Formulation and Evaluation of Hydro-gel containing *Eclipta alba* extract

Pushpendra Kumar Kurre* Suresh Kumar Ghritlahare, Manmohan Singh Jangdey

Department of Pharmacy, Shri Rawatpura Sarkar University Raipur, (C.G.) -492015, India

Article Information

Received 18 April 2020
Received in revised form 1 Oct 2020
Accepted 3 October 2020

Keywords:

Eclipta alba,
Hydrogel,
Carbopol 940,
Anticancer activity

Corresponding Author:

E-mail : pusu.006kurre@gmail.com

Mob.: xxxxxxxxx

DOI: [10.20510/ukjpb/8/i5/1606402614](https://doi.org/10.20510/ukjpb/8/i5/1606402614)

Abstract

Formulation & evaluation of *Eclipta alba* hydro-gel, the medicinal herbal hydrogel was prepared by using alcoholic extracted leaf powder of *Eclipta alba*, Carbopol-934, Acacia, Glycerin Sodium benzoate and HPMC. Leaves in concentration (1% and 5%) and evaluated using physiological measurements. The prepared herbal hydrogel formulation was studied for pre-liminary evaluation such as Viscosity, pH, Spreadability, Rheological studies, Skin irritation test and Drug content uniformity Accelerated stability studies for 3 months. The Formulated hydrogel pH was found to range of 6.45 to 6.68, which lies in the normal pH range of the skin. The formulations did not produce any skin irritation, i.e., erythematic and edema for about a week, when applied over the skin. The viscosity of formulation was range 1024 which spread on the skin properly. On the basis of evaluation study, it can be concluded that *Eclipta alba* Linn. Medicinal herbal hydrogel may be used for wound healing, antibacterial and antifungal activity anticancer, Anti-inflammatory activity.

1 Introduction

The nature of Hydro-gels is hydrophilic, three-dimensional and polymeric network of hydrogel capable to absorbing the high amounts of water/biological fluids. The high water content, soft consistency and porosity, they closely simulate the natural living tissues, as compare to other synthetic bio-materials formulations. Hydro-gels may be stable chemically, disintegrates and dissolved. This Hydro-gel may be changed or stable it depends upon the nature of various functional Group presents their structure. The charged Hydro-gels exhibit changes, swelling upon unusual pH and they can go through changes in form & consistency when hydro-gel exposed to electric fields.

The chemically Hydro-gels are generally formulated in two-different methods: 'three-dimensional polymerization in this method a monomers of hydrophilic are polymerized in the existence of a multifunctional cross-linking agent, or by hydro-gel forms direct linked to water-soluble polymers^{1,2}. Hydrogel is form natural polymers including proteins for example collagen and gelatin as well as polysaccharides for example starch, alginate. Synthetic polymers are usually equipped using chemical polymerization methods that forming Hydro-gels³.

Eclipta alba is commonly identified as Bhingraj, & False Daisy and plant belonging to family Asteraceae. It is the perennial herb usually found spreading easily in moist tropical country. Leaves are opposed, serrate, 3.0 to 5.0cm long and blackish-green in colour. The entire plant and seeds have huge therapeutic value^{4,5}. *Eclipta alba* contain many chemical constituents glycosides, alkaloids, coumestans, flavonoids, polyacetylenes, triterpenoids. The leaves contain stigma sterol, a-terthienylmethanol, wedelolactone, dimethylwedelolactone & dimethylwedelolactone-7-glucoside. The roots give heptacosanol and hentriacontanol. The root contains polyacetylene and substituted thiophenes. The aerial part was report to contain a P-amyrin phytosterol, glucoside luteolin-7 and n-hexane extract, phytosterol P-glucoside a glucoside of wedelolactone, triterpeic acid in polar solvent extract. The polypeptideisolated from the plant yield, phenylalanine, glutamic acid, cystine, tyrosine & methionine on hydrolysis. Nicotine & Nicotinic acid were reported to occur in this plant⁶.

