

# Formulation & Evaluation Of Effervescent Granules For The Treatment Of Kidney Stone.

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## ABSTRACT

Kidney stones are a common urological disorder affecting millions worldwide. Bahuhinia Racemosa leaves have been traditionally used to treat kidney stones due to their diuretic and anti-inflammatory properties. This study aimed to develop and evaluate effervescent granules of Bahuhinia Racemosa leaves extract for the treatment of kidney stones. The granules were prepared using a wet granulation method and evaluated for their physical properties, effervescent time, and dissolution rate. The granules showed good flowability, uniform size distribution, and rapid effervescence. The dissolution study revealed a rapid release of Kaempferol, the active compound present in Bahuhinia Racemosa leaves. The effervescent granules demonstrated potential as a convenient and effective dosage form for the treatment of kidney stones.

**Keywords-** Bahuhinia Racemosa, Effervescent Granules, Kidney Stones, Kaempferol, Diuretic, Anti-inflammatory.

## INTRODUCTION

In this formulation, Bauhinia racemosa leaves serve as a primary component due to their known therapeutic properties, including anti-inflammatory, antimicrobial, and antioxidant activities. However, the active phytochemicals present in a single plant may not always achieve the full spectrum of desired therapeutic effects. To enhance efficacy and reduce potential toxicity, other complementary herbs are combined with Bauhinia racemosa in a carefully optimized ratio. (1).

Formulated as effervescent granules, this dosage form offers improved patient compliance, rapid onset of action, and better bioavailability. The effervescent system not only aids in faster dissolution but also masks the bitter taste often associated with herbal extracts. This innovative delivery method aligns with traditional Ayurvedic principles while incorporating modern pharmaceutical advancements for enhanced therapeutic outcomes. In the context of kidney stone treatment, herbal formulations made from medicinal plants offer a natural and effective alternative to synthetic drugs. By utilizing carefully selected herbs with proven diuretic, anti-lithiatic, and anti-inflammatory properties, an advanced formulation can be developed in the form of effervescent granules. This innovative dosage form enhances the solubility and absorption of the active phytoconstituents, leading to faster relief from symptoms and improved elimination of kidney stones. The effervescent granules not only ensure convenient administration and improved patient

compliance but also align with the holistic principles of herbal medicine, offering a safe and natural solution for managing kidney stones.(2).

Kidney stones are a prevalent urological disorder affecting millions worldwide, causing significant morbidity and impacting quality of life . The management of kidney stones involves medical expulsive therapy, pain management, and surgical interventions, but these treatments have limitations *Bauhinia Racemosa*, a plant species, has been traditionally used in Ayurvedic medicine to treat various ailments, including kidney stones. The plant's leaves possess diuretic, anti-inflammatory, and antioxidant properties, which may help prevent kidney stone formation and alleviate symptoms .

Effervescent granules offer a convenient and effective dosage form for delivering active ingredients . They provide rapid dissolution, improved bioavailability, and enhanced patient compliance Urolithiasis, also known as urinary calculi or renal calculus, is a medical condition characterized by the formation of stones within the urinary tract.(3).

In most cases, these small crystals are flushed out harmlessly with the urinary flow. However, in some individuals, they can grow in size and form larger stones that remain in the kidney or migrate into other parts of the urinary tract. At least a few people will experience kidney stones at some point in their lives, often enduring excruciating pain as the stones form and attempt to pass through the urinary system. The concentration of these stones in the kidney can increase over time, intensifying the discomfort.(4).

- **Importance of Effervescent Granules in Kidney Stone Management Using *Bauhinia racemosa* Leaf Extract :-**

Effervescent granules are a convenient and patient-friendly dosage form that disintegrate rapidly in water, releasing carbon dioxide and delivering the active ingredient in a palatable and fast-absorbing solution. When formulated with medicinal plant extracts like *Bauhinia racemosa*, these granules offer multiple advantages in the management of kidney stones:

### **1.Therapeutic Properties of *Bauhinia racemosa***

*Bauhinia racemosa*, commonly known as the “camel's foot tree,” has been traditionally used in Ayurveda for its anti-urolithiatic, anti-inflammatory, and antioxidant properties.

Its leaves contain phytochemicals such as flavonoids, saponins, and tannins which are known to prevent stone formation by reducing oxalate levels and inhibiting crystal aggregation in kidneys.(5).

