“Formulation and Evaluation of Herbal Anti-Ulcer Mouth Gel”

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Abstract: The present study focuses on formulation and evaluation of herbal anti-ulcer mouth gel which mainly focuses on herbal ingredients such as Azadirachta indica, Psidium guajava, ocimum tenuiflorum, curcuma longa. Aphthous stomatitis painful and recurrent phenomenon the traditional medicine is used from decades for treatment of aphthous stomatitis. This Herbal ingredient has pharmacological properties such as antioxidant, anti-ulcerative, anti-microbial, antivirus activity. The herbal oral gel formulation was prepared by using ethanolic extract of guava, Tulsi, neem, turmeric, carbopol934 propylene glycol, methylparaben, propyl paraben, triethanolamine and required amount of distilled water. Various synthetic and semi synthetic preparation are used to treat mouth ulcer but they have some serious adverse effect on the continuous application like adrenal insufficiency, Hyperglycaemia, Immunosuppression, osteoporosis, GIT disturbance etc. Use of plant-based medicaments is gaining huge popularity due to better patient compliance and minimum side effect.

Keywords: Aphthous Stomatitis, Carbopol 934, Ethanolic Extract, Herbal Gel

I. INTRODUCTION

Aphthous stomatitis or mouth ulcer is an ulcerative condition that is related to the oral mucosa and is characterized by repeating ulcers in the throat and oral cavity. [1] 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] Semi-solid formulations include gel having a liquid phase which are then thickened by other components. Topical gels are intended for the application on skin or to certain mucosal surfaces for local action or percutaneous penetration of medicament preparations.[4] A large number of Indian medicinal plants are attributed with various pharmacological activities as they contain diversified classes of phytochemicals. As the conventional synthetic drugs suffer from a numerous side effect, these herbal ingredients provide a good alternative. [5] The mechanism involved in production of antinocer activity of the plant is due to its antioxidant, anti-inflammatory, mucus secreting, cytoprotective or healing activities.[6] Leaves of Azadirachta indica, commonly called as neem, belonging to family Meliaceae, are rich in several phytoconstituents such as Nimbina, Nimbidin, Nimbolide, and liminoids, quercitin and sitosterol. They have very strong antibacterial, antifungal and anti-inflammatory activity [7] and are quite commonly used for oral and dental treatments.

Leaves of Ocimum tenuiflorum, called as Tulsi, belonging to family Lamiaceae, is a common herb known for its wide variety of pharmacological activities such as antimicrobial, anti-oxidant, anti-inflammatory, analgesic, antipyretic, immunomodulatory, hepatoprotective and neuroprotective effects. Pharmacological activities of Ocimum tenuiflorum could be attributed due to the presence of the phytoconstituents such as eugenol, methyl eugenol, carvacrol, sesquiterpene, apigenin, luteolin, and Ursolic acid.[8] 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, antitumor 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, uvio1, oleanolic acid and Ursolic acid [9] 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 curcumindoids, such as curcumin, desmethoxycurcumin, and bisdemethoxycurcumin. Volatile oil of Curcuma longa possesses anti-inflammatory and anti-arthritic activities. Water- and fat-soluble extracts of curcumin exhibited strong antioxidant activity comparable to vitamins C and E [10] Thus in the present research work, the ethanolic extracts of these plants have been incorporated in gel formulations which could be used for the management of mouth ulcers, a condition that is associated with microbial invasion.
II. PLANT PROFILE:

- Azadirachta indica

![Leaves of Azadirachta Indica](image1)

**Synonym:** Neem tree, Indian lilac

**Biological source:** Fresh and dried leaves and seed oil of Azadirachta Indica J. (Melia Indica or M. Azadirachta Linn.)

