# Chemical composition of whiteleg shrimp (Litopenaeus vannamei) cultivated from intensive farming and traditional farming

*by* Cek Turnitin

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# Chemical composition of whiteleg shrimp (*Litopenaeus vannamei*) cultivated from intensive farming and traditional farming at Bulukumba regency, South Sulawesi

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# Chemical composition of whiteleg shrimp (*Litopenaeus vannamei)* cultivated from intensive farming and traditional farming at Bulukumba regency, South Sulawesi.

**Y H Sipahutar[1], H K Ramli[1], M G E Kristiani[1], D H Guntur Prabowo[1], M R Suryanto[1] and R B Pratama[1]**

[1] Sekolah Tinggi Perikanan, AUP Road, Pasar Minggu, South Jakarta, Jakarta, Indonesia

E-mail: yuliati.sipahutar@gmail.com

**Abstract.** The aim of this research was to study the effect of intensive and traditional farming on the chemical composition of whiteleg shrimp (*Penaeusvannamei*) during storage till up to 8 days. The study on intensive and traditional farming were done at MariorennuVillage, Gantarang Subdistrict and at Manjalling Village, Ujung Loe Subdistrict, respectively, Bulukumba Regency, as well as at the Research and Development Center of Fishery Products of Makassar, South Sulawesi, the Province of South Sulawesi. The research design was conducted by a randomized complete block design with a storage treatment of 0, 2, 4, 6, and 8 days. The parameters studied are water content, ash, lipid, and protein content, as well as total volatile base (TVB), trimethylamine (TMA), pH, and free fatty acids (FFA). Whiteleg shrimps from intensive farming and traditional farming were stored in a coolbox containing with 2: 1 ratio of ice and shrimp, respectively. The addition of ice was carried out every day for 8 days storage, and chemical analysis was conducted at intervals of 2 days. Chemical testings was carried out based on the SNI method. Samples were measured as much as 10-15g and then chemically tested reffer to the method in SNI. The results for both intensive and traditional farming of whiteleg shrimp showed that storage time had a significant influence on the following parameters i.e. TVB, pH, FFA, water content, and protein content. No significant effect was found for following parameters, namely TMA, ash and fat content.

**Keywords:** chemical composition, whiteleg shrimp, intensive farming, traditional farming

## 1. Introduction

Bulukumba is a fairly rich area in terms of aquaculture, where the area of ponds reaches 3,576 ha with a potential of 4,000 ha, aquaculture of 6,030 ha with the potential development of 9,000 ha, freshwater cultivation 124.4 ha with a potential of 1,020 ha. The production of whiteleg shrimp in Bulukumba Regency in 2015 was 2241.4 tons and in 2016 there was 2591.8 tons [1].

The process of decreasing the quality of shrimp is caused by factors derived from the shrimp material itself and environmental factors. This decline in quality occurs autolysis, bacteriology, and oxidation [2]. Shrimp handling can be carried out based on the origin of production, among others, from catches in the sea, public waters or harvested fishponds. Regardless of its origin, shrimp handling must be carried out quickly, carefully, and through a cold chain system while maintaining a temperature of around 0°C. Handling like this is done because the characteristics of shrimp products are very easily damaged. The destructive nature of shrimp raw materials was related to the high water

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content (80%) and free amino acid content which is a condition and a very good medium for bacterial growth [3]. In principle, the handling of shrimp in the pond was the same as handling shrimp in the sea, namely carrying out handlling so that it is always in the cold chain. Therefore, harvesting shrimp in ponds is usually done at night so that the caught shrimp is not directly exposed to sunlight [2].

The study of the quality and level of consumer preference for whiteleg shrimp needs to be done so that it can be used as a reference for the community both producers and consumers in conducting cultivation, processing, and consumption. This study was aimed to determine the quality of the chemical composition of whiteleg shrimp from intensive ponds and traditional ponds during the storage for up to 8 days.