### **2.Effervescence Enhances Drug Delivery:-**

- Effervescent granules dissolve quickly in water, improving patient compliance, especially among those who have difficulty swallowing tablets.
- The rapid disintegration of granules in water enhances the bioavailability of the extract, allowing for quicker onset of action.

- CO<sub>2</sub> released during effervescence may enhance gastrointestinal absorption of the herbal constituents.(6).

### 3.Improved Stability and Palatability:-

- Effervescent formulations mask the bitter taste of herbal extracts, improving palatability.
- The dry form ensures better shelf stability compared to aqueous herbal formulations(7).

### 4.Role in Prevention and Management of Kidney Stones:-

- The active compounds in *B. racemosa* help in dissolving or preventing the growth of calcium oxalate stones, the most common type of kidney stone.
- Regular consumption of such formulations may reduce recurrence rates of stones by promoting diuresis and preventing crystal retention.(8).

### Advantages:-

- 1) Especially beneficial for patients with swallowing difficulties (e.g., elderly or children)(9).
- 2) Pleasant taste due to flavored and buffered effervescent base masks the bitter taste of herbal extracts.
- 3) The rapid disintegration in water and subsequent absorption of active compounds accelerates the therapeutic action—important in relieving symptoms like pain or inflammation associated with kidney stones.(10).
- 4) Dry granule form improves shelf-life and protects sensitive phytochemicals in *Bauhinia racemosa* from degradation compared to liquid formulations.
- 5) The extract is known to inhibit calcium oxalate crystallization and promote dissolution of existing stones.
- 6) Flavonoids, tannins, and saponins in the leaves provide nephroprotective and anti-inflammatory activity.(11).
- 7) Pre-measured doses in sachets or packs offer ease of use and accurate dosing—beneficial for chronic management of kidney stone recurrence.
- 8) Reduced Pain And Discomfort.
- 9) Improved Patient Outcomes.
- 10) Increased Patient Compliance.
- 11) Attractive Dosage For The Public.(12)

### Disadvantages:-

#### 1)Hygroscopic Nature and Storage Issues:-

Granules are highly hygroscopic (absorb moisture easily), which can lead to clumping, loss of effervescence, or reduced shelf life if not stored properly in airtight containers.(13)

## 2)Complex and Costlier Manufacturing Process:-

The formulation of effervescent granules requires controlled environmental conditions and special excipients like acid-base pairs (e.g., citric acid + sodium bicarbonate).

## 3)Unpleasant Taste or Aftertaste of Herbal Extract

Despite flavoring, the strong bitter or earthy taste of *Bauhinia racemosa* may not be completely masked, leading to poor palatability in some individuals.(14).

## 4)Need for Water for Consumption

Effervescent granules must be dissolved in water before use. This can be inconvenient in settings with limited access to clean water, unlike tablets that can be swallowed directly.

## 5)Chemical Instability of Some Herbal Constituents

Active compounds in *Bauhinia racemosa* (e.g., flavonoids) may undergo oxidation or degradation during effervescence reaction or over time, potentially reducing efficacy if not properly stabilized(15).

### Plant Profile



**FigNo:-1.Leaf Of *Bahuhinia Racemosa***

**Botanical Name:-**Bahuhinia Racemosa Lam

**Kingdome-** Planate

**Division-** Angiosperms

**Class-** Eudicots

**Order-** fabales

**Family-** Caesalpiniaceae Also known as The Leguminosae or Fabaceae.

**Subfamily-** Caesalpinoideae

**Genus-** Bauhinia

**Species** -*B. racemosa*.(16).

### **Medicinal Uses Of *Bahuhinia Racemosa* Leaves:-**

- 1)Anti-Inflammatory Activity.
- 2)Antioxidant Properties.
- 3) Antimicrobial Activity.
- 4) Antidiabetic Potential
- 5) Antiurolithiatic (Kidney Stone Prevention).(17).

## **AIM AND OBJECTIVE**

**Aim:-** To evaluate the potential of *Bauhinia racemosa* leaf extract in the prevention and treatment of kidney stones (urolithiasis).

