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Effect Of Combination Treatment Of Concentration Liquid Smoke, Immersion Duration, Packaging And Old Type Storage Different Levels Of Fiber And Ash Fish Tilapia Fillet (*Oreochromis niloticus*)

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Abstract : This study aims to determine the protein content of fillet of tilapia (*Oreochromis niloticus*) given preservation with liquid smoke derived from a combination of liquid smoke treatment concentration, soaking time, types of packaging and storage time are different. This study was conducted experimentally using factorial experiment with a completely randomized design patterns (RAL) 5 x 3 x 3 x 5 with 3 replicates in order to obtain 675 experimental units. A factor consists of the concentration of liquid smoke consisting of Control (smokeless liquid / 0%), 5% and 10%, 15% and 20%; factor B consists of soaking time with liquid smoke is composed of three (3) levels ie soaking time 5 minutes, 10 minutes and 15 minutes; factor C consists of the type of packaging consists of three (3) levels ie without packaging (control), packaging polyethylene (PE) and packaging of polypropylene (PP) and factor D consists of the storage time (days) consists of 5 (five) levels ie 0 , 3,6,9 and 12 days. The parameters measured were the levels of fiber and ash level level. Results of research on the analysis of variance showed (a) there was an interaction on the treatment difference with a long soaking period of storage of the raw fiber fillet of tilapia, as well as in a combination of three treatments, soaking time differences, differences in the concentration and duration of storage as well as a combination of soaking treatment, types of packaging and storage time subsequent to a combination of the two , three, and four other treatments showed no significant difference (no interaction), (b).there was an interaction on a combination of the two treatments soaking time difference with the storage time of the ash content of tilapia fillets, while the combination of two other treatments were not significantly different show next to the triple combination treatment of soaking time, concentration, and storage time significantly (the interaction) , while the combination of the other three treatments were not significantly different (no interaction) and to the combination of four treatments of soaking, the concentration difference types of packaging, and storage time showed no significant difference (no interaction).(c). content crude fiber fillet of tilapia on a combined treatment of liquid smoke concentration of 5%, soaking time 10 minutes with storage time of 9 days on the packaging shows the results of the largest PE 17.777% while the yield crude fiber contained in the smallest liquid smoke treatment concentration of 10% (L2) , soaking time 10 minutes (K2) for storage of 9 days of 0.41%. (d).the ash content of tilapia fillets at a concentration of 5% liquid smoke, a long submersion for 15 minutes at a storage time of 9 days provide the highest value (11.721%) and the smallest (6.635%) occurred in the treatment of liquid smoke concentration of 10% with 10 minutes soaking time the storage time of 12 days.

Key words: fish fillet, immersion, concentration, packaging, storage, fiber,ash.

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I. Introduction

Among the species of freshwater fish are now being developed and grown in the provinces of West Sumatra are Tilapia (*Oreochromis niloticus*). The potential of aquaculture land estimated area of 12,300 hectares [1]. This is because it easily lived, rapidly proliferating, white meat and it was quite tasty. Processing methods can be developed against the fish is a fish fillet processing. Results fishery processing such as fillets of fish including food very quickly decompose (high perishable food). As perishable foodstuffs, then the quality of the fish must be maintained as much as possible to get into the hands of consumers. For that we need good handling and preservation and processing into products ready to be eaten but durable power longer. One way of processing that has long been known to the public is the curing of fish.

Fumigation is a technique of embedding and incorporating various chemical compounds of smoke into foodstuffs [2]. Fogging was intended to extend the shelf life of a material, but in line with the increase in public acceptance of the product smoke then that goal began to turn to the flavor, which gives aroma and distinctive taste and prevents rancidity of the meat due to the oxidation of fat. Fumigation can be done traditionally or in modern [3]. Traditional fumigation can be done in the cold and heat by burning wood or sawdust, where the smoked fish direct contact with the smoke. While modern fumigation using liquid smoke (steam dispersion in the fluid as a result of condensation of smoke from wood pyrolysis) as media fumigation. Generally wider community, especially the coastal communities do fumigation with traditional fumigation techniques. Though the technique of curing it has a lot of shortcomings, among other things take a long time, is not efficient in the use of firewood, the uniformity of the product to produce color and flavor desired difficult to control, environmental pollution, and the most dangerous is the residual tar and hydrocarbon compounds polycyclic aromatic *(Benzo(a)pyren)* deposited in food that can be harmful to health. In areas producing smoked fish, in order to meet the source of the smoke (wood) many people who cut down trees, even be protective coastal mangroves were not spared from logging target. These circumstances make alternative use of firewood has to be considered as well as fogging technique was time to be replaced with modern fumigation.

The use of liquid smoke broader application to replace the traditional way of curing. With the provision of liquid smoke aroma smoke on fish would be more practical because only by spraying or dipping the fish in a solution of liquid smoke, followed by heating. The development of liquid smoke more rapidly in the preservation of foodstuffs, due to the costs required for timber and equipment manufacture more efficient smoke, harmful components can be separated or reduced before being used in food as well as the composition of the liquid smoke is more consistent for repeated use [4].

Modern fogging is fumigation with the gas phase (gas phase smoke) or fumigation with liquid smoke (liquid smoke). Fumigation with the liquid smoke made by soaking the product in liquid smoke that has been disbursed through the process of pyrolysis and distillation [4]. Fumigation this way can improve the quality of products in terms of health because of carcinogenic compounds such as benzo (a) pyren contained in the liquid smoke can be absorbed and reduced in number, while the tar can be separated by using sedimentation and filtration [5].

Some research on the production and use of liquid smoke has been carried out include the determination of the temperature and time of pyrolysis of rubber wood to produce liquid smoke quality [6], the study of raw materials cinnamon at a temperature pyrolysis 400^{o}C produce quality liquid smoke [7], the study wood sweet with a temperature pyrolysis of 400^{o}C at concentrations of 1500 ppm showed antioxidant teringgi amounted to 35.091% [8], the determination of antibacterial properties of liquid smoke produced from several kinds of soft wood [9], the preservation of the tongue smoked with liquid smoke produced from teak [10] , Budaraga research results et al, [11] to get the dominant content of liquid smoke coconut husks, coconut shell and cinnamon contains acetic acid and phenol. Further research Budaraga et.al., [12] to get the cytotoxic properties (the ability to kill Artemia salina) liquid smoke cinnamon at 400^{o}C temperature pyrolysis of 19.048%. These studies all utilize hardwood and softwood separately. Whereas softwood with low lignin content will be very effective to extend the lasting power of fish and produce flavor which is not typical [13] when combined with other wood (hardwood).

Based on the above research, the cinnamon is ideal to use as a preservative. The results of further research Budaraga *et al*, [14] to get the purification of liquid smoke cinnamon on the distillation temperature of 140^{o}C have undetectable levels of *benzo(a) pyrene*. Further research Budaraga *et al*, [15] to get the liquid smoke toxicity cinnamon purified by precipitation during the 3-day 83.75%. Results antioxidant liquid smoke cinnamon in a manner different purification produces antioxidants that are strong enough (<50 ppm) Budaraga

et al, [16]. Furthermore, the results of research Budaraga *et.al.*, [17] to get the measurement results on the antibacterial properties of E. coli liquid smoke cinnamon purified by precipitation for 3 days resulted in inhibition diameter 34.129 mm / ppb. Their immersion in liquid smoke concentration cinnamon right would affect the levels of antioxidants and so far there is no information about it.

