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Formulation and Evaluation Of Eco -Friendly Room Freshner Jelly Containing Mint and Neem

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ABSTRACT :

The increasing demand for natural and eco-friendly household products has encouraged the development of herbal air fresheners as alternatives to chemical-based options. This study focuses on the formulation and evaluation of an air freshener jelly using natural ingredients such as neem and mint extracts for their antimicrobial and refreshing properties, China grass (agar-agar) and gelatin as gelling agents, and mogra essential oil for fragrance. The jelly was prepared through a simple heating and mixing technique, ensuring even distribution of all components. Various formulations were evaluated based on parameters like physical appearance, pH, fragrance retention, stability, and antimicrobial activity. The results indicated that the jelly maintained its structure and fragrance over an extended period, demonstrating good stability and potential antimicrobial benefits. This herbal jelly air freshener offers a safe, biodegradable, and pleasant-smelling alternative for indoor air purification.

Keyword : Azadirachta indica, Mint, China grass, Gelatin, Anti- microbial Activity And Essential oil .

INTRODUCTION :

Freshener is a household product that can release the chemicals they contain into the air and inhaled by Consumers which are intended to dampen smells bad inside the room so as to cause the room feels comfortable. Forms of freshener on the market there are several types, among others, the solid (used for cabinets and toilets), Liquid, spray and gel. Fragrances, gel is usually laid out by hanging or placed in a place [1]

Freshener consists of two basic ingredients, namely, fragrances and solvents. Solvents there are two Types of water and oil. Fragrances that uses water-based materials are made in the form of a gel [2]. Shaped air Freshener scent gels have a relatively short stability, yet easy teruarai making it safe for the environment. In addition, the air freshener in gel dosage form is easier in terms of storage and packaging [3] The use of natural polymer and biopolymers as a raw material have several advantage such as good water solubility, ability to swell,does not produce toxicity and are biocompatible.China grass has good gel forming properties abundant in nature and it safe for the environment. Despite China grass being a good geling agent and capable of entrapping and releasing fragrance, it cannot be used alone in air freshner gel because of synersis a phenomenon where water is Coming out the gel matrix.[4]Air quality has a significant impact on human health and well-being, especially in indoor environments where people spend a large portion of their time. Many commercial air fresheners rely on synthetic fragrances and chemicals that may trigger allergies, respiratory issues, or environmental concerns [5]

As awareness grows around the risks associated with chemical-based products, there is increasing demand for natural, eco-friendly alternatives that are safe for both humans and the environmental. In this context, the development of herbal-based air freshener jellies offers a promising solution. Natural ingredients such as neem oil (Azadirachta indica) and mint oil (Mentha spp.) are well known for their antimicrobial, deodorizing, and refreshing properties [6]These plant-based oils not only contribute a pleasant aroma but also help purify indoor air by reducing microbial load. Mogra Essential oils like eucalyptus, lavender, and lemongrass are also widely used in aromatherapy for their calming, energizing, or mood-enhancing effects.[7]When used in air freshener formulations, they can offer both functional and psychological benefits, such as reducing stress or creating a relaxing atmosphere.To stabilize and present these oils in a slow-releasing, solid form, natural gelling agents like gelatin and china grass (also known as agar-agar) are utilized. These agents form a semi-solid jelly matrix that can retain fragrance for extended periods without the need for chemical preservatives[8]

This study aims to formulate and evaluate a human-friendly air freshener jelly by combining the antimicrobial benefits of neem and mint oils with the fragrance-enhancing qualities of essential oils, using gelatin and china grass as natural gelling agents. The resulting formulation is intended to be safe, sustainable, and effective for indoor use.[9]

Objective :

To ensure the product is safe, non-toxic, and suitable for human use in indoor environments. And to promote the use of biodegradable and sustainable materials in air freshener products.

Plant profile:

1.Neem:

Common name: Azadirachta indica, margosa, nimtree or Indian lilac

Biological Source : Neem consists of almost all the part of the plant which are used as drug of Azadirachta indica.

It is belong to Family :**Meliaceae**

Fig.No.1 :- Neem

Chemical Constituents : .