## 2. Research methodology

White leg shrimp samples were taken from intensive. PT. 2512 at Mariorennu Village, Gantarang Sub-district and traditional ponds (government pilot ponds) at Manjalling Village, Ujung Loe Sub-district, Bulukumba Regency, South Sulawesi, the Province of South Sulawesi. The sample was put in a fiberglass bath and ice was added with a ratio of ice and shrimp 2:1. The base was coated with ice first, then arranged with shrimp that has been put in plastic on top and covered with ice. Samples were tested and stored within 0 days, 2 days, 4 days, 6 days and 8 days to be observed.

The research method was Randomized Block Design (RBD) with the treatment of 0 days, 2 days, 4 days, 6 days and 8 days. This research was conducted for three (3) months from February until April 2017. Statistical analysis of the test data was carried out with ANOVA, and if it was significantly different, it was continued with an Honest Real Difference Test (BNJ). Test parameters were water content (SNI-01-2354.2-2006), ash content (SNI-01-2354.1-2006), fat(SNI 01-2354.3-2006), protein (SNI 01-2354.4-2006), TVB (SNI 2354.8:2009), TMA (SNI 2354.8:2009), pH test, FFA.Equipment used includes thermometer, oven, desiccator, gluttering, graying furnace, digital weighing scale, soxhlet, fat sleeve, aluminum cup, desiccator, gluttering, porcelain cup, kjehdal flask, titration instrument, measuring cup, beaker, dropper, titration device, protein destruction tool (kjeltec), a protein distillation device (foss), erlenmeyer, fume hood, filter paper, funnel, goblet, and water bath.

## 3. Result and discussion

### *3.1. Water Content*

Water is an important component in food ingredients because water can affect appearance, texture, and taste. The low water content in food ingredients will inhibit the growth of microorganisms thus extending the shelf life of these foods [1]. This water content test was carried out to determine the water content in intensive pond shrimp and traditional pond shrimp from the storage of 0, 2, 4, 6, and 8 days. Table 1 presented the result of water content at intensive and traditional farming.

**Table 1.** Test results of water content on intensive and traditional pond shrimp

| Storage day | Intensive | Traditional |
|---|---|---|
| Day 0 | $76.005 \pm 1.85^{a}$ | $75.44 \pm 0.85^{a}$ |
| Day 2 | $76.8375 \pm 1.49^{ab}$ | $75.9475 \pm 0.79^{ab}$ |
| Day 4 | $78.6125 \pm 0.19^{bc}$ | $77.5725 \pm 0.77^{b}$ |
| Day 6 | $80.4275 \pm 0.53^{cd}$ | $79.3125 \pm 0.5^{c}$ |
| Day 8 | $82.4175 \pm 0.9^{d}$ | $81.6525 \pm 0.91^{d}$ |

Note: the numbers in the same column are followed by different superscript letters (a, b, etc.) which are significantly different at 5% at confidence level

ANOVA analysis showed that storage day had significant effects on water content for both intensive and traditional farming. The further test found that for intensive storage time the Day 0 had no significant effect on Day 2 storage but possessed significant influence at the 0.05 confidence level on storage day 4, 6, and 8. The Day 2 had significant influence on Day 6 and Day 8, as well as Day 4

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on Day 8 at the 0.05 confidence level for storage days. In traditional pond shrimp, the length of storage time had significant effect on the moisture content. Day 0 possessed significant influence on Day 4, 6, and 8 of storage time at 5% confidence level. Meanwhile Day 2 of storage time had no significant effect with Day 4 but giving significant influence with Day 6 and 8, respectively in water content.

Water content in intensive pond shrimp and traditional ponds on the 0th-day observations were 76,005 and 75.44% respectively, so it can be said that the shrimp water content still meets the standards of 71.5 - 79.6%. However, after undergoing a storage process of up to eight (8) days, the shrimp water content of two different types of ponds is increasing. This is likely to occur due to the binding process/absorption of free water by the shrimp body to the surrounding environment. Fishery products generally have very high water content. The high water content in food will make it easier for microorganisms to grow so that it can cause changes in food ingredients. The low water content in food ingredients will inhibit the growth of microorganisms thus extending the shelf life of these foods [4].

