ejpmr, 2018,5(1), 260-264

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

FORMULATION AND EVALUATION OF HERBAL TOOTH GEL CONTAINING ALOE VERA: COMPARED STUDY WITH MARKETED PREPARATIONS

Vaibhav Shende*

Kamla Nehru College of Pharmacy, Butibori, Nagpur - 441108, Maharashtra, India.

***Corresponding Author: Vaibhav Shende**

Kamla Nehru College of Pharmacy, Butibori, Nagpur - 441108, Maharashtra, India.

Article Received on 02/11/2017 **Article Revised on 22/11/2017** **Article Accepted on 13/12/2017**

ABSTRACT

The aimed of current research to formulate tooth gel utilizing leaf extract of Aloe Vera. In multiple clinical studies and 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 observed good stability. The anti- microbial evaluation against S.aureus reveal the formulated Aloe vera tooth gel exhibited notable activity with ZOI of 19.5 mm at MIC of 25µg/mL. The outcome of this research herbal tooth gel shows equal patronizing and engrossing passion over the marketed preparation it was consider after the comparing the marketed preparation (Colgate, Dabour Red, Dant-kanti, Close up) with formulated herbal tooth gel. It has good scope in future dental research and dental health of public.

KEYWORDS: Aloe vera, leaves extract, tooth gel, anti-microbial, ZOI, comparative study, dental.

INTRODUCTION

Aloe vera is also known as a miracle plant. The most known species of Aloe vera which is grown world wide is a Aloe barbadensis Miller. Aloe gel 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 Aloe vera 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 major health problem throughout the world. It may be use 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 any harmful effect.[3]

Aloe vera orally administered 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]

It is an two group comparative study. Food debris are white small particles on teeth, can be easily rinsed off or clean. The dental plaque is thin film of bacteria that sticks to teeth and yellow colour can't be rinsed off. There has been closer relationship between tartar, calculus and periodontal disease. The extract are use like Aloe vera, Flavouring agent and other ingredients are SLS-Detergent, Carbapol- 940, Sodium benzoate etc.

This led to paing increased attention on using natural ingredients in herbal dentrifrices.[10]

The aim of study was to formulate herbal base product was compare the efficacy with conventionally marketed formulated toothgel or toothpaste and evaluated the various parameter like colour, spreadability, foamability, extrudability and anti-bacterial activity. However, there is approach to provide the formulation for commercial production of herbal dental product with environmental friendly attributes.

MATERIALS AND METHODS

Chemicals

Carbopol-940(Loba Chemicals), Sodium Carboxy Methyl Cellulose(S.D.Fine-Chem. Ltd.), Polyethylene Glycol-4000 (Central Drug House), Triethanolamine (Loba Chemicals), Sodium Benzoate (Loba Chemicals), Sodium Saccharine (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, 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 vera 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 50 ml of distilled water with continuous stirring using mechanical stirrer. 5 ml 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 ingredients were mixed to Carbopol-940 gel in properly manner with continuous stirring and triethanolamine was added drop wise to formulation for adjustment of required pH and to obtain gel in required consistency.[11]

Duration of formulation trial phase various problem like homogeneity, spreadability and viscosity occurs to overcome it the concentration of carbopol- 940 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: Composition of Chemicals.

Sr. No	Ingredients	Quantity Taken
1	Carbopol-940 (g)	1.5
2	Sodium CMC (g)	1
3	Sodium Saccharin (g)	0.5
4	SLS (g)	2
5	Polyethylene Glycol- 4000 (g)	2
6	Sodium Benzoate (0.05%) (g)	0.5
7	Tri-ethanolamine (ml)	q.s
8	Distilled Water (ml)	q.s
9	Aloe Vera (ml)	5

EVALUATION OF FORMULATED TOOTH GEL[12]

Physical Examination (Colour, Odour, Taste, Smoothness, Relative Density)

Formulated tooth gel was evaluated for its colour. The visually colour was checked.

