Organoleptic quality of whiteleg shrimp (*Litopenaeus vannamei*) cultivated from intensive and traditional pond at Bulukumba District, South Sulawesi

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Abstract. The focus of this research is the effect of intensive and traditional ponds on the organoleptic quality of white shrimp (*Penaeus vannamei*) during 8 days of storage. The study was conducted in a traditional pond at Manjalling Village, Ujung Loe Sub-District, and intensive ponds at Mariorennu Village, Gantarang Sub-District, Bulukumba District. The study design was carried out using the Randomized Block Design experimental method, with storage treatment of 0, 2, 4, 6, 8 days. The parameters studied were appearance, odor and texture. White shrimp from intensive ponds and traditional ponds are put in a cooler with a ratio of 2:1 ice and shrimp. The addition of ice is done every day and organoleptic testing is done at 2-day intervals. Around 10-20 g samples were used for organoleptic test using methods employed in SNI 01-2728.1-2006. Data analyzed using Kruskal Wallis continued with multiple comparisons. Organoleptic test of intensive and traditional ponds in 8 days storage shows the value of organoleptic quality decreases and is not acceptable for consumption, with shrimp appearance values 6.28 and 6.4; odor of 6.15 and 6.59 and textures of 6.24 and 6.6. The standard organoleptic value is 7 based on SNI method. Therefore, shrimp is rejected because it does not meet the minimum specified quality. The conclusion is the organoleptic quality value of traditional shrimp ponds is higher than intensive shrimp ponds.

1. Introduction
Aquaculture business is an economic activity that utilizes Coastal Resources. The coastal area that supports brackish land is 1,225,500 ha with a total coastline reaching 81,000 km, while only 60,500 ha (± 50%) has been utilized, thus increasing opportunities for developing brackish water conservation agriculture from various important needs and still wide widths wide. Pond cultivation activities are expected to improve the welfare of farmers in coastal areas.

Bulukumba Regency is a coastal area with a strong maritime character, an area rich in marine and fisheries resources, has several potential advantages of important and strategic economic values. Economic growth in the marine and fisheries sector reached 9.42%. Vanname shrimp production in Bulukumba Regency in 2015 was 2241.4 tons and in 2016 as many as 2591.8 tons [9].

Shrimp farming activities in Indonesia have long been carried out by the farmer’s community, starting from the application of traditional technology to the application of intensive technology.
According to almost 80% of shrimp species developed in Indonesia, they come from the Penaeidae family, mainly Penaeus monodon and Penaeus marquis.

Traditional cultivation defined as a cultivation technique without implementing the aeration system in ponds caused by lack of capital. At the initial stage, water quality management is carried out, then the farmer raises the water when the pond water has changed color to greenish color and when the seed are spread. The shrimp are given shrimp feed after reaching the expected weight [13].

Intensive cultivation is a cultivation business by farmers with bigger capital. Farmers have a pond area that varies between 5-20 pond plots. Feeding is done by complete feed containing protein ranging from 25-35%. The frequency is regulated according to the needs of shrimp biomass that live in pond waters [23].

Shrimp is a source of high-quality animal protein and is a potential fishery commodity to compete with Indonesia's oil and gas commodity exports. But, there are some downside because shrimp is prone to damaged due to high water content (80%) and free amino acid content, which promotes spoiling due to bacterial growth [19]. Because of this reason, shrimp quality and safety must be maintained; therefore good handling and production processes are needed. Harvesting shrimp in ponds usually done at night in order to not exposing them to sunlight [18]. Shrimp quality is mainly determined by the physical state, organoleptic (appearance, color, smell, taste, and texture), size, and uniformity of shrimp.

Shrimp quality degradation is caused by many factors, from the shrimp itself and environmental factors such as autolysis, bacteriology, and oxidation. Shrimp handling must be done quickly, carefully, and through a cold chain system while maintaining temperatures around 0ºC [4]. Handling carried out in this order to maintain shrimp quality, because they are probe to damaged. The destructive nature of shrimp raw materials is related to high water content. Shrimp handling can be done based on the origin of production, among others, from the catch in the sea, public waters or harvested ponds. According to [10] the application of low temperatures as soon as possible such as cooling using bulk ice temperatures, reaching 0ºC is the most effective and commonly applied effort to maintain the freshness of recently dead fish.

