EXTRACTION OF GLYCERIN OIL AND PRODUCTION OF NATURAL BAR SOAP BY USING PONGAMIA SEEDS

AJ Shreyas[1], Dr. C. Anbalagan[2]

1. Research Scholar, Department of Civil Engineering, Bharath Institute of Higher Education & Research, Chennai -600073.
Author: a.jshreyas1989@gmail.com
2 Professor, Department of Civil Engineering, Bharath Institute of Higher Education & Research, Chennai –600073.
Corresponding Author: anbalagan.civil@bharathuniv.ac.in

ABSTRACT

For Centuries before modern science and technology, medicine was practiced traditionally by men and women. Incorporation of pongamia plant part is very common in Ayurvedha and Siddha Indian medicine practices. In addition to the properties in the Pongamia pinata exhibits many Pharmacological attributes. The value added utilization opportunities of Crude Glycerol are Reviewed. The Majority of Crude Glycerol is used as Making of Natural bar Soap. The term Glycerol is often used interchangeably with Glycerin, its name as Propan-1,2,3-triol. The Soaps Produced have the pH within the desirable limits (7-9) and Soaps have Shown good results in removing the stains on household utensils and glass wares.

KEY WORDS: Pongamia, Glycerin, NaOH Sodium hydroxide, Natural Bar Soap.

INTRODUCTION

Pongamia Seeds:

First, anti-Plasmodia characteristics make Pongamia pinnata important to treat malaria caused by Plasmodium falciparum, leaves of Pongam trees exhibits anti-inflammatory qualities as well as anti-diarrheal activity and the leaf extracts the antioxidants. Pongamia prevent ulcers by protecting damage from aspirin. It may also provide diabetic patients with a safer anti-hyperglycemic drug. Flower is used to traet bleeding hemorrhoids or Piles. Fruit is Aid treatment of abdominal tumors', female genetically tract infections, ulcers and hemorrhoids, Seed extracts can be used to heal scar tissue of tumors, trae high blood pressure, and treat anemia, powder reduces fever and helps in treating bronchitis and whooping cough. Pongamia oli is used an astringent and kill parasitic worms. Helpful in treating whooping cough, Piles, liver pain, Chronic fever, ulcers and leprosy(extracted from Seeds). Relieves sore joints and muscles and Arthritis. Used to trae eczema and other skin irritation when mixed with zinc oxide. Whole leaves used as digestive and laxative and to trae inflammation wounds. Leaf juice aids in treatment of leprosy, gonorrhea, flatulence, coughs and colds. Leaf infusions and extracts alleviate rheumatism and itches, respectively. Stem are used to lower or relive fever and to sedate the central nervous system. Bark relieves Coughs and colds, reduces spleen inflammation, and mental disorder, useful for treatment of bleeding Piles.

Glycerin:

Glycerin is a neutral, Sweet Tasting, Colorless, Thick liquid which freezes to a gummy paste and which has a high boiling point. Glycerin can be dissolved into a water or alcohol, but not oils. On the other hand, many things will dissolve into glycerin easier than they do into water or alcohol. So it is good Solvent. Glycerin is a Material of outstanding utility with many areas of Application. The Key Glycerin's technical versatility with many other substances, and easy handling. Glycerin is also virtually nontoxic to human health and to the environment Physically Glycerin is Water soluble, Clear, almost Colorless, odorless, viscous hygroscopic liquid with a high boiling point. Chemically Glycerin is a trihydric alcohol, capable of being reacted as an alcohol yet stable under most conditions with such an uncommon blend of properties, glycerin finds application among a broad diversity of end use. In some Glycerin is the material of Choice because of its physical characteristics, while other uses rely on glycerin's chemical Properties. Glycerin has over 1500 known end uses. Major or large volume, application include some dozen different categories that range from foods to urethane foams, about 300 million pounds of glycerin are used annually .other leading areas of consumption is estimated at about 1.1-1.2 billion pounds per year and is expected to rise as industrialization progress in less developed countries. The origin, chemical structure, and utility of glycerin have been known for little more than two centuries. Glycerin was accidentally discovered in 1779 by K.W Scheele, the Swedish Chemist, while he was heating a mixture of olive

oil and Litherage (lead monoxide). Scheele called glycerin the "Sweet principle of fat" Scheele later established that other metals and glycerides produce the same chemical reaction which yields glycerin and soap. The immense potential of glycerin went largly untapped until M.E Chevreul, the French pioneer investigator of fats and oils, studied it early in the 19th Century.

