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Research Article

Formulation and Evaluation of Tooth Gel from *Aloe vera* leaves extract

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Abstract

The aimed of current research to formulate tooth gel utilizing leaf extract of *Aloe vera*. In multiple clinical studies, *Aloe vera* has used in dentistry for wound-healing effect, gingivitis, plaque control and curing oral mucosal lesions. *Aloe vera* is natural, ancient ingredient. The formulated *Aloe vera* tooth gel evaluated by physical examination: Colour-yellowish brown, Appearance-Homogeneous, smooth nature, Transparency-translucent and Relative density-10.5, No microbial growth in sample plate, pH-7.5, Viscosity-3100cp, Extrudability amount percent-91.33, Spreadability-6.5cm/sec and obsereved good stability. The anti-microbial evaluation against *Staphylococcus aureus* reveal that formulated *aloe vera* tooth gel exhibited notable activity with ZOI of 19.5 mm at MIC of 25µg/mL. The outcome from this research evidently signified that the natural plant *Aloe vera* using to formulate tooth gel may be a new approach to formulate tooth gel economically and minimum side effect than synthetic formulation and good scope in future about dental research in natural remedies.

Keywords: *Aloe vera*, leaves extract, tooth gel, dental, anti-microbial, ZOI, herbal.

INTRODUCTION

Aloe vera is known as a miracle plant. The most known species of *Aloe vera* which is grown worldwide is *Aloe barbadensis* Miller. *Aloe vera* gel is derived from inside of aloe leaf. It is the mucilaginous gel produced from centre (parenchyma) of the plant leaf. It is the preparation which is called pure "*Aloe vera* gel" in commerce[1]. The gel stimulates cell growth and enhances the restoration of damaged skin. It moisturizes the skin because it has a water holding capacity. As use a drink it will protect the mucous membrane of the stomach especially when irritated or damage[2].

Dental disease is to be a major health problem throughout the world. It may be acute or chronic and treatment is long term required. The efficient use of anti-bacterial agents for the treatment of various dental problems requires a sufficient drug concentration at the site of action without unwanted effect[3]. *Aloe vera* orally administrate shows wound healing enhancement in the early phase after single dose acute radiation exposure and the improving wound activity might be attributed to its stimulating effect on increase inflammatory cell infiltration, fibroblast proliferation, angiogenesis and growth factor production[4].

The nanoparticles of *aloe vera* shows targeted delivery. The nanotechnology platforms could serve as customizable, targeted drug delivery vehicles capable of carrying large dose of therapeutic agent into malignant cells while avoiding healthy cells[5]. The synthetic anti-microbial agent shows problem of drug resistance and other side effect. In pharmaceutical world gel is the most convenient and patient friendly dosage form. The gel is formulated by drug incorporating in semi rigid structure of polymer and gel are sticky, easily spreadable with good esthetic value[6].

The non-profit organizations like the International *Aloe* Science Council have set standards for *aloe vera* approval and seal of quality for aloe products with established therapeutics beneficial[7]. The part of the plant is group of specialized cells known as the pericyclic tubules, which occur just beneath the outer green ring of the leaf. These cells produce exudates that consist of bitter yellow latex with powerful laxative like action[8].

Various side effects or toxicity of synthetic drugs can be overcome by use of herbal drug in the form of suitable drug delivery system this is better patient compatible with less side effect[9]. The aim of

study is the formulation of *Aloe vera* tooth gel with polymers and their evaluation for various parameters like clarity, colour, consistency, spreadability, viscosity and anti-microbial activity. However, there is approach to provide the formulation for commercial production of tooth gel with environmental friendly attributes.

MATERIALS AND METHODS

Chemicals

Carbopol-940(Loba chemicals), Sodium Carboxy methyl cellulose(S.D. Fine- Che. Ltd.), Poly ethylene glycol-4000(Central Drug House), Tri-ethanolamine(Loba chemicals), Sodium saccharine(Loba chemicals),Sodium benzoate(Loba chemicals) were purchased from the market.

Collection

The leaves of *Aloe vera* were collected from the plant present at the medicinal garden campus of the Kamla Nehru College of Pharmacy situated in the Butibori area of Nagpur City in Maharashtra state of India. The plant was identified and authenticated by Dr. Dongarwar, Department of Botany, RTM Nagpur University, Nagpur, Maharashtra, India.

Extraction

The fresh *Aloe vera* leaves were collected from the plant, washed in the running tap water for 15 min then it was rinsed with sterile distilled water and mild chlorine solution, then dissected longitudinally and the colourless parenchymatous tissue ie *Aloe* gel was scraped out using sterile knife, thick epidermis was selectively remove and gel like pulp separated with spoon, minced and homogenized in mixer.

