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Utilization of Milkfish Offal *(Chanos chanos)* as a Shrimp Paste Product with Different Salt Concentrations

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Abstract

High milkfish production results in high processing waste, such as fish offal which is often simply disposed of without optimal utilization. This study aims to utilize milkfish offal as a raw material for making shrimp paste with variations in salt concentration. The study used the Complete Random Design (RAL) method with three different salt treatments, namely 0% as a control, 15% and 20%. The parameters tested included proximate analysis (water, carbohydrates, proteins, fats and ash) as well as sensory tests (appearance, aroma, taste and texture). The results of the proximate test showed 0% salt concentration with a water content value of 15.37%, carbohydrate content of 34.32%, protein content of 32.21%, fat content of 15.91%, ash content of 2.18%. Salt concentration is 15% with a water content value of 14.57%, carbohydrate content of 32.54%, protein content of 26.92%, fat content of 13.46%, ash content of 12.52%. Salt concentration 20% with a water content value of 14.71%, carbohydrate content 32.34%, protein content 24.52%, fat content 13.04%, ash content 15.39%. The results of the sensory test showed 0% salt concentration with a value of 7.8, smell 7.67, taste 7.13, texture 7.53. Salt concentration 15% with appearance value of 7.93, smell 8.33, taste 8, texture 7.4. Salt concentration 20% with appearance value 7.6, smell 7.73, taste 7.4, texture 7.07. In conclusion, the water, protein and sensory content have met the requirements of SNI (water max 35%, protein min 15% and sensory min 7), the results of ANOVA statistical analysis, show that the variation in salt concentration has a real effect on the proximate and has no real effect on the sensory value.

Keywords: milkfish; offal; shrimp paste products; salt

Abstrak

Produksi ikan bandeng yang tinggi menghasilkan limbah pengolahan yang tinggi, seperti jeroan ikan yang sering kali hanya dibuang tanpa pemanfaatan yang optimal. Penelitian ini bertujuan untuk memanfaatkan jeroan ikan bandeng sebagai bahan baku pembuatan terasi dengan variasi konsentrasi garam. Penelitian menggunakan metode Rancangan Acak Lengkap (RAL) dengan tiga perlakuan garam yang berbeda yaitu 0% sebagai kontrol, 15% dan 20%. Parameter yang diuji meliputi analisis proksimat (air, karbohidrat, protein, lemak dan abu) serta uji sensori (kenampakan, aroma, rasa dan tekstur). Hasil uji proksimat konsentrasi garam 0% dengan nilai kadar air 15,37%, kadar karbohidrat 34,32%, kadar protein 32,21%, kadar lemak 15,91%, kadar abu 2,18%. Konsentrasi garam 15% dengan nilai kadar air 14,57%, kadar karbohidrat 32,54%, kadar protein 26,92, kadar lemak 13,46%, kadar abu 12,52%. Konsentrasi garam 20% dengan nilai kadar air 14,71%, kadar karbohidrat 32,34%, kadar protein 24,52%, kadar lemak 13,04%, kadar abu 15,39%. Hasil uji sensori konsentrasi garam 0% dengan nilai kenampakan 7,8, bau 7,67, rasa 7,13, tekstur 7,53. Konsentrasi garam 15% dengan nilai kenampakan 7,93, bau 8,33, rasa 8, tekstur 7,4. Konsentrasi garam 20% dengan nilai kenampakan 7,6, bau 7,73, rasa 7,4, tekstur 7,07. Kesimpulannya kadar air, protein dan sensori telah memenuhi persyaratan SNI (air maks 35%, protein min 15% dan sensori min 7), hasil analisis statistik ANOVA, menunjukkan variasi konsentrasi garam berpengaruh nyata terhadap proksimat dan tidak berpengaruh nyata terhadap nilai sensori.

