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Research Article

A COMPARATIVE PHARMACEUTICO-ANALYTICAL STUDY OF *TUTTHADRAV*

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KEYWORDS: *Tutthadrava*, *Shodhana*, Pharmaceutico-Analytical Study.

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ABSTRACT

Tuttha is mineral containing copper and sulphur, easily available and is well known for its medicinal use since ancient time. In modern medicine the use of *Tuttha* (copper sulphate) is much used as topical applications where as in Rasashastra *Tuttha* was used internally as well as externally therapeutically, many external applications were told in classical texts. So it is used for medicinal purpose and various *Shodhana* processes are adopted, which render *Tuttha* into the therapeutic form and free from the side effects. Presently *Tutthadrava* is prepared, marketed and practiced inspite of being explained as effective remedy for various disorders. In this study *Tutthadrava* was prepared by using *Shodhit Tuttha*.

Three samples of *Tuttha* were collected from various places i.e., A1- market, A2- market, A3- market. All three samples were comparatively examined for their *Grahya lakshanas*.

Comparative pharmaceutical study of *Tuttha Shodhana* and *Tutthadrava Nirman* and analytical study of *Shodhit Tuttha* and *Tutthadrava* was carried out. All the five *Shodhit tuttha* samples were subjected to analytical study in laboratory as pH, Total ash, Acid insoluble ash, Water insoluble Ash, Loss on drying at 105° c, Colour, Odour, Assay of element as Cu, Fe, S. was done and X-RD.

INTRODUCTION

Since the time of Vedas, Drugs were used after purification and preservation techniques on the body and successfully treat physical and mental ailments are seen.

The extended trails of medical science landed in evolution of Rasashastra. Rasashastra is one of the main tributary of ancient medical science includes the entire field of inorganic pharmaceutical preparation incorporating metallic and nonmetallic compounds.

The Rasa preparation are devoid of test, effective in less dose, quick acting having long shelf life, easy for handling etc.; makes their use convenient and important in therapeutic profile.

In the quest of updating the same, the present work is planned upon one of the Rasashastra's pharmacological agent *Tuttha*.

Tuttha was described in the treatment of various diseases like *Kushta*, *Putigandhit vrana, Phirangaja vrana*, *Arsha, Switra, Krimiroga*...etc. Its various forms were used as application like, Drava, *Vatii, Bhasma*. Rasatarangini told that external use of *Tuttha* in the form of *Tutthadrava*. Here *Tutthadrava* used externally in the *Putigandhit vrana*, *Dushta vrana*, *Phirangaj vrana*, *Updaounshaj vrana*, *Netravartma* as *Dhawana*. These *Vrana* creates due to various micro-organisms which delayed the process of healing.

So in present study we saw the antibacterial effect of *Tutthadrava* in selected bacteria which is present in *Putigandhit vrana.*

Presently *Tutthadrava* is prepared, marketed and practiced in spite of being explained as effective remedy for various disorders. In the study *Tutthadrava* prepared by using *Shodhit Tuttha*.

Review of literature: It presented as Review of *Tuttha* in various *Granth* has and modern view. Review of *Shodhana* concept, Review of all *Shodhana dravyas* used for *Tuttha Shodhana*. Also review of analytical procedures and anti bacterial study was done.

Pharmaceutical study: In this part the material and method of preparation of *Tuttha shodhana* and *Tutthadrava Nirman* were explained in the form of methods, observations, precautions and results.

Analytical study: In this all analytical results of Raw *Tuttha, shodhit Tuttha* was explained.

Antibacterial study: It includes study of antibacterial effect of *Tutthadrava* prepared by five methods.

Aims and Objectives

Aims

1. Comparative Pharmaceutical Study Of *Tuttha Shodhana and Tutthadrava Nirman*
2. Comparative Analytical Study of *Shodhit Tuttha* and *Tutthadrava***.**

Objectives

1. *Tuttha shodhana* done by five methods.
2. *Tutthadrava nirman* by using five *Shodhit tuttha* samples.
3. Analytical of all *Shodhit tuttha* samples.

Materials and Methods

Aim of the study

1. *Tuttha shodhana* and preparation of *Tutthadrava* according to classical reference.
2. Physical and Chemical analysis of *Shodhit Tuttha.*

Materials

1. Raw *Tuttha*

2*. Shodhana Dravyas* - 1. Nimbu. 2. *Raktachandan*. 3. *Manjista*. 4. *Gomutra*. 5. *Dadim*.

Method of preparation: Method of preparation of *Tuttha Shodhana* and *Tutthadrava Nirman* are described here after as,

1. Selection of Raw materials
2. Pharmaceutical study
3. Analytical study

The materials and methods were used are based on Rasatarangini literature with some modification depending upon practical experience and feasibility of the methods.

Selection of Raw Materials

For preparation of *Tuttha shodhana* the raw materials are;

1. Raw *Tuttha*. 2. Nimbu.3. *Raktachandan*. 4. *Manjista*. 5. *Gomutra*. 6. *Dadima*.

Raw *Tuttha*: It is major raw drug required for preparation of *Tuttha shodhana*. Three samples of *Tuttha* were collected from various places i.e. A1- market, A2- market, A3- market. All three samples were comparatively examined for their *Grahya lakshanas*.

Sikhikantasamchya: Colour like neck of the Peacock.

Guru: Heavy

Snigdha: Unctuous

Mahaujjwal : Brilliantness

In all three samples mentioned *Gravya lakshanas* were observed, so the sample from Sangali market was selected for the study.

- *Shodhan dravya* as, *Nimbu, Dadim, Manjista, Raktachandanwas* collected from local market which was verified and then used for *Shodhana* of *Tuttha*.
- *Gomutra* was collected from *Goshala*.

Pharmaceutical Study

The pharmaceutical study was conducted in following methods

A) *Tuttha Shodhana* Methods

B) *Tutthadrava Nirman*

***Tuttha Shodhana* methods:** The whole method of preparation of *Tuttha shodhana* was divided in five different way's with reference of Rasataringini 21 tarang.

