Available Online at http://www.recentscientific.com

ISSN: 0976-3031

International Journal of Recent Scientific Research
Vol. 6, Issue, 5, pp.4308-4311, June, 2015

International Journal of Recent Scientific Research

RESEARCH ARTICLE

ELEMENTAL, PHYTOCHEMICAL AND ANTIMICROBIAL ANALYSIS OF AMORPHOPHALLUS COMMUTATUS LINN

*Sagarika Damle and Atul Kotian

Department of Life Sciences, K.C. College, Mumbai, India

ARTICLE INFO

Article History:

Received 2nd, April, 2015
Received in revised form 10th, April, 2015
Accepted 4th, May, 2015
Published online 28th, May, 2015

Key words:

Amorphophallus commutatus, phytochemical, antimicrobial, elemental analysis

ABSTRACT

India's diverse ecosystems and climatic conditions have lead to abundance of plant species. A variety of seasonal plants are a part of Indian diet. *Amorphophallus commutatus* Linn., locally known as Shevra, belonging to Family Araceae, grows in wild during monsoon season in Maharashtra. According to the locals, only certain parts of the plant are edible and those are considered to render certain health benefits. Therefore, a comparative analysis of phytochemical constituents and antimicrobial activities of its edible and inedible parts was taken up that would help in highlighting its prospective use in healthcare sector along with minimising the wastage of inedible plant part. Elemental analysis of the edible part also established the nutritional benefits of this seasonal but less popular plant of urban population.

INTRODUCTION

India's diverse ecosystem and varied climatic conditions harbours several plant species that thrive in various bio geographic zones of the country. There are an estimated 250,000 flowering plant species around the world, out of which 17,672 flowering species are found in India (MoEF, 2004). Monsoon plays an important role in providing ideal conditions for several seasonal plants to complete various stages of their reproductive cycle. Varied seasonal plants have long been a part of diet in Indian population when other vegetables are scarce. Most of these, play an important role in human life, because they not only have nutritional significance but also contain medicinal properties. There are several wild seasonal edible plants that are consumed by local people in several forms such as roots, tubers, leaves, flowers, fruits and seeds etc. and these are often nutritionally more rich than some cultivated species (Madhkar and Jadhav, 2013).

During the last few decades, due to increasing development of drug resistance in pathogenic microorganisms and well as the appearance of undesirable side effects of certain antibiotics, researchers are focusing on developing plant based drugs, revisiting an ancient system of utilizing plants for disease management and control. Plants offering inhibitory effects against pathogens, have been reported in a wide range, with a goal to discover new classes of antibiotics that could offer safer solutions to the above mentioned health hazards (G.H. Shahidi, 2004). Transmission of antibiotic resistance genes between pathogenic bacteria has recently become an area in of interest scientific research, due to its close relation to the occurrence and severity of infection affecting human health. The recent rise in Anti-microbial resistance has been attributed to the high usage of anti-microbial drugs in the clinical setting as well as their over-use in agriculture (Shanks & Peteroy-Kelly, 2009). Previous work done by researchers on *Amorphophallus commutatus* Linn. included anti-microbial and in-vitro Free Radical scavenging activity of its rhizome (A.R. Krishna *et al*, 2013; Kavita Krishna *et al*, 2011). Since the plant has an edible and inedible portion that is often discarded as a waste, the current research undertook a comparative analysis of some of its secondary metabolites and antimicrobial effects of these two portions. An elemental analysis of important macro and micro elements was also performed for the edible plant part, so as to know its dietary benefits.

METHODS AND MATERIALS

Plant material

The fresh plant material was bought from local markets of Dahisar (19.25°N 72.859°E) and Borivali (19.23°N

Corresponding author:* **Sagarika Damle
Department of Life Sciences, K.C. College, Mumbai, India

72.86°E) in Mumbai (Bhojne P. *et al*, 2014). The soiled parts were thoroughly cleaned with tap water first and then with distilled water and air dried on filter papers. The plant was then separated into two separate plant samples. The edible sample contained spadix and male flowers and the inedible constituted of female flowers and the spathe. As the fresh plant is susceptible to rotting, these two samples were then dried thoroughly in a hot air oven at 50°C till stable dry weight was obtained. After drying, the edible and inedible plant parts were individually crushed with mortar and pestle to obtain a coarse powder which was stored in airtight plastic bottles under dark conditions till further use.

