Journal of Research in Medical and Dental Science
2022, Volume 10, Issue 11, Page No: 259-263

Available Online at: www.jrmds.in
eISSN No. 2347-2367: pISSN No. 2347-2545

Phytochemicals and Antibacterial Activity of *Muntingia calabura* Leaves Based Product

Gilbis Tamil Priya[1,2*], Yasmin Y[1,2]

[1]Department of Zoology, Muslim Arts College, Thiruvithancode, Kanyakumari District, Tamil Nadu, India
[2]Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Muntingia calabura is a well-known, fast-growing tree clasped with different medicinal and health benefits. Different parts of the tree are being used for various ailments in different parts of the world. The leaves possess hepatoprotective, antidiabetic, antiulcer, anti- inflammatory, anti-proliferate, antimicrobial and antioxidant activity. The M. calabura leaves exhibited potential for anti-proliferative and antioxidant activities. The extract from the following plants parts like its leaves were prepared in different aqueous solvents like ethanol, methanol, acetone, chloroform and water. In this present study phytochemicals are present in Muntingia calabura leaves. Flavonoids, Phenols & Saponins are highly abundant in Methanol extract. Antibacterial activity of Muntingia calabura leaves were also analyzed .The present study was aimed to formulate the Muntingia calabura leaves chapatti flour and the sensory evaluation is conducted by 20 semi-trained panel members. The keeping quality and microbial analysis were also done.

Key words: *Muntingia calabura*, Phytochemicals, Antibacterial activity, Keeping quality

HOW TO CITE THIS ARTICLE: Gilbis Tamil Priya, Yasmin Y, Phytochemicals and Antibacterial Activity of Muntingia calabura Leaves Based Product, J Res Med Dent Sci, 2022, 10 (11): 259-263.

Corresponding author: Gilbis Tamil Priya

e-mail✉: gilbispriya@gmail.com

Received: 28-Oct-2022, Manuscript No. JRMDS-22-81634;

Editor assigned: 31-Oct-2022, PreQC No. JRMDS-22-81634(PQ);

Reviewed: 15-Nov-2022, QC No. JRMDS-22-81634(Q);

Revised: 18-Nov-2022, Manuscript No. JRMDS-22-81634(R);

Published: 25-Nov-2022

INTRODUCTION

Traditional medicine encompasses multiple indigenous traditions around the world. In western and other developed nations, its usage is often in conjunction with, and complementary to, modern medicine. As a treatment to its persistence, over 80% of the world population is known to still utilize traditional medicine for primary health care. Most are in under developed countries, many of which are situated in biodiversity hotspots in Southern Asia, Africa, Central and Southern America among others. Plants are the Single largest source for traditional medicines [1].

Plants have an limitless ability to synthesize secondary metabolites. These substances serve as the molecules of plant defense against predation of microorganism, insects and herbivores [2]. The compounds that are superintended for the therapeutic effect are usually the secondary metabolites. A systemic study of crude drug embraces through consideration of both primary and secondary metabolites derived as a result of plant metabolism. The plant material may b subjected to phytochemical investigation for the detection of various plant constituents [3].

There has been an increased urgency to discover novel antibiotics/antimicrobial compounds due to emergence of drug resistance microorganisms. Therefore, an infection caused by antibiotic resistant microbes complicates conventional treatment causing prolonged illness and increases the death risks [4]. *Muntingia calabura L*. is one of those many traditional plants that is known to control blood glucose levels. It is extracted by steeping the dried leaves in hot water [5]. The acquired knowledge of plant extracts and phytochemicals usage possessing antimicrobial properties can be of great significance in therapeutic treatments.

Many plant extracts show their antimicrobial traits, which is due to the presence of compounds synthesized in the secondary metabolism of the plant. These secondary metabolites mainly consists of phenolic including polyphenols, flavonoids, tannins and quinines known for their potent antioxidant, cytotoxic and antimicrobial activities [6].The high content of flavonoid from cherry leaves may be referred as a natural antioxidant and has biological activity due to the rough surface of its leaves. Cherry leaves has glandular trichome, is a secretory accumulation of bioactive compounds associated with antioxidant activity [7]. The leaves are rich in

flavanoidal compounds like flavanones, flavones, flavans and biflavans as the major constituents, possessing antidiabetic and cytotoxic activities [8].

