



Formulation & Evaluation of vitamin-C Infused Bath-bombs

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Abstract:

This project focuses on the formulation and evaluation of bath bombs designed for aromatherapy, by using a blend of baking soda, citric acid, cornflour, Epsom salt, jojoba oil, vanilla extract, lavender extract, coconut oil, and coffee. These ingredients were chosen for their potential therapeutic benefits, including relaxation, stress relief, and skin nourishment. The bath bombs were formulated to create a fizzing effect upon contact with water, releasing fragrant essential oils and extracts for an aromatic bathing experience. The formulation process involved careful selection and blending of dry and liquid ingredients to achieve the desired texture, fragrance, and skin nourishing properties. Various formulations were tested for their fizzing performance, fragrance intensity, skin feel, and overall bathing experience. Results show that the formulated bath bombs exhibit excellent fizzing performance and release a pleasant aroma upon dissolving in water. The inclusion of jojoba oil and coconut oil helps with the moisturizing and skin-softening effects of the bath bombs, leaving the skin feeling hydrated and rejuvenated. In conclusion, this project demonstrates the potential of bath bombs as a convenient and enjoyable way to include aromatherapy into daily self-care routines.

1. INTRODUCTION

Aromatherapy is a healing treatment that uses essential oils & promotes health and well-being. Its main aim is to improve physical, mental, and emotional health through the inhalation or topical application of these aromatic compounds. Aromatherapy has been practised since ancient times. Ancient civilisations like Egypt, China, and India used aromatic plant oils for medicinal, cosmetic, and spiritual purposes. Especially in ancient Indian ayurveda, aromatherapy is used to balance the tridoshas, often by using specific essential oils that are believed to have balancing effects.¹ The use of these essential oils in abhyanga and panchakarma enhances the overall experience and benefits.² The modern concept of aromatherapy was developed in the early 20th century by French chemist René-Maurice Gattefossé.

Essential oils are the key components used in aromatherapy. They are extracted from various parts of plants, including flowers, leaves, bark, roots, and peels. The extraction methods include distillation, cold pressing, and solvent extraction. Each essential oil has its own unique chemical composition and therapeutic properties.

Aromatherapy works through the sense of smell (olfaction) and the skin. When you inhale the essential oils, aromatic molecules travel through the nasal passages and stimulate the olfactory nerves. These nerves send impulses to the brain's limbic system, which is responsible for emotions, memory, and behaviour. The limbic system then influences the endocrine system, which regulates hormones, and the autonomic nervous system, which controls involuntary bodily functions such as heart rate and digestion. Essential oils can also be absorbed through the skin when applied topically.

Some of the potential benefits of aromatherapy include:

- Reduced stress and anxiety: help to ease tension, and promote feelings of peace & relaxation.
 - Improved sleep: Lavender oil is a popular choice for promoting better sleep. Inhaling lavender oil or applying a diluted solution to your temples before bed can help you relax and fall asleep faster.
 - Pain relief
 - Increased energy levels: Invigorating smells like coffee can help to increase energy levels and improve alertness
 - Boosted mood
 - Relief from headaches and migraines
 - Improved digestion
- Stronger immune system Certain essential oils, such as lavender and chamomile, are known for their calming properties and can help reduce stress and anxiety. Other essential oils like lavender and sandalwood can promote relaxation and improve sleep quality.

Essential oils also have analgesic (pain-relieving) properties and can be used to alleviate headaches and muscle pain. Citrus essential oils, such as lemon and orange and also certain oils like vanilla are known for their uplifting and mood-boosting effects.

