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## Additions of Extract Turmeric on the Presto of Lalawak Fish (*Barbodes balleroides*) Stored at Room Temperature

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### ABSTRACT

The purpose of this research is to determine the effectiveness of turmeric and its best concentration in preserving the presto of lalawak fish based on the characteristics of microbiological tests and chemical tests including checking water content and pH. The research experimental method covered five treatments by adding turmeric extract solutions of 0%, 1%, 3%, 5%, and 7%. The test parameters observed in the research were microbiological tests using the method of TPC (Total Plate Count) in duplicate and chemical tests including checking water content and pH. The results showed that all treatments by adding turmeric extract were with concentrations of 1%, 3%, 5%, and 7% able to extend the shelf life presto of lalawak fish more than two days compared to the presto of lalawak fish which were not treated with turmeric extract or control (0%) which can only last two days. The treatment of the addition of 5% turmeric extract is able to provide the long lasting strength of lalawak fish for up to five days so that the shelf life is longer than other treatments, as evidenced by the TPC (*Total Plate Count*) value of  $5.81 \times 10^5$  CFU / gram on the 6th day. The water content reached 67.5% on the 6th day and the pH value reached 6.50 on the 5th day.

**Keywords:** pindang presto, Lalawak Fish, Turmeric, shelf life, TPC (Total Plate Count), Water content, pH, *Barbodes balleroides*, *Barbonymus balleroides*

## 1. INTRODUCTION

Lalawak fish (*Barbodes balleroides*) is one of the consumption fish that live in fresh water. At present the abundance of lalawak fish in Indonesia is widespread in Java and Kalimantan. In West Java, lalawak (*Barbodes balleroides*) are found in the Jatigede Dam. It was mentioned that the dominant fish with a wide distribution in the Jatigede Reservoir were 261 lalawak fish (58.13%) of the total caught 449 fish.

Jatigede Reservoir is a reservoir located in Sumedang Regency, has an area of  $\pm 4,122$  ha and is located not far from residential areas. The functions of the Jatigede Reservoir include electricity generation, irrigation, flood control and fisheries.

The people around the Jatigede Reservoir which were affected initially had a livelihood as farmers did not yet know the other ways of using lalawak fish other than just being bought and sold on fresh.

### Distribution:



Lalawak fish (*Barbodes balleroides*) (Fig. 1) have a fairly high reproductive potential and economic potential because they have good meat that is consumed by local residents. Lalawak which has quite a lot of thorns and thick meat can be innovated to become pindang. Fish scanning is a preservation effort and fish processing using salting and heating techniques. Fish scanning with presto technique is one of the effective ways to soften fish spines because it uses high pressure, about 1 atmosphere, so that lalawak fish that have enough thorns are very suitable to be innovated to be pindang presto.

Presto prawn products are included in food which is easily deteriorated during storage at room temperature. This is due to the high water content in leaf products and contamination from outside air which will trigger the growth of microorganisms, especially bacterial

decomposition. Optimal heating is not enough to maintain a high shelf life, therefore the main obstacle to processing fish by means of scanning is the short shelf life.



**Figure 1.** *Barbodes balleroides* (Valenciennes, 1842)

Presto only has a shelf life of 1-2 days at room temperature storage. One effort to extend the shelf life can be added by preservatives. Lots of preservatives that can be used, namely natural preservatives and synthetic preservatives. One of the natural preservatives that can be used is turmeric. There are many data and literature that prove that turmeric rhizome has a large potential to be used as a preservative because of its pharmacological activity as an anti-bacterial.

The addition of curcumin compounds and essential oils contained in turmeric can inhibit bacterial growth and as an antifungal so as to maintain food quality. Curcumin compounds contained in turmeric are around 3% - 10%, but turmeric has a lot of crude fiber which is an insoluble material in water. The presence of crude fiber will accelerate the process of mushrooming. Therefore, the use of turmeric in processing should be a solution of turmeric extract.

## **2. MATERIALS AND METHODS RESEARCH**

Research was conducted in January 2019 at the Fisheries Product Processing Technology Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University. The tools used in the research are grouped into six based on their designation, namely tools for making presto lalawak fish (cutting boards, knives, scales, and presto fish), tools for making turmeric extracts (knives, cutting boards, grated, and gauze), tools for testing microbiologists (scales, petri dishes, porcelain saucers, pipettes, test tubes, ovens, incubators, bunsen, and colony counters), tools for testing moisture content (digital scales, petri dishes, desiccators and ovens), and pH checking devices (plates petri, pH meter, and pH buffers 4 and 7).