***Kata Kunci**: garam; jeroan; ikan bandeng; produk terasi*

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INTRODUCTION

Fish is one of the sources of protein Fish is one of the sources of animal protein and has a high nutritional content including minerals, vitamins, and unsaturated fats, (Asmara et al., 2023; Nusa, 2019; Wicaksono, 2023). Protein is needed by the body for growth and replacement of

damaged body cells. Foods that contain high protein are fish, which is about 20%. Milkfish *(Chanos chanos)* is one of the commodities that is widely cultivated and quite popular among the community. Milkfish or more familiarly known as sponge fish by the Bugis and Makassar people is a fish that is widely consumed in Indonesia, as well as a favorite fish for the people of Makassar, (Iskandar et al., 2023). Based on data from the Ministry of Maritime Affairs and Fisheries, milkfish production in South Sulawesi has continued to increase since 2021, (Putra et al., 2022). In addition, the demand for milkfish from various countries has also increased in 2023, with total exports reaching 1,208.8 tons. Increasing milkfish production, waste (by-products) is increasing, this is because MSMEs processed milkfish products are also increasing, (Luthfiyana et al., 2023). Koli et al (2012) stating that 3/4 of the total weight of fish is waste. Fishery waste is estimated to have a proportion of about 30-40% of the total weight of fish consisting of the head (12.0%), bones (11.7%), fins (3.4%), skin (4.0%), spines (2.0%), and offal (4.8%). Fish waste in the form of blood, mucus, bones, skin, fins, head, fins and offal can cause unpleasant odors and interfere with health because it pollutes the environment, (Atma, 2016).

Cahaya Bandeng SME is a Small and Medium Enterprises (SMEs) located in Kursuminge Village, Tanralili District, Maros Regency, South Sulawesi. UKM Cahaya Bandeng is engaged in fish processing, especially milkfish. The main product of Cahaya Bandeng UKM is milkfish without thorns. In addition, there are several other products, namely shredded milkfish, presto milkfish, sponge kambu and other processed milkfish products. The large market demand for spinless milkfish products has increased production so that the waste produced from the rest of the product processing is increasing. Waste or by-products from product processing are only disposed of and not used properly, so they can pollute the environment. One way to utilize milkfish offal is to make shrimp paste. Shrimp paste is a simple fermentation product, the process is through the addition of salt and stored in a closed condition for a certain time. Salt in the fermentation process serves as a preservative and flavoring agent.

Thariq et al (2014) states that the growth of pathogenic bacteria and rotting bacteria can be prevented with salt. The addition of an optimal amount of salt to fermented products will stimulate the growth of lactic acid bacteria that can inhibit pathogens, (Sarofa & DS, 2017). According to Yuliana (2007) Lactic acid bacteria are tolerant of high salts and produce antimicrobial compounds, one of which is lactic acid. BAL (Lactic Acid Bacteria) is safe for humans so it can be applied as a probiotic agent because it belongs to the group of good bacteria and meets GRAS status (Generally recognized As Safe), (Putri & Kusdiyantini, 2018). The quality of shrimp paste is greatly influenced by the concentration of salt used during fermentation because the growth of salt-resistant bacteria affects the quality of fermented products. Salt can form certain fermentation conditions that help microorganisms that are halotolerant (salt-resistant) and trigger reactions that produce certain characteristics in the shrimp paste produced. The fermentation process will break down amino acids from the raw materials through enzyme activity into glutamate acid, (Anggo et al., 2015). The glutamic acid content gives the shrimp paste a savory taste. The higher the activity of proteolytic enzymes during the fermentation process, the higher the amino acids will also produce. The high salt content in shrimp paste will inhibit the activity of proteologic enzymes, thus causing a savory taste. Another function of salt in fermentation is that it can attract water in a material. Salt can also inhibit the work of proteolytic enzymes in hydrolyzing carbohydrates, proteins, and fats so that the ability to produce simple molecules and volatile compounds is inhibited, which will affect the characteristics of shrimp paste, (Majid et al., 2014).

Based on the above problems, it is important to do so because it offers innovative solutions in the management of fishery waste, especially milkfish offal. If successful, shrimp paste products from fish offal can be an economical and environmentally friendly alternative, as well as provide additional benefits for fisheries industry players, especially small and medium scale. In addition, this research supports efforts to diversify local food based on national biological resources and opens opportunities for the development of new processed products with high selling value. Furthermore, the results of this research can be the basis for the development of local fermentation technology with a scientific approach that considers sensory aspects and nutritional value. It is hoped that the results can be developed on a scale of household industry to medium-scale industries to improve the welfare of

coastal communities. In addition, this research is in line with the principles of the circular economy which emphasizes the reuse of organic matter and waste reduction.

