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FORMULATION AND EVALUATION OF ESSENTIAL OIL FROM HIBISCUS ROSA SINENSIS

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Abstract:

The present study focuses on the formulation and evaluation of essential oil extracted from Hibiscus rosa-sinensis, a traditionally valued medicinal plant known for its antioxidant, anti-inflammatory, and skin-nourishing properties. Fresh hibiscus petals were subjected to hydro-distillation for essential oil extraction, followed by formulation into a stable cosmetic preparation. Physicochemical parameters such as color, odor, pH, viscosity, and stability were analyzed to ensure quality and consistency. The essential oil was further evaluated for antimicrobial activity, antioxidant potential, and compatibility with common cosmetic excipients. Results indicated that the Hibiscus rosa-sinensis essential oil possesses significant bioactive potential, making it suitable for use in skincare and therapeutic formulations. The study concludes that essential oil derived from hibiscus can be an effective natural ingredient for herbal cosmetic products due to its safety profile and multifunctional properties.

Keywords: *Hibiscus rosa-sinensis, Essential oil formulation, Hydro-distillation, Physicochemical evaluation, Antioxidant activity, Antimicrobial properties.*

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INTRODUCTION:

Nature is a vital part of human life, providing everything we need to survive and thrive. Our basic needs, such as food, clothing, and shelter, all come from natural resources. Another important necessity is maintaining good health, and this is where plants play a major role. For thousands of years, people have used plants as a source of medicine, relying on nature to treat illnesses and support well-being. This knowledge about using herbs and plants has been passed down from generation to generation, making herbal medicine a key part of traditional healthcare systems around the world.

Even today, many people continue to use herbal remedies for health issues because they are easily available, affordable, and have fewer side effects compared to modern medicines. In fact, the World Health Organization (WHO) reports that more than 80% of the world's population depends on herbal medicine as their main form of healthcare. This shows that even with the development of modern medicine, natural remedies still play a huge role in keeping people healthy.

Among the many medicinal plants, *Hibiscus rosa-sinensis*, commonly known as hibiscus, stands out. This beautiful flowering plant is often recognized for its large, colourful blossoms, but it also has a long history of being used for its healing properties. In various cultures, hibiscus is valued not just for its beauty, but for its ability to help with different health problems. For example, it is used in traditional medicine to treat digestive issues, such as upset stomach, and to soothe skin problems like rashes. The flowers, leaves, and even the roots of the hibiscus plant contain natural compounds that are thought to have health benefits.

People are becoming more interested in herbal remedies like hibiscus because they are considered safer and have fewer side effects than some modern medicines. Hibiscus is particularly popular for its potential benefits in lowering blood pressure, helping to manage weight, and boosting the immune system. It is often consumed as a tea, in which the dried flowers are steeped in hot water to make a refreshing and health-boosting drink. In some cultures, the plant is also used to make natural hair and skin treatments.

Figure 1: Bud of Hibiscus flower, Hibiscus flower, Petals of Hibiscus, Young Plant

Therefore, it is important to protect plants like hibiscus and other medicinal herbs. This means not only using them responsibly but also taking steps to conserve their natural habitats. By doing so, we can ensure that future generations can benefit from the healing properties of these plants and continue the traditions that have been part of human culture for thousands of years. The use of hibiscus in traditional medicine is a reminder of how deeply connected we are to nature and how essential it is to preserve it for our well-being.

HISTORY:

The hibiscus flower (*Hibiscus rosa-sinensis*) has a long and interesting history, with roots in tropical Asia and the Pacific Islands. Over time, it spread to different parts of the world, including Africa, India, China, and the Americas, where it became important in cultural traditions, medicine, and art.