The results of the analysis on intensive pond shrimp and traditional pond shrimp can be concluded that during the storage process from day 0 to day 8, shrimp showed a significantly different effect on the water content in shrimp where the interaction occurred at a value of $p < 0.05$. The value of traditional pond shrimp water content was lower than intensive pond shrimp, so it can be said that the level of freshness of traditional pond shrimp is superior to intensive pond shrimp, and the traditional pond shrimp decay process is slower than intensive pond shrimp. This result is allegedly due to the absence of the addition of chemicals such as chlorine, antibiotics, or prebiotics into the traditional pond, so it is certain that there are no chemicals that contaminate and react with the body of the whiteleg shrimp that can affect the process of shrimp decomposition

### *3.2. Dust Level*

Food ingredients contain more than 95% organic matter and water. The rest consists of mineral elements which are also known as inorganic substances. Organic materials burn during the combustion process, but the organic matter is not because that is called ash [5].

Ash content in intensive and traditional pond shrimp differed with the length of storage time (table 2). Intensive shrimp ash content ranged from 2.29 - 2.72 while the ash content of traditional pond shrimp ranged from 2.15 - 2.48. The ash content in intensive pond shrimp and traditional ponds can still be received both from day 0 storage and 8th-day storage. This is because the ash content in shrimp does not meet the specified threshold or standard. Statistical analysis found that there was no significant influence from storage time on as content values for both intensive and traditional farming.

**Table 2**. Test results of ash content on intensive and traditional pond shrimp.

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | 2.4375 ± 0.21$^{a}$ | 2.42 ± 0.23$^{a}$ |
| Day 2 | 2.4975 ± 0.366$^{a}$ | 2.435 ± 0.27$^{a}$ |
| Day 4 | 2.7275 ± 0.05$^{a}$ | 2.4875 ± 0.38$^{a}$ |
| Day 6 | 2.54 ± 0.21$^{a}$ | 2.5725 ± 0.27$^{a}$ |
| Day 8 | 2.2925 ± 0.18$^{a}$ | 2.1525 ± 0.16$^{a}$ |

Note: the numbers in the same column are followed by different superscript letters (a, b, etc.) which are significantly different

### *3.3 Protein Level*

Protein is an important food substance for the body because this substance besides functioning as a fuel in the body also functions as a builder and regulator substance. Protein is a source of amino acids that contain elements of nitrogen (N), carbon (C), hydrogen (H), and oxygen (O) which is not owned by fat or carbohydrates [6]. This protein level test was carried out to determine protein levels and decrease protein levels in intensive pond shrimp and traditional pond shrimp on storage of 0, 2, 4, 6, and 8 days as shown in table 3.

The value of traditional shrimp protein levels was higher than intensive pond shrimp, so it can be said that traditional pond shrimp are superior to intensive pond shrimp. Statistical analysis found that intensive pond shrimp and traditional pond shrimp had a significantly different effect on protein levels in shrimp at $p < 0.05$ during the storage process from day 0 to day 8. The Day 0 had significant difference with Day 4, 6, and 8. Day 2 also had significant influence with Day 6 and 8, as well as Day 6 possessed significant difference result for protein level with day 8 at 0.05 confidence level.

**Table 3.** Test results of protein on intensive and traditional pond shrimp

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | $18.6675 \pm 1.35^{a}$ | $19.3025 \pm 0.78^{a}$ |
| Day 2 | $17.7925 \pm 1.2^{ab}$ | $18.81 \pm 0.98^{ab}$ |
| Day 4 | $15.935 \pm 0.18^{bc}$ | $17.27 \pm 1.06^{bc}$ |
| Day 6 | $14.4175 \pm 0.57^{cd}$ | $15.5075 \pm 0.33^{c}$ |
| Day 8 | $12.6625 \pm 0.85^{d}$ | $13.5575 \pm 0.82^{d}$ |

Note: the numbers in the same column are followed by different superscript letters (a, b, etc.) which are significantly different

The test results showed that the protein content of traditional pond shrimp was higher than that of the intensive shrimp protein. Potential things that make different protein levels are the type of feed and life cycle and habitat of the shrimp. The type of feed used for traditional ponds is natural to feed such as plankton, fito, and zooplankton, while the feed used for intensive ponds is artificial feed such as pellets. In the harvest process, there are differences in handling there. Post-harvest handling on traditional ponds is done by cool, clean, careful, and Quick, with a comparison of ice according to the standard. In intensive ponds, the ratio of ice does not meet the standards so that the shrimp temperature after harvest rises above 5°C. According to [6] The diversity of chemical composition can be caused by food factors, species, sex, and the age of the commodity. Intensive shrimp protein and traditional pond shrimp protein content are less at 8th-day storage. This was due to the protein denaturation process in the shrimp body. Various cooking conditions above 60°C can cause a decrease in fish and shrimp protein along with a reduced content of dissolved water [7].