In 1823 Chevreul obtained the first patent for a new way to produce fatty acids from fast treated with an alkali, which included the recovery of glycerin released during the process. Thirteen years later, Pelouze, another French investigator announced the empirical formula as C_3HO_5, The accepted Structural formula C,H(OH) was established by Berthelot and Lucia.

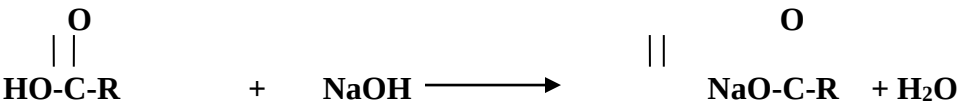
Glycerin plays an important role in nature, too it is one of nature's wonders and is closely linked to the life process them, being a Component of all living cells. It occurs naturally in wines, beers, bread, and other fermentation products of grains and sugars. Glycerin is found abundantly in nature in the form of triglycerides, the chemical combinations of glycerin and fatty acids which are the principal constituents of almost all vegetable and animal fats and oil highly glycerolizes in plants originate from carbohydrates produced Photo synthetically from water and carbon-di-oxide. In animals, they appear to be formed through assimilation of triglycerides present in foods and through biosynthesis from other food substances, especially carbohydrates.

Characteristics of Crude glycerol:

The Production of bio-diesel provides a relatively large amount of co-products and wastes, such as gluten meal, gluten feed, oil cake, waste water, and Crude glycerol within these wastes, crude glycerol is the major by-product of bio-diesel industry, in general, about 10 Kg Crude glycerol is produced for every 100kg of bio-diesel. Crude glycerol generated by homogeneous base-catalyzed transesterification contains approximately 50 to 60% of alkalis, especially in the form of alkali soaps and hydroxides, 15% to 18% of Methyl esters, 8 to 12% of Methanol, and 2% to 3% of water. In addition to Methanol and Soaps, Crude glycerol also contains a variety of elements such as Ca, Mg, P, or S and other Components.

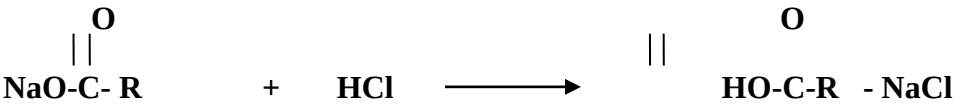
Crude Glycerol generated from bio-diesel production is impure and of little economic value. In General, Glycerol makes up 65% to 85% (W/W) of the Crude Stream. The wide range of purity values can be attributed to different glycerol purification methods or different feed stocks used by bio-diesel produced from various bio-diesel feed stocks.

Methanol and free fatty acids (Soaps) are the two major impurities contained in crude glycerol. The existence of Methanol is due to the fact that bio-diesel producers use excess methanol to drive the chemical transesterification to completion, and do not recover the entire Methanol. The Soaps, which are soluble in glycerol layer, originate from a reaction between the free fatty acids present in the initial feedstock and the Catalyst base.



Fatty Acid **Soap**

In addition to Methanol and Soaps, crude glycerol also contains a variety of elements such as Calcium, Magnesium, Phosphorous, or Sulphur. The Crude glycerol derived from alkali-catalyzed transesterification usually has a dark brown color with a high Ph(11-12). When pH is adjusted to a neutral range, soaps will be converted into free fatty acids as shown in figure.



Soap **Fatty Acid**

The free fatty acids in the crude glycerol stream results in a cloudy solution. After settling for a period of time, this cloudy solution will be separated into two clear phases, with the top layer being the free fatty acid phase, and the bottom layer glycerol phases. Glycerol refers to the Chemical compound 1.2.3-Propanetriol, CH, OHCHOHCH, OH, and to the anhydrous content in a glycerin product or in a formulation.

