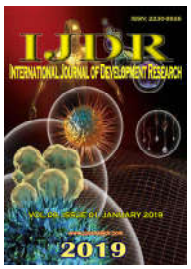
ISSN: 2230-9926

*Available online at http://www.journalijdr.com*

IJDR

*International Journal of Development Research*
*Vol. 09, Issue, 01, pp.25310-25314, January, 2019*



ORIGINAL RESEARCH ARTICLE OPEN ACCESS

# A STUDY ON PROXIMATE MINERAL COMPOSITION OF PLANTAIN *(MUSA PARADISIACA)* WASTES; A POTENTIAL NUTRITIVE SOURCE IN THE FORMULATION OF ANIMAL FEEDS

**[1]Karthikeyan, G., [2]Dr. Vidya, A. K. and [3]Bhuvaneswari, A.**

[1, 3]Assistant Professor, Department of Biochemistry, Kongu Arts and Science College, India
[2]Associate Professor and Head, Department of Biochemistry, Kongu Arts and Science College, India

**ARTICLE INFO**

***Article History:***
Received 22nd October, 2018
Received in revised form
17th November, 2018
Accepted 03rd December, 2018
Published online 30th January, 2019

***Key Words:***
*Musa Paradisiaca* Bract,
proximate Composition,
Anthocyanin, Animal Feeds and Dyeing.

**ABSTRACT**

Plantain fruit constitute an important source of energy as a staple diet in the tropics. The peel of the fruit is discarded as waste after the edible portion is eaten; thereby constituting a menace to the environment, especially where its consumption is common, while the bracts are left on the farm as wastes. This research work has comprehensively investigated the presence of proximate mineral composition and secondary metabolites in the *Musa Paradisiaca* bract waste by using standard methods of AOAC. In this study different solvent extract namely aqueous, ethanol, acetone and hexane extract were prepared from *Musa Paradisiaca* bract for screening its biochemical constituents. The 10 g of waste sample contains 1.79 % of moisture content, 4.19 % of Ash content, and 8.0 - 13.0 mg of carbohydrate, 8.5 - 9.5 mg of Proteins. Plantain bract is rich in iron (5.0 – 7.0 mg) and magnesium (2.0 – 3.0 mg).it also contains huge amount of total phenol (2.0 - 3.5 mg) and flavonoids (3.0 - 4.5 mg) per 10 g of sample. This study is mainly carried out to identify the presence of Anthocyanin pigment in *Musa Paradisiaca* bract sample. Result of this study confirmed the presence of anthocyanin pigment in fresh extract of *Musa Paradisiaca* bract. The knowledge gained by our present study suggest for use of anthocyanin pigment extracted from the Banana extract in textile industry for dyeing a cotton fabric in the presence of mordants. Plantain wastes pose to be potential good sources of nutrients for production of animal feeds, and their utilization for this purpose should be encouraged, as this will also help in reducing the menace of plantain waste in the environment.



**Citation: Karthikeyan, G., Dr. Vidya, A. K. and Bhuvaneswari, A. 2019.** "A study on proximate mineral composition of plantain *(musa paradisiaca)* wastes; a potential nutritive source in the formulation of animal feeds", *International Journal of Development Research*, 09, (01), 25310-25314.

## INTRODUCTION

Plantain is one of the most important crops of the tropical plants. The banana plant, often referred to as a 'tree', is the largest herbaceous flowering plant. It belongs to the family Musaceae and the genus Musa. It is a tropical plant that is native to India (Adeolu *et al.,* 2013). Cultivated banana plants vary in height depending on the variety and growing conditions. Most are around 5 m (16 Ft) tall, with a range from 'Dwarf Cavendish' plants at around 3 m (10 Ft) to 'Gros Michel' at 7 m (23 Ft) or more.3,4 Leaves are spirally arranged and may grow 2.7 metres (8.9 Ft) long and 60 cm (2.0 Ft) wide. Plantain contains a high fibre content, and thus is capable of lowering cholesterol and helps to relieve constipation and hence prevention of colon cancer.

***Corresponding author:*** **Mr. Karthikeyan, G.,**
Assistant Professor, Department of Biochemistry, Kongu Arts and Science College, Erode, India.

