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Research Paper

Development And Evaluation of Herbal Body Lotion

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Abstract
Lotions are the emulsion which are used for moisturizing and providing emollient action to the skin. Herbal body lotion is prepared from herbal extracts which can be used for dry, oily and normal skin. Synthetic lotions may sometimes cause allergic reactions like scaly skin, hence development of herbal body lotion gamed importance as it overcomes the limitations of skin problems, provides rapid onset of action by releasing lotion directly to body through skin. Extracts of Cassia fistula and Azadirachta indica obtained by maceration method and can be formulated as herbal lotion to improve antibacterial and antifungal action. The formulated herbal lotion was evaluated for various parameters like pH, viscosity, spreadability, washability, homogeneity, presence of foreign particles. smoothness, consistency and zone of inhibition.

Keywords
Lotion, extracts of Cassia fistula and Azadirachta indica, antibacterial action.

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I. INTRODUCTION

Licensed drugs are usually obtained from natural substances or their synthetic derivatives. Therefore, plant extracts have special improvements in terms of functionality and medical use [1,2]. Plant extracts are liquid preparations of plants and alcohol used in various pharmacological and cosmetic applications. Cosmetics are anything that is applied, poured, sprinkled or sprayed on the human body for the purpose of cleaning, beautifying, increasing attractiveness and changing appearance. Creams, lotions, gels, lipsticks, hair conditioners and shampoos can be made from plant extracts. Extraction processes are used to separate inert substances obtained from plants from medicinal substances using certain solvents. Maceration, boiling, distillation process, pressing, filtration, reflux extraction, Soxhlet extraction, supercritical fluid extraction (SFC), pressurized fluid extraction (PLE), microwave-assisted extraction (MAE) and ultrasound-assisted extraction (UAE) are some of the extraction technologies. [3,4]

Lotion is an emulsion with increased moisturizing and softening properties. Herbal essence body lotion is effective in eliminating all skin irritations. When the skin is moisturized, it becomes smooth, soft and has a healthy-looking appearance. Therefore, the development of herbal body lotion is very important in eliminating the limitations of both dry and oily skin. needle. It may contain antibacterial agents and other additives. It should be applied to undamaged skin without rubbing. Products are usually suspended in aqueous solutions to form emulsions. Some emulsions are cosmetic milks or solutions. The ingredients are made into a thin paste, mixed and the liquid phase is added to form an emulsion. High speed mixers or colloid mills provide better dispersion and are therefore suitable for preparing large emulsions. Skin care products consist of water phase, oil phase, emulsifier and pharmaceutical ingredients. Many substances such as fragrances, glycerin, preservatives, thickeners are added to cosmetics.[5]

Function of lotion

- Moisturizes & Nourishes
- Anti-Aging Benefits
- SPF Protection
- Smoothens & Softens
- Heals & Soothes
- Nutrition & Essential Oils

Key strength of lotion

- Effective in the treatments for inflamed lesions
- Indicated for the topical treatment of lice in children.
- Used for the delivery of medications such as antibiotics, antiseptics, antifungals, corticosteroids, anti-acne agents to the skin.
- Prevents skin dermatitis caused by frequent exposure to cleaning agents in soap. [6,7,8].

HERBAL EXTRACT

Herbal medicines are still popular in healthcare among people worldwide, especially in developing countries, because of their low cost and low side effects. According to the World Health Organization (WHO), the use of herbal medicine is more common than conventional medicine in the world. Many drugs are derived from plants. Examples include aspirin (bark), digoxin (foxglove), quinine (cinchona bark), and morphine (opium poppy) [9]. Herbal formulations can be administered orally, rectally, topically, parenterally, by inhalation, nasally, ophthalmically, or optically. Herbal products can be fully defined and labelled as medicinal products containing active ingredients obtained from above ground or underground plants or other plant products. There are many types of prepared herbal medicines or herbal preparations that can be extracted, distilled, pressed, fractionated, purified, concentrated or fermented using various solvents.[15]

II. MATERIALS AND METHODS

Azadirachta indica, Cassia fistula, almond oil and other components were gathered and verified before being used to make the lotion.