- In ancient times, hibiscus was admired for its bright colours and beauty. In Egypt, people drank hibiscus tea to cool down in the hot weather, and the flower was also used in skincare.
- In China, hibiscus has long been a symbol of wealth, fame, and beauty. It was also used in traditional medicine to improve health.
- In India, hibiscus is linked to Hindu religious rituals and is often associated with the goddess Kali. The flower represents the divine feminine, and its bright red petals are seen as a sign of power and energy.
- In Hawaii, hibiscus is known as "pua aloalo" and is the state flower. People wear it behind their ears as a decoration. Wearing it on the left means someone is taken, and wearing it on the right means they are single.
- In places like Tahiti, hibiscus flowers are used in traditional garlands called leis. The flower is a symbol of beauty, grace, and hospitality

  Hibiscus oil, made from the flowers or leaves, has also been used for a long time, especially in traditional beauty and health practices.
- In ancient Indian Ayurvedic practices, hibiscus oil was used for hair care. It is thought to help prevent hair loss, reduce dandruff, and support hair growth. The oil is made by soaking hibiscus flowers in a base oil, like coconut oil, and then using it as a hair treatment.
- The cooling effect of the oil was also used to calm irritated scalps and soothe the skin.
- In African traditions, hibiscus oil was used to moisturize the skin and help with minor skin problems, such as sunburns.
- The oil was also used to add shine to hair and make it easier to manage.

MORPHOLOGY:

The morphology of *Hibiscus rosa-sinensis*, commonly known as the Chinese hibiscus or rose mallow, includes various distinct structures:

Roots: *Hibiscus rosa-sinensis* has a fibrous root system, which provides stability and absorbs water and nutrients effectively. The roots are usually shallow but can spread widely in the soil.

Stem: The stem is woody at the base and herbaceous towards the top. It is usually erect, green when young, and turns woody with age. The stem is cylindrical and supports the leaves and flowers.

Leaves: The leaves are simple, alternate, and have an ovate shape with serrated (toothed) edges. They are usually dark green, glossy, and measure about 4-8 inches in length. The leaves contain a prominent midrib and venation.

Flowers: The most notable part of the hibiscus is its large, showy flowers, which can range in colour from red, pink, yellow, white, to orange. They are typically about 4-6 inches in diameter. The flower is complete and has five petals arranged in a radial symmetry, making it actinomorphic. *Hibiscus rosa-sinensis* is characterized by its single or double flowers, with stamens and pistils fused into a prominent central column.

Fruit: The fruit of *Hibiscus rosa-sinensis* is a small, five-lobed capsule that splits open when mature to release seeds. However, this species rarely produces seeds, as it is often propagated through cuttings.

HABITAT:

Hibiscus rosa-sinensis thrives in warm, tropical, and subtropical climates, making it well-suited to regions with mild winters and high humidity. Here are some specific habitat features for this species:

Climate: It prefers a tropical to subtropical climate, with temperatures ranging from 60°F (15°C) to 95°F (35°C). It does not tolerate frost, and freezing temperatures can damage or kill the plant. Ideal humidity is moderate to high.

Sunlight: *Hibiscus rosa-sinensis* requires full sun to partial shade. Full sun exposure results in more vibrant blooms, while partial shade can protect it in especially hot climates.

Soil: This species grows best in well-drained, slightly acidic to neutral soils (pH 6.0 to 7.5). The soil should be rich in organic matter and retain moisture without becoming waterlogged. Sandy loam or loamy soil types are preferred.

Watering: The plant needs consistent moisture, especially in warm and dry conditions, but it is also somewhat drought-tolerant once established. Good drainage is essential to prevent root rot.

Natural Distribution: While native to East Asia, *Hibiscus rosa-sinensis* is cultivated widely in tropical and subtropical regions worldwide, including in gardens and parks for its ornamental value.

These conditions help *Hibiscus rosa-sinensis* produce vibrant, large flowers, making it a popular ornamental shrub in warm climates.

TAXONOMICAL CLASSIFICATION:

Table.1: Taxonomical classification

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Malvales
Family	Malvaceae
Genus	Hibiscus
Species	Hibiscus rosa sinensis

PHYTOCHEMICAL CONSTITUENTS:

The phytochemical constituents of *Hibiscus rosa-sinensis* (commonly known as hibiscus) contribute to its traditional use in herbal medicine and cosmetics.

