

# PREPARATION AND EVALUATION OF CAFFEINATED TOOTHPASTE WITH THYME ESSENCE

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**ABSTRACT:** Caffeinated toothpaste that is to be used like regular toothpaste for brushing one's teeth. Toothpaste contains 67.4 mg of caffeine per milliliter of toothpaste, which is the recommended amount. However, since toothpaste isn't meant to be swallowed, not all of this caffeine which reach the bloodstream. Caffeine can be absorbed through the lining of the mouth and gums so we estimate that after a minute of brushing, about 30-50 mg will have been absorbed. Brushing longer will allow for more absorption. It cleans teeth, but it's also infused with caffeine to wake up in the morning. The toothpaste also boasts another effect, that it works much faster than coffee, which makes sense considers to be applied it straight to gums rather than ingesting it. The downside is that the "woke" effect doesn't last as long as it does with drinking coffee. Traditional oral care products are boring. For most people, oral care is a chore, something they do because they feel they have to. People don't brush twice a day. Our mission is to turn oral care into something people can get excited about. Brushing teeth should be an indispensable part of your morning routine. **Methods:** Caffeinated Toothpaste was formulated in forms of gel and opaque and Thyme essence was added to it. The formulation was evaluated in terms of stability in different temperatures, pH, consistency, uniformity, taste, smell, and compatibility with special packaging for toothpaste at three temperatures. Profilometry was used to determine abrasivity. **Results:** Addition of thyme essence to formulation had no deleterious effect in stability, consistency, taste and smell. The pH of opaque and gel formulations was 7.02 and 7.45, respectively. The abrasiveness of opaque and gel formulations was in standard ranges. **Conclusion:** Formulation of toothpaste with *T. vulgaris* essential oil was acceptable and might be considered as a desirable herbal toothpaste.

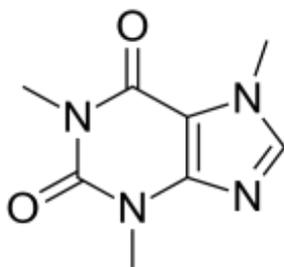
**Keywords :** caffeine, *Thymus vulgaris*, opaque, abrasivity, stability test

## MANUSCRIPT

*Thymus vulgaris* (Lamiaceae), or thyme as common name, contains a useful essential oil. It has antiseptic, expectorant, antispasmodic and carminative activities.

Caffeine is a central nervous system (CNS) stimulant of the methylxanthine class. It is the world's most widely consumed psychoactive drug. Unlike many other psychoactive substances, it is legal and unregulated in nearly all parts of the world. There are several known mechanisms of action to explain the effects of caffeine. The most prominent is that it reversibly blocks the action of adenosine on its receptor and consequently prevents the onset of drowsiness induced by adenosine. Caffeine also stimulates certain portions of the autonomic nervous system.<sup>1</sup>

Caffeine is a bitter, white crystalline purine, a methylxanthine alkaloid, and is chemically related to the adenine and guanine bases of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).



## The impact of coffee on health :

Caffeine, chlorogenic acids and diterpenes are important components of coffee. Tolerance often acts as a modulator of the biological actions of coffee. There is a significant impact of coffee on the cardiovascular system, and on the metabolism of carbohydrates and lipids. Contrary to previous beliefs, the various forms of arterial cardiovascular disease, arrhythmia or heart insufficiency seem unaffected by coffee intake. Coffee is associated with a reduction in the incidence of diabetes and liver disease. Protection seems to exist also for Parkinson's disease among the neurological disorders, while its potential as an osteoporosis risk factor is under debate. Its effect on cancer risk depends on the tissue concerned, although it appears to favor risk reduction. Coffee consumption seems to reduce mortality<sup>2</sup>.

