JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

FORMULATION AND EVALUATION OF HERBAL ORAL GEL.

[1]Santoshi T. Chavan [2] Madhavi M. Namanwar [3]Satish B. Kosalge [4]Shubham V. Jadhav

[1]Student of M.Pharmacy (Pharmaceutics) Hi Tech college of pharmacy chandrapur 442406.(M.S.) India.
[2]Professor of Hi Tech college of pharmacy chandrapur 442406.(M.S.) India.
[3]Principal of Hi Tech college of pharmacy chandrapur 442406.(M.S.) India.
[4]Student of M.Pharmacy (Pharmacognosy) Hi Tech college of pharmacy chandrapur 442406.(M.S.) India.

Abstract: Herbal medicines is still the spine of about 80% of the ecosphere's people, for key health care because of healthier cultural suitability, better compatibility with human frame and lesser side effects. Herbal medicines consist of plant or its part to treat wounds, sickness or infections and are used to prevent and treat sicknesses and diseases or to promote health and curing. It is a drug or preparation made from a plant and used for any to such purpose. Herbal medicines are the oldest form of health care known to mankind. Gel formulations prepared with HPMC K 100 M, Xanthan gum and Carbopol 934 presented decent homogeneity, no skin irritation, good stability and anti-inflammatory activity. However, the Xanthan gum-based gel demonstrated to the formula of choice, since it showed the highest ratio of extrudability, good spreadability and rheological properties. 1% root extract of Clerodendrum serratum showed the best anti-inflammatory activity. Herbal gel by using Terminalia chebula. The plant is commonly mentioned as 'King of Medicine' in Tibet. It chiefly contains active constituents like steroids, flavonoids, tannins, reducing sugar, belleric acid, bellericoside, chebulinic acid, gallic acid, ethyl gallate,punicalagin, terflavin A, terchebin, luteolin, and tannic acid . It is mainly used as antibacterial and antifungal, analgesic, anti-inflammatoy, sun burns and wound healing. Pothos scandens Linn leaf extract gel illustrates their burn wound healing activity. Coccinia indica aqueous extract have valuable impact on the various phases of wound healing like wound contraction and resulting in faster healing than aqueous extract. ethanolic extracts of as Aloe barbedensis, Ocimum tenuiflorum and Azadirachta indica very capable antifungal and antimicrobial activity comparable with a marketed gel.

Keywords: Herbal gel

Introduction: -

The word ''gel'' is derived from ''gelatin,'' and both ''gel'' and ''jelly'' can be drawn back to the Latin gelu for ''frost'' and gel are, meaning ''freeze'' or ''congeal.'' This source shows the essential idea of a liquid setting to a solid-like material that does not flow, but is elastic and retains some liquid characteristics. Use of the term ''gel'' as a classification originated during the late 1800s as chemists attempted to classify semisolid substances according to their phenomenological features rather than their molecular compositions. At that time, analytical methods needed to determine chemical structures were absent. Gels are defined as semi rigid systems in which the movement of the dispersing medium is restricted by an interlacing three-dimensional network of particles or solvated supermolecules of the dispersed phase. The USP defines gels (sometimes called jellies) as semisolid systems containing either suspensions made up of small inorganic particles, or large organic molecules diffused by a liquid. Where the gel mass contains a network of small separate particles, the gel is classified as a two-phase system. In a two-phase system, if the particle size of the dispersed phase is relatively large, the gel mass is sometimes called as a magma. Single-phase gels consist of organic supermolecules uniformly distributed throughout a liquid in such a way that no apparent boundaries occur between the dispersed supermolecules and the liquid.

Properties of Gels.

1. The gelling agent must be inert, safe and cannot react with other constituents.
2. The gelling agent should produce a functional solid-like nature at the time of storage which is easily broken when exposed to shear forces produced by squeezing the tube, trembling the bottle or at the time of topical application.
3. It should have appropriate anti-microbial agent.
4. The topical gel must not be gluey.
5. The ophthalmic gel must be sterilized.
6. The apparent viscosity or gel strength increases with an increase in the effective crosslink density of the gel.
7. They exhibit the mechanical features of the solid state.
8. Each constituent is continuous throughout the system.
9. There is high degree of attraction amongst the dispersed phase and water medium so the gels remain equally distributed upon standing and doesn't freely settle.