**Family:** Meliaceae

**Chemical constituents:** Nimbin, Azadirachta, Gedunin, salannin, Azadiradione, Meliantriol, Azadirone, Azadirchatin.

![Chemical Structure of Azadirchatin](image2)

**Pharmacological Activity:**

1. **Antioxidant:** Free radical or reactive oxygen species are one of the main culprits in the genesis of various diseases. However, neutralization of free radical activity is one of the important steps in the disease’s prevention. Antioxidants stabilize/deactivate free radicals, often before they attack targets in biological cells. Leaf and bark extracts of A. indica have been studied for their antioxidant activity and results of the study clearly indicated that all the tested leaf and bark extracts/fractions of neem grown in the foothills have significant antioxidant properties [12]

2. **Anti-inflammatory:** Earlier finding showed immunomodulator and anti-inflammatory effect of bark and leave extracts and antipyretic and anti-inflammatory activities of oil seeds [13]

**Anti-microbial:** Neem and its ingredients play role in the inhibition of growth of numerous microbes such as viruses, bacteria, and pathogenic fungi.[14]

3. **Anti-bacterial:** The antibacterial activity of the bark, leaf, seed, and fruit extracts of Azadirachta indica (neem) on bacteria isolated from adult mouth and results revealed that bark and leaf extractsshowed antibacterial activity against all the test bacteria used.[15]

- Psidium Guajava

![Leaves of Psidium guajava](image3)

**Synonym:** Guajava pyrifera

**Biological source:** It is obtained from small tropical tree or shrub of Psidium guajava.

**Family:** Myrtaceae

**Chemical constituents:** Quercetin, Avicularin, Apigenin, Guaijaverin, Kaempferol, Gallic acid, Catechin, Chlorogenic acid, Caffeic acid,
Pharmacological Activity:
1. Anti-microbial: Guava leaves have high antibacterial activity in extracts that can inhibit the growth of S. aureus. Plant leaf and bark methanolic extracts of P. guajava have high antimicrobial activity. These extracts can inhibit the Bacillus and Salmonella bacteria.[16]
2. Anti-inflammatory: Extract of guava in ethyl acetate can stop the germ infection and thymus production. It can act as anti-viral agent. It can enhance the mRNA expression. Guava can alter the heme oxygenase-1 protein’s work. And due to this reason, it can be used as anti-inflammatory agent for skin. Extract of guavain ethanol inhibit the lipopolysaccharide from manufacturing of nitric oxide. It suppresses the expression of E2. In this way it works as anti-inflammatory agent.[17]
3. Anti-oxidant: Quercetin, quercetin-3-O-glucopyranoside and morin can be isolated from leaves. Nantitanon W, Okonogi S. Comparison of antioxidant activity of compounds isolated from guava leaves and a stability study of the most active compound. It is considered as most active and strong antioxidant inthe leaves of guava.[18]

- Ocimum Tenuiflorum

**Fig. 2.3 Leaves of Ocimum tenuiflorum**

**Synonym:** Holy basil, Tulsi, Damole

**Biological source:** It consist of fresh and dried leaves of ocimum species.

**Family:** Lamiaceae

**Chemical constituents:** Eugenol, Rosmarinic acid, Estragole, Oleanolic acid, Ursolic acid, Carvacrol, Beta caryophyllene, eucalyptol, camphor

**Fig 2.3.1: Chemical Structure of Eugenol**

Pharmacological Activity:
1. Anti-oxidant: The phenolic compounds, viz., cirsinole, cirsimaritin, isothymusin, apigenin and Rosmarinic acid, and appreciable quantities of eugenol (a major component of the volatile oil) from OS extract of fresh leaves and stems possessed good antioxidant
activity [19]

2. Anti-bacterial: OS fixed oil showed good antibacterial activity against Bacillus pumilus, Pseudomonas aeruginosa and S. aureus. Higher content of linolenic acid in OS fixed oil could contribute towards its antibacterial activity.[20]

3. Anti-inflammatory: The fixed oil and linolenic acid possess significant anti-inflammatory activity against PGE2, leukotriene and arachidonic acid induced paw oedema in rats by virtue of their capacity to block both the cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism [21]

- Curcuma longa

   **Fig. 2.4 Powder of Curcuma Longa**

   Synonyms: Turmeric, Haldi

   Biological source: Turmeric is the dried rhizome of Curcuma longa Linn.

