



LEAVE-IN CONDITIONER FOR SCALP PSORIASIS

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ABSTRACT: Leave -in conditioners are a type of hair conditioner that can be applied on dry, haven't washed hair and can be left on hair without washing out. They lock in moisture on scalp and hair. The study was aimed at formulating and evaluating a leave-in conditioner for scalp psoriasis containing Peanut oil, Coconut oil and Castor oil. Peanut oil contains fluocinonide acetonide which possesses antipsoriatic property. Castor oil possesses anti-inflammatory and antibacterial property and Coconut oil prevents dryness of scalp and hair. The formulation is suitable for application on scalp and it reduces itchiness and dryness associated with scalp psoriasis. The evaluation parameters such as colour, clarity, pH, moisturization time, cleaning action, spreadability, contact angle were performed.

Keywords : Leave-in conditioner, Scalp, Scalp psoriasis, Moisturise, Hair, Cosmetic, Formulation

INTRODUCTION

Hair care products are trending cosmetics which help to maintain hair and scalp healthy and manageable. Hair products include hair conditioners, hair oils, hair sprays, hair straighteners and relaxers, shampoos, rinses, tonics and serums.

Hair Conditioners are viscous liquid applied to hair after shampooing in order to condition the hair^{1,2}. Leave-in conditioners, which are also called no-rinse conditioners, are used after you wash your hair and before you style it. Usually applied to towel-dried hair and they're not washed out. Leave-in type formulation is direct application type, it sticks to the surface of scalp and hair fibre and stays on it for a longer time⁴. It should be capable of forming a smooth film on the hair surface and scalp⁵. Leave-in conditioner for Scalp Psoriasis is mainly aimed for psoriasis conditions. Leave-in conditioner for psoriasis hydrates, nourishes, heals, strengthens and smooths the scalp. They help to improve the psoriatic treatment. It's usually lighter than standard conditioner, so it won't weigh down the scalp, hair or make it greasy^{5,6}.

Psoriasis is an immune-mediated, chronic condition in which skin cells build up and form scales and itchy, dry patches⁷. It disrupts the immune system and instructs the body to grow skin cells faster. These cells do not shed instead it starts building up and causes plaques⁷. Triggers include infections, stress and cold⁷.



fig 1: Hair anatomy

BUILDING BLOCKS OF A CONDITIONER^{8,9}

Table 1: composition of conditioner

INGREDIENTS	USE
Active ingredient	Drug or raw material are used as active ingredients
Emulsifier	To combine oil and wat
Humectant	Which attract water on skin
Thickener & stabiliser	For optimising the consistency of formulation
Antistatic agent	Reduce static charge build up and provide conditioning
Antioxidant	To prevent oxidation of contents.
Conditioning agent	To provide lubrication and also for easily spread on surface
pH regulator	To adjust pH of the formulation
Preservative	Kill microorganism and waterborne bacteria and prevent the growth of fungus, mould ,yeast.

TYPES OF CONDITIONER.⁸

- Rinse out conditioner
- Leave in conditioner
- Moisturising conditioner
- Volumizing conditioner

IDEAL PROPERTY

- Not too greasy.
- Easily spreadable.
- Good fragrance
- Easily removable
- Effectively lock moisture
- Very thin.⁶
- Less viscous⁶.

ADVANTAGES^{2,6,8,10}

- 1.Protect from sun and environmental damage
- 2.Provides extra moisture to the hair.
- 3.Provides shine and smoothness.
- 4.Prevents hair breakage.
- 5.Styling time saver.
- 6.Improves manageability
7. Easy detangling of hair strands.⁶
8. Increased contact time

DISADVANTAGES

- 1.Expensive
- 2.Applying too much can lead to dandruff and leave hair dull and coarse.
- 3.Loss of hair volume.
4. Improper choosage can leave hair more greasy and heavier.