Besides this, its high potassium content is found to be useful in the prevention of raising blood pressure and muscle cramp. Various parts of the plant such as the leaves, root, fruit stalk, bract and fruit have been used for medicinal and domestic purposes (NarasingaRao, 2014). The aim of the study is to identify the biochemical constituents present in the vegetable sample of *Musa Paradisiaca bract* especially Mineral analysis (macro and micro), Secondary metabolites and identification of natural pigments (*Anthocyanin*) in *Musa Paradisiaca bract* sample (Narayana *et al.,* 2017). In view of the need for waste management and upsurge in the prizes of livestock feeds coupled with their increasing demand, this study was conducted to determine the proximate and mineral composition of *Musa paradisiaca* wastes (bracts) flour for possible utilization as livestock feeds. This study is also suggested for use of anthocyanin pigment present in the Banana bract extract in textile industry for dyeing a cotton fabric in the presence of mordants (Okorie *et al.,* 2015).

## MATERIALS AND METHODS

**Collection of sample**: The Banana bract was collected from local market of tirupur. The collected samples were rinsed under running water to remove solid particles from the surface and allowed to shade dry for 5 days, grained to powder and stored in air tight container.

**Preparation of plant extract:** 10 g of fresh sample material (banana bract) is mixed with 100 ml of different solvents (distilled water, ethanol, hexane and acetone). This was kept in rotatory shaker for 24 hours of incubation and finally filtered using Whatmann No. 1 filter paper. The above filtrate is stored in refrigerator and used for further study.

**Analysis of Biochemical constituents:** The carbohydrate, free amino acid and protein present in the banana bract are estimated by O - toluidine method, Ninhydrin method and Bradford method respectively.

**Analysis of Minerals:** The minerals like magnesium and iron are estimated by using titan yellow method and Wong's Method respectively.

**Analysis of Secondary Metabolites:** The secondary metabolites such as total phenol and flavonoids are estimated using standard protocol of Folin-Ciocalteau reagent method and Aluminium chloride method respectively.

**Estimation of anthocyanin:** The pigment present in the banana bract was estimated by using following protocol, 1g of fresh sample was taken and extract is prepared by adding10ml of acetone. The extract is centrifuged at 3000 rpm for 10mins at room temperature. Transfer supernatant into the standard conical flask. Again grind the precipitate with 10ml of acetone and centrifuge. Transfer the supernatant into the same conical flask and it is repeated until the colour disappears. The content in the standard flask are made up to 100ml with acetone. Measure absorbance at 530 and 637 nm.

**Estimation of Ash Content and Moisture Content:**

- **Estimation of ash content:** Empty silica crucial was cleaned well and heated over a Bunsen flame to red hot. Cooled in a desiccator and weighed. Heating, cooling and weighing were repeated to obtain constant weight. About 4.0g of sample was taken in two different crucibles. The crucible was heated over a Bunsen burner until the sample turned ash. Heating, cooling and weighing were repeated until constant weight were got.
- **Estimation of Moisture content:** An empty crucible was cleaned well and heated to red hot over a Bunsen burner. Cooled it in a desiccator and weighed. Heating, cooling and weighing were repeated until a constant weight was obtained. 4.0g of sample was taken and heated in a oven at 100$^{o}$c for 6 hrs. Coold in desiccators and again weighed. This process was repeated until constant weight was obtained.

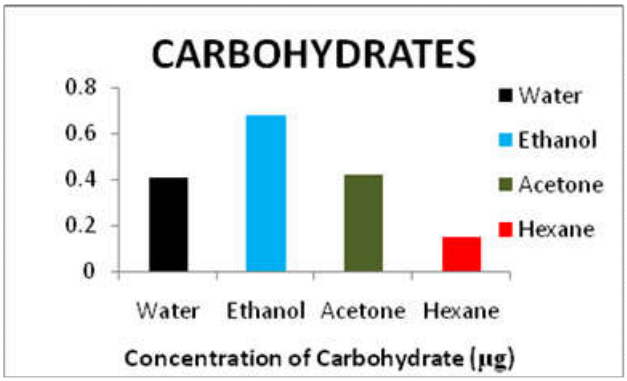
## RESULTS AND DISCUSSION

The present study mainly deals with the investigation of biochemical constituents, Mineral composition, Secondary metabolites and Natural pigments present in the banana bract sample to assess the nutritional potential of the sample.