Studies reveal a variety of bioactive compounds with potential health benefits. Key constituents include:

Flavonoids: These are abundant in hibiscus and include anthocyanins, which give the flower its vibrant color and offer antioxidant, anti-inflammatory, and antimicrobial properties. Specific anthocyanins in hibiscus are cyanidin, delphinidin, and quercetin.

Polyphenols: Hibiscus contains various polyphenols, which have strong antioxidant effects. These include ellagic acid, caffeic acid, and chlorogenic acid.

Alkaloids: Some alkaloids present in hibiscus are known for their biological activity, including potential cardiovascular benefits.

Saponins: Saponins in hibiscus may contribute to its cholesterol-lowering properties and have been shown to have immune-boosting and antimicrobial effects.

Tannins: Tannins are polyphenolic compounds that may exhibit antimicrobial and astringent properties, making hibiscus beneficial for skin health.

Polysaccharides: These complex carbohydrates have potential immunomodulatory and anti-inflammatory effects.

Organic Acids: Hibiscus is rich in organic acids like citric, malic, and tartaric acids, which contribute to its sour taste and offer antioxidant and antimicrobial benefits.

Terpenoids: Terpenoids, including beta-carotene and various essential oils, provide antioxidant properties and contribute to hibiscus's therapeutic effects.

GEOGRAPHICAL DISTRIBUTION:

Hibiscus rosa-sinensis is widely distributed across tropical and subtropical regions due to its ability to thrive in warm climates. Here's an overview of its geographical distribution:

Native Region: The exact native range of *Hibiscus rosa-sinensis* is not definitively known, but it is believed to be indigenous to East Asia, particularly in regions like China, India, and the Pacific Islands.

Asia: Common throughout tropical and subtropical Asia, especially in China, India, Malaysia, Thailand, and Indonesia.

Pacific Islands: Widely found in the Pacific, including the Philippines, Fiji, and Hawaii.

Africa: Found in East Africa and is widely cultivated in several African countries, both as an ornamental plant and for traditional medicinal uses.

The Americas: Naturalized in parts of Central and South America, including Brazil and Mexico. It's also widely cultivated in the Caribbean and the southern United States, particularly Florida and Texas.

Australia: Grown across tropical and subtropical regions of Australia, where it's valued for its ornamental beauty in gardens.

MODERN PHARMACOLOGICAL USES:

1. Antioxidant Properties
   Hibiscus contains high levels of flavonoids, anthocyanins, and phenolic compounds, which are known for their antioxidant properties. These compounds help combat oxidative stress, reducing cell damage and potentially lowering the risk of chronic diseases.
2. Antimicrobial and Antifungal
   Hibiscus extract has shown antimicrobial and antifungal activity, which may be effective against bacteria like *E. coli*, *Staphylococcus aureus*, and certain fungal strains. This property supports its use in treating infections and skin conditions.
3. Cardiovascular Health
   Hibiscus tea is commonly used to help manage blood pressure and cholesterol levels. Studies suggest that hibiscus extracts may help lower LDL cholesterol and triglycerides, reducing the risk of heart disease. Its diuretic effect also aids in controlling blood pressure.
4. Anti-inflammatory and Analgesic
   The anti-inflammatory properties of hibiscus are beneficial in treating inflammatory conditions like arthritis and soothing muscle pain. Its analgesic effects make it a useful traditional remedy for reducing pain.
5. Antidiabetic Effects
   Hibiscus may help in managing blood sugar levels by improving insulin sensitivity and reducing glucose absorption. This is especially useful in managing type 2 diabetes and related metabolic disorders.
6. Liver Protection
   Hibiscus is also valued for its hepatoprotective properties. It may protect the liver by reducing oxidative stress and helping in detoxification processes, which is helpful for liver disorders and in protecting against liver damage.
7. Skin and Hair Health
   Hibiscus oil and extracts are often used in skincare products for their hydrating, anti-aging, and soothing effects on the skin. The plant's antimicrobial and anti-inflammatory properties make it beneficial for acne-prone skin and

conditions like eczema. For hair, hibiscus oil is used to promote growth, reduce dandruff, and strengthen hair follicles.