1. *Shodhana* Method 1: *Nirmalikaran* of *Tuttha* [1]
2. *Shodhana* Method 2: *Tuttha Shodhana* by *Nimbu swarasa mardan.* [2]
3. *Shodhana* Method 3: *Tuttha Shodhana* by *Raktachandan* and *Manjista kwath Bhawana.* [3]
4. *Shodhana* Method 4: *Tuttha Shodhana* by *Gomutra Swedana.* [4]
5. *Shodhana* Method 5: *Tuttha Shodhana* by one of the *Amla varga dravya* (*Dadim*). [5]

Before *Shodhana Nirmalikarana* of *Tuttha* is essential and after that it is subjected to *Shodhana*.

***Shodhana* Method 1**

Tuttha Shodhana* by *Nirmalikaran

Materials

- Raw *Tuttha* - 750 gm
- Hot water - 375 ml

Methods

1. *Ashuddha Tuttha* was taken in *Khalva yantra* and powdered (750 gm).
2. Powdered *Tuttha* was taken in steel vessel and hot water (375 ml) was added to dissolve the *Tuttha* powder.
3. After dissolving solution was filtered through filter paper in glass vessel and allowed to settle

down for around 30 hours under room temperature.

4. The crystal of *Tuttha* were formed at bottom of the glass vessel and supernal liquid was removed.
5. *Tuttha* crystal were allowed to dry in shade and used for *Shodhana* process.

Observations

1. Time taken for dissolving *Tuttha* powder was 2-5 min.
2. After filtration blackish coloured residue was collected on filter paper. It was 6 gm in wt.
3. Time taken for re-crystallization process was 30 hr's.
4. 154 gm of *Tuttha* was remained un-dissolved.

Table 1: Observation during *Nirmalikaran* of *Tuttha*

Observation	Before *Nirmalikarana*	After *Nirmalikarana*
Colour of *Tuttha*	Muddy blue	blue
Colour of *Tuttha* solution	Dark blue	blue
Nature of crystals	Hard	Smooth and brittle

Precautions

1. Powdered *Tuttha* was used for *Nirmalikarana*.
2. Continuous stirring was done to dissolve *Tuttha* in hot water.
3. Proper care was taken from hard odour and vapours during dissolving and filtration.
4. During re-crystallization process of *Tuttha* the glass vessel was not disturbed.

Result

- Initially weight of Raw *Tuttha* - 750 gm
- Weight of *Tuttha* after *Nirmalikarana* - 550 gm
- Loss of weight After *Nirmalikarana* - 200 gm

***Shodhana* Method 2**

Tuttha Shodhana* by *Nimbu Swarasa Maradan

Shodhana was done in 2 phase

i] *Nimbu swaras Nirman*

ii] *Tuttha shodhana* by *Nimbu swaras mardan*

***Nimbu swaras nirman*[6]**

Materials: Fresh *Nimbu* (Lime fruit)- 6 fruit

Procedure

1. Wash 6 fruit of *Nimbu* by portable water properly.
2. Cut them into two valves with knife, and place them in lemon juice extractor, compress to collect lemon juice in to a Glass vessel.
3. Then it was filtered through clean cotton cloth, measured by measuring cylinder and stored for further procedure.

Observations

Colour - Faint Yellowish

Taste - Sour

PH - 3

Precautions: *Nimbu Swaras* should not be collected in Copper vessel.

Result: Finally obtained *Nimbu swarasa* was – 80 ml

***Tuttha shodhana* by *Nimbu swaras mardan*[7]**

Materials

1. Crude *Tuttha* - 200 gm
2. *Nimbu swarasa* - 60 ml

Procedure

1. *Nirmalikrut Tuttha* was powdered in *Khalwa yantra*.
2. *Nimbu swarasa* was added till *Samyak plutha* (60 ml was required).
3. Then triturated up to 6 hours (*Dwiyamam*) till *Tuttha* powder was dried and *shodhana* process was completed.

Observations

1. 60 ml of *Nimbu rasa* was required for 200 gm of *Tuttha shodhana* process.
2. After adding *Nimbu swarasa* colour turns to Dark Blue colour.
3. The final *Shodhita Tuttha* was sky blue in colour.

Precautions

1. The *Khalwa yantra* should be clean and dry.
2. Freshly prepared *Nimbu swarasa* should be used.
3. Careful and Thorough trituration should be done.
4. Sufficient quantity of *Nimbu swarasa* should be added for *Shodhana*

Result

1. Initially weight of Raw *Tuttha* - 200 gms
2. Weight of *Tuttha* after *Shodhana* - 196 gms
3. Loss of weight after *Shodhana* - 4 gms

***Shodhana* Method 3**

Tuttha Shodhana* by *Rakataachandan* and *Manjishta Kwath Bhawana

Shodhana was done in 2 phase

1. *Raktachandan* and *Manjista kwath Nirman*
2. *Tuttha shodhana* by 7- *Kwath Bhawana*

Raktachandan* and *Manjista kwath Nirman [8]

Materials

1. *Raktachandan* - 100 gm
2. *Manjista* - 100 gm
3. *Jala* - 1600 ml

Procedure

1. Dried stems of *Raktachandan* and *Manjista* were procured.
2. They were crushed with the help of pulveriser to obtain *Bharad churna*.
3. This *Bharad churna* was taken (200gm) and 1600 ml water was added to it and allowed to soak overnight.
4. On the next day, whole mixture was subjected to moderate heating on LPG gas to retain 1/8, as about 200 ml.
5. It was then filtered through a clean cloth and collected it.

Observations

Color - Dark Reddish brown (*Raktta saman*)

Test - *Kashay*

PH - 6

Precautions: *Mandagni* was given during *kwath* preparation.

Result : 200 ml *Kwath* was obtained.

