Journal of Integrated Research
Vol. 1, No. 1, July 2023 – June 2024
Website : https://journalofintegratedresearch.com/

Formulation and Evaluation of Herbal Cream using Methanolic Extract of *Azadirachta indica*

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Abstract:

Various types of cream is considered for wound healing but these are still appears to be limited in rate of tissue regeneration**.** Plants are more potent healers because they promote the repair mechanism in the natural way. In this study, skin cream was prepared using *Azadirachta indica* leaves extract. Various formulations were prepared by varying the amount of excipients such as stearic acid, bees wax, stearyl alcohol, tween-80, methyl paraben, sorbitol solution, potassium hydroxide, deionised water etc. Formulation of Herbal Skin Cream using methanolic neem extract was successfully developed that met the relevant pharmaceutical characteristics. The prepared formulations are then evaluated for parameters like physical properties, pH, viscosity, spread ability and stability of the formulated cream. The prepared formulations showed good spreadability, no evidence of phase separation and good consistency during the study period. Stability parameters like visual appearance, nature, viscosity and pH of the formulations showed that there was no significant variation during the study period. The prepared formulations showed proper pH range that is approximately pH 6; it confirms the compatibility of the formulations with skin secretions. The creams were found to be stable during stability study according to ICH guidelines (40 ± 2 °C/ 75 ± 5 % RH) for 3 months.

1. Introduction:

Cosmetic products are used to protect skin against exogenous and endogenous harmful agents and improve the beauty and attractiveness of skin. Cosmetics are not only developing an attractive external appearance, but towards achieving long life of good health by reducing skin disorders. The herbal ingredients present in skin care products that supports the strength to the skin, integrity of skin and texture, moisturizing, maintaining elasticity of skin by reduction of collagen and photo protection etc. This character of cosmetic is due to presence of ingredients in skin care formulation, because it helps to reduce the production of free radicals in skin and manage the skin properties for long time. The cosmetic products are the best choice to reduce skin disorders such as skin aging, skin wrinkling, hyper pigmentation and rough skin texture etc. The usage of synthetic products becomes very harmful from long time for the youth as well as our environment (1,5,6). Various synthetic compounds, chemicals, dye and their derivative proved to cause various skin diseases having numerous side effects. The value of herbs in the cosmeceutical making has been extensively improved in personal care system and there is a great demand for the herbal cosmetics (2). Thus, we are using herbal cosmetics as much as possible. The basic idea of skin care cosmetic lies deep in the Rigveda, Yajurveda, Ayurveda, Unani and Homeopathic system of medicine. These are the products in which herbs are used in crude or extract form. These herbs should have varieties of properties like antioxidant, anti-inflammatory, antiseptic, emollient, anti-seborrheics, anti-kerolytic activity and antibacterial etc. The word herbal is a symbol of safety in contrast to the synthetic one which has adverse effects on human health (3,4).

1.1. *Azadirachta indica* (Neem)

- **Botanical Name**: *Azadirachta indica*
- **Common Name**: Marathi-Kadu Limba, Hindi-Neem, Tamil-Vepu
- **Popular Name**: Indian Lilac, Margosa Tree.
- **Parts Used**: Leaves, Flower, Oil, Seed
- **Taxonomic hierarchy**:

  Kingdom: Plantae

Division: Magnoliophyta
Order: Sapindales
Family: Meliaceae
Genus: Azadirachta
Species: *A. indica*

Products made from neem trees have been used in India for over two millennia for their medicinal properties. Neem products are believed by Siddha and Ayurvedic practitioners to be anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive, and sedative. It is considered a major component in siddha medicine and Ayurvedic and Unani medicine and is particularly prescribed for skin diseases. Neem oil is also used for healthy hair, to improve liver function, detoxify the blood, and balance blood sugar levels. Neem leaves have also been used to treat skin diseases like eczema, psoriasis, etc (7,8).

Neem oil contains margosic acid, glycerides of fatty acids, butyric acid and trace of valeric acid. Various active principles are nimbidin, nimbidal, azardirachtin, nimbin, azadirine, gedunin, salanin. They have diverse medicinal activities.

Neem oil is especially beneficial for curing skin ailments. Oil is used for dressing for foot ulcers, eczema and skin diseases like ringworm, scabies and mange in dogs. It is a powerful insect repellant, anti-bacterial, anti-fungal, anti-viral, anti-inflammatory and also strengthens the body's overall immune responses. Neem oil contains fatty acids which build collagen, promote wound healing and maintain the skin's elasticity. (9,10)The active ingredients of neem oil help in the process of wound healing and the skin is able to retain its suppleness as the wounds heal. Neem oil has a high content of essential fatty acids. They keep the site moist and give a soft texture to the skin during the healing process. Alcoholic extract of neem is useful in eczema, ringworm and scabies. Neem leaf extracts and oil from seeds has proven anti-microbial effect. This keeps any wound or lesion free from secondary infections by microorganisms. Clinical studies have also revealed that neem inhibits inflammation as effectively as cortisone acetate, this effect further accelerates wound healing (11,12,13).