### **Objective:-**

- 1) To prepare and characterize the extract of *Bauhinia racemosa* leaves using suitable extraction methods (e.g., aqueous, ethanolic).
- 2) To analyze the phytochemical constituents present in the extract that may contribute to antiurolithiatic activity.
- 3) To assess the *in vitro* antiurolithiatic activity of the leaf extract through methods such as crystal nucleation, aggregation, and growth assays.
- 4) To evaluate the *in vivo* efficacy of the extract in animal models induced with kidney stones (if applicable).
- 5) To compare the efficacy of *Bauhinia racemosa* extract with standard antiurolithiatic drugs.
- 6) To determine the safety and toxicity profile of the extract for therapeutic use.

## **NEED OF WORK**

Need for Research on *Bauhinia racemosa* Leaf Extract in Treating Kidney Stones:-

### **1)Prevalence of Kidney Stones**

- Kidney stones (nephrolithiasis) are a common urological problem, causing significant pain, urinary tract obstruction, and recurrence.
- Synthetic treatments (like surgery or lithotripsy) are effective but expensive and sometimes come with complications or recurrence.

## 2)Interest in Herbal Remedies

- Traditional medicine systems (Ayurveda, Siddha, Unani) utilize various plants to dissolve or prevent stone formation.
- Natural remedies may offer cost-effective, less invasive alternatives with fewer side effects.

## 3)Why Bauhinia racemosa?

- It is traditionally used in Indian folk medicine for kidney-related ailments.
- Known to have antioxidant, anti-inflammatory, diuretic, and antimicrobial properties—all potentially helpful in treating or preventing kidney stones.

## 4)Potential Mechanisms for Antiurolithiatic Activity

- Diuretic effect: Increases urine output, which may help flush out small stones or prevent crystal accumulation.
- Antioxidant activity: Reduces oxidative stress, which is implicated in stone formation.
- Inhibition of crystal formation: Phytochemicals may inhibit nucleation, aggregation, or growth of calcium oxalate crystals.

## 5)Phytochemical Constituents

- Leaves are rich in flavonoids, tannins, saponins, alkaloids, and phenolic compounds.
- These compounds might play roles in chelating calcium ions, reducing oxalate levels, or modulating urinary pH.)

# MATERIAL AND METHODS

## 1)Materials Needed:

- Fresh or shade-dried *Bauhinia racemosa* leaves
- Distilled water
- Grinder/blender
- Muslin cloth or Whatman No.1 filter paper
- Beaker/flask
- Water bath or heating setup
- Bahuhinia racemosa Leaves Extract
- Citric Acid.
- Sodium Bicarbonate.
- Tartaric Acid.
- Mnitol or Lactose.

- Sodium Benzoate.
- Flavoring Agent.
- Polyvinylpyrrolidone,(18).

## 2)Method of Aqueous Extract of Bahuhinia Racemosa (Leaves):

### A) Maceration Method (Conventional Extraction)

- 1.Collection: Harvest healthy, fresh Bahuhinia Racemosa Leaves.
- 2.Cleaning: Wash thoroughly to remove dirt and impurities.
- 3.Drying: Shade-dry at room temperature until crisp.
- 4.Grinding: Crush dried leaves into coarse powder.
- 5.Soaking: Mix powder with solvent (ethanol, methanol, or water) in 1:5 or 1:10 ratio.
- 6.Maceration: Let sit for 24–72 hours at room temperature with occasional.
- 7.Filtration: Filter through Whatman paper to separate extract.(19).



**Fig No:-2 Maceration Method**

### B) Ultrasonication Method:

- 1.Collection: Select fresh, healthy Bahuhinia Racemosa Leaves
- 2.Washing: Rinse thoroughly with clean water.
- 3.Drying: Shade-dry until fully moisture-free.
- 4.Grinding: Coarsely grind the dried leaves..
- 5.Weighing: Measure leaf powder as per desired ratio.
- 6.Solvent Mixing: Add solvent (ethanol/methanol/water) in 1:10 (w/v) ratio.
- 7.Ultrasonication: Sonicate at 20–40 khz for 15–60 mins at  $\leq 50^{\circ}\text{C}$ .
- 8.Filtration: Filter to remove solid residues.
- 9.Concentration: Concentrate extract via rotary evaporation or gentle heating.(20).



