

RESEARCH / INVESTIGACIÓN

Formulation and organoleptic evaluation of Poly Herbal Cream of Punica, Neem, Carrot & Jamun as Active Ingredients

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Abstract: Assuming that herbal preparation is better with fewer side effects than synthetics, natural treatments are more effective than allopathy in terms of side effects for better human body healing. Herbal products have a growing demand in the world market, and the plants have been reported in the literature as having various pharmacological activities such as anti-microbial, anti-oxidant, anti-inflammatory activity, [UdMO4] anti-cancer, anti-diabetic. The purpose of this study was to develop anti-aging poly-herbal cream by mixing the extract of Punica leaf, Neem Oil, Jamun powder, Carrot powder as the main ingredient, and then creams were developed based on the anti-oxidant ability of herbal extracts and performed their evaluation study. *Punica granatam* leaves were shade dried and extracted using the Soxhlet method with different solvents such as n-hexane, benzene, and alcohol. [UdMO5] Fine extract powder was collected and removed distilled water thoroughly. The cream was formulated into different concentrations, namely F1, F2, F3, and F4. Similar types of research with similar components have been reported, but in this experiment, the formulation is different, and this work is kept cost-efficient and straightforward; it's an attempt to reduce few components and prepare cream and evaluate its potential. According to The International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use ICH [UdMO6] guidelines, the cream was stable during stability studies, and F3 turned out to be a better formulation than the other three.

Key words: Anti-aging, Poly-herbs, Herbal Remedy, Herbal Cream, Pharmaceutical Cream, Skin Care.

Introduction

Dermal layer aging results from continual deterioration due to cellular DNA and protein; aging is classed into 2 distinct varieties: sequential skin aging and photo-aging. Each type has distinct clinical and historical options, and sequential skin aging is a universal and specific process characterized by physiological alteration in skin function. Within the aging process, keratinocytes cannot create a helpful stratum corneum, and the rate of formation from neutral lipids slows down, leading to dry pale skin with a wrinkle. In contrast, photo-aging is caused by the disorganization of stratum and dermal parts associated with physiological state and helio dermatitis. Herbs and plants have already proved helpful as a tool in the practice of medicine¹⁻³.

Cosmetic merchandise is used to shield pores and skin in opposition to exogenous and endogenous dangerous retailers and beautify the splendor and elegance of skin and the usage of cosmetics now not only handiest growing an appealing outside look, but also towards accomplishing sturdiness of suitable fitness via way of means of decreasing skin disorders³⁻⁸. The artificial or herbal substances found in skincare formulation that helps the health, texture, and integrity of dermis, moisturizing and preserving the pliancy of the skin with the aid of using decreasing the type I collagen, photo-protection, and plenty more, and this belongings of beauty is because of the presence of substances in cosmetics as it allows to lessen the production of loose radicals in the skin and manage the dermal residences which is the obstruction to penetrate the skin for an extended time^{3,5,6}. Cosmetic merchandise is the satisfactory desire to lessen dermal problems like hyperpigmentation, skin wrinkling, skin aging, problematic pores, rough skin texture, etc. The need for natural cosmetics is swiftly increasing, and the growth is because of the supply of recent ingredients, the monetary rewards for growing hitting merchandise, customer needs, and higher expertise in dermal biology^{3,5,9-11}. The plant parts utili-

zed in cosmetic products should have medicinal properties like anti-inflammatory, anti-oxidant, emollient, anti-seborrheic, antiseptic, anti-bacterial activities, etc. Herbal merchandise declares to have fewer adverse effects, normally visible with merchandise containing artificial agents. The marketplace studies suggest a rise in the trade with the cosmetic industries, a prime function in fueling this international call for herbals¹²⁻¹⁴.

Punica leaf, part of the tree pomegranate

P. granatum is one of the most common and potential plants for medicine in managing various ailments¹⁵. *Punica granatum* L. (belongs to the family *Punicaceae*) has been used to treat many ailments. Various plant parts have been scientifically tested for various pharmacological activities, such as potent antioxidative^{15,16}, anti-inflammatory, anti-bacterial, anti-microbial, anti-fungal properties, anti-hypertensive, and antiproliferative properties^{17,18}. Pomegranate has excellent potential to be developed for use in dermal products¹⁹. Chlorophyll-a extracted from pomegranate leaf and stem may be a potential source and can supply natural or herbal colorants for the coating enterprises and nail varnish. Pomegranate leaf extracts act on inhibiting the development of obesity and hyperlipidemia in obese mice fed with a high-fat diet²⁰⁻²².