Odour was found by smelling the product.

Taste was checked manually by tasting the formulation.

The Smoothness was tested by rubbing the gel formulation between the fingers.

Relative density was determine by weight in gram taken in 10 ml formulation and 10 ml distilled water using RD bottle.

Transparency

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

pH

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

Homogeneity
The tooth gel shall extrude a homogeneous mass from the transparent collapsible tube or any sutible container by applying of normal force at 27±20C. In addition bulk of contents shall extrude from the crimp of container and then rolled it is a gradually.

Determination of sharp and edge abrasive particles
Extrude the content 15-20 cm long on the butter paper, repeat the same process for at least ten collapsible tubes. Press with the contents of the entire length with finger tip for the presence of sharp and hard edged abrasive particles. Tooth gel shall not contain such particles.

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 pattern. The growth of microbial was check continuously upto 15 days.

Foamability
The foamability of formulated tooth gel evaluated by taking small amount of formulation with water in measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted.

Determination of moisture and volatile matter
5 g of formulation placed in a porcelain dish containing 6-8 cm in diameter and 2-4 cm depth in it. Dry the sample in oven at 1050C.

Calculation
% by mass=100MI/M MI-Loss of mass(g) on drying

M- Mass (g) of the material taken for the test.

Extrudability
In this method, The formulated gel were filled in standard capped collapsible aluminium 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. 500 g 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.

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 5 min 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 80 g with the help of string attached to the hook and the time (Sec) required by the top slide to cover a distance of 7.5 cm was noted. A short interval 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 performed 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, 30ºC±2ºC / 65% ± 5% RH, 40ºC±2ºC / 75%±5% RH for the period of three months and studied for appearance, pH and spreadability.

Anti-microbial Activity
The in-vitro anti-microbial 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 Hrs. and then cultured cells were tend tomultiply 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 Hrs, comparing ciprofloxacin as the positive control. The diameter of zone of inhibition (ZOI) was measured in millimetres (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.[13]

Reading of Plate and Interpretation
After 14 to 16 Hrs. 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 confluent lawn of growth.

After measured the diameter of ZOI the data was noted and interpreting the result.[14]

Comparison: Formulated Herbal Tooth Gel Marketed Preparations[15]

The formulated herbal tooth gel was compared with marketed preparations follows Anti-microbial activity,

Spreadablity, Foamability, pH determination, % Moisture content.

RESULT AND DISCUSSION

The herbal tooth gel formulated from the Aloe vera leaves extract natural ingredient and small amount of synthetic agents. At the formulation trial process various batches were perpared due to the problem like homogeneity, spreadability, foamability and viscosity in some batches. That batches discarded permanently and make a one final batch was selected for next steps. The formulated herbal Aloe vera tooth gel was yellowish brown in colour, translucent in appearance and showed the good homogeneity with absence of lumps.

Physical Examination

Sr. No	Parameters	Observations
1	Colour	Yellowish brown
2	Odour	Characteristic
3	Taste	Sweet
4	Smoothness	Smooth
5	Relative density	10.5

Evaluation Results

Sr. No	Parameters	Observations
1	Transparency	Translucent
2	pH	7.5
3	Homogeneity	Good
4	Abrasiveness	Good abrasive
5	Viscosity	3100cp
6	Microbial growth	No MG
7	Foamability	9.5(Good)
8	Moisture content	15.1%
9	Extrudability	91.33
10	Spreadability	6.5cm/sec (Good)
11	Stability	Stable

Extrudability

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

Stability

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

Colour	Apperance	Spreadability	pH
Yellowish brown	Homogeneous	6.4	7.2

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

Colour	Apperance	Spreadability	pH
Yellowish brown	Homogeneous	6.35	6.90

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

Colour	Apperance	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 herbal 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 24.5 mm ZOI at MIC of 6.25µg/mL. Therefore it may be concluded that formulated herbal tooth gel have potential to exhibit anti-microbial activity.