Extraction are a way to separate a desired substance when it is mixed with others. The mixture is brought into contact with a solvent in which the substance of interest is soluble, but the other substances present are insoluble. Components of active compounds from plants or animals can be extracted based on "Like Dissolved Like Theory" compounds will be extracted depends on solubility [9].

Many underdeveloped countries are rich in biodiversity hotspots like Southeast Asia, AFRICA, Central and Southern America. Among all the natural resources, plants are the single largest source for traditional medicines, accounting for 25% of new drugs components being tested for clinical trial [10].

In the present study *Muntingia calabura* leaves was selected, a shrub introduced to Southeast Asia from Trophical America. It is also known locally as Jamaica cherry, belonging to Elaeocarpaceae family [11]. For its high adaptability to strive, even in poor soil conditions including acidic or alkaline, *M. calabura* is now the most commonly found roadside plants in Malaysia [12]. It is well adapted in areas where it is introduced, This plant species is heavily indigenized in most localities [13]. It is often seen growing as roadside trees [14].

Objectives

- ✓ To Formulate *Muntingia calabura* leaves chapatti flour.
- ✓ To Estimate the antibacterial activity of *Muntingia calabura* leaves powder.
- ✓ To Analyze the Phytochemical present in *Muntingia calabura* leaves powder.
- ✓ To Identify the Keeping quality of *Muntingia calabura* leaves powder.
- ✓ To Evaluate the Organoleptic properties *Muntingia calabura* leaves powder chapatti.

MATERIALS AND METHODS

Procurement of the samples

The fresh leaves of *Muntingia calabura* Leaves is collected as sample, It was collected from the Mulagumoodu Junction near Azhagiamandapam. The other ingredients such as wheat purchased from a nearby supermarket in Kulashekaram, Kanyakumari district in Tamilnadu.

Processing of sample

The sample are thoroughly washed in running water 4-5 times. The samples were cleaned to remove the dirt and the foreign particles. The samples were dried separately by shadow drying with full care and attention. Then the dried leaves were powdered using a standard mixer until it becomes a fine powder. The powder was the stored in an airtight container for further use.

Formulation of chapatti flour

The wheat flour is made by taking the wheat berry, removing the bran or outer shell and grinding the seed in to a flour like consistency. Take 95gm of wheat flour and add 5 gm of leaves powder in to it. Make it as a *Muntingia calabura* leaves powder chapatti flour.

Method of preparation

The powered *Mutingia calabura* leaves were used for the preparation of chapatti .Take a large- sized bowl. Put two cups of flour along with add pinch of leaves powder, mix it well and then add a cup of water, salt and ghee in it. Mix well and start kneading a dough. Make sure that the dough is not too thick nor too thin. It has to be of a soft and pliable consistency. Add water to get the consistency right. Keep kneading for a while. Now roll out few balls from the prepared dough. Place them on a flat surface, flatten them further with the help of a rolling pin. Keep using the flour in order to prevent the rolls from sticking to the surface. Once the chapattis get the perfect round shape, place a pan on the medium flame.

Sensory evaluation

Sensory analysis is a scientific discipline that applies principles of experimental design and statistical analysis to use of human senses for the purpose of evaluating consumer products.

Sensory analysis was conducted in a clean undisturbed environment. The prepared product was coded and presented to score card were the quality parameters such as appearance, taste, color, texture, flavor and overall acceptability were qualified. Prepared products was subjected to sensory analysis to find out acceptability. The product was organoleptically evaluated by 20 semi-trained judges from the department of Nutrition & Dietetics, Muslim Arts College, Thiruvithancode.

Keeping quality

Keeping quality of *Muntingia calabura* leaves powder were done to find out the storage behavior of the product. They were kept in room temperature for a period of 3 months. They were examined .Once in a week to find out the growth of microbes and off flavor.

Statistical analysis

The primary data thus collected were consolidate and subjected to statistical analysis Mean, Standard Deviation & Error Mean.

Phtyochemical analysis

Qualitative analysis

Flavonoids

To 5 ml of the diluted ammonia solution, a portion of the solvent extract (50 mg) followed by addition of concentrated sulphuric acid. The visible colour changes were observed.

Tannins
Tannins were determined by mixing 50 mg extract, 2 ml of water and 2 drops of ferric chloride. A green colour indicated the presence of tannin.