2. Materials and methods:

Materials and preparation of extract: Table 1 shows the list of materials used during this study. Methanolic extract of *Azadirachta indica* were prepared by Soxhlet method (14).

Table 1: List of materials

Sr no.	**Materials used***	**Sources**
1	Leaves of *Azadirachta indica*	SSCP Campus, MANAWALA
2	Stearic acid	Merck Lifesciences Pvt. Ltd. Mumbai
3	Liquid paraffin	Merck Lifesciences Pvt. Ltd. Mumbai
4	Bees wax	Merck Lifesciences Pvt. Ltd. Mumbai
5	Stearyl alcohol	Merck Lifesciences Pvt. Ltd. Mumbai
6	Methyl paraben	Merck Lifesciences Pvt. Ltd. Mumbai
7	Potassium hydroxide	Merck Lifesciences Pvt. Ltd. Mumbai
8	Tween 80	Merck Lifesciences Pvt. Ltd. Mumbai
9	Sorbitol solution	Merck Lifesciences Pvt. Ltd. Mumbai

2.2. Preliminary phytochemical investigation of methanolic extract of the neem:

Preliminary phytochemical investigation of the methanolic extract of the plants is done by using TLC chromatogram**.**

2.3. Formulation and evaluation of the herbal skin cream:

2.3.1. Formulas for preparation of cream: Table 2 shows the formulas for preparations of creams (15).

Table 2 : Formulations of cream.

Sr. no.	Ingredient	Formula1 (%)	Formula2 (%)	Formula3 (%)	Formula4 (%)	Formula5 (%)	Formula6 (%)
1	*A. indica* extract	5	5	5	5	5	5
2	Liquid paraffin	5	5	5	5	5	5
3	Stearic acid	3	3	5	5	4	5
4	Bees Wax	5	6	5	4	6	5
5	Stearyl alcohol	10	10	10	8	8	7
6	Tween-80	8	5	5	5	5	6
7	Methyl paraben	0.12	0.12	0.12	0.12	0.12	0.12
8	Sorbitol solution	6	6	5	5	5	5
9	Potassium hydroxide	5	5	5	5	5	5
10	De-ionized water	33	36	37	40	39	38

2.3.2. Evaluation of skin care cream

2.3.2.1.Physical evaluation of the formulation

The formulations were inspected visually for their appearance, colour and odour.

2.3.2.2 Measurement of pH

pH was measured using a pH meter, which was calibrated before each use with standard buffer solutions at pH 4, 7, 9. The electrode was inserted into the sample 10 minutes prior to taking the reading at room temperature (16).

2.3.2.3 Viscosity

The viscosity of the formulations was checked using a Brookfield Viscometer. The gels were rotated at 0.3, 0.6, 1.5 rotations per minute. The viscosity of the gel was obtained by multiplying the corresponding dial reading with the factor given in the Brookfield Viscometer catalogue (17).

2.3.2.4 Spread ability

Spread ability is measured in terms of time in seconds taken by two slides to slip off from the gel when placed in between the slides under the direction of a certain load. The excess amount of sample was placed between the two glass slides and a definite amount of weight was placed on these glass slides to compress the glass slides of uniform thickness. A weight of 70 g was added and the time required to separate the two slides was noted. Spread ability was calculated using the formula (18).

$$S = M*L / T$$

where,

M = wt tied to upper slide,

L = length of glass slides,

T = time taken to separate the slides.

2.3.2.5 Stability

Stability testing of drug products begins as a part of drug discovery and ends with the demise of the compound or commercial product. To assess the drug and formulation stability, stability studies were done according to ICH guidelines. The stability studies were carried out as per ICH guidelines. The cream filled in bottle and kept in humidity chamber maintained at 40 ± 2°C / 75 ± 5 % RH for three months. At the end of studies,