### *3.4. Fat Level*

Fat can be defined as materials that can dissolve in ether, chloroform or benzene, but cannot dissolve in water. Fat is a trihydric glycerol bond with fatty acids that are monobasic [8]. The value of the fat content in traditional pond shrimp does not differ greatly from intensive pond shrimp fat, so it can be said that the level of the fat content of traditional pond shrimp is almost the same as the intensive pond shrimp (table 4).

**Table 4.** Test results of *Fat* on intensive and traditional pond shrimp

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | $1.6325 \pm 0.33^{a}$ | $1.575 \pm 0.18^{a}$ |
| Day 2 | $1.58 \pm 0.29^{a}$ | $1.56 \pm 0.16^{a}$ |
| Day 4 | $1.475 \pm 0.13^{a}$ | $1.4075 \pm 0.16^{a}$ |
| Day 6 | $1.38 \pm 0.21^{a}$ | $1.395 \pm 0.14^{a}$ |
| Day 8 | $1.375 \pm 0.2^{a}$ | $1.4025 \pm 0.19^{a}$ |

Note: the numbers in the same column are followed by different superscript letters (a, b, etc.) which are significantly different

Statistical analysis of ANOVA found that day storage at intensive and traditional farming had no significantly affect on the fat content of shrimp. Fat content test results obtained various values.

Intensive shrimp fat content was ranged from 1.38-1.63 while the fat content of traditional pond shrimp ranged from 1.39-1.57. According to [9] based on the fat content of shrimp included in shrimp with a medium fat content of 2-5% as well as carp, lemuru fish, salmon and also types of shellfish. The results of the analysis of intensive pond fat and traditional pond shrimp showed that the shrimp was still acceptable because the fat content in the shrimp body was still within normal limits. Factors that influence the diversity of fat composition include species, fishing season, geographical location, level of gonadal maturity and size of the shrimp [6].

*3.5 TVB Test*

The condition and number of TVB levels depend on the quality and freshness of the fish. The lower the freshness of the fish was the higher the TVB content of the fish. The purpose of this test was to determine the level of freshness of intensive pond vannamei shrimp and traditional ponds from a total base that evaporates. The results of the ANOVA test showed that the length of time of observation day had a significant effect on the growth rate of TVB in intensive pond shrimp and traditional pond shrimp ($p$ 0.000 <0.05) (table 5).

**Table 5.** Test results of TVB on intensive and traditional pond shrimp

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | $12.0325 \pm 0.44^a$ | $9.9875 \pm 0.44^a$ |
| Day 2 | $19.7 \pm 1.71^b$ | $12.8425 \pm 1.71^b$ |
| Day 4 | $24.9225 \pm 1.08^c$ | $15.1750 \pm 1.08^c$ |
| Day 6 | $25.6725 \pm 0.84^c$ | $20.4175 \pm 0.84^d$ |
| Day 8 | $32.87 \pm 1.19^d$ | $24.7525 \pm 1.19^e$ |

Note: the numbers in the same column are followed by different superscript letters (a, b, etc.) which are significantly different

ANOVA results show significant differences. The results of the TVB test on intensive pond shrimp showed a very significant effect on the length of storage time. Observation of day-0 storage is very significant for the storage of 2$^{nd}$, 4$^{th}$, 6$^{th}$, and 8$^{th}$ days. Day 2 storage has a significant effect on the storage of 4$^{th}$, 6$^{th}$ and 8$^{th}$ days. 4$^{th}$-day storage has no significant effect on the 6$^{th}$ day of storage where the notation on the 4th and 6th-day storage shows the same notation. Storage observations on the 6th day have a significant effect on 8$^{th}$-day storage.

