



Comparitive study on phytochemicals from leaves of *Mentha piperita* (Mint), *Psidium guajava* (Guava) and *Moringa oleifera* (Drumstick)

M.Sathish Kumar*, M.R.K.Rao, Neema Kumari Jha, Priti Ranjan

Department of Industrial Biotechnology, Bharath University, Selaiyur, Chennai - 600073. India.

Received on:17-10-2012; Revised on: 19-11-2012; Accepted on:10-01-2013

ABSTRACT

Propanolic extract of leaves of three plants namely mint (*Mentha piperita*), guava (*Psidium guajava*), drum stick (*Moringa oleifera*) were prepared separately. Comparison for the presence of some important phytochemicals like, terpenoids, reducing sugars, tannins, carbonyl, flavonoids, phlobatanins, steroids etc. were studied. It was found that saponins, terpenoids and reducing sugar was present in all the three plant extracts. Carbonyl and flavonoids were present in guava leaves. Moringa leaves exhibited the presence of carbonyl, flavonoids, phlobatanin and steroids. In the mint leaves tannins, carbonyls, flavonoids, phlobatanin and steroids were conspicuous by their absence.

Keywords: Phytochemicals, *Psidium guajava*, *Mentha piperita*, *Moringa oleifera*, Flavonoids, Terpenoids

INTRODUCTION

Phytochemicals are, in the strictest sense of the word, chemicals produced by plants. Plants generally contain phytoconstituents like anthraglycosides, phlobatanin, tannins, reducing sugars, flavonoids, alkaloids, saponins, coumarins, phenols, carboxylic acids, terpenes, etc. These phytoconstituents confer specific characteristics and properties to plants. The constituents of plants are known for their medicinal value to treat various ailments since time immemorial. The discovery, development and use of modern medicines have a deep rooted connection with the age old practice of folk and traditional medicinal ~~background of the natives (Baladin et al, 1985)¹~~. Thus the ancient wisdom has been the basis of modern medicine and will remain so as one of the important sources of future medicine and therapies (Hussain and Gorski, 2004, Kirtikar and Basu, 2004, Hassimotto et al, 2005)^{2,3,4}. Most of the present medicines owe their origin to plants. The knowledge of the phytochemicals present in each plant, their isolation, characterisazation and their efficacy in treating various diseases is being pursued widely across the globe (Kamble and Pradhan, 1988, Koche et al, 2008)^{5,6}.

Therefore, the analysis of these constituents in plants would help in determining various biological activities of plant products. The present study compares the phytochemicals present in the propanolic extracts of leaves of Mint, Guava and Moringa plants. Although literature is available on the extraction of crude extracts of these plant

leaves by various extracting solvents like hexane, ethaneol, methnol, ethyl acetate, acetone, water etc. there is a dearth of report on the propanolic extraction and characterization of phytochemicals of these plants (Metwally et al, 2010)⁷. Therefore the present study focuses on the propanolic extraction and subsequent phytochemical analysis of these three plant extracts.

A member of mint family (Lamiaceae), *Mentha piperita*, is a herbaceous rhizomatous perennial plant growing to 30–90 cm with smooth stems. The rhizomes are wide-spreading, fleshy, and with bare fibrous roots. The leaves are from 4–9 cm long and 1.5–4 cm broad, dark green with reddish veins and with an acute apex and coarsely toothed margins. The leaves and stems are usually slightly hairy. The flowers are purple, 6–8 mm long, with a four-lobed corolla about 5 mm diameter. They are produced in whorls around the stem, forming thick, blunt spikes. Peppermint has high menthol content, and is often used in tea and for flavouring ice cream, confectionery, chewing gum and tooth paste. The oil also contains menthone and menthyl esters, particularly menthyl acetate. One animal study has suggested that peppermint may have radio protective effects in patients undergoing cancer treatment (Baliga and Rao, 2008)⁸. The aroma of peppermint has been found to enhance memory (Moss et al, 2008)⁹. Extensive literature survey revealed that *Psidium guajava*, acclaimed as ‘poor man’s apple of the tropics’, has a long history of traditional use for a wide range of diseases. The fruit as well as its juice is freely consumed for its great taste and nutritional benefits. It is antidiabetic, antioxidant, antibacterial, among other beneficial effects (Oh et al, 2005, Chen and Yang, 2006, Obinna et al, 2008, Adeyemi et al, 2012)^{10,11,12,13}.

*Corresponding author.