While aromatherapy is generally considered safe, there are some potential risks to be aware of. As essential oils are very concentrated, it's important to dilute them with a carrier oil, such as coconut oil or jojoba oil, before applying them to the skin, to ensure they do not cause any skin irritation, burning, or any allergic reactions. A common dilution ratio is 2-3 drops of essential oil per 1 teaspoon (5ml) of carrier oil.³

Some safety tips for using aromatherapy:

- Never ingest essential oils. Swallowing them can be toxic and dangerous. Keep essential oils out of reach of children and pets.
- Avoid contact with eyes and mucous membranes. Essential oils can be very irritating to the eyes. Avoid contact and rinse thoroughly with water if it happens.
- If pregnant, breastfeeding, or having a medical condition such as epilepsy, high blood pressure, or skin conditions like eczema, consultation with a doctor before using essential oils is recommended.
- Some essential oils can also interact with medications.
- Use caution with essential oils around children. Their skin is more sensitive, and they may be more prone to reactions.

1.1 Bath bomb

Bath bombs are mixtures of dry materials that can be shaped and dried. A common bath product that is refreshing, relaxing, and fragrant. Bath bombs are made primarily of simple acids and bicarbonate. These products are dry when dry but when dissolved in water they work strongly, creating a moisturizing effect that detoxifies the skin, leaving it looking smooth and fresh, and the intense smells they create have a therapeutic effect.⁴

These elements combine to create a fizzing sensation. Additionally, they cleanse, de-odorise and rejuvenate the skin and strengthen blood vessels. The main ingredients in bath bombs are baking soda, citric acid and cornstarch.

These work together to form a complex mixture that, when wet, is hydrolysed. **Sodium bicarbonate (NaHCO₃)** is a key ingredient in bath bombs and other products designed to create fizz and foam.⁵ It's a white powder. Sodium bicarbonate has many uses and goes by many other names. It is also known as baking soda, as well as cooking soda.

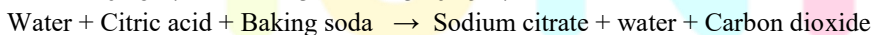
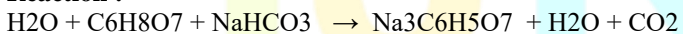
Ascorbic acid powder in bath bombs helps in skin brightening. **Vitamin C** is known for its ability to show a brightening effect on the skin and help to achieve an even skin tone. It also helps in the overall appearance of the skin making it look more refreshed, radiant, and, youthful. Vitamin C is also a very powerful antioxidant that can help protect the skin from damage by free radicals. This can help in the prevention of premature ageing, and keep the skin looking healthy and youthful. Vitamin C also plays an important role in collagen production. Thus adding vitamin C in bath bombs helps support collagen production and maintain skin elasticity. It also has anti-inflammatory effects that help soothe skin and promote a fast healing of wounds and blemishes. It is beneficial for people with acne-prone skin. Vitamin C can help improve the skin's ability to retain moisture making it more hydrated and supple.⁶

Corn starch acts as a thickening agent as well as a conditioner and absorbs excess moisture without drying out the skin. This product acts as a dry additive with baking soda and citric acid.

Epsom salts are healing salts that contain a combination of magnesium and sulfate ions. It helps regulate magnesium levels in the body and aids in the production of serotonin, which in turn helps to calm and relax.

One of the benefits of taking a bath infused with Epsom salts is that it relieves stress and relaxes the body. The faster a bath bomb dissolves in water, the more CO₂ it releases, the fizzier it gets, and the faster it works. The finished chemical reaction between water, sodium bicarbonate and citric acid creates fizz and bubbles as the bath bomb hits the water.⁷

Reaction :



In the above reaction, citric acid reacts with sodium bicarbonate in the presence of water to form a sodium salt citric acid, water, and carbon dioxide. Bubbles will form inside due to the evolution of carbon dioxide and Water on the sides. Citric acid and sodium bicarbonate do not harm the skin now as they absorb enough water to damage nerves and skin

Other herbal ingredients used in bath bombs are Jojoba oil, Coconut oil, Coffee, Vanilla essential oil, and Lavender essential oil.

