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SCREENING OF ANTIMICROBIAL ACTIVITY OF *TINOSPORA CORDIFOLIA* HYDROGEL

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Abstract

Tinospora cordifolia (Willd.) is one of the most versatile rejuvenating herbs, possessing numerous therapeutic attributes. Recent reports investigated and ascertained its role as a potent antimicrobial herb. Present study was therefore attempted to evaluate comparative antimicrobial efficacies of *Tinospora cordifolia* hydrogel prepared by different concentration of carbopol base gel formulation. Formulation no TC1 showed good organoleptic properties and better viscosity, pH, extrudibility and spreadability as compared to other formulation. Formulation TC1 showed significant antibacterial activity and possess great potential against microorganism. Phytochemical studies revealed various functional groups like glycosides, alkaloids, tannins, phenols, starch and sterols in extract, which might be accountable for their antimicrobial potential. No microbial load was detected within extract. The study showed good antimicrobial activity. Present study may prove a torch bearer for future studies to comprehend its biological activities.

Key Words: *Tinospora cordifolia*, Antimicrobial activity, Hydrogel, Carbopol, Spreadability.

Introduction

Ancient medicine used plant source for ailment of many diseases Herbal. Indian history plants products were used in the form of extract, powder, creams and lotions etc. herbal drugs have been the remedy for medicinal healing through much of human history and such conventional medicines are still practiced today. Present medicines has seen the plant based medicines its chemical constituent as base of many pharmaceutical products. Herbalism is the plant based medicine which was practiced before believed in treating patient on diseases condition The scope of herbal medicines is sometimes extended to include fungal and bee products as mineral, shells and certain animal parts (Engebretson, 2002).

Herbal medicines may be referring to phyto medicines or phytotherapy. Parabolism describes another and pseudoscientific practices of using raw plant or animal extract as not proven medicines or health promoting agents (Schmidt, B. *et al*., 2008).

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Tinospora cordifolia which is known by the common name heart-leaved moonseed, guduchi and giloy. Guduchi is herbacious wine of the family Menispermaceae. Indigeneous to the topical areas of India, Myanmar and Srilanka. Gels are semi solid analogous preparation made up of solutions or dispersion of one or more medicament in suitable hydrophilic or hydrophobic bases (Priyanka *et al*., 2014).

They are made with the help of suitable gelling agent. They are applied to skin or certain mucous membrane for the protective prophylactic or therapeutic purpose. It may contain suitable added substances such as antioxidants, stabilizers and antimicrobial preservatives (Abhishek *et al.*, 2015). Gels are mainly used for large open wounds on severely injured skin should be sterile. Gels should be packed well closed or if it may contain water or volatile ingredient it should be suitable lightly-closed container. Use container which reduce microbial contamination. Collapsible tube of suitable metal or plastic should be used (V. Shanthi *et al*., 2013).

Table 1: Preparation of *Tinospora cordifolia* hydrogel.

Ingredients	T.C. 1	T.C. 2	T.C. 3
Crude drug	1gm	1gm	1gm
Carbopol 934	4%	6%	8%
Propylene glycol	10ml	10ml	10ml
Na benzoate	10gm	10gm	10gm
Triethanolamine	1 to2 drops	1 to2 drops	1 to 2 drops

It is macromolecular network that swells but do not dissolve in aqueous solution, have been used as bases for rectal and vaginal drug delivery. Because of the hydrophilic functional group present on polymeric network hydrogel swells the use of hydrogel matrix for drug delivery involves the dispersion of the drug in matrix, when the hydrogels delivery system is placed in aqueous environment it swells, enabling the drug to diffuse out of the macromolecular network. The rate and extent of drug release depends on rate of migration of water into matrix (Remington, Edt. 21).

Material and Methods

Guduchi was obtained as a kind of gift sample from Olyam road Kunilnagar, Adka Bandiyod, Kasaragod, Kerala. Carbopol 934, propylene glycol, sodium benzoate, triethanolamine were procured from NGSM Institute of Pharmaceutical Sciences.

Extraction of *Tinospora cardiofolia*

Powder the dried stem of guduchi into course form. The powdered drug is soaked in a paper chromatographic chamber with 1000 ml of methanol for 6-7 days. Filter the soaked drug through muslin cloth. The residue is again soaked with 500ml of methanol for 4-5 days and the process is repeated again with 250 ml for 2 days. Dry the extract with china dish in water bath.

Preparation of *Tinospora cardiofolia* hydrogel

Weighed quantity of different concentration of carbopol 934 (4, 6, 8%) were measured and allowed to swell in a beaker for 24 hours. Accurately weighed amount of plant extract was solubilized in PEG was then added to soaked polymer solution with stirring; then the solution was neutralized by drop wise of triethanolamine. Sodium benzoate is added as preservative to the formulation (Table 1).

