International Journal of Research in Pharmacy and Pharmaceutical Sciences
ISSN: 2455-698X; Impact Factor: RJIF 5.22
www.pharmacyjournal.in
Volume 2; Issue 3; May 2017; Page No. 26-30

Biochemical and phytochemical analysis of *maranta arundinacea* (L.) Rhizome

Amrutha Jayakumar, * A Suganthi

Assistant Professor, Department of Botany, Nirmala College for Women, Coimbatore, Tamil Nadu, India

Abstract
Maranta arundinacea, (L.) belongs to the family Marantaceae. The plant rhizome evaluated for the biochemical and preliminary phytochemical analysis. Nutritional analysis showed that moisture content is (7.6%), ash content (1.2%) carbohydrates (7200mg/100g), proteins (1200mg/100g) and starch (6480mg/100g).Based on this work, concluded that *Maranta arundinacea* L. rhizome show high nutritional value. It is used as baby food. It is used to treat indigestion, diarrhea and urinary infections. Powdered rhizome of *Maranta arundinacea* was extracted with methanol and aqueous solvents and tested for phytochemical analysis. Phytochemical analysis revealed the presence of alkaloids, glycosides, flavonoids, terpenoids, saponins and tannins. Based on the phytochemical analysis alkaloids, glycosides and saponins are abundantly present in methanol and aqueous extract. Alkaloids are used in reducing headache and fever. Glycosides are used to cure coughs and circulatory problems. Saponins have anticancer, antioxidant and anti-inflamatory properties and helps in losing weight. *Maranta arundinacea* rhizome recommended for pharmaceutical industry.

Keywords: *maranta arundinacea,* nutritional, phytochemical, rhizome

Introduction
Over past decade the extensive use of natural plants as primary health remedies due to their pharmacological properties is quite common (Lee *et al*., 2004) [14]. Herbal products have gained increasing popularity in the last decades, and are now used by approximately 20% of the population Plants have been a source of medicine for thousands of years and phytochemical continue to play an essential role in medicine (Bent, 2008) [3]. Phytochemicals are biologically active, naturally occurring chemical compounds found in the plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients (Hasler 1999) [9]. They protect plant from disease and damage and contribute to the plant's colour, aroma, and flavour (Gibson 1998) [6]. Each medicinal plant species has its own nutrientcomposition besides having pharmaco-logically important phytochemicals. These nutrients are essential for the physiological functions of human body. Such nutrients and biochemicals like carbohydrates, fats and proteins play an important role in satisfying human needs for energy and life processes (Hoffman *et al*., 1998; Mathews *et al*., 1999; Dingman, 2002) [10, 15, 4].

Maranta arundinacea L. Commonly known as West Indian arrowroot is an important starchy medicinal plant which finds uses in traditional food and medicine from time immemorial (Pradeepkumar 2008) [17] (Fig 1).It belongs to the family Marantaceae having 31 genera and about 550 species distributed throughout the tropics (Andersson 2008) [1]. *Maranta arundinacea* is native to Mexico, Central America, West Indies and South America The tuberous rhizomes are rich in starch and used in confectionery for the preparation of biscuits and also in the preparation of weaned foods (Ika *et al.*, 2011) [11]. The plant which grows under shade is resistant to many insect and pathogen (Shanthakumari *et al*., 2007) [22]. Arrowroot is bland, making it suitable for neutral diets, especially for people who are feeling nauseous (Fig 1a). The starch have medicinal uses and is an important ingredient in the preparation of barium meals and tablets (Nihaa *et al*., 2012). Recent study suggested that the arrowroot flour is potential source of prebiotics (Harmayani *et al.*, 2011) [8]. The present study deals with the nutritive and phytochemical analysis of *Maranta arundinacea.*

Fig 1: *Maranta arundinacea* (L.)

