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Maranta Arundinacea Linn. (*Tugaksheeri*) – Phytochemical Evaluation

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ABSTRACT:

Tugaksheeri is an important drug that has been widely used in the preparation of various ayurvedic formulations. The plant is botanically identified as *Maranta arundinacea* Linn. of marantaceae family and has a nutrient dense starchy rhizome which has very low glycemic index, easy to digest and ideal for meeting the nutritional demands of sick. As per *Samhithas* and *nighantus* it is used in the treatment of *kshaya* (tuberculosis), *swasa* (dyspnoea), *kasa* (cough), *daha* (burning sensation), *raktha dosha* (disorders of blood), *kamala* (jaundice), *pandu* (anaemia) and *mutrakruchra* (dysuria). In folklore practices it is widely used in the treatment of *diarrhea*, dysentery and colitis. In order to validate these traditional claims scientifically and also to determine the quality and purity preliminary phytochemical evaluation of the drug was carried out. It revealed the presence of variable phytoconstituents such as alkaloids, phenol, flavonoids, steroid, carbohydrate etc which are responsible for the therapeutic potential of the drug. Values of total ash, acid insoluble ash, moisture content, alcohol and water-soluble extractives were comparable with the available references. Apart from the findings of previous research works, in the present study water insoluble ash value, quantitative estimation of fibre, tannin, total sugar, reducing sugar, qualitative analysis of ash for acid and basic radicals, successive solvent extraction in various solvents like petroleum ether, cyclohexane, acetone and alcohol, qualitative analysis of successive solvent extractives were carried out for the first time. All these findings will help to ensure the quality and purity of the drug.

Key words: Phytochemical analysis, *Tugaksheeri*, *Maranta arundinacea* Linn., phytoconstituents, therapeutic potential

INTRODUCTION

Tugaksheeri is an important drug that has been widely used in Ayurvedic classics. In *samhithas* the drug is extensively used in various compound formulations. The plant is botanically identified as *Maranta arundinacea* Linn. of marantaceae family.[1] The plant has a nutrient dense starchy rhizome which has very low glycemic index, easy to digest and ideal for meeting the nutritional demands of sick.[2] As per *Samhithas* and *nighantus* it is having *Madhura rasa*

(sweet in taste), *sheetha veerya* (cold potency),[3] *guru* (heavy)[4] *snigdha* (unctuous)*guna*.[5] It is *balya* (provides strength),[6] *paushtikam* (nourishing),[7] *dhatuvridhikara* (nourishing dhatus)[5] and used in the treatment of *kshaya* (tuberculosis), *swasa* (dyspnoea), *kasa* (cough),[3] *daha* (burning sensation), *raktha dosha* (disordres of blood), *kamala* (jaundice), *pandu*(anaemia)[5,6] and *mutrakruchra* (dysuria)[5]. In folklore practices it is widely used in the treatment of diarrhoea, dysentery and colitis. The rhizome powder cooked in milk, is given along with sugar, in irritable bowel syndrome and ulcerative colitis to alleviate the irritation and facilitate the healing of ulcers.[8] Now a days extensive research works are conducting to validate these traditional claims scientifically and proved its anti-oxidant, immunostimulatory, vibriocidal, antiulcerogenic[9] and hepatoprotective activity.[10] Phytochemical evaluation refers to the extraction, screening and identification of medicinally active substances in plants which are responsible for various pharmacological activities. So phytochemical evaluation is the primary stepping stone for scientific validation of pharmacological activities. Standards for preliminary phytochemical evaluation of some of the parameters were provided in *Ayurvedic pharmacopoeia of India* [11] and *Quality standards of Indian medicinal plants*.[12] Previous research works were also conducted for evaluation of phytochemical standards of *Maranta arundinacea* Linn. [13], [14], [15]. Present study aimed to validate its therapeutical potential and also contribute more findings towards to prove the identity, genuinity and purity of the drug.