Jojoba oil is similar to the natural oils produced by the skin and hence makes it an excellent moisturizer. Skin is kept hydrated and smooth. Also due to its anti-inflammatory activity, it helps soothe the skin and reduce the redness. It forms a protective barrier on the skin and helps to retain moisture.⁸

Coconut oil is a natural moisturizer that helps hydrate the skin and make it soft and smooth. It is also known to have antibacterial properties which help cleanse the skin and reduce infections. Coconut oil has an antioxidant property that helps in protecting the skin against the action of free radicals.

It also has anti-inflammatory benefits like jojoba oil. The pleasant smell of coconut oil also adds a tropical aroma.⁹

Coffee acts as a gentle exfoliant and helps remove dead skin cells and dirt from the skin to reveal smoother and healthier-looking skin cells. It is rich in antioxidants like chlorogenic acid and melanoidin which helps protect the skin against free radicals. Caffeine in coffee stimulates the blood flow which makes the skin supple and healthy and also reduces the appearance of cellulite and stretch marks. The stimulating aroma of coffee can be uplifting and provides a sensory boost during a bath. It also helps to improve mood and induce a general alertness.¹⁰

Vanilla extract has a warm and sweet scent of vanilla which is known to have a calming and relaxing effect on the mind and body making it ideal for a soothing bath experience. It can help reduce stress and anxiety and promote relaxation, which enhances the overall sensory experience. Vanilla extracts contain vanillin which shows antioxidant properties, which prevent ageing and help skin look young and youthful. Also, vanilla extract enhances the moisturising effects of other moisturising agents in the bathrooms.¹¹

Lavender essential oil is well known for its calming and relaxing properties. Its use in Bathbomb can help reduce stress and anxiety, and promote a sense of relaxing calmness. The soothing aroma of lavender is known to promote better sleep. A warm bath using a lavender bath bomb before bedtime helps in relaxing the mind and body leading to a restful sleep. Lavender oil has analgesic properties, which help to relieve minor aches and pains. Thus it helps in reducing tension in muscles, providing relief from sore and stiff muscles. Lavender aroma also helps in reducing the feeling of sadness, and depression and promotes a positive outlook.¹²

1.2 Method

Aromatherapy through bath bombs involves the administration of essential oils via inhalation and absorption through the skin during a bath.

1. Preparation: Fill the bathtub with warm water.
2. Choose Your Bath Bomb: According to the need choose the desired bath bomb. E.g. for exfoliation choose coconut coffee, for relaxation choose vanilla, for stimulating sleep and pain relief choose lavender
3. Drop the Bath Bomb: Once the bathtub is filled, drop the bath bomb into the water. It will start to fizz and dissolve, releasing its aromatic oils and other ingredients
4. Enjoy the Aromatherapy: As the bath bomb dissolves, inhale the steam to enjoy the aromatherapy benefits. The scent of the essential oils can help relax the mind and body.
5. Soak in the Bath: Relax in the bath for at least 15-20 minutes to allow the essential oils to be absorbed through your skin. The warm water can also help relax your muscles and improve circulation.
6. Rinse Off: After soaking, rinse off with clean water to remove any residue from the bath bomb and essential oils.
7. Pat Dry: Gently pat dry with a towel. Avoid rubbing, as this can irritate the skin.
8. Moisturize: After your bath, apply a moisturizer to lock in hydration and keep the skin soft and smooth

2. NEED OF THE STUDY:

Bath bombs are specifically designed to enhance the aromatherapy experience during bathing. They typically contain a combination of baking soda and citric acid, which react when they come into contact with water, creating a fizzy effect. Along with these base ingredients, bath bombs often include essential oils, herbs, and other natural ingredients chosen for their aromatic and therapeutic properties.

When the bath bomb is dropped into the bathwater, it begins to fizz and release its ingredients into the water. This creates a fragrant and soothing atmosphere in the bathroom, allowing the user to breathe in the aromatic vapors. The warm water of the bath helps to open up the pores, allowing the essential oils to be absorbed into the skin and providing a more intense aromatherapy experience. Different essential oils have different effects on the body and mind. For example, lavender essential oil is known for its calming and relaxing properties, making it ideal for reducing stress and promoting better sleep. Peppermint essential oil, on the other hand, is invigorating and can help to boost energy and improve focus.