Kwath was freshly prepared every time for given seven *Bhawana* to *Tuttha* for *Tuttha shodhana.*

Tuttha shodhana* by 7- *kwath bhawana[9]

Materials

1. Crude *Tuttha* - 200 gm
2. *Raktachandan* and *Manjista kwath* - 100 ml

Procedure: Here, according to reference of Rasataringini seven *Bhawana* of *Rakttachandan* and *Manjistha kwath* was given for *Tuttha Shodhana*.

➢ 1st *Bhawana*

- *Nirmalikrrut Tuttha* was taken in *Khalwa yantra* and powdered it.
- *Rakttachandan* and *Manjistha kwath* was added till *Samyak plutha* (60 ml was required).
- Then triturating was continued till *Tuttha* powder was drying.
- After drying *Shodhit Tuttha* was collected.

➢ 2nd *Bhawana*

- 1st time *Bhawit Tuttha* powder was taken for 2nd *Bhawana* in *Khalwa*.
- After that *Rakttachandan* and *Manjistha kwath* was added till *Samyak plutha* (50 ml was required).
- Then trituration was continued till *Tuttha* powder was drying.
- After drying *Shodhit Tuttha* was collected.

➢ 3rd *Bhawana*

- 2nd time *Bhawit Tuttha* powder was taken for 3rd *Bhawana* in *khalwa*
- After that *Rakttachandan* and *Manjistha kwath* was added till *Samyak plutha* (50 ml was required).
- Then trituration was continued till *Tuttha* powder was drying. After drying *Shodhit Tuttha* was collected.

➢ 4th *Bhawana* :

➢ 5th *Bhawana*: Above same process was done for 4th, 5th, 6th, 7th time *Bhawana* one after one

➢ 6th *Bhawana* :

➢ 7th *Bhawana* :

Observations

1. 60 ml of *Rakttachandan and Manjistha kwath* was required for 200 gm of *Tuttha shodhana* process (each *Bhawana*)
2. After adding *Rakttachandan* and *Manjistha kwath* colour turns to gray colour.
3. The final *Shodhita Tuttha* was gray in colour.

Table 2: Observation during *Raktachandan and Manjista kwatha Bhawana*

Observations	Colour changes	Required *kwatha*	Required Time
Before *Bhawana*	Blue	60 ml	6 hrs
After 1st *Bhawana*	Faint blue	60 ml	6 hrs
After 2nd *Bhawana*	Faint bluish gray	60 ml	6 hrs
After 3rd *Bhawana*	Faint gray	60 ml	6 hrs
After 4th *Bhawana*	Greyish	60 ml	6 hrs
After 5th *Bhawana*	Gray	60 ml	6 hrs
After 6th *Bhawana*	Gray	60 ml	6 hrs
After 7th *Bhawana*	Gray	60 ml	6 hrs

Precautions

1. The *Khalwa yantra* should be clean and dry.
2. Freshly prepared *Rakttachandan and Manjistha kwath* should be used.
3. Careful and Thorough trituration should be done.
4. Sufficient quantity of *Rakttachandan and Manjistha kwath* should be added for *Shodhana*

Result: Results after seven *Bhawana*

1. Initially weight of Raw *Tuttha* - 200 gms
2. Weight of *Tuttha* after *Shodhana* - 192 gms
3. Loss of weight After *Shodhana* - 8 gms

***Shodhana* Method 4**

Tuttha Shodhana* by *Gomutra Swedana

Materials

1. Crude *Tuttha* - 200 gm
2. *Gomutra* - 3 lit

Procedure

1. *Nirmalikrrut Tuttha* was taken in *Khalwa yantra* and powdered it.
2. After that *Tuttha* powder (200 gm) was collected in the three layered cloth and made *Pottali* for *Tuttha shodhana*.
3. Collected *Gomutra* was filtered in steel vessel by filter paper.
4. Then *Gomutra* was added in *Dola yantra* (3 lit required) and *Purchundi* was dipped in *Gomutra* with the help of stick, 3 fingers above from bottom of vessel.
5. *Dolayantra* was kept on gas for *Tuttha swedana*.
6. *Manda* Heat was given to *Dolayantra* till 9 hrs.
7. After heating *Dolayantra* was kept for cooling and allowed to settle down for recrystallizatuion around 24 hours under room temperature.
8. The crystals of *Tuttha* were formed at bottom of the *Dollayantra* (vessel) and supernal liquid was removed.
9. *Tuttha* crystal were collected and allowed to dry in shade.

Observations

1. Only 5 min was required for complete dissolving *Tuttha* in *Gomutra*.
2. Colour of *Gomutra* was changed from yellow to black.
3. Hard *Gomutra* smell was felt during *Swedana*.
4. A black crystal was occurred at the bottom of vessel, also some copper particle was identified around vessel. Which are shows in photos.
5. Time required- 9 hrs for *Swedan* and 30 hrs for recrystallization.

Precautions

1. Maintain the sufficient quantity of *Gomutra* in *Dolayantra* during process.
2. Careful for saphonification and west of *Tuttha* during heating.
3. Give *Mandaagni*.
4. During re-crystallization process of *Tuttha* the glass vessel was not disturbed.

Result

1. Initially weight of Raw *Tuttha* - 200 gms
2. Weight of *Tuttha* after *Nirmalikarana* - 176 gms
3. Loss of weight After *Nirmalikarana* - 24 gms

***Shodhana* Method 5**

Tuttha Shodhana* by *Dadim Swarasa Bhawana

Shodhana was done in 2 phase

i] *Dadim swaras Nirman*

ii] *Tuttha shodhana* by *Dadim swaras* 7- *Bhawana*

Dadim swaras Nirman

Materials: *Dadim* fruit - 2 fruit

Procedure

1. Take 2 fruit of *Dadim*.
2. Cut them into valves with knife, then separate the granules and collect it. Collected granules place them in juice extractor and prepare juice.
3. Collect juice into a Glass vessel.
4. Then it was filtered through clean cotton cloth, measured by measuring cylinder and stored for further procedure.