M.Sathish Kumar,
Assistant Professor,
Dept. of Industrial Biotechnology,
Bharath University,
Chennai- 600 073,India.

Guava leaves have been the subject for diverse research on their constituents, pharmacological history in folk medicine (Gutierrez *et al*, 2008)¹⁴. Most research, however, has been conducted on apple guava (*P.guajava*), with other species remaining unstudied. From preliminary medical research in laboratory models, extracts from apple guava leaves or bark are implicated in therapeutic mechanisms against cancer, bacterial infections, inflammation and pain (Ojewola *et al*, 2006, Chen *et al*, 2007, Mohfuzul Haque *et al*, 2007)^{15,16,17}. Essential oils from guava leaves display anti-cancer activity in vitro (Manosroi *et al*, 2007)¹⁸.

Guava leaves are used in folk medicine as a remedy for diarrheal (Kaljee *et al*, 2004)¹⁹ and, as well as the bark, for their supposed antimicrobial properties and as an astringent. Guava leaves or bark are used in traditional treatments against diabetes (Mukhtar *et al*, 2006)²⁰. In Trinidad, a tea made from young leaves is used for diarrhoea, dysentery and fever.

Moringa oleifera Lam. is a small or middle sized tree, about 10 m in height. *M. oleifera* is known as drumstick tree in English, *Soanjna* in Hindi and *Shevga* in Marathi. The plant belongs to the family Moringaceae. Today, it has become naturalized in many locations in the tropics and is widely cultivated in Africa, Ceylon, Thailand, Burma, Singapore, West Indies, Sri Lanka, India, Mexico, Malabar Malaysia and the Philippines (Ramachandran *et al*, 1980)²¹. *Moringa* leaves have antioxidant, antistress and many other medicinal values (Naidu *et al*, 2012, Luqman and Kumar, 2011, Luqman *et al*, 2012, Anwar *et al*, 2007)^{22,23,24,25}.

The aim of the present study was to find various phytochemicals present in the three plant leaves samples by using propanol as an extraction medium since there is no report available by using propanol as an extraction medium. Standard procedures were applied to isolate the various phytochemicals available in the leaf extracts. The three plants selected are already known to have various medicinal values. The extraction was proceeded to know the different types of phytochemical available in each of the leaf samples separately. The results were tabulated and the presence and absence of the phytochemical were discussed.

MATERIALS AND METHODS

Fresh leaves were collected from different localities in Chennai and shade dried for one day after proper washing. Each leaf samples were separately cut into very small pieces and 50 grams of which were soaked in 100 ml of propanol for a week. The extracts were filtered with Whatman filter paper no.1 and the filtrate was collected and stored in 4°C till further use.

One ml of sample was taken in test tubes for each test for phytochemical analysis. The extracts were analyzed for the presence of al terpenoids, reducing sugars, saponins, tannins, carbonyls, flavonoids, phlobatannis and steroids as per the methods of Adetuyi *et al*, 2009, Trease and Evans, 1989, Sofowora, 1982 and Finar, 1983^{26,27,28,29}.

Test procedures

Test for saponins: about 1 ml of plant extract was takes in a test tube

and mixed with 5 ml of distilled water. The solution was boiled for 2 minutes. Observation for the occurrence of frothing would indicate the presence of saponins.

Test for tannin: 1 ml of plant extract was mixed with 5 ml water and heated on water bath for 10 minutes. The mixture was filtered and ferric chloride was added to the filtrate and observed for dark green solution which indicates the presence of tannin.

Test for carbonyls: 1ml of plant extract was taken in a test tube and few drops of 2, 4 –Dinitrophenylhydrazine solution was added and shaken. Instant appearance of yellow crystals indicates the presence of aldehyde.

Test for reducing sugars: 2 ml of plant extract was added with 5 ml of distilled water and filtered. The filtrate was boiled with 3-4 drops of Fehling’s solution A and B for 2 minutes. Appearance of orange red precipitate would indicate the presence of reducing sugar.

Test for terpenoids: 1 ml of plant extract was taken in a test tube with 2 ml of chloroform. To this, concentrated sulphuric acid was added carefully to form a layer. Presence of reddish brown color at the interface would show would show the presence of terpenoids.

Test for flavonoids: 1 ml of plant extract was taken in a test tube and mixed with dilute sodium hydroxide solution. To this dilute hydrochloric acid was added. Observation of yellow solution that turn colorless later would indicate the presence of flavonoids.