Characteristics of Gels

Swelling

Gels can swell, gripping liquid with an increase in volume. This can be observed on as the initial phase of dissolution. Solvent penetrates the gel matrix so that gel-gel relations are replaced by gel-solvent interactions. Limited swelling is usually the result of some grade of cross-linking in the gel matrix that prevents total dissolution. Such gel swells significantly when the solvent mixture possesses a solubility behaviour comparable to that of the gellant.

Syneresis

Many gel systems undergo shrinkage upon standing. The interstitial liquid is expressed, collecting at the surface of the gel. This process stated to as syneresis, is not limited to organic hydrogels, but has been seen in organogels and inorganic hydrogels as well. Typically, syneresis becomes more pronounced as the concentration of polymer decreases. The mechanism of contraction has been related to the relaxation of elastic stresses established during the setting of the gel. As these stresses are relieved, the interstitial space existing for solvent is reduced, forcing the expression of fluid. Osmotic effects have been implicated, as both pH and electrolyte concentration influence syneresis from gels consist of the ionic gel formers gelatin or psyllium seed gum.

Ageing

This process is referred to as ageing. Colloidal systems usually exhibit slow spontaneous aggregation. In gels, ageing results in the slow formation of a dense network of the gelling agent. This process is like to the original gelling process and continues after the initial gelation, since the fluid medium is lost from the afresh formed gel Structure. The inflexibility of a gel arises from the presence of a network formed by the interlinking of particles of the gelling agents. The nature of the particle and the kind of force that is responsible for the linkages determine the structure of the network and the properties of the gel.

Rheology

Solutions of the gelling agents and dispersion of flocculated solid are pseudo plastic i.e., showing Non-Newtonian flow performance, characterized by a reduction in viscosity with an increase in shear rate. The tenuous structure of inorganic particles dispersed in water is disrupted by applied shear stress due to breaking down of interparticle association, exhibiting a greater tendency to flow. Similarly, for supermolecules the applied shear stress aligns the molecules in the direction of stress, straightening them out and diminishing the resistance to flow.

Formulation of gel

A sufficient quantity of Carbopol 934 was soaked in distilled water overnight, and then mixed with distilled water with non-stop stirring using a mechanical stirrer. Another solution containing varying quantity of EEA, EEO and EEZ and the required number of methyl paraben and propyl paraben were added with non-stop stirring. Propylene glycol was also added to the solution. This prepared solution was further mixed with Carbopol 934 solution carefully with continuous stirring, volume was made up to 30ml with water and the pH was maintain by addition of triethanolamine to obtain gel of required consistency. Formulations of herbal gels were formulated by varying the herbal ingredients in each of the formulation as

Formulation of herbal gels

Ingredients

Sr. No.	Ingredients	Quantity Taken
1	Carbopol 934	1.5
2	Sodium CMC	1
3	Sodium Saccharin	0.5
4	SLS	2
5	Polyethylene Glycol-4000	2
6	Sodium Benzoate	0.5
7	Tri-ethanolamine	q.s.
8	Distilled Water	q.s.
9	Aloe Vera	5

Evaluation of Gel

3.1. Visual appearance

The prepared gels were verified for colour, clarity, texture, transparency and occurrence of any gritty particles.

3.2. Measurement of pH

The pH of herbal gel formulations was evaluate by using digital pH meter. 1 gm of gel was taken and distributed in 10 ml of distilled water and keep aside for 2 hours. The amount of pH of formulation was carried out in 3 times and the average values are stated. pH of gel formulation was stated.

3.3. Homogeneity

Established gel formulations were tested for homogeneity by visual appearance after the gels have been poured in to the container. They were tested for their presence and visual appearance of any aggregate's masses.

3.4. Spreadability

Spreadability is expressed in terms of time in seconds taken by 2 slides to slip off from gel that is placed in between the slides under the direction of certain weight. If the time taken for separation of 2 slides is fewer then well the Spreadability.

Spreadability is calculated by using the formula:

$$S = M \times L / T$$

Where,

M = weight tied to upper slide
L = length of glass slides
T = time taken to separate the slides

3.5. Viscosity

The viscosity of prepared formulations are analysed by the Brookefields viscometer with helipath using spindle number 96 at 10 rpm.