Preparation of Plant extract

The preserved plant samples were individually subjected to Soxhlet extraction (Rispail, N. *et al*, 2005; Kethani Devi and Krishna, 2013) using ethanol (300ml) as solvent. The extracts were then subjected to rotary evaporation (Joshi *et al*, 2013) and stored in Erlenmeyer flask capped with cotton under refrigeration at 4°C for long term storage (Eldhose *et al*, 2013).

Elemental Analysis

Acid digested plant extracts were subjected to Inductively Coupled Plasma- Atomic Emission Spectroscopy (ICP-AES) (Elekes *et al*, 2010; Ajayi *et al*, 2011).

Phytochemical Analysis

Qualitative analysis of plant extracts was performed using standard procedures for Alkaloids, Tannins, Terpenoids, Flavanoids, Steroids and Cardiac Glycosides. Any changes in color of solution were recorded and compared with Standard results to correlate with presence of secondary metabolite (Soni and Sosa, 2013; Hebbar and Nalini, 2014; M. Jeyachandran *et al*, 2013; Arya *et al*, 2012).

Antimicrobial Testing

The disc diffusion method (Verma V. *et al*, 2012) was used to screen the anti-microbial activity of both the plant samples. Whatmann filter paper discs dipped in plant extracts were places alongside with standard anti-biotic discs of Penicillin (10units/disc), Gentamicin (10mcg/disc) and Tetracycline (10mcg/disc) used as positive control samples. The loaded discs were placed on the surface of medium, and the plates were incubated at 37°C for 24 hours. The experiments were set up in triplicates. Zones of inhibition formed around the disc, were measured and mean values were recorded.

RESULTS

Elemental Analysis

Elemental analysis was conducted using the edible part only and some of the macro and micro elements, important in human nutrition, were estimated quantitatively. As it can be observed, all elements under investigation, were present in the edible plant sample. Out of the two heavy metals investigated, cadmium was below the detectable levels but some traces of lead were found in the sample.

Table 1 Elemental Analysis of edible part of *A. commutatus*

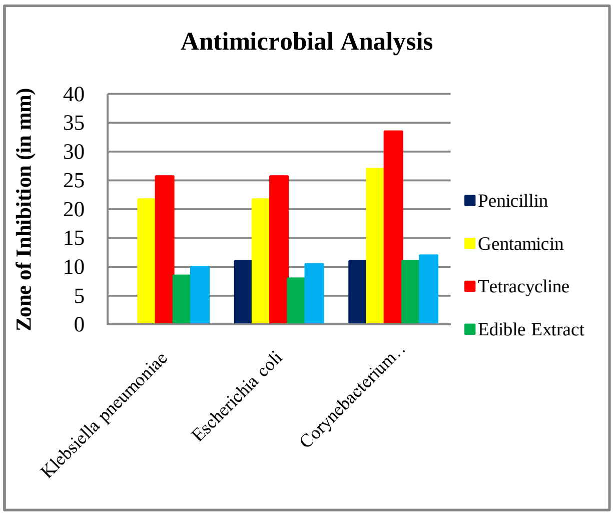
Type of Element	Name	Concentration (ppm)
Macro	Potassium (K)	>1468.84
Macro	Sodium (Na)	63.552
Macro	Calcium (Ca)	300.673
Macro	Magnesium (Mg)	165.029
Micro	Iron (Fe)	12.065
Micro	Copper (Cu)	0.691
Micro	Zinc (Zn)	2.714
Heavy Metal	Lead (Pb)	0.545
Heavy Metal	Cadmium (Cd)	ND

Phytochemical Analysis

Table 2 Phytochemical tests for detection of Secondary metabolites

Test	*A. commutatus* Edible	*A. commutatus* Inedible
Alkaloids		
Marquis' Test	+ve	+ve
Dragendroff's Test	+ve	+ve
Meyer's Test	+ve	+ve
Hagar's Test	-ve	-ve
Wagner's test	+ve	+ve
Flavanoids		
Ammonia Test	+ve	-ve
Terpenoids		
Salkowski Test	+ve	-ve
Tannins		
Prussian Blue Test	+ve	+ve
Steroids		
Liebermann Burchard Test	-ve	-ve
Cardiac Glycosides		
3,5 – Dinitrobenzoic acid Test	-ve	-ve

A comparative account of the different plant secondary metabolites for the ethanolic extracts of edible and inedible parts of *A. commutatus* is listed above in Table 2.



Graph 1 Comparative analysis of inhibitory effect of plant extracts and standard antibiotics against selected microorganisms

The edible extract gave positive results for the presence of alkaloids in most of the tests; it also gave positive tests for presence of flavanoids and terpenoids. The inedible extract gave mostly negative tests for alkaloids; however, it gave positive results for flavanoids and tannins.

