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THREE-SPOT GOURAMI (TRICHOGASTER TRICHOPTERUS) CHIPS WITH DIFFERENT AND DURATION COOKING METHOD

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ABSTRACT
Research on dry marsh Three-Spot Gourami has been carried out without utilizing and addition of sow seasoning as much as 15%. Removal of the head can reduce the weight of products and nutrients wasted without being utilized. In addition, the use of sow seasoning needs to be studied again, considering the negative side of instant seasoning that can interfere with health. This study investigated the influence of cooking methods and duration to maximize the overall utilization of the Three-Spot Gourami fish body and reduce the concentration of seasonings. However, nutritionally and consumer acceptance is still in the maximum value range. The stages of the study are divided into 2 (two) groups. First, the manufacture of marsh astringent chips by ripening (without cooking, boiling, steaming, and pressurized steaming). The best treatment in the first research phase will be continued in the second phase, namely cooking with duration of 0, 10, 20, 30, and 40 minutes. At each of the stages, marsh-astringent chips are characterized proximately (water, ash, fat, proteins, and carbohydrates), physics (crispness), and organoleptic (appearance, colour, taste, aroma, and texture) for stage 1 and stage 2 characterization of physics (crispness) and organoleptic (appearance, colour, taste, flavour, and texture). The trial design used a Complete Randomized Design (RAL) with treatment according to each stage. The results of the first phase of the study showed that the treatment of pressure steaming method (A_3) was the best treatment with the characteristics of the water content of 6.56%, protein content of 51.09, ash content of 9.67%, the fat content of 16.59%, the appearance of 6.75, colour 8, texture of 8.2, taste of 7.55, the aroma of 7.65 and crispness 7.85. While the second stage of the study, the best treatment was in the cooking time for 20 minutes (B_2) with a value of appearance 6.7, colour 8.25, texture 7.85, taste 7.80, aroma 8.35, and crispness 7.45.

KEY WORDS
Trichogaster trichopterus, chips, proximate, organoleptic, sow spice.

The waters in South Kalimantan include rivers, swamps, reservoirs, and other puddles and have many types of fish, one of which is the swamp blue gourami fish *(Trichogaster trichopterus)*. Data from the South Kalimantan provincial fisheries service shows that in 2018 the swamp Three-Spot Gourami fish *(Trichogaster trichopterus)* in South Kalimantan, which is in the river waters, amounted to 1951.8 tons, while in swamp waters amounted to 3051.7 and inundation waters amounted to 4.2 tons. Hence, the total number of swamp Three-Spot Gourami fish in South Kalimantan waters was 5007.7 tons (South Kalimantan Provincial Fisheries Service, 2020).

The marsh Three-Spot Gourami fish *(Trichogaster trichopterus)* is one type of fish that is quite well known in the community, especially in South Kalimantan. Marsh Three-Spot Gourami fish are abundant in the waters of swamps, rice fields, and creeks. Marsh Three-Spot Gourami fishing can be carried out throughout the year, with high catches around May, June, July, August, and September. Marsh spacing fish is found in swamp waters, including the family Anabantidae with the common name *treespot goramy* because on its body there are two black spots and one eye which becomes 3 black spots. It is commonly found in waters between 20-28ºC, the fresh waters of Malaysia, Burma, and Indonesia (Murjani, 2009).

The great potential of Three-Spot Gourami rawa is mainly used as dried fish with sales already extending to outside Kalimantan, used primarily as a souvenir from Kalimantan. Processing dried Three-Spot Gourami fish is carried out using traditional methods, namely by drying in the sun.

Large production from swamp Three-Spot Gourami will potentially not be utilized if the production is abundant, namely in the range of May and June. Because the drying process requires a long time (1 – 2 days), and the drying place is limited. The high production of fresh Three-Spot Gourami fish and the limited production of dried Three-Spot Gourami fish will cause problems. Many Three-Spot Gourami fish are not used, so a fast processing alternative is needed, and the scope of product marketing is broader.

Rahmawati and Aisyah (2018) have researched the use of swamp spasms in crispy fish by adding sow seasoning. This study showed that the process without utilizing the fish head was processed using the pressure cooking method (prescooker) for 40 minutes. Nadia *et al.* (2020) suggested that the processing of tilapia chips (*Oreochromis niloticus*) or, under the famous name, *baby fish*, will increase in nutritional composition along with the increase in body weight and the length of harvest life. Dewi *et al.* (2017) added that the processing of wader fish chips (*Rasbora jacobsoni*) by slicing oil after the frying process would increase protein content and lower PV and TBA as oxidation parameters, namely 4.47 meq/kg and 0.04 malonaldehyde/g.

