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Research Article

Exploring Fruit Remedies for Ulcer Treatment: An Invitro Analysis

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ABSTRACT

Objective: To compare the anti-ulcer activity of *litchi chinensis* and *withania coagulans* fruit extracts using an *In-vitro* analysis.**Design:** This was an *in-vitro* experimental study. It involved comparing the acid-neutralizing capacity of different concentrations of fruit extracts with a standard antacid.**Intervention:** The interventions were the different concentrations (100mg, 200mg, 500mg, and 1000mg/ml) of the fruit extracts from *Litchi chinensis* and *Withania coagulans*. The standard antacid (aluminum hydroxide + magnesium hydroxide at 500mg/ml) also served as an intervention for comparison. Additionally, different formulations (syrup, suspension, and effervescent granules) of the fruit extracts were prepared and tested, with the suspension ultimately being the focus.**Main Outcome Measure:** The primary outcome measure was the acid neutralizing capacity (ANC) of the fruit extracts at various concentrations. This measured how effectively the extracts could neutralize acid, which is directly related to their potential to treat peptic ulcers.**Results:** The results showed concentration dependent reduction in acid neutralizing capacity per gm of antacid was found as 157.5, 91.25, 40 and 21.75 for *Litchi chinensis* and 81, 58, 24 and 14.4 for *Withania coagulans*. Standard (500 mg/ml) ANC value was found to be 40.1 quite similar concentration of test drug. Whereas, test drug concentration 500 mg/ml was found to neutralize acid more significantly as compared to standard.**Conclusion:** Different formulations (syrup, suspension and effervescent granules) were prepared using fruit extracts. According to the results suspension has shown better results than other formulations.**Key Words:** Acid Neutralizing Capacity, Effervescent Granules, *Litchi chinensis*, Peptic Ulcers, Syrup, Suspension, *Withania coagulans*.**ARTICLE INFO:** Received 27 Dec. 2024; Review Complete 16 Feb. 2025; Accepted 15 March 2025. ; Available online 15 April. 2025**Cite this article as:**Sireesha Kalva, Salma Sulthana, Tejasri Oruganti, Exploring Fruit Remedies for Ulcer Treatment: An Invitro Analysis, Asian Journal of Pharmaceutical Research and Development. 2025; 13(2):21-25, DOI: <http://dx.doi.org/10.22270/ajprd.v13i2.1534>

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INTRODUCTION

An ulcer is a local defect or excavation of the surface of an organ or tissue that is produced by the shedding of inflamed necrotic tissue. Charaka has defined nonhealing ulcers as discolored, foul-smelling, profuse discharging and severe intense painful ulcers.

Sushruta has mentioned that after complete healing of the wound, the scar never disappears and its imprint persists lifelong and is called as vrana (*ulcers*).^[1]

Peptic ulcer disease is one of the most common gastrointestinal disorders, which causes a high rate of morbidity particularly in the population of non-industrialized countries.^[2] Stress, lifestyle choices, alcohol consumption, tobacco and excessive non-steroidal anti-inflammatory drugs

(NSAIDs) use is the main causes of peptic ulcers and related issues.^[3] Peptic ulcer results from an imbalance between some endogenous aggressive factors [hydrochloric acid, pepsin, refluxed bile, leukotrienes, Reactive Oxygen Species (ROS)] and cytoprotective factors, which include the function of the mucus-active phospholipids, Prostaglandins (PGS), mucosal blood flow, cell renewal and migration, nonenzymatic and enzymatic antioxidants and some growth factors.^[4] The medications used in the treatment of gastric inflammation aim to reduce the acid secretion in the stomach thereby reducing the acidity inside the gastric lumen and promoting gastric ulcer healing.

The currently used antiulcer drugs like H₂ receptors blockers, proton pump inhibitors, antimuscarinics produce adverse reactions such as hypersensitivity, arrhythmia, impotence and

haemopoietic changes. Ayurveda is an extensively practiced and accepted traditional system of medicine that has maintained its global prevalence for centuries. Therefore, there is a need to explore for newer therapeutic antiulcer compounds derived from plant sources.