Almond oil is the oil isolated from Almonds

The almond *Prunus dulcis* (Mill) D.A. Webb (subfamily Prunoideae of family Rosaceae) contains fixed oil, phenolic compounds abundant in almonds; it also contains and some micronutrients, vitamins, minerals and has different pharmacological activities²³⁻²⁶. Almond seeds and oil have cardio-protective, immune-stimulant effects, anti-inflammatory, and reduce irritable bowel syndrome symptoms, and they are also helpful in treating constipation^{27,28}. Almond oil has also been used to

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treat dry skin disorders like psoriasis, eczema, and many more disorders in ancient treatment cultures but today it is used in aromatherapy and for producing many skin-hair cosmetics²⁹.

Jamun powder is made from sun-dried Jamun Seeds

The black Jamun (*Syzygium cumini* L.) is an important indigenous plant of Myrtaceae, commonly known as jamun or Indian blackberry, originally from Indonesia and India, which has anti-oxidant solid antigenotoxic potential^{32,33}. The fruit pulp is sweet, and the seeds are acidic and sour. The presence of oxalic, gallic, tannic acids and other alkaloids creates one to feel such an astringency taste. The pulp and seeds are used for traditional medicine against diabetes, diarrhea, and ringworm infection also protect against radiation-induced sickness^{32,34-37}. It is very beneficial as it has anti-diabetic, cytoprotective, anticoagulant, analgesic and anti-inflammatory, anti-cancerous, anti-microbial, anti-oxidant, hypo-lipidemic, hepato-protective properties^{35,38,39}.

Carrots

(*Daucus carota*) are essentially root veggies belonging to the family of *Apeaceae* or *Umbelliferous*. These veggies are believed to have originated approximately 5000 years ago. Carrots are to be had in diverse, colorful variations like pink, orange, white, purple, etc; however, the maximum usually observed variants are pink carrots and orange carrots. Carrots have anti-oxidants, which enables in regaining the misplaced glow of the skin. It helps in imparting remedies from scars and blemishes. Carrot is a unique anti-growing old compound due to the presence of Vitamin A.

Additionally, a considerable quantity of Vitamin C. Vitamin A acts as an excellent anti-oxidant, fights with the free radicals of the body, stabilize them, and stops them from unfavorable our pores of skin cells and accordingly prevents the symptoms of growing old like wrinkles, pigmentation, and chippy pores and skin tone. Vitamin C enables the prevention of wrinkles using assisting the manufacturing of collagen in the body, which is a crucial protein required for retaining pores and skin elasticity. Carrot is likewise a wealthy supply of β -carotenoids, which boom or trigger skin immunity in opposition to solar rays and heals sunburns⁴⁰⁻⁴³.

Neem tree

(*Azadirachta indica*) is a local, evergreen, tropical tree to India⁴⁴. Neem is a versatile, multifarious tree with a great capacity to own the most beneficial non-wooden products. Neem has various medicinal properties, including anti-cancer properties. In India, Neem is called the village of pharmacy due to its recovery versatility, and it's been utilized in Ayurvedic medication for extra than 4,000 years because of its medicinal properties⁴⁴⁻⁴⁷. Azadirachtin is the principal compound of the neem oil with insecticidal activity⁴⁸. Neem extracts were also reported to possess inhibitory effects on several cancer cell lines such as breast, gynecological, gastrointestinal, hematological, prostate, and skin cancers. Several active chemical compounds were discovered in neems, such as Nimbin, Nimbin, Saladin, azadirachtin (AZA), glycosides, and dihydrochalcone polyphenolics, coumarin, and tannins⁴⁹⁻⁵¹. Pharmacological activities have been reported, including anti-bacterial, anti-inflammatory, anti-fungal, anti-arthritic, anti-pyretic, anti-gastric ulcer, hypoglycemic, and anti-tumor activities^{46,49,52-54}.

Grapeseed oil

Is obtained from the seeds of grapes, and it was a by-product of winemaking and had many uses ranging from cooking cosmetics in controlling several diseases and wound healing potential⁵⁵⁻⁵⁷. *Vitis vinifera* L., which is commonly called grape used as a food and a beverage⁵⁸. It is widely used as cooking oil, in skin care applications, and also as cosmetics. The grape seed oil contains 0.8 to 1.5% of phenols, steroids, and minor amounts of vitamin E. The grape seed oil was reported to possess the highest gallic acid, anti-oxidant, epicatechin, proanthocyanidins, catechin, and procyanidins. It has anti-oxidant, anti-fungal, anti-bacterial, antiviral, and anti-inflammatory activities^{59,60}.

