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Quality Assessment of Maha Aswaganthi Chooranam via Phytochemical and Physicochemical investigations

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Abstract:

The present study aimed to perform a comprehensive phytochemical and physicochemical evaluation of the classical Siddha herbal formulation, *Maha Aswaganthi Chooranam*, to ensure its quality, safety, and standardization. The formulation was subjected to physicochemical analysis, phytochemical profiling, particle size determination, and solubility assessment in accordance with the guidelines prescribed by the Pharmacopoeial Laboratory for Indian Medicine (PLIM). Physicochemical parameters revealed the following values: loss on drying – 8.4 ± 0.2%, total ash – 2.1 ± 0.5%, acid-insoluble ash – 0 ± 0%, water-soluble extractive value – 11.37 ± 1.62%, and alcohol-soluble extractive value – 8.46 ± 0.41%. Preliminary phytochemical screening confirmed the presence of alkaloids, flavonoids, glycosides, tannins, saponins, terpenoids, triterpenoids, phenolic compounds, carbohydrates, reducing sugars, and lignin. Microscopic examination and particle size analysis showed an average particle size of 138 ± 34.3 µm.The obtained results indicate that *Maha Aswaganthi Chooranam* complies with quality control parameters and contains diverse bioactive constituents, thereby supporting its traditional therapeutic applications and ensuring its suitability for medicinal use.

Keywords: *Siddha, Maha aswaganthi chooranam , Physicochemical analysis, Phytochemical profiling,Particle size determination.*

Introduction:

Siddha is one of the world's oldest traditional medical systems, utilizing formulations derived from animals, minerals, herbs, and combinations of herbs (poly-herbals). These medicines are gaining increasing attention for their potential therapeutic benefits and minimal side effects. To ensure their quality, safety, and effectiveness—and to successfully integrate them into modern healthcare—standardization is essential. *Siddha* physiology is founded on the balance between three fundamental humours: *Vali* (air), *Azhal* (fire), and *Iyyam* (water). Any disturbance in this balance results in disease, known as "*Noi nilai*." Therefore, treatment in *Siddha* aims to restore the balance of these disrupted humours. In particular, an imbalance of *Kapham (Iyyam)* and *Vadham (Vali)* in the respiratory system can alter the airways by releasing inflammatory substances, leading to bronchoconstriction. This sudden narrowing of the airways causes difficulty in breathing. In *Siddha* literature, this condition is referred to as *Swasakasam* or *Eraippu Noi*. The symptoms of *Swasakasam* closely correspond to those of bronchial asthma as described in modern medicine. Bronchial asthma is a serious global health problem. 5% to 10% of persons of all ages suffer from this chronic airway disorder. Asthma is a chronic inflammatory disease of the airways characterized by bronchial hyperreactivity and a variable degree of airway obstruction. The prevalence of bronchial asthma in India differs across various studies and age groups, with estimates typically ranging from 2% to 15.7%. According to Medires, a major study estimated that around 34.3 million people in India are affected by asthma, representing 12.9% of the global asthma burden. The *Siddha* system of medicine recommends various polyherbal and herbomineral formulations for managing *Swasakasam* (Bronchial Asthma). One such remedy is the classical *Siddha* preparation *Maha Aswagandhi Chooranam*, a polyherbal formulation referenced in traditional *Siddha* texts.The *Anuboga vaithiya bramma ragasiyam* Part 2 Page no 102. For the standardization of this drug, physicochemical parameters such as loss on drying, total ash value, acid-insoluble ash, water-soluble extractive, alcohol-soluble extractive, pH, and solubility, particle size are analyzed. These tests are essential for detecting adulterants, ensuring shelf-life, and maintaining batch-to-batch consistency. Phytochemical analysis enables the identification and quantification of bioactive plant compounds such as alkaloids, flavonoids, tannins, phenols, saponins, glycosides, proteins, and carbohydrates, triterpenoids,lignin which contribute to the therapeutic effects of *Siddha* formulations

MATERIALS AND METHODS

Selection of the drug:

The *Siddha* formulation *Maha Aswagandhi Chooranam (MAC)* was selected as the trial drug. It is derived from the *Siddha* literature *Anuboga Vaithiya Bramma Ragasiyam* Part 2 Page No-102 and is indicated for the management of bronchial asthma.