## Origin of coffee :

The coffee tree, scientifically known as *Coffea arabica*, is native to Abyssinia and Ethiopia, but grows well in Java, Sumatra, and other islands of the Dutch East Indies; in India, Arabia, equatorial Africa, the islands of the Pacific, in Mexico, Central and South America, and the West Indies. The plant belongs to the large sub-kingdom of plants known scientifically as the Angiosperms, or Angiospermae, which means that the plant reproduces by seeds which are enclosed in a box-like compartment, known as the ovary, at the base of the flower. The word Angiosperm is derived from two Greek words, sperma, a seed, and ageion, pronounced angeion, a box, the box referred to being the ovary<sup>3</sup>.

**TOOTHPASTE :**

Toothpaste is defined as a dentifrice in the form of a smooth, semisolid, homogeneous mass containing acceptable ingredients such as abrasives/polishing agents, surface active agents, humectants, binding agent, and other appropriate substances for oral health maintenance<sup>5</sup>. Toothpaste is defined as a dentifrice in the form of a smooth, semisolid, homogeneous mass containing acceptable ingredients such as abrasives/polishing agents, surface active agents, humectants, binding agent, and other appropriate substances for oral health maintenance. The product can be opaque, transparent or combination thereof, coloured or white, packed in a suitable container from which it can be extruded in the form of a continuous mass<sup>5</sup>.

Toothpaste is classified as drugs not cosmetics. Because drugs should contain an ingredient to achieve the effect the consumer desires, it is important to determine if different brands of toothpastes contain effective antibacterial ingredients<sup>6,7</sup>. The main purpose of toothpaste is to reduce oral bacterial flora and deliver fluoride to the teeth. This is because fluoride has been proven to protect teeth against attack from bacteria and can be found naturally in many everyday things including food and drinking water. Toothpaste that efficiently reduces oral bacterial flora should contribute to dental health. Triclosan is usually used in gum. It is a constituent used to avert gum disease because of its antibacterial properties. The active ingredient sodium fluoride is also known to have antibacterial properties.<sup>7</sup>

**Importance of caffeinated toothpaste :**

Traditional oral care products are boring. For most people, oral care is a chore, something they do because they feel they have to. And 50% of Americans don't brush twice a day<sup>8</sup>. The mission is to turn oral care into something people can get excited about. Brushing your teeth should be an indispensable part of your morning routine. Caffeinated Toothpaste doesn't deliver a megablast of caffeine, but provides a subtle buzz, increasing focus and alertness, all without a crash. Regular coffee drinkers who use caffeinated toothpaste still enjoy their morning cup of coffee – the difference is they feel great as they are getting ready and don't find themselves staring anxiously at a coffee machine, waiting for it to slowly finish brewing. Caffeinated Toothpaste beats plaque and tartar buildup in the same way as the leading brands. Not to mention that Caffeinated Toothpaste whitens your teeth, compared to coffee which stains and darkens. But this toothpaste does more than just give you a minty-clean smile. Caffeinated Toothpaste gives you a rush while you brush, whenever you need it most. Brush just after waking up to blast away morning grogginess in minutes. Brush mid-day to relieve yourself of post-lunch drowsiness, or to refocus before that big meeting. One brush with Caffeinated Toothpaste gives you the same energy boost as a cup of coffee, and much quicker. The tubes we're selling here provide up to 90 brushes. That's 90 cups of coffee, and up to \$245 saved (approximate calculation)<sup>9,10</sup>.

**Formulation of clear gel and opaque toothpaste**

In this study, 2 gel and 2 opaque toothpastes were formulated. Each type had thyme oil and caffeine. The amounts of oil used in the formulations were based on microbial studies and measurement of minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). The formulated toothpastes were packaged in laminate tubes.

**Determination of physicochemical properties****Homogeneity**

Determination of homogeneity was studied by applying normal force to containers at  $27 \pm 2^\circ\text{C}$ .

**Tube inertness**

Tube inertness was examined by cutting the tubes and investigating internal surface for any signs of deterioration in different storage conditions including normal and heating temperature at  $45 \pm 2^\circ\text{C}$  for 180 days. **Sharp and edge abrasive particles**

This test was performed considering the extrusion of the content of 10 tubes and investigating the presence of sharp and hard edged abrasive particles.