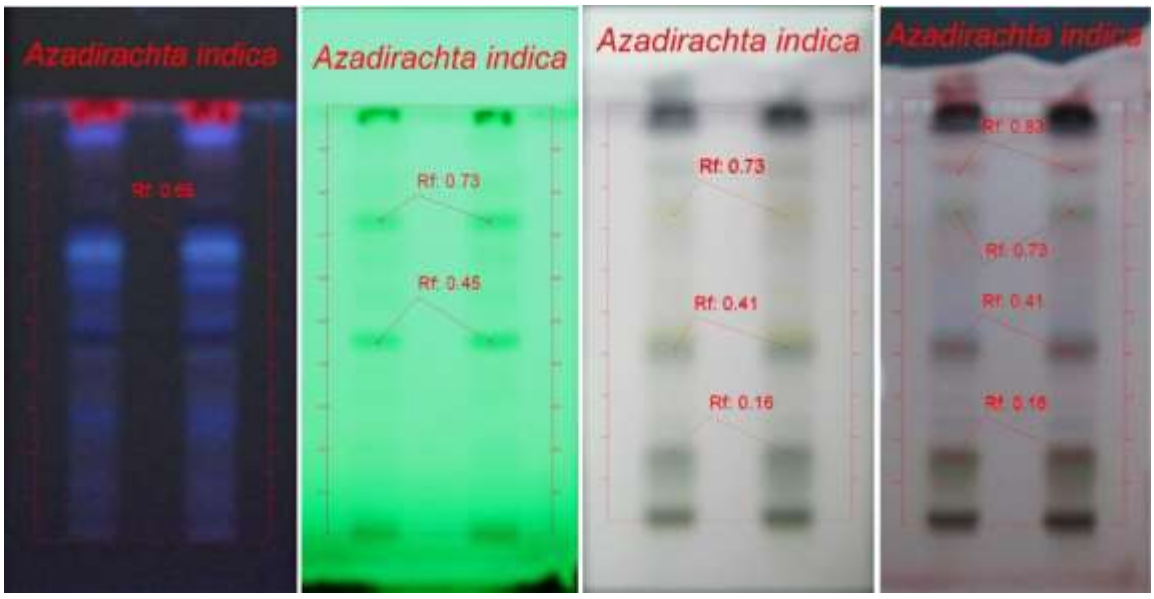
samples were analyzed for the physical properties, pH and viscosity (19).

3. Results and Discussions:

3.1 Preliminary phytochemical investigation of methanolic extract of plants:

TLC chromatogram of *Azadirachta indica*

- Mobile phase : Ethyl acetate: n-Butanol: Formic acid: Water (25:15:5:5)
- Tank saturation: 20 minutes
- Sample applied: 7µl & 9 µl
- Solvent front: 85mm
- Drying : 5minutes
- Detection/visualization: At 366nm, 254nm & after derivatization
- Derivatization: Anisaldehyde sulphuric acid



UV 366 nm UV 254 nm Under visible light UV 366 nm

3.2 Evaluation of skin care cream

3.2.1 Physical Properties of Cream: All creams are semisolid in nature. Creams are yellowish in colour and have characteristic odour.

3.2.2 Thermal stability of cream (At room temperature and 65% ± 5% RH)**:** Formula 1 to 4 creams were stable at room temperature but formula 5 and 6 were showed slight oily separation.

3.2.3 pH of the cream: pH of the cream shows in the table no. 3 which range from 5.89 to 6.11 of the different formulations. pH of creams is close to 6 which suitable for skin because pH of the skin is approximately 6.

Table 3: pH of the creams

Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
6.05	5.89	6.11	6.02	5.97	5.94

3.2.4 Viscosity of the cream: At 0.5 rpm to 1.5 rpm viscosity was decreased from 7342 to 1876 cps. So, if we decrease the rate of shear it increases the viscosity of cream. Viscosity of creams is inversely proportional to rate of shear (rpm) and the results are showed in table no. 4.

Table 4: Viscosity of the creams

rpm	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
0.3	7342	7413	7534	7241	7187	7216
0.6	3876	3906	3987	3456	3187	3296

1.5	1876	1893	1956	1785	1863	1816

3.2.5 Spread ability of the cream: The spread ability of the formulations is showed in table 5. The spread ability ranges from 13.8 to 14.2.

Table 5: Spread ability of the creams

g.cm/sec	Formula 1	Formula 2	Formula 3	Formula 4	Formula 5	Formula 6
Spread ability	14.2	14.1	14.4	13.8	13.7	14.0

3.3 **Accelerated Stability Studies of Cream:** Accelerated stability testing of prepared formulations were conducted at 40° ± 2°C temperature and 75± 5% relative humidity and studied for 90 days. The creams formulations did not show any change in the physical characteristics, pH and viscosity in the stability studies which are shown in table no. 6 and 7. The creams were found to be stable during stability study according to ICH guidelines (40 ± 2 °C/ 75 ± 5 % RH) for 3 months.