Ingredients of the *Maha Aswaganthi Chooranam (MAC)*

Table no 1: Ingredients of *MAC*

S.NO	INGREDIENTS	BOTANICAL NAME	QUANTITY
1	*Lavangam*	*Sygygium aromaticum*	1 palam(35g)
2	*Sirunaaga poo*	*Mesua nagassarium*	2 palam(70g)
3	*Kaasa elam*	*Amomum globosum*	4 palam(140g)
4	*Nar seeragam*	*Cuminum cyminum*	8 palam(280g)
5	*Thippili*	*Piper longum*	16 palam(562g)
6	*Chukku*	*Zingiber officinale*	32 palam(1120g)

7	*Amukkura kizhangu*	*Withania somnifera*	64 palam(2240g)
8	*Seena karkandu*	*Saccharum officinarum*	7 ser (1960g)

Figure no :1 Ingredients of *MAC*

Lavangam

(Syzygium aromaticum)

Sirunagapoo

(Mesua nagassarium)

Kaasa Elam

(Amomum globosum)

Narseeragam

Cuminum cyminum

Thippili

(Piper longum)

Chukku

(Zingiber officinale)

Amukkara kizhangu

(Withania somnifera)

Seena karkandu

Saccharum officinarum

Collection of the drug :

The raw drugs were procured from an authorized national herbal drug store in Chennai.

Drugs Recognition and authentication :

Botanists and experts from the PG Gunapadam (Pharmacology) Department at Government Siddha Medical College, Arumbakkam, Chennai, have identified and authenticated all the raw drugs. Each sample has been properly labeled and preserved in the PG Gunapadam laboratory for future reference.

Purification of Raw drugs:

The purification of all ingredients was carried out as per the guidelines of traditional *Siddha* literature, ***Sarakkugalin Suddhi Seimuraigal***.

Method of preparation:

The ingredients *Lavangam*, *Sirunaaga poo, Kaasa elam*, *Nar seeragam*, *Thippili, Chukku*, and *Amukkura kizhangu* were taken, finely powdered, and sieved using a thin cloth to obtain a smooth consistency. The resulting powder was then purified using the *Pittaviyal* method (steam purification technique).

Then It is mixed well with *seenakarkandu* powder and dried and bottled up in an air tight container and labelled as *Maha Aswaganthi Chooranam*

Drug profile:

Drug name : *Maha Aswaganthi Chooranam*

Route of administration : Oral

Dosage :*Thirikadi* (800mg-1000mg)

Adjuvant : Milk or Ghee

Indications :*Swasam 5, Kaasam 5, Gunmam 8, Paandu 5,Megam 18*

Standardization of the drug:

Standardization of the drug provides validation for its use as a medicinal product by subjecting it to various analyses to determine its quality, safety, and efficacy. This process involves evaluating organoleptic properties, conducting physicochemical and phytochemical analysis, and identifying the active constituents and elements present in the formulation were done at Noble Research Institute,Perambur ,Chennai.

Organoleptic character :

The organoleptic characters of the sample were assessed, including its Appearance,State ,Nature, odour, Touch and other morphological characteristics.

Physicochemical analysis:

The physicochemical properties were evaluated, and the findings were systematically recorded.

Loss on Drying:

Test drug was accurately weighed in evaporating dish. The sample was dried at 105oC for 5 hours and then weighed.

Determination of Total Ash:

Test drug was accurately weighed in silica dish and incinerated at the furnace a temperature 400oC until it turns white in color which indicates absence of carbon. Percentage of total ash will be calculated with reference to the weight of air-dried drug.

Determination of Acid Insoluble Ash:

The ash obtained by total ash test will be boiled with 25 ml of dilute hydrochloric acid for 6mins. Then the insoluble matter is collected in crucible and will be washed with hot water and ignited to constant weight. Percentage of acid insoluble ash will be calculated with reference to the weight of air-dried ash.

Determination of Alcohol Soluble Extractive:

Test sample was macerated with 100 ml of Alcohol in a closed flask for twenty-four hours, shaking frequently during six hours and allowing it to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105oC, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

Determination of Water Soluble Extractive:

Test sample was macerated with 100 ml of chloroform water in a closed flask for twenty-four hours, shaking frequently during six hours and allowing it to stand and for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105oC, to constant weight and weigh. Calculate the percentage of water-soluble extractive with reference to the air-dried drug.

pH determination:

Required quantity of test sample was admixed with distilled water and the subjected to screening using pH meter.