8. Uses in Haircare: Rich in vitamins and fatty acids, hibiscus oil is known for promoting hair growth, conditioning, and treating dandruff. It's commonly used in hair oils and shampoos for these effects.
9. Skin Moisturizer: The oil is used for its emollient properties, providing hydration and enhancing skin elasticity, which helps in anti-aging.
10. Aromatherapy: Hibiscus oil is sometimes used in aromatherapy due to its calming fragrance, which may help reduce stress and improve mood.

MATERIAL AND METHODS:

Plant collection:

Fresh flowers of *Hibiscus rosa sinensis* were collected. Flowers were washed thoroughly with distilled water.

Extraction Method:

Steam Distillation

Steam distillation is the first method used for obtaining Hibiscus oil. With this method, Hibiscus water will be obtained from hibiscus petals by using a steam distillation unit. Hibiscus water obtained from a steam distillation unit. Thin layer of oil present on surface of Hibiscus water recovers from hydrosols by using n-hexane in it, oil will be separate from n-hexane by distillation. A thin layer of oil is recovered from hydrosols by using organic solvents, n-hexane which was added to hydrosols all the oil was extracted from hydrosols and two layers formed (aqueous and organic), these two surfaces separated using separating funnel and upper organic layer will be preserve for further process. Oil was separated from organic solvent (n-hexane) by using a process of distillation using a recovery 11 evaporator at 45°C and the remaining concrete oil was collected into another flask to remove moisture from concrete oil sodium sulphate (2gm) was added to this concrete oil and was filtered through a filter paper in this way concrete oil was obtained. To get absolute oil from concrete oil a minimum volume of absolute alcohol was added in the concrete oil. All the natural waxes were removed by absolute alcohol. These natural waxes were filtered through filter paper. Now absolute alcohol was removed by distillation by using a rotary evaporator, as explained above. Last traces of n-hexane were removed by bubbling of nitrogen gas through this oil. In this way Hibiscus oil was obtained by using steam distillation.

Evaluation of Hibiscus oil

1) pH determination:

The pH meter use for pH determination i.e., pH of Hibiscus oil is between 5.5-7.0

2) TLC Test:

1. The extracts were analysed using aluminium TLC plates coated with silica gel with mechanical pipette.
2. The extract was Deposit 1cm from bottom of the plate and space out 1.5 cm from each other
3. The plates were placed inside TLC chromatography tank containing the mixture ethyl acetate: Methanol: ammonium hydroxide (85:10:5) total run of mobile phase was 18 cm after that spray TLC plate with 15ml of reagent ferric chloride: iodine.
4. The reagent was prepared by mixing equal volume of two solution a) 1g of iodine dissolve in 25 ml of acetone. b) 2/5 g of ferric chloride and 5g tartaric acid both dissolve 25ml of water the place it in hot air oven for dry.
5. After drying the spot are visualized.

3) Antibacterial activity:

1. The antibacterial activity of the hibiscus essential oil was evaluated using the agar diffusion method. The following procedure was employed.
2. Tryptone soya agar medium was prepared and poured into petri dishes. After the agar solidified, a bacterial suspension was evenly spread over the surface of the agar.
3. The extracted hibiscus essential oil was applied on the surface of the inoculated agar. The petri dishes were then incubated to allow the oil to interact with the bacteria.
4. The antibacterial activity was assessed by measuring the zone of inhibition around the oil application, indicating its effectiveness in preventing bacterial gr 4) Physical appearance

The prepared product's physical characteristics, color, and texture Herbal serum samples were examined

1. Test for homogeneity

A dry, spotless glass slide was covered with the herbal serum and placed a glass lid on it. The appearance was examined in the illumination. The mixture was additionally examined visually for aggregates, homogeneity, or floccules.

