Research Article

iMedPub Journals
www.imedpub.com

International Journal of Drug Development and Research

2020
Vol.12 No.2:150

DOI: 10.36648/0975-9344.12.2.150

Formulation and Evaluation of Herbal Oral Gel Containing Extracts of Powdered *Psidium guajava* Linn Leaves with *Curcuma longa* Linn Rhizomes to Treat Mouth Ulcer

Richa Sing*, Sagar Bansal and Manoj Kumar Mishra

Department of Pharmaceutics, Shambhunath Institute of Pharmacy, Jhalwa, Prayagraj, UP, India

***Corresponding author:** Richa Sing, Department of Pharmaceutics, Shambhunath Institute of Pharmacy, Jhalwa, Prayagraj, UP, India, Tel: +91 95327 55762; E-mail: richasingh13may@gmail.com

Received date: May 12, 2020; **Accepted date:** May 26, 2020; **Published date:** June 01, 2020

Citation: Sing R, Bansal S, Mishra MK (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. Int J Drug Dev & Res Vol.12 No.2: 150.

Abstract

The objective of this study was to formulate and evaluate the herbal oral gel containing extracts of powdered *Psidium guajava* Linn leaves and *Curcuma longa* Linn rhizomes to treat mouth ulcer. The traditional medical study is an integral part of the culture and the interpretation of health by indigenous populations in almost world. Guava leaves have been usually used to govern several diseases such as rheumatism, diarrhea, diabetes mellitus, wound sore throat, cough and it also gives good antimicrobial, antifungal, anticancer activity. Guava comprises some essential phytoconstituents such as tannins, triterpenes, flavonoid: quercetin, pentacyclic triterpenoid: guajanoic acid, saponins, carotenoids, lectins, leucocyanidin, ellagic acid, amritoside, beta-sitosterol, uvaol, oleanolic acid and ursolic acid while turmeric has anti-inflammatory, antibacterial activity, virucidal, antimutagenic, antioxidant properties. Turmeric contains a large variety of phytochemicals such as curcumin, demethoxycurcumin, eugenol, tannins, alkaloids, saponins, terpenoids and curcumol. The herbal oral gel formulation was prepared by using guava leaf extract, turmeric rhizome extract, carbopol 934, propylene glycol, methyl paraben, propyl paraben, triethnolamine and required amount of distilled water. The triethanolamine was added drop wise to maintain the pH (6.7-7.2) of oral mucosa. The physicochemical parameters of formulations such as pH, spreadability, viscosity, extrudability, gelling strength and antifungal activity were determined. The results showed that the optimized herbal oral formulation containing guava leaf extract and turmeric rhizomes extract shows that all physicochemical parameters were found to be compatible with the normal range. Anti-fungal study of formulation revealed excellent efficacy against *Candida albicans*. Developed herbal oral formulation was stable, safe and effective for the treatment of mouth ulcer.

Keywords: *Psidium guajava* Linn; Leaf extract; Curcumin; Herbal gel; Mouth ulcer

Introduction

Gels are mainly semi-solid formulations having a liquid phase that has been thickened with some other components. Topical gel preparations are used for the skin application or percutaneous penetration of medicament or local action to certain mucosal surfaces [1]. Mouth ulcers are small sores or an abrasion that develops in mouth or at the base of gum. Mouth ulcers are also known as canker sores or apthopus ulcer. A break or breach in the mucous membrane, that lines within the mouth is also recognised as a mouth ulcer. It generally arises as a yellow or white colour depression in mouth. Mouth ulcers are usually generated by a number of causes, such as biting the inner layer of cheek, food allergies, hard teeth brushing, hormonal changes, vitamin deficiencies, bacterial infection and diseases [2] **(Figure 1).**

Figure 1: Mouth ulcer.

