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Research Article

A Novel Development of Eco-Friendly Herbal Perfume Using Natural Floral Extracts

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ABSTRACT

The present study focuses on the development of an eco-friendly herbal perfume using natural floral extracts obtained from rose, mogra, and night-blooming jasmine flowers. Synthetic perfumes often contain harmful chemicals that may cause skin irritation and environmental pollution. Therefore, herbal perfumes prepared from natural plant sources provide a safer and sustainable alternative. Floral extracts were prepared using solvent extraction and blended with natural fixatives and essential oils to enhance fragrance retention. The formulated perfume was evaluated for fragrance stability, skin compatibility, pH, appearance, and longevity. The developed herbal perfume exhibited a pleasant aroma, good stability, and minimal adverse effects, making it suitable for cosmetic and aromatherapy applications. Objective: The objective of this project was to develop an eco-friendly herbal perfume using natural floral extracts of Rose, Mogra, and Night-Blooming Jasmine as sustainable alternatives to synthetic perfumes. The study aimed to formulate a skin-friendly, biodegradable, and pleasant-smelling natural perfume with good fragrance retention and stability. MethodFresh flowers were collected and cleaned before extraction. The floral extracts were prepared using the solvent extraction method with ethanol. The obtained extracts were filtered and blended in suitable proportions with ethanol, glycerin, and sandalwood oil as a natural fixative. The prepared perfume was stored in amber- colored bottles for maturation. Evaluation tests such as odor, appearance, pH, stability, skin irritation, and fragrance longevity were carried out. Result The formulated herbal perfume showed a pleasant and refreshing floral aroma with good stability and fragrance retention. The perfume remained clear without phase separation during storage. The addition of sandalwood oil improved the lasting effect of the fragrance. Skin irritation tests indicated that the formulation was safe and suitable for topical application. Conclusion: The study successfully demonstrated that natural floral extracts can be effectively used to prepare an eco-

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friendly herbal perfume. The developed formulation was stable, skin compatible, biodegradable, and free from harmful synthetic chemicals. Therefore, the herbal perfume can be considered a sustainable and safe alternative to commercial synthetic perfumes.

INTRODUCTION

Perfumes have been used for centuries for personal grooming, cultural practices, and therapeutic purposes. In modern times, most commercial perfumes are manufactured using synthetic aromatic chemicals that may cause skin irritation, allergies, respiratory problems, and environmental pollution. Increasing awareness about the harmful effects of synthetic ingredients has created a growing demand for natural and eco-friendly cosmetic products. Herbal perfumes prepared from plant-based materials provide a safer, biodegradable, and environmentally sustainable alternative to synthetic fragrances.[1]

Natural flowers are rich sources of volatile oils and aromatic compounds responsible for their pleasant fragrance. Among them, Rose is widely known for its sweet floral aroma and calming properties. Mogra possesses an intense and refreshing fragrance commonly used in traditional perfumery and aromatherapy. Night-Blooming Jasmine is famous for its strong nocturnal fragrance and soothing sensory effects. These flowers contain natural essential oils that can be extracted and blended to prepare herbal perfumes with unique aromatic characteristics.

Eco-friendly herbal perfumes are advantageous because they are free from toxic synthetic chemicals, alcohol-heavy formulations, and artificial fixatives. They are generally skin-friendly, biodegradable, and less harmful to the environment. In addition to providing fragrance, natural floral extracts may also offer aromatherapeutic benefits such as stress relief, relaxation, and mood enhancement.[2]

The present project focuses on the development of an eco-friendly herbal perfume using natural floral extracts of rose, mogra, and night-blooming jasmine. The study involves extraction of floral essence, formulation of the perfume using natural ingredients, and evaluation of its fragrance stability, skin compatibility, and overall quality. This work aims to promote sustainable cosmetic products and encourage the use of herbal alternatives in the perfume industry.

MATERIALS AND METHODS

Fresh flowers of rose, mogra, and night-blooming jasmine were collected early in the morning to preserve maximum fragrance. The flowers were washed gently with distilled water to remove dust and impurities and then air-dried at room temperature. ethanol (95%) Distilled water Glycerine were collected from S K Enterprises Pune, Maharashtra. All other chemicals and reagents used in the study were analytical grade.[3]

Materials Required

ANALYTICAL METHOD

The extract of flower were analyzed for various parameter Organoleptic Evaluation Determination of pH Solubility Studies Phytochemical Screening Compatibility Study Fragrance retention test Skin irritation test Evaporation test specific gravity test and stability test various parameters are used to study to evaluate the formulation.

