

THE EFFECTIVENESS OF IMMERSION TIME WITH SATURATED NaCl TOWARD MICROPLASTIC LEVELS IN SHELLFISH

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Abstract

Introduction: Plastic waste is a type of inorganic waste that can cause pollution in water bodies. Plastic waste in the aquatic environment can be degraded into microscopic particles called microplastics. Shellfishes are one of the aquatic biota with feeding filter properties, so that they allow microplastics to enter the shells body. The presence of microplastics can pose food safety risk, which can have negative health impacts. There is a need for treatment before shellfishes are consumed to reduce the levels of microplastics, namely immersion using saturated NaCl. Saturated NaCl can float particles that have smaller density. The aim of the research is to analyze the effect of immersion time using saturated NaCl toward microplastic levels in shellfishes. **Methods:** Type of pre-experimental research with pretest-posttest group design. The independent variable of the study is the immersion time using saturated NaCl with variations of 30, 60, 90 minutes. The dependent variable of the study is the microplastic levels in shellfishes. The research sample is green mussels with 9 replications. Microplastic observation using a binocular microscope with a magnification of 10 and count the amount in 50 gr. The analysis used paired T test. **Result and Discussion:** The effectiveness of reducing the levels of microplastic before and after soaking using Saturated NaCl for 30 minutes was 54.86%, 60 minutes was 62.83%, and 90 minutes was 61.72%. Analysis of the effect of immersion time using saturated NaCl on microplastic levels for 30 minutes of treatment obtained p value 0.000(<0.005), treatment for 60 minutes p value 0.000 (<0.005), and treatment for 90 minutes p value 0.000 (<0.005). It means that the immersion time using saturated NaCl for 30, 60 and 90 minutes affects the microplastic levels in shellfishes. **Conclusion:** Immersion time in 30 minutes is ineffective to reduce microplastic levels in shellfishes. Immersion time in 60 and 90 minutes is quite effective to reduce microplastic levels in shellfishes. Immersion time using saturated NaCl in 30, 60, and 90 minutes affects the microplastic levels in shellfishes.

Keyword: Immersion time, Saturated NaCl, Shellfishes, Microplastic levels

Introduction

Based on the Law of the Republic of Indonesia Number 32 of 2009, Environmental Pollution is the entry or inclusion of living things, substances, energy, and/or other components into the environment by human activities so that it exceeds the established environmental quality standards (1) . One type of pollution is water pollution. One of the causes of water pollution is waste originating from industrial and human activities. The most commonly found waste is inorganic waste such as plastic.

Plastic waste that has been in the aquatic environment for a long time will be degraded or split into microplastics. Microplastic is a very small plastic whose size is <5mm(2). Microplastics that flow with the water will enter the water bodies and will eventually settle in the

sediment (3). The existence of microplastics has an impact on the environment because it can affect the food chain indirectly (4). Microplastics in marine waters can be categorized as physical pollution. They will intentionally or unintentionally come into the aquatic biota digestive system, one of which is shellfishes (5).

Shellfishes are one of the aquatic biota that has feeding filter properties (6). It means that they look for food by filtering the food around it using a hose that is on its body called a siphon. Microplastics measuring 5 mm may also be picked up and enter the shell's body. In addition, shellfish is also one of the aquatic biota that is often consumed by humans. Thus, the presence of these microplastics in shellfishes consumed by humans may pose food safety risk (7).

Other than being microplastics, plastics can release harmful chemical compounds such as phthalates, bisphenol A, 4-nonylphenol, methyl

tert-butyl ether (MTBE), formaldehyde, synthetic dyes and volatile carbon compounds (8). If people consume shellfishes that contain microplastics, it will cause negative impacts on health such as endocrine system disorders (hormones) and breast cancer (9).

The need for prevention before the impact on human health occurs, can be done namely by doing a treatment before they are processed and consumed. One of the treatments is immersion using saturated NaCl. The immersion method using NaCl is intended to reduce the microplastic content in shellfishes, so that the risk to health can be minimized because of the nature of NaCl which can float particles that have smaller density.

The purpose of this study is to analyze the effect of soaking time using Saturated NaCl on the microplastic content of shellfishes.

1. Methods

The type of the research is pre-experimental research with pretest-posttest group design. The reasearch sample is green mussels. The independent variable of the study is the immertion time using saturated NaCl with variations of 30, 60, 90 minutes. The dependent variable of the study is the microplastic levels in shellfishes. There will be about 9 replications.

The procedure to examine the microplastics in shellfishes is to weigh 50 grams of mussel meat, add 150 ml of 10% KOH, then incubate at 60°C for 24 hours. If there is still mussel meat that has not been crushed, then add 5 ml of 30% H2O2, let stand at room temperature for 24 hours. Sample filtration using a 5 mm porous sieve. Sample filtration using 0.3 micron pore filter paper. Put the filter paper in the oven until it dries up. Do the observations using a microscope with a magnification of 10 times. Count the amount of microplastic in 50gr. Calculate the effectiveness of NaCl immersion time to reduce the microplastic content in the shellfishes. Analyze the effect of soaking time using Saturated NaCl on microplastic levels using the paired t test.

