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# A Comparative Phytochemical Analysis of *Abhavitha* and *Bhavitha Choorna* of *Durva* (Powder and Processed Powder of Whole Plant of *Cynodon dactylon* Linn. Pers.).

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**ABSTRACT:** The herb *Durva* (*Cynodon dactylon* (L.) Pers.) has a long history of medicinal use and serves as a component in many key herbal formulations. In Ayurveda, the pharmaceutical process known as *Bhavana* is used to enhance a drug's effectiveness and impart additional therapeutic qualities. In this study, powdered whole plant of *Durva* was treated by soaking it overnight in its own fresh juice (*swarasa*) as part of the *Bhavana* process. Preliminary phytochemical evaluations were conducted on both *Abhavitha Choorna* (dried powder) and *Bhavitha Choorna* (processed powder) of *Durva (Cynodon dactylon* (L.) Pers.). The results showed that the *Bhavitha Choorna* had higher levels of crude fiber, total sugars, and water-soluble extractives compared to the *Abhavitha Choorna*, indicating that the *Bhavana* treatment may enhance the drug's potency. The present study aims to compare the phytochemical analysis results of both *Abhavitha Choorna* (dried powder) and *Bhavitha Choorna* (processed powder) of the drug.

**KEYWORDS:** *Cynodon dactylon* (L.) Pers., *Durva Choorna*, *Bhavitha Durva Choorna*, Phytochemical analysis, *Bhavana*.

## INTRODUCTION

*Durva,* botanically identified as *Cynodon dactylon* (L.) Pers.[1] is an important herb having significant medicinal properties, with references dating back to the *vedic* period and continuing into modern times. *Medhavardhaka* (intellect promoting*)* and *kumatinashaka* (removing negative thoughts) actions of *Durva* were quoted in *Rigveda*.[2] As per *samhithas, Durva* is a potent *seetaveerya* drug and is mentioned under *mahakashayas* and *ganas* mentioning its different *karmas* like *pittasamsamana* (reducing pitta)*, varnya* (complexion enhancing) and *prajasthapana* (sustaining pregnancy).[3,4,5] *Durva* is utilized both internally and externally as juices, pastes, decoctions, or powders, particularly in *pitta, kapha*, and *rakta prakopa* conditions. It has a variety of pharmacological effects and is a component of many traditional formulas. The drug's plant extracts contain phytoconstituents like alkaloids, terpenoids, phytosterols, flavonoids (such as apigenin, luteolin, orientin, and vitexin), and important minerals.[6]As per earlier studies, the plant has a variety of properties, including

antioxidant, anti-inflammatory, osteoprotective, cardioprotective, antidepressant, and anti-anxiety effects.[7,8,9,10]

According to Acharya Charaka, *samskara* is the alteration of a drug's inherent characteristics combined with the addition of new ones. One such *samskara* mentioned in the classics is *Bhavana*, which is well known for boosting the therapeutic potency of drug and allowing for the use of lower dosages. According to Bhaishajya Ratnavali,[11] *Bhavana* is a technique that involves soaking powdered medications in liquids, such as *swarasa*, etc. at night and keeping them for sundry. This process has to be repeated seven times. Similarly, *Bhavitha Durva Choorna* is made through the *Bhavana* process using its own fresh juice. In order to assess how traditional processing alters the presence and distribution of phytochemical constituents, this study compares the phytochemical analysis of the crude powder (*Abhavitha Choorna*) and processed powder (*Bhavitha Choorna*) of the entire *Durva* plant (*Cynodon dactylon* Linn. Pers.).

## MATERIALS AND METHODS

### Drug Collection

The whole plant of *Durva* (*Cynodon dactylon* (Linn.) Pers.) was freshly harvested from the Thrissur district in kerala. When the blossoms appeared, the drug was collected. Collection was carried out in a way that ensured the drug samples were free from contamination by any toxic weeds. The faculty of the Department of Dravyaguna Vigyana at Government Ayurveda College, Tripunithura, identified the drug specimen that was gathered, and the Department of Botany at St. Albert's College (Autonomous), Ernakulam, authenticated the plant with a voucher number 603.