Over three fourth of world population depends mainly on the plants and plant derived herbal medicines. 30% of the plant species are used for medicinal purposes. Market for plant derived drugs of whole world may estimate for about Rs. 200,000 crores. Presently, contribution of India is less than Rs. 2000 crores. Export of raw drugs from India has gradually grown by 26% to Rs. 165 crores in 1994-95 from Rs. 130 crores in 1991-92. The yearly production of raw material from medicinal and aromatic plants is worth about Rs. 200 crores. This is likely to reach US $1150 by the year 2000 and US $5

trillion by 2050 [3]. It has been observed that plant drugs constitute 25% of total drugs in developed countries such as United States, while in fast developing countries like China and India the contribution is above 80%. Thus, the economic importance of medicinal plants in India is much more than rest of the world. These countries contributes two third of the plants used in modern system of medicine and the indigenous systems of medicine provides health care system of rural population [4]. *Psidium guajava* L. known as Guava is a medicinal plant belonging to the family Myrtaceae. *Psidium guajava* is a well-known traditional medicinal plant used in various indigenous systems of medicine. It is widely distributed throughout India. Guava (*Psidium guajava* L.) leaves have traditionally been used to manage several diseases such as rheumatism, diarrhea, diabetes mellitus, wound sore throat, cough and it also gives antibacterial activity, anticancer activity. It contains important phytoconstituents such as tannins, triterpenes, and flavonoid: quercetin, pentacyclic triterpenoid: guajanoic acid, saponins, carotenoids, lectins, leucocyanidin, ellagic acid, amritoside, beta-sitosterol, uvaol, oleanolic acid and ursolic acid [5] **(Figure 2).**

Figure 2: Guava leaves and fruits.

The biological source of Turmeric is *Curcuma longa* which belongs to the family Zingiberaceae. The phytochemical components of turmeric include diaryl heptanoids, a class including numerous curcuminoids, such as curcumin, demethoxycurcumin, and bisdemethoxycurcumin. Volatile oil of *Curcuma longa* possess anti-inflammatory and anti-arthritic activities. Water and fat soluble extracts of curcumin exhibited strong antioxidant activity comparable to vitamins C and E [6] **(Figure 3).**

Material and Methods

Collection and authentication of plant materials

The leaves of plant *Psidium guajava* and rhizomes of *Curcuma longa* were collected from the local area of Jhalwa, Prayagraj, Uttar Pradesh, India in month of September 2019 and the plant specimens are authenticated by "Botanical Survey of India, Prayagraj" Accession no. 104331 and 104332 respectively.

Chemicals

Ethanol, Methanol, Carbopol 940, Methyl paraben, Propyl paraben, Propylene glycol 400, Triethanolamine, Distilled water. All ingredients of analytical grade purchased from Merk Ltd and Thomas Baker Chemical Pvt. Ltd.

Equipments

Digital balance, pH meter, Magnetic stirrer, Digital water bath, Ultra sonicator, Brookfield LVDV – II + Pro viscometer.

Figure 3: Turmeric plant, rhizomes and powder.

The aim of present study is to establish the Formulation and Evaluation of herbal oral gel containing extracts of powdered *Psidium guajava* Linn leaves and *Curcuma longa* Linn rhizomes to treat mouth ulcer.

Preparation of plant extracts

The leaves of guava and rhizomes of turmeric were washed under running tap water to remove dust particles and shade dried at room temperature for 3-4 weeks. The dried plant parts were reduced to coarse powder with a mechanical grinder and passed through a 40 no. mesh sieve. The powder was then subjected to extraction by cold maceration using ethanol, methanol and water to attain their respective extracts. Both 100 g of dried guava leaves powder and turmeric powder were macerated in 500 ml of ethanol, methanol and water in separate conical flask for 24 hrs at room temperature, under occasional shaking. After 24 hrs mixture were filtered out using simple filtration method and filtrates were collected in separate vessels. To obtain the extract the solvent were removed from the filtrate under reduced pressure by using a rotary vaccum evaporator at 45-50°C [7].

