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To formulate and evaluate herbal mouthwash

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Abstract

Mouthwash being one of the significant formulations as a part Oral health care in our day to day life. As per the research, there is rare number of mouthwash available as herbal formulation with medicated use. So considering that in mind, the key objective of this project work, i.e. herbal formulation is to provide an alternative preparation for oral health related issues like toothache, swelling, redness, bacterial or fungal infection in mouth, tooth decay, bleeding gums, weakened gums, etc. Also for improving gums strength, removing bad breathe and give fresh feel during good start of the day. Using of herbal contents like Clove as anti-inflammatory and analgesic, Sesame for the plague removal and strong gums, Peppermint for removing bad breathe and Eucalyptus for a flavour as well as its anti-bacterial properties and gum protection. Ginger has anti-fungal properties along with antibacterial nature. No alcohol was used during the preparation to avoid any side effects. The effectiveness of mouthwash was confirmed and it also showed by the stability of the product. This product can be given for the Analgesic and Anti-inflammatory effects and for microbial or fungal growth in oral cavity and also it can be given as a daily use oral health care mouthwash.

Keywords: Oral healthcare, anti-inflammatory, antibacterial, antifungal, analgesic, strong gums, tooth decay, toothache, redness, swelling in mouth, fresh breathe

Introduction

Eucalyptus Oil



Fig 1: Eucalyptus plant

Synonyms: Eucalyptus, Dinkum oil, Lemon gum tree.

Biological Source: Eucalyptus oil is the volatile oil obtained by the distillation of the fresh leaves of *Eucalyptus globulus* and other species of Eucalyptus, belonging to family *Myrtaceae*. It is rectified, if necessary. It should contain not less than 65% of cineole.

Source: The crude oil, thus produced is rectified again after treatment with sodium hydroxide. The oil is filtered and filled in suitable containers. In the year 1994-95, eucalyptus oil of Rs. 22.5 lakhs (15.3 tonnes was exported from India.

Description

Colour: It is a colourless or pale yellow liquid.

Odour: Aromatic and camphoraceous.

Taste: Pungent and camphorous followed by the sensation of cold.

It is soluble in 90% alcohol, fixed oils, fats and in paraffin. It is insoluble in water.

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Chemical Constituents

Eucalyptus oil chiefly contains cineole, also known as eucalyptol (About 80%).

Uses

Eucalyptus oil is used as a counter-irritant, an antiseptic and expectorant. It is used to relieve cough and in chronic bronchitis in the form of inhalations. It is an ingredient of several liniments and ointments. Solution of eucalyptus oil is used as nasal drops.

Storage

Keep in well closed container away from light and in cool place.



Fig 2: *Eucalyptus globulus* plant

Clove Oil

Synonyms: Caryophyllum; Clove flower; Clove buds.

Biological Source: Clove consists of dried flower buds of *Eugenia caryophyllus*, family *Myrtaceae*. It should contain not less than 15% (v/w) of clove oil.



Fig 3: Clove plant

Geographical Source: It is indigenous to Amboyna and Molucca islands. It is now cultivated chiefly in Zanzibar, Pemba, Penang, Madagascar, Caribbean islands, Sri Lanka and India. In India, cloves are grown in Nilgiri, Tenkasi-hills and in Kanyakumari district of Tamil Nadu state. It is also cultivated in Kottayam and Quilon districts of Kerala.

Macroscopic Characters

Colour: Crimson to dark brown.

Odour: Slightly aromatic.

Taste: Pungent and aromatic followed by numbness.

Size: About 10 to 17.5 mm in length, 4 mm in width, and 2 mm thick.

Shape: Hypanthium is surmounted with 4 thick acute divergent sepals surrounded by dome shaped corolla. The corolla consists of unexpanded membranous petals with several stamens and single stiff prominent style. Cloves are heavier than water.