The next process followed by drying the fillets of tilapia resulting in decreased water levels expected product microbial activity is inhibited, resulting in a longer lasting power products. During this time the nature of the community is still traditional fish processing, fish fillet products in the form of beef jerky is usually not packaged properly so easily contaminated by microorganisms which will result in reduced power durable besides that do not observe shelf. Besides the water content of the product is still relatively high. To obtain a lower water content, then fillet products were not made in the form of a thick but in the form of thin slices. It is intended that the liquid smoke cinnamon can more rapidly penetrate into slices of fillet of tilapia, as well as the drying process faster. With the form of the product in the form of thin slices of fillet, hoped no bones were shipped, all the edible parts and form a thin more attractive for consumers. Contamination with microbes and other damage can be prevented by packing with a plastic bag. It remains no information about the type of packaging and storage right on the antioxidant content of tilapia fillet stuffed with liquid smoke. The results of the study [18] showed no packaging was good at cooking spices during storage will cause a loss of quality. The purpose of this study to determine the fiber content and ash content of tilapia fillet smoked given combined treatment of liquid smoke concentration, soaking time, types of packaging and storage time are different.

II. Raw and Methods

The materials used for the manufacture of fish is tilapia fillets black bought at the market bottom of the crocodile with an average weight of 250 grams / fish, alcohol 70%, salt, water and liquid smoke cinnamon purified by distillation temperature of 140°C. The tools used in this study are: a. Equipment for the manufacture of preservative solutions flask, glass beaker, beakers, pipettes, propipet and pengaduk.b. Equipment for the manufacture of fish filet was basins, pans, mixers, stainless steel knives, water heating, cutting boards, work desks, spray equipment, pan drainer, freezer, and analytical scales. c. Equipment for drying of tilapia fillets: briquette stove heat resistance [19], a drying oven tool length 240 x width 100 x height 80 cm measurement device 200°C [20]. d. Equipment for packaging and storage: storage shelves, polyethylene, polypropylene plastic, paper labels, paper plates for a fillet. Another tool used in this study such as, refrigerator coolers, freezers, flask, cup petridist, electric stove, filter paper, oven, burette, incubators, ovens, porcelain dish, desiccator, filter, thermometer, erlenmeyer 125 ml and 500 ml, beaker, filter paper, soxhlet, test tubes, micro burette, pipette, pipette volumetric flask of 250 ml.

2.1.Method Research

The experimental design used in this study using factorial pattern in a completely randomized design (CRD) is a combination of liquid smoke concentration with soaking time, types of packaging and storage in order to obtain 5 x 3 x 3 x 5 x 3 trial replications = 675 experimental units. The first factor consisted of 5 (five) level is the concentration of liquid smoke control, 5% and 10%, 15% and 20%; The second factor of soaking with liquid smoke is composed of three (3) levels ie soaking time 5 minutes, 10 minutes and 15 minutes; The third factor type of packaging consists of three (3) levels ie without packaging, packaging polyethylene (PE) and polypropylene packaging (PP) and the factor of the place of storage time (days) consists of 5 (five) levels ie 0,3,6,9 and 12 days. The observed data in the form of the fiber and ash content analyzed by analysis of variance on the real level of 5%, when next significantly different by Tukey's test at 5 percent significance level [21].

2.2.Action Research.

2.2.1.Preparation liquid smoke.

Before the pickling process fillet of tilapia with liquid smoke cinnamon purified by distillation temperature of 140oC first prepare liquid smoke subsequent dilution with distilled water. The concentration of preservative liquid smoke used is smokeless liquid (control), 5%, 10%, 15% and 20%.

2.2.2.Making fillet of tilapia and preservation with liquid smoke

The process of making fillets of tilapia and preservation with liquid smoke cinnamon well as packaging and storage done in this study are as follows: In the conduct of research activities begins with the preparation of materials and tools such as a desk, knives, cutting boards that have been sterilized with alcohol 70% and cinnamon liquid smoke that has been purified. Prepared aqudest (control), liquid smoke concentration of liquid smoke 5%, 10%, 15% and 20%, Tilapia been in fresh condition refers to the SNI [22] on the specifications of fresh fish and SNI [23] on the requirements of the raw material with the characteristics -ciri raw materials are clean, free of any odor indicating decay, is free of signs of decomposition and forgery, free from other natural properties that can reduce the quality and not harmful to health. Organoleptic characteristics of the raw material has a freshness: a) appearance: intact, convex eyes, bright white cutlet; b) The smell: specific fresh fish; c) texture: Solid, compact and elastic, with a weight of 250 ± 10 grams. As for how to manufacture fillets of tilapia as follows: Cultivated using fresh fish that has passed through the phase freezing (rigor mortis) and cleanliness is always maintained by weeding the scales of a fish, discarding the entrails, feces, and lining the wall of the stomach is black, then do the washing up clean to remove any remaining dirt, blood, loose scales and slime. Already clean then performed an incision behind the gill fins to the back of the head; front heads toward keekor incision along the dorsal fin using a stainless steel knife and a knife made parallel so separated from the ribs when taking fillet.

Turn the fish, cut off the back fin gills until the head backward; The cut of the tail toward the head. Open the fillet by cutting towards the head with a knife close to the ribs, cutting through the bone of thorns. Furthermore fillet obtained immediately put into the freezer -20°C as soon as possible. To prevent a decline in quality, cleanliness fillet is always maintained and in working to make fillets have to really pay attention to sanitary aspects such as using gloves, head, working table knife would have been made sterile by sprayed and rinsed with alcohol before starting the job.

In this study using fish fillets in the form of block ie boneless fillets. Avoid contamination which can easily infiltrate into the meat tissue and muscle meat that has been open to the whole fish. In the process of handling for each stage of work to keep the fish stay fresh is to protect from the sun, wind, other heat source to increase the temperature of the fish and once made fillet put in the freezer. To reduce drip (water from the muscle tissue is lost in the frozen product melted) fillet do immersion in pure saline solution 15% for 20 seconds.

This fillet construction work done quickly but carefully to avoid spoilage, contamination and defects due to carelessness which may adversely affect the product and to anticipate these things put in feezer. Waste obtained from pemfiletan be removed from the processing to avoid contamination of the product.In blocks, fillets transported easily stored and handled SNI [24]. Furthermore, fish blocks are cut in the form of stick (size of ± 5 x 10 cm with a thickness of ± 2 cm) and are given treatment liquid smoke is a concentration of 5%, 10%, 15%, 20% and control (without liquid smoke) and combined with the long immersion different ie 5 minutes, 10 minutes and 15 minutes. After completion of the immersion, the fillet is removed and drained and winds up dry fillet surface. Fillet of tilapia further arranged on the shelves of the oven so evenly, and dried at 70 ° C for 6 (six) hours.

After the fillets of tilapia smoked dry due to heating, fillet cooled at room temperature for ± 20 minutes to cool placed in a clean container styreform and hygienic [25], and then inserted into the packaging polyethylene (PE), polypropylene (PP) and without packaging shall be retained and held at room temperature observations began days 0, 3 days, 6 days, 9 days and 12 days against the fiber content [26] and the ash content [27].