Evaluation

• Organoleptic properties: The blank formulation (formulation without API) is compared with formulation containing API. The changes in properties indicate decomposition. Homogenity & texture is evaluated by pressing the gel b/w the thumb and index finger. Immediate feeling after application is used to check stiffness, greasiness, grittiness etc (Umesh *et al*., 2017).

• Spreadability: This tested by putting 1gm of sample in b/w two horizontal glass slide (10×20cm) by keeping certain wt on the top and checking the diameter of the sample spreaded in glass slide after one minute.

• Extrudibility: It is important to know the force required to extrude material from the tube. Evaluation of the gel formulation extrudability was based on % of gel extruded from the lacquered aluminium collapsible tube on applying wt in gms to extrude at least 0.5cm ribbon of gel in 10sec (Bhautik *et al*., 2016).

• Viscocity: Level the viscometer by adjusting the feet and rotate the viscometer until the spindle is placed at the center. The sample was taken in the beaker. The speed of the viscometer was set as 5rpm and 10rpm. The instrument used was Brook field viscometer LV DV-II+PRO with spindle no.62. Three trials were conducted for each sample an average were taken as actual value of sample viscosity (Avnish *et al*., 2010).

• pH: It was measured using pH meter. A little amount of sample is taken and touched to the bulb part of pH meter with the help of glass rod. Obtained values are noted for different samples. The bulb of pH meter should be cleaned using tissue paper for each interval.

• Anti-microbial activity: Agar cup plate method was adopted for this study. Different concentrations of drug were prepared for anti-microbial studies. The agar plate were prepared aseptically with *E. coli* was the organism and test were added with amoxicillin as the standard drug. The plate was incubated at 36°C for 2 days and then they were examined for the inhibition zone diameter which is an indicator for antifungal Activity (Phoebe *et al*., 2015).

Results and Discussion

Evaluation of formulated gel

Gel formulations were found to be yellowish green in nature with good consistency, Smooth feel on application no grittiness and stickiness (Table 2). The values of spread ability indicate that the gel is easily

Table 2: Organoleptic evaluation.

Properties Formulation	Colour	Odour	Consistency	Appearance	Grittiness	Stickiness
TC 1	Yellowish green	Characteristic	Good	Smooth	No	None
TC 2	Yellowish green	Characteristic	Good	Smooth	No	None
TC 3	Yellowish green	Characteristic	Good	Smooth	No	None

Table 3: Evaluation parameters of formulated gel.

Batch	Spreadebility (mm)	Homogenisity	pH	Extrudability (gm)
TC 1	45	Homogeneous	7.7	145
TC 2	40	Homogeneous	7.4	150
TC 3	59	Homogeneous	7.7	120

Table 4: Evaluation of viscosity.

RPM	TC 1	TC 2	TC 3
5	1138	1144.33	1171.66
10	531.3	595	596

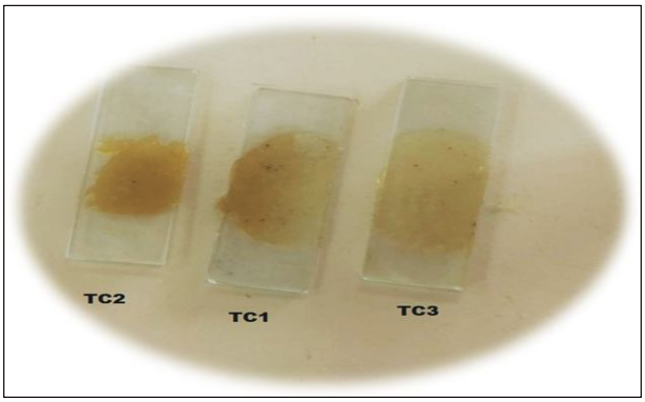

Fig. 1: Spread ability test.

Fig. 2: Extrudibility test showing best result.

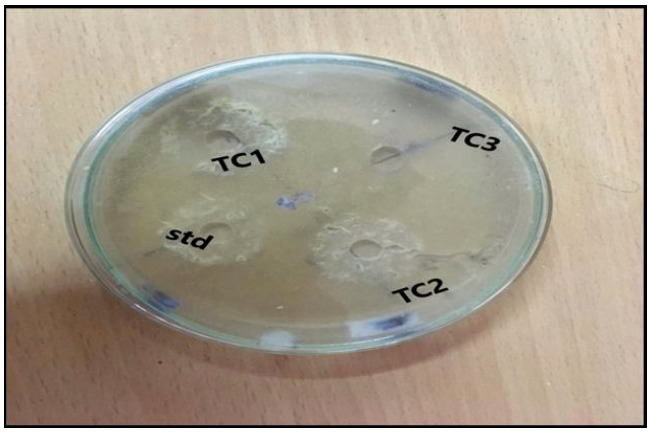

Fig. 3: Agar plate with antimicrobial activity showing zone of inhibition.