PREPARATION OF METHOD

Extraction of Essential Oils by Clevenger Apparatus Fresh flowers of rose, mogra, and night-blooming jasmine were collected early in the morning. The flowers were washed gently with distilled water to remove dust and impurities. The cleaned flowers were chopped or crushed lightly to increase the surface area for extraction. Setup of

Clevenger Apparatus**.** A clean round-bottom flask was connected to the Clevenger apparatus and condenser. The apparatus was checked properly to avoid vapor leakage. Hydro-Distillation Process**.** About 100–150 g of crushed floral material was placed into the round-bottom flask. Distilled water was added sufficiently to immerse the flowers completely. The flask was heated using a heating mantle. The water started boiling, producing steam containing volatile aromatic oils. The steam carrying essential oils passed through the condenser where it cooled and converted into liquid. The condensed liquid collected in the graduated tube of the Clevenger apparatus. Due to density differences, the essential oil separated from water and accumulated in the oil collection chamber. The extracted essential oil was carefully collected using a separating funnel or dropper. The oil was stored in amber-colored airtight bottles to protect it from light and oxidation[4,5].

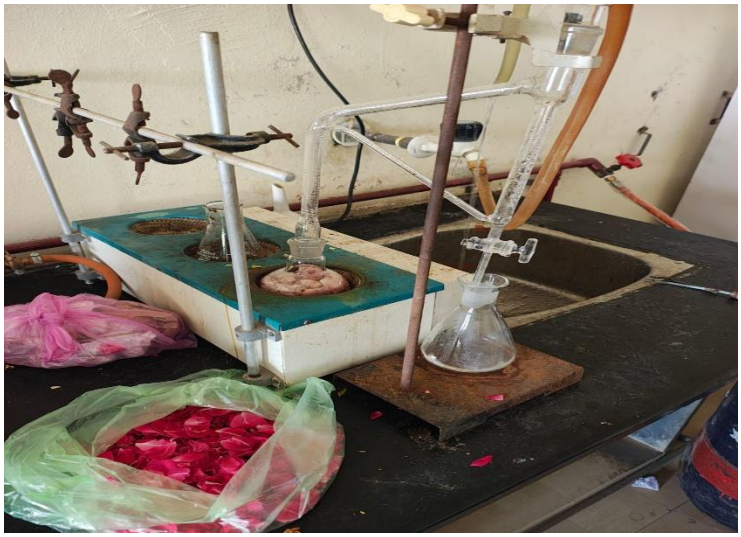

Fig No.1: Hydodistillation of Flower

EVALUATION OF EXTRACT[7,8,9]

1. Organoleptic Evaluation Take 1–2 drops of essential oil in a clean watch glass. Observe the color against white background. Smell the sample carefully to note fragrance characteristics. Record odor intensity, type, and pleasantness. Note appearance and clarity.

2. Odor Profile Analysis Apply a small amount of oil on blotter paper. Allow it to stand for 1–2 minutes. Smell at different time intervals (0 min, 10 min, 30 min). Record top, middle, and base notes of fragrance. Note changes in aroma over time.

3. Physical Property Testing Measure density using a specific gravity bottle or pycnometer. Determine viscosity by allowing oil to flow through a narrow tube and comparing flow time. Observe color consistency under light. Record all physical characteristics.

4. Solubility Test Take small quantity of essential oil in test tubes. Add ethanol to one tube and distilled water to another. Shake well and observe miscibility. Check for separation, precipitation, or clarity. Record observations.

5. Stability Study Store essential oil samples in amber bottles. Keep at room temperature and also in light exposure conditions. Observe periodically

for 1–4 weeks. Note any changes in color, odor, or phase separation.

6. Volatility Test Place 1–2 drops of oil on filter paper. Leave it at room temperature. Observe evaporation rate at regular time intervals. Record fragrance persistence duration.

7. Purity Test Visually inspect oil for sediments or cloudiness. Smell for any artificial or chemical odor. Check for uniform appearance without separation. Record purity observations.

8. Yield Calculation Weigh the initial amount of fresh flowers used. Measure the quantity of extracted essential oil. Calculate yield using formula:

$$\text{Yield (\%)} = \frac{\text{Weight of oil obtained}}{\text{Weight of plant material}} \times 100$$

9. Skin Compatibility Test (Patch Test) Apply a diluted form of essential oil on the inner forearm. Leave it undisturbed for 24 hours. Observe for redness, itching, or irritation. Record results carefully.