3. Results and Discussion

3.1.Content Fiber

Results of analysis of variance showed interaction at treatment difference of soaking the storage time of the crude fiber, as well as in a combination of three treatments, the difference of soaking, the concentration difference and storage as well as a combination treatment prolonged submersion, types of packaging and storage of the raw fiber fillet of tilapia , For the combination of two, three, and four other treatments showed no significantly different with crude fiber (no interaction). The average value of the fiber content of tilapia fillet

treatment of liquid smoke concentration with soaking time, types of packaging and different storage time is presented in Table 1 and Figure 1 below.

Table 1. Average fiber content (%) of tilapia fillets treatment differences in the concentration of liquid smoke, prolonged submersion, types of packaging and storage

Type Packaging	Long (K) soaking (minute)	Concentration (L) liquid smoke (%)	Long storage (S) (day)					Mean (L)/(K)
			0 (S_0)	3 (S_1)	6(S_2)	9(S_3)	12(S_4)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		0 (L_0)	1.528	0.504	0.9367	0.504	1.493	0.99
	5 (K1)	5 (L_1)	1.788	0.504	0.9367	0.504	1.387	1.02
		10 (L_2)	1.341	0.4097	0.3083	0.4097	0.606	1.21
		15 (L_3)	1.667	0.5417	0.3223	0.542	0.8337	0.78
		20 (L_4)	1.461	0.722	0.664	0.722	0.7453	0.86
	Mean 5 minute		2.16	0.54	0.63	0.54	1.01	0.98
Control		0 (L_0)	0.9357	0.504	1.489	1.527	0.508	0.99
(non	10 (K2)	5 (L_1)	0.936	0.504	1.384	1.778	0.5083	1.02
packaging)		10 (L_2)	0.3083	0.4097	0.6053	1.834	0.413	0.71
(KK)		15 (L_3)	0.322	0.5417	0.8317	1.667	0.5463	0.78
		20 (L_4)	0.6633	0.722	0.7437	1.461	0.7283	0.86
	Mean 10 minute		0.63	0.54	1.01	1.65	0.54	0.87
		0 (L_0)	1.488	1.527	0.5053	0.939	0.504	0.99
	15 (K3)	5 (L_1)	1.382	1.778	0.5053	0.9393	0.504	1.02
		10 (L_2)	0.6043	1.83	0.4103	0.3093	0.41	0.71
		15 (L_3)	0.8307	1.667	0.543	0.3233	0.542	0.78
		20 (L_4)	0.7427	1.461	0.7237	0.666	0.722	0.86
	Mean 15 minute		1.01	1.65	0.54	0.64	0.54	0.87
	Mean	0 (L_0)	1.32	0.85	0.98	0.99	0.84	0.99
	concentration	5 (L_1)	1.37	0.93	0.94	1.07	0.80	1.02
	liquid smoke	10 (L_2)	1.75	0.88	0.44	0.85	0.48	0.88
		15 (L_3)	0.94	0.92	0.57	0.84	0.64	0.78
		20 (L_4)	0.96	0.97	0.71	0.95	0.73	0.86
	Mean	5	0.98					
	long	10	0.87					
	soaking (minute)	15	0.87					
	Mean long storage		1.27	0.91	0.73	0.94	0.70	0.91
	Mean packaging control (KK)		0.91					
		0 (L_0)	1.528	0.504	0.851	0.504	1.234	0.92
	5 (K1)	5 (L_1)	1.778	0.504	0.851	0.504	1.234	0.97
		10 (L_2)	1.341	0.4097	1.099	0.41	0.6047	1.37
		15 (L_3)	1.667	0.5417	0.4537	0.542	0.562	0.75
		20 (L_4)	1.461	0.722	1.076	0.722	1.340	1.06
	Mean 5 minute		2.16	0.54	0.87	0.54	0.99	1.02
Packaging		0 (L_0)	0.8503	0.504	1.231	1.527	0.5057	0.92
PP	10 (K2)	5 (L_1)	0.8503	0.504	1.231	1.778	0.506	0.97
		10 (L_2)	1.098	0.4097	0.6037	4.338	0.411	1.37

		15 (L_3)	0.4533	0.5417	0.5607	1.667	0.5437	0.75
		20 (L_4)	1.075	0.722	1.337	1.461	0.7243	1.06
	Mean 10 minute		0.87	0.54	0.99	2.15	0.54	1.02
		0 (L_0)	1.228	1.527	0.5053	0.852	0.5047	0.92
	15 (K3)	5 (L_1)	1.228	1.778	0.5053	0.852	0.5047	0.50
		10 (L_2)	0.6017	1.638	0.4103	1.100	0.4103	0.41
		15 (L_3)	0.559	1.667	0.543	0.454	0.5427	0.54
		20 (L_4)	1.333	1.461	0.7237	1.077	0.723	0.72
	Mean 15 minute		0.99	1.61	0.54	0.87	0.54	0.62
	Mean	0 (L_0)	1.20	0.85	0.86	0.96	0.75	0.92
	concentration	5 (L_1)	1.29	0.93	0.86	1.04	0.75	0.97
	liquid smoke	10 (L_2)	2.01	0.82	0.70	1.95	0.48	1.19
		15 (L_3)	0.89	0.92	0.52	0.89	0.55	0.75
		20 (L_4)	1.29	0.97	1.05	1.09	0.93	1.06
	Mean	5 (K_1)	1.02					
	long	10(K_2)	1.02					
	soaking (minute)	15(K_3)	0.62					
	Mean long storage		1.34	0.90	0.80	1.19	0.69	0.98
	Mean packaging control (PP)		0.89					
		0 (L0)	1.528	0.7383	0.966	0.5053	1.052	0.96
	5 (K1)	5 (L1)	1.778	1.423	0.9663	0.5053	1.052	1.14
		10 (L2)	1.668	1.511	1.194	0.4103	0.635	1.08
		15 (L3)	1.797	0.5	1.589	0.543	0.6737	1.02
		20 (L4)	1.461	0.693	0.8153	0.7237	0.675	0.87
	Mean 5 minute		1.65	0.97	1.11	0.54	0.82	1.02
Packaging		0 (L_0)	0.9647	0.504	1.049	0.5053	0.7397	0.75
PE	10 (K2)	5 (L_1)	0.9657	0.504	1.050	1.778	1.425	1.14
		10 (L_2)	1.192	0.4097	0.6333	1.668	1.514	1.08
		15 (L_3)	1.587	0.5417	0.672	1.667	1.363	1.17
		20 (L_4)	0.8143	0.722	0.6733	1.461	0.9267	0.92
	Mean 10 minute		1.10	0.54	0.82	1.42	1.19	1.01
		0 (L_0)	1.046	1.527	1.049	0.9693	0.5057	1.02
	15 (K3)	5 (L_1)	1.047	1.778	1.425	0.9693	0.506	1.15
		10 (L_2)	0.6313	1.668	1.513	1.198	0.411	1.08
		15 (L_3)	0.67	1.667	1.363	1.594	0.5437	1.17
		20 (L_4)	0.671	1.464	0.9267	0.818	1.084	0.99
	Mean 15 minute		0.81	1.62	1.26	1.11	0.61	1.08
	Mean	0 (L_0)	1.10	1.00	1.05	0.85	0.72	0.95
	concentration	5 (L_1)	1.01	0.76	0.83	0.92	0.64	0.83
	liquid smoke	10 (L_2)	0.95	0.69	0.72	0.96	0.64	0.79
		15 (L_3)	0.96	0.74	0.68	1.09	0.64	0.82
		20 (L_4)	0.94	1.03	0.80	1.15	0.90	0.96
	Mean	5 (K_1)	1.02					
	long	10(K_2)	1.01					
	soaking (minute)	15(K_3)	1.08					