1. ***Azadirachta indica***

Azadirachta indica have wide variety of uses mainly involve the pharmacological action such as anti-inflammatory, antidiabetic, antihyperlipidemic, antibacterial activity, antifungal activity, antiulcer activity etc. each and every part of this plant have various uses such as leprosy, eye problem, effective against various skin diseases.[23]

Figure no: 1 Azadirachta indica

[Source: https://stock.adobe.com/in/images/neem-leaves-azadirachta-indica/19107409]

2. ***Cassia fistula***

Cassia fistula flower extract displayed an anti-ageing property when introduced to the human skin fibroblast and has a variety of cosmetic and nutritional applications. It displays an ability to cause hypopigmentation and can be applied as a whitening agent. Pharmacological action such as anti-inflammatory activity, purgative action, anti-viral action, larvicidal and ovicidal potential. [12,13]

Figure no: 2 Cassia fistula
[source: https://www.iplantz.com/plant/348/cassia-fistula/]

3. ***Almond oil***

Almond oil functional category as the emollient, oleaginous vehicle and solvent .it used for improve skin complexion and prevent athlete's foot and treat dry skin condition such as psoriasis.[14]

Figure no: 3 Almond oil
[Source: https://www.harpersbazaar.com/beauty/skin-care/a38917200/almond-oil-for-skin/]

PREPARATION OF PLANT EXTRACT

Extraction of *Cassia fistula*

150 g of shade dried young plant material for each sample was extracted with each of solvent 70 percent of methanol for 72 hrs. at room temperature in a 5-litre beaker in separate experiments. The residue was extracted twice the same fresh solvent and extract combined [15]

Extraction of *Azadirachta indica*

50g of dried powders of neem leaves were extracted with 250 ml of methanol for 3 days with periodic shaking and then filter and filtrate was collected [16]

FORMULATION OF BODY LOTION

Herbal body lotion was prepared from herbal extracts which is extracted by maceration method (dried powder of drugs treated with methanol and kept for given period of time, then filtered and extract is collected). Bentonite is used in formulation as viscosity enhancer. Glycerin is used as solvent which provide humectant and emollient action. Liquefied phenol used as preservative. Along with its almond oil is used to improve skin complexation. Sodium citrate is used convert gel form of bentonite to solution.[17]

Table no.1: Formulation design for herbal lotion

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
Bentonite(g)	4	5	6	7	8	9	10	11	12	13	14	15
Sodium citrate	9	8	7	6	5	4	3	2	1	0.5	0.1	0.1
Glycerine (ml)	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1
Cassia fistula (ml)	4.7	7.1	5.5	3.2	6.3	7,9	4.7	3.9	2.3	7.1	5.5	6.3
Azadirachta indica extract (ml)	7.9	5.5	7.2	9.4	6.3	4.7	7.9	8.7	10.2	5.5	7.1	6.3
Liquefied phenol (ml)	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21
Almond oil drops	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