CHEMICAL COMPOSITION OF LEAVE-IN CONDITIONER

Table 2: Chemical composition of leave-in conditioner and their use

INGREDIENTS	USES
Peanut oil	Anti-psoriatic activity. Contain antioxidants that prevent dandruff and scalp psoriasis Also to improve the thickness of formulation
Castor oil	Castor oil has antibacterial and antifungal properties. They are rich in vitamin e.
Coconut oil	Coconut oil prevents the dryness caused by psoriasis by trapping the moisture in skin.
Rosemary oil	They have anti inflammatory properties and also antifungal properties. Removes bacteria that close the hair follicle.
Guar gum	Used for thickening and viscosity control. The formulation has a smooth texture and is easy to apply.
Citric acid	To obtain required pH.
Glycerine	To improve viscosity
Rosewater	To makeup the volume

SCALP¹¹

The scalp which covers cranium composed of soft tissue. It is anteriorly bordered by the human face, and posteriorly and laterally by the neck. The scalp extends from the superior nuchal lines - occipital turbulences to the supraorbital foramen. It forms the house for hairs. There are five layers to the scalp: the skin, connective tissue layer, galea aponeurotic, loose areolar connective tissue, and the pericranium.

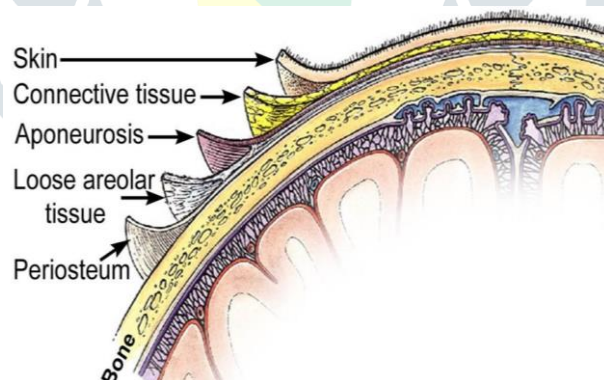


fig 2: Layers of scalp

The scalp serves as the physical barrier to protect the cranial vault from physical trauma and potential pathogens that can cause infections which can further affect the brain.¹²

The first layer of scalp is the skin, which is thick and carries hair follicles and sebaceous glands. The hair follicles can further extend deeper into the dense connective tissue layer, where the scalp's nerves, lymphatics, and the vascular supply resides. Epicranial aponeurosis is an immobile and strong connective tissue. The loose connective tissue is a flexible plane which separates pericranium from top three layers. It is also important for scalp mobility. The pericranium is the deepest layer of the scalp which is composed of dense irregular connective tissue. It is firmly adhered to the calvarial bone of the skull. It contains the vascular supply that is vital to supporting the underlying calvarium.¹²

Layers of scalp.¹³

First three layer is tightly held together, forming a single unit

a) Skin

- Skin contain hair follicle and sebaceous gland

b)Connective tissue (dense)

- Connect skin to aponeurotic layer
- Richly vascularised and innervated

c) Aponeurotic layer

- A tough layer of dense fibrous tissue
- Thin structure, tendon-like which connects the occipitalis and frontalis muscles.
- Occipitofrontalis muscles move the scalp ,wrinkle the forehead and raise the eyebrow.

d) Loose connective tissue

This layer separates epicranial aponeurosis from periosteum.It contains numerous blood vessels.

e) Periosteum

It covers the outer surface of skull bones.

Function of scalp¹²

- House of hair follicles.
- It acts as a real physical protective barrier.

MATERIALS AND METHODS

DRUG PROFILE - Description of drugs taken for the preparation of leave in conditioner was given in table 3.