Observations

Colour- Whitish Pink

Taste- Sour and sweet

PH- 6

Precautions -Should not be kept open.

Result -Final obtained *Dadim swarasa* – 100 ml

This *Swarasa* was fresh prepared every time for given seven *Bhawana* to *Tuttha*.

Tuttha shodhana* by *Dadim swaras* 7- *Bhawana

Materials

1. Crude *Tuttha* - 200 gm
2. *Dadim swarasa* - 100 ml

Procedure: Here; according to reference of Rasataringini seven *Bhawana* of *Dadim swarasa* was given for *Tuttha Shodhana*.

1st *Bhawana*

1. *Nirmalikrrut Tuttha* was taken in *Khalwa yantra* and powdered it.
2. *Dadim swarasa* was added till *Samyak plutha*. (60 ml was required).
3. Then trituration was continued till *Tuttha* powder was drying.
4. After drying *Shodhit tuttha* was collected.

2nd *Bhawana*

1. 1st time *Bhawit Tuttha* powder was taken for 2nd *Samyak plutha (Bhawana* in *Khalwa yantra*.
2. After that *Dadim swarasa* was added till 60 ml was required).
3. Then trituration was continued till *Tuttha* powder was drying.
4. After drying *Shodhit Tuttha* was collected.

3rd *Bhawana*

1. 2nd time *Bhawit Tuttha* powder was taken for 3rd *Bhawana* in *Khalwa yantra*.
2. After that *Dadim swarasa* was added till *Samyak plutha* (60 ml was required).
3. Then trituration was continued till *Tuttha* powder was drying. After drying *Shodhit Tuttha* was collected.

- **4th *Bhawana***
- ***5thBhawana***: Above same process was done for 4th, 5th, 6th, 7th *Bhawana* one after one.
- **6th *Bhawana***
- **7th *Bhawana***

Observations

1. 60 ml of *Dadim swarasa* was required for 200 gm of *Tuttha shodhana* process.
2. After adding *Dadim swarasa* colour turns to violet colour.
3. The final *Shodhit Tuttha* was in faint violet colour.

Table 3: Observation during *Dadim swarasa Bhawana*

Observations	Colour changes	Required *Dadim swarasa*	Required Time
Before *Bhawana*	Blue	60 ml	6 hrs
After 1st *Bhawana*	Faint blue	60 ml	6 hrs
After 2nd *Bhawana*	Faint bluish	60 ml	6 hrs
After 3rd *Bhawana*	violet	60 ml	6 hrs
After 4th *Bhawana*	violet	60 ml	6 hrs
After 5th *Bhawana*	Violet	60 ml	6 hrs
After 6th *Bhawana*	Faint violet	60 ml	6 hrs
After 7th *Bhawana*	Faint violet	60 ml	6 hrs

Precautions

1. The *Khalwa yantra* should be clean and dry.
2. Freshly prepared *Dadim swarasa* should be used.
3. Careful and Thorough trituration should be done.
4. Sufficient quantity of *Dadim swarasa* should be added for *Shodhana*.

Result: Results after seven *Bhawana*

- Initially weight of Raw *Tuttha* - 200 gms
- Weight of *Tuttha* after *Shodhana* - 193 gms
- Loss of weight After *Shodhana* - 7 gms

Tutthadrava Nirman

Using the above *Shodhit tuttha's Tutthadrava* was prepared for its in vitro antibacterial study. All above *Shodhit Tuttha* was used in preparation of *Tutthadrava*. [10]

So the whole method of preparation of *Tutthadrava* was divided in five different way's.

1. *Tutthadrava Nirman* by using *Nirmalikrut Tuttha.*
2. *Tutthadrava Nirman* by using *Nimbu swaras shodhit Tuttha*
3. *Tutthadrava Nirman* by using *Raktachandan* and Manjista *kwath Bhavit Tuttha.*
4. *Tutthadrava Nirman* by using *Gomutra shodhit Tuttha*.
5. *Tutthadrava Nirman* by using *Dadim swaras shodhit Tuttha*

Procedure

1. 2 *Ratti* or 4 *Ratti* of *Shodhit tuttha* was taken.
2. Then it added in 50 ml of water (5 pal).
3. Starrer the solution till *Tuttha* was dissolved in it.
4. After complete dissolution *Tutthadrava* was prepared.

***Tutthadrava Nirman* by *Nimbu swaras shodhit Tuttha* [11]**

Materials

1. *Nimbu swaras shodhit Tuttha* - 500 mg (4 ratti)
2. Distilled Water - 50 ml

Procedure: 500 mg *Nimbu shodhit Tuttha* was kept and added in the 50 ml distilled water in glass vessel. Starrer the solution till complete dissolution of *Tuttha*. Then prepared Drava was collected.

Observations

1. Complete dissolution occurred in 5 min.
2. Faint blue colour Drava was formed.

Result: 50 ml *Nimbu swaras shodhit Tuttha* Drava obtained.

***Tutthadrava Nirman* by *Raktachandan* and *Manjista kwatha shodhit Tuttha*[12]**

Materials

1. *Raktachandan* and *Manjista kwath* - 500 mg *shodhit Tuttha*
2. Distilled Water - 50 ml

Procedure

1. 500 mg *Raktachandan and Manjista shodhit Tuttha* was kept and added in the 50 ml distilled water in glass vessel.

2. Starrer the solution till complete dissolution of *Tuttha*. Then prepared Drava was collected.

Observations:

1. Complete dissolution occurred in 5 min.
2. Gray colour Drava was formed

Result: 50 ml *Raktachandan* and *Manjista kwath Shodhit Tutthadrava* was obtained.

***Tutthadrava Nirman by Gomutra shodhit Tuttha*[13]**

Materials

1. *Gomutra shodhit Tuttha* - 500 mg
2. Distilled Water - 50 ml

Procedure

1. 500 mg *Gomutra shodhit Tuttha* was kept and added in the 50 ml distilled water in glass vessel.
2. Starrer the solution till complete dissolution of *Tuttha*. Then prepared Drava was collected.