Drawbacks associated with the existing antiulcer therapy. Many chemical compounds have been isolated from medicinal plants with antiulcer activity.^[5]

Litchi chinensis fig: 1 is a fruit tree belonging to Sapindaceae family. *Litchi* pericarp contains significant amounts of flavonoids and anthocyanins, including procyanidin b2, b4, epicatechin, cyanidin-3- rutinoside, cyanidin-3-glucoside, quercetin-3-rutinoside and quercetin-3-glucoside, etc.^[10] These compounds carry high free radical scavenging properties and could be used as anti-inflammatory, anti-oxidant or anti-cancer agents.^[6]



Figure 1: *Litchi chinensis* (Litchi)

The *Withania coagulans* fig:2 belongs to the family solanaceae.^[12] It consists of various primary and secondary metabolites such as carbohydrates, proteins, amino acids, alkaloids, pHenols, tannins, steroids, saponins, organic acids, etc. *Withania coagulans* shows free radical scavenging, cardiovascular, hypoglycemic, hypolipidemic, central nervous system depressant, hepatoprotective, anti-inflammatory, antitumor, immuno-suppressive, and cytotoxic, and wound healing effect. Hence, this study has been taken with an aim to formulation and evaluation of syrup, suspension and effervescent granules of *Litchi chinensis* and *Withania coagulans*



Figure 2: *Withania coagulans* (Paneer Dodi)

MATERIALS AND METHODS:

1. Collection of Herbal Drugs:

The Extract of *Litchi chinensis* and *Withania coagulans* fruit were identified and authenticated by a botanist, confirming their botanical identity as *Litchi chinensis* and *Withania coagulans*, which are stored in the SVCP herbarium.

Evaluation of Aqueous Extracts of *Litchi chinensis* and *Withania coagulans*.

Preliminary Phytochemical Screening

Standard screening tests of aqueous extracts of *Litchi chinensis* and *Withania coagulans* were carried out for various plant constituents. The extracts were screened for the presence or absence of secondary metabolites such as carbohydrates, alkaloids, saponins, flavonoids, triterpenoids, tannins using standard procedures.^[8]

Tests for carbohydrates (Molisch's Test):

A small quantity of the extracts was dissolved separately in 4 ml of distilled water and filtered. The filtrate was subjected to Molisch's test to detect the presence of carbohydrates and further addition of fehling's reagent if the brick red color appears it confirms the presence of reducing sugar.

Test for alkaloids (Mayer's Test):

A 100mg of an extract was dissolved in dilute hydrochloric acid. Solution was clarified by filtration. Filtrate was tested with Mayer's reagents. The treated solution was observed for any precipitation.^[9]

Tests for saponin (Froth Test):

0.5g extracts were dissolved in 10ml of distilled water for about 30 seconds. The test tube was stoppered and shaken vigorously for about 30 seconds the test tube was allowed to stand in a vertical position and observed over 30 minutes period of time. If a "honey comb" froth above the surface of liquid persists after 30 minutes the sample is suspected to contain saponin.^[10]

Tests for flavonoids (Lead Acetate Test):

To a solution of 0.5 g extract in water, about 1ml of 10% lead acetate solution was added. Production of yellow precipitate is considered as positive for flavonoids.

Test for terpenoids (Salkowski Test):

5 ml of the extract was mixed with 2 ml of chloroform and concentrated sulphuric acid to form a layer. A reddish-brown coloration of the interface showed the presence of terpenoids.

Test for tannins (Ferric Chloride Test):

Ferric chloride test: the extract was diluted to 5 ml with distilled water. To this a few drops of neutral 5% ferric chloride solution was added. A dark green color indicates the presence of phenolic compounds.^[11]

2. Acid neutralizing capacity^[12-15]

Principle: the acid-neutralizing capacity (ANC) is the amount of acid that can be neutralized by an antacid. the united states pharmacopoeia (USP) describes the ANC test as a back-titration method using sodium hydroxide (0.5n solution) to a set endpoint of pH 3.5 to determine the number

of milliequivalents of acid (hydrochloric acid 1N solution) neutralized by the Minimum Labeled Dosage (MLD) of an antacid.