Various parts of the plant is used for various therapeutic and commercial purposes due to presence of different type of chemical in different parts of this plant. Some of them being :

Leaf :- quercetin, nimbosterol, nimbin

Flower :- nimbosterol, kaempferol

Bark :- nimbin, nimbidin, nimbosterol

Seeds :- Azadirachtin,Azadiradione, nimbin, vepinin.[10]

Uses :

1.Air Purification: Neem helps kill airborne bacteria and germs, making the air cleaner and healthier to breathe.[11]

2. Odor Control: Its natural deodorizing effect helps neutralize bad smells instead of just masking them.[12]

3. Insect Repellent: Neem oil can help keep mosquitoes, flies, and other insects away—making it especially useful in tropical regions.[13]

4. Non-toxic & Safe: Unlike synthetic chemicals, neem is safe for humans and pets when used properly.[14]

5. Sustainable: As a plant-based product, neem is eco-friendly and biodegradable. [15]

2.Mint :

Botanical name: Mentha piperita , Mentha arvensis or Mentha spicata

Common name : Pudina

Biological Source: Peppermint is the dried leaves or aerial parts of the plant Mentha piperita Linn., belonging to the family Lamiaceae

Fig.No.2:- Mint

Chemical Constituents :

1. Menthol – A key active compound responsible for the cooling sensation and aroma.

2.Menthone – Provides the characteristic minty smell; contribute to antimicrobial activity.

3. Isomenthone – A stereoisomer of menthone, present in smaller amounts.

4.Menthyl acetate – Adds a sweet, minty fragrance.

5. 1,8-Cineole (Eucalyptol) – Offers a refreshing scent and some respiratory benefits.

6.Limonene – A citrus-scented terpene with antioxidant propertie

Uses. :

1. Refreshing Aroma

Mint oil, especially from Mentha arvensis or Mentha piperita, provides a cool, refreshing, and uplifting scent that helps improve the indoor environment. It contributes to a pleasant atmosphere by masking or neutralizing unwanted odors.

2. Natural Antimicrobial Agent

Mint essential oil contains menthol and menthone, which possess strong antimicrobial and antifungal properties. These help in reducing airborne pathogens and maintaining a cleaner indoor air quality [16]

3. Stress Relief and Mood Enhancement

The aroma of mint has been shown to reduce mental fatigue and promote alertness. Its inclusion in air fresheners may help relieve stress and improve concentration [17]

4.Non-toxic and Safe

Compared to chemical-based air fresheners, mint-based jelly fresheners are safer and eco-friendly. When used in natural formulations with gelling agents like agar or gelatin, they are safe for children and pets.[18]

5. Insect Repellent Properties

Mint oil can repel certain insects like mosquitoes and flies, adding another functional benefit to its aromatic use in room fresheners [19]

3.Mogra

Common name : Mogra

Botanical Name: Jasminum sambac

Biological Source:

Mogra is derived from the flowers of Jasminum sambac,

which belongs to the family **Oleaceae**.

Fig. No.3 : Mogara

Chemical Constituents:

The primary chemical constituents found in Mogra include:

Essential oils (0.1–0.3%), including:

Linalool, Benzyl acetate. , Jasmone ,Indole , Methyl anthranilate

Eugenol. , Flavonoids [20]

Uses :

1.Pleasant and Long-lasting Fragrance

Mogra (Arabian jasmine) emits a rich, sweet floral scent that is highly valued in perfumery and room fresheners. It provides a naturally pleasing aroma that helps create a calming and luxurious indoor atmosphere.

2. Mood Enhancement and Relaxation

Mogra essential oil is often used in aromatherapy to relieve stress, promote relaxation, and improve sleep quality. When added to air freshener jellies, it helps reduce anxiety and mental fatigue by acting on the limbic system[21]

3. Natural Deodorizing Agent

The floral notes of mogra help neutralize unpleasant odors rather than just masking them. This makes it useful in homes, cars, and bathrooms for maintaining a fresh environment [22]

4. Non-Toxic and Safe

Unlike synthetic fragrances, mogra essential oil is plant-based and safe for everyday use in closed indoor settings. It is especially suitable for people seeking chemical-free fragrance options.