3.6. Antimicrobial activity

The antimicrobial activity of gel formulations and a marketed moth ulcer gel was carried out by well diffusion method. Two microbial cultures Candida Albicans (fungi) and E-coli (bacteria) were used. The antibacterial activity of the prepared gel formulations was carried find by agar well diffusion method. The plates of the nutrient agar media were set. Each plate was inoculated with an aliquot (0.1 ml) of the bacterial suspension which was spread consistently on the surface of the medium of the plate. After 15 min, wells with 6 mm diameter were made with the help of a sterilised cork borer in the solid medium and occupied with 0.5g of gel. All the plates were incubated at 37 ◦C for 24 h. The antibacterial activity was evaluated by measuring the diameter of the zone of inhibition (ZOI) in mm. Triplicates were carried out for each extract in contradiction of each of the test organism. For the antifungal activity, the plates of the sabouraud dextrose agar media were set. Each plate was inoculated with an aliquot (0.1 ml) of the fungal suspension which was spread consistently on the solid media. After 15 min, the wells with 6 mm diameter were made by using sterile cork borer and filled with 0.5g of gel formulations. All the plates were incubated at 27 ◦C for 5-7 d and then the diameter of the zone of inhibition was noted. Triplicates were carried out for every extract against each of the test organism.

Classification of Gels

Gels can be classified based on colloidal phases, nature of solvent used, physical nature and rheological properties, etc. Based on colloidal phases They are classified into:

a. Inorganic (Two phase system)
b. Organic (Single phase system)

Inorganic (Two phase system)

If the partition size of dispersed phase is comparatively large and form the three-dimensional structure throughout gel such a system contains of floccules of small particles rather than larger molecules and gel structure in this system is not always steady. They must be thixotropic-forming semisolid on standing and become liquid on agitation.

Organic (Single phase system)

These consist of large organic molecules present on the twisted strands dissolved in a continuous phase. This larger organic molecule either natural or synthetic polymers are discussed as gel formers they tend to entangle with each other their random motion or bound together by Vander walls forces.

Based on nature of solvent Hydrogels (Water based)

A hydrogel is a network of polymer chains that are hydrophilic rarely found as a colloidal gel in which water is dispersion medium. They are extremely absorbent natural or synthetic polymeric networks. They also have a degree of elasticity likely to the natural tissue due to their significant water content.

Uses for hydrogels

1. Sustained-release drug delivery systems
2. Rectal drug delivery and diagnosis
3. Hydrogel-coated wells have been used for cell culture
4. As scaffolds in tissue engineering
5. As environment sensitivity detector
6. Contact lenses (silicone hydrogels, polyacrylamides, polymacon)
7. ECG medical electrode
8. Dressing of healing

E.g., Bentonite magma, gelatin, cellulose derivatives, carpooler and poloxamer gel.

Organogels (With a non-aqueous solvent)

An organogel is a non-crystalline, non-glassy thermoreversible solid substance composed of a liquid organic phase stuck in a 3D cross-linked network. The liquid can be vegetable oil, an organic solvent or mineral oil. The solubility and particle sizes of the substance are important characteristics for the elastic properties and firmness of the organogel. Regularly these systems are based on self-assembly of the structurant molecules.

Xerogels

It is a solid formed from a gel by drying with clear shrinkage. It is frequently retains high and surface area along with very small pore size. When solvent removed under supercritical circumstances the network doesn't shrink and a highly porous. Low-density material known as an aerogel is produced. Heat treatment of a xerogel at higher temperature produces viscous sintering and efficiently transforms the porous gel into a thick glass. E.g., Tragacanth ribbons, β-cyclodextrin, dry cellulose and polystyrene, gelatin sheets and acacia tears.Based on rheological properties Typically gels exhibit non-Newtonian flow properties. They are classified into:

a. Plastic gels
b. Pseudo plastic gels
c. Thixotropic gels

Plastic gels

Flocculated suspensions of Aluminum hydroxide show a plastic flow and the plot of rheogram show the yield value of the gels above which the elastic gel distorts and begins to flow.

Pseudo-plastic gels

Liquid dispersion of tragacanth, sodium alginate, Na CMC exhibits pseudo-plastic flow. The viscosity of these gels decreases with increasing rate of shear without yield value. The rheogram results from a shearing action on the elongated chain molecules of the linear polymers. As the shearing stress is increased the disordered molecules begin to align their long axis in the direction of flow with the release of solvent from gel matrix.

E.g., Liquid dispersion of tragacanth, sodium alginate, Na CMC, etc.

Thixotropic gels

The bonds between particles in these gels are very weak and can be broken down by shaking. The resulting solution will return to gel due to the particles colliding and linking together again (the reversible isothermal gel-sol-gel transformation). This occurs in a colloidal system with non-spherical particles to build up a scaffold like structure.