Pharmacological activity of *Eclipta alba* are Analgesic effect, Anti-aggression activity, Antibacterial activity, Anticancer activity, Antidiabetic activity, Anti helmenthic activity, Antihepatotoxic properties, Anti-inflammatory activity, Hair growth promoter activity, Memory enhancing activity⁷⁻¹⁶. In modern era universal trend towards the use of natural photo-

chemicals contain in natural wealth, such as fruits, vegetables and herbs as antioxidant agents. India is a huge country having broad variety in eco-climatic conditions, mineral and botanical wealth and fauna. The primary objective of this work was to overcome the dependence on synthetic medicines by using herbal-based therapeutics in treating microbial infection, Hence in their study medicinal plant (*Eclipta alba*) used as an alternative choice of chemotherapy as well as prepared their hydrogel.

2 Material and methods

The herbs of *Eclipta alba* were collected between Dec- Jan from village– parsada (kumhari) and The herbs collected for the above purpose was authenticated as *Eclipta alba* (SRIP/Research-63/2016-17-95) by Dr. Rakshapal Gupta, Associate professor, Department of Dravyaguna, Government Ayurvedic College, Raipur. The collected *Eclipta alba* herbs subjected to drying for 15 day in shade. After proper drying the leaves from the stem were separated. After proper drying the leaf of *Eclipta alba* was subjected to reduce into powder form. This procedure was performed by using mill to convert dried leaf into small piece and further reduced into powder form by simple mill.

2.1 Extraction method

Dried powder of leaves of *Eclipta alba* was transferred into soxhlet apparatus. Ethanol was transferred into round bottom flask, which was used as solvent system for extraction. The soxhlet unit was setup. The maintained temperature was 40 - 50 °C by putting apparatus on heating mental. After extraction, the extract of hydro-gel was transferred into china dish and subjected for further process (Fig-1).

Fig1: Ethanolic extraction process of *Eclipta alba*

2.2 Formulation of *Eclipta alba* hydrogel

All the apparatus were washed and dried. The weighed quantity of hydrogel forming polymer (HPMC, carbapol) were dissolved in small amo

unt of double distilled water in various proportion by sonication in a beaker. Then remaining ingredient i.e, glycerine and sodium benzoate were added. Then *Eclipta alba* leaf powdered ethanolic extract of were mixed with above mixture. The Mixtures were subjected to sonication. The prepared hydrogel were transferred in a suitable container (fig. 2 and table1).

Fig 2: Formulation of *Eclipta alba* extract Hydro gel

Table 1: Composition of *Eclipta Alba* hydrogel formulation

Ingredients	Quantity
Carbapol 934	500 mg
HPMC	250 mg
Acacia	250 mg
Glycerine	10 ml
Sodium benzoate	100 mg
Herbal Extract	150mg
Distilled water	Upto 20 ml

2.3 Phytochemical characterization

Phytochemical screening was performed using standard procedures.

2.3.1 Test for reducing agent

The aqueous or alcoholic extract 0.5 ml in 5 ml purified water was added to boiling Fehling's solution (A & B) in test tube and observed colour change.

2.3.2 Test for Anthraquinones

Take 0.5 ml of the ethanolic extract of was boiled with adding 10 ml of sulphuric acid (H_2SO_4) and filter. The filtrate was shaking with adding 5 ml chloroform. Chloroform layer was separated in other test tube and 1.0 ml of diluted ammonia was added. observed colour change

2.3.3 Test for terpenoids

Take 0.5 ml of ethanolic extract and added 2.0 ml of (CHCl₃) chloroform. after that 3.0 ml (Cons.) H₂SO₄ was added slowly and Observed colour change

2.3.4 Test for flavanoids:

2 Methods is used in flavonoids. First take filtrate of an aqueous extract after 5.0 ml dilute ammonia was added to a portion. After that 1.0 ml of (cons.) H₂SO₄ was added. Yellow colour indicates for flavenoids. Second, extract was heated for 3 min along 10 ml ethyl-acetate in steam water bath. The test mixtures were filtered & 4 ml of filtrate were shaken with 1 ml of dilute ammonia solution. The yellow colour indicates that the presence of flavonoid.