METHOD

The research method used was Complete Random Design (RAL) (Brown & Melamed, 1990; Rahmawati & Erina, 2020) with experimental labolatory testing, (Arziyah et al., 2022; Brown & Melamed, 1990) which aims to find out how the proximate content contained in shrimp paste with salt concentrations of 0%, 15%, and 20% and to determine the effect of salting concentration on the nutritional value of shrimp paste in milkfish offal. The research location was carried out at UKM Cahaya Bandeng Maros where shrimp paste was made at the Fishery Products Technology Laboratory, Balik Diwa Institute of Maritime Technology and Business, Makassar and testing was carried out at the Feed Chemistry Laboratory, Faculty of Animal Husbandry, Hasanuddin University. The making of shrimp paste is made using the method of making shrimp innards of skipjack fish by (Nenabais et al., 2018) which is modified with the following stages: (a) Milkfish offal is cleaned, (b) given lime juice, (c) then put in an oven temperature of 700C for 24 hours, (d) after that the milkfish offal is mashed and weighed at a dose of 8 grams of milkfish offal samples, 2 grams of tapioca flour and 4 grams of brown sugar, (e) then the addition of different salt concentrations to the sample with a variation in salt concentration of 0%, 15% and 20%, (f) after the salt mixing process, the shrimp paste is put in an oven at 700C temperature for 6 hours, (g) then fermented for 15 days. Data collection is carried out and obtained using a formula that will be presented in the form of a table containing the percentage of laboratory test results and sensory testing. The data analysis technique is using the SPSS (Software Statistical Package for Social Science) application (Ghozali, 2018) annihilated data using One-Way ANOVA to find out the difference in each treatment given, (Ramdani et al., 2025).

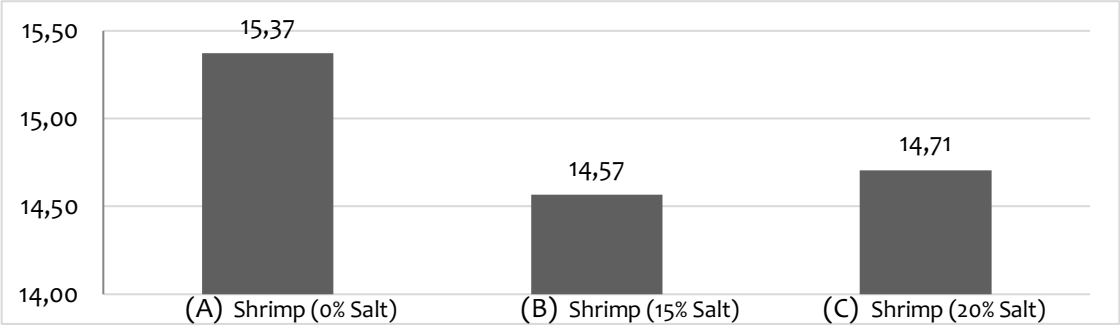
RESULT AND DISCUSSION

One of the leading commodities that is widely cultivated in Indonesia is milkfish *(Chanos chanos)*. This fish is widely known as a highly nutritious and easy-to-process food. However, in the process of processing milkfish, the offal is often considered waste and has not been utilized optimally. In fact, milkfish offal has the potential as an alternative raw material in the manufacture of fermented products such as shrimp paste because of its high protein and fat content. The results of the research on the Utilization of Milkfish Offal *(Chanos chanos)* as a Shrimp Paste Product with Different Salt Concentrations in Cahaya Milkfish Maros UKM are described as follows:

Water Content

The results of the analysis of the moisture content of shrimp pasted milk milk offal *(Chanos chanos)* in treatment A had an average value of 15.37%, treatment B had an average value of 14.57%, treatment C had an average value of 14.71% which can be presented in figure 1 below:

Figure 1.
Moisture Content of Shrimp Paste, Milkfish Offal (*Chanos chanos*)



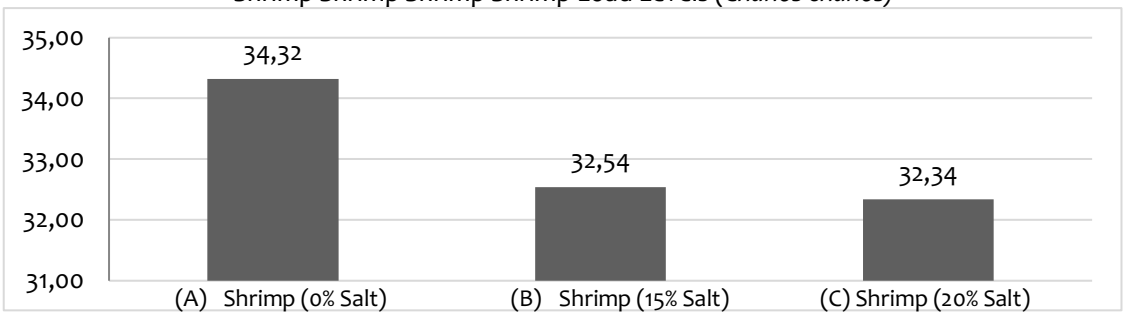
Source: research data processing results