The results of further testing of the TVB content in traditional pond shrimp showed a very significant effect where on day 0 storage it was very significant for the storage of 2$^{nd}$, 4$^{th}$, 6$^{th}$, and 8$^{th}$ days. 2$^{nd}$day storage observation is very significant for the 4$^{th}$, 6$^{th}$, and 8$^{th}$day observations. 4$^{th}$day storage has a very significant effect on the storage of the 6$^{th}$and 8$^{th}$days. 6$^{th}$day storage is very significant for 8$^{th}$day storage.

The table 5, it can be seen that white leg shrimp from traditional ponds on day 0 observations contain 9.9 mgN TVB where the number does not exceed the standard of very fresh shrimp group which is <10 mgN / 100 g. For intensive pond whiteleg shrimp, at the observation of day 0 the shrimp were still grouped in fresh shrimp that were in accordance with the standard, namely $10 \leq TVB \leq 20$ mgN / 100 g. At the second day storage, intensive pond shrimp can still be said to be fresh with a TVB value of 19.7 mgN / 100gr and traditional pond shrimp on the 2nd and 4th-day storage also classified as fresh shrimp. On observations on days 4 and 6, intensive pond shrimp were said to be suitable for consumption shrimp with a TVB value of 24.9 - 25.6 mgN / 100gr where the standard of consumption of shrimp TVB is $20 \leq TVB \leq 30$ mgN / 100 g, as well as traditional shrimp at storage of 6th and 8th days with each TVB value of 20.4 and 24.7 mgN / 100gr. So, it can be concluded that traditional pond shrimp can be consumed until the 8$^{th}$day of storage and intensive pond shrimp are not suitable for consumption on the 8$^{th}$day.

The results of the analysis can be concluded that the longer the shrimp storage process, the higher the level/content of the shrimp TVB. According to [10], this TVB value will increase with increasing

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storage time due to the degradation of enzymes in the shrimp body to produce simple compounds that are constituent components of volatile bases. According to [8], an increase in TVB values during storage due to the degradation of proteins and derivatives produces a number of volatile bases such as ammonia, histamine, $H_2S$, and foul-smelling trimethyl amine. The TVB value obtained from the results of the study showed that the shrimp at the beginning of storage was still in a very fresh state.

The results of the analysis on intensive pond shrimp and traditional pond shrimp can be concluded that during the storage process from day 0 to day 8, shrimp showed a significantly different effect on TVB levels in shrimp where the interaction occurred at a value of $p < 0.05$. Traditional TVB shrimp pond value is lower than intensive pond shrimp, so it can be said that the traditional shrimp pond freshness level is superior to intensive pond shrimp.

### *3.6. TMA Test*

Trimethylamine nitrogen is one method of bacteriological freshness testing or a method of measuring the results of bacterial action derived from trimethyl aminoxide. TMAO content is different in different species, different waters, and in-season differences in one year, body size and age of shrimp [9]. This TMA test was conducted to determine the level of freshness and the rate of increase in TMA content in intensive pond shrimp and traditional pond shrimp. The results of the ANOVA test showed that the length of time of observation day had a significant effect on the growth rate of TMA in intensive pond shrimp and traditional pond shrimp ($p$ 0.000 $< 0.05$).

The results of further tests showed that the storage time was very significant for the intensive content of shrimp TMA. Day 0 storage has a significant effect on the 2nd day storage where the number notation shows in table 1% and 5%. Day 2 storage has a significant effect on 4th-day storage. The 4th day storage has a significant effect on the 6th day storage where the number notation shows in tables 1% and 5%. 6th day storage is very significant for 8th day storage (table 6).