2.3.5 Test for saponins

Firstly 0.5-ml of ethanolic extract takes in test tube and purified water 5 ml. The tested solution was shaken and stable persistent froth was observed. The olive oil 3- drops was mixed with frothing & shaken energetically after the formation of an emulsion.

2.3.6 Test for tannins

Firstly 0.5-ml of ethanolic extract takes and boil with 10 ml of purified water in test-tube then filtered. After that 0.1% of FeCl₃ is added and Observed colour change brownish green and blue-black colours are indicating presence of tannin.

2.3.7 Test for alkaloids

Firstly take 0.5-ml of extract and dilute 10ml alcohol .after that filter the extract and take 5 ml of the filtrate and mixed 2-ml of dilute ammonia. 5.0 ml of CHCl₃ was added and shaking lightly to extract the alkaloid base. The layer of chloroform was extracted along 10 ml of acetic acid. This was divided in two parts first for Mayer's reagent and second Part for Dragendorff's reagent. The formation of a gel with Mayer's reagent reddish brown precipitate with Dragendorff's reagent was regarded as positive for the presence of alkaloids.

2.4 Physicochemical characterization

2.4.1 Loss of weight on drying

The % LOD was measured gravimetrical method in which 5.0 g of accurately weighed air-dried material was placed in a previously dried and tare flat weighing bottle. The sample material was dried in hot oven at 100°C–110°C until 2 sequent weighing did not different more than 5.0 mg.

2.4.2 Ash value

The remaining residue is after incineration is ash content of drug. 3.0 gm of crud drugs was exactly weighed in the treaded silica cross. The crud drug was incinerated by the gradually and progressively until free from carbons and cooled. The ash was weighed and calculated % of total ash by source to air dried samples.

2.4.3 Extractive value

take 5 gm of crude drug were accurately weighed and subjected to maceration by 100 ml ethyl alcohol in 100 ml volumetric flask. Then frequently shacked for 6 hour. The solution was rapidly

filtered and collected. 25 ml of alcoholic extract was evaporat to dryness in the flat bottom shallow dish. The residue ware dried at 105^{0C} and kept into desiccators. The extract was dried at constant weight. Finally % w/w of alcoholic soluble extractive value by source to air dried drugs.

2.4.4 Chromatography

It is a separation technique for non-volatile mixtures. It is operate on plastic or glass sheet which is coated with a thin layer of adsorbent material used silica gel. After the sample has been applied on the plate, a solvent or solvent mixture (known as the mobile phase) is drawn up the plate via capillary action, because different analytes rise the chromatography plate separation is achieved at different rates.

2.5 Evaluation of herbal Eclipta alba Hydrogel

The *Eclipta alba* herbal gel was evaluated as follows:

2.5.1 Appearance

The *Eclipta alba* gel having Carbopol 934 and HPMC were milky white and yellowish transparent respectively. Sodium alginate and methyl cellulose gel was opaque in appearance.

2.5.2 pH Assessment of Eclipta alba gel

The pH values of *Eclipta alba* gel was checked via a pH Meter at constant temperature and the PH was 6.4 found in hydrogel formulation.

2.5.3 Spread ability test

Spread-ability can be analyzed by applying the hydro-gel over an even surface and observed for the grittiness of *Eclipta alba* hydrogel.

2.5.4 Viscosity assessment of Eclipta Alba hydrogel

Viscosity is an important feature to determine the resistance of flow of gel formulation so that it can spread on the skin properly. It was determined with the help of viscometer (Brookfield) using 2 numbers and the viscosity of hydrogel 1024μ.

