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Original paper

THE APPLICATION OF GLYROXYL AS DECONTAMINATION AND DISINFECTION AGENT FOR THE PRESERVATION OF FISHERIES PRODUCT

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ABSTRACT

Fisheries products are regarded as perishable food. Fresh prawn is one of the most valuable fisheries products and its demand increases especially in developed countries. Handling and preserving of fresh prawn has been investigated to keep the quality. Glyroxyl has been successfully used as decontamination agent in the fish sector in the Netherlands. Apart from its use as decontamination agent, glyroxyl has been proved to be an efficient disinfectant. Due to its safe character, it is allowed to put glyroxyl in foodstuff directly, provided that the prescribed concentration is respected.

This study is aimed to investigate the effect of different concentration of glyroxyl (0, 0.3 and 0.5%) on the preservation of fresh prawn. The sample used was white shrimp prawn (Penaeus monodon). The samples were soaked in glyroxyl solution with different concentrations. The analyses were conducted for organoleptic, Total Plate Count (TPC) and E. coli at 0 and 3 days storage at refrigerated temperature.

The results showed that the use of glyroxyl solution (0%, 0.3% and 0.5%) has no effect on the organoleptic parameters of the sample (appearance, color and flesh). However, after 3 days of storage the effect of glyroxcyl became apparent especially for 0 % glyroxcyl treatment. The number of E. coli showed that application of glyroxyl could prevent the growth of E. coli and reduce the number of E. coli in the samples. In addition the E. coli obtained was less than number < 3 / < 3 in all samples after 3 days storage. Increase in glyroxyl concentration resulted in the decrease of bacterial number (TPC) both for 0 and 3 days storage.

Key words: fresh prawn, glyroxyl, decontamination and disinfection agent

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INTRODUCTION

Fisheries products are regarded as a perishable food and are highly susceptible to microbiological and chemical deterioration. Prawns constitute the most valuable commercial fisheries product and its demand increases by year especially in developed countries. Resource potency of prawn in Indonesia are calculated at approximately 178,368 ton per year. Its potency has not been managed optimally which resulted in low-grade quality of product (Darmanto, 2001). After catching, fresh prawn is usually preserved by icing

or brine freezing to retard the formation of black spot (Martin and Flick, 1990). Handling of fresh prawn has been extensively investigated to keep the quality. Regarding effort for reducing bacterial contamination, glyroxyl has been successfully used as decontamination agent in the fish sector in the Netherlands. Glyroxyl is composed of 50% hydrogen peroxide (H_2O_2) and a carrier. The active ingredient is hydrogen peroxide, whereas the carrier prevents rapid dissolution of the hydrogen peroxide and depending on the circumstances, it creates a miniscule coating during a certain period of time. Apart from its use as decontamination agent, glyroxyl has also been proved to be an efficient disinfectant. Glyroxyl has the features of a broad-spectrum disinfectant and distinguishes itself from conventional disinfectant (e.g. H_2O_2 or chlorine) by its mild and long lasting effect. As decontamination agent, glyroxyl primarily prevents the increase of present bacteriological level and secondly reduces the present bacteriological level. For this purpose the concentration may vary between 0.1% and 0.2% (Kon-Des Milieutechnologie, 2001). Anyhow, for practical purpose the optimal concentration of glyroxyl has to be determined experimentally. In addition, due to its safe character, it is allowed to put glyroxyl in foodstuff (including fisheries product) directly provided the prescribed concentration is respected.

This study is aimed at investigating the effect of different concentration of glyroxyl on the quality of fresh prawn and finding out the optimal concentration of glyroxyl that can be applied with special attention to microbiological and organoleptic value.

MATERIALS AND METHODS

Materials

The sample used in this study was white prawn (*Penaeus marguiensis*) bought from the local fish market (Shinagawa fish outlet) and transported to the laboratory on ice. The samples were then soaked in glyroxyl solution with different concentrations (0%, 0.1%, 0.3% and 0.5%). Non glyroxyl treatment (0%) was used as control. The treated samples were then stored at refrigerated temperature for 3 days and then subjected to subsequent analysis.

Organoleptic Analysis

This analysis included observation on appearance, odor and flesh of the samples by some experienced panelist. The method used was based on procedure issued by National Standard of Indonesia SNI 01-2345-1991 (Directorate General of Fisheries, 1995).

Microbiological analyses

Total Plate Count (TPC)

The purpose of this analysis was to observe bacterial number present in the samples by using Total Plate Count method. The analysis was conducted on the samples after first soaking it for 10 minutes in glyroxyl solution. The second analysis was conducted after the treated samples were stored at refrigerated temperature for 3 days (72 hours). The method used is based on procedure issued by National Standard of Indonesia SNI 01-2339-1991 (Directorate General of Fisheries, 1995)

Analysis *Eschericia coli* (*E.coli*)

Apart from TPC analysis, the samples were also subjected to *E.coli* analysis using the method of National Standard of Indonesia SNI 01-2332-1991 (Directorate General of Fisheries, 1995).

RESULTS AND DISCUSSION

Glyroxyl is considered to be a relatively new approved decontamination agent that was introduced in the Dutch Pure Food Act in 1995. Although glyroxyl had got the approval as decontamination agent in the fish sector, more experiments are needed to determine its use for fisheries product such as prawn.