The materials used in this research are lalawak fish, turmeric, salt, nutrient agar, aquades and physiological NaCl.

The research method used is the experimental method. This research uses five treatments. The treatment given is the prestige soaking the presto of lalawak fish in a different concentration of turmeric extract solution, as follows:

Treatment A = 0% turmeric extract concentration (control)

Treatment B = 1% turmeric extract concentration

Treatment C = 3% turmeric extract concentration

Treatment D = 5% turmeric extract concentration

Treatment E = 7% turmeric extract concentration

Percentage of concentration in each treatment based on dilution of the initial extract solution with distilled water. Observations were made on water content, pH, and microbiology (bacteria) on the presto of lalawak fish tank at the 1st day of storage and or to the maximum limit of the total number of bacteria according to SNI No. SNI 4106:2017 which is up to  $5.0 \times 10^5$  CFU/gram.

The procedure in this research is grouped into three parts they are the procedure for making turmeric extract, the procedure for diluting turmeric extract to obtain the solution with a predetermined concentration, and the procedure for making presto of lalawak fish. The test parameters used in this research were microbiological tests using the method Total Plate Count (TPC) in duplicate and chemical tests including checking water content and pH.

## **2. 1. Microbiological Test**

In this research microbiological tests were conducted to determine the total number of bacteria that grew on the presto of lalawak fish during storage at room temperature, this test was carried out using the method Total Plate Count (TPC) in duplicate. Total Plate Count is a calculation of bacterial living cells by determining the number of sample cells capable of forming colonies in suitable agar medium. Bacteria are cultured using Nutrient Agar (NA).

The method Total Plate Count (TPC) includes quantitative tests used to determine the quality and durability of a food product. Calculation of bacteria is carried out every day, until it reaches the limit of acceptance of presto bacterial colonies in accordance with SNI No. 4106:2017 which is  $5.0 \times 10^5$  colonies per gram.

## **2. 2. Chemical Test**

### **2. 2. 1. Water Content**

Water content is the number of molecules free water contained in a product. According to SNI No.01-2354.2-2006, the principle of calculation on water content is that water molecules are removed by heating with a vacuum oven at 95 – 100 °C with air pressure not more than 100 mm Hg for 2 hours or the oven does not vacuum at 105 °C for 3 hours.

### **2. 2. 2. pH**

Measurement of pH is carried out to thought the trend of increasing / decreasing pH during storage. The pH value of fish that ranges from 6,0-7,0 and temperatures around 25 – 30 °C is an ideal condition for growth of decomposing bacteria, while a low pH can inhibit

contamination of decomposing microorganisms, pathogenic microorganisms and toxin-producing microorganisms will die.

### 3. RESULTS AND DISCUSSION

Observation the results of the research was carried out based on the test parameters used, namely the microbiological test using the TPC (Total Plate Count) in duplo and chemical tests include checking water content and pH.

#### 3. 1. Microbiological Test

Results calculated the total amount of bacteria on presto of lalawak fish during storage at room temperature are presented in Table 1.

Based on the data presented in Table 1 it can be seen that at the beginning of storage that is on the day -1 total bacteria reached  $2.96 \times 10^1$  CFU/gram –  $3.56 \times 10^1$  CFU/gram. This is due to the presence of bacteria remaining after the boiling process. These bacteria belong to the class of heat-resistant bacteria and salt bacteria, as well as bacteria that originate from the outside which contaminate of presto of milkfish.

During storage, there was an increase in the total number of bacteria in all the samples of presto lalawak fish, both those treated with turmeric extract and those not (control). The biggest increase in total bacteria is in the control treatment, this shows that given the salt in each scanning process has not been effective enough to suppress bacterial growth, so that on the 3rd day the total bacteria in the control treatment reached  $5.9 \times 10^5$  CFU/gram. In addition to the presto lalawak fish which is given the concentration of turmeric, there is an increase in the total number of bacteria, this is because the bacteria continue to grow even though they have been given anti-bacterial substances such as turmeric.