### Preparation of *Abhavitha Durva Choorna* (Powder of dried whole plant of *Cynodon dactylon* (Linn.) Pers.)

Following collection, potable water was used for thorough cleaning. Shade drying was chosen as the drying method in order to preserve the study drug's active ingredients. The drying process was conducted in a well-ventilated, low-humidity environment under shade, away from direct sunshine. The medication was dried in the shade until it was sufficiently crispy to touch. The resulting fine powder (85 mesh sieve) was ground using a pulverizer and stored in an airtight container with a polythene cover. Figure 1 depicts *Abhavitha Choorna*, a dried powder made from the entire plant of *Cynodon dactylon* (Linn.) Pers.

### Preparation of *Bhavitha Durva Choorna* (Processed powder of dried whole plant of *Cynodon dactylon* (Linn.) Pers.)

*Bhavitha Choorna*, a powder processed from the entire plant of *Durva*, *Cynodon dactylon* (Linn.) Pers. was developed using the *Bhavana Vidhi* reference in Bhaishajya Ratnavali.[11] The *Choorna* (powder) in a tray was progressively added with freshly made *Durva swarasa*, which is the fresh juice of the entire *Cynodon dactylon* (Linn.) Pers. plant. This process was repeated until a thin coating of *swarasa* remained floating on the powder's surface. After that, it was combined with a clean steel spoon to ensure that all of the *Choorna* (powder) particles were evenly absorbed by the *swarasa* (fresh juice). After that, it was exposed to sunshine and covered with a small cloth to dry. The tray was stored under the shed and covered with a light cloth at night. To get rid of stuck particles from the tray, *Choorna* (powder) was blended evenly and stirred early the next day. Next, *Choorna* (powder) was combined with freshly made *swarasa* (fresh juice), and this process was repeated seven times. Following the seventh *Bhavana*, *Choorna* (powder) was exposed to sunshine and covered with a small cloth until it dried entirely. Following adequate drying, the *Choorna* was weighed and ground into a fine powder using a mixer grinder and a small jar to get *Bhavitha Choorna* (processed powder). After that, this *Choorna* (processed powder) was sieved using a mesh size of 85 to make sure no residue remained. This finished *Bhavitha Choorna* was kept in an airtight container with two layers of polythene. Figure 2 displays

the *Bhavitha Choorna*, a processed powder made from the dried whole plant of *Cynodon dactylon* (Linn.) Pers.

**Reagents and Apparatus Required**

The study utilized a range of chemical reagents and solvents, including concentrated and diluted hydrochloric acid, xylene, concentrated and diluted sulfuric acid, concentrated and diluted nitric acid, sodium hydroxide solution, lead acetate solution, sodium oxalate, potassium permanganate, anhydrous sodium carbonate, petroleum ether, cyclohexane, acetone, ethanol, Fehling's solutions A and B, chloroform water, Dragendorff's reagent, Mayer's reagent, Wagner's reagent, neutral ferric chloride, magnesium ribbon, methylene blue reagent, sodium bicarbonate solution, copper sulfate, catechol, and Folin–Ciocalteu phenol reagent. For experimental procedures, standard laboratory glassware and equipment were employed, such as silica crucibles, round-bottom and conical flasks, standard volumetric flasks, and apparatus for extraction and distillation including Dean and stark's, Clevenger, and Soxhlet apparatus. Additional instruments included Bunsen burner, water condensers, hot air oven, muffle furnace, heating mantle, glass beakers with beads, petri dishes, test tubes with lids, measuring jars, funnels, glass rods, watch glasses, burettes, pipettes, and Whatman filter paper.

**Procedure**

**Determination of the Physicochemical Parameters**

The *Abhavitha* and *Bhavitha Choorna* of *Durva* (*Cynodon dactylon* (L.) Pers.) were examined separately for their physicochemical characteristics, including foreign matter, total ash, acid-insoluble ash, water-insoluble ash, moisture content, volatile oil content, fiber content, tannin content, total sugar, reducing sugar, phenol content, pH, and qualitative analysis of ash. Each sample's ash was qualitatively analyzed to determine whether acid radicals such carbonate, phosphate, sulphate, and chloride, as well as the basic radical potassium, were present or absent. The study calculated the cold and hot water-soluble extractive values of *Abhavitha* and *Bhavitha Choorna* of *Durva* as well as their cold and hot alcohol-soluble extractive values. Additionally, to ascertain each sample's extractive profile, successive solvent extraction was carried out using the solvents petroleum ether, cyclohexane, acetone, and alcohol.