Organoleptic Analysis

The effect of glyroxyl on organoleptic quality of white prawn is presented in Table 1. The results showed that the organoleptic value (appearance, odor, and flesh) of non glyroxyl samples (control) have the highest value compared to the others, with a value of 8.39 (mean value). The lowest value was obtained in 0.1% glyroxyl treatment.

The highest organoleptic value shown by the controlled treatment might be due to direct analysis taken on the samples upon arrival in the laboratory, so that no time have elapsed during the analysis. Whereas for glyroxyl treatment, the samples were soaked for 10 minutes which could affect appearance, odor and flesh of the samples. However, after a three-day storage at refrigerated temperature, non glyroxyl samples showed a decrease in organoleptic value (6.89). In contrast, the samples treated by glyroxyl 0.1%, 0.3% and 0.5% showed relatively slight decrease in organoleptic value. These results obviously proved that the use of glyroxyl can retard deterioration of fresh prawn organoleptically.

Microbiological Analysis

From the microbiological point of view, it is necessary to observe the effect of using glyroxyl in reducing microbial number or preventing the growth of a particular microorganism within the food product. In addition, food product intended for export should be free from pathogenic microorganism. The most watched-out for pathogenic microorganisms in food are *E.coli*, *Salmonella*, *Staphylococcus aureus* etc. Apart from these, total bacterial number is important before accepting food and there is standard requirement for bacterial number defined by consumer/ buyer.

From the results, total bacterial numbers of the samples during storage tend to increase especially for glyroxyl concentration of 0%, 0.1% and 0.3%. On the other hand, glyroxyl concentration of 0.5% showed significant reduction on bacterial number during storage (Table 2).

Glyroxyl is considered as a decontaminating agent in the Netherlands. A decontaminating agent is a processing aid that is applied to kill microorganism in direct contact with food products but does not become an ingredient of the product. (Kon-Des Milieutechnologie, 2001).

According to the National Standard of Indonesia, the standard requirement of bacterial number permitted for fresh shrimp should be less than 5×10^5 colony/gram sample (Directorate General for Fisheries, 1994). Based on the results, all samples comply with the standard requirement from total bacterial number point of view.

The number of *E.coli* in fresh prawn showed that glyroxyl concentration of 0%, 0.1% and 0.3% had high *E.coli* initially and considered to be unacceptable, except for glyroxyl treatment with 0.5%. Contamination of *E.coli* in food product can occur when sanitation and hygiene is not applied during handling and

processing of the product. Obviously, once the product come into contact with human, bacterial contamination cannot be prevented and will have an effect on the increase of bacterial number and pathogenic microorganism. Washing and applying decontamination agent may reduce all these problems (Sunarya, 1993).

From this study, application of glyroxyl resulted in significant decrease of *E.coli*. After 3 days storage at refrigerated temperature, the number of *E.coli* was reduced by < 3 for all samples. According to the National Standard of Indonesia, *E.coli* of fresh prawn should be less than 3 MPN/gr sample. Therefore, from the results, it can be concluded that glyroxyl can be used as decontaminating agent (decontaminant), particularly for preventing the increase of bacteriological number (for glyroxyl concentration of 0.5%) and reducing the present *E.coli* level in white prawn.

CONCLUSION

Based on the study, it can be concluded that:

1. Glyroxyl can be effectively used as decontamination and disinfection agents for fresh prawn
2. Application of glyroxyl did not affect the quality of product organoleptically.
3. Glyroxyl concentration of 0.3% is considered to be the most appropriate concentration for preserving fresh prawn.

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Table 1. The Effect of Glyroxyl Concentration on Organoleptic Value of White Prawn (*Penaeus marguiensis*) during Storage at Refrigerated Temperature.

Glyroxyl Concentration	Organoleptic Value					
	0 day Storage			3 days Storage		
	X	SD	Tolerance (0.05%)	X	SD	Tolerance (0.05%)
0 % (non glyroxyl)	8.39	0.30	$8.15 < \mu < 8.63$	6.89	0.31	$6.64 < \mu < 7.14$
0.1 %	7.78	0.46	$7.41 < \mu < 8.15$	7.06	0.41	$6.73 < \mu < 7.39$
0.3 %	7.89	0.37	$7.59 < \mu < 8.19$	7.28	0.30	$7.04 < \mu < 7.52$
0.5 %	8.06	0.36	$7.77 < \mu < 8.55$	7.33	0.27	$7.11 < \mu < 7.55$

X : Mean Value
SD : Standard Deviation

Table 2. The Effect of Glyroxyl Concentration on Bacterial Number (TPC) and *E.coli* of White Prawn (*Penaeus marguiensis*) during Storage at Refrigerated Temperature.

Glyroxyl Concentration	Storage Time			
	0 day		3 days	
	TPC	*E.coli*	TPC	*E.coli*
0 % (non glyroxyl)	2.3×10^{-4}	7 / 4	2.7×10^{-4}	< 3 / < 3
0.1 %	2.2×10^{-4}	43 / 4	2.6×10^{-4}	< 3 / < 3
0.3 %	1×10^{-5}	9 / 7	1.9×10^{-4}	< 3 / < 3
0.5 %	1.3×10^{-3}	4 / <3	$1.6\ 10^{-4}$	< 3 / < 3