**Biochemical parameters:** Banana bract contains varying amount of Carbohydrate, Protein and Free amino acids.

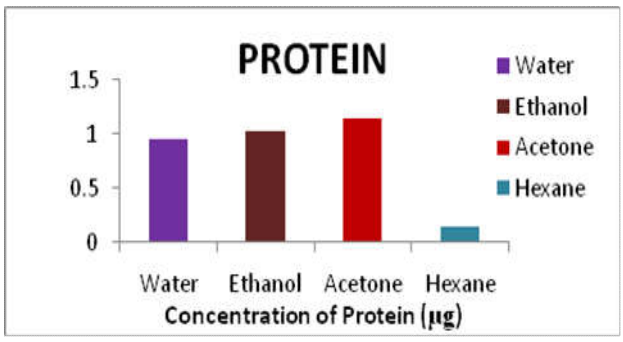
**Carbohydrates:** The amount of carbohydrate present in the banana bract sample is noted in following table and graph. From the above results, the amount of carbohydrate present in the Water, Ethanol, Acetone and Hexane extract is found to be 8.2, 13.6, 8.4 and 3.0 mg respectively. Thus, it is evident that ethanol and acetone extracts contain richer amount of carbohydrate than water and hexane extracts.

| Extracts | Concentration of Carbohydrates (mg) |
|---|---|
| Water | 8.2 |
| Ethanol | 13.6 |
| Acetone | 8.4 |
| Hexane | 3.0 |




**Protein:** The amount of protein present in the banana bract sample is noted in following table and graph. From the above results, the amount of protein present in the Water, Ethanol, Acetone and Hexane extract is 8.4, 8.8, 9.5 and 1.2 mg respectively. This proves that ethanol and **acetone** extracts contain greater amount of protein than **water** and **hexane** extracts.

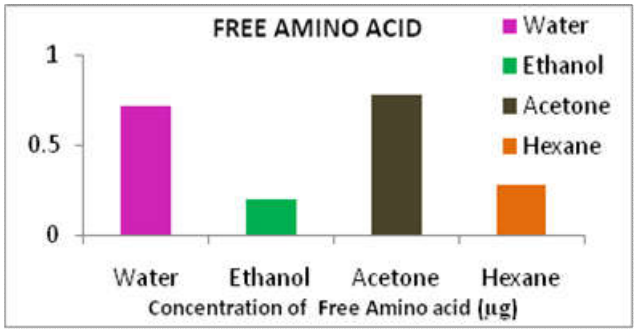
| Extracts | Concentration of Protein (mg) |
|---|---|
| Water | 8.4 |
| Ethanol | 8.8 |
| Acetone | 9.5 |
| Hexane | 1.2 |




**Free amino acids:** The amount of free amino acid present in the banana bract sample is as follows. The amount of free amino acid present in the Water, Ethanol, Acetone and Hexane extract is found to be 4.3, 1.2, 4.7 and 1.7 mg respectively. In this case, water and acetone extracts contain richer amount of free amino acid than ethanol and hexane extracts.

Earlier reports suggest that carbohydrate, protein and free amino acid are an essential components of diet needed for survival of animals and human beings.

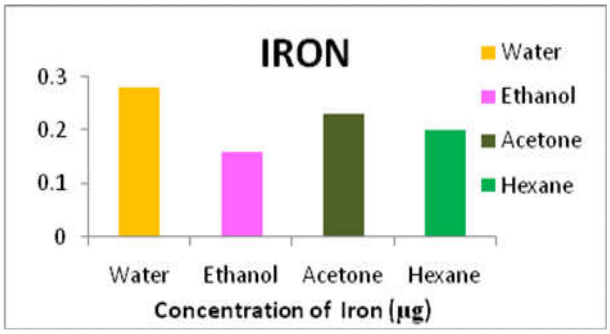
| Extracts | Concentration of free Amino acid (mg) |
|---|---|
| Water | 4.3 |
| Ethanol | 1.2 |
| Acetone | 4.7 |
| Hexane | 1.7 |




**Estimation of minerals:** Banana bract contains varying amount of iron and magnesium.

**Iron:** The amount of iron present in the banana bract sample is as follows. In our Present study, the amount of iron present in the Water, Ethanol, Acetone and Hexane extract is found to be 7.0, 4.0, 5.5 and 0.5 mg respectively. This clearly show that water and acetone extracts contain more amount of iron than ethanol and hexane extracts.

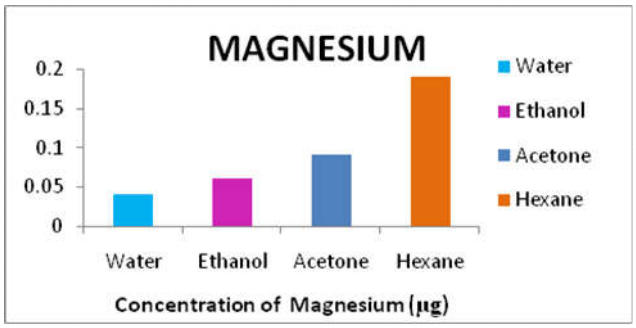
| Extracts | Concentration of iron (mg) |
|---|---|
| Water | 7.0 |
| Ethanol | 4.0 |
| Acetone | 5.5 |
| Hexane | 0.5 |




**Magnesium:** From the results, the amount of magnesium present in the Water, Ethanol, Acetone and Hexane extract is 8.2, 13.6, 8.4 and 3.0 mg respectively. Therefore it is evident that acetoneand hexane extracts contain higher amount of magnesium than water and ethanol extracts. From the above results, the amount of magnesium present in the Water, Ethanol, Acetone and Hexane extract is found to be 8.2, 13.6, 8.4 and 3.0 mg respectively. The result thus confirms thatacetoneand hexane extracts contain richer amount of magnesium than water and ethanol extracts. Hence it can be concluded that the bract serves as good source of mineral elements.