RESULT:

Extraction of essential oil from *Hibiscus rosa sinensis* was perform successfully. The antibacterial activities of oil of *H. rosa sinensis* flowers was carried out against three human pathogens such as *Staphylococcus aureus*, *Bacillus subtilis* and *E. coli*.

In antibacterial activity of essential oil of hibiscus flowers show following result:

Table.2: Result of antibacterial activity of Hibiscus oil

	B. subtilis.	*S. aureus.*	*E. coli.*
Essential oil	-	-	-

Fig.6: Collected flower samples

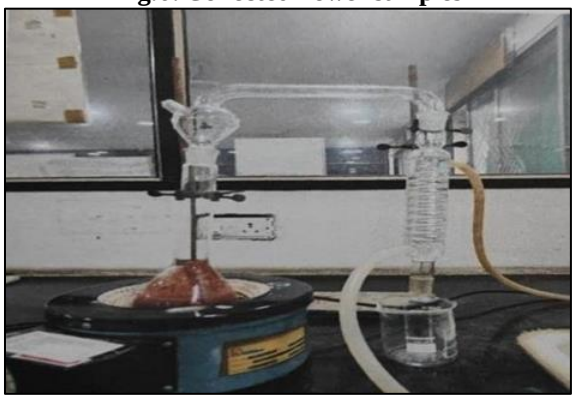

Fig.7: Extraction of hibiscus oil by steam distillation

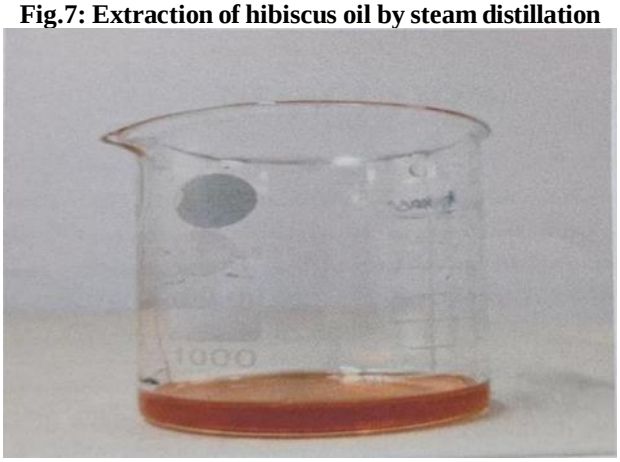

Fig.8. Extracted essential oil of hibiscus flower

DISCUSSION:

The extraction of essential oil from *H. rosa sinensis* was accomplished through the steam distillation process, closely following the procedures outlined in the research paper authored by Younis, et al., (2006).

We further investigated the antibacterial activity of this essential oil against three human pathogens, specifically *B. subtilis, S. aureus*, and *E. coli*. It's worth noting that there is no existing research paper that parallels this particular investigation.

CONCLUSION:

The research work discussed in the provided text is focused on the extraction and evaluation of the antibacterial properties of different components of *Hibiscus rosa-sinensis*, a flowering plant belonging to the Malvaceae family. Specifically, the study explores the potential use of aqueous extracts and essential oil from *Hibiscus rosa-sinensis* for combating infections caused by human pathogens. The study examines different extraction methods and their effects on antibacterial activity against three pathogens: *Staphylococcus aureus, Bacillus subtilis,* and *Escherichia coli.*

Essential Oil: In contrast, the essential oil extracted from *Hibiscus rosa-sinensis* does not demonstrate significant antibacterial activity against the pathogens tested in this study, as indicated by the absence of clear zones of inhibition.

The study provides valuable insights into the potential medicinal properties of *Hibiscus rosa-sinensis* and contributes to the growing body of knowledge regarding the health benefits of this plant. However, more research is needed to better understand the active compounds and mechanisms underlying its antibacterial effects.

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