Perfume Formulation Procedure

Measured quantities of all extracted essential oils were mixed in a clean beaker. Ethanol was added slowly with continuous stirring. Glycerine was incorporated to improve smoothness and skin feel. Sandalwood oil was added as a natural fixative for long-lasting fragrance. The mixture was stirred thoroughly to obtain a uniform solution. The prepared perfume was transferred into amber-colored spray bottles. The bottles were stored in a cool and dark place for 7 days for maturation and proper blending of fragrance.

Ingredient Quantity

Rose essential oil (10ml), Mogra Essential oil (10ml), Night blooming jasmine essential oil

(10ml) Ethanol 60 ml, glycerine 5ml.

EVALUATION PARAMETER [10],[11,12]

The prepared eco-friendly herbal perfume was evaluated using the following parameters to determine its quality, stability, safety, and performance.

1. **Organoleptic Evaluation** Take a small amount of herbal perfume in a clean vial. Observe the color and clarity against white light. Smell the sample to evaluate fragrance characteristics. Note the appearance and texture visually.The perfume was examined for: Color Odor Appearance Clarity

2. **pH Determination** Take 10 mL of perfume in a clean beaker.Dip a pH strip or electrode of a pH meter into the sample. Compare the color change with standard pH chart or record digital reading. Note the final pH value. The pH of the perfume was measured using pH paper or a digital pH meter.

3. **Stability Study** Store the perfume in amber bottles at room temperature. Observe samples at regular intervals (e.g., daily or weekly).Check for color change, odor change, and phase separation. Record observations for a fixed period (2–4 weeks).The perfume was stored at room temperature and observed periodically for: Color change Turbidity Phase separation Fragrance stability

4. **Skin Irritation Test** Clean a small area of skin (usually forearm). Apply a small quantity of perfume. Leave it undisturbed for 24 hours. Observe for redness, itching, or swelling. Record results. A small amount of perfume

was applied to the skin to check for: Redness Itching Irritation Allergic reaction

5. **Fragrance Retention Test** Spray a fixed amount of perfume on skin and cotton cloth. Note the start time of application. Check fragrance intensity at regular intervals. Record the time until fragrance is no longer noticeable.

6. **Solubility Test** Take small quantity of perfume in test tubes. Add ethanol and distilled water separately. Shake well and observe miscibility. Check for precipitation or phase separation. Record results.

7. **Specific Gravity Determination** Clean and dry a pycnometer. Fill it with distilled water and weigh it. Empty and refill with perfume sample. Weigh again. Calculate specific gravity using formula:

$$\text{Specific Gravity} = \frac{\text{Weight of perfume}}{\text{Weight of equal volume of water}}$$

8. **Evaporation Test Place** 2–3 drops of perfume on filter paper or glass slide. Allow it to dry at room temperature. Observe evaporation rate and residue formation. Record observations regarding volatility and residue.

9. **Stability study of formulations** The prepared herbal perfume was filled into amber-colored glass bottles. Samples were stored under different conditions: Room temperature (25–30°C) Refrigerated condition (4–8°C) Light exposure (near sunlight/window) The samples were observed for a period of 2–4 weeks.

Observations were recorded at regular intervals (initial, 7th day, 14th day, 28th day).

RESULT

Distilled water is the only solvent for separation of oil from the material

Preparation of Extract

Table No.1: Prepration of Extract

Plant	Solvent Used	Extraction Method
Rose	Distilled water	Hydrodistillation (Clevenger)
Mogra	Distilled water	Hydrodistillation
Night-blooming jasmine	Distilled water	Hydrodistillation

Various extract was prepared by using distilled water and gel a clear essential oil from the hydro distillation

Result of extraction

Organoleptic Evaluation

Organoleptic evaluation was done by checking various parameter like colour dour appearance clarity of extract and it get clear idea regarding extract.

Table No.2: Organoleptic Parameter of Extract

Parameter	Rose Oil	Mogra Oil	Night-Blooming Jasmine Oil
Colour	Pale yellow	Light yellow	Pale greenish-yellow
Odour	Sweet floral	Strong, rich floral	Sharp musky floral
Appearance	Clear	Clear	Slightly tinted
clarity	High	High	Moderate–High

Fragrance Intensity & Longevity

Fragrance was determined by various extract like mogra nightblooming jasmin and rose and it get a clear idea regarding fragrance intensity

Table No.3: Fragrance Parameter of Extract

Parameter	Rose Oil	Mogra Oil	Night-Blooming Jasmine Oil
Initial Intensity	Medium	Very High	High
Fragrance Duration	Moderate–Long	Long-lasting	Moderate
Stability of Scent	Good	Very Good	Moderate

Physical Properties

Various Physical parameters like density viscosity Refractive index homogeneity was determined by the various extract.