Properties of Glycerin:

Physical Properties:

1.	Molecular Wight	92.09
2.	Melting Point	18.17^0 C
3.	Boiling Point(760mm Hg)	290^0C
4.	Density (20^0C)	1.261 g/cm^3
5.	Vapor Pressure	0.0025 mm Hg at 50^0C
		0.195 mm Hg at 100^0C
		4.3 mm Hg at 150^0C
		46 mm Hg at 200^0C
6.	Refractive index	1.474
7.	Surface tension	63.4 dyne/cm at 20^{o}C
8.	Compressibility(28^{o}C)	2.1*10 Mpa
9.	Viscosity	1499 c.p at 20^{o}C (100% Glycerol)
10.	Specific Heat	0.5779 Cal/gm at 20^{o}C(99.94% Glycerol)
11.	Heat of Vaporization	21060 cal/mole at 55^{o}C
		18170 cal/mole at 195^{o}C

12.	Heat of formation	159.6 Kcal/gm Mole
13.	Heat of Combustion	1662 KJ/mole
14.	Heat of Fusion	18.3 KJ/mole
15.	Thermal Conductivity	0.29 $w/^0k$
16.	Flash Point	177^0 C
17.	Fire Point	204^0C

Chemical Properties:

Clear: Glycerin is Completely Colorless, having a clear appearance similar to water and alcohol. Its index of reaction is 1.49, which is somewhat higher than water. This value is close to that of crown glass or an 80% sugar solution. Glycerin's Lack of color makes it useful as an additive with other substance. It gives products a glossy appearance but adds no coloration of its own.

Viscous: According to the Hyper Physics website, glycerin is almost over 1500 times more Viscous than water. This means when glycerin is a liquid at Normal temperatures and pressure, it flows and pours very slowly. This property makes it useful for making a variety of food products that need extra body, such as candy and icings as well as products like Tooth Paste.

Solvents: Glycerin dissolves completely in both water and alcohol. While Many Solvents dissolves either polar or non-polar Substances. Glycerin does both. It can also dissolve many organic and inorganic Substances. It's Versatility as a Solvent and its relative safety makes it useful for producing pharmaceuticals.

Lubricant: More resistant to oxidation than mineral oils, glycerin is used as a lubricant. It can be used where mechanical parts are exposed to benzene or gasoline, as these substances won't dissolves glycerin as they would dissolve oil. You can mix graphic powder into glycerin to further improve its lubricating properties. If its viscosity is an issue, glycerin can be mixed with water or alcohol to thin it, making it flow more quickly around lubricated parts.

Products from Glycerin:

There are Products that can be made out of the glycerin, most commonly Soaps, Hand Sanitizers, Hand Cleaners, Floor Cleaner etc... Although it is brown and very unattractive the glycerin makes a very good Soap. It is important that the Methanol is removed before it is converted into another product. Manufacturing soap out of a bio-diesel waste product like glycerin is very beneficial as it is recycling an already recycled item.

Glycerin Soaps –Benefits and Advantages:

Many of the commercial soaps available today don't have glycerin in them. The reason for this is because glycerin, which is a natural by-product of the soap production process, has fantastic moisture retention and softening qualities. These are all the qualities that manufactures of lotions and cream are after. Thus, manufacturers of mass produced commercial soaps extract the glycerin

the soaps and sell it off to manufacturers of lotion and creams. There are many advantages and benefits to using glycerin soap as those soaps are proven to be more moisturizing, in fact, glycerin Soaps are considered to be some of the most moisturizing soaps are available on the market. Qualities of the soaps allow the soap to be both moisturizing and softening and suitable for different type of skins. These soaps will help our skin to remain moisturized and become healthy. There are various other benefits to using glycerin soap, including the following,

Natural Soap:

One of the main advantages of using glycerin soap is that if we buy the correct brand, it can be made from entirely natural ingredients and processes. These Soaps aren't produced from synthetic ingredients. However, we will need to keep in mind that different soap manufactures make use of different manufacturing processes. Although most glycerin soaps are 100% Natural, Certain manufactures of glycerin soaps might add some synthetic ingredients to their soaps so it is worth verifying that the soaps completely Natural.

