



RECENT ADVANCES IN BIOLOGICAL SCIENCES

VOLUME-1



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K.B.N. COLLEGE

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RECENT ADVANCES IN BIOLOGICAL SCIENCES

Volume 1

PREFACE

We are greatly privileged to organize a National Seminar on "Recent Advances in Biological Sciences" between the 28th and 29th of October 2022 by the Departments of Botany and Zoology, K.B.N College (Autonomous) in collaboration with Krishna University, Machilipatnam. The Departments of Botany and Zoology have been strenuously pursuing, and inculcating research aptitude among the taught and also the researchers, extending meaningful impetus.

In the contemporary period, biology has made great advances that have influenced all major branches of human knowledge. The solutions to major problems, like health and shelter, are expected from the pursuit of biological sciences. The student of biology can acquire a perceptive of all facts of the subject by a proper understanding of the structural and functional organization of plants, animals and man. While learning historical developments and modern trends, the students must be aware of the application and significance of this biological background in daily living. It will help to enter various academic and professional pursuits or to enter life with great satisfaction as regards this knowledge of living surroundings, processes and phenomena.

Biology is one of the most exciting disciplines of science and the thrill of its discoveries should reach the common man. Advances in Biology hold a lot of promise for improvement of the human life; hence we believe that the excitement of this field should be transmitted to the students.

The present book has been developed to meet the above needs. We are grateful to all the contributors for writing informative and authoritative and informative articles for this volume. The publication of the present work could not have been possible without the sincere cooperation and hard work of contributors. We have tried to honour their ideas in the original shape. While dealing with such voluminous work, errors are likely to occur despite our best efforts. However, the onus of technical content rests with contributors.

We pay humble regards to K.B.N College Management and wish to thank all who extended their full cooperation in many invisible ways during the preparation of this book.

Dr. M. RAHAMTULLA
Sri. S. ISMAIEL ALI BASHA

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PHYTOCHEMICAL SCREENING AND QUANTITATIVE ESTIMATION OF METALS IN NUT GRASS USING FLAME PHOTOMETRY

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ABSTRACT

Plants are the rich source of medicine because of the presence of large amount of phytochemicals and the phytomedicines which act symbiotically. In addition plants are act a rich source of minerals which have a profound effect for the continuity of life by supporting the phytomedicines in feedback manner. Sodium (Na) and potassium (K) are the two important metals that plays vital role in the human body. Preliminary phytochemical screening of Acetone Hydro alcohol aqueous extracts of nut grass powered plant material reveals in the presence of alcoholised, terpenoids and steroids in it. Quantitative determination of Sodium and Potassium in these extracts using Flame Photometry reveals the presence of 12.56 ppm, 5.67 ppm and 3.32 ppm of Na in acetone, aqueous alcoholic and in water extracts respectively, whereas 8.46 ppm, 13.45 ppm and 5.12 ppm of K present in acetone, aqueous alcoholic and in water extracts respectively.

Key words: Nut Grass, Phytochemical screening, Flame photometry.

1. PLANT INTRODUCTION

NUTGRASS (Fig. 1) although not a grass species, the name 'nutgrass' was commonly used for this plant in Australia. It is also sometimes called nut sedge[1] or purple nutsedge,[2] red nut sedge, Khmer kravanhchruk[3] is a species of sedge (Cyperaceae) native to Africa, southern and central Europe (north to France and Austria), and southern Asia. The word cyperus derives from the Greek κύπερος, kyperos,[4].

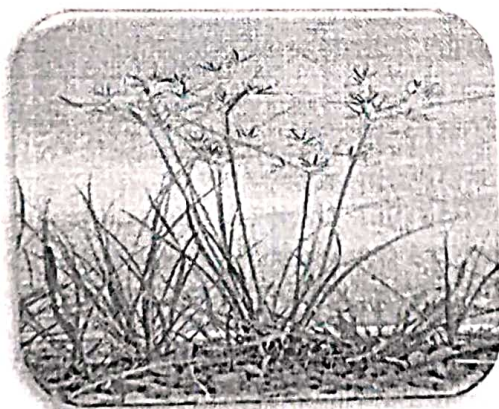


Fig. 1 Nut grass plant

Literature survey reveals that it has antimicrobial activity as well as determined the possible bioactive components of *Cyperusrotundus* rhizomes using GC-MS analysis, These results have

shown that the plant has a significant biological effect, which can be used as an antimicrobial drug against bacteria and fungi. [5]. The antibacterial activity test was done by measuring the diameter of the inhibition zones using the diffusion agar method [6]. It is a multipurpose plant, widely used in traditional medicine around the world to treat various diseases such as analgesic, alternative, astringent, antispasmodic, antibacterial, carminative, contraceptive, demulcent, emmenagogue, emollient, febrifuge, immunostimulant, laxative, tonic, vermifuge, indigestion, constipation, dysentery, abdominal distention, neurogenic gastralgia, chest pains, irregular menstruation, painful menstruation, skin diseases, furuncle infections, leprosy, sprains and bruises, and fever [7-9]. Methanolic extract of *Cyperus rotundus* showed significant anti-helminthic activity [10]. The observed antioxidant activity in the various parts of the grass may be due to their rich pool of phytochemicals [11]. Aqueous extracts and leachates of leaves and tubers of *Cyperus rotundus* L. exhibited inhibitory effects against fetal growth of rats during pregnancy [12]. The ethanolic extract showed highest anti-bacterial activity [13], anti-hyperglycemic effect [14], anti-ulcer activity [15].

