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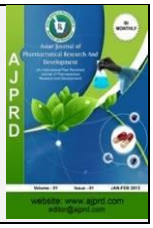

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Research Article

Formulation and Evaluation of Herbal Anti-Sweat Roll on for Summer

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ABSTRACT

The increasing preference for natural and safe cosmetic products has encouraged the development of herbal alternatives to conventional deodorants and antiperspirants. Sweating is a normal physiological process; however, the breakdown of sweat by skin microflora leads to unpleasant body odour. Synthetic antiperspirants, commonly containing aluminium salts, may reduce perspiration but are often associated with skin irritation and safety concerns on prolonged use (1,2). The present study was designed to formulate and evaluate an anti-sweat herbal roll-on using plant-based ingredients such as neem extract, aloe vera gel, alum, and essential oils known for their antimicrobial and astringent properties. The formulation was prepared by incorporating herbal extracts into a suitable aqueous base and evaluated for parameters including pH 5.8, viscosity 450 cps, spreadability 19.5g.cm/s, homogeneity was Excellent, skin irritancy was Absent,and stability was Highly Stable. The developed formulation exhibited acceptable physicochemical characteristics, maintained stability under different storage conditions, and showed no signs of irritation on application. The presence of herbal components contributed to effective control of odour-causing microorganisms. Hence, the study supports the use of herbal roll-on formulations as a safe and effective alternative to synthetic deodorants.

KEYWORDS: Herbal Roll On, Neem, Aloe Vera, Antiperspirant, Antimicrobial.

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INTRODUCTION

Sweating plays an essential role in maintaining body temperature and physiological balance. Human sweat glands, particularly eccrine and apocrine glands, secrete fluids that are initially odourless. However, microbial activity on the skin surface leads to the decomposition of sweat components, producing volatile compounds responsible for body odour (1). This issue can affect personal hygiene and social confidence, leading to the widespread use of deodorants and antiperspirants.

Deodorants primarily act by reducing or masking odour through antimicrobial agents and fragrances, whereas antiperspirants decrease sweat production by temporarily blocking sweat ducts (2). Most commercial antiperspirants contain aluminium-based compounds, which are effective but may cause adverse reactions such as skin irritation, allergic responses, and concerns regarding long-term safety. These limitations have driven interest toward the development of safer, plant-based alternatives.

Herbal formulations are gaining importance due to their compatibility with skin, lower toxicity, and additional therapeutic benefits. Plant-derived ingredients such as neem (Azadirachta indica) are widely recognized for their antibacterial properties, particularly against odour-producing microorganisms. Essential oils like tea tree oil and lavender oil possess significant antimicrobial and deodorizing effects, making them suitable for topical applications (11–13). Aloe vera is commonly used in cosmetic formulations due to its soothing, moisturizing, and anti-inflammatory properties, which help reduce skin irritation (14).

In addition to herbal ingredients, natural astringents such as alum (potassium aluminium sulphate) are used to minimize sweating by tightening skin pores without

completely blocking them. This provides a mild antiperspirant effect while maintaining normal skin function. The combination of antimicrobial agents and astringents in a single formulation can effectively control both odour and perspiration.

Roll-on dosage forms are widely accepted for topical application due to their convenience, controlled dosing, and uniform spreadability. These formulations consist of a liquid preparation applied through a rolling ball mechanism, ensuring even distribution over the skin surface. For an effective roll-on formulation, parameters such as pH, viscosity, stability, and skin compatibility must be carefully optimized (15,18).

Previous studies have reported that herbal deodorant formulations exhibit satisfactory antimicrobial activity, stability, and user acceptability, supporting their potential as alternatives to synthetic products (4–6). However, there remains a need to develop formulations that combine efficacy, safety, and stability using easily available herbal ingredients.

Therefore, the present study focuses on the formulation and evaluation of an anti-sweat herbal roll-on using selected natural components. The aim is to develop a stable, non-irritant, and effective formulation capable of reducing body odour and perspiration while ensuring user safety.