Materials and methods :

Neem Extract	**2 g**	Antibacterial activity, Repeal insects,kill insects
Mint Extract	**1 g**	Cooling, Antimicrobial activity, Strong Aroma
China Grass	**5 g**	Natural Gelling Agent
Gelatin	**2g**	Thickening gel base
(HPMC) Hydroxypropyl Methyl Cellulose	**0.8 g**	Gel Stabilizer
Propyl Glycol	**2 g**	Humectant Solvent
Sodium Benzoate	**0.2 g**	Preservatives
Distilled water	**36.5 ml**	Solvent
Colour	**q.s**	Aesthetic apperance
Mogra oil	**0.5 ml**	Fragrance and Therapeutic Benefits
Total	**50**	

Table no.1 .Formulation Table [23]

Equipment used in Herbal room freshner Jelly Prepration :

Equipment	Purpose
Digital Weighing Balance	To accurately measure ingredients in gram
Beaker	For mixing gelling agent and ingredients safety
Measuring Cylinder	To measure accurately ingredients
Hot plate	To heat and dissolve, china grass, gelatin,heat sensitive compund
Stirring rod	To ensure homogeneous mixing of the gel base.
Thermometer	For monitoring temperature when adding volatile oil

Dropper	For precise addition of essential oil and colour
Glass jar Container	Final packaging for the jelly product

Table no.2. Equipment used in Herbal room freshner jelly Prepration [24]

Method Of Prepration :

1. **Soak China Grass (Agar)**
   Soak the china grass in a portion of distilled water **(q.s)** for 15-20 min
   Heat gently until fully dissolved

2. **Add Gelatin**
   Incorporate gelatin into the warm agar solution. Continuing to heat gently until.completely dissolved

3. **Prepare HPMC**

Separately disperse HPMC in warm distilled water and allow into hydrate fully.combine this with agar ,gelatin mixture, stirring continuously to achieve a uniform gel base.

4. **Incorporate Propylene Glycol and Extract**

Add Propylene Glycol,Neem extract and mint extract to the gel base mixing thoroughly to ensure even distribution.

5. **Add Sodium Benzoate**

Dissolve sodium benzoate in a small amount of warm distilled water and add it to the mixture as a preservatives.

6 Add Essential oil and colour

Introduce the essential oil and Colorant to the gel, mixing well to achieve the desired fragrance and apperance

7 . Adjust Final Weight

Add additional distilled water to bring the total weight to the gel to 50 g

8. **Packaging**

Transfer the prepared gel into clean,sterilized container and store in cool and dry places

Several Formulation of Air Fresheners Gel Formulation :

Materials	A 1	A2	A3
Neem Extract	2. g	2 g	2 g
Mint Extract	1.g	1 g	1 g
China grass	2 .g	3 g	5 g
Gelatin	1.g	2 g	2 g
HPMC	0.5 g	0.6 g	0.8 g
Propyl glycol	1.g	2 g	2 g
Sodium benzoate	0.1 g	0.1 g	0.2 g
Distilled water	40.9 ml	39.5 ml	36.5 ml
Colour	q.s	q.s	q.s
Mogra oil	0.5 g	0.4 g	0.5 g

Table .no.4.several formulation of Air Freshener Gel Formulation

Note : A -1 Gel with 1% concentration of china grass (Agar) 1%

A-2 Gel with 2% concentration of china grass and ,

A -3 Gel with 3% concentration of china grass.

(Using formulation of batch A-3)

Air Freshener Gel Formulation

Distilled water was added to the china grass and sodium benzoate and stir until dissolved. The mixture

Was heated at a temperature of 75°C, stirring, stirring until homogeneous then lowered the temperature to 65°C,

Propylene glycol is added and stirred. Then added essential oil stirring until homogeneous, inserted in the mold and allowed to stand at room temperature[25]

Evaluation Test:

1.Irritation test

The 0.5 g quantity of each gel was applied to the normal hairless skin in an area to check for irritation and then covered With a semi-occlusive bandage for a duration of 1 hr. After the application time, the bandage was removed, the applied .Gel completely scrapped off, and the area was visually inspected for any rashes or similar symptoms. The test was Conducted for a period of 7 days. The results were expressed in terms of grades [26].

2. Wash- ability

The ability of the formulated gels to be washed was determined by applying the gel on the skin, and observing the ease And degree of washing it away with distilled water through manual scrubbing [27].

