2. Then the viscera of the fish are mixing until smooth.
3. The already fine offal is put into a container, and mixed with additional ingredients such as fine bran, cornstarch and starch as a traditional adhesive and then mix thoroughly.
4. After that the pellet dough is put into the pellet printing machine, then the formed pellets are dried in a 45^{o} C temperature blower oven for 8 hours.

In the research of Pinandoyo *et al.* (2020), it was stated that the nutritional content of the feed with a combination of 0% offal flour and 60% fish meal has about 30%, protein, 7.23% fat, 29.22% carbohydrates, 13.22% ash, and 20.29% crude fiber. The combination of 20% fish offal flour and 40% fish meal has about 31.79% protein, 7.43% fat, 29.22% carbohydrates, 11.16% ash, and 20.46% crude fiber. The combination of 40% fish offal flour and 20% fish meal has 30.10% protein, 7.63% fat, 29.39% carbohydrates, 11.16% ash, and 20.46% crude fiber. Finally, the combination of 60% fish offal flour and 0% fish meal has 29.56% protein, 7.78% fat, 30.49% carbohydrates, 12.72% ash, and 19.45% crude fiber.

According to Wulandari (2000), the manufacture of fish silage in Indonesia has developed and is known in two ways, namely chemically and biologically which will then be fermented. Chemical manufacturing uses the addition of strong acids, namely mineral acids (inorganic acids) which are very corrosive so that they need to be neutralized first before use (Akhirani 2011). The neutralization process requires additional time and costs so it is very ineffective to use. The acids commonly used are formic acid and propionic acid while other organic acids such as benzoic acid, acetic acid, sorbic acid, and citric acid are rarely used, even though the price is relatively the same and is also easy to obtain in the market. Biological manufacturing is utilizing certain microbes (lactic acid bacteria) by adding carbohydrate sources such as bran, pollard or molasses.

The process of making fish silage made from fish offal according to Handajani (2014), is carried out in two stages, namely the first stage of cleaning and grinding fish offal and the second stage is mixing or homogenizing the grinding results of fish offal with probiotic microorganisms (*Lactobacillus casei* and *Saccharomyces cerevisiae*) + molasses. Then fermented for two weeks (Abun *et al.* 2004) inside a sealed container. During the fermentation process, do not forget to do stirring 3 times during the first 3 days and 1 time per day after 3 da ys. stirring is carried out to homogenize silage during the hardening process (Suharto 1997).

The nutritional protection of fish offal silage based on the research of Sulistyoningsih (2015), it is stated that fish offal silage has a nutritional content consisting of 15.49% crude protein; 35.59% crude fat; 19.33% crude fiber; 0.86% calcium, 1.15% phosphorus; with metabolic energy (EM) 3593.67 Cal / g. Silage is said to be good if it has a pH of 3-4, sour smell (dominated by lactic acid), not moldy, contains lactic acid bacteria more than 10^6 and has almost the same nutritional value as the original ingredient (Sulistyoningsih 2015).

Fish silage can be used as a preserve for animal feed ingredients or fish without reducing the quality of the ass. In some studies, fish silage was used to improve the quality and quantity of farm animals or fish. Fish offal silage can be used as a mixed ingredient in fish feed formulations. Silage can increase protein content, inhibit the activity of putrefactive organisms and help the breakdown of proteins into short peptides or easily digestible amino acids (Kompiang and Liyas 1983).

CONCLUSION

Based on the literature of the review, fish offal contains protein of 14.01±0.68% lipids of 20.00±1.04%, minerals of 4.75±0.64 and water of 60.62±2.15%. This fish offal can be processed into non-food products that have high relative added value. Products that can be made are liquid fertilizers, hydrolyzed into peptones, extracted to take (isolated) enzymes, made feed ingredients and fermented into silage as a feed ingredient.

BIBLIOGRAPHY

Abun, Denny, R., and Deny, S. 2004. *Effect of Tuna Fish Waste Treatment Method (Thunus Atlanticus) on Nutritional Content and Metabolic Energy Value in Broilers*. Research Report. Padjadjaran University. Bandung.

Aditya, S., Suparmi, and Edison. 2015. Study of Manufacture Solid Organic Fertilizer From Fisheries Waste. *Jomfaperika*, 2 (2): 1 – 11.