Formulation

Carbopol-940 and sodium CMC were dispersed in 50ml of distilled water with continuous stirring using mechanical stirrer. 5ml of distilled water was mixed with required quantity of sodium benzoate then heated on water bath to dissolve properly. Solution was cooled and polyethylene glycol-4000 was added and mixed with first solution. Then required quantity of *aloe vera* leaves extract was mixed to the above mixture and volume was make up using remaining distilled water. Finally full mixed ingredient were mixed to Carbapol-940 gel in properly manner with continuous stirring and tri-ethanolamine was added drop wise to formulation for adjustment of required pH and to obtain gel in required consistency[10].

Duration of formulation trial phase various problem like homogeneity, spreadability and viscosity occurs to overcome it the concentration of carbopol and sodium CMC were increase and decreased. Therefore other batches remove at starting and make final only one batch. Table 1 shows composition of chemicals and plant extract.

Table 1: Compositon of Chemicals

Ingredient	Quntity taken
Carbapol-940 (g)	1.5
Sodium CMC (g)	1
Sodium saccharin (g)	0.5
Sodium lauryl sulphate (SLS) (g)	2
Poly ethylene glycol-400 (g)	2
Sodium benzoate (0.05%) (g)	0.5
Tri-ethanolamine (ml)	q. s.
Distilled water (ml)	q. s.
Aloe vera (ml)	5

EVALUTIAON OF FORMULATED TOOTH GEL

Transparency

Approximately 5ml of formulated gel was taken in the 10ml test tube and its transparency was checked visual.

Smoothness

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

Relative density

The relative density of formulation was determined by weight in gram taken in 10ml formulation and 10ml distilled water using RD bottle.

pH

pH of the formulated gel was determined by using pH meter. In this method, 1 g gel was dispersed in 100ml purified water. the electrode was washed

with double distilled water, dried by tissue paper and calibrated before use with standard buffer solution at 4.0, 7.0 and 9.0. The pH measurements were done in triplicate and average values were calculated.

Viscosity

It was determined by using viscometer (Brookfield) with 2 number spindles.

Microbial growth

In this method nutrient agar media was used. The blank and sample petriplates were used and formulated gel sample were aseptically transferred on the sample plate in cross patern. The growth of microbial was check continuously upto 15 days.

Extrudability

In this method, the formulated gel were filled in standard capped collapsible aluminum tube and sealed by crimping to the end. The weights of the tubes were recorded. The tubes were placed between two glass slides and were clamped. 500g was placed over the slides and then cap was removed. The amount of the extruded gel was collected and weighed. The percent of the extruded gel was calculated[11].

Spreadability

In this method, slip and drag characteristic of gel involve. Formulated gel (2g) placed on the ground slide under study. The formulated gel placed (sandwich like) between this slide and another glass slides for 5min to expel air and to provide a uniform film of the gel between slides. Excess of the gel was scrapped off from the edges. The top plate was then subjected to pull of 80g with the help of string attached to the hook and the time (sec) required by the top slide to cover a distance of 7.5cm was noted. A short inter vak indicated better spreadability.

Formula was used to calculate Spreadability:

$S=M \times L /T$

Where,

S= Spreadability

M= Weight in the pan (tied to the upper slide)

L= Length moved by the glass slide

T= Time (sec) taken to separate the upper slide from the ground slide.

Stability study

The stability study was perfomed as per ICH guidelines. The formulated gel was filled in collapsible tubes and stored at different temperature and humidity conditions, 25ºC± 2ºC / 60% ± 5% RH, 30º C ± 2ºC / 65% ± 5% RH, 40ºC ± 2ºC / 75% ±5% RH for the period of three months and studied for appearance, pH and spreadability.

Anti-bacterial activity

The in-vitro anti-bacterial study of formulated tooth gel was performed by disc diffusion method in triplicate maner by using Muller Hinton Agar medium against a pathogenic bacterial strain *Staphylococcus aureus*(*S. aureus*, MTCC 3160). S. aureus was initially cultured in nutrient broth and incubated at 37ºC for 24 Hr and then cultured cells were tend to multiply in the Muller Hinton agar plates. Then the formulated tooth gel containing discs were placed over the bacterial plates and incubated at 37ºC for the 24 Hr, comparing ciprofloxacin as the positive control. The diameter of zone of inhibition (ZOI) was measured in millimeters (mm).

The minimum inhibitory concentration (MIC) is the smallest concentration in which the compound displays no visible microbial growth. It was determined by agar streak dilution method in triplicate manner. The protocol involve formation of microbial suspension (~10^5 CFU/mL), application to the petridish with serial dilution and incubation of petridish at 37± 1ºC. the MIC value was determined and the average was taken[12].

Reading of plate and interpretation

After 14 to 16 Hr of incubation, each plate was examined. If the plate satisfactorily streaked, and the inoculum was correct the result of ZOI should be uniformly circular and a confluent lawn of growth. After measured the diameter of ZOI the data was noted and interpreting the result[13].

RESULTS AND DISCUSSION

The tooth gel formulated from the *Aloe vera* leaves extract and small amount of synthetic agent. At the formulation trail process various batches were prepared due to the problem like homogeneity,

spreadability and viscosity in some batches. That batches discarded permanently and make a one final batch. The formulated *aloe vera* tooth gel was yellowish brown in colour, translucent in appearance and showed the good homogeneity with absence of lumps.