Peppermint oil

(*Mentha piperita*) extracted from peppermint leaves is an excellent gastric stimulant, carminative, which has also been used in cosmetic formulations as a perfume component and a general skin conditioning agent^{61,62}. Peppermint (*Mentha* × *Piperita*) is a hybrid mint, which is a cross between Water mint (*Mentha aquatica*) and Spearmint (*Mentha spicata*) that is thought to be grown naturally^{62,63}.

Similar types of research with similar Active Pharmaceutical Ingredients API have been reported. However, in this experiment, the formulation is different, and in each formulation, peppermint oil is used as the flavoring agent, whereas in the literature review, it is found that each formulation has a different flavoring agent. This work is kept cost-efficient and straightforward, it's an attempt to omit few components and prepare cream and evaluate its potential.

Materials and methods

The plan of work and the procedure followed for this experiment were performed by Matangi and the team in 2014³. The experiment was performed in Bharat Technology, Uluberia, in 2018 as an academic project for the partial fulfillment of a Bachelor of Pharmacy degree.

Materials

Glycerin, Propylene Glycol, Zinc oxide, Micro Crystalline Cellulose, Sodium alginate, Methylcellulose, Beeswax, Sodium benzoate/paraben, Almond oil, Punica leaves, Neem oil, Jamun powder, Carrot powder, Vitamin E, Grapeseed oil, Peppermint oil, and Purified water.

Preparation of Punica leaf extract

Punica granatum leaves were bought from the market and dried. The dried leaves were ground to a fine powder in a suitable grinder mixture. Shade dried powder was extracted using a Soxhlet extractor with hexane, alcohol, and distilled water separately to get the semisolid extract. The organic solvents were then recovered by steam distillation. The extracts were then concentrated to remove wetness under reduced pressure and controlled temperature, respectively, and they were preserved in a refrigerator.

Preparation of Jamun Seeds powder

Black Jamun (*Syzygium cumini* L.) were bought from the market, and the seeds are separated from the freshly part of the fruit, washed adequately, and dried. The seeds were dried under the sun for a week. Seeds were pounded along with the outer skin and made into a fine powder.

<u>Ingredients</u>	<u>Category</u>	<u>F1</u>	<u>F2</u>	<u>F3</u>	<u>F4</u>
Jamun Powder	API*	5g	5gm	5gm	5gm
Punica leaf extract	API	2ml	2ml	2ml	2ml
Neem Oil	API	2ml	2ml	2ml	2ml
Carrot Powder	API + Vitamin A Source	3gm	3gm	3gm	3gm
Glycerin	Moisturizer	3ml	3ml	3ml	3ml
Propylene Glycol	Moisturizer + Binder	3ml	3ml	3ml	3ml
ZnO	Skin whitener	3gm	3gm	3gm	3gm
Methyl Cellulose	Polymer	5gm	-	-	-
Sodium Alginate	Polymer	-	2gm	5gm	-
Microcrystalline Cellulose	Polymer	-	3gm	-	5gm
Cetyl Alcohol	Surfactant + emollient	1ml	1ml	1ml	1ml
Beeswax	Base	3gm	-	3gm	-
Grapeseed Oil	Base	-	2ml	-	-
Almond Oil	Base	2ml	2ml	2ml	2ml
Stearic acid	Base	-	-	-	2gm
Lanolin	Base	-	-	-	1gm
Sodium Benzoate	Preservative	2gm	2gm	2gm	2gm
Peppermint Oil	Flavoring agent	2ml	2ml	2ml	3ml
Purified water	Vehicle	QS*	QS	QS	QS

*API – Active Pharmaceutical Ingredient; QS – Quantity as required.

Table 1. Formulation Table.

Cream Formulation

The formula for the cream is given in Table No. 1.

Method For Preparation Of Cream

Shade-dried Punica leaf powder was put separately in a soxhlet extractor, and then ethanol was added successively. The extracts were then concentrated under reduced pressure and controlled temperature for dryness and were stored for stabilization at a specific temperature. Glycerin was applied to the binder and polymer content, the water mixture in a beaker. This forms liquid dispersion and displays the property of slight swelling. The Punica leaf extract, neem oil, and Jamun powder were added to the liquid dispersion. Using a water bath, melted oils together with the base in a separate beaker. Skin whitener and preservative were gradually incorporated along with all other components. Triturated all ingredients above and the requisite consistency was established, which forms poly-herbal anti-aging cream.

Results and discussion

Evaluation of cream

There are various evaluation parameters for cream. For this work, the evaluation parameters chosen are Organoleptic evaluation, Microbial Count test, Stability Studies, pH determination, homogeneity determination, wetness determination, smear determination, emolliency determination, viscosity determination, dilution test, dye solubility test.

