International Journal of Pharmacological Research
ISSN: 2277-3312
www.ssjournals.com
Journal DOI:10.7439/ijpr

Phytochemistry, proximate analysis, mineral and vitamin compositions of *Psidium guajava linn* in methanol root and leaf extracts

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Abstract

Psidium guajava Linn, is a medicinal plant and food crop cultivated in tropical and subtropical countries and used widely as food, and in folk medicine in the treatment and prevention of many diseases around the universe. But, the Pharmacological basis for its various therapeutic applications has not been elucidated. Samples of *P. guajava* L. Root and leaf extracts were analysed and its Phytochemistry, proximate analysis, vitamins and mineral constituents were revealed. The Phytochemical analysis indicated that *P. guajava* L. Root and leaf methanol extracts contain Gallic Acid (Root 0.01mg, leaf 0.02mg), malic acid (Root 0.02mg, leaf 0.01mg), Tannin (Root 0.022mg, Leaf 0.01mg), Leukocyanidins (Root 0.01mg, leaf 0.03mg), Sterols (Root 0.011mg, leaf 0.02mg), Flavonoid (Root 0.11mg, leaf 0.32mg), chlorogenic Acid (Root 0.12mg, leaf 0.13mg), Ferulic acid (Root 0.01mg, leaf 0.01mg), Ellagic acid (Root 0.011mg, leaf 0.021mg), Avicularin (Root 0.001mg, leaf 0.003mg), and Limonene (Root 0.001mg, leaf 0.001mg), the proximate analysis revealed the presence of moisture (Root 81%, leaf 83%), Protein (Root 0.62%, leaf 0.58%), Carbohydrate (Root 6.22%, leaf 6.31%), Total Fat (Root 0.55%, leaf 0.61%), Saturate Fat (Root 0.163%, leaf 0.158%), and Ash (Root 0.62%, leaf 0.63%). *Psidium guajava* also contain these minerals K (Root 301mg, Leaf 300mg), Na (Root 3.42mg, Leaf 3.40mg), Zn (Root 0.36mg, Leaf 0.35mg), Fe (Root 0.62mg, Leaf 0.59mg), Mg (Root 13mg, Leaf 13.8mg), P (Root 28mg, Leaf 30mg), Ca (Root 22mg, Leaf 23mg), and also vitamins including Vit. A (Root 79µg, Leaf 78.2µg), Vit.B (Root 0.06mg, Leaf 0.05mg), Vit. B_2 (Root 0.08mg, Leaf 0.09mg), Vit B_6 (Root 0.136mg, Leaf 0.140mg), Vit. C (Root 102mg, Leaf 100mg), Vit. E (Root 1.36mg, Leaf 1.39mg), Niacin (Root 1.52mg, Leaf 1.49mg), Folate (Root 16µg, Leaf 13µg). These Phytochemicals, Proximates, Minerals and Vitamins found in these medicinal plant has justified its scientific rationale behind its folklore medicinal uses.

Keywords: *Psidium guajava linn*, Phytochemistry, Proximates , Minerals , Vitamins and Diseases.

1. Introduction

Psidium guajava L., is a small tree of about 10m high with a thin, smooth, patchy and peeling bark with it leaves opposite, short - petiolate, with a prominent pinnate veins of 5-15cm long and with showy flowers that has whitish petals of up to 2cm long and numerous stamens [1,2]. The fruits are fleshy yellow globose to ovoid berry of about 5cm in diameter with an edible pink mesocarp containing numerous small hard white seeds [1]. The plant is a native of Mexico [1,3] and extends throughout South America, Europe, Africa and Asia [1,3]. It grows in all the tropical and subtropical areas of the world and adapts to different climatic conditions but prefers a dry climate [1,2]. Its medicinal usage has been reported in indigenous system of medicines in America more than elsewhere [1]

P. guajava L. is used in many parts of the world for the treatment of a number of a diseases. It is used in Mexico to treat gastrointestinal and respiratory disturbances and as anti-inflammatory agent [1,4]. The leaf of *P. guajava L.* is used traditionally in South Africa folklore medicine to manage, control and treat a plethora of human ailments like diabetes and hypertension [1,5,6,7]. In the Caribbean and Latin America it is used to treat diarrhoea and stomach-aches due to indigestion [1,8,9,10] and in Uruguay, the decoction of the leaves is used as vaginal and uterine wash, especially in leucorrhoea [1,11]. In the Philippines the astringent unripe fruit, the leaves, cortex of the bark and the roots are used for washing ulcers and wounds [1,12]. *P. guajava L.* leaves are used by the Chinese to treat diarrhoea [1, 13] and in Brazil the fruit and leaves are used to treat anorexia, cholera, diarrhoea, indigestion, dysentery, gastric insufficiency, inflammed mucous membranes, laryngitis, skin problems, sore throat, ulcers and vaginals discharges (1,14) and in U.S.A the leaf of *P.*

guajava L. extracts are used to treat diarrhoeas and to produce useful drug (1, 15).