Sensitive skin:

Sensitive skin in Particular will benefit from glycerin soap due to its moisturizing and softening qualities and natural ingredients. The use of synthetic ingredients in soaps can actually cause severe skin complications or irritate or exacerbate skin problems. Even the most sensitive of skin can use glycerin soaps. These soaps can even be used on skins suffering from problems such as a Psoriasis and eczema. The skin irritations and negative reactions produced by regular soap is not a problem for those whose use of glycerin Soap.

Skin Moisturizing:

Glycerin has been proven to act as Humectants, Which means that it is able to attract moistures, thanks to this inherent quality of glycerin, this soaps will attract moisture to the skin and also effectively lock it in. this will provide the skin with a constant source of hydration, preventing the skin from drying out. This is not the case with certain other brands of commercial soap with a low or nonexistent level of Glycerin, which dries the skin out and makes it feel tight and flaky.

Healthier Skin:

By using glycerin soap, we will keep our skin moisturized which will create the great foundation for healthy and vibrant, supple skin. This will help us to even prevent wrinkles, tears in the skin and Stretch marks, among other Benefits.

MATERIALS AND METHODOLOGY

Materials used for Production of Glycerin Soaps are:

Production of Glycerin Soap:

Apparatus:

1. Electric heater
2. Beaker
3. Measuring jar
4. Stirrer
5. Conical flask
6. Mould

Brief Experimental Procedure

The present work involves in Preparation of soap from Crude glycerol produced from Seeds i.e., Pongamia with different ratio of Sodium hydroxide and Water.

Concentration 1: 4.81g NaOH flakes is dissolved in 25ml of distilled water.

Concentration 2: 3gm of NaOH flakes is dissolved in 20ml of distilled water.

Glycerin 100ml

Procedure:

The first step in any of these recipies is to remove the methanol from the glycerin. If we do not methanol recovery in our glycerin it will contain a high percentage of methanols. This will dangerous to the health of whoever is using the products as well as being dangerous to you when you heat the glycerin. All residual methanols must be removed before the glycerin can be used for other purpose. Methanol will boil off at temperature above 70^0C. The Glycerin can be distilled to capture the methanol or simply heated under a fume hood to remove methanol. Allow 45 minutes of boiling at temperature to ensure all methanols' is driven off. Once the methanol is removed, the glycerin is safe to handle and is suitable for making Soap.

1. After the removal of methanol the glycerin is allowed to Cool and NaOH solution is added to the glycerin and stirrer continuously so as to mix well. It forms a thin layer of trace occurs
2. At this stage any scent or fragrance can be added with soap so as to get the good smell.
3. Finally the soap mixture is poured into the mould which is box linked with a plastic Sheet and allowed to set for 24 hours.
4. After drying remove the soap from the mould and allowed to cure for 4 days then Ph test is Conducted on the Soap to determine its usability.

5. The p^H of Soap is usually between 7 to 9 the p^H is can be determine by using p^H Paper.
6. The same procedure is Procedure is followed for two different concentrations of NaOH Solution as mentioned above.

Ingredients used in making bar soaps from Glycerin are, glycerin, water and lye. The amounts of water and lye used will affect the lathering abilities of the Soap. I have found that the more water used , the more lather the soap will produce. And using more lye will produced a soap which is very strong and cuts grease well, but also dries out the skin. To began, filter the glycerin to remove any unwanted impurities you may have to heat the glycerin back to a liquid state in order to strain it. A good strainer is a restoring type strainer used for vegetable oil or an old pair of panty hose works well. The amount of lye and water used will depend on the amount of glycerin you are processing. I have found that one quart of water /gallon of glycerin (or25%) works well, producing soap with good lathering and cleansing abilities. On the lye, I use 38.5gms per liter or 5.5oz per gallon of glycerin. I have used these quantities on several batches of glycerin, even when the glycerin is from WHO from different sources.

Heat the glycerin in a Stainless Steel or Aluminum Pot (or your bio-processor)to 150^0 F to remove any excess methanol (if you used ethanol, heat to 175^0 F). Measure the proper amounts of water and lye to be used, heat the water to100^0 F., and the lye and mix until all the leys is dissolved. Be sure not to breathe the fumes. Pour the water or lye mix into the glycerin. Continue to heat the glycerin for another 10 minutes while mixing. Allow to mix for an additional 10 minutes (20 minutes total) at slow speed. The mixture may foam up slightly an form soap bubbles. After mixing is complete, the soap can be poured into a container and allowed to cool.