Table 3: Drug profile

SLNO	DRUG	SYNONYM	BIOLOGICAL SOURCE	CHEMICAL CONSTITUENTS	USES
1.	Coconut oil	Copra oil,Coconut oil,Palm oil	Obtained by expression of dried solid part of endosperm Cocos nucifera L. Family: Arecaceae	<ul style="list-style-type: none"> • Fatty acids. • Caprylic acid(8%). • Capric acid(7%). • Lauric acid(49%). • Myristic acid(8%). • Stearic acid(2%) 	Anti-inflammatory,stimulates hair growth,moisturises skin and scalp, improves oral health,increases metabolism etc.
2.	Castor oil	Ricinus oil,Oleum ricini,	Obtained by cold expression seeds. Ricinus communis Linn. Family:Euphorbiaceae	Contain triglycerides of: <ul style="list-style-type: none"> • Ricinoleic acid(80%). • IsoRicinoleic acid. • Linoleic acid. • Stearic acid. • Isostearic acid. 	Powerful laxative, natural moisturiser, boost hair growth,treat eczema etc.
3.	Peanut oil	Arachis oil,Groundnut oil,Katchung oil	Obtained by expression of seeds Arachis hypogaea. Family:Papilionaceae.	<ul style="list-style-type: none"> • Palmitic acid(8.3%). • Oleic acid(56%). • Stearic acid(3.1%). 	Beneficial in Psoriasis, improves heart health, increase brain health, boosts immunity, lowers

				• Linoleic	blood pressure etc.
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EXCIPIENT PROFILE: Description of excipients used in the preparation is shown in table 4.

Table 4 : Excipient profile

DRUG	CITRIC ACID	CATIONIC GUAR GUM	ROSEMARY OIL	GLYCERINE
SYNONYM	Sour salt, Aciletten, Hydrocerol A.	Jaguarc13s, Guar hydroxypropyl trimonium chloride.	Rosemary Verbenone Essential oil.	Glycerol, Thymol, Squalene, Glyceride.
FUNCTIONAL CATEGORY	Antioxidant, pH adjuster.	Emulsifying agent, Stabilising agent, Thickening agent.	Anti inflammatory agent, Antioxidant,	Emollient, cosolvent, humectant, tonicity agent.
DESCRIPTION	Colour- White solid colour. Odour- Odourless. Solubility- soluble in water, alcohol, acetone. Density- 1.665g/cm ³ .	Colour- Whitish or yellowish colour. Odour- slight odour. Solubility- soluble in cold water. Density-0.8-1.0g/ml.	Colour- Colourless to pale yellow colour. Odour- Pungent and somewhat astringent. Solubility- Soluble in water, slightly soluble in methanol and chloroform. Density- 0.908g/ml.	Colour- Colourless to brown coloured liquid. Odour- Odourless. Solubility- Soluble in water, ethanol, practically insoluble in benzene, chloroform, slightly soluble in acetone. Density- 1.26g/cm ³ .
USES	Improves the hair appearance and manageability, adjust pH	Prevent frizz, Moisturizer, Softner, emulsifier	Stimulate hair growth, Anti Inflammatory, anti-oxidant	Moisturiser

FORMULATION OF LEAVE- IN SCALP CONDITIONER

Contents used and its quantity

Oils such as coconut oil, peanut oil, castor oil, rosemary oil, glycerin, citric acid, guar gum and rose water were taken. Glycerin (3ml), guar gum (0.3gm), rosemary oil (1ml), citric acid (quantity sufficient to make pH), and rose water (q.s) were used in the same quantity for four formulations. Coconut oil, castor oil, peanut oil were taken in different quantities.

Quantity of ingredients used in Leave-in conditioner formulation is shown in table 5.

Table 5: List of quantity of ingredients

INGREDIENTS	F1	F2	F3	F4
Coconut oil (ml)	3	3	4.5	4.5
Castor oil (ml)	1.5	1.5	1.5	3
Peanut oil (ml)	1.5	3	3	3
Glycerin (ml)	3	3	3	3
Citric acid (gm)	q.s	q.s	q.s	q.s
Guar gum (gm)	0.3	0.3	0.3	0.3
Rosemary oil (ml)	1	1	1	1
Rose water (ml)	q.s	q.s	q.s	q.s

PREPARATION OF LEAVE- IN CONDITIONER^{1,2}

1. PREPARATION OF AQUEOUS PHASE

AQUEOUS PHASE : Citric acid, Guar gum

Citric acid and guar gum were taken in above-mentioned quantities. They were mixed together to form the aqueous phase.

