
P2 = feed Noni juice with the addition of 10 ml
P3 = feed with the addition of Noni juice 15 ml
P4 = feed with the addition of Noni juice 20 ml

Result statistical tests show that the administration of noni juice in commercial feed showed results that were not significantly different between treatments (p>0.05) on the retention of fatty fish catfish. Based on data Table 2 shows that there is an increase in fat retention in treatment P1, P2, P3 and P4. It is the highest fat retention in treatment P4 (15.71%), and lowest for fat retention in treatment P0 (11.19%).

Kristiana et al. [25] found that noni fruit extract increases growth and protein retention of tilapia. According to [26] describe the ability of fat retention fish store and utilize dietary fat. Statistical analysis showed that the administration of Noni juice in commercial feed showed results that were not significantly different between treatments (p> 0.05) on the retention of fatty fish catfish. Based on the data in Table 2 shows that there is an increase of fat retention in treatment P1, P2, P3, and P4. It is the highest fat retention in treatment P4 (15.71%), and lowest for fat retention in treatment P0 (11.19%).

These results show that the retention of fat did not show significant differences, but the retention of fat tends to increase with increasing levels of noni juice. This is due to the high-fat content of noni juice so that the fat content in the diet and body fat also tends to increase. High levels of this fat can be stored or used as an energy source. This is in accordance with the opinion [27] who said that one
of the functions of fat or lipid is as a producer of energy, per gram of lipid produce about 9 to 9.3 calories, excessive energy in the body is stored in adipose tissue as potential energy. Low-fat retention value because the content of the feed protein metabolism high enough for the high energy required. The amount of fat that is used to generate the likelihood is much greater than that stored in the body, resulting in low-fat retention. Here we can see that the fat can serve as protein-sparing effect to provide energy in connection with increasing protein feed.

3.3. Quality water
Data parameter values water quality in fish farming catfish can be seen in Table 3

| Parameter                          | PO  | P1   | P2   | P3   | P4   |
|------------------------------------|-----|------|------|------|------|
| Temperature (°C)                   | 27-28 | 27-28 | 27-28 | 27-28 | 27.5 |
| Oxygen Dissolved (mg / liter)      | 4-6  | 4-6  | 4-6  | 4-6  | 4-6  |
| pH                                 | 6-7  | 6-7  | 6-7  | 6-7  | 6-7  |
| Ammonia (mg / liter)               | 0.5-1 | 0.5  | 0.5  | 0.5-1 | 0.5  |

Water quality parameters measured include temperature, pH, ammonia and dissolved oxygen. The water temperature in the study ranged from 27-280C, the temperature optimal for catfish. This opinion is reinforced by [28] stating catfish (Clarias sp.) Live in a temperature range of 22-34°C. The results of pH measurement indicate the range between 6.5 to 7.4. According to [28] acidity for the growth of catfish (Clarias sp.) is 6 - 9. DO in the study ranged from 4-6 mg/l, the DO range optimal for fish catfish. This opinion is reinforced by Wijanarko [28] that declared dissolved oxygen levels in the waters are ideal for the growth of catfish (Clarias sp.) is > 1 mg/l. The measurement results of ammonia in this study indicate the range between 0.5-1 mg/l.

4. Conclusion
Based on the results research has been done on the addition of Noni juice in commercial feed on the retention of protein and fat retention catfish fish, it can be concluded as follows: a) the addition of noni juice on commercial diets significant effect on the retention of the protein in catfish (Clarias sp.), and b) the addition of Noni juice on commercial diets do not provide a real impact on the retention of fat in catfish (Clarias sp.).