Medicinal plants and indeed herbal medicine is the oldest form of health care known to mankind and from antiquity, the primitive man observed and appreciated the great diversity of plants available to him, the plants among other things principally provided medicine, clothing, shelter and food [16]. Herbs contain a variety of chemical substances that are precursors for the synthesis of useful drugs and are pharmacologically active [17]. Traditional medicine, being the oldest form of health care known throughout history of mankind uses herbs [18].

2. Materials and methods

The root and leaf samples of the plant was harvested from Uhuokwu Village in Oriendu Autonomous community, Ohuhu-Umuahia North Local Government Area of Abia state of Nigeria and was identified by Taxonomist from Botany Department of the University of Calabar as *Psidium guajava Linn*. The fresh leaves and roots of the plant were washed free of dirt and debris and shade dried for two weeks. The dried samples of the root and leaf were crushed into powder and extracted using methods described previously by Sofowara and Olaniyi [18], Maxwel *et al* [19], Udia *et al* [20] and Ogbonna *et al* [21]. The resulting dried extracts was labelled and stored in the refrigerator at 40^{o}C for use throughout the study.

3. Results

Table 1: Quantitative Phytochemical results of *P. guajava L.* Root and Leaf Methanol extracts (Mg/100g dry weight)

Constituents	Root	Leaf
Malic acid	0.02 ± 0.02	0.01 ± 0.01
Saponin	0.02 ± 0.02	0.03 ± 0.02
Gallic acid	0.01 ± 0.01	0.02 ± 0.02
Tannin	0.02 ± 0.02	0.01 ± 0.01
Leukocyanidins	0.01 ± 0.02	0.03 ± 0.02
Flavonoid	0.11 ± 0.01	0.32 ± 0.03
Sterols	0.01 ± 0.01	0.02 ± 0.01
Chlorogenic acid	0.12 ± 0.01	0.13 ± 0.01
Ferulic acid	0.01 ± 0.02	0.01 ± 0.02
Ellagic acid	0.01 ± 0.03	0.03 ± 0.01
Avicularin	0.001 ± 0.01	0.003 ± 0.01
Limonene	0.001 ± 0.02	0.001 ± 0.02

The values presented in this table are on dry weight basis. The values are Mean ± S.D of three determinations

Table 2: Proximate composition of *P. guajava L.* root and leaf methanol extracts (%)

Constituents	Root	Leaf
Moisture	81.00 ± 0.01	83.00 ± 0.01
Protein	0.62 ± 0.02	0.58 ± 0.02
Carbohydrate	6.22 ± 0.02	6.31 ± 0.02
Total fat	0.55 ± 0.01	0.61 ± 0.01
Saturates fat	0.16 ± 0.01	0.16 ± 0.02
Ash	0.62 ± 0.02	0.63 ± 0.01

The values presented in this table are on dry weight basis. The values are Mean ± S.D of three determinations

Table 3: Mineral Compositions of the root and leaf Methanol extracts of *P. guajava L.* (Mg/100g dry weight)

Constituents	Root	Leaf
Potassium	301.00 ± 0.01	300.00 ± 0.02
Sodium	3.42 ± 0.02	3.40 ± 0.02
Zinc	0.36 ± 0.01	0.35 ± 0.01
Iron	0.62 ± 0.02	0.59 ± 0.01
Magnesium	13.00 ± 0.02	13.80 ± 0.01
Phosphorus	28.00 ± 0.01	30.00 ± 0.01
Calcium	22.00 ± 0.01	23.00 ± 0.01

The values presented in this table are on dry weight basis. The values are Mean ± S.D of three determinations

Table 4: Vitamin Compositions of the Root and Leaf Methanol extracts of *P. guajava L.* (Mg /100g)