**Fig No:-3 Ultrasonication**

#### 4) Formulation Tble:-

**Table No- 1 Formulation Table**

Ingridients	Quantity	Function
Bahuhinia Racemosa Leaves Extract Liq	2.5ml	Antiurrolithiasis
Citric Acid	5gm	Effervascent Agent
Sodium Bicarbonte	2.5gm	Alkaline(Effervascent Agent)
Tartaric Acid	1gm	Acid(Improves Effervascence)
Lactose	2.5gm	Filler, Sweetner
Polyvinylpyrrolidone	1.5gm	Binder

#### • Preparation Of Herbal Effervascent Granules:-

##### A) Preparation of Bahuhinia Racemosa Leaves Liquid Extract:-

- 1.Powder the dried Bauhinia racemosa leaves (sieve through 40 mesh).
- 2.Take 100 g of leaf powder and transfer to a clean glass jar.
- 3.Add 500–700 mL of 70% ethanol (or distilled water for aqueous extract).
- 4.Seal the jar and keep in a cool, dark place for 48–72 hours.
- 5.Shake occasionally (2–3 times daily).
- 6.After maceration, filter the extract through muslin cloth or filter paper.
- 7.Concentrate the filtrate using a water bath at 40–50°C or a rotary evaporator until it reaches syrup-like consistency.
- 8.Store in a sterile, airtight container in a refrigerator (4–8°C).(21).

##### B ) Sieve And Dry Ingridients:-

- 1.Pass All Ingridients Through Sieve No.40 To Get a Uniform Particle Size.
2. Dry Citric Acid And extract In Hot Air Oven At 50°C To Remove Residual Moisture.(22).

**C) Mixing:-**

1. Accurately Weigh The Extract, Acids ( Citric Acid + Tartaric Acid ), And Sodium Bicarbonate.
2. Mix Citric Acid And Tartaric Acid With The Extract in Dry Mortar.
3. Add Sodium Bicarbonate Gradually And Mix Thoroughly. (23).

**D) Granulation:-**

1. Slightly Moisten The Mixture Using Ethanol And Water To Form A Damp Pass.
2. Pass Through Sieve (Mesh No. 12-16) To Form Granules.

**E) Drying:-**

1. Dry The Granules In Tray Dryer Or Hot Air Oven At 40-50°C Until A Constant Weight Is Achieved.
2. Pass The Dried Granules Through Sieve No- 20 To Break Lumps. (24).

**EVALUATION:-****Phytochemical Evaluation Of Extract *Bahuhinia Racemosa* Leaves:-**

- **Test For Flavonoids:-**

**A) Shinoda Test (Magnesium Hcl Reduction Test)**

1. Take 2 mL of the *B. racemosa* leaf extract (ethanol or methanol-based).
2. Add a small piece of magnesium ribbon.
3. Slowly add few drops of concentrated HCl.

**Observation:** Pink, red, or orange color indicates the presence of flavonoids (typically flavonols or flavones).

**B) Alkaline Reagent Test:**

1. Add 2 mL of 2% NaOH to 2 mL of the leaf extract.
2. Mix well. Add dilute HCl dropwise after initial color change.

**Observation:** Yellow color appears with NaOH and disappears with HCl, confirming flavonoids.

**C) Lead Acetate Test:-**

Add 1 mL of 10% lead acetate to 2 mL of extract.

**Observation:** Yellow precipitate formation confirms the presence of flavonoids.

**D) Ferric Chloride Test:-**

Add few drops of 1% FeCl<sub>3</sub> to the extract.

**Observation:** Green or blackish coloration may indicate flavonoid phenolic groups. (25).

- **Detection Of Tannins And Phenolic Compounds:-**

**A) Iodine Test:**

Procedure: Treat the extract with a dilute iodine solution.

**Observation:** A transient red coloration suggests the presence of tannins.

**B) Lead Acetate Test:**

Procedure: Introduce a few drops of 10% lead acetate solution to the extract.

**Observation:** Formation of a white or yellowish precipitate suggests tannin presence.

**C) Gelatin Test:**

Procedure: Mix the extract with a 1% gelatin solution containing 10% sodium chloride.

**Observation:** A white precipitate confirms the presence of tannins.(26).

- **Detection Of Steroids:-**

**A) Liebermann–Burchard Test:**

Procedure: Dissolve the extract in chloroform, add acetic anhydride, and then carefully add concentrated sulfuric acid along the side of the test tube.