Table No.4: Physical Property of Extract

Parameter	Rose Oil	Mogra Oil	Night-Blooming Jasmine Oil
Density	Moderate	Moderate	Slightly low
Viscosity	Low–Medium	Medium	Low
Refractive Nature	Clear	Clear	Slight variation
Homogeneity	Good	Excellent	Good

Solubility Test

Solubility was determined by the various extract and it showed good result

Table No.5: Solubility Parameter of Extract

Solvent	Rose Oil	Mogra Oil	Night-Blooming Jasmine Oil
Ethanol	Fully miscible	Fully miscible	Fully miscible
Water	Insoluble	Insoluble	Insoluble

Stability in Solution	Stable	Very stable	Moderately stable

Stability Study

Stability study was done by various extract and it was shoewd a good result

Table No.6: Stability Parameter of Extract

Condition	Rose Oil	Mogra Oil	Night-Blooming Jasmine Oil
Room Temperature	Stable	Highly stable	Stable
Light Exposure	Slight change	Stable	Slight degradation
Long Storage	Good	Very good	Moderate

Skin Compatibility (Patch Test)

Patch test or skin compatibility test was done by various extract and it showed a good result

Table No.7: Skin compatibility Parameter of Extract

Oil Type	Result
Rose Oil	No irritation
Mogra Oil	No irritation
Night-Blooming Jasmine Oil	No irritation Mild sensitivity in rare case

Table No.8: overall Skin compatibility Parameter of Extract

Essential Oil	Overall Quality	Perfume Suitability
Rose	High	Excellent blending agent
Mogra	Very High	Best fragrance contributor
Night-Blooming Jasmine	Moderate–High	Fixes depth and uniqueness

All three essential oils showed good physicochemical properties and are suitable for herbal perfume formulation. Among them, mogra oil exhibited the highest fragrance strength and stability, rose oil provided balance and softness, while night-blooming jasmine contributed a unique musky aromatic note enhancing overall perfume quality.

Formulation and Development of various Batches

The herbal perfume was developed using essential oils obtained from Rose, Mogra, and Night-Blooming Jasmine. Three different formulations (batches) were prepared by varying the ratio of essential oils to optimize fragrance quality, stability, and longevity.

Table No.9: Various formulations of Extract

Ingredients	F1 (Rose Dominant)	F2 (Mogra Dominant)	F3 (Balanced)
Rose oil	7.5 mL (50%)	3.75 mL (25%)	5 mL (33%)
Mogra oil	3.75 mL (25%)	7.5 mL (50%)	5 mL (33%)
Night-blooming jasmine oil	3.75 mL (25%)	3.75 mL (25%)	5.1 mL (34%)
Total essential oils	15 mL	15 mL	15.1 mL
Ethanol (95%)	80 mL	80 mL	79.9 mL
Glycerin	5 mL	5 mL	5 mL
Sandalwood oil	0.5 mL	0.5 mL	0.5 mL

Evaluation of various Batches

The herbal perfume formulations were prepared using essential oils of Rose, Mogra, and Night-Blooming Jasmine. The three batches (F1, F2, F3) were evaluated based on organoleptic properties, physicochemical parameters, stability, and fragrance performance.

Organoleptic Evaluation

Various organoleptic evaluation was done by F1 F2 and F3

Table No.10: Organoleptic Evaluation of Formulations

Parameter	F1 (Rose Dominant)	F2 (Mogra Dominant)	F3 (Balanced)
Color	Light yellow	Pale yellow	Light yellow transparent
Odor	Soft floral, mild rose note	Strong, rich jasmine floral	Well-balanced floral blend
Appearance	Clear	Clear	Clear
Overall acceptability	Good	Excellent	Very Good

Fragrance Evaluation

Various Fragrance test was done by F1 F2 and F3 from this all result are showed within Acceptable limit

