Chapter in Book

ReWasCO Liquid Soap

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Abstract: *The recycling rate of waste cooking oil (WCO) in Malaysia is estimated to be lower than paper, plastic, and glass. Therefore, ReWasCO was an innovative WCO liquid soap product as an alternative to reduce domestic WCO in the country. The novelty of this innovation project, the preparation process of this ReWasCO liquid soap was 100% using WCO, whilst the available formulation requires a mixture of oils, including the new oil for preparing WCO liquid soap. In addition, this project used a mixture of tropical plants such as pandan and kaffir lime leaves which are not widely commercialized. Then, a study of consumer acceptance of the final product produced was performed. Overall, 92% of the consumers rated this product as"good" and "very good". Regarding costing, ReWasCO liquid soap could save around 273% of money compared to the commercially available soap which aligned with the country's aspirations of creating a prosperous society: money saving and minimising environmental pollution.*

Keywords: waste cooking oil; liquid soap; recycle.

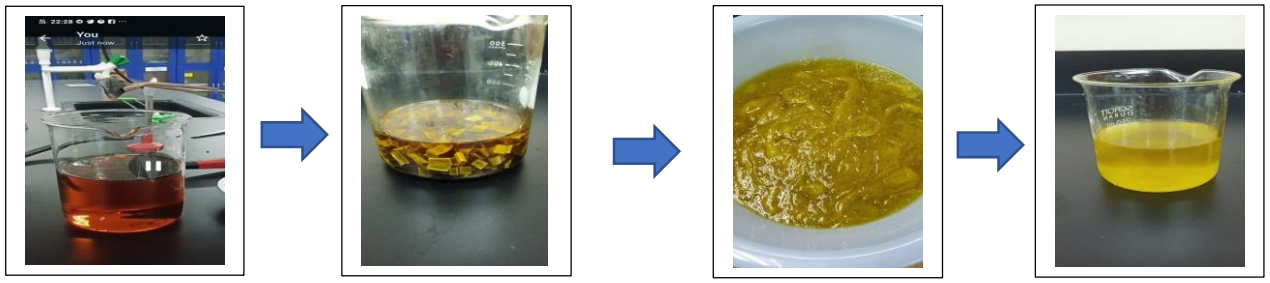
1. INTRODUCTION

Waste cooking oil (WCO), the liquid residues from the used cooking oil, is one of the problems in domestic waste disposal in Malaysia. According to Loh et al., (2006), WCO was produced daily by homes, restaurants, and caterers. Therefore, this causes the accumulation of WCO of about 500,000 tonnes annually in Malaysia. However, in general, there is limited awareness of WCO disposal system. Most of the WCO was disposed of through domestic drainages such as sinks, drains, and toilets. This led to environmental issues, which resulted in water pollution, soil pollution, disruption of the marine ecosystem, and drain clogging (Kulkarni & Dalai, 2006). Many countries like Japan, the United States, Taiwan, and European Union have taken the step to recycle WCO decades ago by converting the waste into soaps, energy by anaerobic digestion, thermal cracking, and recently the production of biodiesel. Unfortunately, in Malaysia, according to the study by Kabir et al. (2014) there were 88% of the households in Petaling Jaya, (one of the district in Malaysia) were reluctant to recycle the WCO. Therefore, this project was to innovate the WCO into multipurpose liquid soap as it is one of the necessities of every home. In Malaysia, one bottle (900 ml) of dishwashing soap on the market can last for 2 weeks for one family (5-6 people). This project is in line with the government's aim in developing a prosperous society: money saving and minimising environmental pollution.

2. METHOD & MATERIAL

Filtered WCO (500g) was pre-treated with active carbon. After the WCO was cooled down to room temperature, the carbon was removed. About 20 g of dried pandan and kaffir lime leaves were added in the WCO, and the mixture was then heated for 1 hour, then left overnight. After that, the pandan and kaffir lime leaves residues were filtered.

About 144 g of potassium hydroxide (KOH) was dissolved in 280g of distilled water. Then, KOH solution was added in the pre-treated WCO to produce WCO soap base. WCO soap base was mixed well with hand-blender until homogeneous. This WCO soap base was heated using double boiling technique for 8 hours. After cooling, 3 litres of distilled water was added into WCO base and left overnight. The WCO soap base was dissolved slowly until thickened. Then, 50 ml 10% w/v acid ascorbic solution was added in the WCO liquid soap. Now the finished product of ReWasCO liquid soap was to be used.



Filtered WCO

WCO infused with pandan and kaffir lime leaves

WCO soap base added with water

Finish product ReWasCO

Figure 1. ReWasCO liquid soap-making process.

Finally, this final product was distributed to consumers to assess their acceptance of this product. The characteristic of odour, visual, colour, viscosity, cleaning effectiveness and overall product acceptance were assessed.

3. FINDINGS

The total yield of liquid soap from this project was 3700 ml. There is no unpleasant odour from this WCO liquid soap event though no artificial fragrant was used in this product.

