QUALITY OF SCAD MACKEREL (*Decapterus* sp.) *PINDANG* PROCESSED AT DIFFERENT LEVELS OF SALTING AND COOKING TREATMENT

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ABSTRACT

Regarding source of animal protein, *pindang* (salted and cooked fish) seems to have a greater potentiality than *ikan asin* (salted and dried fish), since *pindang* is more favorable in terms of sensory properties; thereby, *pindang* can be more widely consumed. Besides, *pindang* is also ready-to-eat product, which make it easier to consume. This research aimed at evaluating the different degree of salting and cooking on quality of scad mackerel *pindang*. The experiment was carried out according to Randomized Block Design, consisting of two processing methods: steam (A) and pressured or presto (B), with various concentrations of salt, i.e. 5%, 10% and 15%. The sample was then analyzed for content of protein, moisture, ash, as well as hedonic profile. The results showed that the best quality of scad mackerel *pindang* was achieved at pressured fish with salt 5%, yielding protein of 34,68%, moisture of 64,79%, and ash of 1,80%.

Keywords: *pindang*, salt concentration, cooking methods, scad mackerel

INTRODUCTION

A traditional fish product, called *pindang,* has become a popular food in Indonesia. It is ranked the second plasce after salted fish (traditional name *ikan asin*) based on disposition in traditional processing (Anon., 2006). Regarding to efforts in improvement of domestic protein consumption, *pindang* tends to be more prospective than *salted* fish, since it has been more acceptable with regard to taste. Therefore, consumption of *pindang* should be easier to raise. Besides, *pindang* is a ready-to-eat product, which make it more favorable to consumers (Agency for Marine and Fisheries Research, 2005).

Pemindangan, a process to manufacture *pindang,* is a method for converting fish into *pindang,* with aid of salting and cookng process. Salt serves to give salty taste, as well as to reduce deterioration due to bacteria. Furthermore, spices such as garlic, bay leaf and galangal, are also added. Solid-state salt (crystal) is often used, thoroughly added to fish at 5-25% of total fish weight.

Concentration of salt used is important to consider, since it noticeably affect the salty taste of the product, as well as its storability. Salt solution is also used, by directly mixing solution with the fish. The fish must be appropriately submerged in salt solution to ensure the quality (Budiman, 2004). In addition, cooking process predominantly accounts for removal of spoilage bacteria.

Furthermore, *pemindangan* can be categorized into some types, depending on process, container, fish, spices, and origins (Adawyah, 2007). Difference in method, processing, and procedures may differ, relying on place, processors, and condition, which seems to be more dependent on environmental factors which are unable to be evaluated through quantitative measurement (Heruwati, 2006).

Based on processing types, *pindang cue* is one of the prominent methods, in which the fish is boiled in salt solution; while *pindang garam* is obtained through boiling the fish in a few amount of water, then added with salt. Last, *pindang presto* is processed with aid of high pressure steamer to produce soft bone fish. *Pindang* is made from a variety of fish, including milk fish, tongkol, kembung, cakalang amas, nila, and scad mackerel. The *pindang* can also enriched with spices such as turmeric. Based on location, various *pindang* products are very famous, including Pekalongan, Tuban, Muncar, and *pindang* juwono (Adawyah, 2007).

Although numerous previous studies on *pindang* have been reported (Ariyani, and Yennie, 2008; Fauziah, *et al*., 2014; Rachmat, *et al*., 2014; Handayani, *et al*., 2017), the discussion on salting and cooking process for manufacture of *pindang* is rather scarce. For this reason, our experiment is conducted to discuss effects of salting and cooking treatments on quality of *pindang* from scad mackerel.

METODOLOGY

Materials

Fresh scad mackerel (*Decapterus* sp.) was collected from fishermen in Selayar. Salt and spices were also used, including basil leaves, lemon grass stalks, lemon leaves, purchased from Langgur market.

Sample preparation

Protocol for *pemindangan* of scad mackerel was described as follows. Fresh scad mackerel (± 200-250 g/fish) was immediately transported from Selayar to laboratory using a plastic container with

ice cubes. After sorting and gutting, the fish was throughly washed and drained. Subsequently, the fish was submerged in salt solution (5%, 10%, 15%) for 30 min, then seasoned with mixture of spices containing basil leaves, lemon leaves, lemon grass stalks. Afterwards, the seasoned fish was cooked in two cooking methods: steaming at 100°C and autoclaving (presto) at 121°C for 1 h.

