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VALUE-ADDED PRODUCT OF TEA FOR HOLISTIC HEALTH AND HYGIENE

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ABSTRACT

There are numerous applications of soap and it is being used since time immemorial by almost everyone as a skin care product to maintain their personal hygiene and holistic experience. But these humble soaps have been receiving a lot of attention in the recent past due to corona virus outbreak and antiviral soaps are now being extensively used as a preventive measure by one and all against covid 19 virus.

The objective of this study was to trace the history of soap making and to make handmade tea soaps as value added products of tea using various fresh tea leaf extracts, pastes of Cambod variety of tea and other organic ingredients. Extreme care was taken during the preparation of these handmade soaps to make them fall within the recommended range. Calculation of Lye and water for preparing these soaps were done by using Soapcalc.net calculator and the soaps were tried and tested on willing volunteers and their feedbacks and ratings were recorded for statistical analysis. The soaps made of tea extracts were found to be very efficient in cleaning, softening, smoothening the skin, functioning as an antioxidant. It was also found to protect the skin from sun and refrain from dark spots as well as wrinkles. Considering the feedback response received from the users, it can be concluded that these hand-made tea soaps can be a much safer and better alternative to the chemical soaps made using many harsh chemicals and may be explored further for research and effective commercialization.

Keywords : handmade tea soaps, cold process, value-addition, holistic-health.

Introduction

Tea has always received attention as an import beverage and an export-oriented crop. But not much importance has been given to the generation and diversification of tea products especially in value added forms either as nutraceutical or confectionary items or in the form of toiletries and cosmeceuticals which are now being commercialized in different parts of the world. This paper focuses on value addition and diversification of tea products and aims to produce hand-made tea soaps for hygiene and holistic health. Adding tea leaves to a soap bar or liquid adds healthy and helpful ingredients. These ingredients stave off bacteria and germs and give the soap a bit more of a boost in germ fighting. Further, the soaps being hand-made is purely organic and is very safe for skin and

contains many beneficial ingredients. Polyphenols, catechins, flavonoids and antioxidant present in tea help to block damage to skin, curb premature aging, help prevent skin infections, protect the skin, balance sebum and decrease signs of aging such as hyper-pigmentation and fine lines. The tannins and caffeine in the tea reduce blood vessels that then reduce the puffiness. The soaps so prepared are not only good for maintaining holistic health and hygiene but can also gain consumer acceptance worldwide and may help the ailing tea industries to overcome many challenges globally faced by tea industries today.

Tea [*Camellia sinensis* (L.) Kuntze] is the mostly widely consumed drink after water and has a vital role in growing economy of all tea producing countries. Due to steady production of tea, the world market price

of processed tea has kind of stagnated with supplies being stable and escalating production costs with decreasing returns for the tea growers (De. *et al.*, 2019). The industry has been further crippled by the launch of various health drinks, beverages with varied flavours, taste and health benefits so as to satisfy the versatile health promoting and organoleptic demands of the 21st century consumer market (Vattem and Maitin, 2016). Therefore, the tea industry has now become compelled to look for alternatives for income generation and product diversification in the form of value-added products seems to be the only promising alternative. Considering this backdrop, a sincere attempt was made in the present study to prepare handmade tea soaps for personal hygiene and holistic experience of consumers using the standard protocols. Soaps were chosen as value added products of tea as a lot of other products like flavoured tea, cold tea, tea cola and various other medicinal herbs infused tea have already flooded the market. Not much research work except some with green tea has been done for producing Tea soaps. The authors believe that this kind of diversification from bulk tea exportation to value added tea products with well-defined marketing strategies will go a long way in helping to face the stiff

competitive challenges in the world market (Watchira *et al.*, 2016). Further, these hand-made soaps with different oils, calming scents with skin friendly ingredients will take the cleaning and bathing experience of consumers to an altogether different level of holistic experience.

History of soap making

Soap is being used as a cleaning agent since ancient era. But there are no archeological treasures that can be studied to chart its history (Konkol and Rasmussen, 2015). The earliest evidence of the production of Soap-like materials dates back to around 2800 BC in ancient Babylon (Chapter IV Profile of soap industry). Soap was actually used for laundering purposes for centuries and it was still not used for personal hygiene until the Civil War. The soap industry, thereafter, split into separate worlds soap for hygiene and detergents for laundry (History of soap making, 2029). In modern times soap is being used as an agent for cleansing, preventing disease and feeling refreshed. Soap is being accepted during Covid pandemic as one of the effective agents to destroy Coronavirus. The evolution of soap making procedures since ancient period are given in the Table 1.

Table 1: Evolution of Soap making procedure

Time period	Evolution of Soap making procedures	References
2500 BC	Sumerians heated a mixture of oil and wood ash	(Jurgen, 2012)
1500 BC	Egyptians combined animal fats or vegetable oils with a soda ash substance called Trona	(Levey, 1958)
556-539 BC	Nabonidus mixed uhulu [ashes], cypress [oil] and sesame [seed oil]	(Dafni, 2019)
175 -150 BC	Citizens of Athens and Rome rub oil over their bodies before scraping it off with pumice stones or metal scrapers. The Gauls and Germans combine ashes with animal fats and rub it in their hair	(Amanda, 2019)
2 nd Century	Greek physician, Galen, recommends soap for both medicinal and cleansing purposes.	(Partington and Hall, 1999)
3 rd Century	Arabians made liquid and solid soaps using a combination of vegetable and aromatic oils. They made soap by mixing sesame oil with a potash, alkali and some lime before boiling the concoction, and pouring it into moulds.	(Alchemy, Islam)
5 th to 14 th Century	Guild soap makers used vegetable and animal oils with plant ashes and perfumes to create body soaps, shampoos, and laundry detergent. Europeans started to use soap for personal hygiene	(Joshi, 2017)
15 th to 19 th Century	Delicate washing ball was prepared by Sir Hugh Plat, included Orace, Cypres, Calamus Aromatics, Rose leaves and Lavender. Castle soaps made in Europe during 1700 century. The main ingredient of castle soap was olive oil. The world's first transparent soap was produced in London by Andrew Pears. Nicholas Le Blanc, discovered the production of caustic soda (Na_2CO_3) from table salt (NaCl). Later on, a new method of soap making was developed. In this new method, soaps were made through the reactions of natural fats and oils with caustic soda. Liquid soap was invented in 1900 century.	Liquid soap-MEL Chemistry (2014); Alchemy (Islam), Thomas (2020)
20 th to 21 st Century	Synthetic detergent soaps were introduced in the early stage of the era. Technological advancement made the vegetable oil widely available for production of bathing soaps by using different types of vegetable oils instead of animal's fat. But commercially	Jaquith (2018)

soaps were manufactured with heavy chemical loads to create foam and bubble in the soap which is harmful for skin. Natural soap exclusively made by small batch producers like homemade soap makers. The habitual hand washing was proved as one of the ways to decline infectious disease in the early 20 th century as well as in 21 st century during Covid -19 pandemic.	
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Soap for hygiene and holistic health

Holistic approaches to health are derived from ancient healing traditions that help to achieve higher levels of wellness and prevent diseases [Institute of Holistic Health Studies]. Preventing diseases, especially infectious diseases and contagious viral diseases including corona virus are the greatest concern for all around the world. The spread of infectious agents by contaminated hands was realized since the 19th century (Hand Hygiene in Healthcare Setting-CDC, 2019). It was proved that the hygiene agents play a crucial role in disrupting the chain of infections due to pathogens and proper hand hygiene was proven to be an effective way to prevent infections (Ijaz *et al.*, 2021). World Health Organization recommended that

hand washing with soap is the most cost-effective way to prevent and protect infectious diseases including severe acute respiratory syndrome causing coronavirus 2 (SARS-CoV-2) infections (Chaudhary *et al.*, 2021). Soap water forms tiny molecules, called micelles and has important orthogonal mechanisms of action relevant to decontamination of hands (Ijaz *et al.*, 2021). Pathogens including coronavirus may be associated with dirt or organic or inorganic load, known as soil load. The hydrophilic part of the soap micelles dissolve dirt or soil load and the hydrophobic part of the soap micelles dissolve the non-polar part of the soil load and the lipid-enveloped virus (Chirani *et al.*, 2021) and help in eradication of viral load.