Antimicrobial Analysis

From the above graph, it can be seen that though antimicrobial activity exhibited by both the plant extracts was not as high as commercially available antibiotics, the plant extracts did show some significant activity. Amongst the three bacterial species used, highest antimicrobial activity was observed against *C. diphtheria* by both edible and inedible plant extracts. It was interesting to note that out of the two extracts used, inedible extract offered higher resistance as compared to edible extract. Thus, this plant can be utilized for its anti-microbial activity.

DISCUSSION

According to National Institute of Nutrition standards, both macro and micro elements were found in adequate quantity in the edible part of *Amorphophallus commutatus* (ICMR, 2009). Potassium and Iron topped the chart in the macro and micro elements respectively. As Potassium plays a key role in Sodium- Potassium pump and Iron is an integral structural part of haemoglobin and other non-heme proteins, this plant can serve as a supplementary source of these nutritional elements in human diet. However, presence of lead indicates necessity of further investigations, as the presence and concentration of these heavy metals, is mostly habitat dependent. (Bhujbalrao R. *et al*, 2015)

Presence of alkaloids and tannins is seen in both edible and inedible plant samples. However, flavanoids and terpenoids were found only in the edible sample. Further investigations are required for characterizing the types of secondary metabolites. Since these secondary metabolites play an important role in antimicrobial activity (Wallace, 2004), their presence in *A. commutatus* can be correlated with its antimicrobial efficacy.

Increasing usage of antibiotics has made several pathogenic bacteria resistant to common antibiotics. Both extracts of *A. commutatus* showed significant activity against laboratory strains of microbes. The inedible part which is usually discarded as a waste, exhibited significant activity against Corynebacterium. The antimicrobial properties of this plant can be explored for using it in the formulations or its synergistic effect in combination with present drugs used against common pathogens.

CONCLUSION

Based on the results obtained from the elemental analysis, *A. commutatus* can serve as a good supplementary source of dietary elements. Presence of secondary metabolites such as alkaloids, flavanoids, tannins and terpenoids is an important criterion for this plant to be used in bioprospecting. It also indicates the plants ability to fight infections as these secondary metabolites are helpful in plant's defence mechanism. The efficacy of the edible and inedible plant samples to control microbial growth, suggests the probability of its usefulness in therapeutics. Though the inhibitory effect of the plant is lower than the standard antibiotics, the higher activity of inedible part against one of the pathogen offers an exciting option of minimising the plant waste and utilization of inedible part in therapeutics.

From all the above findings, it can be concluded that *Amorphophallus commutatus* is an underutilized seasonal plant from the dietary and therapeutics point of view. It needs stronger promotion through awareness programmes, to popularise it among the urban population. Owing to its wild habitat, its cultivation on large scale, can also help the farmers in rural and tribal areas to generate better income.

Acknowledgement

The authors would like to thank 'Jigyaasa'- Science Honors Program of K.C. College for providing necessary research facilities. They also express their gratitude to Principal, Ms. Manju Nichani, and the staff of Department of Life Sciences, K.C.College, Mumbai, for their support throughout the study. They also thank SAIL, IIT, Mumbai for their assistance in elemental analysis.

References

Ajayi I. A., Ajibade O. and Oderinde R. A., (2011). Preliminary Phytochemical Analysis of Some Plant Seeds, *Research Journal of Chemical Sciences*, 1(3) June: 58-62

Anjali Soni and Sheetal Sosa, (2013). Phytochemical Analysis and Free Radical Scavenging Potential of Herbal and Medicinal Plant Extracts, *Journal of Pharmacognosy and Phytochemistry*, 2 (4): 22-29

Arjun R. Krishna, Asis Singh, V. Abdul Jaleel , Sreena Raj , S. Karthikeyan and K. M Gothandam (2013). Morphological, phytochemical, and anti-bacterial properties of wild and indigenous plant (Amorphophallus commutatus), *Journal of Medicinal Plant Research*, 7(13), pp. 744-748

Bhojne P., Damle S., Thite A. and Dabholkar V. (2014). Anti-Microbial Effects of Some Leafy Vegetables - A Comparative Analysis, *International Research Journal of Biological Sciences*, Vol. 3(8), 26-32

Bhujbalrao R, Damle S, Thite A and Krishnmurty B (2015). Elemental analysis of some Seasonal Plants of Maharashtra, India, *Int. Res. J. Biological Sci.*, 4(4): 25-29

Binil Eldhose, Vicente Notario and M.S. Latha (2013). Evaluation of Phytochemical Constituents and In vitro Antioxidant Activities of Plumbago indica Root Extracts, *Journal of Pharmacognosy and Phytochemistry*, 2 (4): 157-161