Fig 1a: Rhizome of *Maranta arundinacea*

Materials and methods

Collection of plant material

The fully mature rhizomes of *Maranta arundinacea* L. were collected from Kannur district, Kerala during September 2016. The rhizomes were washed with distilled water and shade dried. The dried rhizomes were manually grained to a fine powder. Fine powder of rhizome was stored at the air contained and it used for physiochemical analysis.

Nutritive analysis

Moisture content

Fresh weight of the sample was determined and placed the sample in a hot air oven initially for one hour at 100ºC and then the dry weight of the sample become constant.

$$\text{Moisture content \%} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Fresh weight}} \times 100$$

Total ash

About 5g of powdered rhizome was accurately weighed and taken separately in silica crucible, which was previously ignited and weighed. The powder was spread as a fine layer on the bottom of crucible. The powder was incinerated gradually by increasing temperature to make it dull red hot until free from carbon. The crucible was cooled and weighed. The procedure was repeated to get constant weight. The percentage of total ash was calculated with reference to air dried powder.

Extraction and estimation of total soluble carbohydrates

Extraction

200mg sample dried rhizome powder was suspended in 1:5(w/v) hot 70% ethanol and extracted for 10 minutes. The pellet was re-extracted twice with equal volumes of 70% of ethanol. The ethanol extracts were clarified by centrifugation, pooled and concentrated to 1-2ml. The concentrated ethanol extracts was diluted to 50 ml with distilled water.

Estimation

The total soluble carbohydrate from dried rhizome powders were extracted and estimated by the anthrone reagent method of Yemm and Wills (1954) using glucose as a standard at 660nm using a spectrometer. The average values were expressed on percentage on dry weight basis.

Extraction and estimation of total proteins extraction

Extraction

200 mg sample of dried rhizome powder were taken and was suspended in 1:5% (W/V) phosphate buffer. The extract was removed by centrifugation at 3000 rpm for 10 minutes. The pellet was washed with phosphate buffer twice and the defatted meal was washed with 100ml of cold 10% trichloro acetic acid (TCA) and centrifuged at 3000 rpm for 15 minutes. The procedure was repeated, the resulting TCA-washed pellet was suspended in NaOH solution.

Estimation

The proteins separated were estimated following the method of Lowry *et al.,* (1951) after TCA precipitation, as described earlier. The values were expressed as percentage on dry weight basis.

Extraction and estimation of starch

Extraction

Air- dried rhizome sample was suspended in 1:5(W/V) hot 80% ethanol and extracted for minutes at 90˚C.The pellet was re-extracted twice with equal volume of hot 80% ethanol. The ethanol extracts were clarified by centrifugation, pooled and concentrated to 1-2 ml by evaporations in vaco. The concentrated ethanol extract was diluted to 50 ml with glass distilled water.

Estimation

From suitable aliquots of the above extract, total soluble carbohydrates were estimated by the anthrone reagent method using glucose as a standard at 620 nm in a spectronic 20D spectrometer. The values were expressed as percentage on dry weight basis.

Preliminary phytochemical screening

Preparation of plant extract

Each 15 gm of air dried powder were taken in 50 ml of methanol and water. Plugged with cotton wool and then kept on a rotary shaker at 199-220 rpm for 48 hours. The solvent were evaporated to the final volume one-fourth of the original volume and stored at 4 °C in air tight containers. The plant extract used for phytochemical analysis The condensed extracts were used for preliminary screening of phytochemical such as alkaloid, glycosides, carbohydrates, flavonoids, terpenes, saponins, phenols, tannins, quinones, cellulose, steroids, and gums.

Chemicals

Methanol, Ethanol, Mayer's Reagent, Glacial Acetic Acid, Ferric Chloride, Concentrated Sulphuric Acid, Concentrated Hydrochloric Acid, Molish Reagent, Ammonia, Chloroform, Distilled Water, iodine.

Test for Alkaloids

To reveal the presence of alkaloids, few drops of Mayer's reagent (potassium mercuric iodide) reagent were added to the extract, cream colour precipitate visualises the presence alkaloids.