Observations

1. Complete dissolution occurred in 5 min.
2. Brown colour Drava was formed.

Result: 50 ml *Gomutra shodhit Tuttha* Drava obtained

***Tutthadrava Nirman* by *Dadim shodhit Tuttha*[14]**

Materials

Dadim shodhit Tuttha - 500 mg

Distilled Water - 50 ml

Procedure

1. 500 mg *Nimbu shodhit Tuttha* was kept and added in the 50 ml distilled water in glass vessel.
2. Starrer the solution till complete dissolution of *Tuttha*. Then prepared Drava was collected.

Observations

1. Complete dissolution occurred in 5 min.
2. Faint violet colour Drava was formed.

Result: 50 ml *Dadim shodhit Tuttha* Drava obtained.

***Tutthadrava Nirman* by *Nirmalikrut Tuttha*[15]**

Materials

1. *Nirmalikrut Tuttha* - 500 mg
2. Distilled Water - 50 ml

Procedure

1. 500 mg *Nirmalikrut Tuttha* was kept and added in the 50 ml distilled water in glass vessel.
2. Starrer the solution till complete dissolution of *Tuttha*. Then prepared Drava was collected.

Observations

- Complete dissolution occurred in 5 min.
- Blue colour Drava was formed.

Result: 50 ml *Dadim shodhit Tuttha Drava* obtained.

Analytical Study

To evaluate quality of finished product, it becomes necessary to subject of prepared drugs in the prospect of science. The drugs, which are manufactured, should be well understood and interpreted in the light of modern chemistry to provide proper scientific background. The increasing need for drugs have made it incumbent that uniformity of drug manufacturing in Ayurveda should be brought about. The need has also been for statutory control to ensure standard of Ayurvedic drugs. This analytical study was done at credited centers namely, Dept, of studies in Rasashastra, in our college, Nikhil laboratories, As no single center could provide all parameters.

Here, we do analytical study of *Shodhit tuttha* samples instead of *Tutthadrava* samples.

Decoding of analytical samples of *Tuttha's* are as

Sample 1 - *Nimbu swaras Mardit Tuttha*

Sample 2 - *Raktachandan and Manjista kvatha bhavit Tuttha*

Sample 3 - *Gomutra Swedita Tuttha*

Sample 4 - *Dadim swaras Mardit Tuttha*

Sample 5 - *Nirmalikrut Tuttha*

Sample 6 - Raw *Tuttha*

The analytical study of *Shodhit Tuttha* presented in two headings viz.

Ayurved parameters

Modern parameters

Ayurved parameters

1. *Shabda* (Sound)
2. *Sparsh* (Touch)
3. *Rupa* (colour)
3. *Rasa* (Test)
4. *Gandha* (Smell)

Modern parameters

Determination of Ph: To evaluate PH of *Tuttha* sample

Apparatus -Sample suspension (1gm sample + 10 ml distilled water) Distilled water, pH meter etc.

Procedure: Switch on and allowed the instrument to warm up. The instrument was equipped with a manual temperature control, the temperature of the solutions was taken and value set to the instrument. Te instrument was calibrated with the known pH of the different buffer solution. The electrode assemblies, rinse in distilled water, and place in the sample solution. pH reading shown on the meter was noted down.

Loss on drying 110^{0}C: This test was conducted to find out the moisture content of the drug.

Procedure: Initially the Petri dishes were cleaned with water and dried in oven at 105°C for 2 hrs. Then 1 gm of the drug sample was taken in a pre weighed dried petridish and it was dried in an oven at 105°C till constant weight is achieved. Then the Petridish was taken out and weighed after self cooling and from the weight loss the percentage of loss on drying was calculated and expressed as % w/w.

Total Ash value: This test was carried out to evaluate the ash content of the sample drug.

Procedure: For this the crucibles were initially cleansed with water and then dried in oven at 105°C for 2 hrs. 1 gm of accurately weighed sample was taken in a pre-weighed dried crucible and was incinerated in a muffle furnace up to 600°C. Then crucible was taken out and self cooling was allowed. The crucible was weighed and from the weight of the ash obtained, the percentage of ash was calculated.

Acid insoluble Ash: The acid insoluble ash content test was conducted to assess the percentage of inorganic content of the sample which insoluble in dilute acid.

Procedure: Ash was taken with 25 ml dilute hydrochloric acid in a beaker of 100 ml capacity and boiled for few minutes and cooled. Then it was filtered through 41 numbers Whattman filter paper and washed with distilled water repeatedly till it becomes chloride free. Then the filter paper along with residue in a glass funnel was kept for drying in the oven. Later that dried paper along with the residue was shifted to pre-weighed crucible and kept in muffle furnace and heated up to 600°C. After cooling it was weighed and from the weight of residue obtained, acid insoluble ash was calculated.

Observations and results of Pharmaceutical study

Table 4: Observation during *Tuttha shodhana* by *Nimbu swarasa*

***Shodhana* method**	**Used *Tuttha* For *Shodhana***	***Dravya* Used for *Shodhana***		**Finally Obtained *Shodhit Tuttha***		**Loss during *Shodhana* in gm**	**Required time in hrs.**
		Dravya	**Quantity**	**Wt.**	**colour**		
Nimbu Swarasa Bhavana	200 gm	*Nimbu Swarasa*	60 ml	196 gm	Sky blue	4 gm	3 hrs.

Result - For *Nimbu swarasa shodhana* 200 gm Tuttha was used. 60 ml *Nimbu swaras* was required for triturating. Finally 196 gm *Shodhit Tuttha* was obtained, which was sky blue in color. 4 gm Loss was seen during *Shodhana* process which was 2 %. Time required for *Shodhana* process was 3 hours.