**Table 6.** Test results of *TMA* for intensive and Traditional pond shrimp

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | $1.375 \pm 0.17^{a}$ | $1.4 \pm 0.18^{a}$ |
| Day 2 | $1.55 \pm 0.12^{ab}$ | $1.75 \pm 0.28^{a}$ |
| Day 4 | $2.15b \pm 0.28^{c}$ | $2.025 \pm 0.37^{a}$ |
| Day 6 | $2.725 \pm 0.28^{cd}$ | $2.425 \pm 0.41^{a}$ |
| Day 8 | $3.125 \pm 0.26^{d}$ | $2.825 \pm 0.25^{a}$ |

Note: the numbers in the same column are followed by different super scrip letters (a, b, etc.) which are significantly different

The results of further tests showed that the length of storage did not significantly affect the TMA content in traditional pond shrimp. The longer the storage time, the higher the content of TMA in shrimp. From the average results of the TMA test of intensive pond whiteleg shrimp as well as traditional ponds starting from the storage of day 0 to day 8, it is still feasible to consume. The TMA value in intensive pond shrimp ranged from 1,375-3,125 mg while the TMA value for traditional pond shrimp ranged between 1.4-2.825 mg. According to the TMA levels in suitable products for consumption do not exceed 10 mg / 100 g. It is stated that the value of TMA-N in black shrimp packaged either vacuum or non-vacuum and stored in cold storage showed that at the beginning of storage the N-TMA value was 0.34 mg / 100g and increased to 3.26 mg / 100g for non-vacuum packaging and 2.44 mg / 100g in vacuum packaging after 8 days of cold storage [11]. Furthermore, the increase was recorded to be 5.59 mg / 100g for non-vacuum packaging and 3.66 mg% in vacuum packaging after 17 days of storage in cold storage.

The results of TMA analysis on intensive pond shrimp and traditional pond shrimp can be concluded that during the storage process from day 0 to day 8, shrimp showed an effect that was not significantly different from TMA levels in shrimp where the interaction occurred at $p < 0.05$.

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Traditional pond shrimp TMA values are lower than intensive pond shrimp, so it can be said that the traditional shrimp pond freshness level is superior to intensive pond shrimp, and the traditional shrimp pond decay process is slower than intensive pond shrimp. The increase in the value of TMA in whiteleg shrimp from intensive ponds is thought to be due to the treatment after the harvest process does not pay attention to the temperature in the shrimp. this results in that, the longer the storage of shrimp at room temperature, the higher the TMA content in shrimp.

### *3.7. pH Test*

The determination of pH value is one indicator of the measurement of the freshness of fish or shrimp. The pH value of fish meat while still alive generally has a neutral pH and after death pH becomes decreased [9]. The ANOVA test results showed that the length of time of observation day had a significant effect on the pH growth rate in intensive pond shrimp and traditional pond shrimp (p 0.000 <0.05) (table 7).

**Table 7**. Test results of *pH* intensive and traditional pond shrimp

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | $6.625 \pm 0.47^{a}$ | $6.375 \pm 0.25^{a}$ |
| Day 2 | $7.75 \pm 0.64^{a}$ | $6.875 \pm 0.25^{a}$ |
| Day 4 | $9.5 \pm 0.7^{b}$ | $8 \pm 0.4^{b}$ |
| Day 6 | $9.75 \pm 0.28^{b}$ | $8.5 \pm 0.57^{bc}$ |
| Day 8 | $10.5 \pm 0.4^{b}$ | $8.875 \pm 0.25^{c}$ |

Note: the numbers in the same column are followed by different super scrip letters (a, b, etc.) which are significantly different

The results of further tests indicate that the length of storage time has a very significant effect on the pH content in intensive pond shrimp. Observation of day-0 storage did not significantly affect the storage of the $2^{nd}$ day but it had a significant effect on the storage of $4^{th}$, $6^{th}$, $8^{th}$ days. Day 2 storage has a significant effect on the storage of 4th, 6th, 8th days. The 4th-day storage did not significantly affect the [illegible] day storage, as well as the $6^{th}$day storage, did not significantly affect the $8^{th}$day storage.

The results of further tests showed that the storage time showed a significant effect on the pH content of traditional pond shrimp. The 0-day storage did not significantly affect the storage of the $2^{nd}$ day but it had a significant effect on the storage of the $4^{th}$, $6^{th}$, $8^{th}$days. Storage of Harike-2 has a very significant effect on 4th, 6th, 8th-day storage. The 4th-day storage has a significant effect on the $6^{th}$-day storage where the number notation shows in tables 1% and 5%. The $6^{th}$day storage is very significant for the $8^{th}$ day storage.