Candace R. Shanks and Marcy A. Peteroy-Kelly, (2009). Analysis of Antimicrobial Resistance in Bacteria Found at Various Sites on Surfaces in an Urban University, BIOS 80(3): 105 – 113

Carmen Cristina Elekes, Dumitriu I., Busuioc G., Iliescu N. S (2010) The appreciation of mineral element accumulation level in some herbaceous plants species by ICP-AES method, Environmental Science and Pollution Research, July, 17(6): 1230-1236

CH. Kethani Devi and Dr. D. Gopala Krishna, (2013). Phytochemical Screening, Antibacterial, Antifungal and Anthelmintic Activity of Morinda citrifolia Stem, *Journal of Pharmacognosy and Phytochemistry*, 2 (1): 115-117

Deepa R. Hebbar and M. S. Nalini, (2014). Evaluation of phytochemicals, total phenolics and antioxidant activities of Schefflera spp. (Araliaceae) from southern India, *Journal of Pharmacognosy and Phytochemistry*, 2 (5): 10-14

G.H. Shahidi Bojar, (2004), Evaluation of Antibacterial Properties of Iranian Medicinal- Plants against Micrmicoous luteus, Serratia marcescens, Kelbsiella pneumoniae and Bordetella bronchoseptica, *Asian Journal of Plant Sciences*, 3(1): 82-86

Hansoon Kwak, Adrian D. Hegeman and Sangkyu Park, (2014), Seasonal Changes in Metabolic Profiles of Galls and Leaves of Rhus chinensis using Gas Chromatography Mass Spectroscopy and Liquid Chromatography Quadrupole Time-of-Flight Mass Spectroscopy, *J. Plant Biol.* 57: 127-135

Himanshu Joshi , Gyanendra Kumar Saxena, Vikas Singh, Ekta Arya and Rahul Pratap Singh (2013). Phytochemical Investigation, Isolation and Characterization of Betulin from Bark of Betula Utilis, *Journal of Pharmacognosy and Phytochemistry*, 2(1): 145-151

Indian Council of Medical Research for National institute of Nutrition, 2009, Nutrient Requirements and Recommended Dietary Allowances for Indians. In: Mineral requirements & Trace mineral requirements, Chapter 8-11, pp. 156-245.

Krishna, R. Kavitha; Karthikeyani, S.; Kumari and S. Krishna (2011). Antibacterial activity of Amorphophallus commutatus, an endemic plant of Western Ghats, South India, *Journal of Pharmacy Research*, Vol. 4 Issue 3, p710

M. Jeyachandran, T. Anantha Kumar and S. Gandhimathi (2013). Phytochemical Investigation of Ethnomedicinal Spermacoce ocymoides Roots, *Journal of Pharmacognosy and Phytochemistry*; 2 (3): 86-88

Madhkar S.D. and Jadhav Varsha (2013). Traditional uses of some wild vegetables of Kolhapur, *Life Sciences Lealet* 54: 19-26

MoEF & Kalpavriksh (2004). National Biodiversity Strategy and Action Plan, India: Final Tech.Report of the UNDP/GEF Sponsored Project, MoEF, Govt.of India,& Kalpavriksh, New Delhi/Pune

Nicolas Rispail, Robert Nash and K Judith Webb (2005). Secondary Metabolite Profiling Method, Lotus Japonicus Handbook Springer.341-348

R. John Wallace (2004). Antimicrobial properties of plant secondary metabolites, Proceedings of the Nutrition Society, 63(4), 621-629

S Shanmugam, Kumar T. Sathish and Panneer Selvam K., Laboratory Handbook on Biochemistry, PHI Learning Pvt. Ltd.: 129-133 (2010)

Verma V., Bhardwaj A., Rathi S. and R.B. Raja, (2012). A Potential Antimicrobial Agent from Cocos nucifera mesocarp extract; Development of a New Generation Antibiotic, *ISCA Journal of Biological Sciences*, 1(2): 48-54

Vikrant Arya, Narender Thakur and C.P. Kashyap (2012). Preliminary Phytochemical Analysis of the Extracts of Psidium Leaves, *Journal of Pharmacognosy and Phytochemistry*, 1(1), 1-5

How to cite this article:

Sagarika Damle and Atul Kotian., Elemental, Phytochemical and Antimicrobial Analysis of Amorphophallus Commutatus linn. *International Journal of Recent Scientific Research Vol. 6, Issue, 5, pp.4308-4311, June, 2015*

****