Test for Glycosides

To 2ml of extract, add 1ml of glacial acetic acid, few drops of 5% $FeCl_3$ and Conc.H_2SO_4 were added reddish brown colour at the junction of two layers and upper layers appears bluish green visualises the presence of glycosides.

Test for Carbohydrates.

To 2.3ml of extract, few drops of Molisch reagent (α-napthol) was added, shaken well and Conc. H_2SO_4 was added from the sides of the test tube, violet ring formation at the junction of two layers visualises the presence of carbohydrates.

Test for Flavonoids
To the 1 ml of extract few drops of 10% Conc. H_2SO_4 was added and followed by adding 1ml of ammonia, formation of greenish yellow precipitate visualises the presence of flavonoids.

Test for Terpenes/Terpenoids
To 2ml of extract, 5ml of chloroform and 2ml of Conc. H_2So_4 was added. Reddish brown colourations of interface visualises the presence of terpenes (Harborne; 1973).

Test for Saponins
To 2ml of extract add water and shaken vigorously for frothing presence visualizes saponins.

Test for Phenols
To 1ml of extract add alcohol and few drops of ferric chloride solution is added for the formation of greenish yellow visualises the presence of phenols.

Test for Tannins
To 1ml of extract, 1ml of 5% $FeCl_3$ was added which visualises by the presence of greenish black precipitate.

Test for Quinones
To 2ml of extract add Conc. HCl by formation of green colour visualises the presence of quinones.

Test for Steroids
To 2ml of extract, 1ml of chloroform and drop of glacial acetic acid was added, followed by heating and add Conc. H_2SO_4 which visualises by the presence of orange colour (Liebermann Burchard test, Salkowski test and Liebermann's reaction).

Results

Table 1a: Moisture content and Total ash value of dry *M. arundinacea* rhizome

Parameter Analysed	*Maranta arundinacea* rhizome
Moisture content	7.4%
Total ash	1.2%

Table 1b: Nutrition composition of *Maranta arundinacea* dry rhizome

Parameter Analysed	*M. arundinacea* rhizome
Carbohydrates	7200mg/100g
Protein	1200mg/100g
Starch	6480mg/100g

From the table 1a showed the nutrition composition of *Maranta arundinacea* rhizome contain moisture content (7.4%), total ash (1.2%). Table 1b showed the presence of carbohydrate (7200mg/100g), protein (1200mg/100g) and starch (6480mg/100g).

Table 2: Phytochemical constitutent of *Maranta arundinacea* dry rhizome.

Phytochemical components	Methanolic extract	Aqueous extract
Alkaloids	++	++
Glycosides	++	++
Flavonoids	+	-
Terpenes	+	+
Saponins	++	+
Phenol	+	+
Tannins	+	_
Quinones	-	-
Steroid	-	-

(++ strong presence, + Presence, - absence)

Qualitaive phytochemical screening of *Maranta arundinacea* rhizome in methanolic and aqueous extract were analysed (Table2). From these results, alkaloids, glycosides and saponins are significantly present in methanolic extract and flavonoids, terpenes, phenol and tannins are slightly present.
Aqueous extract of *M. arundinacea* rhizome revealed that alkaloids and glycosides are significantly present. Terpenes, saponins and phenols are slightly present. Flavonoids, tannins, quinines and steroids are absent in aqueous extract.
In these result revealed that alkaloids and glycosides were abundantly present. It also showed that terpenes and phenols were slightly present in both the extracted sample. Quinones and steroids were absent in both the extracts.