2.5.5 Drug content

For assay of the hydrogels, eclipta alba was extracted from 1 g formulations with 20 mL of phosphate buffer pH7.4 for 30 min. The resultant mixture was filtered through membrane filter (pore size 0.45 μm).The absorbance of prepared sample was spectrophotometrically determined at 277 nm after proper dilution with pH 7.4 phosphate buffer.

2.5.6 Percentage Moisture Content

Moisture percentage (%) loss from the prepared formulation was analyzed by the standard method. Two gram formulation was weighed exactly & kept in a desiccators containing 50gm calcium chloride anhydrous. After three days, the formulation was weighed. The Moisture percentage (%) loss was determined using the formula as follows:

Moisture Percentage (%) loss = Initial weight - Final weight / Final weight X 100

2.5.7 Transparency on drying of Eclipta alba gel

The 5ml gel formulation taken in the 10ml (Borosil[®]) test tube and visually checked for its transparency.

2.5.8 Smoothness on drying of *Eclipta alba* gel

The smoothness of the gel formulation was tested by rubbing between the fingers and observes whether the gel is smooth, clumped, homogenous or rough.

2.5.9 Weighing on drying of *Eclipta alba* gel

The relative density of the formulation or weight/ml of the formulation was determined by taking the weight in gm of 10ml formulation & 10ml distilled water using RD bottle

2.5.10 Accelerated stability studies

The accelerated stability test was performed on optimized prepared formulation as per ICH guiding principles. The prepared tested formulation was filled in aluminium tubes were subjected to stability testing as per ICH guidelines for 3-months at a $40 \pm 2^\circ\text{C}$ temperature & $75 \pm 5\%$ RH. Samples were taken at standard time intervals of 1-month for over a time of 3-months and determined for the change in spread-ability, pH, viscosity and drug contents.

3 Result & discussion

3.1 Phytochemical Screening

Phytochemical screening of ethanolic extract *Eclipta alba*, all tests were positive except for anthrax-quinones, which was absent in *Eclipta alba* (table 2).

Table 2: Phytochemical evaluation of extract of *Eclipta alba*

Test	Ethanol Extract
Fehling test	+
Anthraquinones	-
Terpenoids	+
Flavonoids	+
Alkaloids	+
Saponins	+
Tannins	+
Proteins	+

3.2 Physicochemical characterization

The percentage (%) of loss of weight on drying, total extractive and ash value was analyzed by employing standard procedure (table 3 and fig.3). The percentage of extractive principles of the leaf powder in alcohol solvent systems was also determined.

Fig 3: Ash after incineration of drug

Table 3: Physicochemical evaluation of *Eclipta alba*

Particular	<i>Eclipta alba</i> %
Loss of weight on drying	1.012
Total ash	30
Alcohol	9.4

3.3 Chromatography profile (TLC)

This study has been performed to the ethanolic extracts of the plant powder of *Eclipta Alba*. Silica gel G used for TLC was activated in hot air oven at 100°C for 1 hour. The thin layer plate at a 2-cm distance from the base, mark was made on the line for sample application. Sample was spotted on the line with the help of capillary tube & it was allowed to drying. The plate was placed in the developing chamber with mobile phase. Mobile phases were selected by hit and trial method. Various ratio of solvent system were prepared and the spots was visualized and Rf value was calculated. After visualization of spots solvent system was selected. TLC plates were run using solvent system **Chloroform: Alcohol** in the ratio of **8:2** for alcoholic extract of *Eclipta alba* (fig.4; Table 4). The spots obtained were labeled and Rf value was calculated.

Table 4: Evaluation chart of *Eclipta alba* hydrogel formulation

Characteristics	Result Herbal Hydrogel
Appearance	Green-yellowish transparent
Moisture Content	95%
Transparency	Translucent
Smoothness	Smooth
Viscosity in cpu	1024 μ
pH	6.4
Spread ability	Gritty in nature
Drug content	98.6%

3.4 Accelerated stability studies

The major changes were not found on tested hydro-gel. The tested formulation was observed to be stable after exposure to accelerated humidity and temperature environment for a period of 3- months. No significant changes were seen in physical evaluation parameters and given in the (table 5).