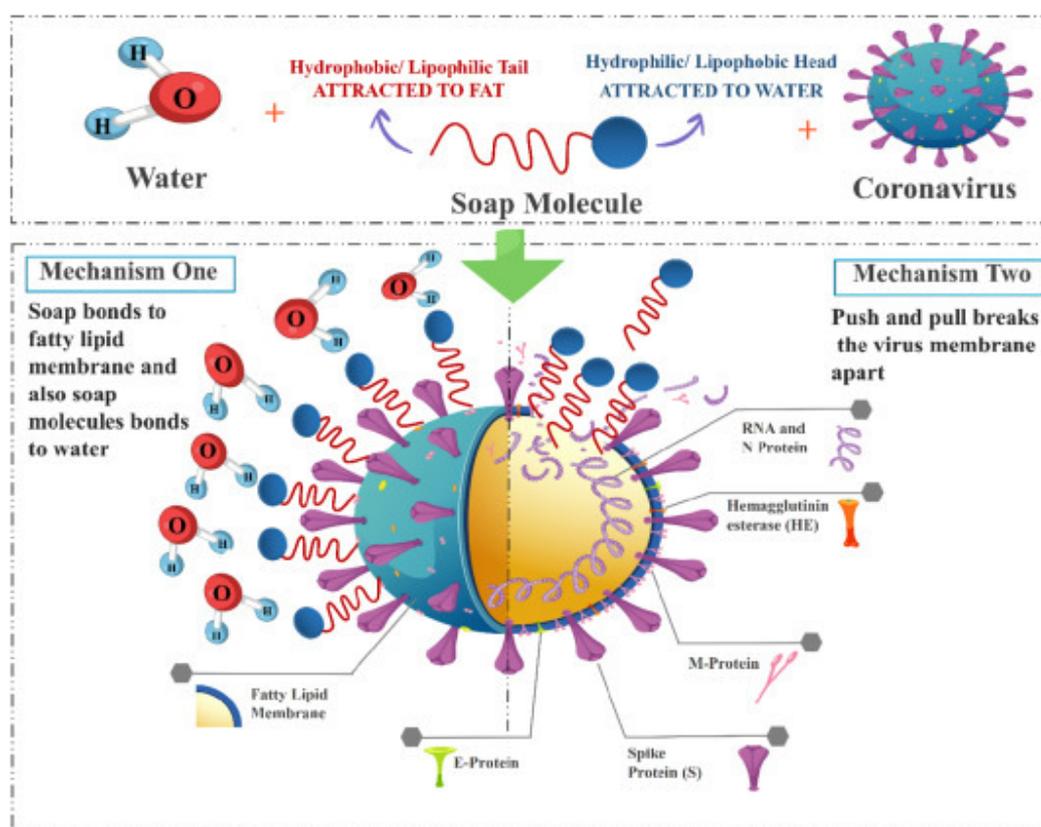


Fig. 1 : Soap mechanism for elimination of Coronavirus (source- Chirani *et al.* 2021)

Although, soaps are the most cost-effective health action to be undertaken to reduce disease, using non-biodegradable chemicals and antimicrobial components in soap and detergent products, such as triclosan (TCS) and sodium lauryl sulphate (SLS)

triclocarban (TCC), fragrances, and preservatives cause severe health concerns for humans and the ecosystem (Chirani *et al.*, 2021). Instead of synthetic fatty acids and artificial fragrance, soaps made with biodegradable vegetable oils like olive oil, palm oils, coconut oil,

sunflower oil, soyabean oil, castor oil, safflower oil and organic fragrance like citronella are the best options not only for environmental well-being but also for holistic health and hygiene which have been strictly followed in the present work undertaken.

Materials and Methods

Plant Material

Leaves of TV26 clone of *Camellia sinensis* (L.) Kuntze belongs to the family Theaceae, were collected from organic tea garden of University of North Bengal.

TV26 clone is the progeny of 521-Aya DA/6 of Cambod/1982 origin with average quality and high yield (Memorandum No.31, Monograph of TV clones By T. S. Barman, 2012, Tea Research Association, Tocklai Experimental Station, Jorhat, Assam).

In soap making, equipments made with glass, plastic, stainless steel, or utensils made up of stones were used. Other materials are considered not suitable for soap making as the lye mixture will react with them (iron, zinc, copper, aluminum etc.). Soaps were made by following the cold process of soap preparation in a

good ventilated area which ensured good passing of air during soap making. While making soaps, care was taken to see that all the materials were ready and arranged to ensure good timing and a fine batch of soaps.

Various materials used during the soap making process as Apparels and Accessories Mask, Long-sleeved dress, Pants, Shoes, Rubber gloves, Safety goggles, old towels, Tissue paper, Table cloth, Newspaper, Fine cotton cloths were used. Silicon spatula, large mixing bowl, Stainless steel spatula for measuring NaOH, measuring cylinder or beaker, Glass rods, Petri dish, Silicon moulds, Stainer, Stainless steel or plastic spoon, Plastic tray, Plastic tray, Hand blender, Infra-red thermometer, Multi cooker, Miscellaneous (bowls, spoons, peeler, plastic container), pH Strips and Electronic balance were used as apparatus. NaOH, Distilled water, Fragrance (Citronella), Olive oil, Coconut oil, Safflower oil Palm oil, Castor oil, Sunflower oil and Soyabean oil were used to make these soaps.



Fig. 2 : Materials used in soap making

Basic Ingredients Used

NaOH and KOH generally called as Lye, Oils and Fats, distilled water, Fragrances are basic ingredients of soap making and were used in this study. NaOH is normally used to make solid soap bars while KOH is used to make liquid soaps. It is a process called Saponification, where triglycerides combine with a strong base to form fatty acids metal salts. The distributions of unsaturated and saturated fatty acid

determine the hardness, aroma cleansing power, lather and moisturizing ability of soaps (Vidal *et al.*, 2018). Different oils of desired choice were used to get a fine bar of soaps.

Lye and Distilled water

Lye generally known as NaOH or Sodium hydroxide, potash or caustic soda is the main ingredient of soap making. Earlier, people used to

extract it from wood ashes but now it is available in stores and this type of commercially available form was used in the present study. Fats and oils are esters of fatty acids and NaOH hydrolyzes them to become soaps and the process is known as saponification. NaOH was dissolved in distilled water and lye solution was prepared for this process.

Fats and Oils

Oils and fats are very important materials in soap making. The oils and fats normally used in soap making can be animal or vegetable fats. Different oils

can be used for soap making but some oils are considered excellent for making good soaps, like olive oil, Avocado oil, Almond oil, Babassu oil, Canola oil, Castor oil, Coconut oil, Corn oil, Cotton seed oil, Emu oil, Grape seed oil, Hazelnut oil, Hemp oil, Jojoba oil etc. Vegetable oils are considered to be more suitable than animal fat. These experiments have been done using olive oil, coconut oil, sunflower oil, Safflower oil, palm oil, soyabean oil and castor oil. Regarding the oils and their benefits in soap bar making, a table below has been provided indicating the kinds of qualities each oil can add to the soap bars.

Table 2 : Oils used for Soap making

Oils	Benefit
Olive oil	It makes hard, long-Lasting soap with a gentle cleansing lather, suitable for all skin types including sensitive skins. High in oleic acid which makes the soap soft and conditioning for all skin types (Mc Bryde, 2021).
Coconut oil	It is a cleanser, an effective skin moisturizer that is easily absorbed into skin. It makes the soap moisturizing, enhance soap lather, reduces inflammation. Coconut oil soaps are also antibacterial, antifungal, antiviral, prevent eczema, acne and promotes skin-healing (Coconut oil for soap making 2021).
Sunflower oil	It is rich in essential fatty acids and vitamin E, adds higher conditioning properties, small bits of hardness and creamy lather to soap bars. It gives silky feeling to the soap bars (Cold Process Soap Recipe with Sunflower Oil, 2019).
Palm oil	It makes a hard bar with a rich creamy lather, when combined with other oils it adds longevity to the soap bars (Qualities of Soap Making Oils, 2018).
Soyabean oil	It is mild, moisturizing and gives a low, creamy lather (Qualities of soap making oils, The Spruce Crafts). Absorbs easily into skin and provides conditioning to bars (Soybean Oil for Soap Making, 2021).
Castor oil	It gives a stable lather that is low, dense and creamy. Very little can make wonders in soap bars. Gives moisturizing quality and easily absorbed by the skin (Fisher, 2019).
Safflower oil	It is high in Linoleic Acid which controls the level of Keratin protein in skin. Heals skin, keep skin young and elastic (Benefits of Safflower Oil, 2016).



