
HAPPY SUNRISE SOAP

Luxurious Lavender

Made with All Natural

Lavender Essential Oil

The *Perfect Travel Soap*
at a *Premium Quality*
and an *Unbeatable Price*

HAPPY SUNRISE SOAP

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CHE 180 – Soap Symposium

Context / Background

Presented here is our soap that we designed and produced for our CHE 180 - Design Studio course.

Our objective was to create a bar of soap to be put on display and for sale to the public.

In general, soap is produced by a process called saponification. Saponification occurs when triglycerides (fat) react with a strong base (NaOH), which is known as lye, to produce glycerol and a fatty acid (soap). The lye hydrolyses the triglyceride, which breaks apart the glycerol molecule from the fatty acids. Each type of fat has a SAP (saponification) value which is the mass of base needed to produce soap from 1 gram of the oil.

Design Criteria / Constraints

For this design, our soap was based on the use of 500 grams of oil. We had to include 5% superfat, and were given a select variety of oils and fats to use. Superfat is extra fat left over from saponification. This is to ensure all the lye fully reacts so that our soap is safe to use. It also accounts for any uncertainties in measuring our ingredients as well as discrepancies in true SAP values.

The fats available for use were: Coconut Oil, Ghee, Cricso, Avocado Oil, Olive Oil, Sesame Oil, Corn Oil, Grapeseed Oil, Sunflower Oil, and Canola Oil. Each fat has its own unique properties as soap.

The process we chose to make our soap is known as cold process. We chose cold process (as opposed to hot process, another common method) because it creates a longer lasting soap, is much more customizable, and creates a more natural bar of soap.

Ingredients

The ingredients we used in our soap are: Ghee, Olea europea (Olive oil), Cocos nucifera (Coconut Oil), Lye, Crisco, Corn Oil, Brassica napus (Canola oil), and Lavandula (Lavender Oil)

Ghee (33%) - a sacred symbol of auspiciousness in India. Claimed to be beneficial for the whole body

Olive Oil (31%) - large amounts of antioxidants and vitamins and has antibacterial properties

Coconut Oil (19%) - improves moisture content of skin and reduce symptoms of eczema

Lye – saponifies the fats to create soap, consists of NaOH solution

Crisco (10%) - great soap properties for conditioning and creamy lather. Contains soybean oil and palm oil. Also contains citric acid which is an antioxidant

Corn Oil (4%) - contains large amounts of ubiquinone, an excellent antioxidant, pleasant colour and texture

Canola Oil (2%) - light texture and rich in vitamins, reduces skin problems and aging signs such as acne, wrinkles, blemishes, spots. Moisturizes and nourishes the skin

Lavender Oil (5 mL) - herb native to northern Africa and Mediterranean. Medicinal benefits include treating anxiety, fungal infections, hair loss, and wounds, insomnia, depression, restlessness. Known for purifying the skin, antiseptic properties.

94 g Coconut Oil + 166 g Ghee + 50 g Crisco + 157 g Olive Oil + 21 g Corn Oil + 12 g Canola Oil = 500 g

Mold Selection

The mold we used to make and store our soap while it set was an unfolded small size milk carton. We chose this because it allowed to use to cut our soap into rectangular prisms at a convenient travel sized shape while minimizing waste.

Packaging

Our packaging was designed so that our soap was perfect to take anywhere, specifically travel. We used an economical and environmentally friendly paper to create the packaging and did not use any plastics.

Notable Design Decisions

Our soap design is inherently safe as well as sustainable and environmentally friendly. All of our fats and lavender are natural and beneficial for the body. Our superfat inclusion ensures that the soap is perfectly safe to use, and our packaging is environmentally friendly and recyclable.

Fat Properties

Oil	Hardness	Cleansing	Conditioning	Bubbly Lather	Creamy Lather
Coconut Oil, 76 deg	79	67	10	67	12
Ghee, any bovine	55	15	22	15	40
Crisco, new w/palm	26	0	74	0	26
Avocado Oil	22	0	70	0	22
Olive Oil	17	0	82	0	17
Sesame Oil	15	0	83	0	15
Corn Oil	14	0	84	0	14
Grapeseed Oil	12	0	88	0	12
Sunflower Oil	11	0	87	0	11
Canola Oil	6	0	91	0	6

Each value in the graph is unitless, and represents the amount that the fat contributes to the soap when saponified.