Experimental Design and Analysis

Randomized block design was applied to evaluate the effects of factors, i.e. cooking methods (steaming and presto) and salt concentration (5%, 10%, and 15%). The experiment was carried out at triplicates.

Proximate analysis was performed according to AOAC (2006), including moisture content, protein (using Kjeldahl), and ash content (using furnace at 525°C for 18 h). Hedonic test was performed using 1-9 scale, i.e. 1 = dislike extremely, 2 = dislike very much, 3 = dislike moderately, 4 = dislike slightly, 5 = neither dislike nor like, 6 = like slightly, 7 = like moderately, 8 = like very much, 9 = like extremely.

Furthermore, the sample was assessed by panelists on four paramaters (appearance, aroma, taste, and texture), described as follows (SNI 01-2346-2009):

1. Appearance: 1 = whole, messy, dull; 3 = whole, messy, dull; 5 = whole, messy, less clean and dull; 6 = whole, neat, less clean, dull; 7 = whole, neat, clean, slightly dull; 8 = whole, neat, less bright; 9 = whole, neat, bright
2. Odor: 1 = rotten and acid smelling; 3 = moderately rotten; 5 = slightly acid; 6 = slightly fresh; 7 = fresh, ; 8 = fresh, with pleasant smelling, 9 = highly fresh, with pleasant smelling
3. Taste: 1 = strongly acid and rotten taste; 3 = slightly acid and rotten taste; 5 = tasteless; 6 = slightly umamy; 7 = tasty with slightly umamy; 8 = tasty and umamy; 9 = tasty very much, umamy
4. Texture: 1 = highly flabby; 3 = flabby; 5 = less firm, flabby; 6 = firm, less flabby; 7 = firm, less cohesive, 8 = firm, tender; 9 = highly firm, tender.

Data collected were then evaluated using analysis of variance (ANOVA), while significant difference between means was verified using Duncan test (Hanafiah, 2011). For hedonic test, data Kruskal Wallis was used to evaluate the data at confidence of 95%. Statistical analysis of

this experiment employed SPSS version 17.

RESULTS AND DISCUSSION

Sensory Profile of the scad mackerel *pindang*

Sensory evaluation is required to observe the suitability of scad mackerel in production of *pindang*. The results showed that the average score ranged from 5,98 ≤ μ ≤ 8,20 (Figure 1) at confidence interval 95%. This suggest that the fish demonstrated sarisfying properties as raw material. The *pindang* product appears as whole, neat, clean, with less bright in color, but it has fresh and pleasant smelling, with tasty and umamy taste. The fish also shows firm and tender texture. Similarly, Adawyah (2007) also reported desirable features of scad mackerel, including whole, unbroken, clean, bright with a specific color, and without salty-foreign materials, spoilage mold, and mucus. For favorable characteristics, *pindang* product produced a distinctive odor, like a boiled fish, without any rancid smelling. In terms of texture, the product should be good at tenderness, with a firm and not-watery (dry) texture. Previous studies on physical features of the fish are also discussed by Fauziah, *et al*. (2014), Ariyani and Yennie (2008), and Handayani, *et al*., (2017).