Preparation of herbal gel

Take 15 ml of distilled water in a beaker and disperse specified amount of carbopol 940 in it with continuous stirring. Kept the beaker aside to swell the carbopol for half an hour. In another beaker take 5 ml of distilled water and add required quantity of methyl paraben and propyl paraben to it by heating on water bath. Cool the solution, then add Propylene

This article is available from: 10.36648/0975-9344.12.2.150

glycol 400. Further required quantity of extract was added to the above mixture and this solution was mixed properly to the Carbopol 940 gel with continuous stirring. finally volume made up to 30 ml by adding remaining distilled water and triethanolamine was added drop wise to the formulations for adjustment of required mouth skin pH (6.8-7) and to obtain the gel at required consistency. The same method was followed for preparation of control sample without adding any extract [8].

Formulation table

The method describes above and the formulae were tabulated in **Table 1.** Along with control sample gel were prepared by addition of required quantity of *Psidium guajava* leaves extract and *Curcuma longa* rhizomes extract to prepared 1%, 2% and mixed mouth ulcer gel respectively [8].

Table 1: Composition of various gel formulations.

Ingredients	Quantity in gm or ml				
	F1	F2	F3	F4	F5
	-1%	-2%	-1%	-2%	(Mixed)
Guava leaf extract	0.3	0.6	-	-	0.45
Turmeric rhizome extract	-	-	0.3	0.6	0.45
Carbopol 940 (1%)	0.3	0.3	0.3	0.3	0.3
Methyl paraben (0.2%)	0.06	0.06	0.06	0.06	0.06
Propyl paraben (0.1%)	0.03	0.03	0.03	0.03	0.03
Propylene glycol 400 (5%)	1.5	1.5	1.5	1.5	1.5
Triethanolamine (1.2%)	0.36	0.36	0.36	0.36	0.36
Glycerine (1.5%)	0.45	0.45	0.45	0.45	0.45
Distilled water	Up to 30 ml	Up to 30 ml	Up to 30 ml	Up to 30 ml	Up to 30 ml

Evaluation parameters

Physical evaluation

Physical parameters such as color, odour and consistency were checked visually.

Color: The color of the formulations was checked by visual inspection.

Consistency: The consistency of formulations was checked by applying on skin.

Odour: The odour of the formulations was checked by mixing the gel in water and observing the smell. Physical evaluations of gel formulations were reported in **Table 2.**

Percentage yield

Weigh the empty container in which the gel formulation was stored then again weigh the container with gel formulation. To obtain the practical yield subtract the weight of empty container with the container with gel formulation. Then the percentage yield was calculated by the formula given below:

Percentage yield = (practical yield/theoretical yield) × 100

Percentage yield of gel formulations were reported in **Table 3.**

Measurement of pH

The pH of gel formulations were determined by using digital pH meter. Take 1 gm of gel and dissolved in 10 ml of distilled water and keep apart for two hours. Then the measurement of pH of formulations was done by dipping the glass electrode completely into the gel system three times and the average values are reported [9]. The pH of gel formulation was reported in **Table 4.**

Homogeneity

All prepared gel formulations were tested for homogeneity by visual inspection after the gels have been set in to the container. They were tested for their presence and appearance of any aggregates [10]. Homogeneity of gel formulation was reported in **Table 5.**

Viscosity

The measurement of viscosity of the formulated gel was determined by Brookfield Viscometer with spindle no. 1 at 25°C. The gels were rotated at speed 0.3, 0.6 and 1.5 rotations per minute and at each speed, the corresponding dial reading was noted. Then viscosity of the prepared gels were obtained by multiplication of the dial reading with factor given in the Brookfield Viscometer catalogues [11]. Viscosity of gel formulation was reported in **Table 6.**

Spreadability

Spreadability is expressed in terms of time in seconds taken by two slides to slip off from gel that is placed in between the slides under the direction of certain load. If the time taken for separation of two slides is less then better the spreadability [12]. 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

Spreadabilty of gel formulations were reported in **Table 7.**

Extrudabilty

The formulated gel were filled in standard capped collapsible aluminium tubes and sealed by crimping to the

end. The weight of filled tubes were recorded and the tubes were sandwiched between two glass slides and were clamped. 500gm weight was placed over the slides and then the cap was removed to extrude. The amount of extruded gel was collected and weighed. Extrudability was determined by calculating the percentage of extruded gel.