Fig. 3 : Basic Ingredients (a) Lye and Distilled water (b) Fats and Oils

Methodology used

Different kinds of processes were used in the present study to make five different varieties of tea soaps using different ingredients. The experiment of making tea soaps were based on following processes:

Cold process soaps

Tea soap (Fresh tea leaf extract)

The process depicted in the given flow chart was followed for making the soap:

Washed and cleaned fresh tea leaves grinded → tea leaf extract was collected in a petri dish by using muslin cloth → Oil (olive oil, coconut oil, palm oil and safflower oil and castor oil) were measured by using an electronic balance and lye solution prepared in chilled distilled water, temperature of the solution increased to 170°F → after some time when temperature decreased to 110°F, lye solution was added slowly with oils and continuously stirred with a silicon spatula for 8-10 minutes → tea leaf extract added with oil and lye mixture → Blended with a hand blender → Fragrance

(citronella 8-10 drops) added with it → Blended for a minute and Poured in moulds → Kept covered with a towel for 24 hours → Next day the batch was ready → Edges were cut to look better → Finally soaps were kept to be cured for 3-4 weeks.

Ingredients and the quality of soap were determined by using lye calculator (Soapcalc.net). Measurements of ingredients, used in the soap and quality of the soap are given below in Table 3 and figure 4 respectively.

Table 3 : Calculation of Lye and water by using Soapcalc.net calculator

Total oil weight	1000 g	Sat : Unsat Ratio	42 : 58
Water as percent of oil weight	38.00 %	Iodine	62
Super Fat/Discount	0 %	INS	156
Lye Concentration	26.655 %	Fragrance Ratio	0
Water : Lye Ratio	2.4898:1	Fragrance Weight	0.00 g
		Pounds	Ounces
Water		0.838	13.40
Lye - NaOH		0.336	5.38
Oils		2.205	35.27
Fragrance		0.000	0.00
Soap weight before CP cure or HP cook		3.379	54.06
		Pounds	Ounces
#	✓	Oil/Fat	%
1	<input type="checkbox"/>	Castor Oil	5.00
2	<input type="checkbox"/>	Coconut Oil, 76 deg	35.00
3	<input type="checkbox"/>	Olive Oil	40.00
4	<input type="checkbox"/>	Safflower Oil	10.00
5	<input type="checkbox"/>	Palm Oil	10.00
		Totals	100.00
		Pounds	Ounces
		2.205	35.27
		Grams	1,000.00
Soap Bar Quality	Range	Your Recipe	
Hardness	29 - 54	40	Lauric
Cleansing	12 - 22	24	Myristic
Conditioning	44 - 69	55	Palmitic
Bubbly	14 - 46	28	Stearic
Creamy	16 - 48	21	Ricinoleic
Iodine	41 - 70	62	Oleic
INS	136 - 165	156	Linoleic
			Linolenic
			17
			7
			14
			3
			5
			36
			14
			0
Additives		Notes	

Source: Soapcalc.net calculator

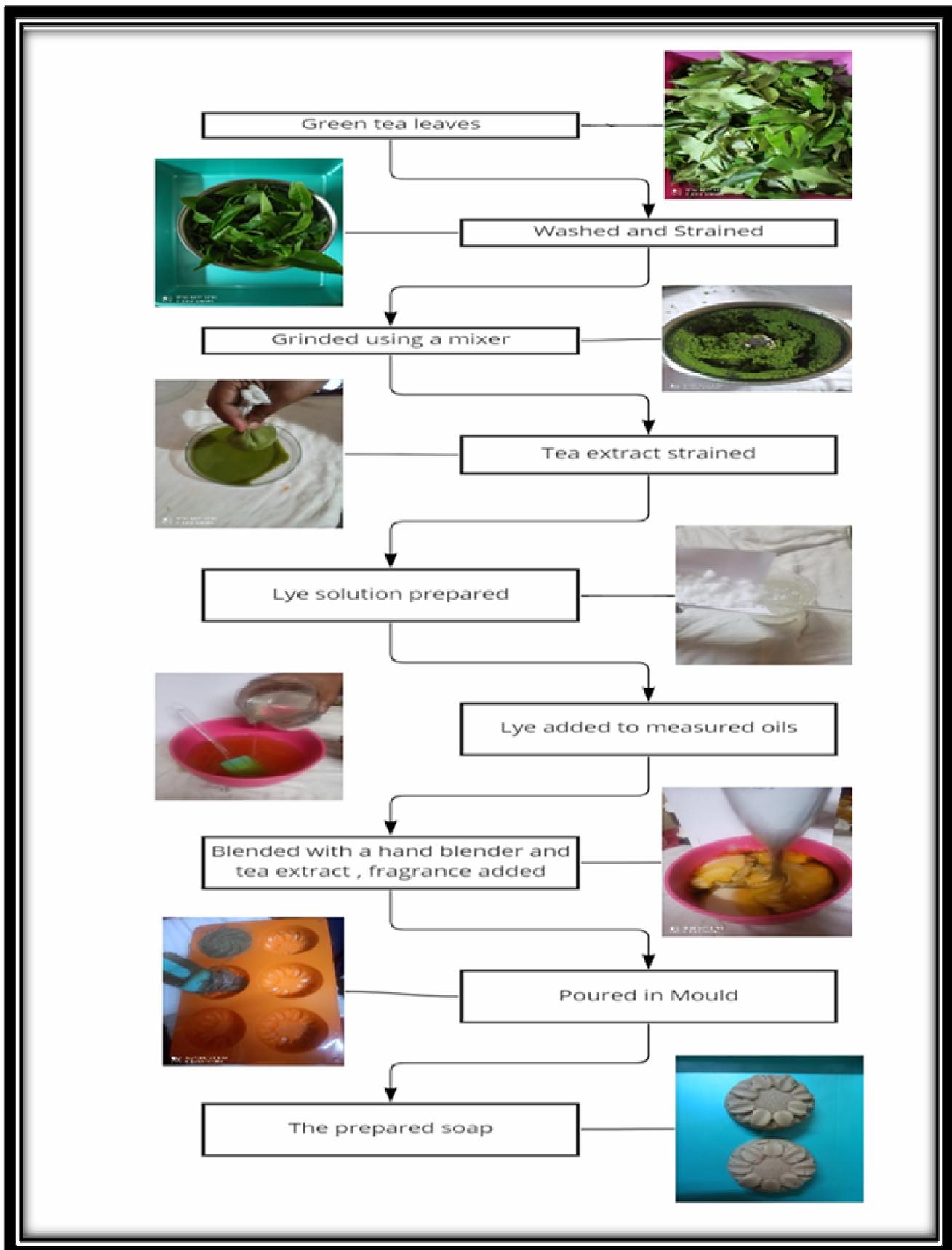


Fig. 4 : Cold processed Tea soap making using fresh tea leaf extract

Tea soap (leaf paste boiled distilled water)

Ground, washed and cleaned fresh tea leaves → 5 table spoon of fresh tea paste boiled in distilled water for 10 minutes → Oil (olive oil, coconut oil, palm oil and sunflower oil) measured by using an electronic balance → Lye solution prepared in chilled distilled water (tea paste boiled water) and temperature increased to 160°F → when temperature decreased to 110° F, lye solution added slowly with oils and continuously stirred with a silicon spatula for 8-10 minutes → Blended with a hand blender for 7-10

minutes → Fragrance (citronella 6 drops) added with it → Blended for a minute → Poured in moulds → Kept covered with a towel for 24 hours → Next day the batch was ready → Edges were cut to look better → Finally soaps were kept for curing for 3-4 weeks.

Ingredients and the quality of soap were determined by using lye calculator (Soapcalc.net). Measurements of ingredients, used in the soap and quality of the soap are given below in Table 4 and figure 5 respectively.