**Observation:** A bluish-green color indicates the presence of steroids.

**B) Salkowski Test:**

Procedure: Dissolve the extract in chloroform and add concentrated sulfuric acid.

**Observation:** A red color in the chloroform layer and green fluorescence in the acid layer suggest the presence of steroids.(27).

- **Detection Of Saponins And Alkaloids:-**

**A) Foam Test:**

Procedure: Shake 1 mL of the aqueous extract vigorously with 5 mL of distilled water for about 15 minutes.

**Observation:** Persistent froth or foam formation indicates the presence of saponin.

**B) Mayer's Test:**

Procedure: Add a few drops of Mayer's reagent (potassium mercuric iodide solution) to 2 mL of the extract.

**Observation:** Formation of a cream or pale yellow precipitate indicates the presence of alkaloids.

**C) Wagner's Test:**

Procedure: Add Wagner's reagent (iodine in potassium iodide) to the extract.

**Observation:** A reddish-brown precipitate confirms the presence of alkaloids.

**D) Dragendorff's Test:**

Procedure: Treat the extract with Dragendorff's reagent (potassium bismuth iodide solution).

**Observation:** An orange or reddish-brown precipitate indicates alkaloids.(28).

**Evaluation Of Formulated Effervescent Granules:-****Physical Evaluation Parameter:-****A) Organoleptic Properties:-**

**Color:** .White To Off- White

**Odor:** Herbal Smell No Rancid

**Taste:** Slightly Bitter.

**Appearance:** Fine Granular/ Powdery ..

**B) Granule Size Distribution:-**

Measured using sieve analysis (e.g., 20 to 60mesh).

Uniform granule size ensures consistent dosing and effervescence(29).

**C) Flow Properties:-****1) Angle of Repose:-**

The fixed funnel method was employed to measure the angle of repose. A funnel was secured with its tip at a given height (h), above a graph paper that is placed on a flat horizontal surface. The blend was carefully pored through the funnel until the apex of the conical pile just touches the tip of the funnel. The radius of the base of the conical pile was measured. The angle of repose ( $\theta$ ) Was calculated using the following formula(30).

$$\tan \theta = h/r$$

Height Of The Conical Pile(h)=2.7cm

Radius Of The Conical Pile(r)=3.9cm

$$\tan(\theta) = 2.7/3.9 = 0.6923$$

Now take the arctangent (inverse tangent):

$$\theta = \tan^{-1}(0.6923) \approx 34.7^\circ.$$

**Angle Of Repose=34.7°.**

This Value Indicates Fair To Good Flow Properties, As Per Standard Interpretation.

Where,  $\theta$  = Angle of repose,  $h$  = Height of the cone,  $r$  = Radius of the cone base. Values for angle of repose  $\leq 30^\circ$  usually indicate a free flowing material and angles  $\geq 40^\circ$  suggest a poorly flowing material, 25- 30 show excellent flow properties, 31-35 show good flow properties, 36-40 show fair flow properties and 41-45 showing passable flow properties.

**Table No:-2 Flow property of powder**

Flow Property	Angle Of Repose(Degree)
Excellent	25-30
Good	31-35
Fair-aid not needed	36-40
Passable-May Hang Up	41-45
Poor-Must Agitate,Vibrate	46-55



**Fig No:4- Angle Of Repose**

## 2) Bulk Density

52 g powder blend introduced into a dry 100 ml cylinder, without compacting. The powder was carefully leveled without compacting and the unsettled apparent volume,  $V_o$ , was read. The bulk density was calculated using the following formula.(31).

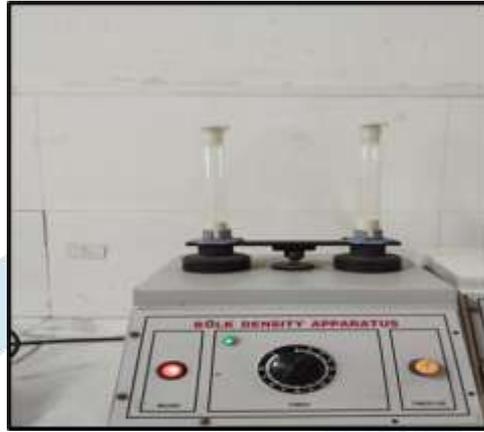
$$\rho_b = M / V_o$$

Where,  $\rho_b$  = Apparent bulk density,  $M$  = Weight of sample,  $V$  = Apparent volume of powder.