The results of the analysis in Figure 1. The highest moisture content was found in shrimp paste A (control) with an average of 15.37%. This is due to the osmosis process involving salt in shrimp paste. Salt draws water from foodstuffs through the process of osmosis when salt is added, the water molecules present in the shrimp paste will move out causing a decrease in the moisture content in the shrimp paste. Low moisture content can affect the concentration of proteins, fats and carbohydrates. The results of the moisture content analysis showed that the difference in salt concentration in the sample affected the water content value in milkfish offal shrimp (Chanos chanos). The three treatments A, B and C have met the SNI 2716:2016 standard with a maximum moisture content of 35% with the lowest moisture content value by treatment B with a value of 14,57%. Bakhiet & Khogalie (2012) explained that the lower the moisture content, the more durable the shrimp paste will be. The results of the statistical test using ANOVA showed that all treatments were significantly different in terms of moisture content because they had a value of sig ($p<0.05$), because of this difference, it was continued with the Tukey test. These results show that treatment A has a different moisture content from treatment B and C. While treatment B and C are not different.

Carbohydrate Content

The results of the analysis of the carbohydrate content of shrimp innards of milkfish *(Chanos chanos)* in treatment A had an average value of 34.32%, treatment B had an average value of 32.54%, treatment C had an average value of 32.34%. which can be presented in figure 2 below:

Figure 2.
Shrimp Shrimp Shrimp Shrimp Load Levels *(Chanos chanos)*



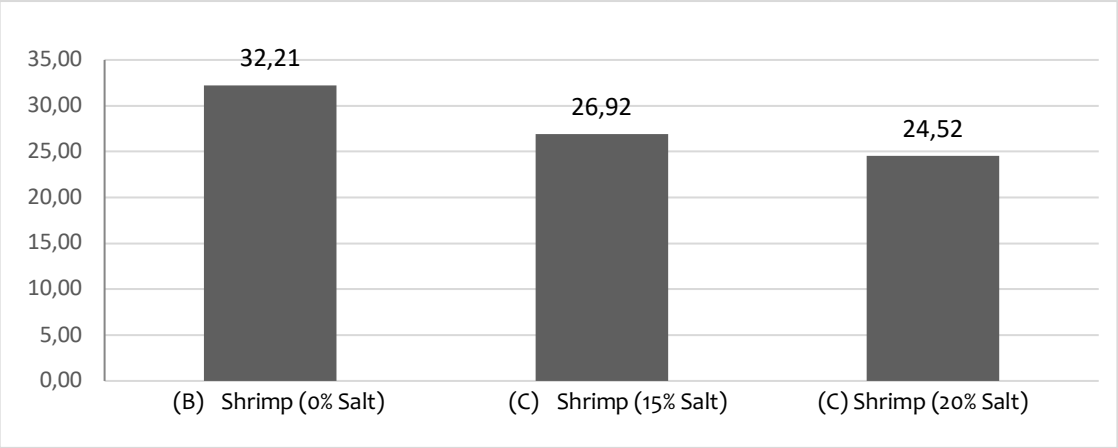
Source: research data processing results

Results of the analysis of Figure 2. The carbohydrate content of the shrimp paste sample A (control) that was not given a salt concentration had a carbohydrate content with an average value of 34.32%, which was the highest value. Meanwhile, treatment B is 15% salt) and C (20% salt) with an average value of B of 32.54% and an average value of treatment of C of 32.34%. This happens because glucose-soluble carbohydrates, sucrose, olisaccharides can be concentrated when salt is added in foodstuffs, (Xia et al., 2023). The enzyme activity of microorganisms involved in carbohydrate metabolism such as amylase can be denatured due to high salt concentrations. Furthermore, the results of a statistical test using ANOVA showed that the application of salt had a real effect on the shrimp inlaid of milkfish *(Chanos chanos)* because it had a value of sig ($p<0.05$), the higher the salt concentration, the lower the carbohydrate content in the shrimp pasture. Because it had a real effect, the Tukey test was continued. These results show that treatment A has different carbohydrate levels from treatment B and C. While treatment B and C are no different.