Table 4 : Calculation of Lye and water by using Soapcalc.net calculator

Total oil weight	500 g	Sat : Unsat Ratio	42 : 58
Water as percent of oil weight	38.00 %	Iodine	67
Super Fat/Discount	0 %	INS	146
Lye Concentration	28.211 %	Fragrance Ratio	0
Water : Lye Ratio	2.5447:1	Fragrance Weight	0.00 g
		Pounds	Ounces
Water		0.419	6.70
Lye - NaOH		0.165	2.63
Oils		1.102	17.64
Fragrance		0.000	0.00
Soap weight before CP cure or HP cook		1.686	26.97
		Pounds	Ounces
#	✓	Oil/Fat	%
1	<input type="checkbox"/>	Coconut Oil, 76 deg	25.70
2	<input type="checkbox"/>	Olive Oil	25.70
3	<input type="checkbox"/>	Palm Oil	27.00
4	<input type="checkbox"/>	Sunflower Oil	21.60
		Totals	100.00
		Pounds	Ounces
		1.102	17.64
		Grams	Grams
		128.50	128.50
		128.50	128.50
		135.00	135.00
		108.00	108.00
		500.00	500.00
Soap Bar Quality	Range	Your Recipe	Lauric
Hardness	29 - 54	41	12
Cleansing	12 - 22	17	Myristic
Conditioning	44 - 69	56	5
Bubbly	14 - 46	17	Palmitic
Creamy	16 - 48	23	19
Iodine	41 - 70	67	Stearic
INS	136 - 165	146	4
			Ricinoleic
			0
			Oleic
			34
			Linoleic
			21
			Linolenic
			0
Additives		Notes	

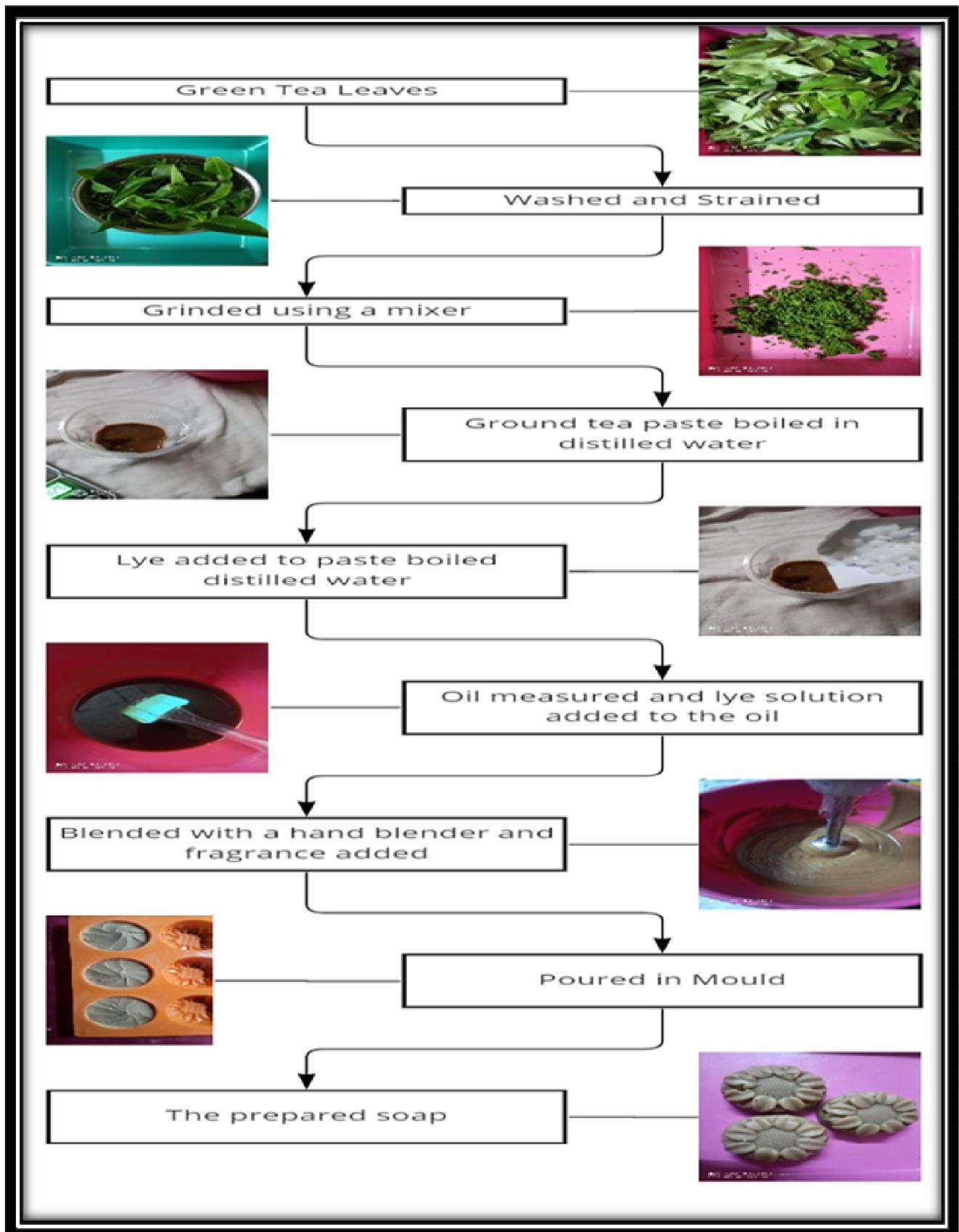


Fig. 5 : Cold processed Tea soap making with fresh tea leaf paste boiled distilled water

Tea soap (Fresh tea leaf paste boiled coconut oil):

Washed and cleaned fresh tea leaves ground → 3 table spoons of tea paste boiled in coconut oil using double boiling process for 30 minutes → kept at room temperature for some time after removing it from multi cooker → Strained with muslin cloth → Oil (tea boiled coconut oil, palm oil and sunflower oil and soyabean oil) measured by using an electronic balance → Lye solution prepared in chilled distilled water and temperature increased to 160°F → when temperature decreased to 110°F, lye solution added slowly with oils and continuously stirred with a silicon spatula for 8-10

minutes → Blended with a hand blender for 10 minutes → Fragrance (citronella 6-8 drops) added with it → Blended for a minute and Poured in moulds → Kept covered with a towel for 24 hours → Next day the batch was ready → Edges were cut for a better look → Finally soaps were kept to be cured for three weeks.

Ingredients and the quality of soap were determined by using lye calculator (Soapcalc.net). Measurements of ingredients, used in the soap and quality of the soap are given below in Table 5 and Figure 6 respectively.

Table 5 : Calculation of Lye and water by using Soapcalc.net calculator

Total oil weight	500 g	Sat : Unsat Ratio	47 : 53			
Water as percent of oil weight	38.00 %	Iodine	69			
Super Fat/Discount	0 %	INS	150			
Lye Concentration	28.661 %	Fragrance Ratio	0			
Water : Lye Ratio	2.4890:1	Fragrance Weight	0.00 g			
		Pounds	Ounces			
Water		0.419	6.70			
Lye - NaOH		0.168	2.69			
Oils		1.102	17.64			
Fragrance		0.000	0.00			
Soap weight before CP cure or HP cook		1.689	27.03			
		Grams				
			190.00			
			76.34			
			500.00			
			0.00			
			766.34			
#	✓	Oil/Fat	%	Pounds	Ounces	Grams
1	<input type="checkbox"/>	Coconut Oil, 76 deg	32.00	0.353	5.64	160.00
2	<input type="checkbox"/>	Palm Oil	30.00	0.331	5.29	150.00
3	<input type="checkbox"/>	Sunflower Oil	20.00	0.220	3.53	100.00
4	<input type="checkbox"/>	Soybean Oil	18.00	0.198	3.17	90.00
		Totals	100.00	1.102	17.64	500.00
Soap Bar Quality		Range	Your Recipe	Lauric		15
Hardness		29 - 54	45	Myristic		6
Cleansing		12 - 22	22	Palmitic		19
Conditioning		44 - 69	50	Stearic		4
Bubbly		14 - 46	22	Ricinoleic		0
Creamy		16 - 48	24	Oleic		22
Iodine		41 - 70	69	Linoleic		27
INS		136 - 165	150	Linolenic		2
Additives				Notes		