Table 6: pH of the creams (Initial and after 3 months)

pH	**Formula 1**	**Formula 2**	**Formula 3**	**Formula 4**	**Formula 5**	**Formula 6**

Initial	6.05	5.89	6.11	6.02	5.97	5.94
After 3 months	6.02	5.91	6.11	5.98	5.97	5.91

Table 7: Viscosity of the cream (Initial and after 3 months)

rpm	**Formula 1**	**Formula 2**	**Formula 3**	**Formula 4**	**Formula 5**	**Formula 6**
Initial	1876	1893	1956	1785	1863	1816
After 3 months	1789	1810	1914	1721	1803	1765

4. Conclusion

The prepared formulation showed good spread ability, no evidence of phase separation and good consistency during the study period. From the above study, it can be concluded that it is possible to develop creams with herbal extracts. The methanolic extract of *Azadirachta indica* exhibited strong antibacterial activity. The results of different tests of cream showed that the formation could be used topically in order to protect the skin against damage. Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. So, an herbal cream which is non-toxic, safe, effective and improves patient compliance by the utilization of herbal extracts would be highly acceptable. Further research will carry out to check scientifically the synergistic action of formulation.

5. References:

1. S. Saraf, C.D. Kaur, Phytoconstituents as photoprotective novel cosmetic formulations, vol. 4,Issue 7, Pharmacogn. Rev., 2010, 1-11.

2. Trailokya Das et.al., Formulation and evaluation of an herbal cream for wound healing activity, International Journal of Pharmacy And Pharmaceutical Sciences, 2014; 6(suppl 2): 693-697.

3. World Health Organization, Legal status of traditional medicine and complementary/alternative medicine: A worldwide review., 2001,131-133.

4. Karunamoorthi K et.al.Tamil traditional medicinal system - Siddha: an indigenous health practice in the international perspectives. International Journal of Genuine Traditional Medicine. 2012, Vol: 2(2):1-11.

5. Imran K et.al: A Review Advances in Topical Drug Delivery System: International Journal of Pharmaceutical Research & Allied Sciences 2011, Vol: 1(1) 14-23.

6. Roberts MS et.al.Targeted drug delivery to the skin and deeper tissues: role of physiology solute structure and disease. Journal of Clinical Experimental Pharmacology and Physiology.1997, Nov. vol:24(11):874-9.

7. Garima Pandey, Kk Verma, Munna Singh. Evaluation of phytochemical, antibacterial and free radical scavenging properties of *Azadirachta indica* (Neem) Leaves. International Journal of Pharmacy and Pharmaceutical science, 2015, Vol: 6(2):444-447.

8. Koul. O., Isman.M.B., and Ketkar.C. M.. Properties and uses of neem, *Azadirachta indica*. Canadian journal of botanical sciences. 1990 vol-68(13): 1-11.

9. Mohammad A. Alzohairy., Therapeutics Role of *Azadirachta indica* (Neem) And Their Active Constituents In Diseases Prevention And Treatment. 2016,Vol:2(1): 1-11.

10. Soniya Adyanthaya, Vidya Pai, Maji Jose M.D.S Antimicrobial Potential of the extracts of the twigs of *Azadirachta indica* (Neem): An in vitro study. Journal of Medicinal Plants Studies 2014:2(6): 53-57.

11. Imam Hashmat , Hussain Azad and Ajij Ahmed Neem (*Azadirachta indica* A. Juss) -A Nature's Drugstore: An overview. International Research Journal of BiologicalSciences. October (2012), Vol:1(6):76-79.

12. Alok Maithani, Versha Parcha, Geeta Pant, Ishan Dhulia, And Deepak Kumar. A Review Introduction *Azadirachta indica* (Neem) Leaf Journal Of Pharmacy Research 11,Vol:4(6):1824-1827.

13. World Health Organization. Traditional medicine: Fact sheet N134. 2008. Dec, [Last accessed on 2012 Apr 15].

14. Evbuomwan BO, Felix-Achor I, Opute CC. Extraction and characterization of oil from neem seeds, leaves and barks. European International Journal of Science and Technology. 2015 Sep;4(7):1-7.

15. Khan MR, Masood RS, Hussain M. Formulation and In-Vitro evaluation of Cream containing Diclofenac Sodium and *Curcuma Longa* for the Management of Rheumatoid Arthritis. International Journal of Pharma Sciences. 2014;4(4):654-60.

16. Lognathan V et al. The effect of polymers and permeation enhancers of flubiprofen from gel formulations. Indian Journal of Pharmaceutical Sciences. 2001; 63(3): 200– 204.

17. Wood J. H., Catacalos G. and Liberman S. V. Adaptation of commercial viscometers for special applications in pharmaceutical rheology-II, Journal of Pharmaceutical Sciences. 1963;52, 375-378.

18. Carl AB, Edward RA. Text book of clinical chemistry and molecular diagnostics. 4th revised edition. 2001

19. Alexander S, Thyangarajapuram N. Formulation and Accelerated Stability Studies for an Extemporaneous Suspension of Amiodarone Hydrochloride. International Journal of Pharmaceutical Compounding. 2003; 3:34-36.