Transparency

The formulated tooth gel was translucent and appearance was homogeneous.

Smoothness

The formulated tooth gel was smooth in nature.

Colour

The colour of formulated tooth gel was yellowish brown observed.

Relative density

The formulated tooth gel was relative density 10.5 observed.

pH

The formulated tooth gel pH was 7.5 observed.

Viscosity

The formulated tooth gel viscosity was 3100cp observed.

Microbial growth

In the formulated tooth gel no microbial growth was observed.

Extrudability

Extrudability	Mean of three tube
Net wt of formulation in tube (g)	12.23
Wt of tooth gel extruded (g)	11.17
Excrudability amount percentage	91.33

The formulated tooth gel was good extrudability observed.

Spreadability

The formulated tooth gel spreadability was 6.5 cm/sec observed that indicate the tooth gel easily spreadable by small amount of shear.

Stability

At 25ºC± 2ºC / 60% ± 5% RH (3rd month):

Colour	Apperance	Spreadability	pH
Yellowish brown	Homogeneous	6.4	7.2

At 30º C ± 2ºC / 65% ± 5% RH (3rd month):

Colour	Appearance	Spreadability	pH
Yelowish brown	Homogeneous	6.35	6.90

At 40ºC ± 2ºC / 75% ±5% RH (3rd month):

Colour	Appearance	Spreadability	pH
Yellowish brown	Homogeneous	6.21	6.84

The stability study was indicated that the formulated tooth gel was good stability.

Anti-microbial activity

The formulated aloe vera tooth gel exhibited fairly good anti-*S. aureus* activity as compaired to the standard drug ciprofloxacin. The formulation exhibited an impressive ZOI of 19.5 mm at MIC of 25µg/mL, whereas ciprofloxacin exhibited 24.6 mm ZOI at MIC of 6.25µg/Ml. therefore it may concluded that formulated tooth gel have potential to exhibit anti-microbial activity.

CONCLUSION

The research concluded that natural remedies are more acceptable and they are safer with minimum side effect than synthetic preparation. The above formulated tooth gel totally capable to the tooth, maintain the oral hygiene and it and showed the action against pathogen ie antimicrobial activity. Therefore, preventing approach to the growth of microorganism inside the oral cavity. The formulated tooth gel was show the good scope in future about dental research in natural remedies.

REFERENCES

1. Tambe R, Kulkarni M, Joice A, Gilani I. Formulation and evaluation of *Aloe vera* gels. J Pharm Res. 2009;2(10): 1588-1590.
2. Devi D L, Srinivas B, Rao B N. An evaluation Antimicrobial Activity of *Aloe barbadensis Miller*(Aloe vera) Gel Extract. J Pharm Biomed Sci. 2012;21(03): 1-4.

3. Katiyar A, Prajapati S K, Akhtar A, Vishwakarma S K. Int Res J Pharm. 2012;3(10): 143-148.
4. Carac A, Boscencu R, Patriche S, Dinica R M, Carac G, Gird C E. Antioxidant and Antimicrobial Potential of Extracts from *Aloe vera* Leaves. Rev Chim(Burcharest). 2016;4(67): 654-658.
5. Telrandhe R. Nanotechnology for cancer therapy: Recent developments. Eur J Pharm Med Res. 2016;3(11): 284-294.
6. Chalke T, Sharma K, Nagare S K, Jirge. Formulation and Evaluation of Punica Topical Gel for its Content of Gallic Acid and Anti-Microbial Study. Int J Drug Delivery Tech. 2016;6(3): 75-78.
7. George D, Bhat S S, Antony B. Comparative evaluation of the antimicrobial efficacy of aloe vera tooth gel and two popular commercial toothpastes: An *in vitro* study. Dental material Gen Dentistry. 2009: 238-241.
8. Khare C P. Encyclopedia Indian Med Plants. 43-45.
9. Partha N, Snigdha P, Laxmidhar M. Formulation development and *in vitro* evaluation of dental gel containing ethanol extract of *Tephrosia purpurea* linn. Int J Pharm Pharm Sci. 2016;8(8): 132-141.
10. Dwivedi S, Gupta S. Formulation and evaluation of herbal gel containing *Sesbania grandiflora* (L) poir leaf extract. Acta Chim Pharm Indica. 2012;2(1): 54-59.
11. Negi A, Sharma N, Singh M F. Formulation and evaluation an herbal anti-inflammatory gel containing *Eupatorium* leaves extract. J Pharmacognosy Phytochem. 2012;1(4): 112-116.
12. Telrandhe R, Mahapatra D K, Kamble M A. Bombax ceiba thorn extract mediated synthesis of silver nanoparticles: Evaluation of anti- *Staphylococcus aureus* activity. Int J Pharm Drug Analysis. 2017;5(9): 376-379.
13. Bauer A W, Kirby W M, Sherris J C, Turch M. Antibiotic susceptibility testing by a standardized single disc method. 1966;45(4): 493-496.