Source: Soapcalc.net calculator

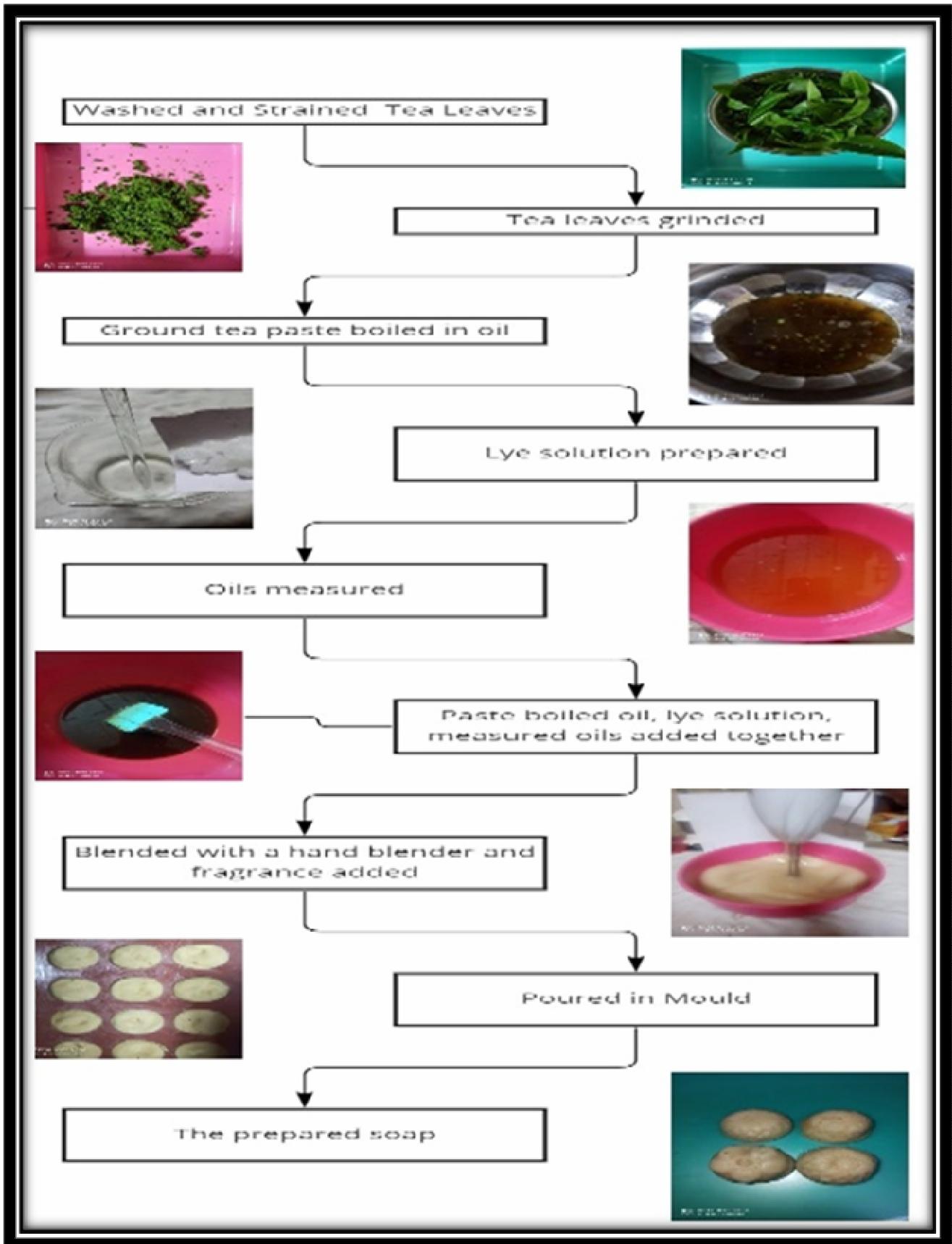


Fig. 6 : Cold processed Tea soap making with fresh tea leaf paste boiled coconut oil

Tea soap (Orthodox black tea from Makaibari Tea Estate)

Black tea leaves (collected from Makaibari Tea Estate) ground → Oil (coconut oil, palm oil and sunflower oil) measured by using an electronic balance → Lye solution prepared in chilled distilled water and temperature increased to 170⁰F → when temperature decreased to 110⁰ F, lye solution added slowly with oils and continuously stirred with a silicon spatula for 8-10 minutes → Blended with a hand blender for 15 minutes → 28gm Black tea dust added

→ Blended with a hand blender for 5 minutes → Fragrance (citronella 10 drops) added with it → Blended for a minute and Poured in moulds → Kept covered with a towel for 48 hours → After two days the batch was ready → Edges were cut for a good look → Finally soaps were kept to be cured for three to four weeks.

Ingredients and the quality of soap were determined by using lye calculator (Soapcalc.net). Measurements of ingredients, used in the soap and quality of the soap are given below in Table 6 and Figure 7 respectively.

Table 6 : Calculation of Lye and water by using Soapcalc.net calculator

Total oil weight	500 g	Sat : Unsat Ratio	49 : 51			
Water as percent of oil weight	38.00 %	Iodine	64			
Super Fat/Discount	0 %	INS	154			
Lye Concentration	28.592 %	Fragrance Ratio	0			
Water : Lye Ratio	2.4974:1	Fragrance Weight	0.00 g			
		Pounds	Ounces			
Water		0.419	6.70			
Lye - NaOH		0.168	2.68			
Oils		1.102	17.64			
Fragrance		0.000	0.00			
Soap weight before CP cure or HP cook		1.689	27.02			
#	✓	Oil/Fat	%	Pounds	Ounces	Grams
1	<input type="checkbox"/>	Sunflower Oil	30.00	0.331	5.29	150.00
2	<input type="checkbox"/>	Palm Oil	40.00	0.441	7.05	200.00
3	<input type="checkbox"/>	Coconut Oil, 76 deg	30.00	0.331	5.29	150.00
		Totals	100.00	1.102	17.64	500.00
Soap Bar Quality		Range	Your Recipe	Lauric	14	
Hardness		29 - 54	47	Myristic	6	
Cleansing		12 - 22	21	Palmitic	22	
Conditioning		44 - 69	49	Stearic	4	
Bubbly		14 - 46	21	Ricinoleic	0	
Creamy		16 - 48	27	Oleic	23	
Iodine		41 - 70	64	Linoleic	26	
INS		136 - 165	154	Linolenic	0	
Additives			Notes			