E.g., Kaolin, bentonite, agar, etc.

Based on physical nature

Elastic gels

Gels of agar, pectin, Guar gum and alginates exhibit an elastic behaviour. The fibrous molecules being linked at the point of junction by relatively weak bonds like hydrogen bonds and dipole attraction. If the molecule owns free -COOH group then extra bonding takes place by a salt bridge of type -COO-X-COO between two adjacent strand networks.
E.g., Alginate and Carbopol.

Rigid gels

This can be obtained from macromolecule in which the framework linked by primary valence bonds.
E.g., In silica gel, silic acid molecules are held by Si-O-Si-O bond to give a polymer structure having a network of pores.

Uses of Gels: -

1. As delivery systems for orally administered drugs.
2. For topical drugs applied directly to the skin, mucous membrane or the eye.
3. As long-acting forms of drug injected intramuscularly or implanted into the body.
4. As binders in tablet granulation, protective colloids in suspensions, thickeners in oral liquid and suppository bases.
5. In cosmetics like shampoos, fragrance products, dentifrices and skin and hair care preparations.
6. Lubricant for catheters.
7. Bases for patch testing.
8. NaCl gel for electrocardiography.
9. Sodium fluoride & Phosphoric acid gel for dental care prophylactic.

REFERENCES

1. Jamadar M. Shaikh R. 2017. Preparation and evaluation of herbal gel formulation. Journal of Pharmaceutical Research & Education, 1(2): 201-222.
2. Bhramaramba R. Babu S. Deepthi D. 2015. Formulation and evaluation of herbal gel containing terminalia chebula retz., leaves extract. Sch. Acad. J. Pharm, 4(3): 172-176.
3. Pawar D. Shamkuwar P. 2013. Formulation and evaluation of herbal gel containing lantana camara leaves extract. Asian J Pharm Clin Res, 6(3): 122-124.
4. Mohammed H. Shahima H. Saraswathi R. Guru P. Nayar C. 2010. Formulation and evaluation of herbal gel of Pothos scandens Linn. Asian Pacific Journal of Tropical Medicine: 988-992.
5. Upadhye K. Charde K. Dixit G. Bakhle S. 2021. Formulation and evaluation of herbal gel for management of mouth ulcers. Indian Journal of Pharmacy and Pharmacology, 8(3):226–230.
6. Sing R. Bansal S. Mishra M. 2020. formulation and evaluation of herbal oral gel containing extracts of powdered psidium guajava linn leaves with curcuma longa linn rhizomes to treat mouth ulcer. iMedPub Journals, 12(2): 1-7.
7. Bambal V. Wyawahare N.Turaskar A. Deshmukh T. 2011. evaluation of wound healing activity of herbal gel containing the fruit extract of coccinia indica wight and arn. (cucurbitaceae). International journal of pharmacy and pharmaceutical sciences, 3(4): 319-322.
8. Jain N. and Roy R. 2020. Formulation and Evaluation of Polyherbal Aqueous Gel from Psidium guajava, Piper betel and Glycerrhiza glabra Extract for Mouth Ulcer Treatment. 12(3):145-148.
9. Madaan V. Manjula T. 2022. Herbal mouth ulcer gel: a review issn: 2277-7067.
10. Misal G. Dixit G. 2012.Formulation and evaluation of herbal gel pp. 501-505.
11. Aslani A.Zolfaghari B. 2016. Design, Formulation and Evaluation of an Oral Gel from Punica Granatum Flower Extract for the Treatment of Recurrent Aphthous Stomatitis. 6(3): 391-398.

12. Jadhav S. 2018. Formulation and Evaluation Pharmaceutical Aqueous Gel of Powdered Guava, Aloe Vera and Acacia Leaves for Treatment of Mouth Ulcer: 2319-7064.
13. Shende V. 2018. Formulation and evaluation of herbal tooth gel containing aloe vera: compared study with marketed preparations 5(1): 260-264.
14. Dixit G. Misal G. 2013. Formulation and evaluation of polyherbal gel for anti - inflammatory activity. 4(3): 1186-1191.
15. Aiyalu R. Govindarjan A. 2020. Formulation and Evaluation of Polyherbal Aqueous Gel from Psidium guajava, Piper betel and Glycerrhiza glabra Extract for Mouth Ulcer Treatment. 12(3):145-148.