Table 5: Observation during *Tuttha shodhana* by *Raktachandan* and *Manjishta kwatha*

***Shodhana* method**	**Used *Tuttha* For *Shodhana***	***Dravya* Used for *Shodhana***		**Finally Obtained *Shodhit Tuttha***		**Loss during *Shodhan* in gm**	**Required time in hrs.**
		Dravya	**Quantity**	**Wt.**	**colour**		
Rakt. and manjista Kwath	200 gm	*Raktchandan* and *manjista kwath*	60 ml each Bhawana	194 gm	Gray	6 gm	6 hrs for each *Bhawana*

Result –For *Rakttachandan* and *Manjishta Kwath shodhana* 200 gm *Tuttha* was used. 60 ml *Rakttachandan* and *Manjishta Kwatha* was required for triturating. Finally 194 gm *Shodhit Tuttha* was obtained, which was Gray in colour. 6 gm Loss was seen during *Shodhana* process which was 3 %. Time required for *Shodhana* process was 6 hrs to each *Bhawana* (7- *Bhawana* was given).

Table 6: Observation during *Tuttha shodhana* by *Gomutra swedan*

***Shodhana* method**	**Used *Tuttha* For *Shodhana***	***Dravya* Used for *Shodhana***		**Finally Obtained *Shodhit Tuttha***		**Loss during *Shodhan* in gm**	**Required time in hrs.**
		Dravya	**Quantity**	**Wt**	**colour**		
Gomutra swedan	200 gm	*Gomutra*	3 lit	186 gm	Black Brown	14 gm	9 hrs

Result –For *Gomutra shodhana* 200 gm *Tuttha* was used. 3 lit *Gomutra* was required for *Dolayantra swedan*. Finally 186 gm *Shodhit Tuttha* was Obtained which was Black Brown in color. 16 gm Loss was seen during *Shodhana* process which was 8 %. Time required for *Shodhana* process was 9 hrs.

Table 7: Observation during *Tuttha shodhana* by *Dadim swarasa*

***Shodhana* method**	**Used *Tuttha* For *Shodhana***	***Dravya* Used for *Shodhana***		**Finally Obtained *Shodhit Tuttha***		**Loss during *Shodhana* in gm**	**Required time in hrs.**
		Dravya	**Quantity**	**Wt.**	**colour**		
Dadimswaras	200 gm	*Dadim Swarasa*	60 ml each *Bhawana*	197 gm	violet	3 gm	6 hrs for each *Bhawana*

Result: For *Dadim swaras shodhana* 200 gm *Tuttha* was used. 60 ml *Dadim swaras* was required for triturating. Finally 197 gm *Shodhit Tuttha* was Obtained which was violet in color. 3 gm Loss was seen during *Shodhana* process which was 1.5 %. Time required for *Shodhana* process was 6 hrs to each *Bhawana* (7- *Bhawana* was given).

Table 8: Observation During *Tuttha Shodhana* By *Nirmalikaran*

***Shodhana* method**	**Used *Tuttha* For *Shodhana***	***Dravya* Used for *Shodhana***		**Finally Obtained *Shodhit Tuttha***		**Loss during *Shodhan* in gm**	**Required time in hrs.**
		Dravya	**Quantity**	**Wt.**	**colour**		
Nirmalikaran	750 gm	Water	375 ml	550 gm	Dark blue	200 gm	24 hrs

Result: For *Nirmalikaran* 750 gm *Tuttha* was used. 375 ml water was required for dissolution. Finally 550 gm *Nirmalikrut Tuttha* was Obtained which was Dark blue in color. 200 gm Loss was seen during *Shodhana* process which was 2 %. Time required for *Shodhana* process was 24 hrs.

Table 9: Observation of *Tutthadrava Nirman*

Sr. no.	***Tutthadrava***	**Used *Dravya***		**Colour of *Drava***	**Required Time**
		***Tuttha* in *Ratti* (mg)**	**Water in pal (ml)**		
1	*Tutthadrava* prepared by *Nimbu swaras shodhit Tuttha*	*Nimbu shodhit Tuttha* - 4 *ratti* (500 mg)	Water 5 pal (50 ml)	Faint blue	5 min
2	*Tutthadrava* prepared by *RkT-manjishta kwath shodhit Tuttha*	RkT-*manjishta kwath shodhit Tuttha*- 4 *ratti* (500 mg)	Water 5 pal (50 ml)	Faint Gray	5 min
3	*Tutthadrava* prepared by *Gomutra shodhit Tuttha*	*Gomutra shodhit Tuttha* - 4 *ratti* (500 mg)	Water 5 pal (50 ml)	Faint Brown	5 min
4	*Tutthadrava* prepared by *Dadim swaras shodhit Tuttha*	*Dadim shodhit Tuttha* - 4 *ratti* (500 mg)	Water 5 pal (50 ml)	Faint violet	5 min
5	*Tutthadrava* prepared by *Nirmalikrut Tuttha*	*Nirmalikrut Tuttha* – 4 *ratti* (500 mg)	Water 5 pal (50 ml)	Blue	5 min

Observations and Results of Analytical Study

Ayurved Parameters Organoleptic Test

Table 10: *Shodhit Tuttha* sample analysis by Ayurvedic parameters

Sample no.	***Shabd***	***Sparsh***	***Rupa***	***Rasa***	***Gandha***
Sample 1	-	Rough	Sky blue	-	Not permeable
Sample 2	-	Smooth	Gray	-	Muddy smell
Sample 3	-	Smooth	Brown	-	*Gomutra* smell
Sample 4	-	Smooth	Violet	-	*Dadim* smell
Sample 5	-	Rough	Blue	-	Not permeable

Sample1- Was Rough in Touch, Sky Blue In Colour, Not Permeable in Smell.

Sample2- Was Smooth in Touch, Gray in Colour, Muddy in Smell.

Sample3- Was Smooth in Touch, Brown in Colour, *Gomutra* in Smell.

Sample4- Was Smooth in Touch, Violet in Colour, *Dadim* Like in Smell.

Sample5-Was Rough in Touch, Blue in Colour, Not Permeable in Smell.