Mass=50gm, Apparent Volume= 100ml

$$\text{Bulk Density} = 52\text{gm}/100\text{cm}^3 = 1.28\text{per cm}^3$$

**Bulk Density= 0.52cm<sup>3</sup>.**



**Fig No:- 5 Bulk Density**

### 3) Tapped Density

After carrying out the procedure as given in the measurement of bulk density the cylinder containing the sample was tapped 500 times initially followed by an additional taps of 750 times until difference between succeeding measurement is less than 2% and then tapped volume,  $V_f$  was measured, to the nearest graduated unit. The tapped density was calculated, in gm per ml, using the following formula.

$$\rho_{\text{tap}} = M / V_f$$

Where,  $\rho_{\text{tap}}$  = Tapped density,  $M$  = Weight of sample,  $V_f$  = Tapped volume of powder

Mass Of Powder=40gm

Tapped Volume After 500 Taps.=62ml

$$\text{Tapped Density (g/ml)} = \text{Mass Of Powder(gm)} / \text{Tapped Volume(ml)}$$

$$= 40\text{gm} / 62\text{ml} = 0.64\text{g/ml}$$

**Tapped Density=0.64g/ml.(32).**

### 4) Hausner's ratio

Hausner's ratio is an indirect index of ease of powder flow. It is calculated by the following formula.

$$\text{Hausner's Ratio} = \text{Tapped density } (\rho_t) / \text{Bulk density } (\rho_b)$$

$$= 0.64 / 0.52 = 1.23$$

**Hausner's ratio=1.23.**

### 5) Carr's index

The Compressibility index (Carr's index) is a measure of the propensity of a powder to be compressed. It is determined from the bulk and tapped densities. In theory, the less compressible a material the more flowable it is. As such, it is measures of the relative importance of interparticulate interactions. In a free flowing powder, such interactions are generally less significant, and the bulk and tapped densities will be

closer in value. For poorer flowing materials, there are frequently greater inter-particle interactions, and a greater difference between the bulk and tapped densities will be observed. These differences are reflected in the Carr's Index which is calculated using the following formulas:

$$\text{Compressibility index(\%)} = [(\rho_{\text{tap}} - \rho_{\text{b}}) / \rho_{\text{tap}}] \times 100$$

Where,  $\rho_{\text{b}}$  = Bulk Density,  $\rho_{\text{tap}}$  = Tapped Density.

$$\text{Compressibility index(\%)} = (\text{Tapped Density} - \text{Bulk Density} / \text{Tapped Density}) \times 100$$

$$= (0.64 - 0.52) \times 100$$

$$= 18.75\%$$

$$\text{Compressibility index(\%)} = 18.75\%$$

**Table No:- 3 Compressibility index values**

Compressibility index	Properties
≤10	Excellent
11 – 15	Good
16 – 20	Fair
21 – 25	Passable
26 – 31	Poor
32 – 37	Very Poor
>38	Very Very Poor

#### 6) Effervescent Cessation Time:

100 ml of distill water was taken in 250ml beaker, one dose of effervescent granules were poured in to the beaker, effervescent cessation time and effervescent production was observed.(33).

#### 7) Moisture Content-

The prepared Effervascent Granules initial weight was lighted, and the dried Effervascent

Granules ultimate weight Was recorded. The moisture content was found to be 1.99% .

Moisture content

- Initial weight ( $w_1$ ) = 28.13 gm (*before drying*).
- Dry weight ( $w_2$ ) = 27.57 gm (*after drying*).

$$\text{Moisture Content (\%)} = \frac{\text{Initial Weight} - \text{Dry Weight}}{\text{Initial Weight}} \times 100$$

This formula was we used to detect moisture content.(34).

**8) pH Of Solution:-****A) Sample Preparation:-**

Weigh A 5gm Of Effervescent Granules

Dissolve The Granules In 100ml of Distilled Water.

**B) Stir The Solution-**

Stir The Solution Using Glass Rod until effervescence ceases and the granules are completely dissolved.

**C) Calibration of pH Meter:**

Calibrate the pH meter using standard buffer solutions (usually pH 4.0, 7.0, and 9.2). Rinse the electrode with distilled water and blot dry.