Protein Up

The results of the analysis of the protein content of the shrimp paste in milkfish innards *(Chanos chanos)* in treatment A had an average value of 32.21%, treatment B had an average value of 26.92%, treatment C had an average value of 24.52% which can be presented in figure 3 below:

Figure 3.
Protein content of milkfish offal (*Chanos chanos*)



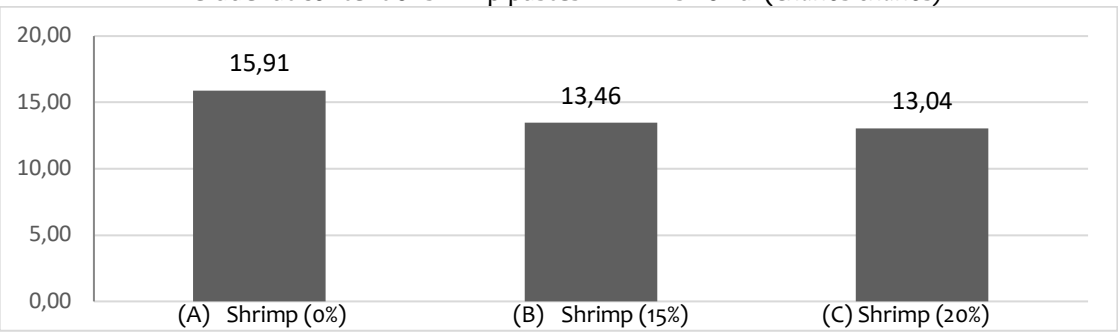
Source: research data processing results

The results of the analysis in Figure 3. The protein content in sample A (control) had the highest protein content of 32.21%, followed by treatment shrimp paste B (15% salt) and C (20% salt) respectively with values of 29.92% and 24.52%. This is thought to be due to the denaturation of proteins by salts during the fermtenation process which causes the transformation of proteins into amino acids. Protein denaturation will make the protein damaged, so that with more and more denatured protein, there will be a decrease in protein levels, (Mushollaeni & Tantalu, 2024). The results of the analysis can be found that the addition of different salt concentrations in shrimp paste affects the protein content in shrimp paste. Based on the quality and safety requirements of SNI 2716:2016 shrimp paste, the three samples of shrimp paste with badmouth fish *(Chanos chanos)* innards meet SNI standards with a protein content of more than 15%. The results of ANOVA's statistical analysis showed that the three samples had a significant effect on protein levels because they had a sig value ($p<0.05$). Because it has a real effect, it is continued with the Tukey test. The results of the Tukey test showed that the A, B and C treatments had different levels of proteins.

Crude Fat Rate

The results of the analysis of the fat content of milkfish offal in treatment A have an average value of 15.91%, treatment B has an average value of 13.46%, Treatment C has an average value of 13.04% can be presented in the image below:

Figure 4.
Crude fat content of shrimp pastes in milkfish offal (*Chanos chanos*)



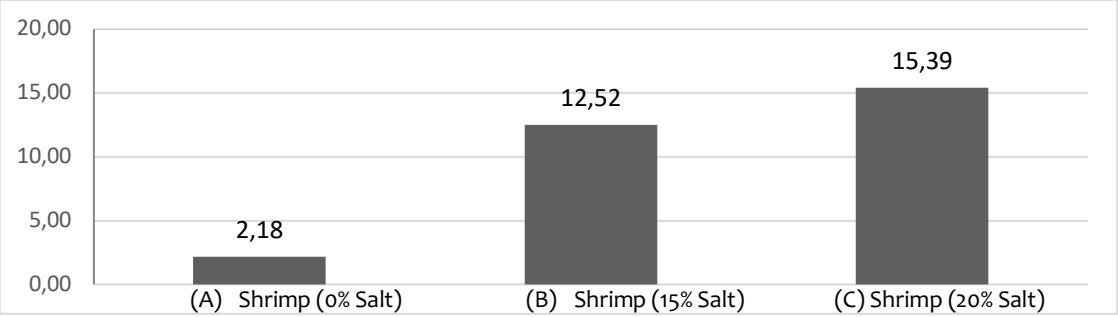
Source: research data processing results