   Family: Zingiberceae

   Chemical constituents: curcumin, curcuminoid, Desmethoxycurcumin, Zingiberene

   **Fig 2.4.1: Chemical Structure of Curcumin**

   Pharmacological activity:

   1. Anti-inflammatory: C. longa’s anti-inflammatory properties may be attributed to its ability to inhibit both biosynthesis of inflammatory prostaglandins from arachidonic acid, and neutrophil function during inflammatory states. Curcuminoids also inhibit LOX, COX, phospholipases, leukotrienes, prostaglandins, thromboxane, nitric oxide elastase, hyaluronidase, collagenase, monocyte chemoattractant protein-1, interferon inducible protein, TNF and interleukin-12. They also decrease prostaglandin formation and inhibit leukotriene biosynthesis via the lipoxygenase pathway [22]

   2. Anti-oxidant: An in vitro study measuring the effect of curcumin on endothelial heme oxygenase-1, an inducible stress protein, was conducted utilizing bovine aortic endothelial cells. Incubation with curcumin resulted in enhanced cellular resistance to oxidative damage [23]

   3. Anti-microbial: the antifungal, antibacterial, phytotoxic, cytotoxic and insecticidal activity of an ethanolic extract of turmeric. The extract showed antifungal activity towards Trichophyton longisusus and Microsporum Canis and weak antibacterial activity against Staphylococcus aureus [24]

III. Oral Ulcer

Canker sores are another name for aphthae or ulcers, these were first stated by Hippocrates who used the term aphthae to describe diseases related to the mouth [26,27]. Oral Aphthosis that is a typical condition characterized by numerous tiny, spherical or oval ulcer with confined margins, it typically presents first in adolescent form of an erythematous lesions with yellowish grey floor. [26] These ulcers, most commonly appear on the non-keratinized oral mucosa, they can cause substantial pain, and may cause difficulty with chewing, eating and speaking. [28]
3.1 Pathophysiology of Oral Aphthous

The pathogenesis of RAS remains poorly defined. It likely involves a predominantly cell-mediated inflammation involving T-cells and TNF alpha production. According to a study by Lehner,[29] under light microscopy, oral ulceration epithelium showed considerable intercellular edema and degenerative changes. There was an epithelial hyperplasia and only the basement membrane adjacent to the ulcer was affected, the rest of the basement membrane appeared intact. Herpetiform ulcers differ from recurrent aphthous ulcer in that they showed epithelial vesicles and intra nuclear inculsion bodies, suggesting a virus etiology.[25]

3.2 Types of Oral Aphthosis and Clinical Aspects

Oral ulcers mostly caused by minor strain, menstruation or stress, or contact with certain hot or spicy foods. During this initial phase erythema develops and it is localized to specific part. Within hours, small white papules form which later ulcerates, and slowly enlarges over the next 48-72 hours.[25]

There are three morphology types

- Minor Aphthous Ulcer
  It affects about 70-80% of patients. It usually occurs on non-keratinized surfaces particularly the mucosa of lip, mucosa of mouth and floor of mouth.[30]

- Major Aphthous Ulcer
  10% of the affected patients present with this complaint. This ulcer usually occurs on the lip, cheeks, tongue, palate, and pharynx.[31]

- Herpetiform Aphthous Ulcer
  It is a rare form of aphthous ulcer, only 1-10% of patients are affected. It is characterized by multiple recurrent picks of extensive, minor, painful ulcers. This ulcer usually occurs on the lips, cheeks, tongue, pharynx, palate, gingiva, the floor of mouth.[30]

Factors responsible for the mouth ulcers

- Toothpastes and mouthwashes that contain sodium lauryl sulfate
- Emotional stress/psychic stress
- Hormonal changes
- Nutritional deficiencies
- Mechanical trauma
- Allergies and sensitivity
- Infectious agent
- Medical conditions [32]

IV. MATERIALS AND METHODS:

4.1 Collection of materials:

The leaves of Azadirachta indica, Psidium guajava, ocimum tenuiflorum, and powder of curcuma longa were collected. Carbopol 934 and all the other solvents were of analytical grade.
4.2 Chemicals: -
Propylene glycol, methyl paraben, propyl paraben, Methanol, triethanolamine, Carbopol 934,