Mean long storage	1.19	0.72	0.69	0.84	0.60	0.81
Mean packaging control (PE)	1.04					
CV = 65,89						

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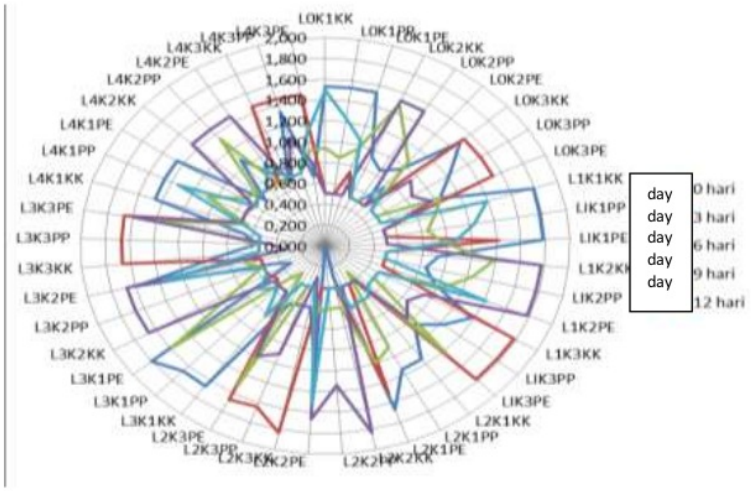

Figure 1. Average fiber content (%) of tilapia fillets treatment differences in the concentration of liquid smoke, prolonged submersion, types of packaging and storage time.

From Table 1 above shows crude fiber content fillet of tilapia on a combination treatment concentration liquid smoke 5% (L_1) soaking time 10 minutes (K_2) with a storage time of 9 days in PE packaging showed the greatest results 17.777%, not significantly different from the treatment of other , Results crude fiber contained in the smallest liquid smoke treatment concentration of 10% (L_2), soaking time 10 minutes (K_2) for storage of 9 days of 0.41%. In packaging polyethylene (PE) crude fiber tilapia fillet fluctuate up and down and showed a significant difference among the treatments that jointly affect the fiber content of tilapia fillets.

Differences in crude fiber is affected because of the difference in treatment. Usually by treatment with liquid smoke the higher the soaking time longer and longer storage time will cause coarse fiber material will decompose so that the fiber content can be decreased. This is caused during storage does not decompose in the fiber component of tilapia fillet meat so that the fibers ballpark did not appear to change.

According to Sulaiman et al., [28] stating crude fiber, is a residue which can not be hydrolyzed by acids or strong bases. This residue consists mainly of the fraction of cellulose, hemicellulose, and lignin. There are several methods of analysis of coarse fibers that have been developed, but the principle is almost the same hydrolysis with filtering material until all that remains is crude fiber as a residue which can not be hydrolyzed.

For the average value of the fiber content of tilapia fillets on the treatment of soaking, types of packaging and different storage time is presented in Table 2 and Figure 2 below.

Table 2. Values interaction fiber content (%) of tilapia fillets treatment differences prolonged submersion in liquid smoke, types of packaging and storage time.

Type Packaging (1)	Long soaking (K) (%) (2)	Long storage (S) (day) 0 (S_0) (3)	3 (S_1) (4)	6(S_2) (5)	9(S_3) (6)	12(S_4) (7)	Mean L*B (8)	Interaction L*B (9)
Control (non packaging) (KK) (B1)	5 (K_1)	2.1571 ^{a}	0.5363 ^{c}	0.6336 ^{c}	0.5363 ^{c}	1.0129 ^{bc}	0.98	0.553
	10(K_2)	0.6331 ^{c}	0.5363 ^{c}	1.1061 ^{bc}	1.6533 ^{ab}	0.5408 ^{c}	0.89	-0.409
	15(K_3)	1.0096 ^{bc}	1.6526 ^{ab}	0.5375 ^{c}	0.6354 ^{c}	0.5364 ^{c}	0.87	0.373
Mean (B1)		1.267	0.908	0.759	0.942	0.697	0.914	0.071
Interaction (B1*L)		-0.765	0.774	-0.064	0.066	-0.318	-0.061	
Packaging PP (B2)	5 (K_1)	2.1551 ^{a}	0.5363 c	0.8661 ^{bc}	0.5364 ^{c}	0.9949 ^{bc}	1.02	0.556
	10(K_2)	0.8653 ^{bc}	0.5363 ^{c}	0.9929 ^{bc}	2.1541 ^{a}	0.5381 ^{c}	1.02	-0.516
	15(K_3)	0.9898 ^{bc}	1.6141 ^{ab}	0.5375 ^{c}	0.8669 ^{bc}	0.5371 ^{c}	0.91	0.265
Mean (B2)		1.337	0.896	0.799	1.186	0.690	0.981	0.042
Interaction (B2*L)		-0.777	0.719	-0.219	0.220	-0.305	-0.072	
Packaging PE (B3)	5 (K_1)	1.6464 ^{ab}	0.9732 ^{bc}	1.1061 ^{bc}	0.5375 ^{c}	0.8175 ^{bc}	1.02	0.475
	10(K_2)	1.1048 ^{bc}	0.5363 ^{c}	0.8155 ^{bc}	1.6199 ^{ab}	1.1936 ^{bc}	0.97	-0.167
	15(K_3)	0.8130 ^{bc}	1.6208 ^{ab}	1.2553 ^{abc}	1.1097 ^{bc}	0.6100 ^{c}	1.08	0.083
Mean (B3)		1.188	1.043	1.059	0.947	0.874	1.022	-0.029
Interaction (B3*L)		-0.556	0.432	0.100	0.382	-0.138	0.044	
Mean concentration liquid smoke (L)	5 (K_1)	1.986	0.682	0.869	0.537	0.942	1.003	0.585
	10(K_2)	0.868	0.536	0.972	1.667	0.758	0.960	0.539
	15(K_3)	0.937	1.629	0.777	0.871	0.561	0.955	0.596
Interaction (L)		-0.699	0.631	-0.061	0.223	-0.254		
Mean Long Storage		1.264	0.949	0.872	1.025	0.753	0.973	
Interaction (B*L*K)		0.040	-0.068	-0.150	-0.003	-0.089		

CV = 65,89

Description: Figures followed by different letters in the same row or column showed significant differences (P <0.05).

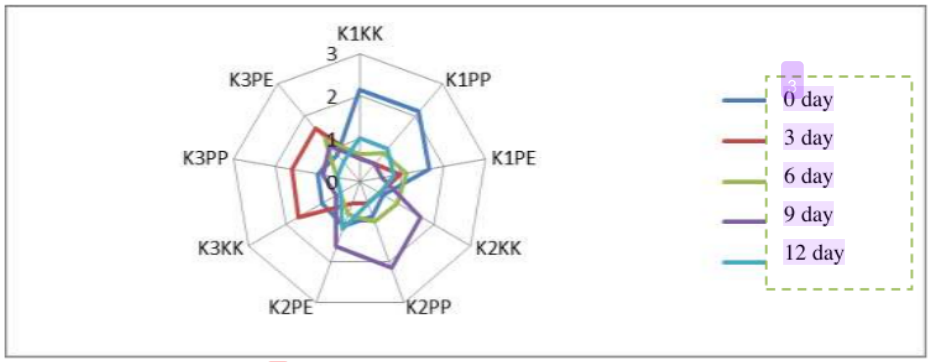

Figure 2. Value interactions fiber content (%) of tilapia fillets treatment differences prolonged submersion in liquid smoke, types of packaging and storage time.