When it is greater than 90% then extrudability is excellent.

When it is greater than 80% then extrudability is good.

When it is 70% then extrudability is fair [13].

Extruadability of gel formulations were reported in **Table 8.**

Clarity

The clarity of all the three batches was determined by visual inspection [14].

Gel strength

Gel strength was determined by the time in seconds required by the weight to penetrate in the gel. A 3.5 gm weight was placed on the surface of 5 gm formulated gel. Gel strength was determined by reporting the time in seconds required by the weight to penetrate 0.5 cm in the gel [10]. The gel strength was then reported in **Tables 9 and 10.**

Anti-fungal activity

The antifungal activity of all optimized formulation and blank formulation were carried out by Cup-plate method in comparison with marketed antifungal formulation (Daktarin oral gel). The antifungal activity test was performed by using *Candida albicans*. Prepared nutrient brought and poured in to sterile petri plates and kept aside for drying and cooling. After that candida albican culture were spread by micron wire loop. A sterile cork borer 6 mm diameter was used to drill holes 4 mm deep. Then place 0.5 gm of gel from each formulations in to this holes. Plates were then incubated at 27°C for 48 hr. Then the zone of inhibition (diameter in mm) was measured [15,16]. Antifungal studies were reported in **Table 11.**

Stability study

Stability studies were performed to observe the effect of environmental conditions or storage conditions on formulation. The optimized formulation was kept in accelerated stability condition at 25°C temperature 60 ± 5% relative humidity, 30°C temperature 65 ± 5% relative humidity and 40°C temperature 75 ± 5% for a period 3 months as per ICH guidelines. The placed sample was withdrawn at 1, 2 and 3 months interval and evaluation was carried out for physical appearance, pH, viscosity, spreadability, extrudability and gelling strength [17]. Stability study was reported in **Tables 12-14.**

Results and Discussion

Physical evaluation

Table 2: Physical evaluation of gel formulations.

Formulations	Color	Consistency	Odour
F 1	Yellowish green	Good	Characteristic
F 2	Yellowish green	Good	Characteristic
F 3	Yellowish green	Good	Characteristic
F 4	Yellowish green	Good	Characteristic
F (mixed)	Yellowish green	Good	Characteristic

Percentage yield

Table 3: Percentage yield of gel formulations.

Formulations	Percentage yield (%)
F 1	96.985
F 2	98.110
F 3	95.421
F 4	96.992
F (mixed)	98.876

pH

Table 4: pH of gel formulations.

Formulations	pH
F 1	6.9
F 2	7.1
F 3	7.0
F 4	6.9
F (mixed)	6.8

Homogeneity

Table 5: Homogeneity of gel formulations.

Formulations	Homogeneity
F 1	Good
F 2	Good
F 3	Good
F 4	Good

This article is available from: 10.36648/0975-9344.12.2.150

F (mixed)	Good

Viscosity

Table 6: Viscosity of gel formulations.

Formulations	Viscosity (cps)
F 1	4800
F 2	4800
F 3	4900
F 4	4700
F (mixed)	4500

Spreadability

Table 7: Spreadabilty of gel formulations.

Formulations	Spreadabilty (gm.cm/sec)
F 1	29.60
F 2	29.12
F 3	24.51
F 4	31.90
F (mixed)	33.20

Extruadability

Table 8: Extrudability of gel formulations.

Formulations	Extrudability (%)
F 1	78.0
F 2	79.0
F 3	77.5
F 4	87.0
F (mixed)	89.5

Gelling strength

Table 9: Gelling strength of gel formulations.