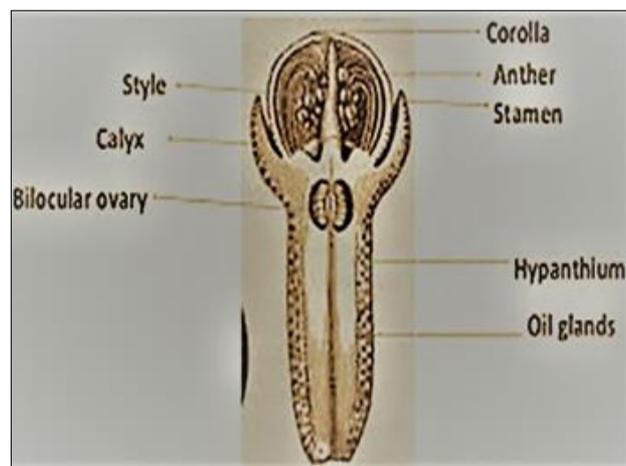


Fig 4: Macroscopic character of clove

Microscopic Characters

The epidermis of the clove is covered with thick cuticle the epidermis itself consists of straight walled cells and large anomocytic stomata, the glands, which are ovoid and schizolysigenous are found in all parts of the drug Phloem fibres, which are isolated, are occasionally found in the spongy tissue. Cluster crystals of calcium oxalate and small number of stone cells are found in the drug. Clove does not contain starch.

Chemical Constituents: The volatile oil of the drug contains eugenol about 70 to 90%,

Description

Oil of clove is colourless to pale yellow in colour. It becomes thick and darker in colour on storage. It has specific gravity of 1.038 * 1.06 refractive index of 1.527 to 1.535 and it boils at 250 degrees *C.

Uses

Clove is used as a dental analgesic, carminative, stimulant, flavouring agent, an aromatic and antiseptic. It is also used in the preparation of cigarettes. The oil is used in perfumery and also in the manufacture of vanillin.

Storage

Clove and its powder should be stored in air-tight containers in cool and dry places.



Fig 5: *Eugenia caryophyllus* plant

Ginger

Synonyms: Zingiber, Zingiberis, Sunthi

Biological Source: Ginger consists of whole or cut, dried scrapped or unscrapped rhizomes of *Zingiber officinale* Roscoe, family *Zingiberaceae*. It contains not less than 0.8% of total gingerols on dried basis.



Fig 6: Ginger Plant

Geographical Source

It is said to be native of South East Asia, but is cultivated in Caribbean islands, Africa, Australia, Mauritius, Jamaica, Taiwan and India. More than 35% of the world's production is from India.

Macroscopic Characters

Colour: Externally, it is buff coloured.

Odour: Agreeable and aromatic.

Taste: Agreeable and pungent.

Size: Rhizomes of ginger are about 5 to 15 * 1.5 to 6.5 cm.



Fig 7: Ginger

Shape: The rhizomes are laterally compressed, bearing short flat, ovate and oblique branches on the upper side, with bud at the apex

Fracture: Short and fibrous.

Extra Features

Longitudinal striations and the occasional projecting fibres are present on the surface of ginger. Transversely cut surface shows well marked endodermis and stele.

Microscopic Characters

Cork consists of irregularly arranged cells, followed by cortex. Cortex is made up of thin walled parenchymatous tissue. Well marked endodermis distinguishes the stele and the cortex. Cortical tissue encloses several closed collateral fibro-vascular bundles. Vascular bundles just inside the endodermis are free of fibres. Oleo-resinous cells and starch grains are found throughout the ground tissue. Endodermis is free of starch.

Chemical Constituents

Sesquiterpene hydrocarbon content of all types of ginger oil from different countries is found to be same and includes α -zingiberene, B-bisabolene, α -farnesene, B-sesquiphellandrene and a curcumene.

Aroma and flavour are the main characters of ginger. Aroma is due to fragrant principles of volatile oil while the flavour, pungency and pharmacological action is exerted by phenolic ketones of oleo-resin. Various components of volatile oil like isometric terpenic aldehydes like geranial and citral, which cause the delicate and lemony aroma. Few sesquiterpene oil hydrocarbons are believed to exert spicy note.

Phenolic ketones of oleo resin include gingerols like shogaols, zingerone, paradols, gingediols, hesahydrocurcumin and also o-methyl ethers of these compounds.

Uses

Ginger is used as a stomachic, an aromatic, a carminative, stimulant and flavouring agent. Ginger oil is used in mouth washes, ginger beverages and liquors.

Ginger powder has been reported to be effective in motion sickness. It has been suggested that adsorbent, aromatic and carminative properties of ginger on G. I. tract cause adsorption of toxins and acid enhanced gastric motility. These may have probably blocking effects of G. I. Reactions and nausea.