Saponins
The extract (50 mg) was diluted with distilled water and made up to 20 ml. This suspension was shaken in a graduated cylinder for 15 min and the result was observed.

Terpenoids
50 mg of each extract was mixed with 2 ml of chloroform. To this one ml concentrated sulphuric acid was added.

Phenolic compounds
The extract (50 mg) was dissolved in 5 ml of distilled water. To this, few drops of neutral ferric chloride solution was added.

Antibacterial activity
The antibacterial activity against Staphylococcus aureus, Staphylococcus epidermis, Pseudomonas and Klebsiella pneumoniae were analyzed using standard procedure.

RESULTS

Phytochemical analysis
Muntingia calabra leaves extracts were subjected to qualitative phytochemical analysis to detect the presence or absence of phytochemical.

Qualitative analysis
The extract was subjected to standard chemical test for the detection of different phytochemical constituents. Results on the presence and absence of flavonoids, tannin, saponin, terpenoids, and phenolic compounds were reported in the Table 1.

Table 1 shows that qualitative analysis of flavonoid, saponins, terpenoids and phenols were analysed in *Muntingia calabura* leaves powder. Various solvents used such as Methanol, Ethanol, Acetone, Chloroform and water. In this table it shows that the presence, more abundance, highly abundance, absence of the phytochemicals present in *Muntingia calabura* leaves. In this present study flavonoids and phenols are highly abundant in methanol extract. The Antibacterial activity of *Muntingia calabura* leaves in different extracts weretabulated below Table 2.

Table 2 shows that ethanolic extract of *Muntingia calabura* leaves shows highest inhibition against the growth of staphylococcus aureus, methanolic extract of *Muntingia calabura* leaves shows highest inhibition against the growth of Staphylococcus epidermis, ethanolic extract of *Muntingia calabura* leaves shows highest inhibition against the growth of Pseudomonas and methanolic extract of *Muntingia calabura* leaves shows the highest inhibition against the growth of Klebsiella pneumonia.

Sensory evaluation
The sensory characteristics like appearance, colour, flavor, texture, taste and overall acceptability were analysed and tabulated below Table 3.

The Mean score for appearance of black tea is 4.7 and *Muntingia calabura* leaves powder Chapatti is 4.8 which is higher than standard. The score value for Texture of standard chapatti is 4.6 and *Muntingia calabura* leaves powder chapatti is 4.7 which is higher when compared to standard.

The score value for taste of standard chapatti is 4.5 and *Muntingia calabura* leaves powder chapatti is 4.8which is higher when compared to standard. The score value for Flavor of standard chapatti is 4.75 and *Muntingia calabura* leaves powder chapatti is 4.95 which is higher when compared to standard. The score value for Colour of standard chapatti is 4.75 and *Muntingia calabura*

Table 1: Qualitative analysis.

Phytochemical	Solvents				
	Methanol	Ethanol	Acetone	Chloroform	Water
Flavonoids	+++	+	++	-----	++
Tannins	++	----	+	++	---
Saponins	+++	+	----	----	++
Terpenoids	++	++	+++	++	---
Phenols	+++	+	+	----	+
+ indicates presence					
++ indicates more abundance					
+++ indicates highly abundance					
--- Indicates absence					

Table 2: Antibacterial activity of *Muntingia calabura* leaves.

Bacteria's name	Zone of inhibition (mm)					
	Standard	Methanolic	Ethanolic	Acetone	Chloroform	Water
Staphylococcus aureus	25	21	25	20	15	10
Staphylococcus epidermis	30	30	25	21	18	11
Pseudomonas	16	30	33	20	20	9
Klebsiella pneumonia	32	30	22	15	16	10

Table 3: Sensory parameters.

S.No	Sensory Parameters	Standard		Sample	
		Mean ± S.D	S.M.E	Mean ± S.D	S.M.E
1	Appearance	4.7 ± 0.30	0.006	4.8 ± 0.65	0.145
2	Texture	4.6 ± 0.48	0.1	4.7 ± 0.30	0.006
3	Taste	4.5 ± 0.65	0.12	4.8 ± 0.65	0.145
4	Flavor	4.75 ± 0.43	0.096	4.95 ± 0.22	0.049
5	Color	4.75 ± 0.43	0.096	4.9 ± 0.30	0.067
6	Overall acceptability	4.7 ± 0.4	0.12	4.95 ± 0.22	0.049

Table 4: Keeping quality of *Muntingia calabura* leaves powder.

