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Research Article

# ARNICA HYDROGEL: AN OIL REPLACEMENT FOR HAIR LOSS TREATMENT

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### ABSTRACT

Hair loss problems can affect physical and mental health of human and have particular significance during pregnancy, lactation and aging process. At present a number of oils and shampoos are available in the market to promote hair growth. Applying the medicated hair oils and shampooing the hairs daily reduces the patient compliance. Thus no therapy is giving satisfactory results to the hair loss. Aim of this work is to prepare non sticky, non greasy, quickly absorbable Arnica Hydrogel to stimulate hair. *Arnica montana* is widely used herbal and homeopathic medicine for hair growth stimulation and available as arnica oil and arnica shampoo. It rejuvenate scalp, stimulates the hair follicles by improving the blood flow and prevent premature hair fall. *Arnica montana* also have anti-inflammatory and anti dandruff properties which assist its hair growth property. Hydrogel have been emerged out as one of the most beneficial topical drug delivery system. It is three-dimensional cross-linked polymer network. Hydrophilic structure of which make them capable of holding the drug and water in its three dimensional network. These biomaterials can hold large quantity of water and swell. When swelled, they become soft & spongy and exhibit excellent biocompatibility. Arnica Hydrogel was prepared by incorporating ethanolic extract of *Arnica montana* in hydrogel at a particular step in order to prepare non greasy formulation. Hydrogel was optimized for the concentration of Carbopol 934. Different Hydrogel formulations were evaluated for their physical appearance, viscosity, pH, spreadability and stability.

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### INTRODUCTION:

Hair loss commonly occurs to most of the people of all age groups. Although it is not life frightening disorder but a thought of becoming bald may lead to emotional stress lack of confidence, inferiority and traumatic experience. Hair consists of two parts: (1) Hair follicle, present in the dermis of the skin, it contains stem cells and allows hair regrowth. (2) Hair shaft, hard filamentous part extends above the skin surface. Hairs are derived from ectoderm of the skin and composed of epithelial cells<sup>1, 2</sup>. Growth of hair exhibits a regular cycles of regeneration, known as the hair cycle. Hair cycle consist of three phases. An active growing phase in hair growth cycle in which the previous hair is shed off is known as Anagen phase. This phase is followed by a small transitional phase known as Catagen phase and this is followed by a dormant resting phase known as Telogen phase in which hair follicle produce different types of hairs. After completing one hair cycle, new cycle restarts and a new hair shaft begins to form<sup>2</sup>. One factor is not sufficient to blame for hair loss. There are many factors responsible for the hair loss are genetic

predisposition, pregnancy, lactation, many hormonal factors, and disease states such as typhoid, malaria, jaundice, and use of chemotherapeutic agents<sup>1, 2</sup>. Some hair disorders are also responsible for hair loss such as dandruff, androgenetic alopecia, and pigmentation. The etiology of hair loss is still not entirely understood and also its absolute medical treatment is not adequately developed<sup>1, 2</sup>.

Till now hair growth treatments have covered the multi-billion dollar market worldwide but still there is no significant improvement in the hair growth. Formulations containing Minoxidil and Finasteride are two approved drugs, useful in the treatment of Alopecia but their side effects limit their uses. To deal with the side effects of the allopathic drugs pharmacist interest have moved towards the herbal drugs as they are lack of any adverse effects as compare to synthetic formulations<sup>1, 2</sup>. There are no of herbal drugs with proven records to treat Alopecia. These drugs are formulated as hair care product containing hair tonics and hair grooming aids<sup>1</sup>. Hair tonics are herbal hair oil which contains herbal extracts in oil base. Nature of oil is

sticky and perfumed. Proper application of these hair oils may use to treat baldness, discoloring of hair, hair falling and dryness of hair. Various patents are existing those claims for the effectiveness of these herbal oils these oils stimulate hair follicles and scalp metabolism by stimulation of dermal papilla, antitestosterone activity and enhanced nutrition to the hair follicle through improved blood circulations to the scalp but their mechanism of action are still not clear<sup>1</sup>. Many herbal oils containing extract of Jatamansi, Sikakai, Ritha, Bhringraj, Shankhapushpi, Amla, Hibiscus, Brahmi and Methi with proven hair stimulating actions, are available in market alone or in combination. Similarly, *Arnica montana* is a widely used herbal preparations for hair growth stimulation. It is also used in homeopathy for hair growth stimulation and available as arnica oil and arnica shampoo for years. *Arnica montana* is also used as external application to reduce dandruff. Daily application of Arnica hair oil gives remarkable results but daily application of oil and shampooing the hairs, leads to reduced patient compliance. So the aim of this work is to prepare a non sticky, non greasy, quickly absorbable Arnica Hydrogel to improve patient compliance and thus hair growth.

In recent times Hydrogels have gained significant attention for the delivery of drugs topically. Hydrogels are competent to deliver various active moiety including genetically engineered pharmaceuticals, like protein and peptides and to get better therapeutic efficacy and safety of drugs<sup>4</sup>. Hydrogels are a network of water soluble natural or synthetic polymeric chains that form a colloidal swollen gel in water as dispersion medium. They contain 99% water. Due to this significant quantity of water, they are flexible, similar to natural tissue and biocompatible. Hydrogels are three-dimensional cross-linked polymer network. Hydrophilic structure of Hydrogel make them capable of holding the drug and water in its three dimensional network<sup>5</sup>.

## MATERIAL AND METHODS:

**Materials:** 10% ethanolic tincture of *Arnica montana* was obtained as gift sample from SKRP

Gujarati Homeopathic Medical College & Research Centre, Indore. Carbopol 940 and sodium hydroxide were procured from Loba Chemie, Mumbai, And Isopropyl myristate was procured from Alpha Chemika, Mumbai. Double distilled water was used for all experiments. All chemicals were pharmaceutical grade and used without further modification.