Discussion
Natural products have been our single most successful source of medicine. Each plant is like factory capable of synthesizing unlimited number of highly complex and unusual chemical substances whose structures could otherwise escape the imagination forever (Kinghorn 2002) [13]. There are at least 120 distinct chemical substances derived from plants that are considered as important drugs currently in use in the world (Farooqi and Sreeamu 2001) [5].
Nutritional analysis of *Maranta arundinacea* showed the moisture content (7.4%) and total ash content (1.2%).The present study found that *Maranta arundinacea* contain carbohydrates (7200mg/100g) proteins (1200mg/100g) and starch (6480mg/100g).
Carbohydrates or saccharrides are the most abundant biological molecules. They play important roles Protein, another class of food often times referred to as the 'Nitrogen-containing natural product', has been proved to be essential for the survival of human being and animals. In the body as sources of energy as well as structural materials (Voet *et al*, 2008) [26]. Starch is the most abundant constituent of plants, it is stored mainly in fruit, rhizome and seed (Madineni *et al.*, 2012) [16]. Starch is extensively used in food, textile and paper industries, others applications are reported in fields such as pharmacy, hygiene products, environmental management, agriculture, biomedical engineering and biofuel production,

depending of it properties (Valencia *et al*., 2012) [26]. rhizome of *Maranta arundinacea* posses various chemical components such as alkaloids, glycosides, phenolic compounds, terpenoids, saponins, flavones and tannins in methanolic extract. Aqueous extract of *M. arundinacea* rhizome contain alkaloids, glycoside, terpenes, saponins and phenols. Alkaloids are also used in medicine for reducing headache and fever. These are attributed for anti- bacterial and analgesic properties (Shi *et al.*, 2004) [24]. The presence of glycosides indicates that they may be potent in curing cardiac insufficiency, coughs and circulatory problems. Also, they may act as good sedatives and have antispasmodic properties (Sule *et al*., 2010) [25]. The medicinal properties of the flavonoids are anticarcinogenic, anti-inflammatory, antibacterial, immune-stimulating, anti- allergic, antiviral and estrogenic effect (Shi *et al*., 2004) [24]. Saponins are also used in hypercholesterolemia, hyperglycemia, antioxidant, anticancer, anti- inflammatory and weight loss etc according to medical field (Rathore *et al*., 2012) [20]. Tannins have stringent properties widely used as an application to sprains, bruises and superficial wounds. They are also responsible for antidysenteric and anti-diarrheal, antimicrobial and antioxidant activities (Rievere *et al.*, 2009) [21]. Terpenes or terpenoids are active against bacteria (Barre *et al.*, 1997; Habtemariam *et al.*, 1993; Scortichini and Pia 1991) [2, 7, 22]. Terpenoids have been found to be useful in the prevention and therapy of several disease, including cancer, and also to have antimicrobial, antifungal, antiparasitic, antiviral, antiallergenic, antispasmodic, antihyperglycemic, anti-inflammatory and immunomodulatory properties (Rabi and Bishyee 2009; Wanger and Elmadfa 2003) [19, 28].