Overall, bath bombs offer a convenient and enjoyable way to incorporate aromatherapy into your self-care routine. They provide a luxurious and relaxing bathing experience that can help to improve both your physical and mental well-being.

Vitamin C-infused bath bombs for aromatherapy offers several benefits:

Natural Ingredients: Using natural ingredients ensures that the bath bombs are free from synthetic chemicals and potentially harmful additives, making them gentle and safe for the skin.

Therapeutic Properties: Herbal ingredients such as lavender, calendula, and coffee can offer additional therapeutic benefits, such as relaxation, skin nourishment, and antioxidant protection.

Vitamin C Boost: Vitamin C is known for its antioxidant properties, which can help protect the skin from damage caused by free radicals and promote overall skin health.

Aromatherapy Benefits: The combination of herbal ingredients and vitamin C can enhance the aromatherapy experience, promoting relaxation, stress relief, and a sense of well-being.

3. RESEARCH METHODOLOGY

3.1 Plan of work

- **Literature review:** Review literature on the benefits of vitamin C, baking soda, citric acid, Epsom salt, cornstarch, vanilla extract, lavender extract, jojoba oil, coconut oil, and coffee for skin and aromatherapy.
- **Ingredient selection and sourcing:** Selecting high-quality ingredients known for their skincare and aromatherapy benefits
- **Formulation Development:** Develop several formulations varying in ingredient ratios to achieve desired texture, fragrance, and colour.
- Preparing the selected formulation & documentation of the process, including the ingredient measurements and mixing
- **Evaluation:** Conduction of evaluation tests to assess fragrance, texture, fizziness, and effervescence.
- **Documentation and reporting:** Documentation of all findings including formulation, and results of evaluations. preparation of a report
- **Conclusion:** Concluding the project outcomes
- **Presentation:** Presenting the project findings

3.2 Experimental

3.2.1 Vanilla bath bombs¹³

Dry ingredients

1. Baking soda – 25 gm
2. Citric acid – 12.5 gm
3. Cornstarch – 12.5 gm
4. Epsom salt – 12.5 gm
5. Vitamin C powder - 1gm

Liquid ingredients

1. Jojoba oil – 2.5 ml
2. Vanilla extract – 1.5 ml¹⁴
3. Water – (optional for binding q.s.)



Procedure :

1. In a mixing bowl add all the dry ingredients. Mix well to ensure there are no lumps.
2. Add vitamin C to the dry ingredients and mix thoroughly to ensure even distribution.
3. In a separate bowl add jojoba oil and vanilla extract.
4. Slowly add the wet ingredients to the dry ingredients with constant mixing.
5. If the mixture is too dry, add water with the help of a spray bottle to help the ingredients bind. The mixture should hold shape when squeezed without any crumbling
6. Once the right consistency is achieved, pack the mixture into moulds and press firmly to ensure it is compacted
7. Keep the bath bombs for about 24 hours to help them set. After they are completely dry, remove them from the moulds and store them in an airtight container

3.2.2 Lavender bath bombs¹⁵

Dry ingredients

1. Baking soda – 25 gm
2. Citric acid – 12.5 gm
3. Cornstarch – 12.5 gm
4. Epsom salt – 12.5 gm
5. Vitamin C powder – 1gm

Liquid ingredients

1. Jojoba oil – 2.5 ml
2. Lavender essential oil – 1 ml¹⁶
3. Water - (optional for binding q.s.)



Procedure :

1. In a mixing bowl add all the dry ingredients. Mix well to ensure there are no lumps.
2. Add vitamin C to the dry ingredients and mix thoroughly to ensure even distribution.
3. In a separate bowl add jojoba oil and lavender essential oil.
4. Slowly add the wet ingredients to the dry ingredients with constant mixing.
5. If the mixture is too dry, add water with the help of a spray bottle to help the ingredients bind. The mixture should hold shape when squeezed without any crumbling.
6. Once the right consistency is achieved, pack the mixture into moulds and press firmly to ensure it is compacted.
7. Keep the bath bombs for about 24 hours to help them set. After they are completely dry, remove them from the moulds and store them in an airtight container.