4.3 Equipment’s: -
Digital balance, hot air oven, muffle furnace, magnetic stirrer etc.

4.4 Apparatus:
Mortar and pestle, beaker, measuring cylinder, petri dish, stirrer etc.

4.5 Preparation of extract:
The collected fresh leaves of Azadirachta indica, Ocimum tenuiflorum, Psidium guajava, and powder of curcuma longa. The leaves were dried in hot air oven at 40 degrees Celsius to avoid degradation of phytoconstituents. After drying, the plant material was coarsely powdered with mortar and pestle and kept in well closed container. About (5) gm, (5) gm, (5) gm, (5) gm powder of Azadirachta indica, Psidium guajava, Ocimum tenuiflorum, curcuma longa respectively was defatted with methanol (80-200) in Soxhlet apparatus. Concentrated extracts of (EEA) ethanolic extract of Azadirachta indica, (EEO) ethanolic extract of ocimum tenuiflorum, (EEP) ethanolic extract of Psidium guajava, (EEC) ethanolic extract of curcuma longa were kept in desiccators till further used.[33]

4.6 Phytochemical screening:
All the above prepared extracts were subjected to preliminary phytochemical screening tests to identify the presence of various components, by using different test and reagents. [34,35]

Test for Flavonoids: the stock solution 1 ml was taken in a test tube and added few drops of dilute NaOH solution. An intense yellow color was appeared in the test tube. It becomes colorless when on addition of a few drops of dilute acid that indicates the presence of flavonoids.

Test for alkaloids: A) Dragendorff’s test – by adding 1 ml Dragendorff’s reagent to 2 ml of extract, an orange red precipitate was formed, indicating the presence of alkaloids.
B) Mayers test – few drops of Mayers reagent were added to 1ml of extract. A yellowish or bluish precipitate was formed, indicating the presence of alkaloids.

Test for phenol (ferric chloride test):
Some amount of extract was taken in test tube and then add 5% of ferric chloride was added in test tube. The appearance of dark green or bluish green color indicated the presence of phenol.

Test for tannins:
0.5g dried powder were taken in test tube. 20ml of distilled water was added and boiled in water bath at about 100°C. The solution was filtered through Whatman No 1 filter paper. After that add few drops of 0.1% ferric chloride. Development of brownish green or blue-black coloration was indication of positive result.[35]

Test for carbohydrates (Fehling’s solution):
Take 2ml of test sample in a clean test tube. Add 2ml of Fehling solution A and Fehling’s solution B to it. Keep the solution in a boiling water bath for about 10 min. if there is formation of red precipitate then the presence of carbohydrates is confirmed.

Test for glycosides (Keller -Killiani test):
A solution of 0.5ml containing glacial acetic acid and 2-3 drops of ferric chloride, was mixed with 2ml of extract. Later 1ml of concentrated H2SO4 was along the wall of test tube.

Test for saponins:
A drop of Na2CO3 solution was added to 5ml of extract in test tube. After vigorous shaking, it will leave to rest for five minutes. Foam formation indicated presence of saponins.

Test for steroids:
Salkowski test: the test extract was shaken with chloroform and concentrated H2SO4 was added along the walls of test tube; a red color appeared, indicating the presence of steroids.

<table>
<thead>
<tr>
<th>Sr no</th>
<th>Phytoconstituent</th>
<th>Azadirachta indica</th>
<th>Ocimum tenuiflorum</th>
<th>Curcuma longa</th>
<th>Psidium guajava</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbohydrates</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Proteins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Amino acid</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Glycosides</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

V. Formulation of Gel
Gel is defined as semi rigid systems in which the movement of dispersing medium is restricted by an interacting 3-dimensional network of particles or solvated macromolecule of the dispersed phase. 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”. [36,37] The rigidity of a gel arises from the presence of network formed by the interlinking of particle gelling agent The nature of particle and a type of force that is responsible for the linkage, which determine the structure of the network and properties of the gel.