Z. officinale (Methanolic extract) has molluscicidal effects, possessing efficacy to control the parasitic infection *viz.* schistosomiasis. U.S. Food and Drug administration has included ginger as product that is generally regarded as safe (GRAS).

Storage

Ginger is coated with lime to improve its colour and quality and hence this particular variety is known as limed ginger.

Adulterants

Ginger is adulterated with exhausted ginger, but it can be detected by determination of water soluble ash, volatile oil content and alcohol and water soluble extractives.

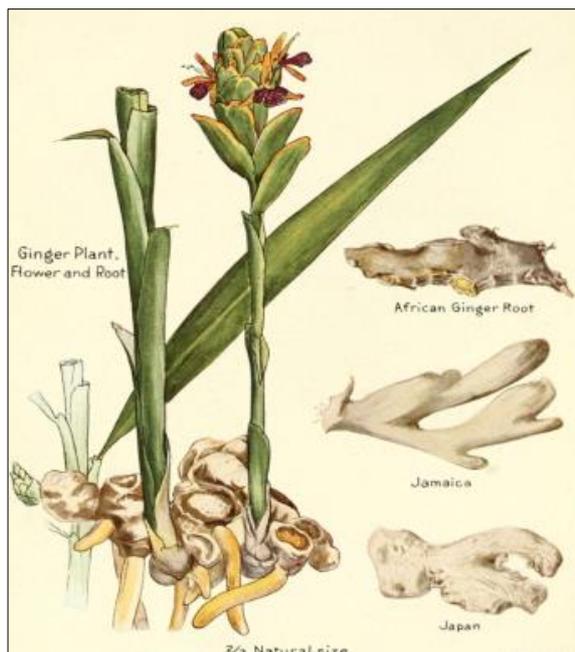


Fig 8: *Zingiber officinale* plant

Peppermint oil

Synonyms: Oleum mentha piperita, Colpermin, Mentha oil.

Biological Source

The oil is obtained by steam distillation of the fresh flowering tops of the plants known as *Mentha piperita* Linn. Belonging to family *Labiatae*. If necessary, it is rectified. Mentha all contains not less than 4.5% and not more than 10% w/w of esters calculated as menthyl acetate, not less than 44% of free alcohols calculated as menthol and not less than 15% and not more than 32% of ketone calculated as menthone.



Fig 9: Peppermint plant

Geographical Source

Mentha species are cultivated in various parts of the world. It grows wild in Europe, while it is cultivated in Japan, England, France, Italy, U.S.A., Bulgaria and U.S.S.R. In India, it is cultivated near Jammu and in Tarai region of Uttar Pradesh.

Standards

1. It is neutral to litmus paper.
2. Weight per ml is 0.9 to 0.912 g.
3. Refractive index-1.4590 to 1.4650.

Chemical Constituents

Peppermint oil contains chiefly-menthol to the extent of 70% in free, as well as, in the format esters, depending upon variety (like American, Japanese, Indian). American peppermint oil cont 80% menthol while Japanese oil contains 70-90%. Other important constituents of the pepperm oil are menthone, menthofuran, jasmone, menthyl isovalerate, menthyl acetate and several ce terpene derivatives. The other terpenes include H-limonene, isopulegone, cineole, pe camphene, etc. Jasmone and esters are responsible for pleasant flavour, while menthofran case resinification and develops dirty smell.

Microscopic characters

Being an inner bark, the cork and primary cortex are absent. Rarely, patches of primary cortex may be present sclerenchymatous Pericycle is prominent. The stellar part shows phloem, phloem fibers, biseriate modually rays and secretory cavities containing volatile oil and mucilage. Starch grains in cortical parenchyma and medullary rays and calcium oxalate crystals in parenchymatous cells are also present

Macroscopic characters

Colour: Colourless to yellow.

Odour: Characteristic and pleasent

Taste: Pungent followed by cooling sensation.

Size: Fruits are 2-4 mm in diameter and 4-30 mm in length.

Shape: Sub globular cremocarpous fruit

Uses

Peppermint or Mentha oil is used as carminative, stimulant, and flavouring agent. It has mild antiseptic properties too. It is used in toothpaste, tooth powders, shaving creams, and different pharmaceutical dosage forms. It is also consumed in the preparation of chewing pam, candies, Jellies, perfumes and essences. Menthol is manufactured in India by S.H. Kelkar and C_{0}, Bhavna Chemicals, Procter and Gamble Ltd. and several others. India produces about 500 tonnes of menthol annually.