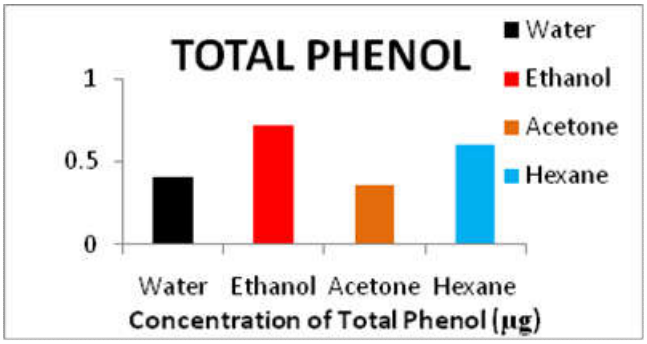
**Estimation of secondary metabolites:** Banana bract contains varying amount of secondary metabolites like total phenol and flavonoid.

| Extracts | Concentration of Magnesium (mg) |
|---|---|
| Water | 1.3 |
| Ethanol | 2.0 |
| Acetone | 3.0 |
| Hexane | 6.3 |




**Total phenol:** The amount of total phenol present in the banana bract sample is as follows

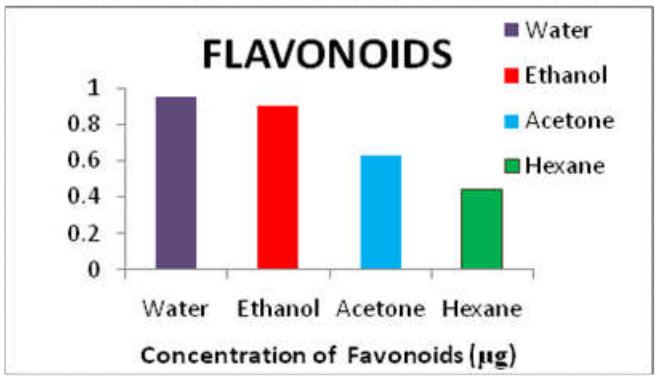
| Extracts | Concentration of Total Phenol (mg) |
|---|---|
| Water | 2.07 |
| Ethanol | 3.6 |
| Acetone | 1.8 |
| Hexane | 3.0 |




From the above results, the amount of total phenol present in the Water, Ethanol, Acetone and Hexane extract is observed to be 2.07, 3.6, 1.8 and 3.0 mg respectively. This clearly suggests that ethanol and hexane extracts contain richer amount of total phenol than water and acetone extracts.

**Flavonoids**: The amount of flavonoid present in the banana bract sample is as follows

| Extracts | Concentration of Flavonoids (mg) |
|---|---|
| Water | 4.7 |
| Ethanol | 4.5 |
| Acetone | 3.1 |
| Hexane | 2.2 |




The amount of flavonoid present in the Water, Ethanol, Acetone and Hexane extract in our study is found to be 8.2, 13.6, 8.4 and 3.0 mg respectively. This again proves that water

and ethanol extracts contain richer amount of flavonoid than acetone and hexane extracts. Thus the overall results of our study reveal *that Musa acuminate bract*s have the potential as good sources of natural compounds.

**Comparison of Ash and Moisture content:** Ash and moisture content present in *Musa Paradisiaca bract* can be determined by standard protocol.

| | |
|---|---|
| Ash content | **4.19%** |
| Moisture content | 1.76 |

The present study showed the ash content and moisture content of *Musa Paradisiaca bract* represented in %.

**Anthocyanin:** The amount of anthocyanin pigment present in banana bract is as follows

| EXTRACT | Value of Anthocyanin Pigment in gram |
|---|---|
| 80% acetone | 0.107 |

The total anthocyanin content extracted by 80% acetone was found to be 0.107 g in banana bract. The present study was carried out to determine the presence of bioactive compounds in the sample of *Musa Paradisiaca bract.* In our study we also examined the element composition and natural pigment of *Musa Paradisiaca bract.* In this study different solvent extract namely aqueous, ethanol, acetone, hexane extract were prepared from *Musa Paradisiaca bract* and screened for its biochemical constituents. The biochemical constituents like carbohydrate and protein is found to be rich in ethanol and acetone extract when compared with other extracts. Amino acid content of *Musa Paradisiacabract* is found to be rich in aqueous and acetone extract when compared with other extracts.