Source Soapcalc.net calculator

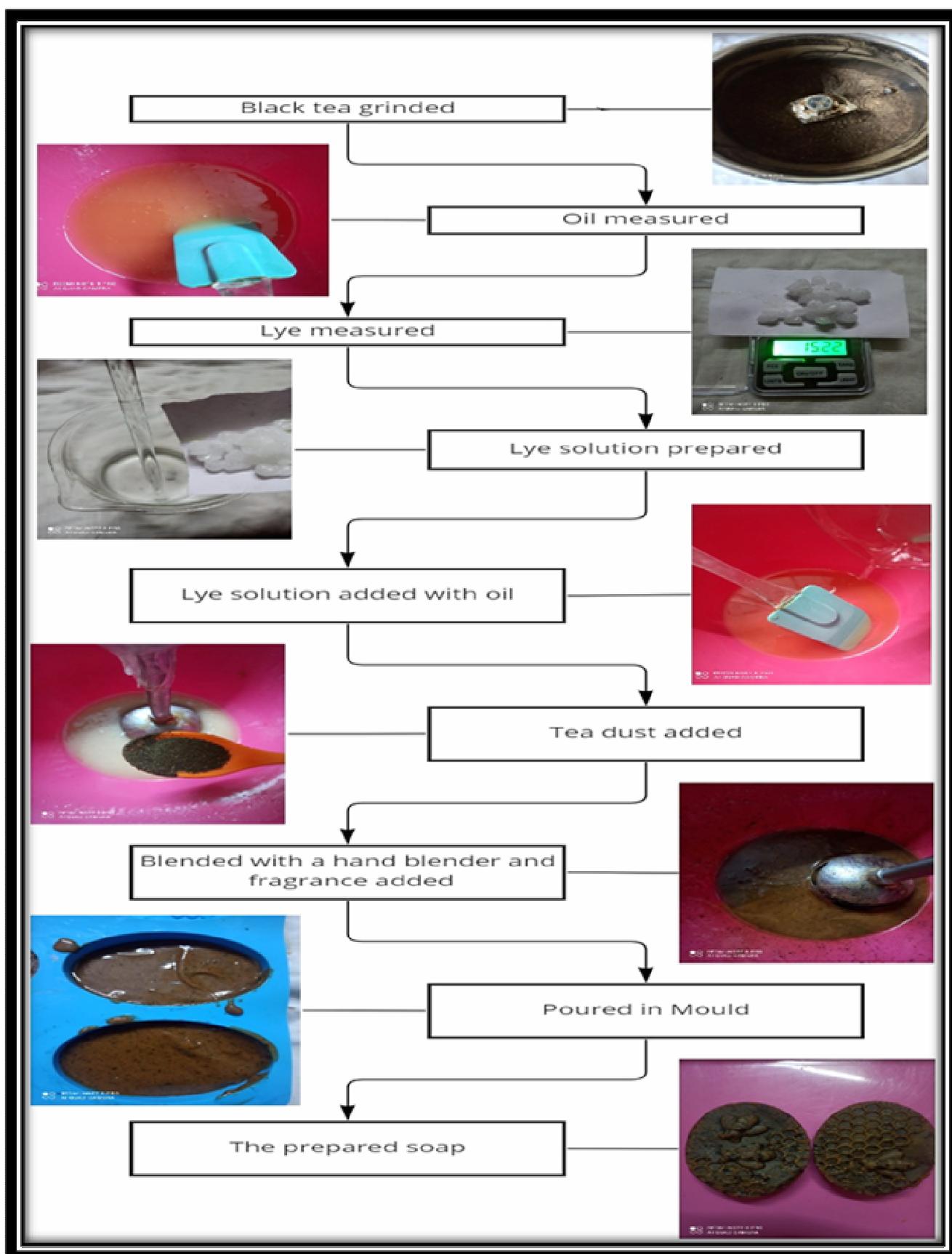


Fig. 7 : Cold processed Tea soap making using black orthodox tea

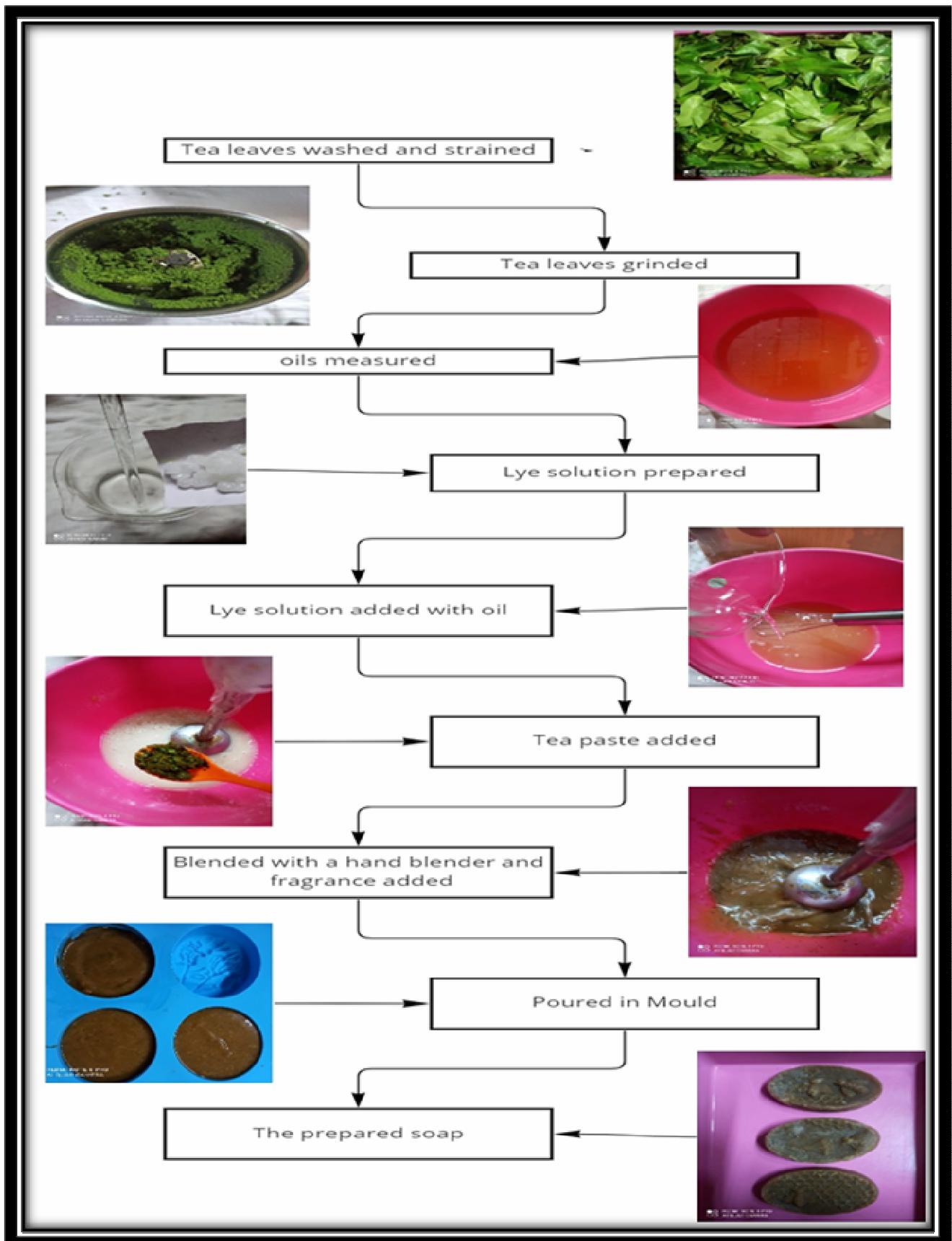


Fig. 8 : Cold processed Tea soap making using fresh tea leaf paste

Result and Discussions

These experiments were done mainly to make tea soaps as value added product of tea because tea is a good ingredient for skin nourishment. Cambod variety was exclusively chosen for this study as it is easily available. Black tea consists of high antioxidants which can reduce cellular damage and can delay skin's ageing. It can also replenish skin damage when splashed on skin (Mukherjee, 2016; Rana, 2020; Jomol, 2021). It is believed to have anti-inflammatory property too. Catechins and flavonoids that are present in black tea can protect skin from UV-B induced skin damage and further the high caffeine content in black tea can bring firmness to the skin, fade blemishes, reduce pigmentation, inflammation etc. (Rana, 2020; Jomol, 2021). Vitamin A and E present in Assam tea nourishes skin and keeps skin glowing without any cosmetic treatment (The Chayi, 2020). It is also an astringent which removes excess oil from skin and can have anti-bacterial benefits.

Camellia sinensis var. *assamica* extract, preparation method and application in cosmetics by Kunming Institute of Botany of CAS disclosed their invention on cosmetic additives adopting *Camellia sinensis* var. *assamica* extract for realizing skin whitening, moisturizing and antioxidant activity (Lixin *et al.*, 2015).

Antioxidant and moisturizing effect of *Camellia assamica* seed oil and its development into microemulsion in 2018 was studied by Chaiyana *et al.* They investigated the fatty acid content, antioxidant and moisturizing effect of *Camellia assamica* seed oil and corroborated the findings of earlier workers and supported its potential to be used as a cosmeceutical (Chaiyana *et al.*, 2018).

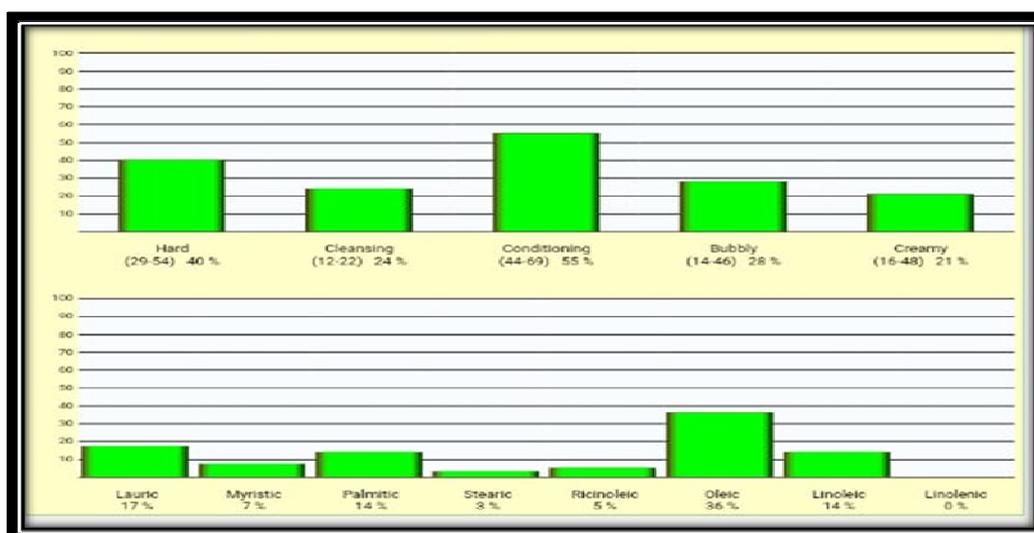
Becker *et al.* in 2019 made research on 'Safety assessment of *Camelia sinensis* derived ingredients used in cosmetics. According to them cosmetic ingredient which are being used derived from *Camelia sinensis* plant parts works as antioxidants and skin conditioning agents humectant and miscellaneous. They have provided tables of parts which can be used in making cosmetics and provided every kind of information regarding the safe, usable amount of tea in different products (Becker *et al.*, 2019).