MATERIALS AND METHODS

Collection and preparation of drug

Fresh rhizome of *Maranta arundinacea* Linn. free from all contaminations were collected from the cultivated lands of Palakkadu district during January 2021. Identification of the collected plant specimen was done by a senior faculty at Department of Dravyaguna vijnanam, Govt. Ayurveda College, Tripunithura. Collected fresh rhizomes were washed thoroughly, then the outer scale leaves were removed, cut into small pieces and dried well under shade. Well dried rhizomes were then powdered and sieved through a mesh size of 120. The obtained fine powder was then stored in air tight containers and used for phytochemical evaluations. (Figure 1,2,3)

Reagents

Dilute and concentrated sulphuric acid, dilute and concentrated hydrochloric acid, xylene, dilute and concentrated nitric acid, sodium hydroxide solution, lead acetate solution, anhydrous sodium carbonate, potassium permanganate solution, petroleum ether, cyclohexane, acetone, methanol, fehling's solution A and B, chloroform, dragendroff's reagent, mayer' s reagent, neutral ferric chloride, magnesium ribbon, methylene blue reagent, sodium bicarbonate, copper sulphate, catechol, folin catechu phenol reagent.

Apparatus

Silica crucible, round bottom flask, Dean and stark's apparatus, Clevenger's apparatus, Soxhelet apparatus, water condenser, hot air oven, muffle furnace, Bunsen burner, heating mantle, petridishes, glass beakers, standard flask, conical flask, measuring jars, glass rods, funnel, watch glass, burettes, pipettes, shaker, centrifuge, whatmann filter paper.

Procedure

Physicochemical parameters

Rhizome of *Maranta arundinacea* Linn. was studied for physico chemical standards like foreign matter, total ash, acid insoluble ash, water insoluble ash, volatile oil, moisture content, fibre, tannin, total sugar, reducing sugar, phenol and pH.

Qualitative analysis of ash

Ash of rhizome of *Maranta arundinacea* Linn. was subjected to qualitative analysis to confirm the presence of acid radicals carbonate, phosphate, chloride and sulphate and basic radical potassium.

Determination of extractive values

Extractive values at different solvents were used to assess the quality, purity and also to detect adulteration. The cold and hot water soluble extractive values, the cold and hot alcohol soluble extractive values of the rhizome of *Maranta arundinacea* Linn. were evaluated in the study. Successive solvent extraction of the drug was carried out using the solvents petroleum ether, cyclohexane, acetone and alcohol.

Phytochemical parameters

Preliminary phytochemical screening of the drug was done to confirm the presence or absence of phytochemical constituents alkaloids, flavonoids, phenol, saponins, carbohydrates, proteins, steroids and tannins. Qualitative analysis of petroleum ether, cyclohexane, acetone and alcohol extracts were done for analysing the presence of steroids, alkaloids, flavonoids and phenols.

All the above procedures were done as per the standard procedures mentioned in *Ayurvedic Pharmacopoeia of India.*

RESULTS

A. Determination of physicochemical parameters

Physicochemical parameters such as foreign matter, total ash, acid insoluble and water insoluble ash, moisture and volatile oil contents, estimation of fibre, tannin, sugar, phenol and pH were done for *choorna* (powder) of rhizome of *Maranta arundiacea* Linn. (Table 1)

B. Qualitative analysis of ash

The qualitative analysis of ash of *choorna* (powder) of *Maranta arundinacea* Linn. rhizome showed the presence of carbonates, phosphate, chloride, sulphate and potassium. (Table 2)

C. Determination of extractive values (water soluble and alcohol soluble)

Cold alcohol soluble and hot alcohol soluble extractive value of the powdered drug was 1.3 % and 7.6 % respectively. The cold water soluble and hot water-soluble extractive value of the powdered drug was 14.7 % and 65.4 % respectively. (Table 3)

D. Determination of Successive solvent extractive values

The following results were obtained on successive solvent extraction of powdered rhizome in solvents like petroleum ether, cyclohexane, acetone and alcohol. (Table 4)

E Determination of the phytochemical constituents

a. Qualitative analysis

Qualitative analysis of the powdered drug showed the presence of alkaloids, flavonoids, saponins, carbohydrates, proteins, phenols, steroids and tannins. (Table 5)

b. Qualitative analysis of successive solvent extractives

Results obtained for qualitative analysis of successive solvent extractives in petroleum ether, cyclohexane, acetone and alcohol of *choorna* (powder) of rhizome of *Maranta arundinacea* Linn. were tabulated. (Table 6)