Whiteleg shrimp should be given a cooling treatment as soon as possible because of the storage of room temperature can increase activity of bacteria and enzymes begins to take place where the pH value and TVB value are related to the activity of bacteria and enzymes that naturally exist so that an increase in pH will result in the formation of ammonia, TMA and derivatives [11]

The longer the storage process, the higher the pH of the shrimp. The pH standard of fresh shrimp is 7-8. The results of research conducted on whiteleg shrimp in accordance with the explanation of [12] the longer the storage time of the resulting pH value increases along with the phase of decline in the quality of shrimp. This is allegedly due to the work of fast metabolic enzymes in shrimp and glycogen content in shrimp meat due to the process of death in shrimp. Increasing the pH value during cold temperature storage is thought to be due to the formation of amines by decarboxylation amino acids [12].

The pH of intensive pond whiteleg shrimp and traditional ponds is still said to meet the standard on day 0 storage until $4^{th}$day storage. Shrimp with a high pH is closely related to the process of decreasing the quality of shrimp where the process of enzyme formation due to bacterial activity becomes faster. According to [13] changes in pH values occur due to the process of autolysis and

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bacterial activity. Changes in pH values in the phase of deterioration in quality can be caused due to the production of lactic acid from glycogen breakdown in shrimp meat.

The results of pH analysis on intensive pond shrimp and traditional pond shrimp can be concluded that during the storage process from day 0 to day 8, shrimp showed a very significant different effect on pH levels in shrimp where interactions occurred at $p < 0.05$. Traditional pond shrimp pH value is lower than intensive pond shrimp, so it can be said that the freshness of traditional shrimp is superior to intensive pond shrimp, and traditional pond shrimp decay process is slower than intensive pond shrimp.

*3.8 FFA (Free Fatty Acid) Test*

Free fatty acids are fatty acids that are not bound as triglycerides. Fatty acid levels are the best indicator to determine the number of fatty acid levels in intensive pond shrimp and traditional ponds. The results of the ANOVA test showed that the length of time of observation day has a significant effect on the growth rate of FFA in intensive pond shrimp and traditional pond shrimp (p 0.000 <0.05) (table 8).

**Table 8**. Test results of *FFA* of intensive and traditional pond shrimp

| Day Storage | Intensive | Traditional |
|---|---|---|
| Day 0 | $11.65 \pm 0.79^a$ | $6.626 \pm 0.79^a$ |
| Day 2 | $13.05 \pm 0.46^a$ | $7.325 \pm 0.58^{ab}$ |
| Day 4 | $15.675 \pm 0.82^b$ | $7.9 \pm 0.62^{ab}$ |
| Day 6 | $17.9 \pm 1.0^c$ | $8.7 \pm 0.78^{bc}$ |
| Day 8 | $20.525 \pm 1.27^d$ | $9.975 \pm 0.61^c$ |

Note: the numbers in the same column are followed by different super scrip letters (a, b, etc.) which are significantly different

The results of further tests showed that the FFA content in intensive pond shrimp had a significant effect on the presence of storage treatments. The 0-day storage did not significantly affect the storage of the 2$^{nd}$ day, but it was highly significant for the storage of the 4$^{th}$, 6$^{th}$, 8$^{th}$ days. Day 2 storage has a significant effect on the storage of 4$^{th}$, 6$^{th}$, 8$^{th}$ days. 4th-day storage has a very significant effect on the storage of the 6$^{th}$and 8$^{th}$days. 6$^{th}$day storage is very significant for 8$^{th}$day storage. The further test results show that the 0-day storage has a significant effect on the 2$^{nd}$day storage where the notation is in the 1% and 5% tables. The second-day storage did not significantly affect the 4th-day storage but it had a significant effect on the 6th-day storage where the notation was in the 1% and 5% tables. The 6$^{th}$day storage is very significant for 8$^{th}$day storage.