Constituents	Root	Leaf
Retinol (vitamin A)	79.00 ± 0.01µg	78.20 ± 0.01µg
Thiamine (vitamin B_1)	0.06 ± 0.01	0.05 ± 0.02
Riboflavin (vitamin B_2)	0.08 ± 0.02	0.09 ± 0.01
Pyridoxine (vitamin B_6)	0.14 ± 0.02	0.14 ± 0.02
Ascorbic acid (vitamin C)	102.00 ± 0.02	100.00± 0.02
Tocopherol (vitamin E)	1.36 ± 0.01	1.39± 0.01
Nicotinic acid (Niacin)	1.52 ± 0.02	1.49 ± 0.02
folate	16.00 ± 0.02µg	18.00 ± 0.01 µg

The values presented in this table are on dry weight basis. The values are Mean ± S.D of three determinations

4. Discussion

The root and leaf methanol extracts of *Psidium guajava* linn have been found to contain many phytochemical components although in small amounts. The presence of these phytochemicals in both the root and leaf methanol extracts has supported its use in the treatment of sore throats, bleeding gums, douche for vaginal discharge, regulation of menstrual periods and mouth sores in herbal treatment. The presence of gallic acid in both the root and leaf methanol extract has supported its cardio-protective effects against ischemia reperfusion and as an antioxidant [22,1] and also provide extra defense against bacterial and viral infections. The presence of ferulic and chlorogenic acids has supported its use as an antioxidant [23,1] and capacity radical scavenging activity, antimutagenic, anticarcinogenic and inflammatory – inhibiting effects and endothelial protective properties [24,1], the presence of avicularin has revealed its antimicrobial activity against Salmonella enteritidis and Bacillus cereus [25,1]. The presence of limonene in both the leaf and root methanol extracts has revealed its anti- inflammatory and inhibitory effects on nitric oxide production and in vitro antitumor [26,1]. The presence of malic acid in both the root and leaf extracts facilitates the absorption of vitamin C and contributes to the fruits acidic taste and the presence of saponin has supported the use of the plant in managing of inflammation.The inhibitory effect of saponin on inflamed cells and its ability of precipitating and coagulating red blood cells have been reported [27,28].

P. guajava L. contain moisture in high amount,minimal amount of carbohydrate and small amounts of protein,total and saturated fats and ash. The presence of protein,carbohydrate and fat indicates that the leaf and root methanol extracts of *P. guajava L*. may assist in growth, tissue repair and energy production in the body.

The root and leaf methanol extracts of *P. guajava L*. has high amount of potassium and low amount of sodium, these lays credence to its use in the treatment of hypertension and arteriosclerosis and therefore can be used to treat chronic diseases due to its invigorating effect. The plant also has marginal amount of Magnesium, Phosphorus and Calcium and small amounts of Zinc and Iron.These macromolecules may also be important for the body's growth and development and diseases control. Magnesium and Zinc intervene in many metabolic reactions and therefore important for the functional conservation and regeneration of the prostate gland [29].They stimulates cellular activities and contain anti-carcinogenic properties [30],Magnesium lack in the body causes nervousness,irritability,cramps and spasms.

The root and leaf methanol extracts of *P.guajava L*. also contains very important Vitamins. *P. guajava L*. has a high amount of vitamin C, this important vitamin may be used to treat nicotine addiction and prevent scurvy, anemia and the tendency for haemorrhage, improves ossification,protects against intoxication and infection and strengthens mucosal tissues [28]. The plant also contain Vitamin A which is important for vision,growth, immune function, fetal development and cellular development. It also contain vitamin E which acts as a defense against oxidative damage via free radical scavenging and in fertility and also help prevent infections and cancer, deficiency causes sterility. It also vitamin B_6 which help in glucose generation, nervous system functions,immune response,hormone regulation and for synthesis of niacin which aids in enzyme functions and also protects the skin. Niacin encourages growth and protects against pellagra while folacin helps in the formation and maturation of the red blood cells. It is necessary for the normal functioning of the digestive mucosa and encourages growth [28].

5. Conclusion

Psidium guajava linn is an important nutritious plant that provides efficient amounts of nutrients that the body need for its growth and functions. Our findings has provided evidences that the methanol extracts of the root and leaf extracts of *P.guajava L* is a potential source of natural antioxidants and this has justified its various therapeutic applications in forkloric medicines.

Acknowledgement

The authors are grateful to the people of Uhuokwu village,Ohuhu Umuahia,Abia State,Nigeria for their technical assistance and Emem Uko Udoh for typing the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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