**Table 1.** Total Bacteria Pindang lalawak Presto Fish during Storage at Room Temperature

Treatment	Storage Duration (days)					
	1	2	3	4	5	6
<b>A (0%)</b>	$3,56 \times 10^1$ CFU/gram	$4,97 \times 10^3$ CFU/gram	$5,93 \times 10^5$ CFU/gram	$6,22 \times 10^5$ CFU/gram	$7,00 \times 10^6$ CFU/gram	$7,33 \times 10^6$ CFU/gram
<b>B (1% )</b>	$3,25 \times 10^1$ CFU/gram	$4,42 \times 10^2$ CFU/gram	$4,78 \times 10^3$ CFU/gram	$5,87 \times 10^5$ CFU/gram	$6,14 \times 10^6$ CFU/gram	$7,17 \times 10^6$ CFU/gram
<b>C (3%)</b>	$3,20 \times 10^1$ CFU/gram	$3,99 \times 10^2$ CFU/gram	$4,98 \times 10^3$ CFU/gram	$5,67 \times 10^5$ CFU/gram	$6,40 \times 10^6$ CFU/gram	$7,33 \times 10^6$ CFU/gram
<b>D (5%)</b>	$2,96 \times 10^1$ CFU/gram	$3,98 \times 10^2$ CFU/gram	$3,98 \times 10^2$ CFU/gram	$4,91 \times 10^3$ CFU/gram	$4,97 \times 10^4$ CFU/gram	$5,81 \times 10^5$ CFU/gram
<b>E (7%)</b>	$2,99 \times 10^1$ CFU/gram	$3,95 \times 10^2$ CFU/gram	$4,91 \times 10^3$ CFU/gram	$4,99 \times 10^4$ CFU/gram	$5,84 \times 10^5$ CFU/gram	$7,55 \times 10^6$ CFU/gram

Based on bacterial content, treatment B of turmeric extract was 1% and treatment C of turmeric extract of 3% had a rejection limit on day 4th with a calculation of bacteria  $5,87 \times 10^5$  CFU/gram and  $5,67 \times 10^5$  CFU/gram. Presto of lalawak fish with D treatment (5%) gave the lowest total bacterial count and the increase in the total number of bacteria also occurred on the 6th day, the increase was slower than that of other lalawak fish with other treatments. This shows that the antibacterial properties of turmeric on treatment D (5%) work to inhibit bacterial growth optimally.

Based on observations during storage, in treatment E with the highest concentration of turmeric extract which is 7% it has more total bacterial amount which reaches  $5,84 \times 10^5$  CFU/gram on day 5th compared to treatment D which is given a concentration of turmeric extract of 5 % which has a smaller total bacterial number which reaches  $5,81 \times 10^5$  CFU/gram on the 6th day, making the presto of lalawak fish prestige more durable. This difference is caused by the high concentration of turmeric given to treatment E (7%). Turmeric can stimulate bacterial growth with the addition of nutrients from turmeric such as cabbage, protein, and vitamins which are a medium for bacterial growth (Kaamiliina 2005). The inhibition of bacterial growth is due to the administration of turmeric which is antibacterial. The antibacterial properties of turmeric are from curcumin and the essential oils they contain.

### 3. 2. Chemical Test

#### 3. 2. 1. Water Content

Water content is one of the factors that has a major influence on the durability of food ingredients. The water content in food ingredients determines the acceptability of freshness and durability (Winarno 1997). During storage at room temperature, the prestressed water content of the presto of lalawak fish have to increasing as shown in Table 2.

**Table 2.** Percentage of the Water Content of the Presto of lalawak Fish during Storage at Room Temperature

Treatment	Storage Duration (days)					
	1	2	3	4	5	6
<b>A (0%)</b>	55,0%	59,0%	67,0%	71,0%	75,0%	76,0%
<b>B (1%)</b>	42,5%	55,0%	59,5%	61,0%	70,0%	71,0%
<b>C (3%)</b>	45,0%	54,0%	60,0%	62,5%	67,5%	75,0%
<b>D (5%)</b>	44,0%	52,5%	57,5%	59,0%	60,5%	67,5%
<b>E (7%)</b>	42,5%	53,5%	56,0%	60,0%	61,0%	69,5%

Increased the water content during storage tends to caused by humidity around the sample or material. If the water content of the sample or material is low while the humidity of the surrounding air is high, it will absorb moisture from the surrounding air so that the water content

becomes high and vice versa. In the results of this research, the best shading characteristics of the presto of lalawak fish based on water content parameters are the presto which has the lowest average water content value.

The low water content can cause hard bacteria to live. The low water content of the presto of lalawak fish at the beginning of storage is due to the boiling process (boiling and salting). High temperatures can cause a decrease in the ability of fish meat to maintain body fluids.