MATERIALS AND METHODS

Polyherbal Roll-On Formulation (50 mL)

Table 1: Formulation Table

Sr. No	Ingredient	Function	Batch F1	Batch F2	Batch F3
1	Potassium Alum	Antiperspirant	2g	2g	2g
2	Rose Water	Cooling and	10ml	10ml	10ml
3	Aloe Vera Gel	Skin soothing	5ml	5ml	5ml
4	Glycerin	Moisturizer	2ml	2ml	2ml
5	Lemon Extract	Antibacterial	1ml	1ml	1ml
6	Ethanol	Preservative	5ml	5ml	5ml
7	Neem Extract	Antibacterial	1ml	2ml	3ml
8	Tea tree oil	Antibacterial	0.5ml	0.5ml	0.5m
9	Green tea extract	Astringent Substitute	3ml	4ml	5ml
10	Sandalwood Oil	Fragrance	0.5ml	0.5ml	0.5ml
11	Menthol	Cooling	0.1g	0.1g	0.1g
12	Peppermint Oil	Cooling agent	0.5ml	0.5ml	0.5ml
1 3	Distilled Water	Vehicle	q.s to 50 ml	q.s to 50 ml	q.s to 50 ml

Preparation of herbal Extract:

1. Extraction of Neem Leaves (21)

Fresh neem leaves were collected, washed thoroughly with distilled water, and shade-dried for 7–10 days. The dried leaves were pulverized into a coarse powder. About 100 g of the powder was macerated with 500 mL of 70% ethanol for 72 h with occasional stirring. The extract was filtered through Whatman No. 1 filter paper and concentrated using a rotary evaporator at 40–45°C. The concentrated extract was dried and stored in an airtight container at 4°C until further use

2. Extraction of Green Tea Leaves (22)

Green tea leaves were cleaned, shade-dried, and powdered. Approximately 100 g of the powder was extracted with 500 mL of 70% ethanol by maceration for 72 h with intermittent shaking. The extract was filtered through Whatman No. 1 filter paper and concentrated under reduced pressure using a rotary evaporator at 40–45°C. The obtained extract was dried and stored at 4°C until use

3. Extraction of Lemon Peel (23)

Fresh lemon peels were separated, washed, and shade-dried for 5–7 days. The dried peels were ground into a coarse powder. About 100 g of the powder was macerated with 500 mL of 70% ethanol for 72 h. The mixture was filtered through Whatman No. 1 filter paper, and the filtrate was concentrated using a rotary evaporator at 40–45°C. The concentrated extract was dried and stored in an airtight container at 4°C until formulation

Test of Herbal Extracts (24)

1. Test for Carbohydrates

a. Molisch's Test

Procedure:

2 mL of extract was taken in a test tube and 2–3 drops of Molisch's reagent were added. Concentrated sulfuric acid was carefully added along the sides of the test tube.

b. Fehling's Test

Procedure:

Equal volumes of Fehling's solution A and B were mixed and added to the extract. The mixture was heated in a water bath.

c. Benedict's Test

Procedure:

2 mL of Benedict's reagent was added to the extract and heated for 2–5 minutes.

2. Test for Alkaloids

a. Mayer's Test

Procedure:

A few drops of Mayer's reagent were added to the extract.

b. Hager's Test
Procedure:
The extract was treated with Hager's reagent (saturated picric acid solution).

c. Dragendorff's Test
Procedure:
The extract was treated with Dragendorff's reagent.

3. Test for Cardiac Glycosides
a. Keller-Killiani Test
Procedure:
The extract was treated with glacial acetic acid containing ferric chloride, followed by careful addition of concentrated sulfuric acid.

4. Test for flavonoids
a. Alkaline Reagent Test
Procedure:
A few drops of sodium hydroxide solution were added to the extract.

5. Test for saponins
a. Froth Test
Procedure:
The extract was diluted with distilled water and shaken vigorously.

b. Foam Test
Procedure:
The extract was mixed with water and shaken vigorously for several minutes.

6. Test for Steroids
a. Liebermann–Burchard Test
Procedure:
The extract was treated with acetic anhydride followed by concentrated sulfuric acid.
b. Salkowski's Test
Procedure:
The extract was mixed with chloroform and concentrated sulfuric acid.