In Table 2 and Figure 2 shows the coarse fiber fillet of tilapia on a combination of soaking 5 minutes (K1) to the type of packaging polyethylene (PE) with a storage time of 0 days showed the greatest results 16.464%, was significantly different from other treatment or an interaction. Results crude fiber smallest one is on the treatment of soaking 10 minutes (K2), without packaging for storage of 3 days at 0.5363%.

Crude fiber tilapia fillet fluctuate up and down and showed a significant difference among the treatments that jointly affect the fiber content of tilapia fillets. Differences in crude fiber is affected because of

the difference in treatment. Usually the treatment the higher the soaking time with different types of packaging and longer storage time will cause coarse fiber material will decompose so that the fiber content can be decreased. According Fenema [29] that the coarse fibers composed of cellulose, and lignin hemisellolusa. Furthermore, according to Anggorodi [30] that the coarse fibers are organic substances that are not soluble in 0.3 N H_2SO_4 and 1.5 N NaOH were successively cooked for 3 minutes. Furthermore, the value of the interaction of the fiber content (%) fillet of tilapia based treatment liquid smoke concentration, soaking time with different storage time is presented in Table 3 and Figure 3, below.

Table 3. Values interaction fiber content (%) of tilapia fillets treatment differences in the concentration of liquid smoke, long soaking and storage time.

Long (K) soaking (minute)	Concentration (L) liquid smoke (%)	Long storage (S) (day)					Mean L*S	Interaction L*S
		0 (S_0)	3 (S_1)	6(S_2)	9(S_3)	12(S_4)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5 (K1)	0 (L_0)	1.5277 bcde	0.5821 cde	0.9179 cde	0.5044 de	1.2594 cde	0.958	0.274
	5 (L_1)	1.7814 bc	0.8104 cde	0.9180 cde	0.5044 de	0.5048 de	0.904	0.572
	10 (L_2)	3.4501 a	0.7769 cde	0.8671 cde	0.4100 e	0.6152 cde	1.224	1.248
	15 (L_3)	1.7104 bcd	0.5278 cde	0.7883 cde	0.5423 cde	0.6898 cde	0.852	0.435
	20 (L_4)	1.4613 bcde	0.7123 cde	0.8517 cde	0.7226 cde	0.9201 cde	0.934	0.254
Mean (K1)		1.986	0.682	0.869	0.537	0.798	0.974	0.992
Interaction (K1*S)		-0.041	-0.004	-0.052	0.095	-0.099	-0.020	
10 (K2)	0 (L_0)	0.9169 cde	0.5040 de	1.2567 cde	1.5270 bcde	1.2594 cde	1.093	-0.295
	5 (L_1)	0.9173 cde	0.5040 de	1.2218 cde	1.7777 bc	0.5048 de	0.985	-0.344
	10 (L_2)	0.8661 cde	0.4097 e	0.6141 cde	2.6134 ab	0.7793 cde	1.057	-0.773
	15 (L_3)	0.7874 cde	0.5417 cde	0.7883 cde	1.6667 bcde	0.8176 cde	0.920	-0.407
	20 (L_4)	0.8508 cde	0.7220 cde	0.9181 cde	1.4607 bcde	0.7931 cde	0.949	-0.258
Mean (K2)		0.868	0.536	0.960	1.809	0.831	1.001	0.316
Interaction (K2*S)		-0.052	0.095	-0.222	-0.049	-0.124	-0.071	
15 (K3)	0 (L_0)	1.2539 cde	1.5270 bcde	0.6866 cde	0.9201 cde	0.5048 de	0.978	0.338
	5 (L_1)	1.2189 cde	1.7780 bc	0.8119 cde	0.9202 cde	0.5049 de	1.047	0.374
	10 (L_2)	0.6124 cde	1.7120 bcd	0.7780 cde	0.8690 cde	0.4104 e	0.876	0.158
	15 (L_3)	0.6866 cde	1.6670 bcde	0.8162 cde	0.7904 cde	0.5428 cde	0.901	0.183
	20 (L_4)	0.9156 cde	1.4618 bcde	0.7913 cde	0.8536 cde	0.8428 cde	0.973	0.149
Mean (K3)		0.937	1.629	0.777	0.871	0.561	0.955	-0.675
Interaction (K3*S)		-0.242	-0.048	0.043	-0.053	0.143	-0.031	
Mean concentration liquid smoke	0 (L_0)	1.233	0.871	0.954	0.984	1.008	1.010	0.072
	5 (L_1)	1.306	1.031	0.984	1.067	0.505	0.979	0.201
	10 (L_2)	1.643	0.966	0.753	1.297	0.602	1.052	0.211
	15 (L_3)	1.061	0.912	0.798	1.000	0.683	0.891	0.070
	20 (L_4)	1.076	0.965	0.854	1.012	0.852	0.952	0.048
Interaction (L*S))		-0.112	0.014	-0.077	-0.002	-0.026		
Rataan (K)		1.264	0.949	0.869	1.072	0.730	0.977	
Interaction (K*L*S)		0.520	-0.474	0.046	-0.167	0.119		
CV = 65,89								

Description: Figures followed by different letters in the same row or column showed significant differences (P <0.05).

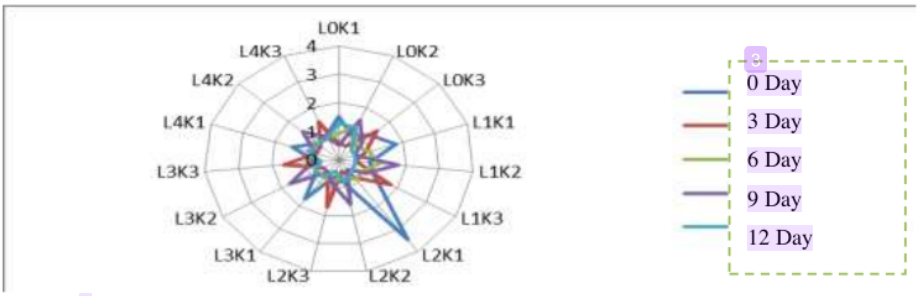

Figure 3. Value interactions fiber content (%) of tilapia fillets treatment differences in the concentration of liquid smoke, long soaking and storage time.

From Table 3 and Figure 3 above shows the value of negative interactions in the treatment of soaking time, concentration and storage time 3 days and 9 days versus fiber content fillet of tilapia while positive interactions on the storage time 0 days, 6 days, and 12 days. Values of positive interaction means the three treatment factors together provide a response to the fiber content. While the value of a negative interaction means the three factors are not the same response. Furthermore, the average value of the fiber content (%) fillet of tilapia on the concentration of liquid smoke and different soaking time is presented in Table 4 and Figure 4.

Table 4. The average value of the interaction of the fiber content (%) fillet of tilapia on the concentration of liquid smoke and different soaking time

Long soaking (K)	Concentration (%) (L)					Mean	Interaction
(minute)	0 (L0)	5 (L1)	10(L2)	15(L3)	20(L4)	L	K*L
5 (K_1)	0.958 [a]	1.048 [a]	1.224 [a]	0.852 [a]	0.934 [a]	1.003	0.123
10(K_2)	0.958 [a]	1.047 [a]	1.057 [a]	0.900 [a]	0.949 [a]	0.982	0.069
15(K_3)	0.979 [a]	1.047 [a]	0.876 [a]	0.901 [a]	0.973 [a]	0.955	0.020
Mean (K)	0.965	1.047	1.052	0.884	0.952	0.980	
Interaction (L*K)	0.001	0.000	-0.021	0.003	0.002		

Description: Figures followed by different letters in the same row or column showed significant differences (P <0.05).