Days	Room Storage	Refrigeration Storage
1-10 days	No change	No change
11-12 days	No change	No change
21-20 days	No change	No change
31-40 days	No change	No change
41-50 days	No change	No change
51-60 days	No change	No change
61-70 days	change	No change
71-80 days	change	No change
81-90 days	change	No change

leaves powder chapatti is 4.9 which is higher when compared to standard. The Mean score for Over all Acceptability of standard chapatti is 4.7 and *Muntingia calabura* leaves powder chapatti is 4.95 which is higher when compared to standard.

Keeping quality

Up to 60 days there were no changes in both room temperature and refrigeration storage. After 60th day changes were seen in room temperature but there were no changes in refrigerator storage (Table 4).

DISCUSSION

Most of the organism are well protected against free radical damage by enzymes such as superoxide dismutase, catalase and by natural antioxidant compounds like ascorbic acid, tocopherols and glutathione [15]. In our body the cooperative defense system protects the body from free radical damage that includes antioxidant nutrients . Hence the antioxidant present in food is an important health protecting factor because of their safety, potential nutritional and therapeutic effect [16].

Phytochemical analysis of *Muntingia calabura* leaf extract revealed the presence of flavonoids, steroids, steroidal/ triterpenoidal compounds and their glycosides. The significant anti-diabetic activity of *Muntingia calabura* leaf extract may be due to the presence of flavanoids, as the literature reveals that the plant flavanoids have anti-diabetic activity [8].

Based on the phytochemical screening, it was known that M.Calabura leaf extract contained flavonoid, tannins, triterpenoids, steroids and polyphenols compounds. Flavonoids were thought to decrease blood glucose levels by enhancing insulin secretion, reducing apoptosis and promoting proliferation of pancreatic beta cells, reducing insulin resistance, inflammation and oxidative stress in muscle and promoting translocation of glucose transporter type 4 (GLUT4) via phosphatidylinositol-3-kinase(P13K)/Akt and AMP-activated protein kinase (AMPK) pathways [17].

Stress involves complex biochemical, Neural and immunological mechanism and plays a crucial role in the progression of a variety of disease states ranging from psychiatric disorders like depression and anxiety, immune suppression, cardiovascular disease, hypertension, peptic ulcer, migraine, allergies, asthma, premature aging rheumatic disease and endocrine disorder [18].There is a dire need from agents having neuroprotective and neuropharmacological activity enhancing learning and memory function of the brain [19].

The beneficial medicinal effects of plant materials typically result from the combinations of secondary metabolites present in the plant, through additive or synergistic action of several chemical compounds acting at single or multiple target sites associated with physiological process. This fact has a basis in the sense that medicinal action of plants are unique to particular plant species or groups [20].The Presence of flavonoids, alkaloids, terpenoids and fatty acids in the plant extract have been reported to be responsible for anxiolytic and sedative efforts observed in different plant extracts [21].

Scientifically, this plant has been proven antinociceptive, anti-inflammatory and anti-pyretic properties [7], potential antimicrobial activity [22], potent antityrosinase and antioxidant activities [23], Cardio protective effect [24]. *M. calabura* also inhibited in vitro growth of candida albicans and Cryptococcus neoformans [25].

CONCLUSION

It is concluded from the present study that *Muntingia*

calabura leaves are rich in phytochemicals. The pharmacological activities of the extract were analysed and found to possess antibacterial properties. The antibacterial activity of *Muntingia calabura* leaves powder extract was analyzed. The keeping quality of the *Muntingia calabura* leaves powder was also checked and the result showed that *Muntingia calabura* leaves powder has no changes until 60 days in both room temperature and refrigeration storage. So, *Muntingia calabura* leaves are highly beneficial for our health and can be consumed by so many disease patients especially diabetic patients.