Solubility:

A pinch of sample was taken in a dry test tube and to it 2ml of the solvent was added and shaken well for about a minute and the results were observed. The test was done for solvents like Chloroform, Ethanol, Water, Ethyl Acetate, Hexane, Dimethyl sulphide (DMSO) and the results were observed individually.

Phytochemical analysis:

The phytochemical screening of the extract provides a general understanding of the types of chemical constituents present in the crude drug. The tests were carried out following the standard procedures described in the method.

Test for alkaloids:

Mayer's Test: To the test sample, 2ml of mayer's reagent was added, a dull white precipitate revealed the presence of alkaloids.

Test for saponins:

To the test sample, 5 ml of water was added and the tube was shaken vigorously. Copious lather formation indicates the presence of Saponins.

Test for tannins:

To the test sample, ferric chloride was added, formation of a dark blue or greenish black color showed the presence of tannins.

Test for glycosides- Borntrager's Test:

Test drug is hydrolysed with concentrated hydrochloric acid for 2 hours on a water bath, filteredand the hydrolysate is subjected to the following tests. To 2 ml of filtered hydrolysate, 3 ml of choloroform is added

and shaken, choloroform layer is separated and 10% ammomia solution is added to it. Pink colour indicates presence of glycosides.

Test for flavonoids:

Alkaline reagent test. Two to three drops of sodium hydroxide were added to 2 mL of extract. Initially, a deep yellow colour appeared but it gradually became colourless by adding few drops of dilute HCL, indicating that flavonoids were present.

Test for phenols:

Lead acetate test: To the test sample; 3 ml of 10% lead acetate solution was added. A bulky white precipitate indicated the presence of phenolic compounds.

Triterpenoids:

Liebermann–Burchard test: To the chloroform solution, few drops of acetic anhydride was added then mixed well. 1 ml concentrated sulphuric acid was added from the sides of the test tube, appearance of red ring indicates the presence of triterpenoids.

Test for Carbohydrates – Benedict's test:

To the test sample about 0.5 ml of Benedic's reagent is added. The mixture is heated on a boiling water bath for 2 minutes. A characteristic colored precipitate indicates the presence of sugar.

Molisch's test:

To 2ml of a plant sample extract, two drops of of alcoholic solution of alpha naphthol are added. The mixture is shaken well few drops of concentrated sulphuric acid slowly along the sides of the test tube. A violet ring indicates the presence of carbohydrates.

Proteins (Biuret Test):

To extracts 1% solution of copper sulphate was added followed by 5% solution of sodium hydroxide, formation of violet purple colour indicates the presence of proteins.

Test for Gum and Mucilage:

To 1ml of extract add 2.5 ml of absolute alcohol and stirring constantly. Then the precipitate was dried in air and examine for its swelling properties. Swelling was observed that will indicate presence of gum and mucilage.

Particle Size Determination by Microscopic Method:

Particle size determination was carried out by the optical microscopic method. In which the sample was dissolved in sterile distilled water (app $1/100^{th}$ dilution). Diluted samples were mounted on the slide and fixed with the stage of an appropriate location. Light microscopic images were drawn with a scale micrometer to arrive at the average particle size. Minimum of 30 observations were made to ascertain the mean average particle size of the sample.

Results:

Organoleptic character:

Figure no 2 : *MAC*

Table no 2 : Organoleptic characters of *MAC*

State	Solid
Nature	Fine
Odor	Characteristic
Touch / Consistency	Soft
Flow Property	Non Free flowing
Appearance	Brownish

The results revealed that *Maha Aswagandhi Chooranam (MAC)* is a fine powder with a pale color, characteristic odor, and a sweet taste.

Table no 3: Physicochemical analysis oh *MAC*

S.No	Parameter	Mean (n=3) SD
1.	***Loss on Drying at 105 °C (%)***	8.4 ± 0.2
2.	***Total Ash (%)***	2.1 ± 0.5
3.	***Acid insoluble Ash (%)***	0 ± 0
4.	***Water soluble Extractive (%)***	11.37 ± 1.62
5.	***Alcohol Soluble Extractive (%)***	8.46 ± 0.41
6.	***pH***	6.62

Table no 4: Solubility profile of *MAC*

S.No	Solvent Used	Solubility / Dispensability
1	Chloroform	Insoluble
2	Ethanol	Soluble
3	Water	Soluble
4	Ethyl acetate	Insoluble
5	DMSO	Soluble

Table no 5: Phytochemical assessment of *MAC*.