**Phytochemical Parameters**

*Abhavitha* and *Bhavitha Choorna* of *Durva* (*Cynodon dactylon* (L.) Pers.) were examined for the presence or lack of phytochemical ingredients such as alkaloids, saponins, flavonoids, tannins, steroids, phenols, carbohydrates, and proteins. In order to identify the presence of steroids, alkaloids, flavonoids, and phenols, qualitative phytochemical analysis was performed on the petroleum ether, cyclohexane, acetone, and alcohol extracts of both test samples.

**RESULTS**

**Physicochemical and Preliminary Phytochemical Assessment**

Observations of the physicochemical and preliminary phytochemical analysis done for the both *Abhavitha* and *Bhavitha Choorna* of whole plant of the drug *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.) are tabulated below:

**Determination of Physicochemical Parameters**

Physicochemical characteristics of both *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.) listed in Table 1.

**Qualitative Analysis of Ash**

Qualitative analysis of ash of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.) enlisted in Table 2.

**Determination of Extractive Values**

Extractive values of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.) are assessed and tabulated in Table 3.

**Determination of Successive Solvent Extractive Values**

Successive solvent extractives value of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.) shown in Table 4.

**Determination of the Phytochemical Constituents**

**Qualitative analysis**

Results obtained by doing qualitative phytochemical analysis of cold water extract of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.) are enlisted in Table 5.

**Qualitative analysis of successive solvent extractives**

Results obtained from the qualitative analysis of successive solvent extractives in petroleum ether, cyclohexane, acetone, and alcohol of *Durva Choorna* (powder of whole plant of *Cynodon dactylon* (Linn.) Pers.) was shown in Table 6 and *Bhavitha Durva Choorna* (processed powder of whole plant of *Cynodon dactylon* (Linn.) Pers.) shown in Table 7.

## DISCUSSION

**Determination of Physicochemical Parameters**

In the present study, the physicochemical and phytochemical parameters of *Choorna* and *Bhavitha Choorna* of *Durva* (*Cynodon dactylon* (Linn.) Pers.) were evaluated to understand the influence of *Bhavana samskara* on the drug. Both samples showed nil foreign matter, indicating proper collection, authentication, and processing of the raw material. The total ash value of *Choorna* was 8.5%, while *Bhavitha Choorna* showed a slightly higher value of 9%, suggesting an increase in total inorganic content after *Bhavana*. This increase may be due to enhanced extraction and retention of mineral constituents during repeated soaking done in *Bhavana* process.

The acid insoluble ash value decreased from 3% in *Choorna* to 2.5% in *Bhavitha Choorna*, and water insoluble ash reduced from 6% to 4%, indicating a reduction in siliceous matter and extraneous earthy impurities following *Bhavana*. This suggests that the *Bhavana* process improves the purity of the formulation. The moisture content was 8% in *Choorna* and reduced to 6% in *Bhavitha Choorna*, which is desirable as lower moisture content contributes to better stability and shelf life. Volatile oil content, which was 1% in *Choorna,* was absent (0%) in *Bhavitha Choorna*, possibly due to volatilization during repeated grinding and drying processes involved in *Bhavana*.

The crude fibre content showed a marginal increase from 30.86% in *Choorna* to 32.80% in *Bhavitha Choorna*, indicating concentration of fibrous components after processing. Tannin content slightly decreased from 0.41% to 0.33%, which may be attributed to partial leaching during wet trituration. In contrast, phenol content increased significantly from 1.26% in *Choorna* to 2.19% in *Bhavitha Choorna*, suggesting enhanced release or availability of phenolic compounds due to cellular disintegration during *Bhavana*. The pH value shifted from 6.46 in *Choorna* to 7.00 in *Bhavitha Choorna*, indicating movement towards neutrality, which may improve palatability and compatibility with physiological conditions.

Carbohydrate analysis revealed that total sugar content increased from 7.49% in *Choorna* to 9.67% in *Bhavitha Choorna*, while reducing sugar content showed a marked rise from 0.48% to 6.56%. This significant increase in reducing sugars indicates hydrolysis of complex carbohydrates during *Bhavana*, supporting the Ayurvedic concept that *samskara* enhances bioavailability and potency of the drug.

Qualitative analysis of ash showed the presence of carbonate, phosphate, sulphate, and chloride radicals in both *Choorna* and *Bhavitha Choorna*, while potassium was absent in both samples, indicating that *Bhavana* did not alter the inherent mineral radical composition of *Durva*.