This research was conducted to determine the organoleptic quality of vannamei shrimp from intensive and traditional ponds. It is intended that as a reference for both producers and consumers in conducting cultivation, processing and consuming shrimp

2. Research methodology
The research method was a randomized block design (RBD) with storage treatment of 0 days, 2 days, 4 days, 6 days, and 8 days. This research was conducted for three (3) months from February to April 2017.

Vanname shrimp samples were taken from traditional ponds (government owned pilot ponds) in Manjalling Village, Ujung Loe Sub-District, and intensive ponds. PT. 2512 in Mariorennu Village, Gantarang Sub-District, Bulukumba District, South Sulawesi Province. Vanname shrimp samples were put into fiberglass tubs, and ice was added in a ratio of 2: 1. The bottom of the fiberglass is coated with ice first, then arranged with shrimp that has been put into the plastic on it and covered again with a layer of ice. Samples were tested and stored within 0 days, 2 days, 4 days, 6 days and 8 days to be observed with organoleptic test parameters.

Statistical analysis of test data was performed with the non-parametric Kruskal Wallis test and continued with multiple comparisons [24]. Organoleptic test of fresh shrimp with an organoleptic assessment sheet SNI 01-2728.1-2006 by non-standard panelists [3].

3. Result and discussion
The organoleptic test is a testing method based on the sensing process, which is a physio-psychological process or the introduction of the human senses as the main tool for measuring the acceptability of products [7]. The characteristic organoleptic parameters observed were appearance, aroma, texture and taste [5]. Organoleptic testing has an important role in the application of quality [27].

Organoleptic testing can provide indications of decay, deterioration in quality, and other damage to the product. The requirements that must exist in an organoleptic test are the presence of samples
(samples), the presence of panelists, and an honest response statement. The valuation of food, which determines whether a product is acceptable or not, is its sensory itself.

Organoleptic testing is carried out to determine differences in the level of freshness of intensive shrimp and traditional shrimp. Determination of deterioration in shrimp quality organoleptically is done using a score sheet determined by the National Standardization SNI 01-2728.1-2006 [3].

3.1. Appearance test
Appearance is the first characteristic that can be assessed the first time by a panelist [7]. The appearance also influences consumer acceptance, although the appearance does not determine the level of consumer preferences absolutely. This appearance evaluation aims to find out panelist acceptance, which is assessed from surface appearance, integrity, neatness, and color of shrimp. This appearance test was conducted to determine the value of shrimp appearance in intensive and traditional ponds from 0, 2, 4, 6, and 8 days storage. Table 1 presents the results of the appearance on intensive and traditional farms.

Table 1. Test results of the appearance on intensive and traditional pond shrimp

| Day Storage | Intensive       | Traditional   |
|-------------|-----------------|---------------|
| Day 0       | 8.80 ± 0.17 a   | 8.83 ± 0.13 a |
| Day 2       | 8.72 ± 0.2 a    | 8.78 ± 0.15 a |
| Day 4       | 7.86 ± 0.21 b   | 8.17 ± 0.31 b |
| Day 6       | 7.41 ± 0.43 c   | 7.73 ± 0.22 c |
| Day 8       | 6.28 ± 0.3 d    | 6.64 ± 0.29 d |

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

The results of the analysis of Kruskall Wallis organoleptic intensive shrimp pond appearance and traditional ponds at a level of confidence of 0.05 showed a significant effect between the type of pond and the storage time.

Further tests showed the appearance of intensive shrimp ponds and traditional ponds had no significant effect on storage day 0 to day 2, but had a significant effect on the confidence level of 0.05 on storage days 4, 6, and 8. Storage on day 2 is a very significant effect on the confidence level of 0.05 with storage days 4, 6, and 8. Storage day 4 is a very significant effect on confidence level 0.05 with storage days 6 and 8. Storage day 6 is very significant at a confidence level of 0.05 with 8th-day storage.