7. Test for Tannins and Phenols
a. Gelatine Test
Procedure:
1% gelatin solution containing sodium chloride was added to the extract.

b. Dilute Nitric Acid Test
Procedure:
The extract was treated with dilute nitric acid.

Method of Preparation

The herbal anti-sweat roll-on formulations (F1, F2, and F3) were prepared using a simple mixing method under hygienic laboratory conditions. All ingredients required for the formulation were accurately weighed and measured using a digital weighing balance and measuring cylinder to ensure uniformity and reproducibility of the batches.

Initially, potassium alum was dissolved in a small quantity of distilled water with continuous stirring until a clear and homogeneous solution was obtained. Rose water was then added slowly and mixed thoroughly. Subsequently, aloe vera gel and glycerin were incorporated into the mixture with continuous stirring to form a smooth and uniform base. Lemon extract was then added and mixed properly to ensure uniform distribution throughout the formulation.

Thereafter, ethanol was incorporated as a preservative and mixed thoroughly. Neem extract and green tea extract were added in varying concentrations according to the composition of F1, F2, and F3 batches. These herbal ingredients were included to enhance the antimicrobial, antioxidant, and astringent properties of the formulation.
Tea tree oil, sandalwood oil, peppermint oil, and menthol were then added gradually with continuous stirring to provide antimicrobial activity, pleasant fragrance, and a cooling effect. Continuous stirring was maintained throughout the preparation process to ensure proper mixing of all ingredients and to prevent phase separation. Special care was taken to obtain a stable and uniform formulation with good aesthetic appearance and consistency.
Finally, distilled water was added in sufficient quantity (q.s.) to make up the final volume to 50 mL. The mixture was stirred continuously until a homogeneous roll-on formulation free from lumps and phase separation was obtained. The prepared formulations were filled into clean and sterilized roll-on bottles, properly labelled, and stored for further evaluation studies. The method of preparation was adapted and modified from previously reported alum-based deodorant formulations (6).

Evaluation Test

1. Organoleptic Evaluation:

The formulation was visually examined for colour, odour, appearance, and consistency.

2. pH Determination:

The pH of the formulation was measured using a calibrated digital pH meter.

3. Homogeneity Test:

The formulation was inspected for uniformity and the absence of lumps or phase separation.

4. Spreadability Test:

Spreadability was determined by measuring the ease with which the formulation spread between glass slides.

5. Viscosity Test:

The viscosity of the formulation was measured using a viscometer.

6. Skin Irritation Test:

The formulation was applied to the skin and observed for redness, itching, or irritation for 24 hours.

7. Stability Study:

The formulation was stored under different temperature

conditions and evaluated periodically for physical changes and stability.

RESULTS

The anti-sweat herbal roll-on formulation was successfully prepared using neem extract, aloe vera gel, alum, glycerine, and essential oils. The prepared formulation was evaluated for various physicochemical and stability parameters. The results obtained are presented below.

Phytochemical Screening of Neem, Green Tea, Lemon Extract

Table 2: Phytochemical Screening

Sr no	Chemical Test	Neem Extract	Lemon Extract	Green Tea Extract
1	**Test For Carbohydrate**			
	a. Molisch's Test	+	+	+
	b. Fehling's Test	+	+	+
	c. Benedict's Test	+	+	+
2	**Test for Alkaloids**			
	a. Mayer's Test	+	-	+
	b. Hager's Test	+	-	+
	c. Dragendorff's Test	+	-	+
3	**Test for Cardiac Glycosides**	-	-	-
4	**Test for Flavonoids**	+	+	+
5	**Test for Saponins**			
	a. Froth Test	+	-	+
	b. Foam Test	+	-	+
6	**Test for Steroids**			
	a. Liebermann–Burchard Test	-	-	-
	b. Salkowski's Test	-	-	-
7	**Test for Tannins and Phenols**			
	a. Gelatine Test	+	+	+
	b. Dilute Nitric Acid Test	+	+	+

Organoleptic Evaluation

The formulation was examined visually for colour,odour,appearance,and consistency.