The results of the analysis of the fat content of shrimp paste in milkfish offal in treatment A had an average value of 15.91%, treatment B had an average value of 13.46%, and Treatment C had an average value of 13.04%. analysis results in Figure 4. The crude fat content in sample A (control) had the highest average crude fat value of 32.21%, compared to the other samples, namely treatment B (15% salt) had an average value of 26.92% and in treatment C (20% salt) with the lowest average value of 24.52%. According to Latief et al., (2018) In his research, it was stated that fat levels caused by the influence of salt concentration occur because salt can act as a catalyst in the process of oxidation of food fats. Then, the results of ANOVA's statistical analysis showed that the treatment of 0%, 15% and 20% salt concentrations influenced the fat content of milkfish offal shrimp with a sig value ($p<0.05$). The higher the salt, the lower the fat content in milkfish offal (Chanos chanos). Because of the influence, it was continued with the Tukey test. These results show that treatment A has different fat content from treatment B and C. While treatment B and C are not different.

Up to Abu

The results of the analysis of the ash content of shrimp paste in milkfish offal *(Chanos chanos)* in treatment A have an average value of 2.18%, treatment B has an average value of 12.52%, treatment C has an average value of 15.39%, can be presented in the image below:

Figure 5.
Shrimp paste ash content of milkfish offal (*Chanos chanos*)



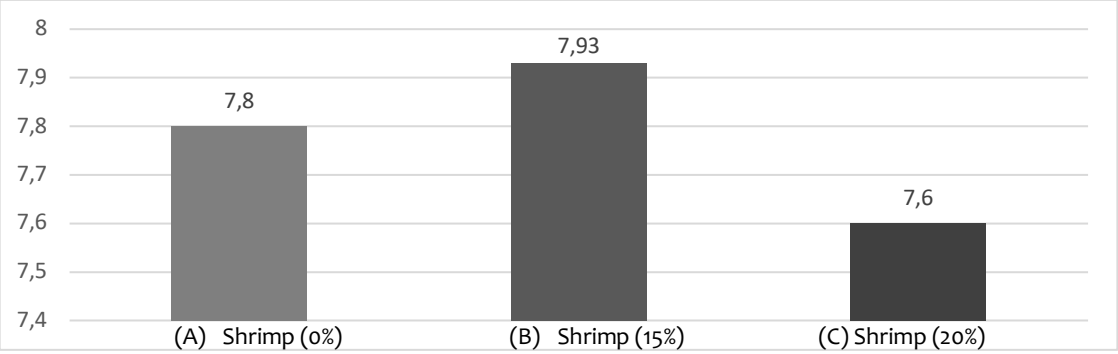
Source: research data processing results

Based on the results of the analysis in Figure 5. The lowest ash content value was in sample A (control) with an average value of 2.18%, while in treatment B (15% salt) and C (20% salt) the salt concentration had a very noticeable effect on the increase in ash content in both treatments. With the average value of sample B is 12.52% and in sample C it is 15.39%. According to (Fadhli et al., 2020) The more inorganic substances in the material, the higher the ash content. The impurities present in the salt can affect the amount of ash content. Based on research conducted by Latief et al., (2018) said that the increase in ash content is very closely related to the factor of adding salt as an inorganic compound. Salt is a crystalline mineral consisting of sodium (Na) and chlorine (Cl), so the addition of salt can increase the amount of minerals in the product and cause the ash content in the shrimp paste to be higher, (Fathurrozi et al., 2024). Hal ini sesuai dengan pernyataan (Purnamasari, 2014) that the ash content in food is closely related to the salt content as an inorganic compound. The addition of salt in various concentrations can increase the amount of minerals, especially sodium, so it can increase ash levels. The results of statistical analysis using ANOVA can be found that the application of different salt concentrations has a real effect on the ash content in the shrimp paste of milkfish offal *(Chanos chanos)* because it has a value of sig ($p<0.05$). The higher the salt content, the higher the ash content in the shrimp paste of milkfish offal (Chanos chanos). Because it is effective, it is continued with the Tukey test. The results showed that treatment A, B and C had different ash levels.