Substitutes and Adulterants

Several species of *Mentha* are known to contain oil. Many a time, these oils are de-mentholized and used as adulterants to the drug.

Storage

Peppermint oil should be stored in well-filled and air-tight containers protected from light and in cool place. Peppermint oil darkens and becomes viscous on storage. If cooled separation of menthol crystals occurs. Other species of

Mentha such as *M. longifolia*, *M. roundifolia* and *M. spicata* (spearmint) also yield volatile oils for flavouring purpose.

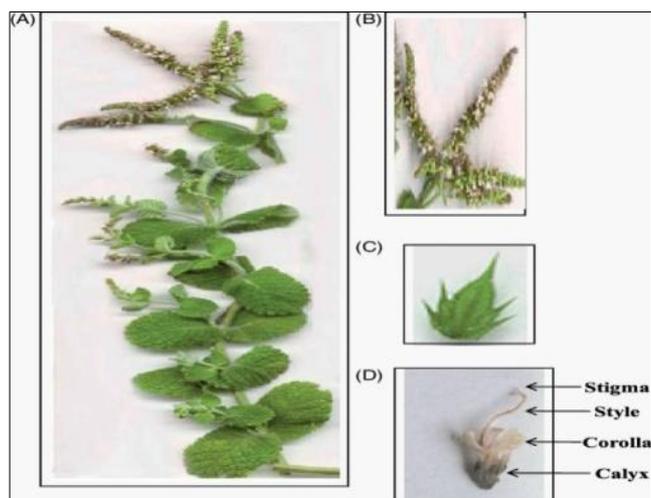


Fig 10: *Mentha piperita* plant

Sesame oil

Synonyms: Teel oil, Gingelly oil, Benne oil.

Biological Source: It is fixed oil obtained by expression from the seeds of *Sesamum indicum* Linn, belonging family *Pedaliaceae*.



Fig 11: Sessame plant

Geographical Source: The plant is indigenous to India, and is cultivated in Caribbean islands, China, Sp and United States,

Identification: Badouin's test Shake 2 ml sesame oil with 1 ml 1% solution of sucrose in hydrochloric acid. A pink or red colour is produced, due to sesamol.

Uses

It is nutritive, laxative, demulcent and has got emollient properties. It is used in the preparation of liniments, plasters, ointments and soaps, similar to olive oil. Pharmaceutically, it is used as a vehicle for intramuscular oily injections. After burning, sesame oil yields high quality black ink.

Chemical Constituents

Gingelly oil contains glycerides of higher fatty acids mainly oleic, linoleic, palmitic, stearic, and arachidic acids. It contains about 5% of olein, and a phenol known as sesamol which is responsible for stability of oil. It contains lignin derivatives viz. sesamin and sesamol.

Morphological description

The sesame plant can be branched or unbranched. The leaves vary in shape and size, and may be alternate or opposite. The growing sequence is indeterminate, with leaves, flowers and seeds being produced as long as the weather permits

Microscopic Character

Epidermis of the sesame seeds made up of thin-walled palisade, the anticlinal walls with more or less curvy. The cells of epidermis are 18- 30 μ wide and 50-95 μ long. Each cell has a spherical mass of calcium oxalate crystals with 12-40 μ diameter in its apex. The spherical mass is not present in those cells which have four ridges in their constituent. The collapsed cells with a yellowish membrane (inner side) are present on the remaining parts of the testa. The cellulosic polygonal parenchymatous cells having fixed oil and small aleurone grains (about 2-10 μ) are also present in the tissue of endosperm and cotyledons. Starch is not present in the cells (T.E Wallis, YNM).

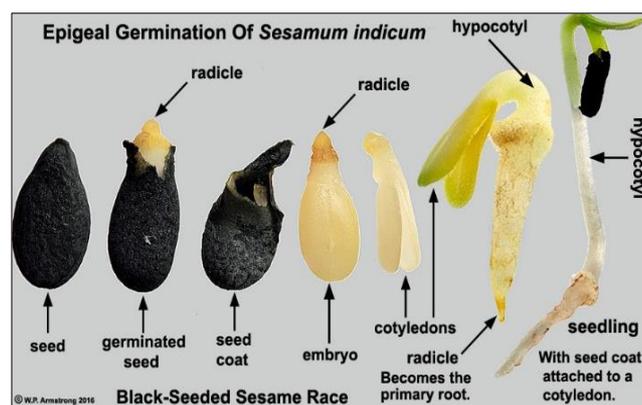


Fig 12: *Sesamum indicum* plant

Liquorice

Synonyms: Glycyrrhiza, glycyrrhiza radix, mulethi.