Modifications in the processing of marsh astringent fish chips need to be studied more deeply to produce fish chips of good quality. The processing of swamp astringent chips that have been carried out by Rahmawati and Aisyah (2018) needs to be improved with the right time for *the press cooking* process and the addition of an oil slicing process to reduce the potential for oil oxidation which will affect the shelf life of swamp astringent chips. So that in this study, observations were made of the method and duration of cooking the presto used so that fish chips are swampy with a whole-body condition with a level of crispness following consumer desires.

The specific objectives of this research activity are:

1. Studying the influence of ripening methods on the chemical, physical and organoleptic characteristics of marsh astringent chips (*Trichogaster trichopterus*);
2. Studying the influence of ripening lama on the organoleptic characteristics of marsh astringent chips (*Trichogaster trichopterus*).

METHODS of RESEARCH

The study was conducted for 3 (months) months, starting from April to June 2022 and located at the Fishery Products Processing Laboratory (PHP), Department of Fishery Product Processing, Faculty of Fisheries, and Marine Ulm.

The tools used in the study have 2 parts. The first part of fish chip processing equipment is other knives, cutting boards, scales, basins, stoves, pans, autoclaves, and oil slicers. The tools used for analysis are goblet cups, *blenders*, whiteness meters, *water baths*, ovens, thermometers, laminary air flow, incubators, 10 x 10 cm glass slabs, Erlenmeyer flasks, soxhlet tubes, porcelain cups, bunsen burners, electric furnaces, desiccators, homogenizers, centrifuges, filter paper, Kjeldahl flasks, soxlets, score sheet sheets, samples, panellist tables, and chairs.

The materials used are divided into 2 parts: fish chip processing materials and materials for analysis. The first ingredient is swamp Three-Spot Gourami fish, while the other ingredients are instant balado flavouring, spicy-sweet, and Antaka brand cheese and cooking oil. The second material used for analysis is NaOH, KCl, K_2SO_4, $CuSO_4$, H_2SO_4, H_2O_2, H_3BO_2, $Na_2(SO_4)_3$, $BaSO_4$, $BaCl_2$, and aquadest.

The Research Stage consists of 2 stages research. The best results in phase 1 research (cooking method) will be selected as the best treatment to be continued in phase 2 research. The stages of research are as follows:

a. Phase 1 research (characterization of swamp Three-Spot Gourami with different cooking method treatment) namely: No cooking, Boiling, Steaming, Pressure steaming;

b. Phase 2 research (Characterization of swamp Three-Spot Gourami with long-term cooking treatment) namely: 0, 10, 20, 30 and 40 minutes.

The procedure for making crispy Three-Spot Gourami fish (*Trichogaster trichopterus*) is as follows (Rahmawati and Aisyah, 2018):

1. Fresh marsh Three-Spot Gourami fish is cleaned by weeding to remove impurities such as mucus, scales, blood, and fish offal;
2. Wash the astringent marsh fish (*Trichogaster trichopterus*) with water until clean and drain;
3. Furthermore, the fish are arranged in the cooker (according to the treatment), then the marsh Three-Spot Gourami fish (*Trichogaster trichopterus*) is presto and overlaid using a banana leaf base with a long cooking time according to the treatment;
4. The fish that have been finished in the presto are then sliced;
5. After the fish is cold, the frying process is carried out and drained;
6. Fish that have been drained then added tabus seasoning according to the treatment;
7. Fish that have been sprinkled are then tested with chemical, physical and organoleptic parameters.

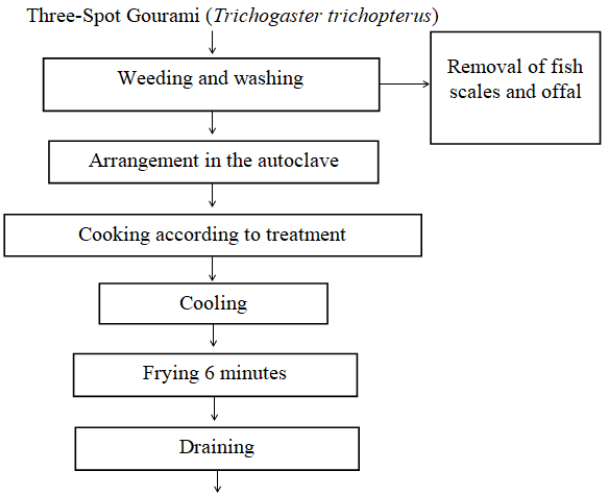

Figure 1 – Three-Spot Gourami (Trichogaster trichopterus) Chips

The design of this study with the treatment used is as follows:

- Stage 1:
  - A_0 = No cooking (control);
  - A_1 = Boiling;
  - A_2 = Steaming;
  - A_3 = Presscooking.
- Stage 2:
  - B_0 = 0 Minutes (control);
  - B_1 = 20 minutes;
  - B_2 = 30 minutes;
  - B_3 = 40 minutes.