Test for phlobatanin: 1 ml of plant extract was taken in test tube and mixed with distilled water and filtered. The filtrate was boiled with 2 % HCl solution. Observation of red precipitate indicates the presence of phlobatanin.

Test for steroids: 1 ml of propanolic extract was mixed with 2 ml of acetic anhydride and 2 ml of sulphuric acid was added to the mixture. Observation for color change from violet to blue or green in samples would indicate the presence of steroids.

RESULTS:

Phytochemicals	Leaf samples		
	Mint	Guava	Drum Stick
Saponin	P	P	P
Terpenoid	P	P	P
Reducing Sugar	P	P	P
Tannin	P	A	A
Carbonyl	P	P	A
Flavonoid	P	P	A
Phlobatanin	A	P	A
Steroid	A	P	A

P- Presence, A- Absence

DISCUSSION

The three plants leaf extracts studied were namely, guava (*psidium guajava*), drum stick (*Moringa oleifera*), mint(*mentha piperita*) have been known for the various medicinal properties. Many reports are

available indicating the antibacterial, antihelminthic, antioxidant capacities of these leaf extracts. Apart from this guava leaves are used for treatment of gastroenteritis, vomiting, diarrhea, dysentery, wound healing, soar throat, cough, toothache, inflamed gums and as mouth wash. Since the three plants have various medicinal properties, the present work was choosen.

Although a lot of work has taken place on the water and ethanolic extracts (Hawrelak, *et al*, 2003, Kamath *et al*, 2008, Rosa *et al*, 2008)^{30,31,32}. The present work focused on the phytochemical present in these three plants by using propanol as an extraction medium.

CONCLUSIONS

Saponins, terpenoids and reducing sugar are present in the leaves of guava, drum stick and mint. Carbonyl and flavonoids are present in guava and drum stick and are absent in mint leaves. Phlobatanin and steroids are present in drum stick leaves and are absent in guava and mint. Tannin is present in guava and absent in drum stick and mint leaves.