**Determination of Extractive Values**

Extractive value analysis demonstrated higher extractability in *Bhavitha Choorna*. Cold water soluble extractives increased from 11% to 12.5%, and hot water soluble extractives increased from 14% to 17%, indicating enhancement of water-soluble constituents after *Bhavana*. Cold alcohol soluble extractives showed a slight increase from 18.16% to 19.12%, while hot alcohol soluble extractives decreased from 6.4% in *Choorna* to 4.2% in *Bhavitha Choorna*, suggesting redistribution of phytoconstituents towards aqueous and moderately polar fractions.

Successive solvent extractive values further supported these observations. In non-polar solvents, extractive values decreased after *Bhavana*, with petroleum ether extractives reducing from 0.7% to 0.4% and cyclohexane extractives from 0.34% to 0.22%, indicating depletion or transformation of lipophilic constituents. In contrast, acetone extractives increased from 1.5% to 3%, and alcohol extractives from 4.9% to 5.8%, demonstrating enhanced extraction of polar and semi-polar phytoconstituents due to *Bhavana.*

**Phytochemical Constituents Evaluation**

Qualitative phytochemical analysis of cold water extracts of both *Choorna* and *Bhavitha Choorna* revealed the presence of alkaloids (Meyer's test positive), saponins, carbohydrates, proteins, phenols, steroids, and tannins, while flavonoids were absent in both samples. Successive solvent extracts showed similar phytochemical profiles in both preparations, with alkaloids, flavonoids, phenols, and steroids predominantly present in acetone and alcohol extracts, indicating that *Bhavana* did not alter the qualitative phytochemical nature but enhanced extractability in polar solvents.

Overall, the comparative evaluation clearly demonstrates that *Bhavitha Choorna* exhibits improved physicochemical parameters, increased water-soluble and polar extractives, enhanced phenolic and sugar content, and better purity indices when compared to *Choorna*. These findings provide experimental validation for the Ayurvedic principle of *Bhavana samskara*, which is said to enhance the potency, bioavailability, and therapeutic efficacy of the drug.

## CONCLUSION

The present study concludes that *Bhavana samskara* brings about significant and favourable alterations in the physicochemical and phytochemical characteristics of *Durva* (*Cynodon dactylon* (Linn.) Pers.) *Choorna*. Comparative evaluation revealed that *Bhavitha Choorna* possessed improved purity parameters, as evidenced by reduced acid insoluble ash (2.5%) and water insoluble ash (4%) when compared to *Choorna* (3% and 6% respectively), along with lower moisture content (6%), indicating better stability and shelf life. The increase in total ash value (9%) suggests enhanced retention of inorganic constituents following *Bhavana*.

*Bhavitha Choorna* demonstrated superior phytochemical expression, particularly through increased phenolic content (2.19%) and a marked rise in total sugars (9.67%) and reducing sugars (6.56%), indicating improved availability of bioactive constituents due to trituration. Enhanced cold and hot water soluble extractive values (12.5% and 17%) and higher acetone (3%) and alcohol (5.8%) extractive values further substantiate improved extractability of polar and semi-polar compounds after *Bhavana*. Although volatile oil content was absent in *Bhavitha Choorna*, this did not adversely affect the overall phytochemical richness of the formulation.

Qualitative phytochemical screening confirmed the presence of alkaloids, saponins, carbohydrates, proteins, phenols, steroids, and tannins in both preparations, with *Bhavitha Choorna* showing comparable qualitative profiles but improved quantitative extractability. Overall, the findings scientifically validate the classical Ayurvedic concept of *Bhavana samskara*, demonstrating its role in enhancing drug quality, extractability, and

potential therapeutic efficacy. Hence, *Bhavitha Choorna* of *Durva* may be considered pharmaceutically superior to simple *Choorna* and more suitable for therapeutic application.