A good Container to use is a Tupperware type Container available at any Wall-Mart .do not need to add any type of release agent this type of containers, and removal is simple. You will need to 28qt. Containers for 3 gallons of Soap at $1^1/2$" thick. Pour the soap into the containers at the desired thickness and cover with a piece of Cardboard or plywood to help hold the heat in , and let set for 24 hours . As the soap cools, it will start to solidify.

After the 24 hours cooling period, the Soap should be ready to be removed and cut into bars. Using a butter knife or putty knife, Slice around the inside edge of the container to release the soap from the sides. Quickly turn the container upside down over piece of News paper or Card board. U may have to tap lightly on the bottom of the container to help it release and drop out. You now have a nice evenly shaped slab of Soap which can be cut into individual bars. Each slab will produce about 45 bars of Soap Measuring 2"x3" each.Allow Soap to set in a cool area for Approximately 4 to 7 Days before using. When first cut the soap will appear dark in colour, but will lighten to tan colour as drying progresses. The resulting Soap is a long lasting bar with good Cleansing abilities leaving no greasy residues. Soap can be stored in plastic zip lock bags or Placed in Plastic tubs in layers with Waxed Papers between each layer and kept in a cool place.

A.Figure shows soap in mold kept for drying Pongamiya Seeds **B. Final Product of Glycerin Soap from**

RESULTS : The result obtained for glycerin is same the only changes in color,. The soap made from glycerin is Red color. The result obtained for different concentration of NaOH is Tabulated Below,

Sl.No.	Composition	pH	Qualitative Description	Effectively as Cleaning Agent
1.	**Concentration-1** 25mlWater+4.81 g NaOH+100ml Glycerol	7.98	The Soap has a more green outer which is unevenly cracked. Also, the soap is very soft that it alters shapes when pressed.	Based on Cleaning stained glass wares and other stainless steel vessels, it is effective in removing stains. It also gives considerable lather which is required when cleaning oily and greasy vessel.
2.	**Concentration-2** 20mlWater+3g NaOH+100ml Glycerol	7.85	The Soap has a Smooth brown outer and is hard enough that does not alter in shape when pressed.	Based on Cleaning stained glass wares and other stainless steel vessels, it is effective in removing stains. However, it is not effective when working with greasy vessels as it produces very little lather which is insufficient.

DISCUSSION

Cost Analysis:

For production of 500ml of Soap which will be in liquid form, can be molded to solid of any shape and size as desired. The cost analysis done for 500ml of glycerin is tabulated below,

Sl.No	Particulars	Quantity	Rate	Amount (Rs)	Remarks
1.	Crude Glycerol	0.5L	Rs.40/L	20.00	Approximate rate assumed for estimation purpose
2.	Sodium Hydroxide flakes	15g	Rs.0.27/g	4.05	Quantity may vary with different concentrations.
3.	Distilled Water	0.1 L	Rs.20/L	2.00	Distilled can be obtained free of cost if distillation unit is available.
4.	Cost of energy for heating	0.02 KW/H	Rs.5/KWH	0.10	
5.	Man Power	One Person for one hour	Rs.25 per hour	25.00	Approximate rate assumed for estimation purpose
			Total (Rs)	**51.15**	

From the result, it is evident that making soap from glycerol is a viable value-added product which can be produced. By adding scent and color they can be made commercially attractive product. Also by changing the concentration of the lye solution added to the glycerol, the lathering ability of the soap can be altered as desired. This can be further investigated to find the best composition of the lye solution. Next, since the two batches of Soap made from two different compositions are made in two different days the quality of the glycerol changes. This seems to affect the texture of the soap the older glycerol seems to give better texture rather than the fresh one. To further verify this relationship experiment can be conducted by conducted by make soap of same composition on different days from the day the glycerol produced.

CONCLUSION

Glycerol to Soap is simply Chemical transformation and the soap production from glycerol can itself be small scale industry. The Soap produced from glycerol can be promoted as eco-friendly soap since the raw material for production of soap will be obtained from production of bio-diesel which is an Eco-friendly.

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