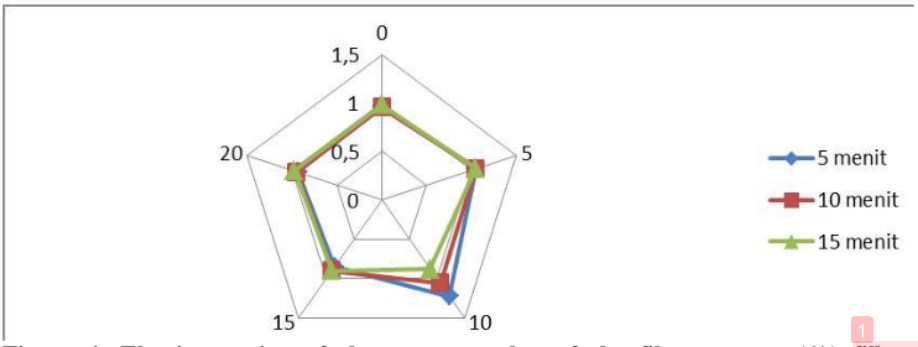

Figure 4. The interaction of the average value of the fiber content (%) fillet of tilapia on the concentration of liquid smoke and different soaking time

In Table 4 and Figure 4 shows the value of positive interaction in the treatment of soaking with different concentrations of liquid smoke to the fiber content of tilapia fillets. While the column shows the value of positive interaction between old soaking with liquid smoke concentrations of 0%, 5%, 15% and 20%. while the value of negative interaction at a concentration of 10% liquid smoke. Values of positive interaction means

both treatment factors together provide a response to the protein content. While the value of a negative interaction means that both factors are not the same response.

3.2. Content Ash

Results of variance showed that the combination of the two treatments with long soaking time difference storage real effect (the interaction) to the ash content ($P < 0.05$), while the combination of two other treatments showed no significant difference. Continues combination of three treatments soaking time, concentration, and storage time significantly (the interaction) to the ash content, while the combination of the other three treatments were not significantly different (no interaction). The combination of four treatments of soaking, the concentration difference types of packaging, and storage time showed no significant difference (no interaction). The average ash content of fillet of tilapia given long soaking treatment, concentration, types of packaging and different storage time is presented in Table 5 and Figure 5 below.

Table 5. The average ash content (%) of tilapia fillets treatment effect different concentrations of liquid smoke, prolonged submersion, types of packaging and storage

Type Packaging	Long (K) soaking (minute)	Concentration (L) liquid smoke (%)	Long storage (S) (day)					Mean (L)/(K)
			0 (S_0)	3 (S_1)	6(S_2)	9(S_3)	12(S_4)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		0 (L_0)	6,688	6,694	9,547	6,886	10,996	8,162
	5 (K1)	5 (L_1)	5,356	5,356	9,545	6,952	11,059	7,654
		10 (L_2)	6,830	6,155	8,851	6,155	6,639	6,926
		15 (L_3)	7,681	6,331	5,408	6,266	8,096	6,756
		20 (L_4)	6,866	7,756	5,623	7,691	7,137	7,015
	Mean 5 minute		6,684	6,458	7,795	6,790	8,785	7,303
		0 (L_0)	9,537	6,608	10,956	6,718	6,864	8,137
Packaging KK	10 (K2)	5 (L_1)	9,535	6,632	11,019	5,386	6,888	7,892
		10 (L_2)	8,841	5,973	6,599	6,860	6,091	6,873
		15 (L_3)	5,398	6,069	8,056	7,711	6,200	6,687
		20 (L_4)	5,613	7,499	7,097	6,896	7,627	6,946
	Mean 10 minute		7,785	6,556	8,745	6,714	6,734	7,307
		0 (L_0)	10,946	6,698	6,864	9,897	6,864	8,254
	15 (K3)	5 (L_1)	11,009	5,366	6,888	9,895	6,888	8,009
		10 (L_2)	6,589	6,840	6,091	9,201	6,091	6,962
		15 (L_3)	5,398	6,069	8,056	7,711	6,200	6,687
		20 (L_4)	5,613	7,499	7,097	6,896	7,627	6,946
	Mean 15 minute		7,911	6,494	6,999	8,720	6,734	7,372
	Mean	0 (L0)	10,946	6,698	6,864	9,897	6,864	8,254
	concentration	5 (L1)	11,009	5,366	6,888	9,895	6,888	8,009
	liquid smoke	10 (L2)	6,589	6,840	6,091	9,201	6,091	6,962
		15 (L3)	8,046	7,691	6,200	5,758	6,200	6,779
		20 (L4)	7,087	6,876	7,627	5,973	7,627	7,038
	Mean long soaking (minute)	5 (K_1)	7,303					
		10(K_2)	7,307					
		15(K_3)	7,372					
	Mean long storage		7,460	6,503	7,846	7,408	7,418	7,327
	Mean packaging control (KK)		7,327					
		0 (L_0)	6,688	6,715	7,524	6,672	9,302	7,380
	5 (K1)	5 (L_1)	5,356	5,356	3,012	6,696	9,307	11,366
		10 (L_2)	6,830	6,070	6,213	5,817	8,905	6,767
		15 (L_3)	7,681	6,117	6,776	8,281	7,758	7,323