3. Physical evaluation

The formulated gel was visually evaluated for color, appearance, and transparency. The smoothness of the gel was

Estimated by rubbing the formulation between the fingers to observe the smoothness, clumps, roughness, and Homogeneity [28].

4.PH and Spreadability.

The probe of the digital pH meter was immerse in a solution made by dissolving 0.5 g of the gel formulations in 25 mL Of distilled water. Similarly, the spreadability of the gels was measured by spreading 0.5 g of the gel on a circle with a 2 Cm diameter pre-marked on a glass plate. Then, a second glass plate was placed on top.

A heavy mass was applied toThe upper glass plate to remove any trapped air and form a uniform film between the slides. The gel was then dragged With an intensity of 0.5g intensity [29]. The time needed for the top glass to force the gel to cover a distance of 2 cm was

Determined using the formula:

Spreadability(S) =Mx ÷ T

Where,

M = weight tied to the upper slide (15 g);

L = length of glass slide (2 cm);

T = time taken (sec) for the gel to cover A pre-marked distance

5. Macroscopic Stability Analysis of the Formulation

The formulated gels were visually inspected for colour, liquefaction, and phase separation. The clarity was determined .Using natural light, and a macroscopic analyses were recorded at different temperatures (4oC, 27oC, and 40oC)

6.Swelling Index

The swelling index of the prepared formulated gel was determined by taking 2.0 g of the gel in a beaker containing 10 mL of distilled water. After 1 hr, the swelled formulation was removed from the beaker and placed on a petri dish [30].

The content was re-weighed, and the swelling index calculated using the formula:

Swelling index = Swelling index = ($Wt-Wo$) x 100 ÷ Wo

Where,

Wt = weight of swollen at t time;

Wo = original weight of gel at zero time

7. Hedonic Test

Hedonic test is a method used to measure the level of preference for products using an assessment form. The minimumNumber of panelists in one test is 6 people. According to [31], the National Bureau of Standards [NBS] 2006 defined the Terms panelists follows: i) Attracted by the organic test sensory and willing to participate ii) Consistent in making Decisions

A test was conducted by Godbole to determine the level of panelist preference for the formulated air freshener gel Preparations [32].Testing was performed using 10 students as panelists, who were asked to smell the air freshener gels.

The percentage of preference for each formulation was calculated using the assessment criteria for air freshener gel

- **Table No 4.Assessment criteria of air freshener gel preparation**

Number	Criteria	Score
1	Very Fragrant	5
2	Fragrant	4
3	Moderate Fragrant	3
4	Less Fragrant	2
5	Not Fragrance	1

8.Total Liquid Evaporation:

Liquid evaporation test of gel preparation is done by weighting the gel weight each week for four Weeks. From this test, obtained gel weight loss for every week and a total weight reduction after four weeks of Storage.

Weight reduction of air freshener gels obtained by calculating the difference in weight of the gel in the Previous week (Mn-1) with a weight of gel at the time of weighing (Mn), while the total weight loss is (M4) with Weight of gel at the initial time (M0). The difference in weight is the amount of liquid that evaporates. Percent Of total liquid evaporation and percent of residual gel weight was measured by gravimetry and calculated by the formula

Formula

Total liquid evaporation percent = Mn- Mn1 ÷Mo ×100%

Residual Gel weight Percent = Mn ÷Mo ×100%

Where,

Mn : weight of gel at the time of weighing;

Mn-1 : weight of the gel in the previous week;

M0 : weight of Gel at the initial time

Results And Discussions:

In this study, Chin Grass acts as the main ingredient in the manufacture of gel, distilled water as Solvent, propylene glycol as Humectant, sodium benzoate as a preservative, Essential oil as a fragrance, and Mint Extract and Neem Extract as a antimicrobial activity, Repeal Insect

China grass ,Gelatin,Hpmc and sodium benzoate were mixed with distilled water, thus forming a gel Mass, is heated at a temperature of 75°C after gel mass is formed, the temperature was lowered to 65°C and then add essential oil, after all the ingredients well mixed homogeneous mass of gel is Poured into the mold.