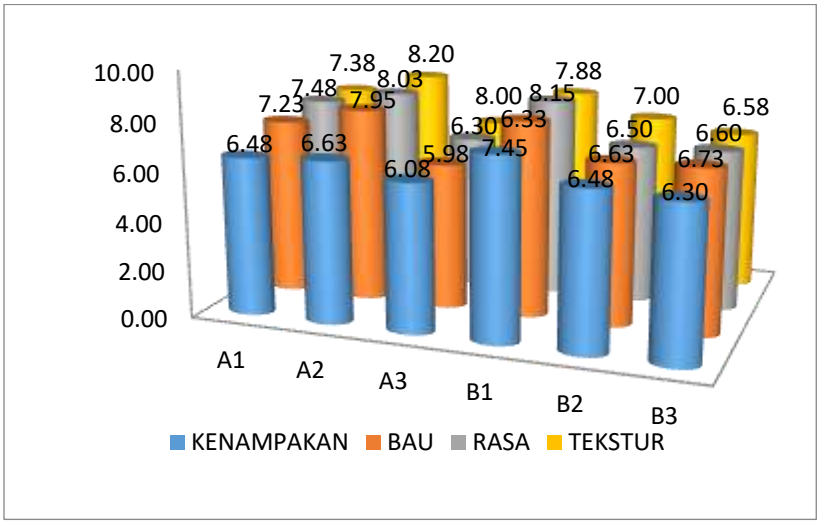

Figure 1. Sensory profile of scad mackerel *pindang*

Suparno (1993) asserted that the acceptable extent of salt level for human sensory was ≤20% of fish weight; in this regard, more salt could produce bit taste. Therefore, the optimum level of salt, as reported by Pandit (2016), was found at

15%, while the use of salt at level of 10% achieved the most favorable properties. During cooking and salting, biochemical reactions may occur at high rate, enabling to cause significant changes on protein formation, content of chemicals (salt, moisture), and consumer acceptance, as well as microbial viability. Riyanto *et al*., (2010) also found that the use of 60-min cooking could produce the best quality of *pindang*.

Proximate composition

Our experimental data showed that cooking methods (steaming, presto) did not show significant impacts to protein level ($p>0.0\%$), but caused significant changes on content of moisture and ash ($p<0.0\%$). Inversely, salt concentration exhibited significant difference on protein (salt concentration of 15%), but did not show any significant effects on moisture and ash content (salt concentration of 5% and 15%).

The results demonstrated that the highest protein content of scad mackerel *pindang* was achieved at salt concentration of 15%, regardless cooking treatments. We found that higher concentration of salt resulted in a greater content of protein, which is linked to role of salt in inducing lysis of protein present in fish flesh and microorganisms due to difference in osmotic pressure and toxicity of chloride ions towards microbials able to devastate respiratory system. Furthermore, Soediaoetama (2006) reported that fish contained a superfluous quantity of protein with variety of essential amino acids. Similarly, Astawan (2004) argued that fish contained complete essential amino acids for human consumption; thus, fish protein was comparable with beef protein. As explained by Basuki *et al*. (2009), fish is also precious source of unsaturated fatty acids such as omega-3, which is widely used in improving human health. In short, fish is a valuable food since it supplies a high proportion of protein, reaching up to 18 g per 100 g fresh fish (Ohoiwutun, 2012); while, protein content of dried fish can reach 40 g per 100 g dried fish.

The experimental data revealed that moisture content of sample cooked using either presto or steaming reached 63-64%. In this case, salt treatment at 5% and 10% was comparable, but it decreased at higher concentration of salt (15%), as presented in Table 1. As reported in previous studies (Ariyani, *et al*., 2004;

Ariyani and Rario, 2006; Ariyani and Yennie, 2008; Dwiyitno, *et al*., 2005), the moisture content of sample reached 60-66%. A higher addition of salt resulted in a lower moisture content. Pandit (2016), explained that treatment of salt 15% showed the best quality, but the most preferable sample was made at salt 10%. Cooking and salting process are crucial since they cause protein denaturation and induce changes in protein, salt, moisture, and bacterial profile, which in turn determine consumer preference.

Table 1. Proximate composition of scad mackerel *pindang*

Treatments	Protein	Moisture	Ash
Steaming + salt 5%	32,94±2,468 c	64,72±0,368b	1,82±0,113b
Steaming + salt 10%	32,99±2,107c	64,78±0,373 b	1,87±0,127b
Steaming + salt 15%	33,90±0,410b	63,15±2,305d	1,79±0,104c
Presto + salt 5%	33,61±2,503b	64,98±0,679 a	1,90±0,185a
Presto + salt 10%	34,48±0,643 a	64,97±0,352 a	1,92±0,177 a
Presto + salt 15%	34,68±0,814 a	63,80±1,379c	1,65±0,247d

The ash content of scad mackerel *pindang* is comparable in all treatments. It is imperative to discuss ash content which may represent nutritions of the food. Longer cooking time is responsible for removal of organic elements such as carbon in protein and fat, as well as sulphate and phosphate in protein.

CONCLUSION

The manufacture of scad mackerel *pindang* treated at salt 10% under steaming process produced the most preferable sample. It needs further studies focusing on shelf life of the sample.

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