Sensory Appearance

The results of sensory tests on the appearance of shrimp paste of milkfish innards (*Chanos chanos*), namely treatment B with the highest value of 7.93, treatment A with a value of 7.8, and treatment C with the lowest value of 7.6 are presented in the image below:

Figure 6.
The average value of the appearance of shrimp paste in milkfish offal (*Chanos chanos*)



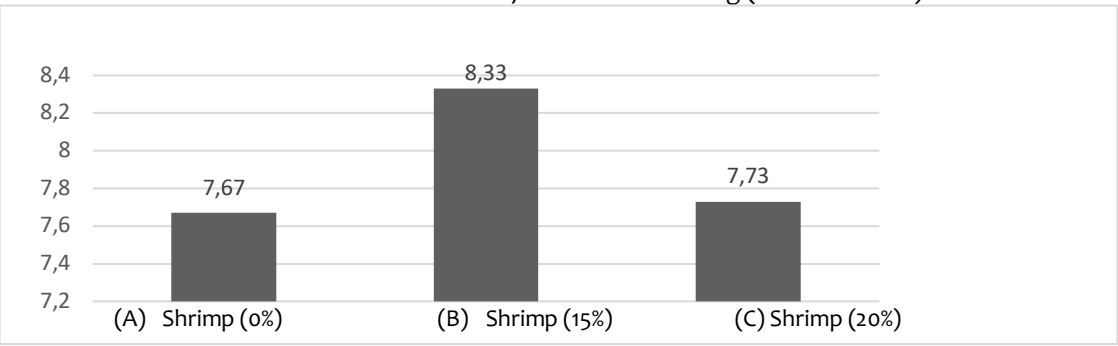
Source: research data processing results

The results of sensory tests of shrimp paste of milkfish offal *(Chanos chanos)* with different salting concentrations did not show a significant difference in the three types of treatment. Research Aristyan et al, (2014) Supporting this finding, the production of shrimp paste with different salt additions influences the organoleptic of shrimp paste rebon. Shrimp paste with 15% salt treatment has a higher appearance value. Based on statistical analysis using ANOVA, it was shown that samples A, B and C had no real effect on the appearance of shrimp innards of milkfish *(Chanos chanos)* because they had a value of sig (p>0.05). Research (Rahmayati et al., 2014) Supporting this finding, the production of shrimp paste with different salt concentrations does not have a real influence on the color of shrimp shrimp paste. In organoleptic testing, shrimp paste with 15% salt treatment was the best result of the study.

Aroma Sensors

Hasil uji sensori terhadap bau terasi jeroan ikanbandeng *(Chanos chanos)* yaitu perlakuan B mendapat nilai tertinggi sebesar 8,33, disusul perlakuan C dengan nilai sebesar 7,73 dan perlakuan C dengan nilai sebesar 7,67 disajikan pada gambar di bawah ini:

Gambar 7.
Nilai rata-rata aroma terasi jeroan ikan bandeng (*Chanos chanos*)



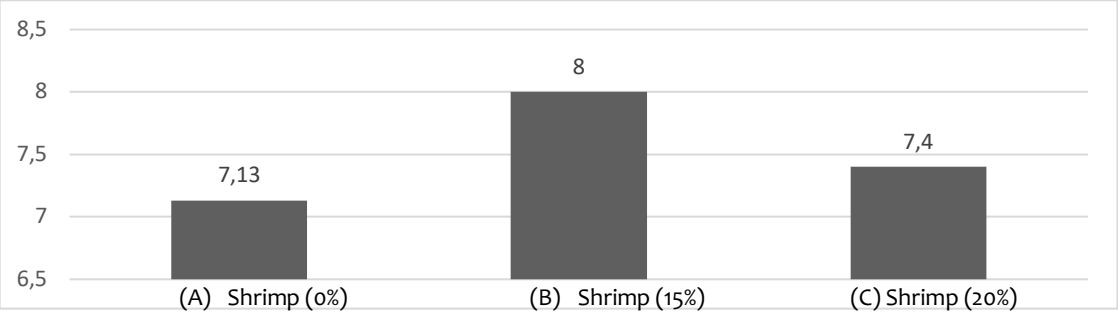
Source: research data processing results

The results of the sensory test on the smell of shrimp paste in milkfish *(Chanos chanos)* were treatment B with the highest score of 8.33, followed by treatment C with a value of 7.73 and treatment C with a value of 7.67. Based on sensory tests, the results of the taste assessment on sample B (15% salt) obtained the highest score with an average value of 8, then treatment sample C (20% salt) with an average value of 7.4 and the value of treatment sample A (0% salt) as a control with an average value of 7.13. From these results, sample B with a treatment of adding 15% salt concentration is preferable to other shrimp pas. The results also showed that the sample with the salt concentration treatment affected the taste of the shrimp paste and was preferred by the panelists. The statistical analysis using ANOVA showed that samples A, B and C had no real effect on the taste of shrimp innards of milkfish *(Chanos chanos)* because they had a sig value (p>0.05).