Procedure:

1. The acid neutralizing capacity (ANC) for the herbal drugs in different concentrations (i.e., 100mg/ml, 200mg/ml, 500mg/ml, 1000 mg/ml) were compared with the standard antacid (aluminum hydroxide+magnesium hydroxide (AHMH) –500 mg/ml.)
2. To 5ml of each herbal extract individually, water was added and mixed well to make up the total volume up to 70 ml, then 30 ml of 1N HCl was added into standard and the test preparation. Both are stirred for 15 mins.
3. 2-3 drops of phenolphthalein solution were added and mixed.
4. The excess HCl was immediately titrated with 0.5N sodium hydroxide solution drop wise until a pink color is appeared.^[9-12]
5. Moles of acid neutralized = (vol of HCl x normality of HCl) – (vol of NaOH x normality of NaOH).
6. Acid neutralizing capacity (ANC) per gram of antacid = moles of HCl neutralize/grams of extract.

Formulation of suspension:^[16,17]

1. In a beaker about 40 ml of the distilled water was taken and to this 35.0g of sorbitol solution 70% was added and mixed well.
2. To the above mixture xanthan gum (in varying concentration) was added and started stirring using homogenizer.
3. In another beaker, methyl paraben was dissolved in 2ml alcohol and added to the above mixture.
4. Drugs and /or their extracts were passed through 120# sieve and then were added in small quantity to the above mixture and stirred for 30 min.
5. Colorants and flavors were added and the volume was made up to 100ml as shown in table 1.

Table 1: Composition of Suspension

| S. No | Ingredients | Quantity(mg) |
|-------|-------------------------------|--------------|
| 1 | Fruit Extract | 2 |
| 2 | Xanthan Gum | 0.2 |
| 3 | Sorbitol 70% Liquid | 35 |
| 4 | Distilled Water To Make | 100 |
| 5 | Preservative (Methyl Paraben) | 0.2 |
| 6 | Colors | Q. S |
| 7 | Flavor | Q. S |

Formulation of Syrup:

A. Preparation of Plant Decoction^[18]

B. Preparation of Syrup:^[19]

1. 66.7 gm of sucrose was weighed and added to purified water and heated until it dissolved with occasional stirring. Sufficient boiling water was added to produce 100 ml.
2. One part of decoction was mixed with five parts of simple syrup (1:5) and required quantity of sodium benzoate (0.2%) and quinoline yellow was added to the above mixture.
3. Sodium benzoate and quinoline yellow act as preservative and coloring agent respectively as shown in table 2.

Table 2: Composition of Syrup

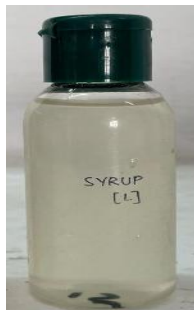
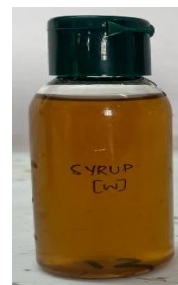
| S. No | Ingredients | Quantity |
|-------|-----------------|----------|
| 1 | Fruit Decoction | 5ml |
| 2 | Simple Syrup | 25ml |

Preparation of Effervescent Granules:^[20,21]

1. The aqueous extract of *Litchi chinensis* & *Withania coagulans* fruit is obtained.
2. Wet granulation method was employed to formulate effervescent granules which contains extract of *Litchi chinensis* and *Withania coagulans*.
3. The composition of the formulation is represented in table 3. All the excipients except polyvinylpyrrolidone (pvp) were passed through a 150 µm mesh size sieve then were mixed with the extract powder.
4. This mixture was then mixed portion-wise with PVP (pre-mixed with ethanol) while kneading manually as shown in table 3.