Table No.11: Fragrance Evaluation of Formulations

Parameter	F1	F2	F3
Initial smell intensity	Medium	Very High	High
Fragrance character	Mild & soothing	Strong & luxurious	Harmonized floral
Top notes	Rose dominant	Mogra dominant	Balanced
Middle notes	Light floral blend	Deep floral intensity	Smooth floral mix
Base notes	Mild jasmine	Strong jasmine base	Balanced musky floral

Fragrance Longevity Test

Table No.12: Fragrance longevity Evaluation of Formulations

Parameter	F1	F2	F3
Skin longevity	3–4 hours	6–8 hours	5–6 hours
Fabric longevity	6 hours	10–12 hours	8–10 hours
Evaporation rate	Fast	Slow	Moderate
Overall performance	Moderate	Best	Good

Physicochemical Evaluation

Various physiochemical parameter like pH solubility clarity and homogeneity test was carried out by F1 F2 and F3 and from all formulation F2 formulation showed a good result

Table No.13: Physiochemical Evaluation of Formulations

Parameter	F1	F2	F3
pH	6.2–6.5	6.3–6.6	6.4–6.7
Solubility in ethanol	Complete	Complete	Complete
Clarity	High	High	High
Homogeneity	Good	Excellent	Very Good

Stability Study (4 Weeks)

Stability parameters for all formulations are done for F1 F2 and F3 the formulations are stored at various conditions like room temperature light exposure Refrigeration fragrance retention for 4 week and observed the result.

Table No.14: Stability Evaluation of Formulations

Condition	F1	F2	F3
Room temperature	Stable	Highly stable	Stable
Light exposure	Slight color change	Minimal change	Slight change

Refrigeration	Very stable	Highly stable	Very stable
Fragrance retention	Moderate loss	Minimal loss	Low loss

Skin Compatibility (Patch Test)

Skin compatibility test was done of F1 F2 and F3 and all formulations are showed a good result and no any kind of irritation was observed

Table No.15: Patch test Evaluation of Formulations

Batch	Observation
F1	No irritation observed
F2	No irritation observed
F3	No irritation observed

All (F1 = F2 = F3 equally safe) no any kind of irritation was observed.

Evaporation Test

F1: Evaporated quickly due to higher volatility of rose-based composition → lowest fragrance retention. F2: Showed slow evaporation and highest fragrance retention due to strong fixative effect of mogra oil → best performance. F3: Showed moderate evaporation rate with balanced fragrance release → medium performance.

Table No.16: Evaporation Evaluation of Formulations

Parameter	F1 (Rose Dominant)	F2 (Mogra Dominant)	F3 (Balanced)
Initial spread	Fast	Moderate	Moderate
Evaporation rate	Fast	Slow	Moderate
Time of complete evaporation	~25–35 min	~45–60 min	~35–50 min
Fragrance persistence	Short	Long-lasting	Moderate-long

The evaporation test clearly shows that F2 formulation is the most stable and long-lasting, while F1 is the most volatile and least persistent.

Specific Gravity test of formulations

Specific gravity was determined by various formulations and from all F1 F2 and F3 formulations F2 formulation showed a good result

Table No.17: Specific gravity Evaluation of Formulations

Formulation	Weight of Sample	Specific Gravity	Observation
F1 (Rose dominant)	24.8 g	0.86	Light, more volatile
F2 (Mogra dominant)	25.6 g	0.89	Slightly denser, stable
F3 (Balanced)	25.2 g	0.88	Moderate density

F1:Lowest specific gravity due to higher volatility and lighter composition. F2: Highest specific gravity indicating better oil concentration and stability. F3: Intermediate value showing balanced formulation. The specific gravity test indicates that F2 formulation is the most stable and well-structured perfume, while F1 is the lightest and most volatile among all batches.

CONCLUSION

The present study focused on the development of an eco-friendly herbal perfume using essential oils extracted from Rose, Mogra, and Night-Blooming Jasmine. The project included extraction of essential oils, formulation of three batches (F1, F2, F3), and their detailed evaluation based on physicochemical, organoleptic, stability, and performance parameters. The study successfully demonstrated that eco-friendly herbal perfumes can be effectively formulated using natural floral extracts. Among all batches, the F2 formulation is the most optimized, stable, and commercially promising herbal perfume, while F3 serves as a well-balanced alternative and F1 as a mild fragrance option suitable for light perfume users.

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Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally

DISCUSSION

No irritation in patch test (safe for topical use) Superior Fragrance Highest stability under both room and accelerated conditions Best overall consumer acceptability and cosmetic elegance

CONFLICTS OF INTERESTS

Declare none

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