Formulations	Gelling strength
F 1	41 ± 0.15
F 2	39 ± 0.10
F 3	35 ± 0.24
F 4	28 ± 0.75
F (mixed)	26 ± 0.12

Optimization of batches

After analysis of all batches of formulations for their evaluation parameters like pH, viscosity, spreadability, extrudability and gelling strength it is observed that the formulation F (mixed) containing equal amount of guava leaf extract and turmeric rhizome extract showed good result. The batch F (mixed) optimized with good pH, viscosity, spreadability, extrudability and gelling strength, hence this formulation is further used for anti-fungal study **(Figure 4).**

Table 10: Optimization of batches.

Parameters	Optimized batch F (mixed)
Color	Yellowish green
Odor	Characteristics
pH	6.8
Viscosity	4500
Spredabilty	33.20
Extrudability	89.5
Gelling strength	26 ± 0.12

Anti fungal studies

Table 11: Antifungal studies of gel formulations.

Formulations	Zone of inhibition (mm)
	Candida albicans
Standard drug	27
F (mixed)	24
Blank	14

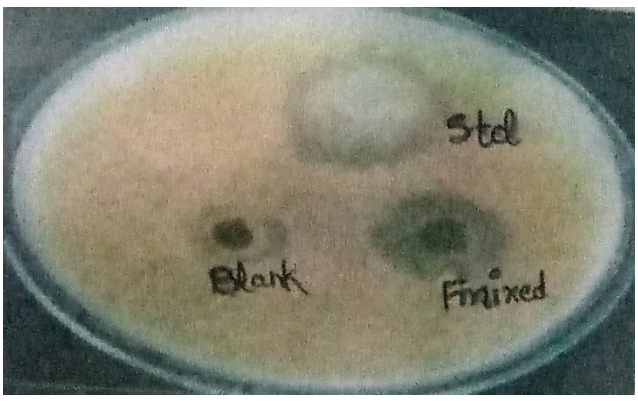

Figure 4: Zone of inhibition.

Stability studies

Table 12: Stability study at 25°C temperature 60% ± 5% RH.

Evaluation parameters	F (mixed)		
	Month-1	Month-2	Month-3
Color	Yellowish green	Yellowish green	Yellowish green
pH	6.8	6.8	6.8
Viscosity	4500	4500	4500
Spreadability	33.18	33.18	33.17
Extrudability	89.4	89.5	89.4
Gelling strength	26 ± 0.10	26 ± 0.11	26 ± 0.11

Table 13: Stability study at 30°C temperature 65% ± 5% RH.

Evaluation parameters	F (mixed)		
	Month-1	Month-2	Month-3
Color	Yellowish green	Yellowish green	Yellowish green
pH	6.8	6.8	6.8
Viscosity	4500	4500	4500
Spreadability	33.19	33.18	33.18
Extrudability	89.4	89.4	89.5
Gelling strength	26 ± 0.10	26 ± 0.11	26 ± 0.11

Table 14: Stability study at 40°C temperature 75% ± 5% RH.

Evaluation parameters	F (mixed)		
	Month-1	Month-2	Month-3
Color	Yellowish green	Yellowish green	Yellowish green
pH	6.8	6.8	6.8
Viscosity	4500	4500	4500
Spreadability	33.18	33.19	33.19
Extrudability	89.4	89.4	89.5
Gelling strength	26 ± 0.11	26 ± 0.10	26 ± 0.11

From the above results it is clearly shows that all the prepared gel formulations was yellowish green in color and having good homogeneity and gelling property. The pH of all gel formulations was in the range compatible with normal pH range of oral cavity. The rheological behaviors of gel formulations were studied with Brookfield viscometer which indicated that the viscosity of gel formulation was consistent neither too thick nor too thin. The study of spreadability shows that with increasing the viscosity of formulation spreadabilty decrease and its vice-versa. The gelling strength and extrudability is found in the suitable range. Thus overall, the gel formulation F (mixed) complies with all parameters of an ideal gel. Accelerated stability studies indicated that the physical appearance, rheological properties, extrudability, spreadability in the optimized formulation remain unchanged upon storage for 3 months. F (mixed) formulation showed good anti-inflammatory and antifungal activity against *Candida albicans* that is main microorganism responsible for mouth ulcer.