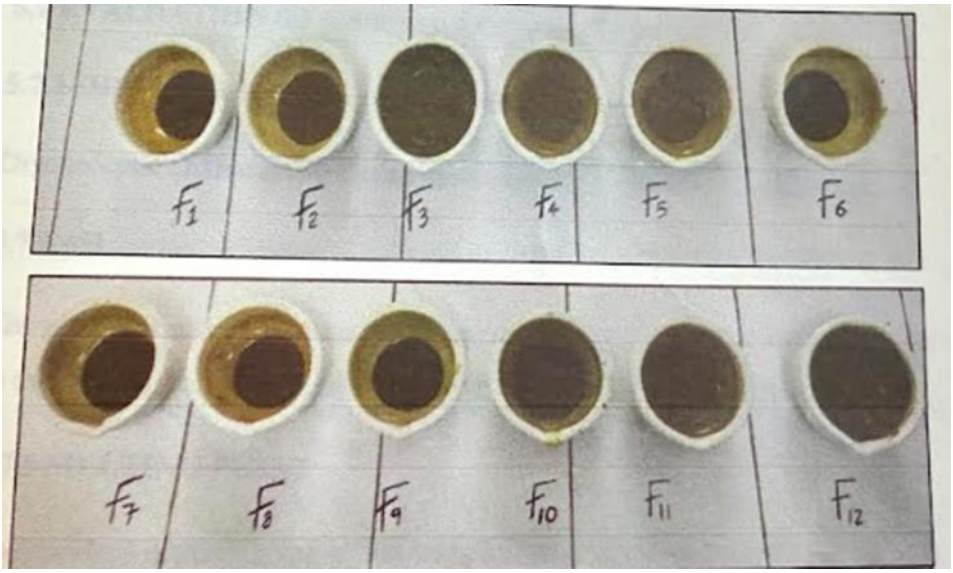

Figure no.4: Formulations

Formulation F1 to F12 were prepared by using herbal extracts of *Cassia fistula Azadirachta indica* and other excipients like bentonite, sodium citrate, glycerin liquefied phenol and almond drops. The formulation design of Herbal body lotion is given in the Table no. 1. F1 to F12 Formulations were formulated by using different concentration of bentonite, sodium citrate and herbal extracts. The quantity of other excipients is kept constant the specified amount of viscosity enhancer bentonite is powered well in mortar in a beaker the required amount of sodium citrate was dissolved in 1-2 drops to water. Then measured quantity of preservative and solvent is added. Pour the solution to mortar dropwise Triturate in unidirectional until a clicking sound is produced (primary emulsion). Then add herbal extracts to the mortar and finally make up the volume with water The solution was kept undisturbed until the air bubbles get removed the aqueous solution was poured into the specific amber color bottle the formulated lotion was further stored in airtight container without exposure to sunlight.

EVALUATION OF HERBAL BODY LOTION

ORGANOLEPTIC CHARATERISTICS

Organoleptic characteristics were assessed from color, odor and texture.

pH

The pH of lotions was measured using a digital pH meter by inserting probe in to the lotion formulation and allowing it to equilibrate for one minute.

MELTING POINT

The standard melting point of the body lotion is in the range 155°F-162°F.

PRESENCE OF FOREIGN PARTICLES

A small amount of formulation was spread on a glass slide and was observed against the light to check for the presence of foreign particles.

VISCOSITY

Viscosity measurement was determined by Brookfield Viscometer II - model using spindle no. S-64 at 20 rpm at a temperature of 25 ± 2 °C.

SPREADABILITY

The spreadability of lotion was determined by glass slide method. 100 mg of lotion was added to glass slide and another glass slide was placed over it. Weight of 20g placed over the upper glass slide and the time taken for moving the upper slide to separate completely from the fixed slide was noted. Spreadability was determined according to the formula:

$$S=M*L/T$$

Where S= Spreadability

M=Weight tied to the upper slide

L=Length of glass slide

T=Time taken to separate the slides Experiments where repeated three times to obtain statistically significant data.

HOMOGENEITY

Each formulation evaluated for homogeneity by naked eye examination. This involves an assessment of appearance including the presence of aggregates [18]

WASHABILITY

A portion of lotion was applied over the skin of hand and allowed to flow under the force of flowing tap water for 10 minutes. The time when the lotion completely removed was noted.[19]

SMOOTHNESS

The smoothness of the formulation was tested by rubbing lotion ten Segers and observed for any grittiness or toughness present to application.[20]

DILUTION TEST

Dilution test was performed to distinguish the type of emulsion. The product diluted with an aqueous solvent to find out the whether the emulsion is o/w or w/o type.[21]

DETERMINATION OF ANTIBACTERIAL ACTION USING AGAR WELL DIFFUSION:

The aim of the study is to assess the antimicrobial activity and to determinate the zone of inhibition of Herbal body lotion on some bacterial strains. Agar well diffusion method was used for the determination of antimicrobial activity Herbal body lotion were screened for their antimicrobial activity against bacteria Staphylococcus aureus (Gram positive organism) and *Pseudomonas aeruginosa* (Gram negative). To assess the antimicrobial activity, a well-diffusion assay carried out at 17 hrs. And old bacterial cultures were inoculated over the sugar surface of Mueller Hinton agar plates using sterile cotton swabs for the wall diffusion assay. After 10 min, wells were cut using a cork borer and each well was loaded with 10 µg/well of control and Herbal body lotion. At 37°C, the plates were incubated for 24 h. Susceptibility was assessed on the basis of the diameter of the zone of inhibition against the test pathogens and the results are tabulated. The antibacterial activity of Herbal body lotion was tested against human pathogens of *Staphylococcus aureus and Pseudomonas aeruginosa* using the control streptomycin.[22]

DETERMINATION OF ANTIFUNGAL ACTION USING ANTIFUNGAL DISK DIFFUSION METHOD

The fungal strains were cultured on potato dextrose agar and incubated at 35 for 24 hours and for 5 days on potato dextrose agar slant for the mold fungi. Using a sterile loop, pure colonies of the *Candida albicans* species were transferred into a tube containing sterile normal saline. For the mold, 1 ml of sterile distilled water supplemented with 0.1% Tween 20 was used to cover and resuspend the colonies. Using a hemocytometer, the suspension was adjusted to 2-5-10 conidia/mL. The suspension was further diluted 1:10 to obtain final working inoculums 2-5×105 conidia/mL. The inoculums were poured over MHA supplemented with 2% of glucose. The sterile 6 mm disks that were impregnated with 20 µL test compound (with a concentration of 10 mg/mL) were placed over the plate. The control (Streptomycin) of the samples A and B incubated at 35°C for 48 hours The zone of inhibition was measured in millimeter.[23]

STABILITY STUDIES

Stability studies were carried out as per ICH guidelines. A sufficient quantity of optimized formulation was kept in a glass vial and it was subjected to accelerated stability studies for period of 6 months using stability chamber at a temperature of 40 +2°C and RH 75±5%. The physical stability of the herbal body lotion was inspected at initial, third month and sixth month by checking pH, viscosity. spread ability, washability, presence of foreign particle, smoothness, antibacterial and antifungal activity.[24]

RESULTS AND DISCUSSIONS

PREFORMULATION STUDY

Identification of herb

The herb used in the study was collected and authentified by Botanist identified as *Cassia fistula* and *Azadirachta indica*.

Organoleptic evaluation of Herbs

Table 2: Organoleptic evaluation of Herbs

CHARECTERSITICS	*Cassia fistula*	*Azadirachta indica*
Color	Yellowish green	Dark brown
Apex	emarginate	Acute
Base	Subacute-cuneate	Oblique
margin	entire	Serrate
Leaf arrangement	alternate	Compound
venation	pinnate	Reticulate
shape	Oblong – broadly ovate	Lanceolate
odor	Mild pleasant aromatic	Characteristic
taste	Slightly bitter	Bitter

Evaluation study of herbal body lotion
Organoleptic evaluation
Colour -greenish brown
Odor -pleasant Odor
Texture -smooth
*Each reading is an average of 3 determination.
The pH of twelve formulations of Herbal body lotion was determined by using Digital pH meter. The observed value ranges from 5.31 to 5.97 as shown in the table no. 2. All the formulations are having pH value near to skin pH and found no significant pH alteration. Therefore, there are no possibilities of skin irritations and allergies.

DETERMINATION OF MELTING POINT
The melting point of body lotion was determined using the melting point apparatus. The observed value was 160°F which was found to be within the standard range of 155°F -162°F.

VISCOSITY EVALUATION
The viscosity of twelve formulations of Herbal body lotion was determined and results are shown in table no.3. The viscosity values range from 145 to 188cps. The F1 formulation is having least value that is 145cps and F12 formulation having highest value of 188cps. The optimum viscosity range of 170 cps was found for F6 formulation. Since bentonite forms magma and enhance viscosity; it was observed that with increasing concentration of bentonite the viscosity has been increased.