RESULTS AND DISCUSSION

The research in stage 1 determines the best cooking method for obtaining the characteristics of the best astringent chips in terms of chemical and organoleptic parameters. Based on the results of data analysis (ANOVA) shows that the treatment does not differ markedly ($p<5\%$) on the parameters of protein content, ash content, fat content, appearance, colour, and aroma. Meanwhile, in other parameters, there are noticeable differences in each treatment ($p>5\%$)(Table 1).

Table 1 – Data from the phase 1 study

Parameters	Treatment											
	A_0			A_1			A_2			A_3		
Moisture content (%)	7.62[a]	±	1,10	16.18[b]	±	0,47	14.50[b]	±	0,04	6.56[a]	±	0,71
Protein content (%)	47.76[a]	±	2,48	49.47[a]	±	1,22	51.03[a]	±	1,47	51.09[a]	±	0,87
Ash content (%)	11.55[a]	±	1,64	11.17[a]	±	0,48	7.93[a]	±	0,42	9.67[a]	±	0,89
Fat content (%)	26.23[a]	±	1,82	18.66[b]	±	0,25	17.45[b]	±	0,06	16.59[b]	±	0,22
Appearance	8.00[a]	±	1,34	6.35[a]	±	1,73	7.35[a]	±	1,27	6.75[a]	±	1,62
Color	7.15[a]	±	1,09	8.50[a]	±	0,76	7.60[a]	±	1,14	8.00[a]	±	0,86
Texture	8.40[ad]	±	0,68	6.70[ab]	±	0,98	7.80[ad]	±	1,01	8.20[cd]	±	1,06
Taste	8.25[a]	±	0,97	7.50[bc]	±	1,00	7.90[ac]	±	0,79	7.55[bc]	±	0,89
Aroma	7.80[a]	±	1,47	7.65[a]	±	1,14	8.05[a]	±	0,76	7.65[a]	±	0,93
Humility	6.05[a]	±	1,00	8.15[b]	±	0,88	7.60[b]	±	1,10	7.85[b]	±	0,81

Note: Numbers on the same parameter followed by the same superscript letter show no real difference at the level of p<5%.

The moisture content of the astringent chips was lowest in the A_3 (press cooking) treatment, with a content of 6.56%. This is because press cooking causes a decrease in the ability to hold water from the swamp astringent due to the rupture of water hydrogen bonds in the swamp astringent, causing water to come out more quickly during frying. Sundari et al. (2015) suggest that high-pressure cooking/boiling for a long time can cause hydrogen bond rupture, making water more volatile during drying.

The parameters of protein and ash levels showed no significant differences for the entire treatment. The cooking process does not affect the amount of protein and ash content but only changes its shape to a more straightforward form. Food processing converts the original form into a state close to the condition to be eaten immediately. One of the processes of processing foodstuffs is to use heating. Food processing using heating is known as the cooking process, which is the process of heating foodstuffs with a temperature of 100 ° C or more with the primary objective of obtaining a better taste, better aroma, and softer texture, to kill microbes and activate all enzymes (Sumiati, 2008).

The cooking process (A_1, A_2, and A_3) significantly affects the fat content of the astringent chips (*p>5%*). Heating factors cause this condition boiling and steaming can remove fat from the astringent body compared to without cooking (A_0). So that fats easily deform into free fatty acids. Falistin et al. (2015) report that the cooking process by boiling and or steaming can dissolve organic and inorganic elements through hot steam that is in line with the release of the carbon chain-forming free fatty acids.

The astringent chips' appearance, colour, and aroma characteristics show a value that does not differ markedly (*p<5%*); this event indicates that the cooking process does not affect the parameter's value. Each treatment's stages of the cooking process are carried out procedurally and maintain sanitation and hygiene so that they do not display other appearances besides the astringent chips. The colour and aroma are still as specific as the swamp spacing process because the quality of the ingredients is still in the fresh category without any significant deterioration in quality. Adrianti et al. (2019) report that foods processed by frying pans have discolouration and aroma due to a combination of Maillard reactions and components in oil. The surface of the outer layer will be brownish-yellow, and the formation of volatile components due to frying.

Based on the data from the phase 1 study, A_3 (pressure steaming) was obtained as the best treatment with the characteristics of the water content of 6.56%, then the protein content of 51.09, ash content of 9.67%, fat content of 16.59%, the appearance of 6.75, colour 8, the texture of 8.2, the taste of 7.55, the aroma of 7.65 and crispness of 7.85. So, cooking with the press method is continued for phase 2 research, namely, cooking for 0, 10, 20, 30, and 40 minutes.