3.2.3 Coconut coffee bath bombs

Dry ingredients

1. Baking soda – 25 gm
2. Citric acid – 12.5 gm
3. Cornstarch – 12.5 gm
4. Epsom salt – 12.5 gm
5. Vitamin C powder – 1 gm
6. Coffee powder – 1 gm^{17,18,19}

Liquid ingredients

1. Coconut oil – 2.5 ml²⁰
2. Water - (optional for binding q.s.)

Procedure :

1. In a mixing bowl add all the dry ingredients. Mix well to ensure there are no lumps.
2. Add vitamin C to the dry ingredients and mix thoroughly to ensure even distribution.
3. Slowly add the coconut oil to the dry ingredients with constant mixing.
4. If the mixture is too dry, add water with the help of a spray bottle to help the ingredients bind. The mixture should hold shape when squeezed without any crumbling.
5. Once the right consistency is achieved, pack the mixture into moulds and press firmly to ensure it is compacted.
6. Keep the bath bombs for about 24 hours to help them set. After they are completely dry, remove them from the moulds and store them in an airtight container.



4. RESULTS AND DISCUSSION

4.1 Results²¹

1. Physical tests

| Parameter | Vanilla | Lavender | Coconut-coffee |
|-----------|---|--------------------------------|--|
| Shape | Seashell | Seashell | Seashell |
| Smell | Characteristic sweet smell (vanilla-like) | Strong relaxing smell | Coffee and chocolaty smell with coconuts |
| Colour | White | Faint pink with purple streaks | Brown |

2. Determination of pH: The pH determination is done by dissolving a bath bomb in 500 ml water. pH is measured using the pH paper strips.
 1. Vanilla: 6
 2. Lavender: 7
 3. Coconut-coffee: 6
3. Determination of effervescence time: The bath bomb is dropped into 500 ml water. The time is taken till there is no more effervescence occurring
 1. Vanilla: 28 sec
 2. Coconut coffee: 34 sec
 3. Lavender: 23 sec
4. Skin irritation test: The bath bombs are applied on the upper underarm of the human subject. The region is marked with a blue marker and it is observed for 24 hrs. no reaction was observed hence it is concluded that the bath bombs don't cause any skin irritation.
5. Stability testing: The bath bombs are kept below room temperature for 2 weeks and changes are observed. The changes observed in the prepared samples of bath bombs was
 1. Vanilla: The colour turned to faint pink from white
 2. Coconut coffee: The colour remained the same
 3. Lavender: the colour turned from white to pink

4.2 Discussions

Applications :

Aromatherapy has many applications in relaxation, stress relief, mood enhancement, muscle relaxation and skincare. Also, bath bombs play an important role in skin moisturization rituals.

The sweet and comforting aroma of vanilla promotes relaxation, reduces stress, and uplifts the mood. Vanilla also has antioxidant properties that can help soothe and nourish the skin, leaving it feeling soft and refreshed. Overall, vanilla bath bombs provide a spa-like experience that can help you unwind and rejuvenate after a long day.

The relaxing aroma of lavender helps reduce stress and anxiety and promotes better sleep. Lavender also has antibacterial and anti-inflammatory properties that can help soothe the skin and reduce irritation. Overall, lavender bath bombs provide a spa-like experience that can help you relax and unwind after a long day.