USES OF GEL:
- As a delivery system for orally administered drug.
- For topical drugs applied directly to the skin, mucus, or the eye.
- As long-acting form of drug injected into the body.
For prolong release of drug.

Table 2: Ingredients of gel

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Ingredients</th>
<th>Quantity</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Azadirachta indica</td>
<td>1.5ml</td>
<td>Antiulcer activity</td>
</tr>
<tr>
<td>2</td>
<td>Ocimum tenuiflorum</td>
<td>1.5ml</td>
<td>Antiulcer activity</td>
</tr>
<tr>
<td>3</td>
<td>Psidium guajava</td>
<td>2ml</td>
<td>Antiulcer activity</td>
</tr>
<tr>
<td>4</td>
<td>Curcuma longa</td>
<td>1.5ml</td>
<td>Antiulcer activity</td>
</tr>
<tr>
<td>5</td>
<td>Methyl paraben</td>
<td>0.2gm</td>
<td>Preservative</td>
</tr>
<tr>
<td>6</td>
<td>Propyl paraben</td>
<td>0.1gm</td>
<td>Preservative</td>
</tr>
<tr>
<td>7</td>
<td>Propylene glycol</td>
<td>2ml</td>
<td>Base</td>
</tr>
<tr>
<td>8</td>
<td>Carbopol 934</td>
<td>5gm</td>
<td>Gelling agent</td>
</tr>
<tr>
<td>9</td>
<td>Triethanolamine</td>
<td>q.s (pH6.5-pH adjustment 7)</td>
<td>pH adjustment</td>
</tr>
<tr>
<td>10</td>
<td>Water</td>
<td>q.s</td>
<td>Aqueous base</td>
</tr>
</tbody>
</table>

V.I. Preparation of herbal gel: [26]

- Take 15ml distilled water in a beaker and disperse specified amount of Carbopol 934 in it with continuous stirring.
- In beaker take 5ml 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 glycol.
- Further required quantity of extract added to above mixture and this solution was mixed properly to the Carbopol 934 gel with continuous stirring.
- Finally, volume made up to 30ml by remaining distilled water and triethanolamine was added drop wise to the formulation for the adjustment of required mouth skin pH (6.8-7) and to obtain the gel required consistency.
- And then herbal gel was prepared.

Evaluation of Gel: [37]

a. Physical evaluation of formulated gel:

The physical evaluation of color, odor, texture and appearance gel were shown in table 5. The color of all batches was yellowish to pale yellow due to guava leaf extract and turmeric extract. The odor was characteristic and the texture of the gel was smooth.

b. Measurement of pH:

The pH of herbal gel formulations was determined by using digital pH meter. 1 gm of gel was taken and dispersed in 10 ml of distilled water and keep aside for two hours. The measurement of pH of formulation was carried out in three times and the average values are reported. pH of gel formulation was reported.

c. Homogeneity:

All developed 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.
d. Spreadability:[38]

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 a certain load. Lesser the time taken to separate the slide better is the spreadability. Spreadability is calculated by using the formula:

\[ S = \frac{M \times L}{T} \]

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

Table 3: Spreadability of formulated gel

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Gram (M)</th>
<th>L (cm)</th>
<th>T (sec)</th>
<th>( S = \frac{M \times L}{T} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>30</td>
<td>3.7</td>
<td>13</td>
<td>9.25</td>
</tr>
<tr>
<td>F2</td>
<td>30</td>
<td>4.2</td>
<td>11</td>
<td>11.45</td>
</tr>
<tr>
<td>F3</td>
<td>30</td>
<td>4.8</td>
<td>12</td>
<td>12.0</td>
</tr>
<tr>
<td>F4</td>
<td>30</td>
<td>4.2</td>
<td>11</td>
<td>11.45</td>
</tr>
<tr>
<td>F5</td>
<td>30</td>
<td>4.7</td>
<td>10</td>
<td>14.1</td>
</tr>
</tbody>
</table>

e. Viscosity:[38]

Viscosities of the formulations was measured by Brookfield viscometer. The viscosity of gel is shown in table 4. The formulation F1, F4, F5 batches showed viscosity between 2100-2300cp. F2, F3 show 2300-2600cp.