REFERENCES

1. Mahmood ND, Nasir NL, Rofiee MS, et al. *Muntingia calabura:* A review of its traditional uses, chemical properties, and pharmacological observations. Pharm Biol 2014; 52:1598-1623.
2. Mallikharjuna PB, Rajanna LN, Seetharam YN, et al. Phytochemical studies of Strychnos potatorum Lf-A medicinal plant. E J Chem 2007; 4:510-518.
3. Khandelwal K. Practical pharmacognosy. Pragati Books Pvt. Ltd. 2008.
4. Barza M, Travers K. Excess infections due to antimicrobial resistance: the "Attributable fraction". Clin Infect Dis 2002; 34:S126-30.
5. Yusof M, Izwan M, Salleh M, et al. Activity-guided isolation of bioactive constituents with antinociceptive activity from *Muntingia calabura* L. leaves using the formalin test. Evid Based Complement Alternat Med 2013; 2013.
6. Pahari B, Chakraborty S, Chaudhuri S, et al. Binding and antioxidant properties of therapeutically important plant flavonoids in biomembranes: Insights from spectroscopic and quantum chemical studies. Chem Phys Lipids 2012; 165:488-496.
7. Zakaria ZA, Nor Hazalin NA, Zaid SN, et al. Antinociceptive, anti-inflammatory and antipyretic effects of *Muntingia calabura* aqueous extract in animal models. J Nat Med 2007; 61:443-448.
8. Perez GRM, Zavala SMA, Perez GC. Antidiabetic effect of compounds isolated from plants. Phytomed 1998; 5:55–75.
9. Triswaningsih D, Kumalaningsih S, Wignyanto P. Estimation of chemical compounds and antioxidant activity of *Muntingia calabura* extract. Int J Chem Tech Res 2017; 10:17-23.
10. Singh R, Iye S, Prasad S, et al. Phytochemical analysis of *Muntingia calabura* extracts possessing anti-microbial and anti-fouling activities. Int J Pharmacogn Phytochem Res 2017; 9:826-832.
11. Soderberg C. Fruits of warm climates. Appropriate Technol 2014; 41:52.
12. Sufian AS, Ramasamy K, Ahmat N, et al. Isolation and identification of antibacterial and cytotoxic compounds from the leaves of *Muntingia calabura* L. J Ethnopharmacol 2013; 146:198-204.
13. Bayer C, Chase MW, Fay MF. Muntingiaceae, a new family of dicotyledons with malvalean affinities. Taxon 1998; 47:37-42.
14. Ragragio EM, De Padua A, Datuin K, et al. Air pollution tolerance index of trees in selected areas in the Philippines. J Applied Phytotechnol Environ Sanitation 2014; 3.
15. Senthilnathan M, Jahan A, Srinivas K, et al. In vitro anthelmintic activity of *Muntingia calabura* leaf extract against Haemonchus contortus. J Pharmacogn Phytochem 2019; 8:793-797.
16. Manekar SS, Rangari VD, Agrawal MN, et al. Formulation and anti-diabetic activity studies of herbomineral formulation for treatment of diabetes. Int J Pharm Sci Res 2014; 5:3912-3917.
17. Vinayagam R, Xu B. Antidiabetic properties of dietary flavonoids: A cellular mechanism review. Nutr Metab 2015; 12:1-20.
18. Abid M, Hrishikeshavan HJ, Asad M. Pharmacological evaluation of Pachyrrhizus erosus (L) seeds for central nervous system depressant activity. Indian J Physiol Pharmacol 2006; 50:143.
19. Spiegler V, Hensel A, Seggewiß J, et al. Transcriptome analysis reveals molecular anthelmintic effects of procyanidins in C. elegans. Plos One 2017; 12:e0184656.
20. Houghton PJ. The scientific basis for the reputed activity of Valerian. J Pharm Pharmacol 1999; 51:505-512.
21. Carlini EA. Plants and the centrarl nervous system. Pharmacol Biochem Behav 2003; 75;501-512.
22. Zakaria ZA, Sufian AS, Ramasamy K, et al. In vitro antimicrobial activity of *Muntingia calabura* extracts and fractions. Afr J Microbiol Res 2010; 4:304-308.
23. Ayesha S, Premakumari KB, Roukiya S. Antioxidant activity and estimation of total phenolic content of *Muntingia calabura* by colorimetry. Int J ChemTech Res 2010; 2:205-208.
24. Nivethetha M, Jayasri J, Brindha P. Effects of *Muntingia calabura* L. on isoproterenol-induced myocardial infarction. Singapore Med J 2009; 50:300.
25. Ramos S, Oliveira J, da Câmara CA, et al. Antibacterial and cytotoxic properties of some plant crude extracts used in Northeastern folk medicine. Rev Bras Farmacogn 2009; 19:376-381.