The QR code at the bottom of the poster contains a link to a database of the properties of all the fats used in making soap. We decided to use the above fats at their respective masses due to their contribution in properties to the soap.

Options and Iterations

A big decision we made in determining the ingredients of our soap was the amount of Crisco we used. Due to its low cost, our soap calculator optimized the ingredient masses by including a large amount of Crisco. We decided to limit the amount of Crisco to 10% because of its less-appealing physical properties and its smell.

	Ingredients Without Crisco Limit		Ingredients With Crisco Limit	
Oil	**Percentage**	**Quantity (g)**	**Percentage**	**Quantity (g)**
Coconut Oil, 76 deg	24%	112.6900828	19%	94.2144421
Ghee, any bovine	17%	83.24035945	33%	166.004391
Crisco, new w/palm	59%	284.4488613	10%	50
Avocado Oil	0%	0	0%	0
Olive Oil	0%	0	31%	156.880533
Sesame Oil	0%	0	0%	0
Corn Oil	0%	0	4%	20.6745918
Grapeseed Oil	0%	0	0%	0
Sunflower Oil	0%	0	0%	0
Canola Oil	0%	0	2%	12.2260401
Total	100%	500	100%	500

It is clear that the limit on Crisco creates a much more balanced soap while still maintaining its properties. The only disadvantage is the higher cost of production.

Soap Calculator: As Designed vs As Made

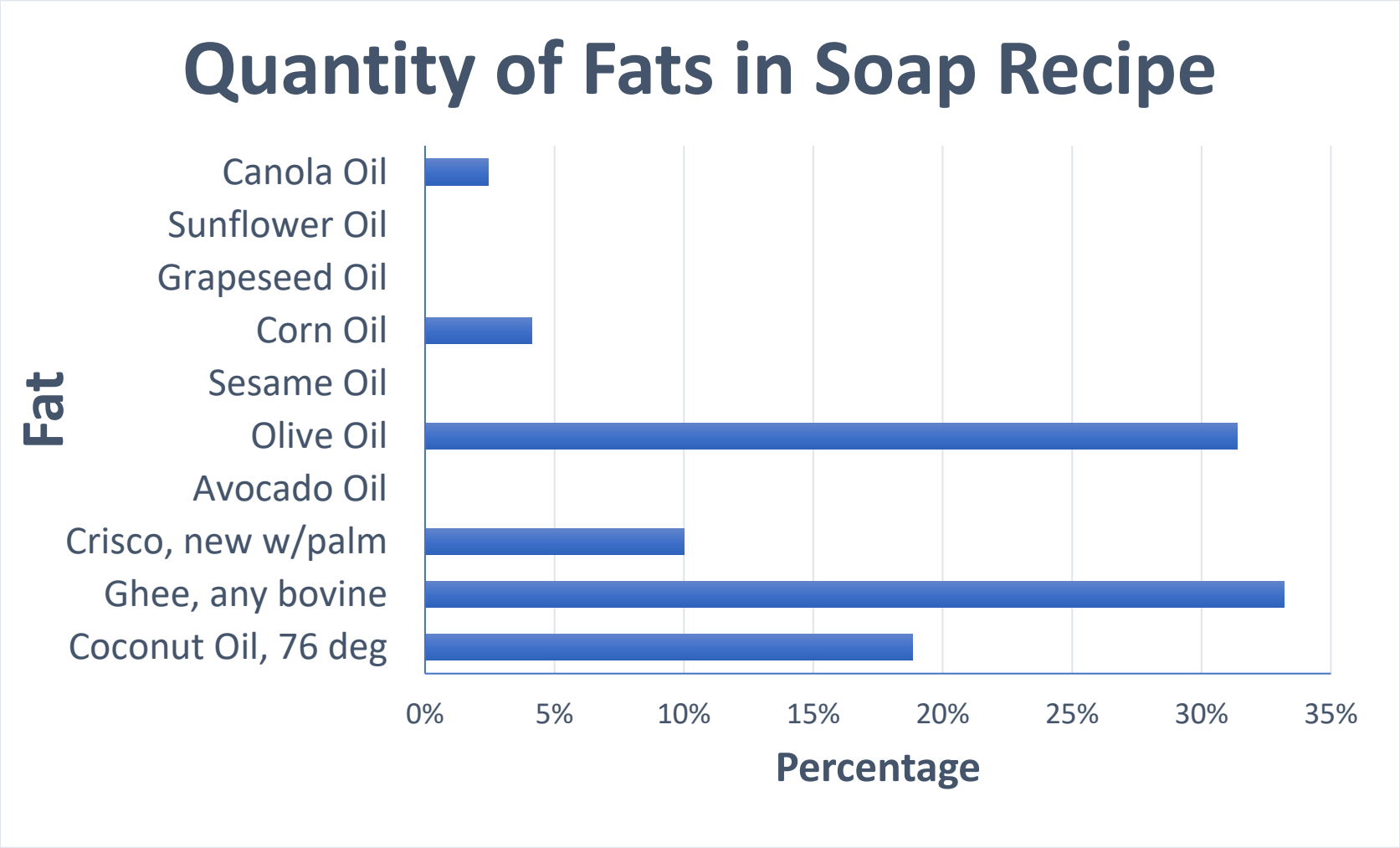
We decided to use the same values that the soap calculator gave us. Our soap calculator was optimized to get our desired property values and a low cost.