Analytical study Results of *Shodhit Tuttha*

Sample -1

Table 11: Observations and Results of *Nimbu swaras Mardit Tuttha*

Physical Test	
Colour	Bluish
Odour	Acidic smell
Chemical Test	
Ph	3.25
Total Ash	48.22 %
Acid Insoluble Ash	1.06 %
Water Insoluble Ash	30.56 %
Loss On Drying At 105^0 C	28.14 %
Particle Size	143.32 µm
Assay of Element	
Cu	20.46 %
Fe	3.72 %
S	5.23 %

Sample -2

Table 12: Observations and Results of *Raktachandana* and *Manjista kvatha bhavit Tuttha*

Physical Test:	
Colour	Gray
Odour	Acidic Smell
Chemical Test	
PH	3.46
Total Ash Value	43.53 %
Acid Insoluble Ash	1.50 %
Water Insoluble Ash	31.62 %
Loss On Drying At 105^0 C	26.86 %
Particle Size	119.42 µm
Assay of Element	
Cu	22.63 %
Fe	1.22 %
S	5.55 %

Sample -3

Table 13: Observations and Results of *Gomutra Swedita Tuttha*

Physical Test	
Colour	Brown
Odour	Acidic Smell
Chemical Test	
PH	4.47
Total Ash Value	44.11 %

Acid Insoluble Ash	2.55 %
Water Insoluble Ash	21. 96 %
Loss On Drying At 105^0 C	5.89 %
Particle Size	95.41 µm
Assay of Element	
Cu	15.74 %
Fe	4.39 %
S	4.36 %

Sample -4

Table 14: Observations and Results of *Dadim swaras Mardit Tuttha*

Physical Test	
Colour	Violet
Odour	Acidic Smell
Chemical Test	
Ph	2.88
Total Ash Value	41.82 %
Acid Insoluble Ash	2.08 %
Water Insoluble Ash	29.53 %
Loss On Drying At 105^0 C	26.82 %
Particle Size	136.79 %
Assay of Element	
Cu	22.24 %
Fe	3.31 %
S	6.15 %

Sample -5

Table 15: Observations and Results of *Nirmalikrut Tuttha*

Physical Test	
Colour	Bluish
Odour	Acidic Smell
Chemical Test	
Ph	2.37
Total Ash Value	42.66 %
Acid Insoluble Ash	1.02 %
Water Insoluble Ash	30.08 %
Loss On Drying At 105^0 C	28.75 %
Particle Size	146.29 µm
Assay of Element	
Cu	23.24 %
Fe	0.45 %
S	9.21 %

Sample -6

Table 16: Observations and Results of raw *Tuttha*

Physical Test	
Colour	Blue
Odour	Acidic Smell
Chemical Test	
Ph	2.65
Total Ash Value	43.20 %
Acid Insoluble Ash	1.15 %
Water Insoluble Ash	32.51 %
Loss On Drying At 105^0 C	28.59 %
Particle Size	291.23 µm
Assay of Element	
Cu	24.04 %
Fe	2.31 %
S	4.35 %

Comparative analytical study and Graphical presentation

PH

Table 17: PH Observations of all *Tuttha* Samples

***Shodhit Tuttha* sample**	**PH**
Sample -1	3.25
Sample -2	3.46
Sample -3	4.47
Sample -4	2.88
Sample -5	2.37
Sample -6	2.65

Graph shows, Sample-6 (Raw *Tuttha*) PH- 2.65. Comparatively after *Shodhana* PH was in sample 1- 3.25, sample 2- 3.46, Sample 3- 4.47, sample 4- 2.88, sample 5 - 2.37.

Total Ash

Table 18: Total Ash Observations of All *Tuttha* Sample

***Shodhit Tuttha* sample**	**Total ash**
Sample -1	48.22 %
Sample -2	43.53 %
Sample -3	44.11 %
Sample -4	41.82 %
Sample -5	42.66 %
Sample -6	43.20 %

Graph shows, Total Ash of Raw *Tuttha* (Sample-6) is 43.20 %. Comparatively after *Shodhana* Total Ash in sample 1-5 ranges from 41.82 % to 48.22 %.

Acid insoluble ash

Table 19: Acid Insoluble Ash Observations of All *Tuttha* Samples

***Shodhit Tuttha* sample**	**Acid insoluble ash**
Sample -1	1.06 %
Sample -2	1.50 %
Sample -3	2.55 %
Sample -4	2.08 %
Sample -5	1.02 %
Sample -6	1.15 %

Graph shows, Sample-6 (Raw *Tuttha*) Acid insoluble ash was 1.15 %. Comparatively after *Shodhana* Acid insoluble ash was in sample 1- 1.06 %, Sample 2- 1.50 %, Sample 3- 2.55 %,Sample 4- 2.08 %, Sample 5- 42.66 %.

Water Insoluble Ash

Table 20: Water Insoluble Ash Observations of All *Tuttha* Samples

***Shodhit Tuttha* sample**	**Water insoluble ash**
Sample -1	30.56 %
Sample -2	31.62 %
Sample -3	21.96 %
Sample -4	29.53 %
Sample -5	30.08 %
Sample – 6	32.51 %

Graph shows, Sample-6 (Raw *Tuttha*) water insoluble ash was32.51%. Comparatively after *Shodhana* water insoluble ash was in sample 1- 30.56 %, Sample 2- 31.62 %, Sample 3- 21.96 %, Sample 4- 29.53 %, Sample 5- 30.08 %.

Loss on drying at 105^0 c

Table 21: Loss on drying at 105^0c observations of all *Tuttha* samples

***Shodhit Tuttha* sample**	**Loss on drying at 105^0 c**
Sample -1	28.14 %
Sample -2	26.86 %
Sample -3	5.89 %
Sample -4	26.82 %
Sample -5	28.75 %
Sample -6	28.59 %

Graph shows, Sample-6 (Raw *Tuttha*) Loss on drying at 105^0 c was 28.59%. Comparatively after *Shodhana* Loss on drying at 105^0 c was in sample 1- 28.14 %, Sample 2- 26.86 %, Sample 3- 5.89 %, Sample 4- 26.82 %, sample 5- 28.75 %.