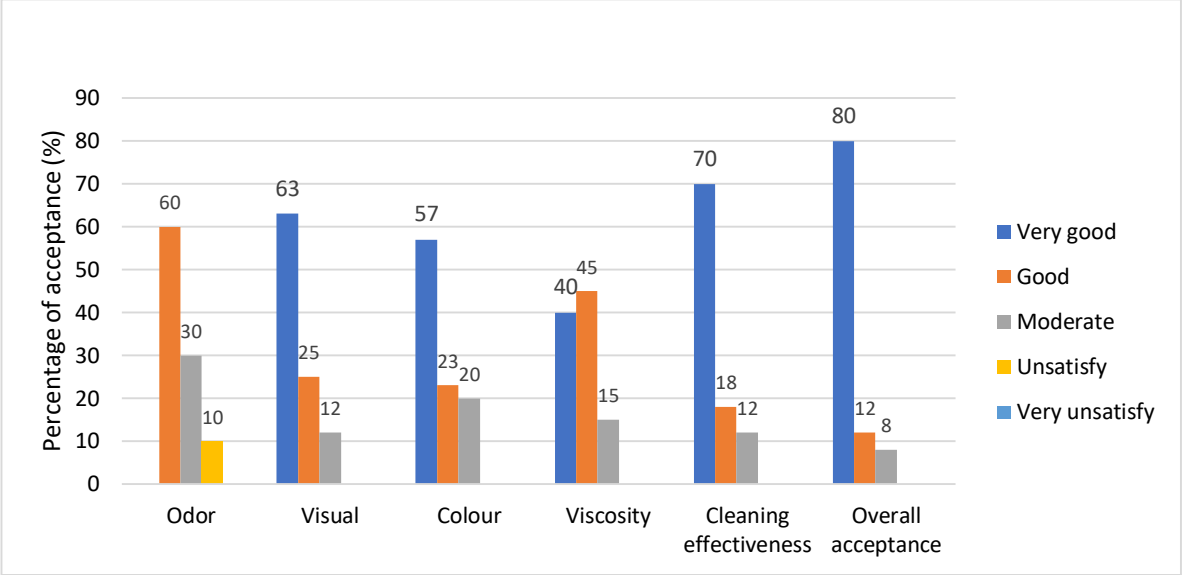


Figure 2. Acceptance level of ReWasCO Liquid Soap Criteria

Figure 2 shows the acceptance of WCO ReWasCO liquid soap criteria among 20 users. Most of the respondents gave a "very good" and "good" rating to the characteristics of this ReWasCO liquid soap. Cleaning effectiveness was stated as the highest ranking at 70%. Nevertheless, 10% of the respondents were dissatisfied with this product since the fragrant aroma was not strong compared to the liquid soap available in the market. For the overall product acceptance, 92% of the consumers mentioned that this product was "good" and 'very good".

4. Discussion

Although there are many homemade soap recipes, the recipes on waste cooking oil solely were very limited. Generally, the type of oil used in soap-making is high-priced oils in Malaysia, such as olive oil and coconut oil. In this project, the original soap recipe has been innovated using WCO without other oil mixtures. The use of activated carbon is to remove any unpleasant odour from WCO. While pandan and kaffir lime help improve the odour and colour of ReWasCO liquid soap.

Table 1. Liquid soap raw material cost comparison for 3700ml soap volume.

	Olive oil base	Waste Cooking Oil (WCO)	Palm Oil base	Commercial Liquid dish wash soap in the market
Coconut oil (150ml)	RM3.5	NA	RM3.5	-
Olive oil (350ml)	RM9	NA	NA	-
Palm oil (350ml)	NA	NA	RM2.30	-
Waste cooking oil (WCO)	NA	RM0	NA	-

Potassium hydroxide (KOH)	RM 2.16	RM 2.16	RM 2.16	-
Utility (water and electricity)	RM 5	RM 5	RM 5	-
Total cost for 3700ml	RM20.1	RM7.16	RM12.96	-
Total cost for 900ml	RM4.78	RM1.74	RM3.15	RM6.50

NA (not applicable)

Table 1 compares the cost needed to produce 900ml (volume of 1 bottle) of liquid soap based on three types of oil, olive oil, palm oil, and WCO. The finding shows that WCO offers the lowest cost, RM1.74 per 900 ml. Comparing WCO base soap with olive and palm oil base soap, consumers can save around RM3.04 (174%) and RM1.45 (81%) of money, respectively. While comparing WCO liquid soap with commercial liquid soap, we can save about RM4.76 (273%) of money.

5. CONCLUSION

ReWasCO liquid soap from the combinations of WCO and local plants (pandan and kaffir lime leaves), has contributed to new novel recycled products. Furthermore, the combination of pandan and kaffir lime in the liquid soap was not yet available in the market. ReWasCO liquid soap can also offer low-cost washing soap and may save our drainage system and marine ecosystem for environmental well-being.

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