Organoleptic test results during storage as a whole can be concluded that the storage until the 6th day is still suitable for consumption because the value is more than 7. On the 8th day storage, the shrimp cannot be consumed. This is because vannamei shrimp during the process of handling and storage are in accordance with the principles of proper handling so that physical damage to shrimp can still be minimized [18]. Shrimp that are stored indicates that the longer the storage will decrease the organoleptic value of the appearance specifications [20].

Organoleptic testing, according to [22], is the most common way to determine the freshness of shrimp because it is easier and faster to do, does not require much equipment, and does not require a laboratory. [27] explained that the appearance of food is one important indicator in determining the quality of food. According to organoleptic testing, the minimum threshold for fresh fish is 7, so the product is declared suitable for consumption [25]. In accordance with SNI 01-2728.1-2006, shrimp with this value are not elastic, not compact, and not solid [3].

3.2. Smell test
Odor or aroma is a parameter that affects the quality of a processed product. The aroma or smell of food can determine the delicacy of these foods [7]. In general, the odor received by the nose and brain is a combination of four main odors, namely fragrant, sour, rancid, and scorched [11]. This odor test is carried out to determine the value of intensive and traditional ponds from 0, 2, 4, 6, and 8 days storage. Table 2 presents the odor test results in intensive and traditional farms.
Table 2. Test results of the smell on intensive and traditional pond shrimp

| Day Storage | Intensive          | Traditional         |
|-------------|--------------------|---------------------|
| Day 0       | 8.83 ± 0.16<sup>a</sup> | 8.86 ± 0.12<sup>a</sup> |
| Day 2       | 8.65 ± 0.18<sup>a</sup> | 8.73 ± 0.2<sup>a</sup> |
| Day 4       | 8.12 ± 0.28<sup>b</sup> | 8.30 ± 0.26<sup>b</sup> |
| Day 6       | 7.29 ± 0.31<sup>c</sup> | 7.63 ± 0.37<sup>c</sup> |
| Day 8       | 6.15 ± 0.46<sup>d</sup> | 6.89 ± 0.36<sup>d</sup> |

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

The results of the analysis of Kruskall Wallis organoleptic odor of intensive shrimp ponds and traditional ponds at a level of confidence of 0.05 showed a significant effect between the type of pond and the length of storage.

Further tests showed that the smell of intensive shrimp ponds and traditional ponds had no significant effect on storage day 0 to day 2, but had a significant effect on the confidence level of 0.05 on storage days 4, 6, and 8. Storage on day 2 is a very significant effect on the confidence level of 0.05 with storage days 4, 6, and 8. Storage day 4 is a very significant effect on confidence level 0.05 with storage days 6 and 8. Storage day 6 is very significant at a confidence level of 0.05 with 8th-day storage.

Organoleptic test results on the overall odor can be concluded that until the 6th day is still suitable for consumption because the value is more than 7. on the 8th-day storage the shrimp cannot be consumed. The value of each intensive and traditional ponds ranged between 8.83 - 6.15 and 8.86 - 6.89. The value of odor in intensive shrimp ponds is lower than the value of shrimp odor from traditional ponds. This is because the process of maintaining intensive shrimp and traditional ponds is very different. The intensive process of raising shrimp ponds involves the use of chlorine, artificial feed, and prebiotics, which allow it to contaminate and damage parts of the fish's body to produce ammonia.

Research [6] shows that the longer the storage, the lower the organoleptic value of odor specifications. The longer the storage will increase TVB, which evaporates the compounds formed due to the breakdown of amino acids found in fish meat, making the organoleptic value of odors decrease [21]. Changes in shrimp odor occur in the process of decay taking place at first the smell by the shrimp itself, then the smell of iodoform, the smell of ammonia, the smell of sulfuric acid, and finally the foul odor. Organoleptic properties related to physical properties, play an important role, especially to determine commodities that are still fresh or rotten [15]. [12] states that off-odor odors in shrimp products are the result of the formation of amine compounds (TMA), sulfides, alcohols, ketones, aldehydes, and organic acids by spoilage microbes. Determination of the shrimp quality deterioration phase is done to determine the condition and freshness of shrimp. Deterioration of shrimp quality includes four stages, namely pre rigor, rigor mortis, posterior, and rotten [26].