Soap Properties of Select Fats

					Oil Properties				
Oil	**SAP (NaOH)**	**SAP (KOH)**	**Hardness**	**Cleansing**	**Conditioning**	**Bubbly Lather**	**Creamy Lather**	**Cost/100 ml**	**Density**
Coconut Oil, 76 deg	0.183	0.257	79	67	10	67	12	1.63	0.92
Ghee, any bovine	0.162	0.227	55	15	22	15	40	1.67	1.01
Crisco, new w/palm	0.138	0.193	26	0	74	0	26	0.42	0.81
Avocado Oil	0.133	0.186	22	0	70	0	22	1.86	0.92
Olive Oil	0.135	0.19	17	0	82	0	17	0.6	0.92
Sesame Oil	0.134	0.188	15	0	83	0	15	1.77	0.92
Corn Oil	0.137	0.192	14	0	84	0	14	0.27	0.92
Grapeseed Oil	0.129	0.181	12	0	88	0	12	0.86	0.92
Sunflower Oil	0.135	0.189	11	0	87	0	11	0.28	0.92
Canola Oil	0.133	0.186	6	0	91	0	6	0.21	0.92

Properties of Fats Adjusted to Inclusion in Recipe

			Contribution to Overall Soap Properties					
Oil	**SAP (NaOH)**	**SAP (KOH)**	**Hardness**	**Cleansing**	**Conditioning**	**Bubbly Lather**	**Creamy Lather**	**Cost/100 ml**
Coconut Oil, 76 deg	17.2412429	24.2131116	14.88588	12.62473524	1.884288841	12.62473524	2.261146609	$ 1.67
Ghee, any bovine	26.89271139	37.6829968	18.26048	4.980131739	7.304193217	4.980131739	13.2803513	$ 2.74
Crisco, new w/palm	6.9	9.65	2.6	0	7.4	0	2.6	$ 0.26
Avocado Oil	0	0	0	0	0	0	0	$ -
Olive Oil	21.17887201	29.8073014	5.333938	0	25.72840748	0	5.333938137	$ 1.02
Sesame Oil	0	0	0	0	0	0	0	$ -
Corn Oil	2.832419083	3.96952164	0.578889	0	3.473331431	0	0.578888572	$ 0.06
Grapeseed Oil	0	0	0	0	0	0	0	$ -
Sunflower Oil	0	0	0	0	0	0	0	$ -
Canola Oil	1.626063338	2.27404346	0.146712	0	2.225139304	0	0.146712482	$ 0.03



Note: Mass of fats included in recipe were directly taken from calculated soap calculator values.

Economics

The total cost of production for our soap $13.10. We were able to create 10 travel sized bars from this soap, so each bar cost $1.31 to produce.

We are selling each bar for a convenient and friendly $2.

Our profit per bar is $0.69 or 53%

The total mass of our soap was 533 grams. Each bar weighs 53.3 grams.

The cost / gram of soap is $0.04

The cost of production / gram of soap is $0.02