		20 (L_4)	6,866	7,648	8,896	9,044	8,566	8,204
	Mean 5 minute		6,684	6,381	6,484	7,302	8,768	8,208
Packaging PP		0 (L_0)	7,514	6,928	9,002	6,718	6,864	7,405
	10 (K2)	5 (L_1)	3,107	6,312	9,007	5,386	6,888	11,540
		10 (L_2)	6,203	5,973	8,605	6,860	6,091	6,746
		15 (L_3)	6,766	6,266	7,458	7,711	6,200	6,880
		20 (L_4)	8,886	7,648	8,266	6,896	7,627	7,865
	Mean 10 minute		6,488	6,625	8,468	6,714	6,734	8,087
		0 (L_0)	8,992	6,698	6,864	7,874	6,864	7,458
	15 (K3)	5 (L_1)	8,997	5,366	6,888	3,467	6,888	11,721
		10 (L_2)	8,595	6,840	6,091	6,563	6,091	6,836
		15 (L_3)	7,448	7,691	6,200	7,126	6,200	6,933
		20 (L_4)	8,256	6,876	7,627	9,246	7,627	7,926
	Mean 15 minute		8,458	6,694	6,734	6,771	6,734	8,175
	Mean	0 (L_0)	7,731	6,780	7,797	7,088	7,677	7,415
	concentration	5 (L_1)	14,820	5,678	15,337	14,183	7,694	11,543
	liquid smoke	10 (L_2)	7,209	6,294	6,970	6,413	7,029	6,783
		15 (L_3)	7,298	6,691	6,811	7,706	6,719	7,045
		20 (L_4)	8,003	7,391	8,263	8,395	7,940	7,998
	Mean	5 (K_1)	8,208					
	long	10(K_2)	8,087					
	soaking (minute)	15(K_3)	8,175					
	Mean long storage		9,012	6,567	9,036	8,757	7,412	8,157
	Mean packaging (PP)		8,157					
		0 (L_0)	6,688	6,886	8,778	6,418	10,902	7,934
	5 (K1)	5 (L_1)	5,356	5,356	8,747	6,824	11,388	7,534
		10 (L_2)	6,830	6,155	7,201	6,034	7,004	6,645
		15 (L_3)	7,681	6,266	7,496	6,126	6,165	6,747
		20 (L_4)	6,866	7,691	6,790	7,595	7,434	7,275
	Mean 5 minute		6,684	6,471	7,802	6,599	8,579	7,227
Packaging PE		0 (L_0)	8,768	6,928	10,867	6,718	6,864	8,029
	10 (K2)	5 (L_1)	8,737	6,947	11,353	5,386	6,888	7,862
		10 (L_2)	7,191	6,128	6,969	6,860	6,091	6,648
		15 (L_3)	7,486	6,266	6,130	7,711	6,200	6,759
		20 (L_4)	6,780	7,691	7,399	6,896	7,627	7,279
	Mean 10 minute		7,792	6,792	8,544	6,714	6,734	7,315
		0 (L_0)	10,857	6,698	6,800	8,798	6,864	8,003
	15 (K3)	5 (L_1)	11,343	5,366	6,824	8,767	6,888	7,838
		10 (L_2)	6,959	6,840	6,062	7,221	6,091	6,635
		15 (L_3)	6,120	7,691	6,135	7,516	6,200	6,732
		20 (L_4)	7,389	6,876	7,591	6,810	7,627	7,259
	Mean 15 minute		8,534	6,694	6,682	7,822	6,734	7,293
	Mean	0 (L_0)	8,771	6,837	8,815	7,311	8,210	7,989
	concentration	5 (L_1)	11,343	5,366	6,824	8,767	6,888	7,838
	liquid smoke	10 (L_2)	6,993	6,374	6,744	6,705	6,395	6,642
		15 (L_3)	7,096	6,741	6,587	7,118	6,188	6,746
		20 (L_4)	7,012	7,419	7,260	7,100	7,563	7,271
	Mean	5 (K_1)	7,227					
	long	10(K_2)	7,315					
	soaking (minute)	15(K_3)	7,293					
	Mean long storage		7,670	6,652	7,676	7,045	7,349	7,279

Mean packaging (PE)	7,278
CV = 67,27	

Description: Figures followed by different letters in the same row or column showed significant differences (P <0.05).

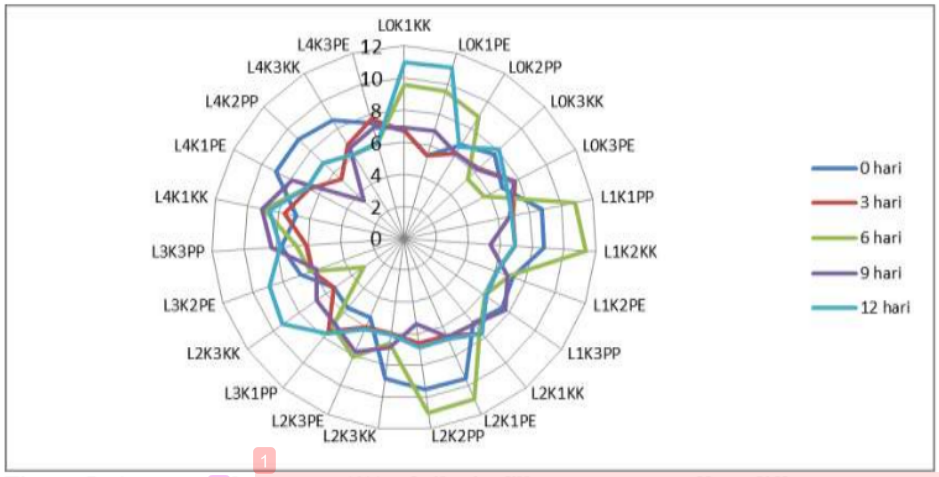

Figure 5. Average ash content (%) of tilapia fillets treatment effect different concentrations of liquid smoke, prolonged submersion, types of packaging and storage time.

The average value of ash content fillet of tilapia in Table 5 and Figure 5 are given treatment liquid smoke concentration of 5%, long soaking for 15 minutes at a storage time of 9 days provide the highest value (11.721%) and a statistically significant interaction. Results of the smallest ash content (6.635%) occurred in the treatment of liquid smoke concentration of 10% with 10 minutes soaking time the storage time of 12 days. This means that the combined treatment with different concentrations of soaking time and different storage time on fillet of tilapia jointly affect the ash content. Differences in ash content is affected because of the difference in treatment. Usually with a longer soaking treatment will cause the material will decompose so that the ash can be decreased with the longer soaking, but the results of this study do not.

According Sediaoetama [31] and Winarno [2] states the ash content is an organic substance remainder a result of burning organic material. The ash content and composition depending on the kinds of materials and how pengabuannya.Kadar ash is the substance left when a perfect sample burned in a furnace ashing and describe the many minerals contained therein. In the process of combustion, organic ingredients will disappear burning, while the inorganic substance does not burn but the form of ash. Furthermore, the average ash content of tilapia fillet effect of combined treatment of different concentrations of liquid smoke, long soaking and storage time is presented in Table 6 and Figure 6 below.

Table 6. The average interaction ash content (%) of tilapia fillets treatment effect different concentrations of liquid smoke, long soaking and storage time.

Long (K) soaking (minute)	Concentration (L) liquid smoke (%)	Long storage (S) (day)					Mean L*S	Interaction L*S
		0 (S_0)	3 (S_1)	6(S_2)	9(S_3)	12(S_4)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5 (K1)	0 (L_0)	6.688 abc	6.765 abc	8.616 abc	6.659 abc	10.400 abc	7.826	-0.715
	5 (L_1)	5.356 c	6.810 abc	16.136 ab	6.824 abc	10.585 abc	9.142	-1.342
	10 (L_2)	6.830 abc	6.127 bc	7.422 abc	6.002 c	7.516 abc	6.779	0.053
	15 (L_3)	7.681 abc	6.238 bc	6.560 abc	6.891 abc	7.340 abc	6.942	0.096
	20 (L_4)	6.866 abc	7.698 abc	7.103 abc	8.110 abc	7.712 abc	7.498	-0.500
Mean (K1)		6.684	6.728	9.167	6.897	8.711	7.637	1.446
Interaction (K1*S)		0.536	0.259	-2.520	0.594	-1.724	-0.571	
10 (K2)	0 (L_0)	8.606 abc	6.822 abc	10.275 abc	6.718 abc	6.864 abc	7.857	0.747
	5 (L_1)	16.126 ab	6.631 abc	10.460 abc	5.386 c	6.888 abc	9.098	4.245
	10 (L_2)	7.412 abc	6.085 bc	7.391 abc	6.860 abc	6.091 bc	6.768	0.220
	15 (L_3)	6.550 abc	6.200 bc	7.215 abc	7.711 abc	6.200 bc	6.775	-0.464
	20 (L_4)	7.093 abc	7.613 abc	7.587 abc	6.896 abc	7.627 abc	7.363	0.076
Mean (K2)		9.157	6.670	8.586	6.714	6.734	7.572	-0.141
Interaction (K2*S)		-2.520	0.230	-1.724	0.536	0.168	-0.662	
15 (K3)	0 (L_0)	10.265 abc	6.698 abc	6.843 abc	8.856 abc	6.864 abc	7.905	0.530
	5 (L_1)	10.450 abc	5.366 c	6.866 abc	16.376 a	6.888 abc	9.189	-2.675
	10 (L_2)	7.381 abc	6.840 abc	6.082 bc	7.662 abc	6.091 bc	6.811	0.037
	15 (L_3)	7.205 abc	7.691 abc	6.178 bc	6.800 abc	6.200 bc	6.815	0.460
	20 (L_4)	7.577 abc	6.876 abc	7.615 abc	7.343 abc	7.627 abc	7.408	-0.057
Mean (K3)		8.576	6.694	6.717	9.407	6.734	7.626	1.305
Interaction (K3*S)		-1.724	0.536	0.171	-2.520	0.168	-0.674	
Mean concentration liquid smoke	0 (L_0)	8.520	6.762	8.578	7.411	8.043	7.863	-0.029
	5 (L_1)	10.644	6.269	11.154	9.529	8.120	9.143	0.076
	10 (L_2)	7.208	6.351	6.965	6.841	6.566	6.786	0.104
	15 (L_3)	7.145	6.710	6.651	7.134	6.580	6.844	0.030
	20 (L_4)	7.179	7.396	7.435	7.450	7.655	7.423	-0.160
Interaction (L)		-1.236	0.342	-1.358	-0.716	-0.391		
Mean (K)		8.139	6.697	8.157	7.673	7.393	7.612	
Interaction (K*L*S)		-0.950	0.017	1.225	-1.255	0.989		