The combination of coconut oil and coffee essential oil creates a refreshing and stimulating scent that can help reduce fatigue and uplift the mood. Coconut oil also provides moisturizing properties that nourish the skin, leaving it feeling soft and hydrated. Overall, coconut-coffee bath bombs provide a revitalizing spa-like experience

4.2.1 Vanilla Bath Bombs

- a. **Aromatherapy:** Vanilla has a warm, sweet scent known for its calming and comforting effects.²² When you use the bath bomb aroma fills the air and creates a soothing atmosphere which reduces stress, and anxiety and helps in relaxation. The scent can make you feel pleasant and improve your mood by remembering soothing moments²³
- b. **Moisturization:** Vanilla extracts in bath bombs help enhance the moisturizing effects of moisturizing contents such as jojoba oil.²⁴ This can help hydrate and nourish the skin leaving it feeling soft, smooth, and moisturised. This can be helpful for rejuvenation of dehydrated skin.²⁵
- c. **Skin soothing:** vanilla contains anti-inflammatory properties that help in soothing irritated skin.²⁶ Vanilla bath bomb is useful in skin conditions like sensitives, and eczema dermatitis. They help to reduce redness, itching and irritation.²⁷

- d. **Fragrance:** the sweet and rich indulgent fragrance of vanilla lingers on your skin after use of the bath bomb, providing a soft and pleasant scent that lasts for hours. Thus there is an additional benefit of adding a natural scent to your body without using additional synthetic perfumes.²⁸
- e. **Relaxation and stress relief:** Using a vanilla bath bomb can help you unwind and relax. Using vanilla bath bombs will enhance the bath experience by adding a touch of luxury. The fizzing action and the release of fragrance make the bath more enjoyable and spa-like²⁹



4.2.2 Lavender Bath Bomb

- a. **Aromatherapy:** lavender is known to have benefits like reducing headaches, promoting better digestion, and overall enhancement of mood.³⁰ The benefits may vary from person to person, most people find the scent of lavender has a positive impact on their overall well-being.³¹
- b. **Skin-soothing:** lavender has natural anti-inflammatory and antiseptic properties, making it beneficial for soothing irritated skin. Lavender bath bombs can help with skin conditions like psoriasis and insect bites.³² The anti-inflammatory activity of lavender helps in reducing redness
- c. **Stress relief:** lavender is known for its stress-relieving properties. Using a lavender bath bomb helps lower cortisol levels in the body which helps in promoting a sense of calmness, well-being & improved sleep.³³
- d. **Improved sleep:** the relaxing effects of lavender can help improve sleep quality. Taking a bath with a lavender bath bomb before bedtime can help you relax and unwind, making it easier to fall asleep and experience a more restful night's sleep.
- e. **Muscle relaxation:** lavender has light analgesic properties. This makes a lavender bath bomb ideal for relieving muscle aches and pains.³⁴



Coconut-coffee Bath Bomb

- a. **Exfoliation:** The coffee topically acts as a natural exfoliant, and helps to remove dead skin cells and unclog pores.³⁵ This can improve the texture and appearance of the skin making it smooth and radiant.

- b. **Antioxidant protection:** Both coffee and coconut oil are rich in antioxidants which help protect skin from damage by free radicals.^{36,37} This helps prevent premature ageing and keep skin young and healthy.
- c. **Moisturization:** Coconut oil is a natural moisturizer that helps in the hydration and nourishment of skin.³⁸ It also helps in improving the skin elasticity and prevent dryness. This makes the skin look soft and supple.³⁹
- d. **Skin soothing:** Coconut oil and coffee both have anti-inflammatory properties that help soothe and calm irritated skin. This can be helpful in people with conditions like eczema, psoriasis and acne.⁴⁰
- e. **Aromatherapy:** The combination of coconut and coffee creates a rich aroma that helps to stimulate the senses and improve mood. The smell also helps to reduce stress, and anxiety thus promoting a sense of relaxation and well-being
- f. **Stress relief:** The combination of coconut oil and coffee essential oil creates a soothing scent that reduces stress. Coffee's aroma uplifts the mood⁴¹, while coconut oil moisturizes the skin, leaving you feeling refreshed after a bath.
- g. **Improved circulation:** The caffeine in coffee helps to improve blood circulation when applied to the skin, which makes the skin supple and healthy and also reduces the appearance of cellulite and stretch marks.⁴²



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