4 Conclusion

In recent advance, the ayurvedic drugs are screened by the researchers of various disciplines for example pharmacologist and other medical and para medicals. *Eclipta alba* topical hydrogel was formulated using polymer. The present gels
Pharm & Biosci J. 2020; 8(5); 30

showed good physico-chemical properties which were assessed in term of Transparency, smoothness, density, moisture content and pH with respect to marketed formulation. These results suggest the feasibility of the topical of hydrogel for the fruitful effective and safe efficacy for skin irritation & skin disorder. Also it can be concluded that *Eclipta alba* Linn. Medicinal herbal hydrogel may be used for wound healing, antibacterial and antifungal activity anticancer, Anti-inflammatory activity.

Fig 4: TLC plates with spots extract of *Eclipta Alba*

Table 4: Evaluation chart of *Eclipta alba* hydrogel formulation

Characteristics	Result Herbal Hydrogel
Appearance	Green-yellowish transparent
Moisture Content	95%
Transparency	Translucent
Smoothness	Smooth
Viscosity in cpu	1024 μ
pH	6.4
Spread ability	Gritly in nature
Drug content	98.6%

5 Acknowledgements

I am grateful to Dr. Manmohan Singh Jangdey, Shri Rawatpura Sarkar University, Raipur, (C.G.) for his support and valuable guidance to carry-out research work. The authors also express their gratitude to director, Shri Rawatpura Sarkar University for the moral support thought the writing of research paper.

Table 5: Physical Parameters after Accelerated Stability Study of Formulation

Characteristics	Initial	after 1 month	after 2 month	after 3 month
pH	6.4 $\pm$ 0.02	6.4 $\pm$ 0.02	6.4 $\pm$ 0.03	6.4 $\pm$ 0.04
Viscosity (cpu)	1024 $\pm$ 0.02	1024 $\pm$ 0.05	1024 $\pm$ 0.06	1024 $\pm$ 0.07
Drug content	98.6 $\pm$ 0.2	98.6 $\pm$ 0.2	98.6 $\pm$ 0.3	98.6 $\pm$ 0.03

Temperature: 40 $\pm$ 2 $^{\circ}$ C ;Relative humidity (RH): 75 $\pm$ 5%RH

6 Declaration of Interest

The authors report has no declaration of interest. The authors alone are responsible for the content and writing of the research paper.

7 References

1. H. Park, K. Park, Biocompatibility issues of implantable drug delivery systems, *Pharm. Res.*, 13 (1996),1770–1776.
2. J.M. Anderson, J.J. Langone,, Issues and perspectives on the biocompatibility and immunotoxicity evaluation of implanted controlled release systems, *J. Control. Rel.*, 57 (1999), 107–113.
3. Zhao Wen, Jin Xing, Cong Yang, Liu Yuying, Fu Jun, Degradable natural polymer hydrogels for articular cartilage tissue engineering, *J Chem Technol Biotechnol*, (2013), 88 (3) , 327–339.
4. Bickoff E.M., Spencer R.R. et al, Studies on the chemical and biological properties of coumestrol and related compound, United state department of agriculture, Technical Bulletin no. 1969, 1408.
5. Chopra R.N. et al, In: Glossary of medicinal plants, SIR publication, New Delhi, 1996, 104.
6. Jadhav V.M. et al, Chemical composition and Pharmacological activity of *Eclipta alba*, *Journal of Pharmacy research*, 2009; 2(8):1129-1231.
7. Sawant M., Issac J.C. et al Analgesic studies on total alkaloids and alcohol extract of *Eclipta alba* (Linn.) Hassk, *Phytotherapy research* 2004; 18 (2):111-113.
8. Lobo O.J., banjid et al, Evaluation of anti-aggressive activity of *Eclipta alba* in experimental animal. *Pak Sci*, 2008; 21(.2): 195-199.
9. Pandey M.K., Singh G.N.,et al, Antibacterial activity of (L) Hassk, *Journal of applied Pharmaceutical Science* 2011; 01 (07): 104-107.
10. Chaudhary H , Dhuna et al Evaluation hydro-alcoholic extract of *Eclipta alba* for its anticancer potential: an in invitro study, *J Ethanopharmacol* 2011;136 (2):363-367.