The results above show the process of increasing the free fatty acid content of shrimp in each storage period. The longer the storage period, the higher the free fatty acid content in the shrimp. From the result above it can be seen that the content of free fatty acids intensive shrimp is higher than the free fatty acids of traditional pond shrimp. Increasing the content of free fatty acids usually consists of several factors including the temperature of the environment, the way of handling, and shrimp feed.

Free fatty acids in intensive pond shrimp have increased rapidly from 11.6 to 20.5 mgN/100gr while for traditional shrimp the value of the content starts from 7.3 and increases to 9.9 mgN/100gr. the content of free fatty acids in intensive ponds is faster than free fatty acids in traditional ponds. The difference in the high FFA content in whiteleg shrimp from intensive ponds and traditional ponds, allegedly due to differences in pond maintenance methods, namely pond habitat, pond size, species, shrimp seedlings, feed type factors, feeding methods, environmental conditions, temperature and water cycle and the process of handling harvesting. The results of the analysis on intensive pond shrimp and traditional pond shrimp can be concluded that during the storage process from day 0 to day 8, shrimp showed a significantly different effect on FFA levels in shrimp where interactions occurred at $p < 0.05$. FFA value of traditional pond shrimp is lower than intensive pond shrimp, so it can be said that the level of the free fatty acid content of traditional pond shrimp is less than intensive pond shrimp.

## 4. Conclusion
The results showed that for both intensive and traditional ponds had a significant effect on the chemical composition of whiteleg shrimp. The storage time was significant for the chemical composition of TVB, pH, FFA, water content, protein content, but non-significant for the chemical composition of TMA, ash content, and fat content. Traditional shrimp ponds are better than intensive shrimp ponds in terms of both chemical content and shelf life.

## 5. References
[1] Dinas Kelautan dan Perikanan Kabupaten Bulukumba 2016 *Dokumen Dinas Kelautan dan Perikanan Kabupaten Bulukumba* (Bulukumba, ID: Dinas Kelautan dan Perikanan Kabupaten Bulukumba)
[2] Purwaningsih S 1995 *Teknologi pembekuan udang* (Jakarta, ID: Penebar Swadaya)
[3] Buckle KA, Edwards RA, Fleet GH, and Wotton M 2009 *Ilmu pangan, terjemahan Purnomo H dan Adiono* (Jakarta, ID: UI-press)
[4] John deMan 2010 *Kimia makan* (Bandung, ID: Penerbit ITB)
[5] Winarno F G 2008 *Kimia pangan dan gizi edisi terbaru* (Jakarta, ID: MBrio Pres)
[6] Gokce M A, Tazbozan O, Celik M and Tabakoglu S 2004 Seasonal variation in proximate and fattyacyd of female common sole (Soleasolea) *Food Chem.*
[7] Afid K I 2009 Komposisi mineral makro dan mikro daging udang Ronggeng (Harpiosquilla Raphidea) akibat proses perebusan (Bogor, ID: IPB University)
[8] Karungi C, Byaruhanga Y B, and Moyunga J H 2003 Effect of pre-icing duration on qualitydeterioration of iced perch (Latesniloticus) *J Food Chemistry*
[9] Suwetja I K 2011 *Biokimia hasil perikanan* (Jakarta, ID: Media Prima Aksara)
[10] Nurul S A 2015 Karakteristik Laju kemunduran mutu dan melanosis udang Vaname *(L. Vannamei)* pada tambak intensive dan non intensive (Jakarta, ID: Sekolah Tinggi Perikanan)
[11] Riyanto R, Kusmarwati A and Dwiyitno 2006 Pengaruh penyimpanan ikan pasa suhu kamar terhadap mutu kimia, mikrobiologi, dan organoleptik *Jurnal Pasca Panen dan Bioteknologi Kelautan dan Perikanan* **1**(**2**)
[12] Leitao M F D F and Rios D D P A 2000 Microbiological and chemical changes in freshwater prawn (Macrobrachiumrosembergii) storaged under refrigeration *Brazil Journal Microbiology* **31**(**3**) 1-4.
[13] Laelah A H 2015 Analisis kemunduran mutu udang Vaname (Litopenaeusvannamei) secara kimiawi dan mikrobiologis (Bogor, ID: IPB University)

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