DISCUSSION

Detailed preliminary phytochemical evaluation of the drug was carried out to determine the quality and purity of the drug. In the present study, Physicochemical parameters such as foreign matter, total ash, acid insoluble and water insoluble ash, presence of moisture and volatile oil were assessed. Qualitative and quantitative estimation of fibre, tannin, sugar, phenol and pH were also done and all the results were compared with the available references. Reference value of loss on drying, total ash, acid insoluble ash, water soluble ash, pH, volatile oil content and moisture content were available from *Ayurvedic Pharmacopoeia of India* and various research articles. Water insoluble ash value, quantitative estimation of fibre, tannin, total sugar, reducing sugar, qualitative analysis of ash for acid and basic radicals, successive solvent extraction in various solvents like petroleum ether, cyclohexane, acetone and alcohol, qualitative analysis of successive solvent extractives were carried out for the first time in the present study.

The powdered drug was devoid of foreign matters such as sand and wood particles, insect debris and other animal contaminants, which proved its purity. Total ash value is the residue remaining after incineration and it indicates the measure of inorganic impurities like sand particles, stone etc. In this study the total ash value of the rhizome powder of the drug was 2.65%, which lies within in the normal reference range as per literature. Acid insoluble ash value represents the siliceous impurities in the sample and in the present study it was found 0.6% and was within the limit. The water insoluble ash value of the powdered drug was calculated as 1.6%, but there are no references available to compare the result. Moisture content of the drug indicates the chance for the decomposition of crude drug either through a chemical change or through microbial growth. The moisture content of the powdered drug was 6% and the result was within the limit. Trace amount of volatile content was obtained from the powdered drug and which was found similar with the data available from the literature. The results of quantitative estimation of fibre content, tannin, total sugar and reducing sugar in the present study were 0.80%, 10.62%, 5.16% and 2.45% respectively. But there is no available data in the literature about the quantitative estimation of these parameters to compare the results. The pH of the rhizome powder of the drug was 6.02% and it turned blue litmus paper to red and which showed its weak acidic nature. Qualitative ash analysis of the rhizome powder of the drug showed the presence of all acid radicals such as carbonates, phosphate, chloride and sulphate and the basic radical potassium. But there was no reference available on assessment of these parameters to compare the results.Extractive values indicate the presence of various phytoconstituents in the drug. It is used to assess the quality of the drug and also used to detect the presence of exhausted drug. Alcohol and water-soluble extractive values of the drug was mentioned in *Ayurvedic Pharmacopoeia of India.* In the present study cold and hot alcohol soluble extractive values were 1.3% and 7.6% respectively and cold water and hot water-soluble extractive values were 14.7% and 65.4% respectively and the values were comparable with the reference value in *Ayurvedic Pharmacopoeia of India.* Here water-soluble

extractive value was higher than alcohol soluble extractive value. And the maximum number of active principles were extracted in water soluble extractives. Successive solvent extraction is the method of extraction of phytoconstituents in the drug using solvents of increasing polarity from a non-polar to a highly polar solvent. Here the solvents used were petroleum ether, cyclohexane, acetone and alcohol and the obtained extractive values were 0.08%, 0.04%, 0.13%, 1.32% respectively. Maximum extractive value was obtained in the solvent methanol. But no references were available to compare the results. In qualitative analysis of the drug, reference regarding the presence of constituents such as starch, carbohydrate, cyanogenic glycoside, cardiotonic glycosides, saponin, terpenoid, resin and flavonoids were available in the literature. Presence of alkaloid, phenol, steroid, proteins, carbohydrates, flavonoids, tannin and saponins were observed in the powdered drug sample in the present study. Then the obtained successive solvent extracts were subjected to qualitative analysis in order to confirm the presence of phytoconstituents. In this study alkaloids and steroids were present in all the four extracts. Flavonoids was present in cyclohexane, acetone and alcohol extracts and was absent in petroleum ether extract. Presence of phenol was found only in cyclohexane and alcohol extract. As per the research article[13] only steroid was present in the petroleum extract and alkaloids, flavonoids and phenol were present in methanolic extract. But in the another article[16] all the four constituents, alkaloids, steroid, phenol and flavonoids were present in methanolic extract.