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**Figure No.1: *Abhavitha Choorna* (Powder of dried whole plant of *Cynodon dactylon* (Linn.) Pers.)**

**Figure 2: *Bhavitha Choorna* (Processed Powder of dried whole plant of *Cynodon dactylon* (Linn.) Pers.)**

**Table No: 1 Physicochemical characteristics of both *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl. No | Physicochemical parameters | *Choorna* | *Bhavitha Choorna* |
|---|---|---|---|
| 1. | Foreign matter | Nil | Nil |
| 2. | Total ash | 8.5% | 9% |
| 3. | Acid Insoluble Ash | 3% | 2.5% |
| 4. | Water Insoluble Ash | 6% | 4% |
| 5. | Moisture Content | 8% | 6% |
| 6. | Volatile oil | 1% | 0% |
| 7. | Crude fibre | 30.86% | 32.80% |
| 8. | Tannin Content | 0.41% | 0.33% |
| 9. | Total sugar | 7.49% | 9.67% |
| 10. | Reducing sugar | 0.48% | 6.56% |
| 11. | Phenol | 1.26% | 2.19 |
| 12. | pH | 6.46 | 7.00 |

**Table No: 2 Qualitative analysis of ash of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl.No | Experiment | *Choorna* | *Bhavitha Choorna* |
|---|---|---|---|
| Acid radicals | | | |
| 1 | Carbonate | + | + |
| 2 | Phosphate | + | + |
| 3 | Chloride | + | + |
| 4 | Sulphate | + | + |
| Basic radicals | | | |
| 5. | Potassium | - | - |

**Table No: 3 Extractive values of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl. No. | Type of Extractives | *Choorna* | *Bhavitha Choorna* |
|---|---|---|---|
| 1. | Cold water soluble | 11% | 12.5% |
| 2. | Hot water soluble | 14% | 17% |
| 3. | Cold alcohol soluble | 18.16% | 19.12% |
| 4. | Hot alcohol soluble | 6.4% | 4.2% |

**Table No: 4 Successive solvent extractives value of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl. No. | Solvents | *Choorna* | *Bhavitha Choorna* |
|---|---|---|---|
| 1. | Petroleum ether | 0.7% | 0.4% |
| 2. | Cyclohexane | 0.34% | 0.22% |
| 3. | Acetone | 1.5% | 3% |
| 4. | Alcohol | 4.9% | 5.8% |

**Table No: 5 Qualitative phytochemical analysis of cold water extract of *Choorna* (powder) and *Bhavitha Choorna* (processed powder) of *Durva* (whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl. No. | Experiment | *Choorna* | *Bhavitha Choorna* |
|---|---|---|---|
| 1. | Test for Alkaloids | | |
| | Dragendroff's test | - | - |
| | Meyer's test | + | + |
| 2. | Test for flavonoids | - | - |
| 3. | Test for Saponins | + | + |
| 4. | Test for Carbohydrates | | |
| | Fehling's test | + | + |
| | Benedict's test | + | + |
| 5. | Test for proteins | + | + |
| 6. | Test for Phenols | | |
| | Ferric Chloride test | + | + |
| | Lead Acetate test | - | - |
| 7. | Test for Steroids | + | + |
| 8. | Test for Tannins | | |
| | Ferric Chloride test | + | + |
| | Lead Acetate test | + | + |

**Table No: 6 Qualitative phytochemical analysis of successive solvent extracts of *Durva Choorna* (powder of whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl. No. | Experiment | Extracts | | | |
|---|---|---|---|---|---|
| | | Petroleum ether | Cyclohexane | Acetone | Alcohol |
| 1. | Test for Alkaloids | | | | |
| | Dragendroff's test | - | - | - | + |
| | Meyer's test | + | - | - | + |
| 2. | Test for flavonoids | + | - | - | + |
| 3. | Test for Phenols | | | | |
| | Ferric Chloride test | + | + | - | + |
| | Lead Acetate test | + | + | - | + |
| 4. | Test for Steroids | + | - | + | + |

**Table No: 7 Qualitative phytochemical analysis of successive solvent extracts of *Bhavitha Durva Choorna* (processed powder of whole plant of *Cynodon dactylon* (Linn.) Pers.)**

| Sl. No. | Experiment | Extracts | | | |
|---|---|---|---|---|---|
| | | Petroleum ether | Cyclohexane | Acetone | Alcohol |
| 1. | Test for Alkaloids | | | | |
| | Dragendroff's test | - | - | - | + |
| | Meyer's test | + | - | - | + |
| 2. | Test for flavonoids | + | - | - | + |
| 3. | Test for Phenols | | | | |
| | Ferric Chloride test | + | + | - | + |
| | Lead Acetate test | + | + | - | + |
| 4. | Test for Steroids | + | - | + | + |