Biological Source

yesti consist of dried, unpeeled, roots and stolons of *Glycyrrhiza glabra* Linn., belonging to family leguminosae. Yesti contains not less than 3.0% of glycyrrhinic acid



Fig 13: Liquorice plant

Geographical Source

The drug is commercially cultivated on a large scale in Spain, Sicily and England. *Glycyrrhiza glabra* var. *glandulifera* (Russian liquorice) grows in Russia and *Glycyrrhiza glabra* var. *violacea* comes from Iran.

Macroscopic Characters

Colour: Unpeeled yellowish brown or dark brown externally, and yellowish internally while the peeled liquorice is pale yellow in colour.

Odour: Faint and characteristic

Taste: Sweet

Size: length 20 to 50 cm and 2cm in diameter

Shape: Cylindrical pieces which are straight may be peeled or unpeeled. Peeled liquorice is Angular

Fracture: It is fibrous in the bark and splintery in wood.

Microscopic Characters

The important histological diagnostic characters of liquorice are given below

1. Unpeeled drug shows the presence of polyhedral tubular brownish cork cell.
2. Fibers are thick, lignified or partially lignified, in the groups of 10 to 15 in phloem and xylem. Vessels are large and closely arranged with bordered pits. Starch and calcium oxalate crystals are present in parenchyma.

Chemical Constituents

The chief constituent of liquorice is a triterpenoid saponin known as glycyrrhizin which is a potassium and calcium salt of glycyrrhizinic acid. Glycyrrhizinic acid is a glycoside and on hydrolysis yields glycyrrhetic acid which has a triterpenoid structure. The different varieties are found to contain varying amt. of glycyrrhizin (From 6 to 14). Spanish liquorice contains 5 to 10%, Russian variety contains about 10%, while Persian liquorice contains 7.5 to 13% of glycyrrhizin. Other constituents of liquorice are glucose (upto 4%), sucrose (2.5 to 6.5%), bitter principle glycyramarin resins, asparagin (2 to 4%) and fat.

Uses

Traditionally, liquorice has been used as an expectorant and demulcent. It is used in cough mixtures, and as a flavouring agent in formulation with nauseous drugs like, ammonium chloride, alkali iodides, quinine, cascara etc.

Liquorice is used most commonly as a flavouring agent for chewing tobacco and snuff tobacco. Ammoniated glycyrrhiza is used as a flavouring agent in beverages, confectionery and pharmaceuticals.

Aparajita

Synonyms: Butterfly pea', Asian pigeon-wings, bluebell-vine, blue pea

Biological source: Botanical Name - *Clitoria ternatea*.
Family - *FABACEAE*.



Fig 14: Aparajita plant

Geographical source

The exact geographic origin of *C. ternatea* is thus difficult to determine, but we may infer from the center of diversity for subgenus *Clitoria*, that *C. ternatea* arose in or around the Indian Ocean and not the Pacific Ocean or South China Sea where it has been in use as a food coloring historically. It is also entirely possible that the taxon we know as *C. ternatea* is an ancient hybrid of one or more members of the subgenus *Clitoria* that had subsequently been introduced to Southeast Asia.

Chemical Constituents

Chemical compounds isolated from *C. ternatea* include various triterpenoids, flavonol glycosides, anthocyanins and steroids. Cyclic peptides known as cliotides have been isolated from the heat-stable fraction of *C. ternatea* extract. The blue colour of *C. ternatea* is a result of various anthocyanins, most importantly ternatins-polyacylated derivatives of delphinidin 3,3', 5'-triglucoside

Morphology

It is a perennial climber. Leaves- pinnate 5-9 foliolate.

Flowers: showy, blue or white, petals unequal, style bearded below the stigma.

Fruits: pods, linear, compressed.

Seeds: 6-10, black, Flowers in rainy season and fruits in winter.