Table 3: Composition of Effervescent Granules.

| S. No | Ingredients | Quantity(gm) |
|-------|----------------------|--------------|
| 1 | Extract | 4.05 |
| 2 | Tartaric Acid | 29.27 |
| 3 | Talc Powder | 1.39 |
| 4 | Magnesium Stearate | 0.69 |
| 5 | Saccharine | 13.56 |
| 6 | Polyethylene Glycol | 2.21 |
| 7 | Citric Acid | 14.64 |
| 8 | Sodium Bicarbonate | 49.76 |
| 9 | Polyvinylpyrrolidone | 4.43 |
| 10 | Ethanol | Q. S |

RESULTS:**(1) Phytochemical Screening of the Extracts:**Figure 3: *Litchi chinensis* syrup.Figure 4: *Withania coagulans* syrup.Figure 5: *Litchi chinensis* suspension.Figure 6: *Withania coagulans* suspension.Figure 7: *Litchi chinensis* Effervescent granules.Figure 8: *Withania coagulans* Effervescent granules.

The results confirmed the presence of carbohydrates, alkaloids, flavonoids, terpenoids in both *Litchi chinensis* and *Withania coagulans* and absence of saponins in *Litchi chinensis* and absence of tannins in *Withania coagulans* shown in table 4.

Table 4: Phytochemical Tests of *Withania coagulans* and *Litchi chinensis*.

| S. No | Chemical Constituents | Test | Inference | Observations (<i>Withania Coagulans</i>) | Observations (<i>Litchi Chinensis</i>) |
|-------|-----------------------|----------------------|--------------------------|--|--|
| 1 | Carbohydrates | Molisch Test | Red Brick Color | + | + |
| 2 | Alkaloids | Mayers Test | Yellow Or White Ppt | + | + |
| 3 | Saponins | Froth Test | Foam Formation | + | - |
| 4 | Flavonoids | Lead Acetate Test | Yellow Ppt | + | + |
| 5 | Triterpenoids | Salkowski Test | Reddish-Brown Coloration | + | + |
| 6 | Tannins | Ferric Chloride Test | Dark Green Color | - | + |

(2) Acid Neutralizing Capacity:

To determine the optimal concentration for maximum efficacy, a series of formulations with varying concentration of [active ingredient] were prepared.

In-vitro anti-ulcer activity was evaluated by determination of acid neutralizing capacity of *Litchi chinensis* and *Withania coagulans* to and the results obtained are reported in table 5 below.

Table 5: Acid neutralizing capacity of *litchi chinensis*

| S. No | Concentration (mg/ml) | Concentration (mg/ml) | Vol. of NaOH consumed | ANC per gram of antacid |
|-------|------------------------------------|-----------------------|-----------------------|-------------------------|
| 1 | Extract of <i>Litchi chinensis</i> | 100 | 28.5 ± 0.28 | 157.5 |
| | | 200 | 23.5 ± 0.28 | 91.25 |
| | | 500 | 19.5 ± 0.28 | 40 |
| | | 1000 | 16.5 ± 0.23 | 21.75 |
| 2 | Standard (AHMH) | 500 | 19.9 ± 0.3 | 40.1 |

Value Is Expressed As Mean ± SEM (N = 3)

Table 6: Acid Neutralizing Capacity of *Withania Coagulans*:

| S. No | Concentration (Mg/ml) | Concentration (mg/ml) | Vol. of NaOH Consumed | ANC Per Gram of Antacid |
|-------|--------------------------------------|-----------------------|-----------------------|-------------------------|
| 1 | Extract of <i>Withania coagulans</i> | 100 | 100 | 43.8 ± 0.20 |
| | | 200 | 200 | 36.7 ± 0.06 |
| | | 500 | 500 | 35.6 ± 0.44 |
| | | 1000 | 1000 | 31.2 ± 0.43 |
| 2 | Standard (AHMH) | 500 | 500 | 19.9 ± 0.3 |

Value Is Expressed As Mean ± SEM (N = 3)