CONCLUSION

Phytochemical analysis of the powered dried rhizome of *Maranta arundinacea* Linn. revealed the presence of variable phytoconstituents such as alkaloids, phenol, flavonoids, steroid, carbohydrate etc which are responsible for the therapeutic potential of the drug. Values of total ash, acid insoluble ash, moisture content, alcohol and water-soluble extractives were comparable with the available references. Apart from the findings of previous research works, water insoluble ash value, quantitative estimation of fibre, tannin, total sugar, reducing sugar, qualitative analysis of ash for acid and basic radicals, successive solvent extraction in various solvents like petroleum ether, cyclohexane, acetone and alcohol, qualitative analysis of successive solvent extractives were carried out. All these findings will help to ensure the quality and purity of the drug.

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Table 1: Physico-chemical parameters of *choorna* (powder) of dried rhizome of *Maranta arundinacea* Linn.

Sl no.	Parameters	*Choorna* (powder) of rhizome of *Maranta arundinacea* Linn.
1	Foreign matter	Nil
2	Total ash	2.65%
3	Acid Insoluble Ash	0.6%
4	Water Insoluble Ash	1.6%
5	Moisture Content	6%
6	Volatile oil	Traces
7	Fibre	0.80%
8	Tannin Content	10.62%
9	Total sugar	5.16%
10	Reducing sugar	2.45%
11	Phenol	0.32%
12	pH	6.02

Table 2: Qualitative analysis of ash of *choorna* (powder) of dried rhizome of *Maranta arundinacea* Linn.

Sl no	Experiment	Ash of *choorna* (powder) of rhizome of *Maranta arundinacea* Linn.
Acid Radicals		
1	Carbonate	+
2	Phosphate	+
3	Chloride	+
4	Sulphate	+
Basic Radical		
5	Potassium	+

Table 3: Extractive values (water soluble and alcohol soluble) of *choorna* (powder) of rhizome of *Maranta arundinacea* Linn.

Sl no	Type of Extractives	*Choorna* (powder) of rhizome of *Maranta arundinacea* Linn.
1	Cold Alcohol soluble	1.3%
2	Hot Alcohol soluble	7.6%
3	Cold water soluble	14.7%
4	Hot water soluble	65.4%

Table 4: Extractive values (in different solvents) of *choorna* (powder) of Rhizome of *Maranta arundinacea* Linn.

Sl no	Solvents	*Choorna* (powder) of rhizome of *Maranta arundinacea* Linn.
1	Petroleum ether	0.08 %
2	Cyclohexane	0.04 %
3	Acetone	0.13 %
4	Alcohol	1.32 %

Table *5*: Qualitative phytochemical analysis of *choorna* (powder) of rhizome Of *Maranta arundinacea* Linn.

Sl.no	Experiment	*Choorna* (powder) of rhizome of *Maranta arundinacea* Linn.
1	b. Meyer's test	+
2	Flavonoids	+
3	Saponins	+
4	Carbohydrates a. Fehling's test	+
	b. Benedict's test	+
5	Proteins	+
6	Phenols a. Ferric chloride test	+
	b. Lead acetate test	+
7	Steroids	+
8	Tannins a. Ferric chloride test	+
	b. Lead acetate test	+

Figure 3 Dried rhizome powder of *Maranta arundinacea* Linn.

Table 6: Qualitative analysis of successive solvent extractives of *choorna* (powder) of rhizome of *Maranta arundinacea* Linn.

Sl no	Extract	Steroids	Alkaloids	Flavonoids	Phenols
1	Petroleum ether	+	+	-	-
2	Cyclohexane	+	+	+	+
3	Acetone	+	+	+	-
4	Alcohol	+	+	+	+

Figure 1 *Maranta arudinacea* Linn.

Figure 2 Rhizome of *Maranta arundinacea* Linn.

Figure 3 Dried rhizome powder of *Maranta arundinacea* Linn.