Uses

It is a multi-utilitarian plant used for food, medicine, dye and animal feed besides ornamentation. However, it is mostly grown as a medicinal herb / ornamental climber in India.

A native medicinal herb, its root, bark, leaves and seeds are used in Ayurvedic preparations. The herb is in use for centuries as a memory enhancer prescribed for children suffering from developmental problems of brain and impaired cognitive function. The plant contains wide range of secondary metabolites like triterpenoids, flavonol glycosides, anthocyanins, steroids and used to treat vata vitiated disorders besides panchakarma treatments for balancing doshas in the body to bring about internal as well as external detoxification. The root is also used for leucoderma.



Fig 15: *Clitoria tematea* plant

Experimental work Requirements

Table 1: Ingredient list use in herbal mouthwash

Sr. No	Ingredients	Botanical name	Function	MI
1.	Eucalyptus oil	<i>Eucalyptus globulus</i>	Flavouring agent	2ml
2.	Clove oil	<i>Eugenia caryophyllus</i>	Anti-inflammatory	0.5ml
3.	Sesame oil	<i>Sesamum indicum</i>	Plague removal	0.5ml
4.	Peppermint oil	<i>Mentha piperita</i>	Removing bad breath	0.05ml
5.	Glycerin	-	Soluble vehicle	1ml
6.	Ginger extract	<i>Zingiber officinale Roscoe</i>	Anti-bacterial agent	5ml
7.	Liquorice extract	<i>Glycyrrhiza glabra</i>	Sweetning agent	5ml
8.	Sodium bicarbonate	-	Preservatve	10% w/v
9.	Aprajita extract	<i>Clitoria tematea</i>	Colorant	2ml
10.	Water	-	Aqueous vehicle	QS. to 100ml



Fig 16: Ingredients used for experimental work of herbal mouthwash

Preparation of ginger ark

- Take 5gm of ginger and crush it with the help of mortar pestle.
- Now add few drops of water to it in order to make it liquid.
- Measure 5ml of ginger ark in a measuring cylinder.



Fig 17: Preparation of ginger ark

Preparation of Liquorice extract

Liquorice extract is that portion of the liquorice root ie, after maceration (Softening by soaking in a liquid), extracted by boiling water. The extract can be further purified by filtration and by the treatment with water.

Liquorice extract is solid as a liquid, paste (block) or spray dried powder. Liquorice paste is preferred for flavouring agent purposes whereas the powdered liquorice is used in confectioneries and pharmaceutical products.



Fig 18: Preparation of liquorice extract

Step 1: Take 2ml of eucalyptus oil in a porcelain dish with the help of a dropper. Now add 0.5ml of Clove oil, 0.5ml Sesame oil and 0.5ml of Peppermint oil to the porcelain dish. Add 1ml of glycerin to the same mixture and mix well.

Step 2: Take 5ml of Ginger ark in a beaker and to it add 5ml of 10% sodium bicarbonate to it. Add 5ml of Liquorice extract to the same.

Step 3: now add mixture 1(i.e. oil based) to the mixture 2 (aqueous based) gradually with simultaneously stirring till the solution becomes homogenous.

Step 4: To add few drops Aparajita extract.

Step 5: Final product is ready to be packaged and labelled.



Fig 19: Final Product of mouthwash

preparation and choosing right herbs for getting the right purpose. Exploration of more of such research work spaces and of variation in the same to do. This mouthwash can be used for oral disease patients and also healthy beings also as it having almost negligible side-effects, to maintain their oral health and hygiene to have a fresh start at for a day, giving a feel good spirit.

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Results

Table 2: Evaluation parameters and result of evaluation parameter

Evaluation	Observation
Visual appearance	Dark green to light grey
Odour	Strong mint
Taste	Sweet
Ph	5.5 or below
Phase separation	Nil
Homogeneity	Good

Conclusion

Herbal mouthwash having anti-inflammatory, anti-bacterial, anti-fungal, analgesic along with strengthening and mouth freshening properties and thus, this new formulated form of oral health care using various natural oils and extracts for getting the benefit of the intended to make the formulation effective use as well as easily acceptable by people. As such, seen in our country, oral hygiene is not given much focus, which on later stages of life leads to chronic diseases like cases of mouth cancer. Searching up for an herbal formulation in market with all the said properties led to making of this product that is cost affordable and user friendly. Referring various books and sites helped getting some clarity over the