Koch *et al.* (2019) studied applications of *Camellia sinensis* and its active constituents in cosmetics and gave a detailed report on the properties of the tea plant, its extracts and preparations in cosmetology for skin care products and for the treatment of selected dermatological diseases (Koch *et al.*, 2019).

Filippini *et al.* (2020) reported that the Green tea has the potential to prevent cancer. They reported that *C. sinensis* contains polyphenols, one subgroup being catechins which are powerful antioxidants and laboratory studies have suggested that these compounds may inhibit cancer cell proliferation. Some experimental and nonexperimental epidemiological studies have suggested that green tea may have cancer preventative effects (Filippini *et al.*, 2020).

Qualitative analysis of experimental soaps

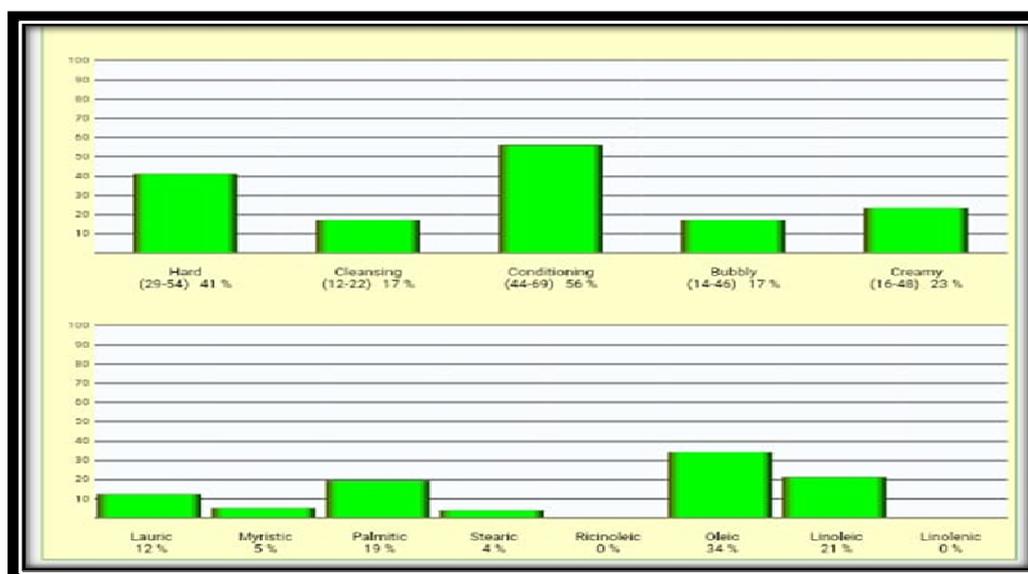
The list of graphs so obtained from Soap calp.net regarding the quality of each kind of bar of soaps gave us a clear idea regarding the soaps that we have prepared. The oils determined the number of fatty acids in each of the soap. The distributions of unsaturated and saturated fatty acid determine the hardness, aroma, cleansing, lather and moisturizing properties of soaps (Vidal *et al.*, 2018).



Bar graph 1 : Parameters of Tea soap quality (Tea leaf extract)

The bar graph no-1 illustrates the properties of this soap, hardness 40% (Recommended level (29-54%)), cleansing 24% (Recommended level 12-22%), conditioning 55% (Recommended level 44-69%), Bubbly 28% (Recommended level 14-46%), creamy 21% (Recommended level 16-48%). The graph shows the result of fatty acids too, Lauric 17%,

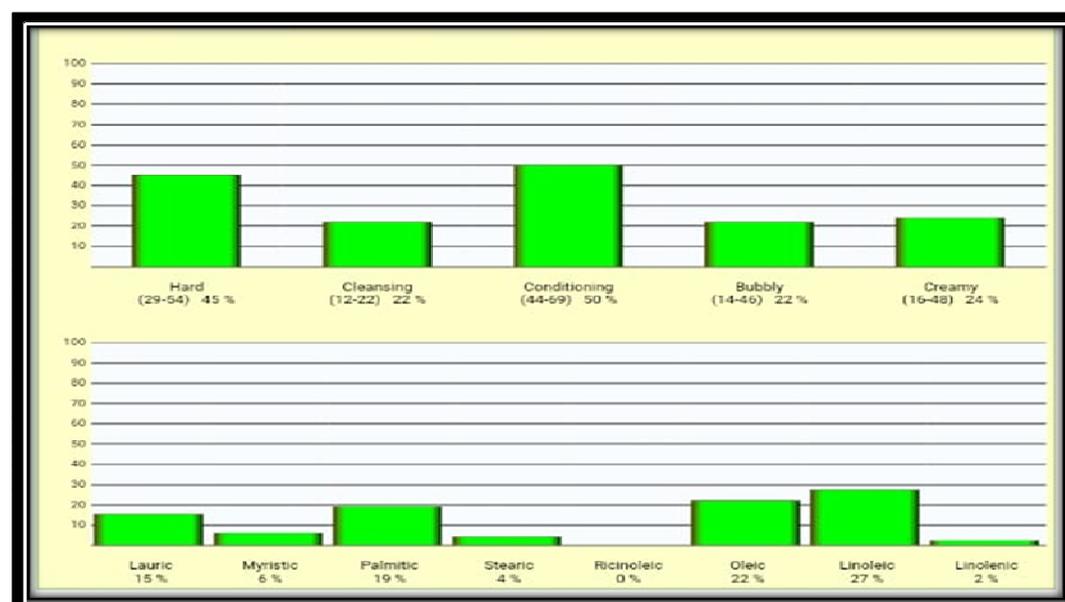
Mystic 7%, palmitic 14%, stearic 8%, Ricinoleic 5%, oleic 36%, Linoleic 14%, Linolenic 0%. All the properties are within recommended level but cleansing property is a little higher which is not in excessive limit and this will not cause any harm to the user or reduce the soap quality.



Bar graph 2 : Parameters of Tea soap quality (Fresh Tea leaf paste boiled water)

The bar graph no -2 illustrates the properties of tea soap (fresh tea leaf paste boiled water) which shows a hardness of 41% (Recommended level 29-54%), cleansing 17% (Recommended level 12-22%), conditioning 56% (Recommended level 44-69%), Bubbly 17% (Recommended level 14-46%), creamy

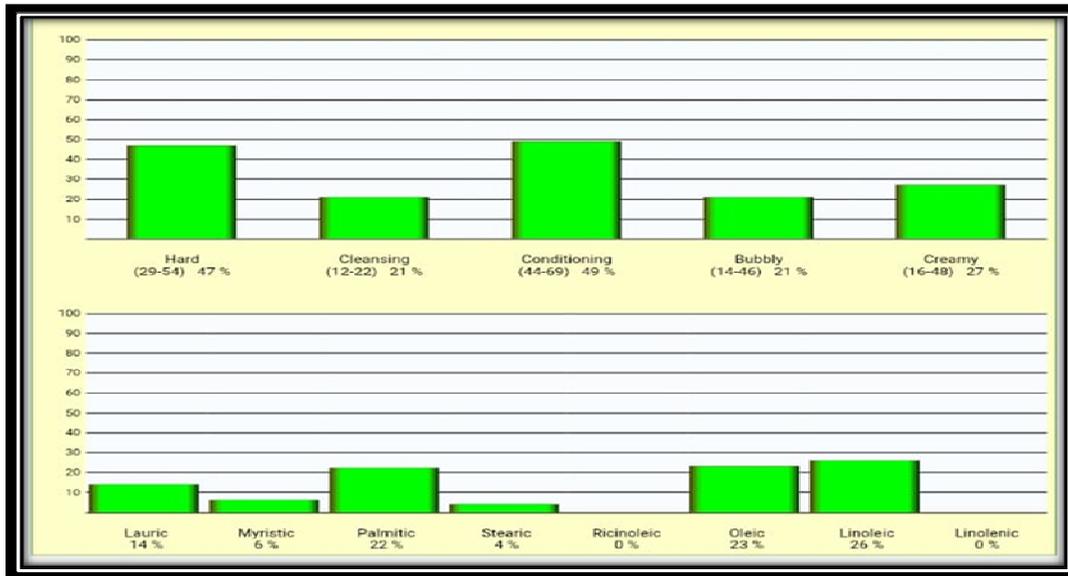
23% (Recommended level 16-48%). The graph shows the result of fatty acids too, Lauric 12%, Mystic 5%, palmitic 19%, stearic 4%, Ricinoleic 0%, oleic 34%, Linoleic 21%, Linolenic 0%. All the properties are within the recommended level which shows a good quality of soap.