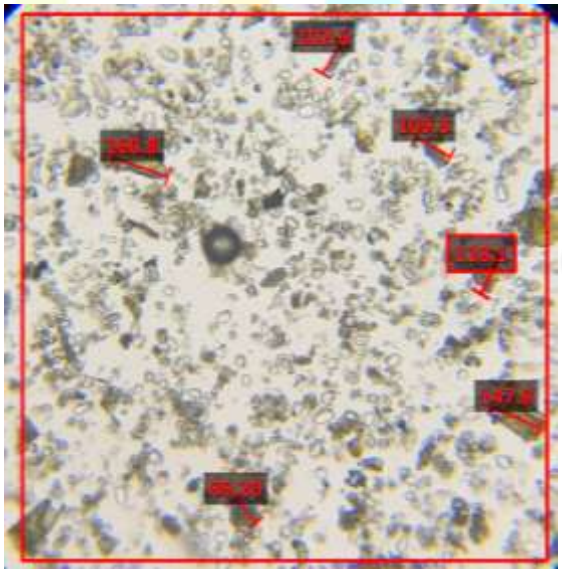
Phyto Chemical Analysis

S.No	Name of the Phyto constituents	Aqueous extract of Maha aswagandi Chooranam
1.	Alkaloids	+
2.	Carbohydrates	+
3.	Reducing sugar	+
4.	Glycosides	+
5.	Proteins and Amino acids	-
6.	Flavonoids	+
7.	Phenolic compounds	+
8.	Tannins	+
9.	Saponins	+
10	phytosterols	-
11	Terpinoides	+
12	Triterpinoides	+
13	Lignin	+
14	Quinone	-
15	Emodins	-
16	Gums and Mucilage	-

(+) Indicates Positive and (-) Indicates Negative

Particle size of determination:

Figure no : Microscopic examination for particle size analysis of *MAC*.



The microscopic observation of the particle size analysis reveals that the average particle size of the sample was found to be 138 ± 34.3 µm.

Discussion:

Standardization of herbal formulations is crucial for evaluating the quality, efficacy, and potency of the drug. *Maha Aswaganthi Chooranam* was standardized through various methods, including the assessment of its organoleptic properties, physicochemical parameters, and phytochemical profiling.

MAC is a finely powdered formulation characterized by its pale colour, pleasant aroma, and sweet taste, which contribute to its ease of consumption.

Solubility plays a vital role in ensuring the effective absorption of a drug within the gastrointestinal tract.The drug *MAC* is soluble in specific solvents such as Water, DMSO, and Ethanol, demonstrating its enhanced solubility, which may improve its bioavailability in the stomach.The microscopic observation of the particle size analysis reveals that the average particle size of the sample was found to be 138 ± 34.3 µm.

The drug *MAC* has a pH of 6.62, indicating a weakly acidic nature. This acidity is important for its bioavailability and therapeutic effectiveness, as acidic drugs are generally better absorbed in the stomach.

The loss on drying was recorded as 8.4 ± 0.2, representing the moisture content of the drug. The total ash content was 2.1 ± 0.5, indicating the presence of inorganic substances.The acid-insoluble ash was 0 ± 0, confirming the absence of siliceous matter.

MAC showed a water-soluble extractive value of 11.37 ± 1.62 and an alcohol-soluble extractive value of 8.46 ± 0.41, suggesting the presence of diverse phytoconstituents.

Phytochemical screening of the *MAC* formulation revealed the presence of Alkaloids, flavonoids, glycosides, tannins, saponins, terpenoids, triterpenoids, phenolic compounds , carbohydrates, reducing sugars, and lignin.

Nanoparticles improve drug solubility and bioavailability, decrease macrophage clearance, and reduce side effects, thereby enabling lower dosages and enhancing therapeutic efficacy.

Conclusion:

The study confirms that the *Maha Aswaganthi Chooranam (MAC)* sample was prepared and processed under hygienic conditions, validating its quality.

Maha Aswaganthi Chooranam (MAC) was standardized following PLIM guidelines and established procedures. The findings from the assessment of organoleptic traits, physicochemical properties, and phytochemical composition provide essential benchmarks for authenticating and evaluating the safety and quality of this Siddha herbal formulation. These parameters may serve as reference standards for future quality control and assessment of the drug.

Declaration by Authors:

Ethical approval

Approved

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Conflict of interest:

The author declares no conflicts of interest.

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