2. PREPARATION OF OILY PHASE

OILY PHASE : Peanut oil, Coconut oil, Castor oil, Rosemary oil.

All the oils were taken in above mentioned quantities. They were stirred and mixed together.

3. ADDITION OF AQUEOUS PHASE TO OILY PHASE

The aqueous phase was added to the oily phase with continuous stirring in a mechanical shaker until desired viscosity is reached. Rose water was added to makeup volume to 30ml.

The product was transferred to a suitable container. The conditioner was taken for evaluation tests.

EVALUATION OF LEAVE- IN CONDITIONER^{1,2,4}

1. **Colour and appearance** : The colour and appearance of the formulation was evaluated visually.

2. **Clarity** : The clarity of the formulation was evaluated visually.

3. **Odour**: The odour of the formulation was evaluated.

4. **pH test** : The pH was analysed using pH paper and pH metre. The pH should be between 4-7

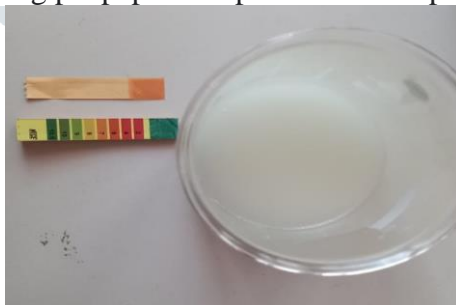


fig 3: pH test

5. **Moisturising time determination**: 1gm of hairball was placed on the surface of 50 ml of different dilutions of the conditioner. The complete sinking time of hair balls were evaluated.

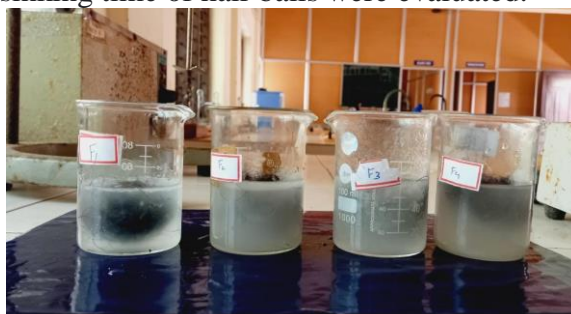


fig 4: Moisturisation time determination

6. Spreadability : Two slides were taken which are of standard dimension. The formulation was placed on one of the slide. The other slide was placed on the top of the formulation, such that the cream was sandwiched between the two slides. 100gm weight was placed upon the upper slide for 5 min, so that the conditioner between the two slides was pressed uniformly to form a thin layer. The weight was removed and the diameter of the spread was noted.

$$S_i = d^2 \times \pi/4$$

S_i - spreading area (mm)², d - spreading area diameter (mm)

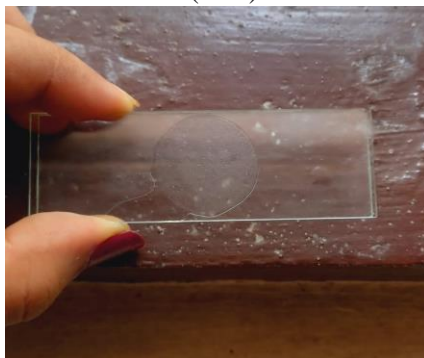


fig 5: Spreadability test

7. Contact angle : Done with Goniometer. Contact angle was measured on a teflon surface using a Goniometer. The angle between the baseline of the drop and the tangent at the drop boundary was recorded.