CV = 67,27

Description: Figures followed by different letters in the same row or column showed significant differences (P <0.05).

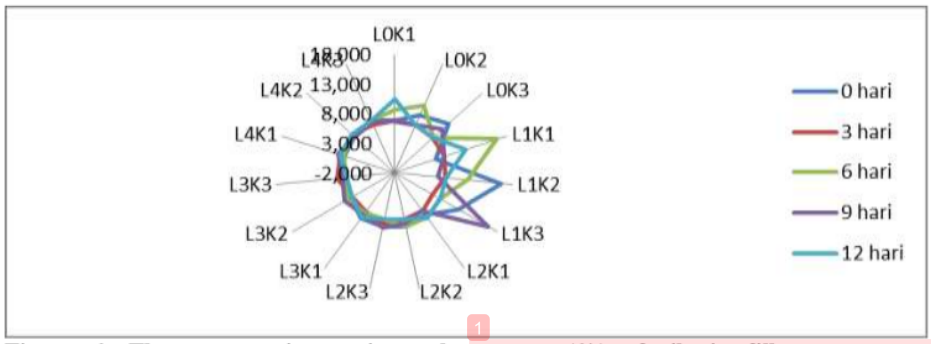

Figure 6. The average interaction ash content (%) of tilapia fillets treatment effect different concentrations of liquid smoke, long soaking and storage time.

In Table 6 (row) indicates the value of negative interactions in the treatment of soaking time, concentration and storage time 0 days and 9 days versus ash content fillet of tilapia while positive interactions on the storage time of 3 days, 6 days, and 12 days. Values of positive interaction means the three treatment factors together provide a response to the fiber content. Value of negative interactions means that these three factors provide a response that is not the same. Furthermore, the value of the interaction of ash content (%) fillet of tilapia based treatment liquid smoke concentration, type of packaging with different storage time is presented in Table 7 and Figure 7 below.

Table 7. Values interaction ash content (%) of tilapia fillets soaking time difference effect of treatment with storage time.

Long soaking (K)	Long storage (S) (day)					Mean	Interaction
(%)	0 (S_0)	3 (S_1)	6(S_2)	9(S_3)	12(S_4)	(S)	S*K
5 (K1)	6.684 [a]	9.157 [a]	8.576 [a]	6.728 [a]	6.670 [a]	7.563	1.241
10(K2)	6.694 [a]	6.6701 [a]	8.5855 [a]	6.7141 [a]	6.7342 [a]	7.080	0.390
15(K3)	8.5755 [a]	6.6941 [a]	6.7169 [a]	9.4074 [a]	6.7342 [a]	7.626	-0.407
Mean (K)	7.507	7.959	7.617	6.713	6.713	7.423	
Interaction (K*S)	-0.114	-0.001	0.113	-0.163	0.000		

CV = 67,27

Description: Figures followed by different letters in the same row or column showed significant differences (P <0.05).

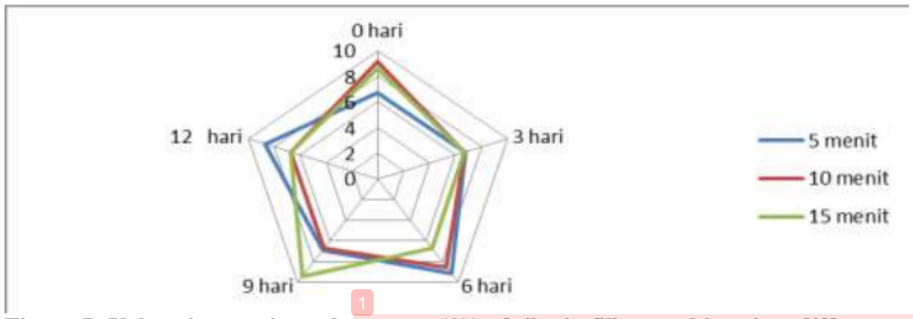

Figure 7. Values interaction ash content (%) of tilapia fillets soaking time difference effect of treatment with storage time.

In Table 7 (lines) shows the value of positive interaction in treatment longer soaking time deposit with 5 and 10 minutes to the ash content of tilapia fillet while the value of negative interactions on a long submerged for 15 minutes. In the column shows the value of positive interaction between old soaking with storage time 6 days while the value of negative interactions on storage time 0 days, 3 days, 9 days. Values of positive

interaction means the three treatment factors together provide a response to the ash content. whereas the mean value of negative interactions both factors provide a response that is not the same.

4. Conclusion.

1. There was an interaction on the treatment difference with a long soaking period of storage of the raw fiber fillet of tilapia, as well as in a combination of three treatments, soaking time differences, differences in the concentration and duration of storage as well as a combination of soaking treatment, types of packaging and storage time subsequent to a combination of the two , three, and four other treatments showed no significant difference (no interaction)

2. There was an interaction on a combination of the two treatments soaking time difference with the storage time of the ash content of tilapia fillets, while the combination of two other treatments were not significantly different show next to the triple combination treatment of soaking time, concentration, and storage time significantly (the interaction) , while the combination of the other three treatments were not significantly different (no interaction) and to the combination of four treatments of soaking, the concentration difference types of packaging, and storage time showed no significant difference (no interaction).

3. Content crude fiber fillet of tilapia on a combined treatment of liquid smoke concentration of 5%, soaking time 10 minutes with storage time of 9 days on the packaging shows the results of the largest PE 17.777% while the yield crude fiber contained in the smallest liquid smoke treatment concentration of 10% (L2) , soaking time 10 minutes (K2) for storage of 9 days of 0.41%.

4. The ash content of tilapia fillets at a concentration of 5% liquid smoke, a long submersion for 15 minutes at a storage time of 9 days provide the highest value (11.721%) and the smallest (6.635%) occurred in the treatment of liquid smoke concentration of 10% with 10 minutes soaking time the storage time of 12 days.

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