As we all know that, Plants are the rich source of medicine because of the presence of large amount of phytochemicals and the phytomedicines which act symbiotically. In addition plants act as rich source of minerals which have a profound effect for the continuity of life by supporting the phytomedicines in feedback manner. Sodium is the major extracellular cation and it plays a major role in body fluid distribution whereas potassium is essential for normal cell function. Potassium is an essential mineral that is needed by all tissues in the body. Potassium is found naturally in many foods and as a supplement. Its main role in the body is to help maintain normal levels of fluid inside our cells.

In this present study Acetone, hydro alcoholic and aqueous extracts of Nut Grass were subjected to preliminary phytochemical screening analysis and further these extracts were studied for the estimation of sodium and potassium using Flame photometry.

MATERIALS AND METHODS

2.1 Collection of plant materials:

The nut grass was purchased in local market Vijayawada. The collected plant materials were dried in shady conditions, the dried material was powdered, the powdered plant material is then stored in suitable conditions (air tight, light resistant containers).

2.2 Chemicals and reagents:

All the chemicals used were of analytical grade and were purchased from Merck chemicals private limited, Mumbai.

2.3 Instruments used: Soxhlet apparatus is used for the extraction of phyto-constituents from the plant powder. Flame photometry.

2.4 Methods

2.4.1 Extraction procedure:

The powdered material Nut Grass of 20 mg was weighed and is subjected to Soxhlet extraction using solvents acetone, hydro alcohol and water in successive modes for 48 h. The solvent was then recovered using Rotary Vacuum Evaporator. Concentrated extract was further evaporated to get dry powder. The dried powder was preserved in an airtight bottle. The crude extracts thus obtained were used for further investigation of phytochemical screening.

2. Experimental

2.1 Preliminary phytochemical screening

The extracts of the powdered leaves of nut grass seeds analyses for the presence of various phyto-constituents like steroids, Tri-terpenoids, saponins, alkaloids, carbohydrates, flavonoids, glycosides and phenolic compounds were identified using standard phytochemical procedures as described below.

3.2 Analysis of Sodium and Potassium by Flame Photometric method:

Preparation of Sample extract for analysis:

For preparation of sample extract, 10 mg of the extract was separately mixed with 10 ml of water. The extract was completely exhausted by adding small quantities of water and filter off every time in a successive manner, to yield final volume of 1 liter.

Preparation of Standard sodium and potassium Solutions:

1000 ppm of standard solution was prepared by dissolving 2.5416 gms of NaCl or 1.9070 gms of KCl in 1 litre of glass distilled water.

A series of 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 ppm solutions were prepared by diluting 1ml, 2ml, 3ml, 4ml, 5ml, 6ml, 7ml, 8ml, 9ml and 10ml of the above standard solutions to 100ml. Sodium and potassium are analysed at a wave lengths of 589 nm and 768 nm respectively.

A calibration graph was drawn with these standard solutions and using this calibration curve concentration of Na and K in the extracts was determined [16].

RESULTS AND DISCUSSION

4.1 Phytochemical screening:

The Acetone and hydro alcoholic extracts of *Cyperus rotundus* showed the presence of alkaloids and steroids. While, provided the absence of terpenoids, saponins, glycosides, tannins, quinones, carbohydrates. Flavonoids and resins were shown in Table 1. The aqueous extract of *Cyperus rotundus* showed the presence of alkaloids, terpenoids, and steroids. While, provided the absence of saponins, glycosides, tannins and quinones.

Table 1: Results of phytochemical screening of the Acetone, hydro alcoholic and aqueous extract of Nut Grass

S.NO	SECONDARY METABOLITES	ACETONE	ETHANOL+ WATER	WATER
1	Alkaloides (Wagnere's test)	+Ve	+Ve	+Ve
2	Terpenoids (foam test)	-Ve	-Ve	+Ve
3	Saponins (legal test)	-Ve	-Ve	-Ve
4	Glycosides (legal test)	-Ve	-Ve	-Ve
5	Tannins (general colour test)	-Ve	-Ve	-Ve
6	Quinone (rhodamine test)	-Ve	-Ve	-Ve
7	Phenols (ferric chloride test)	-Ve	-Ve	-Ve
8	Carbohydrates (fehling's test)	-Ve	-Ve	-Ve
9	Flavonoids (ferric chloride test)	-Ve	-Ve	-Ve
10	Resins (libermann test)	-Ve	-Ve	-Ve
11	Steroids (Salkowski)	+Ve	+Ve	+Ve