Comparative Study: Formulated Herbal Tooth Gel with Marketed Preparation.

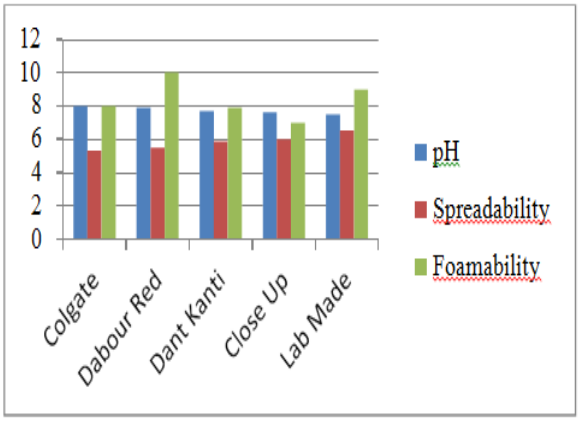

Chart 1: Comparison between pH, Spreadability & Foamability with marketed preparations.

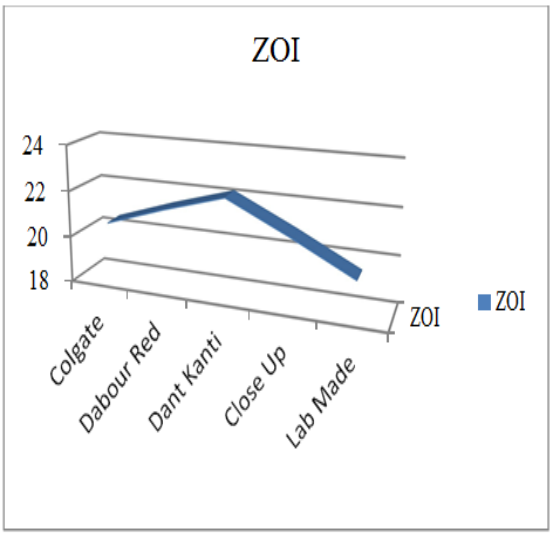

Chart 2: Comparison of anti-microbial activity with marketed formulations.

% Moisture Content Camparison

Sr. No	Preparation	% Moisture Content
1	Colgate	15.10%
2	Dabour Red	25.15%
3	Dant Kanti	10.20%
4	Close Up	14.5%
5	Lab Made	15.1%

The above chart 1,2 and Table shows that formulated herbal tooth gel is having and equal or near about and engrossing passion over the marketed preparation (Colgate, Dabour Red, Dant kanti and Close Up).

CONCLUSION

The research concluded that Herbal tooth gel an emphasizing and more acceptable in dental research and they are safer with minimum side effect than synthetic preparation. The formulated tooth gel capable to the tooth and oral hygine and show the anti-microbial activity against pathogen. The formulation compared with market preparation. Therefore it shows the equal patronizing and engrossing passion over the marketed formulations (Colgate, Dabour Red, Dantkanti, Close Up). The formulated herbal tooth gel has been good scope in future in nature remedies research and Dental health of public.

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 Extract 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 S S. 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 Tephro-sia purpurea linn. Int J Pharm Sci., 2016; 8(8): 132-141.
10. Sing K, Singh P, Oberoi G. Comparative studies between herbal toothpaste (dantkanti) and non-herbal tooth paste. Int J Dent Res., 2016; 4(2): 53-56.
11. 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.
12. Deshmukh P, Telrandhe R, Gunde M. Formulation and Evaluation of Herbal Toothpaste: Compared With Marketed Preparation. Int J Pharm Drug Analysis, 2017; 5(10): 406-410.
13. 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.
14. 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.
15. T Mangilal, M Ravikumar. Preparation and Evaluation of Herbal Toothpaste And Compared With Commercial Herbal Toothpastes: An Invitro Study. Int J Ayu Herb Med., 2016; 3(6): 2266-2273.