Hedonic Test

A test was conducted to determine the air freshener gel formula that is preferred by the panelists, the Test of the 30 panelists were asked to smell the scent of air freshener gels and subsequently asked to fill out the Assessment form (questionnaire) that has been provided. The data obtained from the assessment sheet. Determined the preference value for each preparation by finding the average yield of all the panelists at the 95% Confidence level. Overall results of hedonic test at various time intervals and various formulas can be seen in

- **Table No 5.Results of hedonic test at various time intervals and various formulas**

Number	Time	A1 Formula	A2 Formula	A3 Formula
1	W1	Moderate Fragrant	Fragrant	Very Fragrant
2	W2	Less fragrant	Moderate Fragrant	Fragrant
3	W3	No fragrant	Less fragrant	Moderate Fragrant
4	W4	No fragrant	No fragrant	Less fragrant

Note :

A1 : Gel with 1% concentration of carrageenan 1%; A2 : Gel with 2% concentration of carrageenan; A3 : Gel with 3% concentration of carrageenan; W1 : first week; W2 : second week; W3 : third week; W4 : fourth Week

Hedonic test results data showed that scented of gel air freshener is the most preferred formula A3 with 3% concentration of carrageenan. Formula with a low concentration of carrageenan is less preferred. The higher The concentration of carrageenan then the ability to maintain scented gel formulation to better and more favored. This happens because the smell will be stored by carrageenan which has been expanding into a gel and released

Percent of Total Liquid Evaporation and Percent of Residual Gel Weight:

Total liquid evaporation determined by weighting gel air freshener and calculate weightings for four Weeks. Preparations weight were missing an essential oil and water evaporation of gel. Therefore, the major Weight loss is inversely with the endurance of the gel.The smaller the weight lost or the greater weight of The remaining mean less volatile oil and water to evaporate, the greater the resistance scented gel[26-27]

Gel formula has a same initial weight, then for updates every week, calculating the weight loss gel Gravimetrically, by calculating the value of the remaining weight percentage of the initial weight of the product.

Freshener gel product that has value to the remaining weight percentage of initial weight is higher evaporation Means having a smaller, in other words have a higher resistance fragrance. The percentage of residue gel of the gel air freshener for 4 weeks is shown in Table 4.

Number	Time	A1 Formula	A2 Formula	A3 Formula
1	W1	85,34	90,44	95,53
2	W2	75,15	80,33	85,28
3	W3	60,02	70,11	79,55
4	W4	41,55	59,54	72,45

Table No.6.Percentage of residual gel weight of the gel air freshener

Note : A1 : Gel with 1% concentration of carrageenan 1%; A2 : Gel with 2% concentration of carrageenan; A3 : Gel with 3% concentration of carrageenan; W1 : first week; W2 : second week; W3 : third week; W4 : fourth Week

Residual gel weight percentage of formula A3 with 3% concentration of carrageenan was the highest, Means the ability of formula A3 in maintaining the evaporates substance in a formula better than the formula A1 and A2. This is in line with research that states that carrageenan is a gelling agent that is able to maintain the content of the gel preparation[28-29]. Percentage of total liquid evaporation of air freshener gel for four weeks can been seen

Number	**Formula**	**Total liquid evaporation %**
1	A1	56,45
2	A2	40,42
3	A3	28,56

Table No 7.Total liquid evaporation of air freshener gel for four weeks

Note : A1 : Gel with 1% concentration of chi Grass 1%; A2 : Gel with 2% concentration of china grass; A3 : Gel with 3% concentration of china grass

The total shrinkage lowest to the highest weight in sequence is the formula A1 is 56.45%, ie 40.42%

Formula A2, A3 formula that is 28.56%. Formula A1 contains little china grass so that evaporation is higher Than the melting substances A2 and A3 formulas that contain more china grass, and the more a formula Containing china Grass then the slow evaporation of the liquid. Formula A1 is less preferred by the panelists While A2 and A3 preferred by the panelists as more contains china grass. From the test results organoleptic test By 30 panelists can be seen that the formula A3 is the most preferred by the panelists and still meet the requirements, namely at a temperature of 35 ° C can last up to 4 weeks[30,31]

Fig. No.4.Final Product

Conlusions:

China grass can be formulated as a gel forming base in the preparation of air freshener with fragrance Of essential Oil .The concentration of china Grass as an air freshener with the most preferred base china Grass and gelatin Last a long time is a concentration of 3%.

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