Table 3: viscosity value

Formulation code	Viscosity value (cps)*SD
F_1	145±0.0089
F_2	150±0.0065
F_3	154±0.0090
F_4	162±0.0450
F_5	165±0.0076
F_6	170±0.0097
F_7	174±0.0017
F_8	178±0.0260
F_9	180±0.0067
F_{10}	182±0.0080
F_{11}	184±0.0045
F_{12}	188±0.0059

*Each reading is an average of 3 determination.

SPREADABILITY

Table 4: Spreadability value

Formulation code	Spreadability value (gcm/s)*SD
F_1	10.2 ± 0.0064
F_2	9.65 ±0.0098
F_3	9.34±0.0090
F_4	9.02±0.0680
F_5	8.64±0.0093
F_6	8.45±0.0059
F_7	8.01±0.0234
F_8	7.63±0.0542
F_9	7.38±0.0076
F_{10}	6.42±0.0082
F_{11}	5.84±0.0039
F_{12}	5.02±0.0123

*Each reading is an average of 3 determination.

The spreadability of F1 to F12 formulation of Herbal body lotion was determined using glass slide method and the values were denoted in table no.4. The observed values of spreadability ranges from 5.02 to 10.2 gm./sec. The least value that is 5.02gcm/sec was observed for F12 formulation and highest value of 10.02 gem/sec obtained for F_1 formulation. Since spreadability is inversely proportional to viscosity, from the results, it was observed that with increasing viscosity, spreadability have been decreased. The formulation having highest viscosity is least spreadable.

WASHABILITY

Washability test was done by applying body lotion over skin and removing by washing it under running tap water. All the formulated body lotion F1 to F12 was washable and no stain was left behind on the skin. The herbal lotion was easily removed from the body by washing in running water and hence confirmed that oil in water emulsion.

PRESENCE OF FOREIGN PARTICLE

The F1 to F12 formulations of Herbal body lotion was observed for the presence of foreign particles against light. All the formulation passed the test as there was no foreign particle present.

SMOOTHNESS

The smoothness of the formulated herbal body lotion was tested by rubbing between the fingers. All the twelve formulations were found to be smooth and free of grittiness.

DILUTION TEST

The formulated products were diluted with aqueous solvent and was found the miscible, thus giving the inference that it was o/w type emulsion**.**

HOMOGENEITY

Formulations were evaluated for homogeneity and almost all the twelve formulations were free of aggregates and provide homogenous application.

ANTIBACTERIAL ACTION

Antibacterial action of formulated Herbal body lotion was determined by Zone of inhibition study using Agar well diffusion method against *Pseudomonas aeruginosa* and *Staphylococcus aureus* organism using control *Streptomycin* Maximum Zone of inhibition was observed for *Pseudomonas aeruginosa* comparison to *Staphylococcus aureus*. In negative control, due to resistance of streptomycin against the organism, no zone of inhibition was observed. The result of zone of inhibition study of Herbal body lotion against the organisms were tabulated in Table no. 5 and 6. For gram positive organism the zone of inhibition values varies from 26.57 to 28.62 mm The highest zone of inhibition that is 28.62mm was observed for the Fs Formulation. For gram negative organism, the zone of inhibition values varies from 32.01 to 34.04mm. The highest zone of inhibition that is 34.04mm was observed for the F6 Formulation.

Table 5: Zone of inhibition of herbal body lotion against *Staphylococcus* aureus

Formulation code	Zone of inhibition of herbal lotion (mm)	C +ve	C-ve
F_1	26.57	26.32	6.28
F_2	27.93	26.32	6.28
F_3	26.98	26.32	6.28
F_4	27.01	26.32	6.28
F_5	27.24	26.32	6.28
F_6	28.62	26.32	6.28
F_7	27.63	26.32	6.28
F_8	27.53	26.32	6.28
F_9	27.09	26.32	6.28
F_{10}	27.82	26.32	6.28
F_{11}	26.98	26.32	6.28
F_{12}	27.24	26.32	6.28

Table 6: Zone of inhibition of herbal body lotion against *Pseudomonas aeruginosa*