The best characteristic of the presto of lalawak fish based on the parameters of water content is the prestige of the lalawak fish which has the lowest moisture content.

The presto of milkfish has a water content of 50% - 60,9%, this shows that if the high water content of the presto of lalawak fish exceeds 60,9%, it means that it has been categorized as not consumable. On the 1st to 3rd day of storage, the lalawak fish presto with treatment B, C, D and E, namely the addition of turmeric extract as much as 1%, 3%, 5% and 7% had an average value of less water content from 60.9% and is the lowest water content compared to treatment A (control) which has reached 67.0% on the 3rd day and increases until the 6th day storage.

Treatment B and C is the addition of turmeric extract by 1% and 3% resulting in a fairly low water content value and not too high on the first storage day until the third day's storage, but at the 4th day until the 6th day of storage presto of lalawak fish with treatment B (1%) and C (3%) the value of the water content increases and reaches the maximum limit. The treatment E (7%) began to increase at the 5th day of storage until the 6th day of storage. While treatment D (5%) has a lower water content value, the increase is not too high among other treatments until the 6th day.

Turmeric has a fairly high protein content which is equal to 8.60 per 100 gram of turmeric so that it can be an additional protein in the high quality of lalawak fish. Proteins other than good for the body can also bind water to food. Therefore the high water content of the lalawak fish which has a relatively low value and not too high increase indicates that the protein has the ability to bind water so that the free water in the prestige meat of lalawak does not come out too much.

While increasing the water content in each day for all treatments is thought to be due to the breakdown of the protein structure due to bacterial activity which causes the release of bound water. The amount of free water in the prestige meat of lalawak fish will cause bacterial growth to accelerate, thus the higher the increase in the number of bacteria during storage will cause the increase in the water content of the presto of lalawak fish, this will cause the presto of lalawak fish to rot quickly.

### **3. 1. 2. pH**

The degree of acidity or pH is one of the determinants of a fishery product that is to determine whether or not a product is suitable for consumption, because at certain pH conditions it will trigger the growth of decomposing bacteria which causes the product not to be consumed. The observation of the average change in the pH value boiled the presto of lalawak fish during storage are presented in Table 3.

Measurement of pH values on the samples of the presto of lalawak fish during research activities was carried out using a pH meter. Based on observational data on the pH value during storage, the pH values in all samples of the presto of lalawak fish treated with different treatment have increased since the first day of storage until the last day of storage. The increase in pH value occurs because of the decomposition of macromolecules into simple metabolites by

bacteria, then the bacteria will break down metabolites into simpler, more alkaline compounds, such as nitrogen.

The pH value can affect the growth of decomposing bacteria. The optimum pH value for growth of decomposing bacteria is 6.5 – 7.5, while minimum bacterial growth can be achieved at pH below 5.00. Thus, the best characteristic based on pH value parameters is presto which has the lowest and longest pH increase and / or increase to reach pH 6.5. In treatment A (control), B (1%) and C (3%) had reached pH 6.5 since day 4 but with different pH values. The highest pH value among the three treatments on day 4 was treatment A (control) of 6.61. Meanwhile treatment D (5%) and E (7%) began to reach pH 6.5 on day 5 with the largest pH value of 6.56 for treatment E (7%).

The increase in the lowest and longest pH value to reach pH 6.5 occurred in the prestige of the lalawak fish with treatment D (5%) which reached a pH value of 6.5 on the 5th day with a pH value of 6.50. Until the end of storage, treatment D (5%) has a lower pH value compared to other treatments. This shows that the addition of turmeric extract with a concentration of 5% is quite capable of maintaining pH conditions so that with a low pH value the growth of decomposing bacteria becomes inhibited.

**Table 3.** The pH value of teh Presto of lalawak fish during Storage

Treatment	Storage Duration (days)					
	1	2	3	4	5	6
<b>A (0%)</b>	6,11	6,25	6,43	6,61	6,79	6,95
<b>B (1%)</b>	6,03	6,14	6,28	6,52	6,69	6,88
<b>C (3%)</b>	6,10	6,24	6,49	6,51	6,63	6,92
<b>D (5%)</b>	6,04	6,14	6,21	6,46	6,50	6,71
<b>E (7%)</b>	6,00	6,20	6,26	6,39	6,56	6,88

#### 4. CONCLUSION

Based on the results of microbiological tests and chemical tests which include the water content and pH test, it can be concluded that the presto of lalawak fish with turmeric treated at 5% can maintain the presto of lalawak fish for up to five days.

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