**D) Measurement:**

Immerse the pH electrode into the prepared solution.

Wait for the reading to stabilize (as shown in the image, a stable reading is 6.89).

Record the pH value.

**E) Cleaning:**

Rinse the electrode with distilled water after measurement.

Store the electrode in proper storage solution if not used further. (35).

## RESULT AND DISCUSSION

- Phytochemical Test Result:-**

**Table No:-4**

S.No	Phytoconstituents	Observation	Bahuhinia Racemosa Extract
1	Flavanoids	Pink, Yellow, Green or Blakish Colour.	Present.
2	Tannins And Phenolic Compounds	Green precipitate	Present
3	Steroids	Not Observed Bluish Green Colour	Absent
4	Saponins	Pale Yellow, Reddish Brown Ppt	Absent
5	Alkaloids	Red brown precipitate	Present

### A) Chemical Test Of Flavanoids-

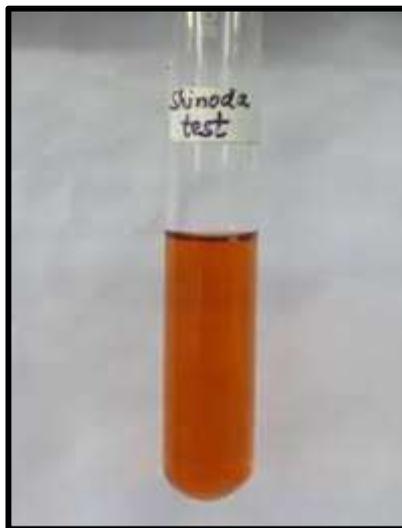


Fig No- 6. Shinoda Test

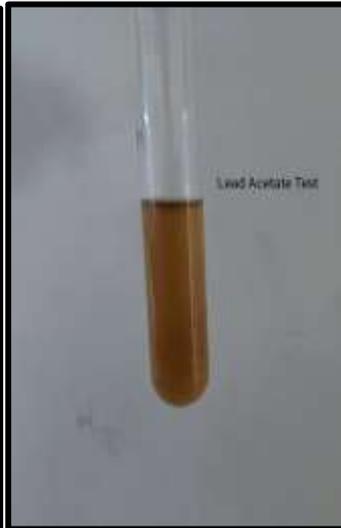


Fig No- 7. Lead Acetate Test



Fig No- 8. Ferric Chloride Test

### B) Chemical Test Of Tannins & Phenolic Compounds-



Fig No:- 9. Test Of Tannins & Phenolic Compounds-

### C) Chemical Test Of Alkaloids-



Fig No- 10. Test Of Alkaloids

## 2) Evaluation Test Results:-

## 1) Organoleptic Properties:-

Table No:5

<b>Colour</b>	White To Off- White
<b>Odor</b>	Herbal Smell No Rancid
<b>Taste</b>	Slightly Bitter
<b>Appearance</b>	Fine Granular/ Powdery



Fig No:- 11 Prepared Effervescent Granules

## 2) Flow Properties:-

Table No:-6

Sr No	Parameter	Result
1	Angle of Repose	34.7°.
2	Bulk density	0.52cm <sup>3</sup>
3	Tapped density	0.64g/ml
4	Hausner ratio	1.23
5	Carr's index	18.75%
6	Effervescent Cessation Time	2-3min
7	Ph Of Solution	6.89



Fig No:-12 Effervescent Cessation Time



**Fig No:- 13 pH Of Solution**

### 3) Moisture Content:-



**Fig No:-14 Initial Weight Of Granules**



**Fig No:- 15 Final Weight Of Granules**

## CONCLUSION

The development of effervescent granules containing *Bauhinia racemosa* leaves extract presents a promising natural approach for the management and treatment of kidney stones. The extract, known for its diuretic, antiurolithiatic, and antioxidant properties, has been successfully formulated into a palatable and easy-to-administer dosage form. The effervescent granules demonstrated satisfactory physicochemical properties, including good solubility, uniformity, and effervescence time. Preliminary pharmacological evaluation supports the potential of *Bauhinia racemosa* in reducing kidney stone formation and promoting their dissolution or expulsion. Further *in vivo* and clinical studies are recommended to validate efficacy and establish dosage guidelines, but the current findings support its potential as a safe, effective, and patient-friendly herbal remedy for urolithiasis.

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