Formulation code	Zone of inhibition of herbal body lotion (mm)	C +ve	C -ve
F_1	33.78	29.73	6.81
F_2	32.01	29.73	6.81
F_3	33.45	29.73	6.81
F_4	33.65	29.73	6.81
F_5	33.29	29.73	6.81
F_6	34.04	29.73	6.81
F_7	32.89	29.73	6.81
F_8	32.74	29.73	6.81
F_9	32.65	29.73	6.81
F_{10}	32.45	29.73	6.81
F_{11}	33.56	29.73	6.81
F_{12}	33.74	29.73	6.81

ANTIFUNGAL ACTION

Antifungal action of formulated Herbal body lotion was determined by Zone of inhibition study using Antifungal disk diffusion method against *Candida albicans* using control Streptomycin. In negative control due to resistance of *Streptomycin* against the organism, no zone of inhibition was observed. The results of Zone of inhibition study of Herbal body lotion against organism were tabulated in Table no.7. The zone of inhibition values varies from 30.23mm to 31.91mm. The highest zone of inhibition that is 31.91mm was observed for F6 formulation.

Table 7: Zone of inhibition of herbal body lotion against *Candida albicans*

Formulation code	Zone of inhibition of herbal lotion (mm)	C + ve	C – ve
F_1	31.34	29.76	6.29
F_2	30.78	29.76	6.29
F_3	31.02	29.76	6.29
F_4	31.45	29.76	6.29
F_5	30.2	29.76	6.29
F_6	31.91	29.76	6.29
F_7	30.29	29.76	6.29
F_8	31.45	29.76	6.29
F_9	31.56	29.76	6.29
F_{10}	30.23	29.76	6.29
F_{11}	30.98	29.76	6.29
F_{12}	31.23	29.76	6.29

After all the evaluation tests of twelve formulations that is F1 to F12 of herbal body lotion, the optimum formulation was found to be Fa In comparison to other formulation, F6 has shown maximum antibacterial and antifungal activity and all other evaluation parameters like pH, Melting point, Viscosity, spreadability, washability, homogeneity, smoothness and dilution test was found to be within the range.

STABILITY TESTING OF OPTIMIZED FORMULATION

The stability studies were conducted for optimized formulation F6 for a period of 3 months. No significant changes were found for the tested parameters like pH, viscosity, spreadability, washability, presence of foreign particle, smoothness antibacterial and antifungal activity at temperature 40°C and humidity 75% RE for 3 months. The studies are being continued up to 6 months.

Table 9: Stability study data at 40 ± 2°C/75% RH

PARAMETER	INTIAL DAYS	3 MONTHS
pH	5.48	5.45
Viscosity	170 cps	168 cps
Spreadability	8.45 gcm/sec	8.42 gcm/sec
Washability	Easily washable	Easily washable
Presence of foreign particle	Absent	Absent
Homogeneity	Homogenous	Homogenous
Smoothness	Smooth	Smooth
Antibacterial activity	28.62 mm	28.62 mm
Antifungal activity	31.91 mm	31.91mm

III. CONCLUSION

The use of Herbal cosmetics has been increased to many fields in personal care system and there is a great demand for the herbal cosmetics. The use of bioactive ingredients in cosmetics influences biological functions of skin and provide nutrients necessary for healthy skin. In the present study, Herbal body lotion was formulated using extracts of Cassia fistula and Azadirachta indica for its antibacterial and antifungal action. Mainly the herbal approach for the proper skin care is principally based on cleansing. nourishing and moisturizing. In this project, in addition to the herbal extracts. moisturizers, emollient, pH adjusters and viscosity enhancers are incorporated which will provide cleansing and moisturizing effect with antifungal and antibacterial property. From all the results, the optimized Herbal body lotion was found to be F6. The F6 formulation has shown maximum

antibacterial and antifungal activity in comparison to standard drug streptomycin. So, it can be concluded that the formulated herbal body lotion has a tremendous scope in future and would be a promising approach in skin care and treatment.

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