References

1. Andersson L, Chase MW. Phylogeny and classification of Marantaceae. Bot. JLinn. Soc. 2001; 135:275-287.
2. Barre JT, Bowden FB, Coll JC, Jesus J, Funete, VE, Janairo GC. A biotic triterpene from *Lantana camera.* Phytochemistry, 1997; 45:321-324.
3. Bent S. Herbal medicine in the United States: review of efficacy, safety, and Regulation: grand rounds at University of California, San Francisco Medical Center. J Gen Intern Med, 2008; 23:854-859.
4. Dingman SL. Water in soils: infilitration and redistribution. Physical hydrology, second edition, upper saddle river, New Jersey: Prentice-Hall, Inc. 2002, 646.
5. Farooqi AA, Sreerammu BS. Cultivation of medicinal and aromatic crops Delhi: University press, 2001, 9-10.
6. Gibson EL, Wardel J, Watts CJ. Fruit and Vegetable Consumption, Nutritional Knowledge and Beliefs in Mothers and Children. Appetite. 1998; 31:205-228.
7. Habtemariam S, Gray AI, Waterman PG. A new bacterial sesquiterpene from *Prema oligotricha*. Journal of Natural products. 1993; 56:140-143.
8. Hamrmayani E, Kumalasari ID, Marsono Y. Effect of arrowroot (*Maranta arundiinacea* L.) diet on the selected bacterial population and chemical properties of caecal digesta of Sprague dawley rats. Int Res J Microbiol. 2011; 2:278-284.
9. Hasler CM, Blumberg JB. Symposium on phytochemicals and biochemistry and Physiology Journal of Nutrition. 1999; 129:756-757.
10. Hoffman PC, Combs DK, Casler MD. Performance of lactating dairy cows fed alfalfa silage or perennial ryegrass silage. J. Dairy Sci. 1998; 81:162-168.
11. Ika DK, Eni H, Lily AL, Sri R, Widya A, Kosuke N *et al*. Cytotechnol, 2012; 64:131-137.
12. Isolated from antiradial extracts of Mallotus metcalfianus. Phytochem. 70:86-94.
13. Kinghorn AD. The role of pharmacognosy in modern medicine. Expert Opin. Pharmacother, 2002; 3:77-79.
14. Lee S, Son D, Ryu J, Lee YS, Jung SH, Kang J. Antioxidant activities of *Acanthopanax senticosus* stem and their lignin components. Arch Pharm Res. 2004; 227:106-110.
15. Mathews CE, Van Holde KE, Ahem KG. Biochemistry. (3rd edn).Benjamin. Cumming, 1999.
16. Madineni MN, Faiza S, Surekha RS, Ravi R, Guha M. Morphological, structural, and functional properties of Maranta (Maranta arundinacea L.) starch, Food Sci. Biotechnol. 2012; 21(3):747-752.
17. Nishaa S, Vishnupriya M, Gopalakrishnan VK. Qualitative assesment of ethanolic extract of Maranta *arundinacea* L. Rhizome using HPTLC International Research Journal of Pharmacy. 2013; 4(2):76-83.
18. Pradeepkumar S, Nair GM, Padmaja G. Purification and characterization of peroxidise from arrowroot (*Maranta arundinacea* L.) leaves. J Root Crops. 2008; 34:164-171.
19. Rabi T, Bishayee A. Terenoids and breast cancer chemoprevention. Breast Cancer Res Treat. 2009; 115:223-239.
20. Rathore Sk, Bhatt S, Dhyani S, Jain A. Preliminary phytochemical screening of medicinal plant Zizphus mauritiana lam. Fruits. Int J Curr Pharm Res. 2012; 4:160-162.
21. Rievere C, Nguyen JHV, Pieter L, Dejeagher B, Heyden YV. Polyphenols edible Legumes-chemistry, processing and health benefit. J Med Food. 2009; 7:67-78.
22. Scrotichini M, Pia RM. Preliminary *in vitro* evaluation of the antimicrobial activity of terpenes and terpenoids towards Erwinia amylovora (Burkill) Winslow Journal of Applied Bacteriology. 1991; 71:109-112.
23. Shanthakumari S, Mohan VR, Johan De Brito A. Chemical analysis of the rhizome of *Maranta arundinacea* L.J. Econ Taxon Bot. 2007; 31:19-23.
24. Shi J, Arunachalam K, Yeung D, Kakuda Y, Mittal G, Jiang Y. Saponins from, 2004.
25. Sule WF, Okono IO, Joseph TA, Ojezele MO, Nwanze JC. *in vitro* antifungal activity of *Senna alata* Linn. Crude leaf extract Adv App Sci Res. 2010; 1:14-26.
26. Valencia GA, Henao ACA, Zapata RAV. "Comparative study and characterization of starches isolated from

unconventional tuber sources. Journal of Polymer Engineering. 2012; 32(8-9):531-537.
27. Voet DJ, CW Pratt. The principals of biochemistry 3rd Edn., John Willey and Sons 111 River street, Hobohen, 2008; 3:4-219.
28. Wanger KH, Elmadfa I. Biological relevance of terpenoids, Overview focusing on mono-, di and tetraterpenes. Ann Nutr Metab. 2003; 47:95-106.