**Stability**

The stability study was performed by storing formulations in three different temperatures and humidity conditions, viz.  $4^\circ\text{C}$ ,  $25^\circ\text{C} \pm 2^\circ\text{C}/60\% \pm 5\% \text{RH}$ ,  $40^\circ\text{C} \pm 2^\circ\text{C}/75\% \pm 5\% \text{RH}$  for a period of 6 months considering ICH guidelines.

**Physicochemical properties result**

The results of physicochemical tests indicate the stability of both formula of Opaque and Jelly at room temperature (the temperature of  $4^\circ\text{C}$  of refrigerated and temperature of  $40^\circ\text{C}$  with germinator and 75% humidity). Also the formulations were satisfactory in terms of the status of consistency, uniformity, taste and smell. Also, there was no fermentation in two formulations. Also both formula had not any sharp and hard edged abrasive particles. The toothpaste container did not produce any corrosion or deterioration and caffeine, Thymus vulgaris essential oil had perfect compatibility with container.

**pH**

At first the pH of Opaque and Jelly formulations before stability test was respectively 6.72 and 6.68. After stability test for a period of 6 months, the pH was 7.01 and 7.51 which were in the standard range.

**pH**

The pH meter was calibrated using standard buffer solution. About 0.5g of the Toothpaste was weighed and dissolved in 50.0 ml of distilled water and its pH was measured.

**Viscosity**

Viscosity of the formulation was determined by Brookfield Viscometer at 100 rpm, using spindle no 7.

**Dye test**

The scarlet red dye is mixed with the caffeinated thymol toothpaste. Place a drop of the caffeinated thymol toothpaste on a microscopic slide covers it with a cover slip, and examines it under a microscope. If the dispersed globules appear red the ground colourless. The caffeinated thymol toothpaste is o/w type.

**Homogeneity**

The formulations were tested for the homogeneity by visual appearance and by touch.

**Appearance**

The appearance of the caffeinated thymol toothpaste was judged by its color, pearlscence and roughness and graded.

**After feel**

Emolliency, slipperiness and amount of residue left after the application of fixed amount of caffeinated thymol toothpaste was checked.

**Type of smear**

After application of caffeinated thymol toothpaste, the type of film or smear formed on the teeth were checked.

**Removal**

The ease of removal of the caffeinated thymol toothpaste applied was examined by washing the applied part with tap water.

**Acid value**

Take 10 gm of substance dissolved in accurately weighed, in 50 ml mixture of equal volume of alcohol and solvent ether, the flask was connected to reflux condenser and slowly heated, until sample was dissolved completely, to this 1 ml of phenolphthalein added and titrated with 0.1N NaOH, until faintly pink color appears after shaking for 30 seconds.

Acid value =  $n \times 5.61/w$

n - number of ml of NaOH required, w - weigh of substance.

**Saponification value**

Introduce about 2 gm of substance refluxed with 25 ml of 0.5 N alcoholic KOH for 30 minutes, to this 1 ml of phenolphthalein added and titrated immediately, with 0.5 N HCL.

Saponification value =  $(b-a) \times 28.05/w$

a - volume in ml of titrant, b - volume in ml of titrant, w - weigh of substance in gm.

**RESULTS**

The pH of the caffeinated thymol toothpaste base was found to be in range of 7.02 and 7.45. The viscosity of was caffeinated thymol toothpaste was in the range of 27021-27053 cps which indicates spreadibility of caffeinated thymol toothpaste. Acid value 5.9, saponification value 25.7 *Dye test* This dye confirms that formulation is o/w type emulsion caffeinated thymol toothpaste. *Homogeneity* : formulation of base produce uniform distribution in caffeinated thymol toothpaste. This was confirmed by visual appearance and by touch . *Appearance* When formulation kept for long time, it found that no change in colour of caffeinated thymol toothpaste base *Type of smear* After application of caffeinated thymol toothpaste base, the type of smear formed on the enamel were non greasy *Removal* The caffeinated thymol toothpaste applied on skin was easily removed by washing with tap water. The formulation found to be satisfactory.

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