### Method of Preparation of Hydrogel

Hydrogel was prepared by the method reported by Monica AS and Gautami J (2014) with slight variations. Total 4 formulations of Arnica Hydrogel was prepared with varying concentration of carbopol 940 and Arnica Montana. Hydrogel was prepared by dispersing carbopol 940 in distilled water, left it for 24 hrs in dark to allow complete swelling. To this 1% v/v isopropyl myristate and 0.0025% w/v benzalkonium chloride were added under magnetic stirrer, and then drug extract was added to form 2% and 5% strength of

the formulation after addition of sodium hydroxide solution. Finally, make up the volume with distilled water under magnetic stirrer to form a homogeneous dispersion of gel.

### Characterization of hydrogel

**Physical Appearance** all the formulations of Hydrogels were inspected visually for their color, homogeneity, consistency.

**Measurement of pH** pH was measured by digital pH meter in triplicate. 1% aqueous solution of prepared hydrogel was prepared and pH was determined.

**Spreadability** Spreadability is used to explain the scope of area to which topical preparations readily spreads on skin or affected part. Topical formulation should have good spreadability. The parallel-plate method is used for determining and quantifying the spreadability of Hydrogels. It is expressed in terms of time in seconds taken by two slides to slip off. Hydrogel was placed in between the slides and upper slide was tied with certain load. Lesser the time taken for separation of two slides, better spreadability of the Hydrogel. Spreadability was calculated by using the formula.

$$S = \frac{(M \times L)}{T}$$

Where

S= Spreadability,

M= Weight tied to upper slide,

L= Length of glass slides and

T= Time taken to separate the slides completely from each other.

**Rheological Study** Rheology is the study of flow and deformation of materials under applied forces. The viscosity of different Hydrogel formulations was determined at 37°C using a brook field viscometer at 100 rpm.

**Test for Grease-Test** was carried out by placing a drop of formulation on filter paper and compare the test filter paper with standard one. Standard was prepared by placing a drop of Arnica hair oil on filter paper. Observation for translucent or greasy spot was taken.

**Accelerated Stability Studies** Stability studies were carried out on all Hydrogel formulations according to International Conference on Harmonization (ICH) guidelines. The formulations were packed in different aluminium tubes and were subjected to accelerated stability testing for 3 months as per ICH norms at a temperature (40 ± 2°C) and relative humidity 75 ± 5%. Samples were taken at regular time intervals of 1 month for over a period of 3 months and analyzed for the change in pH, spreadability and rheological properties.

## RESULTS AND DISCUSSION:

**Physical Examination** The prepared Hydrogel formulations were offwhite to brownish in color and were a smooth, translucent and homogenous appearance.

**Table 1:** Composition of Hydrogel

Ingredients	Formulations Code			
	F1	F2	F3	F4
Carbopol 940(g)	0.5	1	0.5	1
Arnica Mantana Extract (10%)	20 ml	20 ml	50 ml	50 ml
Isopropyl myristate (mL)	1 ml	1 ml	1 ml	1 ml
Benzalkonium chloride	0.25 mg	0.25 mg	0.25 mg	0.25 mg
Distilled water (q.s.)	100 ml	100 ml	100 ml	100 ml

**Spreadability** The spreadability of various Hydrogel preparations were measured by parallel plate method and all the values are giving satisfactory results. Formulation F3 showed the Mmaximumspreadability as it

contains optimized polymer concentration and large volume of vehicle.

**Test for Grease** No formulation was left with a greasy sign on filter paper when compared to standard.

**Table 2:** Evaluation of Arnica Hydrogel

Formulation code	Visual appearance	Viscosity (cps)	Spreadability	pH	Oil Stain
F1	Offwhite and Translucent	9231±2.0	+++	5.9±0.05	--
F2	Offwhite and Translucent	9715±1.5	++	5.7±0.05	--
F3	Brownish and Translucent	9114±2.0	+++	5.9±0.05	--
F4	Brownish and Translucent	9656±1.7	++	5.9±0.05	--

++ Good Spread ability, +++ Better Spread ability, -- No Oil Stain

**Accelerated stability studies:** All formulations were found to be stable after exposure to accelerated temperature and humidity conditions for a period of 3 months. No significant changes were seen in physical evaluation parameters [Table 2 and 3].

**pH:** The pH value of all prepared formulations was found in the range of 5.7-5.9, which is acceptable for topical preparations'.

**Table 3:** Physical Parameters after Accelerated Stability Study of Formulation F1 and F3

Physical Parameter	Formulation F1				Formulation F3			
	Initial	After 1 month	After 2 months	After 3 months	Initial	After 1 month	After 2 months	After 3 months
pH	5.9±0.05	5.8±0.05	5.8±0.05	5.8±0.05	5.9±0.05	5.8±0.05	5.8±0.05	5.8±0.05
Viscosity (cps)	9231±2	9222±1.2	9915±1.5	9242±1.3	9114±2	9154±2	9212±1.2	9108±1.5

## CONCLUSION:

In present work, attempt was made to formulate a non greasy hair tonic which can be applied on scalp daily without shampooing the hairs, to get satisfactory and distinguished effect. Non sticky and non greasy property of the formulation also enhances its acceptance for daily application. Arnica Montana Hydrogel was prepared by

varying the concentration of gelling agent and drug extract. Prepared Hydrogels were evaluated on various parameters and all the data are giving satisfactory results. Optimized formulations F1 and F3 were obtained on the basis of spreadability and viscosity although a further study on animal model has to carry out in order to get effective and optimized formulation.

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