4.2 Metal Analysis by Flame Photometry:

The concentration of sodium (Na) in various plant extracts follows the order - Acetone > hydro alcoholic > Aqueous as shown in Table 2. The highest concentration of Na was being found present in acetone extract and least in aqueous extract. The quantitative estimation of potassium in the plant extracts shows that highest concentration is present in hydro alcoholic extract and the acetone extract has more potassium content than aqueous extract, but less than the hydro alcoholic extract. The proper

level of potassium is essential for normal cell function. An abnormal increase of potassium (hyperkalemia) or decrease of potassium (hypokalemia) can profoundly affect the nervous system and heart, and when extreme, can be fatal. The normal blood potassium level is 3.5- 5.0 millimole/liter (mmol/l). The K ion concentration was found to 98-180 ppm permissible within the range set up by WHO[17-18]. The concentration of sodium ion with the concerned plant was found in the range (120-340 ppm). Sodium is important in maintaining human body fluid volume and maintaining electric potential in the animal tissue.

Table. 2: Concentration of Na and K found in Nut Grass by Flame photometry

Extract	Na ppm	K ppm
Acetone	12.56	8.46
Hydroalcoholic	5.67	13.45
Aqueous	3.32	5.12

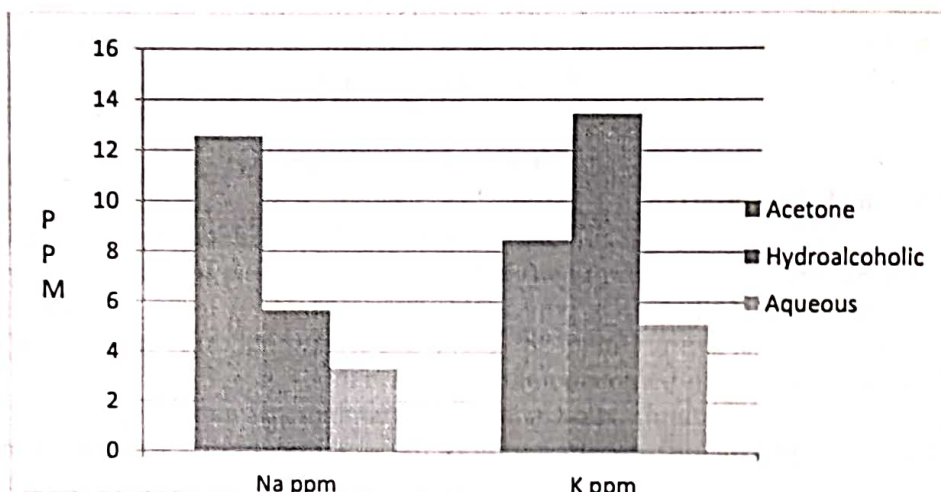


Fig. 2 Na and K content in the plant extract of Nut Grass

CONCLUSION

Hence, the phytochemical screening of the selected plant sample was done. From the study, it could be concluded that plants are a great source of phytochemicals that could be utilized in curing various ailments. The result of this study shows the presence of some phytochemicals such as alkaloid, steroids and terpenoids in the acetone, hydroalcoholic and aqueous extracts of nut grass. This study helped to know the cytotoxic effect of the phytoconstituents present in plant extracts on the living cells. The study provides an important basis for further investigation into the isolation and characterization of phytoconstituents from the selected plants for the development of drugs. The study was only based on qualitative analysis and screening. It would be better if a quantitative detection, their bioactivity, and IR spectra of the various phytochemicals could be performed. The study would be more beneficial if the detection, analysis, and separation of the phytoconstituents could be done.

The results obtained are quite interesting for the concerned plant. The metals analysed in all the three parts are within the range set up by the WHO. The metals in their limit are useful for the living beings, their increase or decrease from the limiting value could cause a defect. The metal ions are very essential for all type of metabolic chains like respiration, reproduction, absorption of nutrients etc, so their deficiency or over accumulation is seen with a direct effect. As per this plant is taken into consideration, it is mineral rich so should be consumed with a good amount.

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About The College:

Kakaraparti Bhavanarayana College is a vivacious outcome of a century old renowned charitable organization, S.K.P.V.V. Hindu High Schools committee with "Tejaswina Vadheethamasthu" as its motto. Since its inception in 1965, it marked an epoch in innovative education, in an academically and economically impoverished area. The college with heightened social imagination and ardent zeal, shone like a lodestar led innumerable students towards the goal of an illustrious life. The ever vibrant college grew by leaps and bounds and has evolved with times. It has been adorned with the Autonomous status by the UGC in the year 2010, and received "Best Laboratory", "Best Academic Achievement", "Best Library", "Best NSS Unit" awards. The College has never rested on its laurels and has been relentlessly raising the bar. It is certified with ISO 9001-2015 which has been given for Quality Management Standard and accorded with CPE in 2016 by UGC. It has been reaccredited with "A" Grade by NAAC in 2019.

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