Conclusion

Natural remedies are more acceptable in the belief that they are safer with lesser side effects than the synthetic medicines. Nowadays herbal formulations have increasing demand in the world market. It is very good attempt to establish herbal gel of guava leaf extract with turmeric rhizome extract. The data presented in this study, it was demonstrated that the developed herbal gel formulation F (mixed) possess significant, therapeutically efficacious, suitable vehicle for drug delivery in low cost but definitely with high potential. The result showed that due to combination dosage form developed new herbal gel formulation having good antifungal activity as well as anti-inflammatory activity so it is safe, stable and good for mouth ulcer treatment.

References

1. Singh M, Mittal V (2014) Formulation and evaluation of herbal gel containing ethanolic extract of Ipomoea fistulosa. Int J Sci Res. 3: 1862-1866.
2. Healthline Media. A Red Ventures Company available at www.healthline.com
3. Joy P, Thomas J, Samuel M, Baby SP (1998) Medicinal plants, Kerala Agricultural University: Aromatic & Medicinal Plants Research Station pp. 1-211.
4. Thomas J (1997) Medicinal & aromatic plants research in India. In UNDP, process training course on Indigenous medicinal & aromatic plants, Beijing, China. pp. 17-27.
5. Kaneria M, Chanda S (2011) Phytochemical and pharmacognostic evalution of leaves of Psidium guajava L. (Myrtaceae), Pharmacogn J. 3: 41-45.
6. Rathaur P, Raja W, Ramteke PW, John SA (2012) Turmeric: The golden spice of life. Int J Pharma Sci Res 3: 1987-1994.
7. S´anchez E, Heredia N, Garcıa S (2010) Extracts of edible and medicinal plants damage membranes of Vibrio cholerae. Appl Environ Microbiol. 76: 6888-6894.
8. Das S, Haldar PK, Pramanik G (2011) Formulation and evaluation of herbal gel containing Clerodendronin fortunatum Leaves Extract. Int J Pharm Tech Res. 1: 140-143.
9. Mokashi M (2015) Formulation and Evaluation of Herbal Gel Containing Methanolic Extract of Annona squamosa Leaves, Int J Sci Res. 4: 1064-1065.
10. Thombre KP, Sharma D, Lanjewar AM (2018) Formulation and evaluation pharmaceutical aqueous gel of powdered cordia dichotoma leaves with guava leaves. Am J Pharm Tech Res.8: 269-274.

This article is available from: 10.36648/0975-9344.12.2.150

11. Yogi D (2015) Formulation and evaluation of gel containing amlexanox for mouth ulcer. Int J Appl Pharm. Biol Res. 4: 356-364.

12. Kaur LP, Garg R, Gupta GD (2010) Development and evaluation of topical gel of minoxidil from different polymer bases in application of alopecia. Int J Pharmacy Pharm Sci.2: 43-47.

13. Mendhekar SY, Thorat PB, Bodke NN, Jadhav SL (2017) Formulation and evaluation of gel containing Neem, Turmeric, Aloevera, Green tea and Lemon extract with activated charcoal and honey. Eur J Pharma and Med Res 4: 439-444.

14. Pandey N (2011) Formulation and evaluation of *invitro* antimicrobial activity of gel containing essential oils and effect of polymer on their antimicrobial activity. Int J Pharm and Pharmaceut Sci 3: 234-238.

15. Koland M (2011) *In vitro* and *in vivo* evaluation of chitosan buccal films of ondansetron hydrochloride. Int J Pharma Invest 1: 164-171.

16. Satish Kumar A, Ravindra A, Gopi Krishna CH, Vijaya Prakash CH, Jansi Rani M, et al. (2016) Formulation and evaluation of an herbal mouth gel containing methanolic extract of Psidium guajava tender twigs for treating oral mucositis. J Global Trends Pharm Sci 7: 3009-3012.

17. Patel J, Patel B, Banwait H, Parmar K, Patel M (2011) Formulation and evaluation of topical aceclofenac gel using different gelling agent. Int J Drug Dev & Res 3: 156-163.