REFERENCES

1. Balandrin, M.F., J.A. Klocke, E.S. Wurtele and W.H. Bollinger, 1985. Natural plant chemicals.
2. Hussain, M.A. and M.S. Gorski, 2004. Antimicrobial activity of Nerium oleander Linn. Asian J. Plant Sci. 3: 177-180.
3. Kirtikar KR and Basu BD. Illustrated Indian Medicinal plants III, Revised and enlarged Edition, 2000. Vol. 3:997-999.
4. Hassimotto, NM, Genovese MI and Lajolo FM. (2005). Antioxidant activity of dietary fruits, vegetables, and commercial frozen fruit pulps. Journal of Agricultural and Food Chemistry 53(8): 2928-2935.
5. Kamble SY and Pradhan SG. Flora of Akola District (MS) 1988.
6. Koche D, Syed I, Nafees I, Shirsat R, Zingare AK, Donode KA. Ethnomedicinal wealth of Nagzira wildlife sanctuary, dist. Gondia (MS) India: Ethnobotanical leaflets, 2: 2008, 532-538.
7. Metwally AM, Omar AA, Harraz FM, El Sohafy SM (2010) Phytochemical investigation and antimicrobial activity of *Psidium guajava* L. leaves. Phamacogn mag 6: 212-218.
8. Baliga, M. S.; Rao, S. (2010). Radioprotective potential of mint: A brief review. J Cancer Res Ther 6(3): 255-262.
9. Moss, Mark, Hewitt Steven, Moss Lucy, Wesnes Kieth (2008). "Modulation of cognitive performance and mood by aromas of peppermint and ylang-ylang". The International journal of Neuroscience 118 (1): 59-77.
10. Oh WK, Lee CH, Lee MS, Bae EY, Sohn CB, et al. (2005). Antidiabetic effects of extracts from *Psidium guajava*. J Ethnopharmacol 93: 411-415.
11. Chen and Yen G. Antioxidant activity and free radical scavenging capacity of extracts from guava (*Psidium guajava* L) leaves. J of Agric. And Food Chemistry, 2006. 2:686-694.
12. Obinna C., Nwodo c.h and Olayinka O. Evolutionary antibacterial activity of *P. guajava* and *Gongronema latifolium*. J Med. Plant Res. 2(8); 189-192, 2008
13. Adeyemi OS, Akanji MA and Kanem JT. Ethanolic extract of *P. guajava* influence protein and bilirubin levels in *Trypanosoma brucei brucei* infected rats. J Biological Sciences 12:111-116.
14. Gutierrez, RM, Mitchell, S and Solis RV(2008). *Psidium guajava*: A review of its traditional uses, phytochemistry and pharmacology. J Ethnopharmacol 111(1):1-27.
15. OJEWOLE, J.A. (2006): Antiinflammatory and analgesic effects of *Psidium guajava* Linn. (Myrtaceae) leaf aqueous extract in rats and mice. *Methods and Findings in Experimental and Clinical Pharmacology* 28(7): 441-446.
16. Chen K, Hsieh C, Peng C, Hsiuh Li, Hsiu M, Chiang H, Huang K, Peng, R.Y (2007). Brain derieved metastatic prostrate cancer DU145 cells are effectively inhibited in vitro by Guava(*Psidium guajava* L.) leaf extracts. Nutr. Cancer 58(1):93-106.
17. Mahfuzul Haque, MD, Bari ML, Inatsu Y, Juneja VK and Kawamoto, S (2007). Antibacterial activity of guava (*Psidium guajava* L.) and Neem (*Azadirachta indica* A. Juss.) extracts against food borne pathogens and spoilage bacteria. Foodborne Pathogens and Disease 4(4): 481-488.
18. Manosroi J, Dhumsnom, P and Mansroi A. (2006). Antiproliferative activity of essential oil extracted from Thai medicinal plants on KB and P388 cell lines. Cancer Letters 235(1): 114-120.
19. Kaljee, LM, Thiem VD, Seidlein V L, Genberg BL, Canh D, Tho LH, Minh TT, Thoa L TK, Clemens JD and Trach DD (2004). Healthcare Use for Diarrhoea and Dysentery in Actual and Hypothetical Cases, Nha Trang, Viet Nam. Journal of Health, Population and Nutrition 22(2):139-149.
20. Mukhtar, HM, Ansari SH, Bhat ZA, Bhat ZA, Navad T and Singh P. (2006). Antidiabetic activity of an ethanolic extract obtained from stem bark of *Psidium guajava*(Myrtaceae). Pharmazie 61(8): 725-727.
21. Ramachandran, C., K. V. Peter and P. K. Gopalkrishnan. Drumstick (*Moringa oleifera*) : a multipurpose Indian vegetable. Economic botany, 34(3), 1980.276-283.
22. Naidu, J.R., Ismail, R.B., Chen Yeng, Sasidharan S. and Kumar P. Chemical composition and antioxidant activity of the crude methanolic extract of *Mentha spicata*. J of Phytology, 2012, 4(1):13-18.
23. Luqman S and Kumar R. Attenuation of hydroxyl radical formation by extracted constituents of *Moringa olifera* Lam. Current Chemical Biology, 5(3): 213-218. 2011.
24. Luqman, S, Srivastava S., Kumar R, Maurya A.K. and Chanda S. Experimental assessment of *Moringa olifera* leaf and fruit for its antistress and antioxidant scavenging potential using in vitro and in vivo assays. Evidence based Comp. Alt. Medicine, 2012. Doi.10.1155/2012/519084.
25. Anwar F, Ashraf M and Gitian A.H. *Moringa olifera*: A food plant with multiple medicinal uses. Phytotherapy Res. 21(1): 17-25, 2007.
26. Adetuyi FO, Ibrahim TA, Jude-Ojei and Ogundahunsi GA. Total phenol, tocopherol and antibacterial quality of honey

- Apis mellifera* sold in Owo community, Ondo State, Nigeria. African Journal of Biotechnology 2009, Vol. 8(7) pp. 1305-1309.
27. Trease, G.E and Evans, W.C 1989. Pharmacognosy, 11th Edn. Brailliar Tiridal Can Macmillian Publishers.
28. Sofowora, A., 1982. Medicinal plants and Traditional medicine in West Africa, John Wiley and Sons, pp.256, New York.
29. Finar, L.L 1983, Organic chemistry: Vol. 25th Edition, pp. 696-765, Longman, London.
30. Hawrelak J (2003) Medicinal herb monograph: Guava (*Psidium guajava*) . J Aust Traditi-Med Soc9: 25-29.
31. Kamath JV, Rahul N, Ashok Kumar CK Lakshmi . *Psidium guajava*: a review. Int. J. Green pharm. 2: 2008, 9-12.
32. Rosa, MP, Sylvia, N and Rosario V.S (2008). *Psidium guajava*: a review of its traditional uses, phytochemistry and pharmacology. J. Ethnopharmacol. 2008.

Source of support: Nil, Conflict of interest: None Declared