5. References
[1] Witjaksono, A 2009 Production Performance Separating Sangkuriang catfish (Clarias sp) Through Water Media Technology Application Height 15cm, 20cm, 25cm, 30cm essay Study Program Aquaculture Technology and Management Faculty of Fisheries and Marine Science, Bogor Agricultural University
[2] Ramadan, R and Sari LA 2018 J Aqua.Fish Health 7, 124-132
[3] Ardyanti, R, DD Nindarwi, LA Sari and PDW Sari 2018 J. Aqua Fish Health 7, 84-89
[4] Mukti, AT, M Arief, LA Sari Dewi NN, AP Rahayu 2019 Grouper 10 (1), 11-17
[5] Son EM, Mahasri G and Sari LA 2018 Journal Aqua Fish Health 7, 111-117
[6] Ministry of Maritime Affairs and Fisheries Analisisidan 2013 The main data of marine and fishery by province in 2012 The data center, statistics and information Ministries kelautan general secretariat and fisheries, Jakarta
[7] Arief M, N and S Subekti Fitriany 2014 JFMS 6 (1)
[8] Setyawati, F, WH Satyantini, M Arief, Kismiyati and Pujijastuti 2018 Journal Of Aquaculture And Fish Health 7 (2): 50-56
[9] Daughter ADA and W Tjahjaningsih 2018 J. Aqua Fish Health 7, 111-117
[10] Mubarak, US, L Sulmartiwi and DTR Tias 2009 J. Fish and Mar 1, 67-72
[11] Arsad, S, C Stavrakakis, V Turpin, P Rossa, Y Risjani, LA Sari, FS Prasetiya, JL Mouget 2019
IOP Conference Series: Earth and Environmental Science 236 (1): 012 044

[12] Sari LA, Masithah ED and Alamsjah MA 2018 JFMR 2, 9-14

[13] Hadadi,A, KT Herrera, E Wibowo, A Pramono, Surahman, and E Ridwan 2009 Aquaculture Center Sukabumihal 175-181

[14] National Research Council (NRC) 1993 Nutrient Requirements of Fish Washington DC: National Academy of Science Press

[15] Sugih, FH 2005 Effects of Probiotics in addition to Pertum uhan Commercial Feed Seed Gurami (Osphronemus Gourami Lac) Essay published Padjadjaran University

[16] Adams,CA 2000 Proc Aust Poult Sci Symp 12: 17-24

[17] Adrian MT, AN Fatima, FL Nabela and AK Wardani 2015 Journal of Food and Agro-Industry 3 (3)

[18] Mukti A T, Dewi E, Satyantini W H, Sulmartiwi L, Sudarno and Hassan M 2019 IOP Conf. Series: Earth Environ. Sci. 236, 012093 doi:10.1088/1755-1315/236/1/012093

[19] Wang,MY, BJ West, CJ Jensen, D Nowicki, C Su, AK Hammer, & G Anderson, 2002, Acta Pharmacol Sin, 23 (12 ), 1127-1141

[20] Peter, 2005 Chemical Constituents and Noni's Function, Noni Indian News Magazine, Issue of October (2)

[21] Haryati, Saade E and Institution A 2011 Effect of substitution of Fish Meal by Maggot Meal on Retention and Utilization Efficiency Body Nutrition of milkfish Faculty of Animal Husbandry, University Hassanudin, Makassar It 6-9

[22] Agustono, H Setyono, T Nurhajati, M Lamid, MA Al-Arief and W P Lokapinasari 2011 Fish Nutrition Practice Guidelines Faculty of Fisheries and Marine Resources Airlangga University Surabaya page 23

[23] Lane, ID 2000 Requirements Essential Amino Acids in Fish Rations Publisher Kanasius, Jakarta

[24] Potterat,O and M Hamburger 2007 Morinda citrifolia (Noni) Fruit- Phytochemistry, Pharmacology, Safety Institute of Pharmaceutical Biology University of Basel Switzerland Planta Med 73

[25] Kristiana V, Mukti A T and Agustono 2019 AACL Bioflux 12 (in press)

[26] Agustono, H Setyono, T Nurhajati, M Lamid, MA Al-Arief and W P Lokapinasari 2011 Fish Nutrition Practice Guidelines Faculty of Fisheries and Marine Resources Airlangga University Surabaya page 3, 7

[27] Aslamyah S 2008 Based Learning Course SCL in Nutritional Biochemistry UNHAS Makassar

[28] Wijanarko P 2002 Water Quality Management Study diktar Department of Water Resource Management Brawijaya University Poor

Acknowledgments
The authors gratefully acknowledge the financial support from the Annual Budget of the Faculty of Fisheries as well as the instrument support.