3. Result and Discussion

a. Microplastic Levels before and after the immersion using saturated NaCl for 30 minutes

The calculation result of microplastic levels before and after the immersion using saturated NaCl for 30 minutes can be seen in table 1.

Table 1. Microplastic Levels before and after the immersion using saturated NaCl for 30 minutes.

Replica	Microplastic Levels /50 gr		Effectivity (%)
	<i>Pre</i>	<i>Post</i>	
1	27	15	44.44
2	24	6	75.00
3	35	11	68.57
4	23	16	30.43
5	26	9	65.38
6	25	13	48.00
7	26	15	42.31
8	40	14	65.00
9	33	15	54.55
Average	28.78	12.67	54.85

Source: Primary Data 2021

The average of the microplastic levels before the immersion using saturated NaCl is 28.78/50 gr while after 30 minutes of the immersion, it falls down to 12.67/50 gr. The immersion time of 30 minutes using saturated NaCl effectively decreases the microplastic levels in the mussels about 54.85%.

b. Microplastic Levels before and after the immersion using saturated NaCl for 60 minutes

The calculation result of microplastic levels before and after the immersion using saturated NaCl for 60 minutes can be seen in table 2.

Table 2. Microplastic Levels before and after the immersion using saturated NaCl for 60 minutes.

Replica	Microplastic Levels/50 gr		Effectivity (%)
	<i>Pre</i>	<i>Post</i>	
1	57	21	63.16
2	33	12	63.64
3	30	6	80.00
4	18	11	38.89

5	37	19	48.65
6	26	9	65.38
7	33	15	54.55
8	34	10	70.59
9	31	6	80.65
Average	33.22	12.11	62.83

Sourcer: Primary Data 2021

The average of the microplastic levels before the immersion using saturated NaCl is 33.22/50 gr while after 60 minutes of the immersion, it slides down to 12.11/50 gr. The immersion time of 60 minutes using saturated NaCl effectively lowers the microplastic levels in the mussels about 62.83%.

c. Microplastic Levels before and after the immersion using saturated NaCl for 90 minutes

The calculation result of microplastic levels before and after the immersion using saturated NaCl for 90 minutes can be seen in table 3.

Table 3. Microplastic Levels before and after the immersion using saturated NaCl for 90 minutes.

Replica	Microplastic Levels/50 gr		Effectivity (%)
	<i>Pre</i>	<i>Post</i>	
1	22	9	59.09
2	17	9	47.06
3	19	2	89.47
4	13	3	76.92
5	48	10	79.17
6	15	5	66.67
7	20	17	15.00
8	21	3	85.71
9	11	7	36.36
Average	20.67	7.22	61.72

Source: Primary Data 2021

The average of the microplastic levels before the immersion using saturated NaCl is

20.67/50 gr while after 90 minutes of the immersion, it drops down to 7.22/50 gr. The immersion time of 90 minutes using saturated NaCl effectively cuts down the microplastic levels in the mussels about 61.72%.

In line with the research conducted by IPB students (10), Edy Ridwanda Sembiring et.al. succeeded in reducing the levels of microplastics in mussels using the method of modifying the density diffusion of salt water. That is by separating the microparticles from the meat by freezing the meat until it forms pores, then the salt water is flowed from the bottom to the top (up flow) through the pores of the meat so that the microplastics can float and be separated from the meat.

d. Analysis of the Difference of Microplastic Levels Before and After the Immersion Using Saturated NaCl for 30, 60 and 90 minutes.

Table 4. Analysis of the Difference of Microplastic Levels Before and After the Immersion Using Saturated NaCl for 30, 60 and 90 minutes.

	Paried Differences				Sig (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the Difference		
				Lower		Upper
Pair 1	1.611E1	6.23387	2.07796	11.31934	20.90289	0.000
Pair 2	2.111E1	7.81736	2.60579	15.10216	27.12007	0.000
Pair 3	1.3444E1	10.53697	3.51232	5.34501	21.54388	0.005

Source: Primary Data 2021

The analysis of the difference of microplastic levels before and after the immersion using saturated NaCl for 30 minutes of treatment obtained p value of 0.000 (<0.050), treatment for 60 minutes obtained p value of 0.000 (<0.050), and treatment for 90 minutes obtained p value of 0.005 (<0.050). There are significant differences in the microplastic levels of the mussels before and after the immersion using saturated NaCl for 30, 60, and 90 minutes.

The drawbacks in the study were using 0.3 micron porous filter paper instead of using 0.1 micron pores according to microplastic size. This allows microplastics under 0.3 microns not to be caught by the filter. In the water and NaCl mixture used for immersion, there are still microplastics after examination.

4. Conclusion

- a. The immersion using saturated NaCl for 30 minutes effectively decreases 54.86% of the microplastic levels of the mussels, 63.82% for 60 minutes and lastly 61.72% for 90 minutes.
- b. There are differences in the microplastic levels before and after the immersion using saturated NaCl for 30 minutes with p value of 0.000 (<0.050), for 60 minutes with p value of 0.000 (<0.050), and lastly for 90 minutes with p value of 0.000 (<0.050).

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6. Reference

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