Sense of taste

The results of the sensory test on the taste of shrimp paste of milkfish innards (*Chanos chanos*), namely treatment B received the highest score of 8, followed by treatment C with a value of 7.4 and treatment A with a value of 7.13 can be seen in the image below:

Figure 8.
Average taste value of shrimp pastes in milkfish offal (*Chanos chanos*)



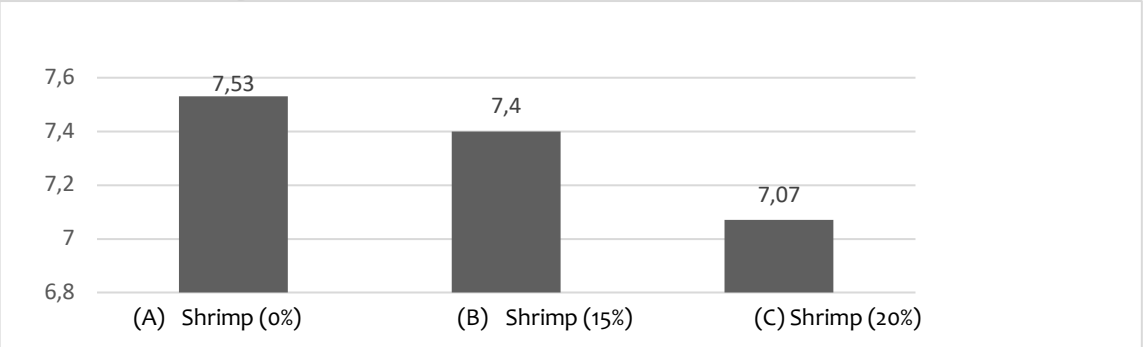
Source: research data processing results

Based on sensory tests, the results of the taste assessment on sample B (15% salt) obtained the highest score with an average value of 8, then treatment sample C (20% salt) with an average value of 7.4 and the value of treatment sample A (0% salt) as a control with an average value of 7.13. From these results, sample B with a treatment of adding 15% salt concentration is preferable to other shrimp pas. The results also showed that the sample with the salt concentration treatment affected the taste of the shrimp paste and was preferred by the panelists. Based on statistical analysis using ANOVA, it was shown that samples A, B and C had no real effect on the taste of shrimp paste of milkfish *offal (Chanos chanos)* because it had a value of sig (p>0.05).

Sensori Tekstur

The results of the sensory test on the texture of the shrimp paste of milkfish innards (*Chanos chanos*), namely treatment A, received the highest score of 7.53, followed by treatment B 7.4 and C with a value of 7.07 presented in the image below:

Figure 9.
Average value of shrimp paste texture of milkfish offal (*Chanos chanos*)



Source: research data processing results

Based on the data from the sensory test results of the sensory test of milkfish innards (Chanos chanos), the results were obtained, namely, the sample with treatment A (0% salt) as a control with a value of 7.53, sample B 7.4 and C obtained tilapia 7.07. Shrimp paste with treatment A, which is with 0% salt concentration, is denser and more compact than samples treated with 15% and 20% salt. In addition, statistical analysis using ANOVA showed that samples A, B and C had no real effect on the texture of the shrimp paste of milkfish innards *(Chanos chanos)* because it had a value of sig (p>0.05). From the three samples, each treatment obtained an average value in accordance with SNI.

CONCLUSION

Based on the results of the proximal test, the application of salt concentration in the offal shrimp paste of milkfish *(Chanos chanos)* influences the nutritional value of the shrimp paste. The higher the salt concentration given to the shrimp innards of milkfish *(Chanos chanos)*, the lower the content of water, carbohydrates, proteins and fats but the ash content increases. Shrimp paste offal milkfish *(Chanos chanos)* with treatment as a control has a high content of water, carbohydrates, protein and fat and a low ash content. Overall, the value of protein content and water content of shrimp paste in milkfish offal *(Chanos chanos)* has met the SNI regarding the quality and safety requirements of shrimp paste food. Then, the sensory value of the insides of milkfish *(Chanos chanos)* with treatment as a control showed a higher value in the texture category. In the shrimp paste sample of milkfish offal *(Chanos chanos)* with treatment B in terms of appearance, aroma, and taste showed a higher value than the sample with treatment C. Overall, shrimp paste of milkfish offal *(Chanos chanos)* was well received by the panelists.

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