8. Cleansing action: 5gm of wool yarn is placed on grease. Then the above wool yarn is placed in 200ml water containing 1 gm of conditioner in a flask. The temperature is maintained at 350°C. The flask is shaken for 4 min (50 times/min). Sample taken out, dried and weighed. Amount of grease removed was weighed using a weighing scale.



fig 6: Determination of cleansing action

9. Stability testing : Done by placing conditioner in a humidity chamber at 45 degree Celsius and 75% R.H for a period of 3 months.

RESULT AND DISCUSSION

The leave-in conditioner was prepared by O/W emulsion method using oily phases including peanut oil, castor oil, coconut oil and rosemary oil mixed with aqueous phase. The leave in conditioner was formulated and passed the evaluation test and all results were mentioned in the following table and chart.

EVALUATION OF COLOUR, APPEARANCE AND ODOUR OF LEAVE-IN CONDITIONER

Table 6: Physical evaluation result

FORMULATION CODE	COLOUR	APPEARANCE	Clarity	Odour
F1	Pearlish white	Smooth	Clear	Herbal-minty
F2	Pearlish white	Smooth	Clear	Herbal-minty
F3	Pearlish white	Smooth	Clear	Herbal-minty

F4	Pearlish white	Smooth	Clear	Herbal-minty
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Discussion : The prepared formulation from F1 to F4 was found to be pearlish white in colour , and semi solid in nature , smooth in appearance, clear free of solid particles, and has herbal-minty odour.



figure 7 : All the four formulations

EVALUATION OF LEAVE IN CONDITIONER

Table 7: Evaluation results

Formulation Code	Colour	Appearance	Clarity	pH	Moisturising time	Spreadability	Contact angle
F1	Pearlish white	Smooth	Clear	5	12min	0.785	85.0
F2	Pearlish white	Smooth	Clear	7	9min	1.766	73.7
F3	Pearlish white	Smooth	Clear	6	13min	1.326	65.5
F4	Pearlish white	Smooth	Clear	4	13min	0.636	85.4

Discussion: The prepared leave-in conditioner formulations from F1 to F4 were subjected to different evaluation tests and it was found to be pearlish white in colour, smooth in appearance , clear. The pH of all the formulations was in the range of 4-7 which was within the range of scalp pH. All the prepared formulations showed varying spreadability. Moisturisation time was determined for all the formulations, out of which F2 showed rapid moisturisation. All the four formulations showed a contact angle of less than 90^0 and can wet the surface of application.

EVALUATION OF CLEANSING ACTION

Table 8: Evaluation of cleansing action

Formulation	Weight of wool before	Weight of wool after
F1	6gm	5.80gm
F2	6gm	5.57gm
F3	6gm	5.91gm
F4	6gm	5.68gm

Discussion: The prepared leave-in conditioner formulations from F1 to F2 were subjected to evaluation of cleansing action and it was found that all the four formulations showed varying cleansing action.

STABILITY TESTING

All the four formulations F1,F2,F3,F4 were stable during storage and didn't showed any change in colour, appearance or odour.



fig 8: Leave-in conditioner

CONCLUSION

The study was done to formulate a leave -in conditioner that produces a symptomatic relief from scalp psoriasis. The symptomatic relief from scalp psoriasis is due to the natural ingredients such as peanut oil, castor oil and rosemary oil. The peanut oil used in the preparation of leave-in conditioner has antioxidant, antipsoriatic, antifungal, antibacterial, anti inflammatory, anti soothing activities for retarding extreme drying and infection on scalp. Various evaluation tests were conducted and it was concluded that the formulated leave-in conditioners were smooth, clear and pleasing in appearance. The pH, spreadability, contact angle,cleansing action were performed.From the results it was concluded that F2 showed better results. Moisturisation time was determined for the formulations out of which F2 showed rapid moisturisation. From the obtained results it can be concluded that the prepared leave-in conditioners were user- friendly, safe and provided relief from dry, itchy , irritating psoriatic scalp.

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