Table 3: Organoleptic Evaluation

Parameter	Batch 1	Batch 2	Batch 3
Colour	Light Green	Light Green	Light Green
Odour	Mild herbal odour	Pleasant Herbal odour	Strong Pleasant Herbal odour
Appearance	Smooth	Smooth and Uniform	Smooth and Uniform
Consistency	Semi Liquid	Semi Liquid	Semi Liquid

All formulations showed acceptable physical characteristics. Batch 3 exhibited a stronger odourdue to menthol and peppermint oil, which enhances user acceptability.

pH Determination

Table 04: pH Determination

Formulation Batch	Batch 1	Batch 2	Batch 3
PH	5.6	5.7	5.8

All formulations fall within the skin-friendly pH range (5–7), indicating safety for topicalapplication. Similar findings have

been reported in topical formulations where maintaining physiological pH helps prevent skin irritation and improves compatibility.

HOMOGENEITY-

The prepared formulation was visually inspected for uniformity and phase separation.

Table 5: Homogeneity

Parameter	Batch 1	Batch 2	Batch 3
homogeneity	Good	Good	Excellent
Phase separation	Absent	Absent	Absent

No lumps aggregates or phase separation were observed indicating proper mixing of ingredients.

1. SPREADABILITY TEST-

The spreadability of the formulation was evaluated to determine ease of application.

Table 6: Spreadability Test

Parameter	Batch 1	Batch 2	Batch 3
Spreadability	14.2g.cm/s	16.8g.cm/s	19.5g.cm/s

The roll on spread uniformly on the skin surface ensuring proper application and user convenience.

2. VISCOSITY-

The viscosity of the formulation was measured using a viscometer.

Table No 07: Viscosity

Formulation	Viscosity
Batch 1	360 cps
Batch 2	420 cps
Batch 3	450 cps

The viscosity was found to be appropriate for smooth flow through the roll-on applicator without leakage.

3. SKIN IRRITANCY TEST

The formulation was applied to the skin and observed for redness itching or irritation for 24 hours.

Parameter	Batch 1	Batch 2	Batch 3
Redness	Absent	Absent	Absent
Irritation	Absent	Absent	Absent
Itching	Absent	Absent	Absent

No signs of irritation or allergic reaction were observed indicating good skin compatibility of the herbal formulation.

STABILITY STUDIES

The formulation was stored under different temperature conditions for 30 days and evaluated periodically.

Table 9: Stability Studies

Storage condition	Batch 1	Batch 2	Batch 3
Refrigerated condition	Stable	Stable	Stable
Room temperature	Stable	Stable	Stable
Elevated temperature	Slight change in odour	Stable	Highly Stable

No significant changes in Batch 3 colour,odour PH or consistency were observed during the stability study period.

CONCLUSION

The present study successfully formulated and evaluated aherbal anti-sweat roll-on intended for use during summer conditions. The prepared formulation exhibited acceptable physical characteristics, good stability, smooth application, and user convenience. Herbal ingredients used in the formulation may help in controlling perspiration, reducing body odour, and providing a refreshing effect without extensive use of synthetic chemicals. The roll-on showed satisfactory performance and was found suitable for topical application. Therefore, the developed herbal anti-sweat roll-on can be considered a promising natural alternative for maintaining freshness and comfort during hot weather. Further studies and clinical evaluation are recommended to confirm its long-term safety and effectiveness.

FUTURE SCOPE

The developed herbal anti-sweat roll-on has good potential for future improvement and large-scale use in the cosmetic and personal care industry. Since the formulation is prepared using natural ingredients, it may serve as a safer alternative to synthetic deodorants and antiperspirants.

Further studies can be carried out to evaluate the long-term safety, effectiveness, and shelf life of the formulation under different environmental conditions. Clinical studies on a larger population may help to confirm its antimicrobial activity, sweat control efficiency, and skin compatibility.

The formulation can also be improved by incorporating additional herbal extracts and essential oils to enhance fragrance, cooling sensation, and therapeutic benefits. Advanced studies such as microbial challenge tests, preservative efficacy studies, and dermatological testing may further support product quality and market acceptance.

In the future, the herbal roll-on may be developed in different variants for men, women, sensitive skin, and sports use. Commercial production and eco-friendly packaging can also increase its consumer acceptance and industrial application.

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