Akhdiya, A. 2003. Isolation of thermostable alkaline protease enzyme-producing bacteria. *Proceedings of ITB Engineering Science*, 9(2):129-159.

End, N. 2011. *Fish Silage For Animal Feed*. UPTD-PSP3 South Sulawesi Provincial Livestock Service. South Sulawesi.

Ariyani F, Heruwati ES, Murdinah, Wibowo TBS, Susetyo AR. 2001. Utilization of tuna fish heads and stingray entrails as a source of coarse pepton for microorganism growth media. Indonesian Journal of Fisheries Research 7: 75-84.

Atma, Y., Taufik, M., and Seftiono, H. 2018. Risk Identification of Food Product HalalNess: A Biotechnology Product Study. *Journal of Technology*, 10 (1): 59-66.

Bhaskar N, Mahendrakar NS. 2008. Protein hydrolisate from visceral waste protein of catla (Catla catla): Optimization of hydrolysis condition for a commercial neutral protease. Bioresource Technology 99:4105-4111

Caruso, G. 2015. Fishery Wastes and By-products: A Resource to Be Valorised. *Journal of Fisheries Sciences*. 9 (4): 080–083.

Djarijah, A. S. 1996. *Cattle Business*. Kanisius. Yogyakarta.

Ghaly, A. E., Ramakrishnan, V. V., Brooks, M. S., Budge, S. M., and Dave, D. 2013. Fish Processing Wastes as a Potential Source of Proteins, Amino Acids and Oils: A Critical Review. *J Microb Biochem Technol*, 5 (4): 107–129.

Gildberg A. 1992. Recovery of Proteinase and Protein Hydrolysate from Fish Viscera. *Bioresource Technology*, 39: 271-276.

Handajani, H. 2014. Improving the Silage Quality of Fish Waste Biologically By Utilizing Lactic Acid Bacteria. *Gamma Journal*, *9* (2): 31-39.

Hapsari, N and Welasi, T. 2013. Utilization of Fish Waste into Organic Fertilizer. *Journal of Environmental Engineering*, 2 (1): 1–6.

Hossain, U., and Nature, A. K. M. N. 2015. Production of Powder Fish Silage from Fish Market Wastes. *Agric. Sci*, 13 (2): 13- 25.

Ihemanma, A., and Ebutex, C. 2013. A Contrast Between Fish Offal's Fertilizer, Chemical Fertilizer and Manure Applied to Tomato and Onion. *Advances in Aquaculture and Fisheries Management*, 1 (9): 090-093.

Jayanti, Z. D., Herpdani, H., and Lestari, S. D. 2018. Utilization of Fish Waste into Silage Flour with the Addition of Hyacinth Flour (*Eichhornia crassipes*). *Fishtech Journal*, 7 (1): 86–97.

Jigme, Jayamangkala, N., Sutigoolabud, P., Inthasan, J., and Sakhonwasee, S. 2015. The Effect of Organic Fertilizers on Growth and Yield of Broccoli (*brassisca oleracea* L. var. *Italica plenck* cv. top green). *Journal of Organic Systems, 10*(1), 9-14.

Kara, M., Sivri D, Koksel H. 2005. Effects of High Protease-Activity Flours and Commercial Proteases on Cookie Quality. *Food Research International*, 8: 479-486.

Khalil, A. A. 2012. Protein characterization of the Aqueous Soluble Phase of Acidified and Autolyzed Bolti Fish (*Tilapia nilotica*) Viscera. Asian Journal of Biotechnology, 4 (3): 108-119.

Company, 1. P . and S. Iiyas, 1983. Silage Fish Processing, Usage and The prospects In Indonesia. *Journal R&D Agriculture*, 11(1) : 13 – 18.

Kurniawati, D., Rahayu, Y. S., and Fitrihidajati, H. 2018. Effect of Applying Organic Liquid Fertilizer from Organ Waste in Fish on the Growth of Red Spinach Plants (*Alternanthera ficoides*). *LanternBio: Biological Scientific Periodicals*, 7 (1): 1–6.

Najim, S. M., Al-Noor, J. M., and Al-Waely, W. A. 2015. Extraction of Crude Peptone from Fish Wastes For Use As A Nitrogen Source In Microbiological Media. *Global Journal of Fisheries and Aquaculture Researches*, 2: 29-37.