Table 4: Viscosity and pH of formulated batches

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Viscosity (cp)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>2200</td>
<td>6.6</td>
</tr>
<tr>
<td>F2</td>
<td>2523</td>
<td>6.2</td>
</tr>
<tr>
<td>F3</td>
<td>2326</td>
<td>6.2</td>
</tr>
<tr>
<td>F4</td>
<td>2258</td>
<td>6.5</td>
</tr>
<tr>
<td>F5</td>
<td>2191</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Table 5: physical evaluation

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Color</th>
<th>Odor</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Yellowish</td>
<td>characteristic smooth</td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>Pale yellow</td>
<td>characteristic smooth</td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td>Pale yellow</td>
<td>characteristic smooth</td>
<td></td>
</tr>
<tr>
<td>F4</td>
<td>Pale yellow</td>
<td>characteristic smooth</td>
<td></td>
</tr>
<tr>
<td>F5</td>
<td>Pale yellow</td>
<td>characteristic smooth</td>
<td></td>
</tr>
</tbody>
</table>

Result and Discussion

Collection and authentication of plant the collected leaves of Azadirachta indica, Ocimum tenuiflorum, Psidium guajava, curcuma longa was identified.

All the prepared gel formulations were evaluated for parameters such as physical appearance, pH, homogeneity, spreadability and viscosity. The observation reveals that the gels were having smooth texture and were elegant in appearance. The pH of all prepared gels was found to be in range of 6.1-
7.0. All the gels showed good spreadability. Also, from the above data it was observed that increase the concentration of plant extract increases the spreadability. All the prepared gels showed good homogeneity. The developed preparations were much clear. The viscosity of all the developed gels was found to be excellent and within the range.

Table 6: Formulation of gel:

<table>
<thead>
<tr>
<th></th>
<th>Methyl paraben</th>
<th>Propyl paraben</th>
<th>Propylene glycol</th>
<th>Triethanolamine</th>
<th>Carbopol 934</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0.2 gm</td>
<td>0.2 gm</td>
<td>2 ml</td>
<td>q.s (6.6)</td>
<td>5 gm</td>
<td>q.s</td>
</tr>
<tr>
<td>6</td>
<td>0.2 gm</td>
<td>0.2 gm</td>
<td>2 ml</td>
<td>q.s (6.2)</td>
<td>5 gm</td>
<td>q.s</td>
</tr>
<tr>
<td>7</td>
<td>0.2 gm</td>
<td>0.2 gm</td>
<td>2 ml</td>
<td>q.s (6.2)</td>
<td>5 gm</td>
<td>q.s</td>
</tr>
<tr>
<td>8</td>
<td>0.2 gm</td>
<td>0.2 gm</td>
<td>2 ml</td>
<td>q.s (6.2)</td>
<td>5 gm</td>
<td>q.s</td>
</tr>
<tr>
<td>9</td>
<td>0.2 gm</td>
<td>0.2 gm</td>
<td>2 ml</td>
<td>q.s (6.2)</td>
<td>5 gm</td>
<td>q.s</td>
</tr>
<tr>
<td>10</td>
<td>q.s</td>
<td>q.s</td>
<td>q.s</td>
<td>q.s</td>
<td>q.s</td>
<td>q.s</td>
</tr>
</tbody>
</table>
Conclusion:

Nowadays there is a lot of demand for herbal formulations in the market due to their cost-effectivity and absence of any side effects. From the above experimental data, it is clear that a gel formulation with herbal ingredients such as Guava, Turmeric, Neem, Tulsi, has good characteristics, viscosity and also possesses a good antimicrobial activity which is necessary in the management of mouth ulcers. It is observed that as the amount of plant extract increases, spreadability increases. Among the five batches formulated, the result of F5 batch were satisfactory making it a most optimized batch with significant antibacterial activity. Hence it can be concluded that the Azadirachta indica, Ocimum tenuiflorum, Psidium guajava, Curcuma longa leaves extract loaded gel is ideal for mouth ulcer.

Reference