Acid Neutralizing Capacity of Different Formulations:**Table 7:** Acid Neutralizing Capacity of Syrup:

| S. No | Fruit | Vol. of NaOH Consumed | ANC Per Gram of Antacid |
|-------|---------------------------|-----------------------|-------------------------|
| 1. | <i>Litchi chinensis</i> | 23 ± 0.2 | 37 |
| 2. | <i>Withania coagulans</i> | 28.5 ± 0.2 | 31.5 |

Value Is Expressed As Mean ± SEM (N = 3)

Table 8: Acid Neutralizing Capacity of Suspension:

| S. No | Fruit | Vol. of NaOH Consumed | ANC Per Gram of Antacid |
|-------|---------------------------|-----------------------|-------------------------|
| 1. | <i>Litchi chinensis</i> | 22 ± 0.2 | 38 |
| 2. | <i>Withania coagulans</i> | 22 ± 0.2 | 38 |

Value Is Expressed As Mean ± SEM (N = 3)

Table 9: Acid Neutralizing Capacity of Effervescent Granules:

| S. No | Fruit | Vol. of NaOH Consumed | ANC Per Gram of Antacid |
|-------|---------------------------|-----------------------|-------------------------|
| 1. | <i>Litchi chinensis</i> | 45 ± 0.2 | 15 |
| 2. | <i>Withania coagulans</i> | 45 ± 0.2 | 15 |

Value Is Expressed As Mean ± SEM (N = 3)

DISCUSSION:

Mouth ulcer is one of the common disorders caused due to a variety of etiological factors. The two most common causes of oral ulceration are local trauma and aphthous stomatitis.^[22] oral ulcers manifest as a nonfatal disease, majorly represented by periodic symptoms of pain and inflammation which are often associated with bleeding and discomfort to patients, disrupting their daily routines and also causing mental agony.^[23]

Traditional herbal medicines are naturally occurring plant derived Substances have been used to treat human illness from the beginning of time. Phytogetic agents are traditionally used for the Prevention and treatment of ulcer. Usually paracetamol, steroids and antibiotics are recommended to treat oral ulcers and suppress the immune system. Due to numerous side effect and negative consequences of these synthetic and semi synthetic medicines have now a days replaced by herbal medications.

The mechanism involved in production of antiulcer activity of the plant is due to its antioxidant, anti inflammatory, mucus secreting, cytoprotective or healing activities. Pharmacological activities of both the plants *Litchi chinensis* and *Withania coagulans* could be attributed to the presence of alkaloids, flavonoids, and triterpenoids. Thus, in the present research work. The extracts of these plants incorporated into three different formulations i.e., syrup, suspension and effervescent granules that can be used for the management of mouth ulcers.

The in-vitro acid neutralizing capacity of fruit extracts of *Litchi chinensis* and *Withania coagulans* in different concentrations were compared with the standard antacid aluminum hydroxide + magnesium hydroxide (AHMH) 500 mg/ml and within various formulations also.

The results showed concentration dependent reduction in acid neutralizing capacity per gm of antacid was found as 157.5,

91.25, 40 and 21.75 for litchi as shown in table 5 and 81, 58, 24 and 14.4 for *Withania coagulans* as shown in table 6. In similar fashion, AHMH (500 mg/ml) ANC was found to be 40.1 quite similar concentration of test drug.

The acid neutralizing capacity of syrup of *Litchi chinensis* and *Withania coagulans* are 37, 31.5 as shown in table 7, acid neutralizing capacity of suspension are 38, 38 as shown in table 8 and acid neutralizing capacity of effervescent granules are 15, 15 as shown in table 9.

CONCLUSION:

The phytochemical evaluation of *Litchi chinensis* and *Withania coagulans* fruit extracts fulfill the requirements for anti-ulcer activity. On the basis results obtained, we can conclude that the fruit extracts of *Litchi chinensis* and *Withania coagulans* has significant reduction of ulcer at the dose of 500 mg/ml to be neutralize acid more significantly as compared to standard and acid neutralizing capacity. In the comparative study of different formulations, it is observed that suspension is better than syrup and syrup is better than effervescent granules for both the drugs.

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