Niddai, N. H., Suwarni, A., and Amalia, R. 2015. Effect of Spraying Liquid Organic Fertilizer for Fish Offal Waste and Pineapple Skin Waste on the Growth Rate of Mustard Green Plants (*Brassica juncea*). *Sanitation: Journal of Environmental Health*, 6 (3): 135–141.

Nurhayati, T., Desniar, and Suhandana, M. 2013. Making Pepton Enzymatically using Raw Materials for Cob Fish Offal. *Journal of Indonesian Fishery Products Processing*, 16 (1): 1-11.

Nurhayati, T., Nugraha, R., and Lihuana, D. N. 2020. Characterization of the Trypsin Ammonium Sulfate Fraction Isolated From the Intestines of Cob Fish (*Euthynnus affinis*). Journal of Indonesian Fishery Products Processing, 23 (2): 372-382.

Pinandoyo, Syakirin, Endar, V. 2020. Effect of Different Combinations of FishMeal and Milkfish Offal Flour on Artificial Feed on Feed Utilization Efficiency and Juvenile Growth of Tiger Shrimp (*Penaeus monodon*). *The Aquifer Pen*, 19 (1): 12-25.

Pratomo, M. D., Wardanidan, D. W., Revonagara, N. A., Ersyah, D., Setijawati, D., Yufidasari, H. S., and Jaziri, A. A. 2020. Characteristics of Pepton from Kurisi Fish Waste (*Nemipterus* sp.) as a Halal Guaranteed Bacterial Growth Medium. *Journal of Aquaculture and Fish Health*, 9 (2): 104-113.

Ratnasari, I., Maryani, and Nursiah. 2020. Addition of Catfish Offal Silage to Catfish Growth and Survival (*Clarias* sp.). *Journal of Oceanic Aquaculture of Rivers and Lakes*, 5 (2): 44-49.

Renzetti S, and Arendt, E. K. 2009. Effect of protease treatment on the baking quality of brown rice bread: From textural and rheological properties to biochemistry and microstructure. *Journal of Cereal Science* 50: 22-28.

Safaria, S., Idiawati, N., and Zaharah, T. A. 2013. Effectiveness of Cellulase Enzyme Mixture Of Aspergillus niger and Trichoderma Reesei In Hydrolyzing Coconut Husk Substrate. *Journal of Equatorial Chemistry*, 2 (1): 46-51.

Sianturi, I. T., Panuntun, F., and Indang, F. 2022. Utilization of Fish Offal with Corn Husk Waste as An Alternative Feed for Catfish. *Clarias*, 3 (1): 28-30.

Simpson BK. 2000. Digestive proteinases from marine animals. In: Haard NF, SimpsonBK (Eds), *Seafood enzymes: utilization and influence on postharvest seafood quality*. New York: Marcel Dekker.

Suhandana, M., Pratama, G., Jumsurizal, Putri, R. M. S., and Septyaningtyas, R. D. 2018. Chemical Composition of Fish Offal Protein Hydrolysate with the Concept of Autolysis Using Internal Enzymes in Fish. *FishtecH - Journal of Fishery Products Technology*, 7 (2): 124 - 130.

Suharto. 1997. Fish Silage Making Techniques. *Journal of Non-Researcher Functional Workshops*. Ciawi Livestock Research Center. Bogor.

Sulistyoningsih, M. 2015. The Effect of Giving Fish Waste Silage on The Protein Content of Meat and Broiler Meat Fat as an Effort to Improve Food Quality. *Pros Sem Nas Masy Biodiv Indon*, 1 (2): 378-382.

Suptijah P. 1998. Extraction of Protease from Tuna Fish Waste. Bulletin of Fishery Products

Technology, Vol.V, No.1 : 56 – 63.

Wulandari, Ayu. 2000. E*valuation of Nutritional Value of Fish Silage Flour by Chemical Method and Binding Material of Rice Bran and Pollard*. Thesis. Bogor Agricultural Institute. Bogor.

Zahroh, F., Kusrinah., and Setyawati, S. M. 2018. C omparison of Variations in the Concentration of Liquid Organic Fertilizer from Fish Waste against the Growth of Red Chili Plants (*Capsicum annum* L.). *Al-Hayat: Journal of Biology and Applied Biology*, 1 (1): 50-57.