Organoleptic evaluation

The cream formulated was evaluated for its organoleptic properties (color, state, and odor). The appearance of the

cream was analyzed by its color and roughness visually and by touch. Results are listed in Table No. 2.

<u>Sr. No.</u>	<u>Specification</u>	<u>Limit</u>
1	State	Semi-solid
2	Color	Greyish white
3	Odor	Characteristic
4	Texture	Smooth

Table 2. Organoleptic Properties.

Test for microbial growth in formulated creams

This method was applied from the work of Matangi and Team in the year 2014³. Here, Streak Plate Method⁶⁴ was used, where the formulated creams were inoculated in a plate with the Muller Hinton agar media. Along with that, a control group was made without the cream for comparison. The plates were kept in the incubator and are incubated for 24 hours at 37°C. After the incubation period, plates were taken out and analyzed for microbial growth by comparing them with the control. Results are listed in Table 3.

Stability studies

Thermal stability testing of cream was done at room temperature with relative humidity (RH) 65%; results are listed in Table 4. To assess the drug and formulation stability for an extended period, accelerated stability studies were done according to ICH guidelines; the results are listed in Table 5.

Sr. No.	Microbial Load	Limits	Result
1	Total Microbial Count	Not More than 100	82
2	Limit Tests: E. coli	No Characteristic Colonies	Complies

Table 3. Microbial Test.

Sr. No	Thermal Stability (at RH 65% and 30+ °C)	F1	F2	F3	F4
1		Stable, no oil separation			

Table 4. Thermal stability determination.

Stability Studies	F1		F2		F3		F4	
	Initial	After 7 days						
Physical Appearance	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid	Semi-solid
Texture	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok
Color	White	White	White	White	White	White	White	White
Thermal Stability	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok
Degradation Of The Product	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Table 5. Accelerated Stability Studies.

Determination of Homogeneity

The formulations were tested for homogeneity by touch for texture and by visual appearance. Result obtained of each formulation is given in Table No. 6,7,8,9.

Determination of the type of smear

It was determined by applying the cream on the surface of the skin of a human volunteer (Self, no ethical permission need as it is non-toxic, natural, and safe components which makes it exceptional⁶⁵. After applying the cream, the type of smear or film formed on the skin was checked. Result obtained of each formulation is given in Table No. 6,7,8,9.

Determination of Viscosity

The viscosity determinations were carried out using a Brookfield viscometer (DV II + Pro model) using spindle number S-64 at 20 rpm at a temperature of 25°C. Result obtained of each formulation is given in Table No. 6,7,8,9.

Determination of pH

Accurately weighed 1gm of the sample was dispersed in 100 ml of water. The pH of the suspension was set at 27°C using a digital pH meter. Result obtained of each formulation is given in Table No. 6,7,8,9.

Spread ability Test

This method was applied from the work of Dhase and Team in the year 2014, Chen and Team in the year 2016^{66,67}.

Spread ability can be expressed by the extent of the area to which the topical application spreads when applied to the affected parts on the skin and the curative value of the formulation also hang-on upon its spreading value. Hence, it was found obligatory to determine the spread ability of the formulation. For this purpose, a small amount of about 23cm of each formulation was applied in between two glass slides, and they were pressed together to obtain a film of uniform thickness by placing 1000gm weight for 5 minutes. Thereafter a weight of 10gm was added to the pan, and the top plate was subjected to pull with the help of string attached to the hook. The time in which the upper glass slide moves over the lower plate to cover a distance of 10 cm was noted. The Spread ability (S) can be determined using the formula^{66,67}.

$$S = (m \times L) / T,$$

Where S–Spread ability;

m - Weight binds to the upper glass slide,

L - Length budged on a glass slide

T - Time is taken.

Results obtained are given in Table No. 10. The cream was found to be easily spreadable.

Dye solubility test

This method was applied from the work of Dhase and Team in the year 2014⁶⁶. In this test, a small sample is mixed with a water-soluble dye and observed under the microscope. If the continuous phase appears red, the cream is O/W (Oil in Water) type as the water is in the external phase, and the dye will dissolve in it to give color. If the scattered globules appear red and continuous phase colorless, they are W/O (Water in

Oil) type. Likewise, if an oil-soluble dye such as Scarlet red or Sudan III is put on to an emulsion and the continuous phase appears red, it is w/o emulsion. Following the procedure, red color was observed; hence, it was O/W type of cream⁶⁶.