Table 5: Zone of inhibition of formulations.

Formulation and standard	TC 1	TC 2	TC 3	Standard (Amoxi-cillin)
Zone of inhibition (mm)	27± 0.36	22± 0.42	15± 0.58	23± 0.81

spreadable by small amount of shear (Fig. 1). The spreading diameter of prepared gel was between 40-59 mm which indicates good spread ability of herbal gel. All formulation was found to be homogenous in nature. The pH of all the formulations was found near pH 7.4 to 7.7 which lies in normal pH range of the skin. Extrudability (Fig. 2) was measured and found to be ranging from 120- 150 gm. (Table 3).

Viscosity measurements were carried out using Brook field viscometer and were ranging between 1138-1171.66 cps for 5 RPM and 531.3 - 596 cps for 10 RPM (Table 4).

Anti-microbial studies: Agar cup plate method was adopted for this study using amoxicillin as standard. *T. cordifolia* with concentration 4% TC 1 has shown good resistance to bacterial growth as compared (Fig. 3) to other formulation of 6% and 8%. The *E. coli* was used as test organism (Table 5).

Conclusion

It is inferred from results that the gel formulations are smooth in appearance, good consistency and non-sticky. The outcome of the present *in vitro* study highlights that formulation TC1 has shown good results in terms of viscosity spread ability and pH as compared to TC 2 and TC 3. The herbal gel TC1 tested was as effective when compared with as amoxicillin as reference standard for antimicrobial activity. Formulation needs further investigations for *in-vivo* bioequivalence testing and also therapeutic equivalence.

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Conflict of Interest

Authors declare no conflict of interest

References

Abhishek, D.D., S.S. Kumar, K.N. Sujit and R. Supriya (2015). Design and Evaluation of Novel Topical Gel Of *Tinospora cordifolia* As Antimicrobial Agent. *Asian. J. Pham. Clin. Res*., **8(6):** 237-240.

Avnish, K.U., K. Kaushal, K. Arvind and S. Hari (2010). *Tinospora cordifolia* (Willd.) Hook. F. And Thoms. *(Guduchi)* – Validation of The Ayurvedic Pharmacology Through Experimental and Clinical Studies. *Ind. J. App. Res.*, **1(2):** 112-121.

Bhautik, K., G. Dipti, P. Dinal, P. Snehal, A. Chintan, S. Nirmal, P. Kartik and S. Chainesh (2016). Formulation and Evaluation of Spironolactone Loaded Emulgel for Topical Application. *J. Pharm. Sci. Bioscientific. Res*., **6(5):** 740-752.

Engebretson, J. (2002). Culture and complementary therapies. *Complement Ther. Nurs. Midwifery*, **8:** 177-184.

Priyanka, M., J. Preya, D. Sharav, P. Dhara and M. Dhananjay (2014). Phytochemical analysis and assessment of *in vitro* antibacterial activity of *Tinospora cordifolia. Int. J. Curr. Microbiol. App. Sci*., **3(3):** 224-234.

Phoebe, F.L. , N.P. John, O.E. Ahmed, R. Lucie and G. Jiri (2015). Design, Synthesis and Evaluation of Novel Phthalimide Derivatives as *in Vitro* Anti-Microbial, Anti-Oxidant and Anti-Inflammatory Agents. *Molecules.*, **20(9):** 16620-16642.

Remington (2005). The Science and Practice of Pharmacy (21st Ed.) **Vol. 1:** 884.

Schmidt, B., D.M. Ribnicky, A. Poulev, S. Logendra, W.T. Cefalu and I. Raskin (2008). A natural history of botanical therapeutics. *Metabolism*., **57:** S3-S9.

Shanthi, V. and R. Nelson (2013). Anitbacterial activity of *Tinospora cordifolia* (Willd) Hook. F. Thoms on urinary tract pathogens. *Int. J. Curr. Microbiol. App. Sci*., **2(6):** 190-194.

Umesh, T., B.W. Jadhao, R.P. Tekade, P.P. Amol and R.P. Vijay (2017). Formulation and *In-Vitro* Evaluation of Oral Hydrogel Containing Miconazole Nitrate. *Asian. J. Pharm. Edu. Res*., **6(4):** 57-68.