DISCUSSION

Discussion of the work entitled "A Comparative Pharmaceutico-Analytical Study of *Tutthadrav*", prepared by different Shodhana methods of *Tuttha*" classified into three groups.

1.Pharmaceutical study discussion
2.Analytical study discussion

Pharmaceutical Study Discussion

Thus pharmaceutical study discussed as –

A) *Tuttha shodhana*
B) *Tutthadrava Nirman*

***Tuttha shodhana*:** According to Rasatarangini *Tuttha shodhana* is carried out by four different methods.

1. *Tuttha Shodhana* by *Nimbu swarasa Mardan*.
2. *Tuttha Shodhana* by *Raktachandan* and *Manjista kwath Bhavana.*

3. *Tuttha Shodhana* by *Gomutra Swedan.*
4. *Tuttha Shodhana* by *Dadim swarasa.*

But *Nirmalikaran* of *Tuttha* also explained in Rasatarangini, in these process only physical impurities separated by Cloth (filter). So it is taken as a *Shodhana* procedure. So first doing the *Nirmalikaran* of *Tuttha*

***Niramalikaran* of *Tuttha*:** In this study before going to *Tuttha Shodhana Tuttha* was subjected to *Nirmalikaran* process with intention to remove the water insoluble impurities. During *Nirmalikaran* some mud mixed small sand particles were seen which filtered afterwards. After *Nirmalikaran* colour of *Tuttha* changed from muddy blue to sharp blue. According to Rasatarangini in *Niramalikaran* 750 gm of Raw *Tuttha* dissolved in 375 ml hot water but 154 gm *Tuttha* remain undissolved. It is may be because of saturation of *Tuttha* in hot water.

***Tuttha Shodhana* by *Nimbu swrasa*:** *Nimbu Swarasa* was used for *Tuttha shodhana*. After *Shodhana* the colour of *Tuttha* changed from Blue to Sky Blue. This process is easy for preparation and antibacterial study of it shows good results.

***Tuttha Shodhana* by *Raktachandan* and *Manjishta kwath*:** *Raktachandan* and *Manjista kwath* used for *Tuttha shodhana*. Seven *Bhawanas* of this *Kwath* was given. Triturate still *Tuttha* was dry. Each time fresh prepared *Kwatha* was used. After *Shodhana* the colour of *Tuttha* changed from Blue to Gray.

***Tuttha Shodhana* by *Gomutra Swedana*:** *Tuttha shodhana* is carried out in *Dolayantra* and *Gomutra* is used as a *Dravdravya*.

1. *Tuttha* was dissolved in *Gomutra* within 2 to 3 minutes.
2. Some precipitation occurs during *Swedana* procedure.
3. After nine hours black coloured liquid is remaining. This remains stay for sedimentation for re-crystallisation.
4. Finally black brownish coloured *Tuttha* was obtained.
5. Some reddish-brown coloured *Tuttha* particles like copper observed in inner side of *Dolayantra*.

Tuttha shodhana* by *Dadim swarasa: *Tuttha shodhana* was done in *Amlavargiya Dadim swaras*. Seven *Bhawana* of *swarasa* was given. Each time fresh collected *Swarasa* was used. After *Shodhana* colour of *Tuttha* was changed from blue to faint violet.

Drava Nirman After *Shodhana*, all above *Shodhit Tuttha* samples are used to prepare *Tutthadrava Nirman* separately with reference to Rasataringini. Each of *Shodhit Tuttha* forms a *Drava*. As;

1. *Nirmalikrut Tutthadrava*
2. *Nimbu swaras shodhit Tutthadrava*
3. *Raktachandan –Manjista Shodhit Tutthadrava*
4. *Gomutra Shodhit Tutthadrava*
5. *Dadim Shodhit Tutthadrava*

The colour of *Tutthadrava* blue, Faint blue, faint gray, Faint Brown, Faint blue respectively. Pharmaceutically preparation of *Tutthadrava* is very easy. Thus it may be used at OPD level for *Vrana dhawana.*

Analytical Study Discussion

All the five *Shodhit tuttha* samples are subjected to analytical study in laboratory as pH, Total ash, Acid insoluble ash, Water insoluble Ash, Loss on drying at 105^{o}c, Colour, Odour.

1) **PH –** When we comparing the PH of Raw Tuttha and all samples of *Shodhit Tuttha, Gomutra Swedita Tuttha* shows slightly higher PH than that of the other samples.
2) **Total ash –** When we comparing the Total ash values of Raw *Tuttha* and all samples of *Shodhit Tuttha*. They show relatively same total ash value.
3) **Acid insoluble Ash** – When we comparing the Acid insoluble ash of Raw *Tuttha* and all samples of *Shodhit Tuttha, Gomutra Swedit Tuttha* shows slightly higher Acid insoluble ash than that of the other samples.
4) **Water insoluble Ash** –When we comparing the water insoluble ash of Raw *Tuttha* and all samples of *Shodhit Tuttha, Gomutra swedit Tuttha* shows slightly less water insoluble ash than that of the other samples.
5) **Loss on Drying** – When we comparing the loss of drying of Raw *Tuttha* and all samples of *Shodhit Tuttha*, *Gomutra swedit Tuttha* shows small quantity of loss on drying than that of the other samples.

CONCLUSIONS

Here Two sources of *Tuttha* are explained In different Rasagranthas, one is mineral source called *Sasyaka* and second is artificially prepared called *Tuttha*. In Rasajalanidhi it is mentioned that in absence of *Sasyaka Tuttha* can be used. Now a day's artificial prepared *Tuttha* is widely available and used. So in present study we selected *Tuttha*. All drugs in Rasashastra should undergo a specific procedure sequentially in order to facilitate elimination of impurities, removal of toxic effect and to obtain assumable forms.

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