3.3. Texture Test

The texture is one of the factors that determine the acceptance of a product. The purpose of texture evaluation is to find out the panelist’s acceptance of the level of elasticity of a product that can be assessed using the sense of touch, which is through excitatory touch [7]. This texture test was carried out to determine the texture values in intensive and traditional ponds from 0, 2, 4, 6, and 8 days storage. Table 3 presents the results of texture tests on intensive and traditional farms.
Table 3. Test results of the texture on intensive and traditional pond shrimp

| Day Storage | Intensif   | Traditional |
|-------------|------------|-------------|
| Day 0       | 8.83± 0.17<sup>a</sup> | 8.79± 0.19<sup>a</sup> |
| Day 2       | 8.73 ± 0.21<sup>a</sup> | 8.76± 0.2<sup>a</sup> |
| Day 4       | 8.20 ± 0.28<sup>b</sup> | 8.13± 0.36<sup>b</sup> |
| Day 6       | 7.38 ± 0.4<sup>c</sup> | 7.57±0.34<sup>c</sup> |
| Day 8       | 6.24 ± 0.43<sup>d</sup> | 6.67±0.35<sup>d</sup> |

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

The results of the analysis of Kruskall Wallis organoleptic texture of intensive shrimp ponds and traditional ponds at a level of confidence of 0.05 showed a significant effect between the type of pond and the storage time.

Further tests showed that the texture of intensive shrimp ponds and traditional ponds had no significant effect on day 0 storage for day 2, but had a significant effect on the confidence level of 0.05 on storage days 4, 6 and 8. Storage on day 2 is a very significant effect on the confidence level of 0.05 with storage days 4, 6, and 8. Storage day 4 is a very significant effect on confidence level 0.05 with storage days 6 and 8. Storage day 6 is very significant at a confidence level of 0.05 with 8th-day storage.

Organoleptic test results of texture parameters in intensive and traditional shrimp ponds on storage day 0 to day 8 were 8.83 - 6.24 and 8.79 - 6.67, respectively. This figure shows that the shrimp on the 8th day of storage have been classified as unfit for processing and consumption. In accordance with the assessment instructions [1], SNI 01-2346-2006 organoleptic value of shrimp under the value of 7 is not elastic, not compact, and not solid. The posterior phase is characterized by the meat will become soft because of the work of enzymes in the body of the shrimp. [17] biochemical changes begin to deteriorate after the deterioration of fishery products, which is caused by autolysis, chemical, and bacterial.

Fish that are stored for a long time will decrease their organoleptic value due to undergoing the process of breaking down complex compounds into simple compounds by bacteria and uncontrolled enzyme activity that affects the physical condition of fish [14]. The enzymes contained in fish produced by bacteria will remodel the parts of the fish resulting in changes in taste, odor, gills, mucus, and texture of fish meat [11]. [16] said that due to a bacterial attack that starts from the rigor mortis phase causes fish mucus to become concentrated, gummy, fishy, sunset eyes, gills, and the contents of the stomach change color with a composition of messy stomach contents and a pungent odor. This is confirmed by [8]; namely, changes in the texture of the meat become softer occurs when the fish has begun to decline in quality. Meat in fish that deteriorates when pressed the texture of the meat is soft or no longer elastic.

The results of the analysis on intensive shrimp ponds and traditional shrimp ponds can be concluded that during the storage process from day 0 to day 8, it showed a very significant different effect on the level of confidence 0.05 value of appearance, odor, and texture. The organoleptic value of traditional shrimp is higher than intensive shrimp, so it can be said that traditional shrimp is superior to intensive shrimp.

4. Conclusion
The results showed that intensive and traditional ponds had a significant effect on the organoleptic test of vanname shrimp. The acceptance level of organoleptic quality in intensive shrimp ponds and traditional ponds on the eighth day is not suitable for consumption. Quality deterioration of shrimp from intensive ponds is faster than shrimp from traditional ponds.

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