Dilution test

This method was applied from the work of Dhase and Team in the year 2014⁶⁶. In this test, the cream is diluted either with oil or water. If the cream is o/w type and diluted with water, it will remain stable as water is the dispersion medium, but if it is diluted with oil, the cream will break as oil and water are not miscible. Oil in water emulsion can be diluted with an aqueous solvent, whereas water in oil emulsion can be diluted with an oily liquid. Following the procedure, it was found to be O/W type of cream as because the obtained product was stable⁶⁶.

The cream was the o/w type of emulsion. Due to the base material, the proper addition of surfactants to its proper quantity, and the proper combination of all the excipients, it was stable. The proper ratio of all ingredients of excipients with the active ingredients also reasons for the stability. During the formulation, the oil phase and water phase are mixed, and it was also responsible for the stability of that cream.

After the formulation of cream by checking all these different evaluation parameters, the 4 formulated creams showed good homogeneity when the creams were observed by touch and visual test. The color and physical appearance (color & odor) were not changed during storage; it may happen due to preservatives' helpful addition.

All the individual pH noted for the formulated herbal creams were F1 - 6.1, F2 - 5.7, F3 - 5.6, F4 - 5.9. The formulation F3 has shown the reading, which was matching to the

Time Interval (Day)	Homogeneity	Type of smear	Viscosity(cp)	Physical changes	pH
0	Excellent	Excellent	12.005	No change in color and odor	6.1
5	Good	Excellent	12.005	No change in color and odor	6.1
15	Good	Good	12.004	No change in color and odor	6.1
20	Good	Good	12.004	No change in color and odor	6.1
30	Good	Good	12.003	No change in color and odor	6.1

Table 6. Formulation 1.

Time Interval (Day)	Homogeneity	Type of smear	Viscosity(cp)	Physical changes	pH
0	Excellent	Excellent	12.521	No change in color and odor	5.7
5	Excellent	Excellent	12.500	No change in color and odor	5.7
15	Good	Good	12.510	No change in color and odor	5.7
20	Average	Good	12.512	No change in color and odor	5.7
30	Average	Good	12.515	No change in color and odor	5.7

Table 7. Formulation 2.

Time Interval (Day)	Homogeneity	Type of smear	Viscosity(cp)	Physical changes	pH
0	Excellent	Excellent	12.499	No change in color and odor	5.6
5	Excellent	Excellent	12.450	No change in color and odor	5.6
15	Good	Good	12.465	No change in color and odor	5.6
20	Good	Good	12.460	No change in color and odor	5.6
30	Average	Good	12.455	No change in color and odor	5.6

Table 8. Formulation 3.

Time Interval (Day)	Homogeneity	Type of smear	Viscosity(cp)	Physical changes	pH
0	Excellent	Excellent	12.008	No change in color and odor	5.9
5	Excellent	Excellent	12.005	No change in color and odor	5.9
15	Good	Good	12.002	No change in color and odor	5.9
20	Average	Good	12.006	No change in color and odor	5.9
30	Average	Good	12.008	No change in color and odour	5.9

Table 9. Formulation 4.

Sr. No.	Time (Sec)	Spread ability Studies (cm)			
		F1	F2	F3	F4
1	15	13.5	13.6	14.3	14.4
2	20	14.1	13.1	14.1	13.6
3	25	13.3	14.6	13.6	13.7

Table 10. Spread ability Test.

skin pH. As per the result, it was found that Trial F3 has better consistency of formulation of cream in the combination of different excipients in their quantities.

The prepared formulations showed no affirmation of phase separation, had good spread ability and had good consistency during the study period. Stability parameters like visual appearance, texture, viscosity, and fragrance of the formulations reflected no significant variation during the study period. The prepared formulations showed an acceptable pH range that was approximately pH 5.6; it confirms the compatibility of the formulations with skin secretions.

Conclusions

In this project work, the selected active ingredients are Punica leaf extract, carrot powder, Jamun powder, and neem oil. These all ingredients are cheap and readily available in the market, including all these ingredients, the selected excipients-beeswax, grape seed oil, almond oil, stearic acid, lanolin as base material; Sodium benzoate as a preservative; Cetyl alcohol as emollient and surfactants; peppermint oil as a flavoring agent for all type of formulation like F1, F2, F3 & F4. F3 stood out to be the better formulation concerning results obtained.

From the existing examination and acquired results, it could be concluded that it's possible to broaden poly natural cream containing natural extracts with anti-oxidants belonging, which may be formulated to act as a barrier or to defend skin and make cosmetic cream.

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Conflict Of Interest

Nil

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