Bar graph 3 : Parameters of Tea soap quality (Fresh tea leaf paste boiled coconut oil)

The bar graph no -3 illustrates the properties of third variant of tea soaps which exhibit a hardness of 45% (Recommended level 29-54%), cleansing 22% (Recommended level 12-22%), conditioning 50% (Recommended level 44-69%), Bubbly 22% (Recommended level 14-46%), creamy 24%

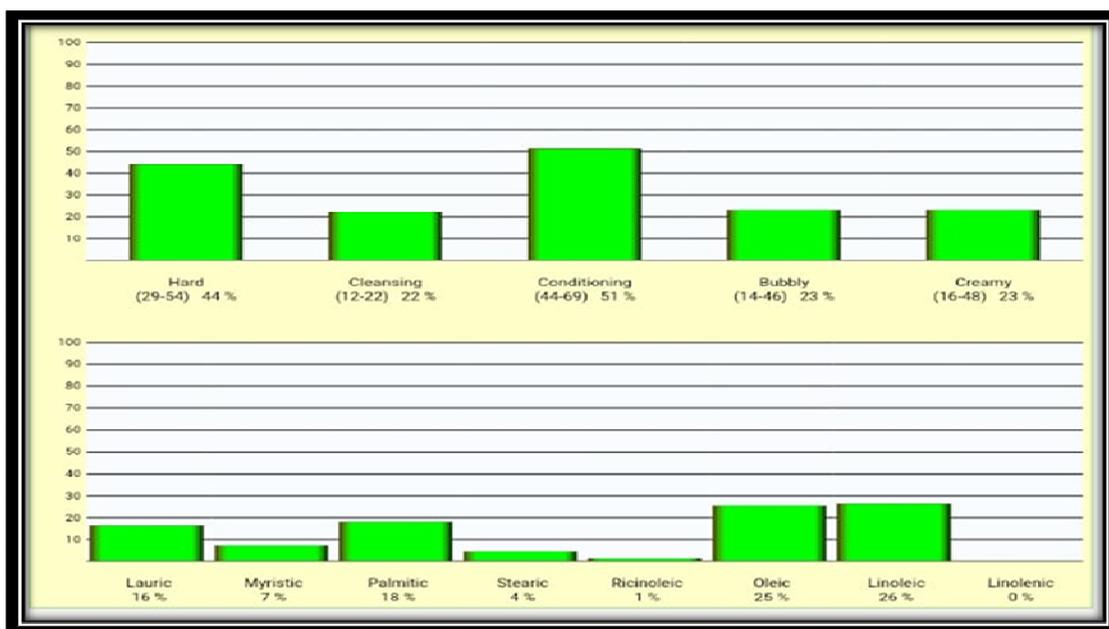
(Recommended level 16-48%). The graph also shows the result of fatty acids too, Lauric 15%, Mystic 6%, palmitic 19%, stearic 4%, Ricinoleic 0%, oleic 22%, Linoleic 27%, Linolenic 2%. All the properties are within the recommended level which shows a soap of good quality with beneficial properties.



Bar graph 4 : Parameters of Tea soap quality (Orthodox Black tea)

The bar graph no -4 illustrates the properties of tea soap (Orthodox Black tea), hardness 47% (Recommended level 29-54%), cleansing 21% (Recommended level 12-22%), conditioning 49% (Recommended level 44-69%), Bubbly 21% (Recommended level 14-46%), creamy 27% (Recommended level 16-48%). The graph also reveals

fatty acids contents of Lauric acid as 14%, Mystic 6%, Palmitic 22%, Stearic 4%, Ricinoleic 5%, oleic 23%, Linoleic 26% and Linolenic 0%. The results obtained shows that all the properties are within the recommended level revealing a soap bar of good quality.



Bar graph 5 : Parameters of Tea soap quality (Fresh Tea leaf paste)

The bar graph no-5 illustrates the properties of tea soap (fresh tea leaf paste) which shows Hardness 44% (Recommended level 29-54%), Cleaning 22% (Recommended level 12-22%), Conditioning 51% (Recommended level 44-69%), Bubbly 23% (Recommended level 14-46%), Creamy 23% (Recommended level 16-48%). The graph also shows the result of fatty acids too in the form of Lauric acid 16%, Mystic7%, palmic18%, stearic 4%, Ricinoleic 1%, oleic 25%, Linoleic 26%, Linolenic 0%. Here too all the properties are seen to fall within the recommended level supporting the good quality of the soap bar.

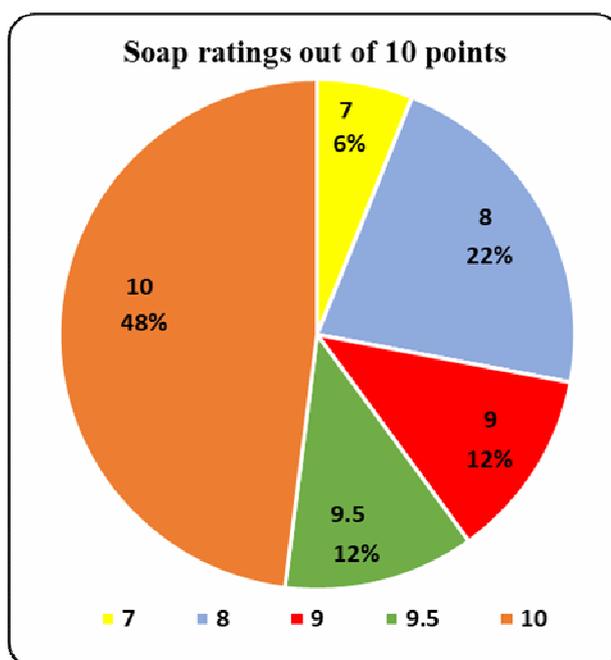
The properties of soaps obtained from differently processed tea parts were represented graphically (Fig: 1 to 5) showing color bar chart of soaps. The results indicate hardness, cleansing, conditioning, bubbly and creamy properties of soaps which were all found to be within the recommended values with standard configuration and gives a clear graphical picture. It also shows the fatty acids combination of soaps which indicates that each of the soaps contains good quality of oils that will be soothing and beneficial for skin.

Analysis of survey regarding reviews of soap users

A survey was conducted among 50 people regarding their views on the experimental soaps. They used the soaps for two months and recorded their views through the given questionnaire:

1. Are you satisfied with the product? yes/no/can't say
2. Is the product true value for money? yes/no/can't say
3. Is it better than the commercial product? yes/no/can't say
4. Do you wish to buy again ? yes/no/can't say
5. Is there any scope for improvement? yes/no/can't say
6. Would you like to recommend this to others yes/no/can't say
7. How would you like to rate the product on a scale of 10? _____
8. Your valuable suggestions-

According to this survey, 100% consumers were satisfied with the product and they opined that these soaps were true value for money and better than commercial soaps available in the market. They were also interested to buy again and recommended these soaps to others. 26% of consumers recommended to improve the colour and texture of soaps, 28% said there is no need for improvement and 46% consumers couldn't remark on scope for improvement. 6% consumers rated the soaps 7 on a scale of 10, 22% rated 8,12% rated 9,12% rated 9.5 and 48% consumers rated the soaps 10 out of 10.



(a) (b)
Fig. 9: (a) Soap reviews analysis (b) Soap ratings

Conclusion

COVID 19 brought shock to the world exposing our vulnerability to various infectious diseases and has changed the way we view our health and hygiene products. Increased risk of infection combined with bulk buying of soaps in preparation for quarantine actually sparked a shortage of many items in the market including soaps and sanitizers. Since then, the demand for soaps has been on the rise and the demand isn't likely to decrease anytime soon. Under such circumstances, these handmade soaps seem to be a promising alternative to harsh chemical soaps commercially available in the market. Moreover, the production of these handmade soaps does not require any industry like set ups or huge investments and can be safely practiced in the comfort of one's own practical laboratory or home. Though the future of these handmade soaps is still unclear, what we do know is that now is the time to get creative with this value-added product of Tea, explore these soaps further and come up with some powerful soaps with antiviral properties creating a spark in the world of soaps.

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Classification: Biological Sciences; Biochemistry;

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