The results of the fingerprint analysis (ANOVA) showed that the parameter values of appearance, colour, texture, taste, and aroma did not differ markedly (*p<5%*). In comparison, the crispness value showed a noticeable different result (*p>5%*). Data on the phase 2 study can be seen in Table 2.

Table 2 – Data from the results of the phase 2 study

Parameters	Treatment														
	B_0			B_1			B_2			B_3			B_4		
Appearance	6.60[a]	±	1,27	7.15[a]	±	1,23	6.70[a]	±	1,53	7.25[a]	±	1,45	6.70[a]	±	1,30
Color	7.50[a]	±	1,24	7.25[a]	±	1,12	8.25[a]	±	0,91	7.45[a]	±	0,94	7.80[a]	±	1,15
Texture	7.25[a]	±	1,12	7.35[a]	±	1,18	7.85[a]	±	0,81	7.85[a]	±	1,14	7.25[a]	±	1,33
Taste	7.40[a]	±	1,05	7.70[a]	±	1,03	7.80[a]	±	1,11	7.60[a]	±	1,05	7.50[a]	±	1,19
Aroma	7.95[a]	±	0,89	7.70[a]	±	0,73	8.35[a]	±	0,93	7.85[a]	±	0,88	7.90[a]	±	0,79
Humility	6.45[a]	±	0,94	6.65[ab]	±	1,18	7.45[b]	±	1,10	7.05[ab]	±	1,15	6.20[ab]	±	1,15

Note: Numbers on the same parameter followed by the same superscript letter show no real difference at the level of p<5%.

The crispness value was 7 in each treatment, but based on notes from several panellists, it was reported that in the B_4 treatment (40 minutes of cooking), the astringent head part was detached from the body. Conditions indicate that the condition of the fish bones remains compact but has begun to become brittle so that some parts of the body are less fused. According to Purnomowati (2006), the processing process with hot water vapour and high pressure causes bones and spines to become soft. In addition, this high-pressure hot water vapour at the same time functions to stop the activity of fish-putrefactive microorganisms, the hardness of fish bones is caused by the presence of organic matter (collagen fibres) and inorganic (calcium, phosphorus, magnesium, chlorine, and flour) in the bones become dissolved. Bones become brittle and easily destroyed when the organic matter contained in them dissolves.

The colour on the astringent chips has a value of no real difference with a lifting range of 7–8 with yellowish criteria. This event is uniform throughout the treatment because the frying process causes a non-enzymatic browning reaction in the astringent chips.

Three-Spot Gourami chips have a dry texture (ranging from 7-8) caused by the oil slicing process using a machine so that almost all of the oil content comes out of the material (astringent chips). Adrianti et al. (2019) reported that the more spin process influenced the texture of the *Thunnus* sp for 2 minutes, where the water content contained in the fish was replaced by oil so that during the more spin process, it functioned to slice the fat contained in the product, the moisture content was reduced, and the texture of the *Thunnus* sp became crispy.

The taste and aroma show values in the range of 7–8, which are still on the specific typical fish criteria. In the process of processing astringent chips, there is no seasoning addition treatment except for the addition of 2% salt so that the original taste and aroma of the Three-Spot Gourami remains even though it is somewhat reduced due to the press cooking and frying process.

The characteristics of crispness show that cooking for 20 minutes (D2) is 7.5 although based on the test, this treatment mark does not differ markedly from the treatment of D_1, D_3, and D_4. These results show that a cooking process of 20 minutes is enough to produce the level of crispiness of the astringent chips preferred by consumers, and when viewed from the length of cooking, the time gap between treatments is only 10 minutes. Kiranawati et al. (2021) reported that the hardness of fish bones decreased significantly along with the increase in the length of time for the pressurized steaming process with a distance of 30 minutes between treatments. Fish bones contain a lot of collagen, which breaks easily against the hot steam produced by the pressure cooker.

CONCLUSION

In this study, it can be concluded that the results of the first phase of research show that the treatment of pressure steaming method (A_3) is the best treatment with the characteristics of the water content of 6.56%, a protein content of 51.09, ash content of 9.67%, fat content of 16.59%, appearance of 6.75, colour 8, the texture of 8.2, taste of 7.55, aroma of 7.65 and crispness7.85. While the second stage of the study, the best treatment

was in the cooking time for 20 minutes (B_2) with a value of appearance 6.7, colour 8.25, texture 7.85, taste 7.80, aroma 8.35, and crispness 7.45.

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