11. Hemalatha S, Ayyappam T et al, Evaluation of antidiabetic and diuretic activity of polyherbal formulation, Indian Journal of Traditional knowledge, 2006; 5(4); 468-470.
12. Sujata C.G. Chaudhary R.S. et al, Antihelmenthic potential of *Eclipta alba*(L.) Hassk against *Pheretima* phosthoma , International journal of Pharmacy and pharmaceutical Sciences 2011; 3 (1).
13. Lal V.K., Amit K. et al, Screening of leaves and roots of *Eclipta alba* for hepatoprotective activity, Archives of Applied Science research: 2000; 2 (1); 86-94.
14. Anumachalam G, Subramanian N. et al Antiinflammatory activity of methanolic extract of *Eclipta prostrata* L. (Asteraceae). African Journal of Pharmacy and pharmacology, 2009; 3 (3); 97-100.
15. Datta K, Anu T.S. et al *Eclipta alba* extract with potential for hair growth promoting activity, Journal of Ethanopharmacology 2009; 124; 450-456.
16. Banji O, Banji D et al, investigation on the effect *Eclipta alba* on animal models of learning and memory, Indian journal of physiology and pharmacology: 2003; 51(3): 274-278.
17. Iqbal Hussain, Naeem Khan, Riaz Ullah, Shanzeb, Shabir Ahmed, Farhat Ali Khan and Sultan Yaz, "Phytochemical, physiochemical and antifungal activity of *Eclipta alba*", African Journal of Pharmacy and Pharmacology, 2011, 5(19) : 2150-2155
18. Manik Sharma, Muhammad Yusuf, Showkat Hussain and Abrar Hussain "phytochemical constituent and pharmacological activity of *Eclipta alba* Linn (Asteraceae): A review", International Research Journal of Pharmacy, 2012,51-53.
19. Charu, Nancy Dhadwal, S.L.Harikumar, Gurfateh Singh, "Preparation of *Aloe vera* cosmetic herbal hydrogel", International Journal of Institutional Pharmacy and Life Sciences 5(5): 2015; 550-555.
20. I.Sudheer Babu1, R.Bhramaramba2 and S. Satya Naga Tejaswini2 "Formulation and Evaluation of Herbal Gel containing *Eclipta alba* Linn, leaves extract" International Journal Of Advances In Pharmacy, Biology And Chemistry ISSN: 2277 – 4688 IJAPBC – Vol. 4(2), Apr - Jun, 2015 PP 496-499
21. Himaja N. "Development And Evaluation Of Poly Herbal Antidandruff Gel" European Journal Of Pharmaceutical And Medical Research , 2015,2(6), 198-201 198-201
22. Audet, P., Lacroix, C., 1989. Two-phase dispersion process for the production of biopolymer gel beads: effect of various parameters on bead size and their distribution. Process Biochemistry 24, 217–226
23. N.A. Peppas, E.W. Merrill, Differential scanning calorimetry of crystallized PVA hydrogels, J. Appl. Polym. Sci. 1976;1457-1465
24. S.R. Stauffer, N.A. Peppas, Poly(vinyl alcohol) hydrogels prepared by freezing thawing cyclic processing, Polymer 1992; 3932- 3936
25. N.A. Peppas, Hydrogels and drug delivery, Curr. Opin. Coll. Int. Sci. 1997; 2: 531-537
26. J.L. Stringer, N.A. Peppas, Diffusion of small molecular weight drugs in radiation-cross linked poly(ethylene oxide) hydrogels, J. Control. Release 1996, 42: 195-202.