In the same way, Iron is found to be rich in aqueous and acetoneextract when compared to other extracts. Whereas magnesium is found to be rich in acetone and hexaneextract when compared to other extracts. The results of the secondary metabolites show that the total phenol is found to be rich in ethanol and hexaneextract when compared to other extracts. Whereas flavonoid is found to be rich in water and ethanol extract when compared to other extracts. This study is mainly carried out to identify Anthocyanin pigment present in *Musa Paradisiaca bract* sample. Result of this study confirmed the presence of anthocyanin pigment in fresh extract of *Musa Paradisiaca bract*. The knowledge gained by our present study suggest for use of anthocyanin pigment extracted from the Banana extract in textile industry for dying a cotton fabric in the presence of mordants. Further the study on the metabolites and their mineral composition throw light on the use of the waste extract of the bract as animal feed.

## Conclusion

This research work has comprehensively investigated the proximate composition, Ash and Moisture properties of banana bract, which is considered as a by-product of banana cultivation. The analysis of banana bract revealed their considerable Ash and Moisture properties and nutritional value. Banana bract powder was found to contain a significant nutritive complement based on their high mineral content.
The plantain wastes were rich in carbohydrates and ash and can serve as basal materials or components of animal feed. The bract samples were high in crude protein, and can serve as protein source for animal feed if bioavailable. Protein is an essential component of diet needed for survival of animals and human being, its basic function in nutrition is to supply adequate amount of required amino acids. The wastes were high in magnesium and iron and can be good source of these minerals. Plantain wastes pose to be potential good sources of nutrients for production of animal feeds, and their utilization for this purpose should be encouraged, as this will also help in reducing the menace of plantain waste in the environment. Also, the presences of good level of mineral elements show their reliability in correcting nutritional disorders and also in the manufacture of organic fertilizer.

**Acknowledgement**

We wish to thank our Management, Principal and staff members of Biochemistry department for providing the necessary facilities and support for this study.

## REFERENCES

Adeolu A.T. and Enesi D.O. 2013. Assessment of proximate, mineral, vitamin and phytochemical compositions of plantain (*Musa paradisiaca*) bract, *International Research Journal of Plant Science,* . 4(7) pp. 192-197.

Adeyemi, O. S. and Oladiji, A. T. 2009. Compositional changes in banana *(Musa ssp.)* fruits during ripening, *African Journal of Biotechnology*, 8 (5), pp. 858-859.

Anthony Cemaluk C. Egbuonu, Oluchi M. Ogele and Kelechi L. Amaraihu 2016. Comparative Evaluation of the Proximate Composition and Antibacterial Activity of Ground *Musa paradisiaca* (Plantain) Peels and Leaves, British Biotechnology Journal, 15(2):pp:1-9.

Arya Krishnan S.A and Dr. Sinija V.R. 2016. Proximate Composition and Antioxidant Activity of Banana Blossom of Two Cultivars in India, *International Journal of Agriculture and Food Science Technology*. 7 (1), pp: 13-22.

Auta S.A and Kumurya A. S. 2015. Comparative proximate, mineral elements and antinutrients composition between *Musa sapientum* (Banana) and *Musa paradisiaca* (Plantain) pulp flour, *Sky Journal of Biochemistry Research*, 4 (4), pp. 025 – 030.

Chandra S Iyer and SoniTilara 2016. Microencapsulation of Anthocyanin Extracts from *Musa Acuminata bracts* and its Application as a Potent Biocolour, *International Journal of Nutrition & Food Science*, 5 (3), pp. 37 - 41.

Dr. Khin Nann NyuntSwe 2012. Study on Phytochemicals and Nutritional Composition of Banana Flowers of two Cultivars (PheeKyan and Thee hmwe), Universities Research Journal, 5 (1), pp. 1 - 8.

Eswa.Ar, R.K. Nanda, K. Ramamoorthy, Z.Isha and S. Gokulakrishnan 2016. Biochemical Composition and Preliminary Qualitative Analysis of Marine Clam *Gafrariumdivaricatum* (Gmelin), Asian Journal of Biomedical and Pharmaceutical Sciences, 6(55), pp. 01-06.

Jenshiroobha. J, M.Saravanakumar, K.M. Aravinthan and P.Suganyadevi 2011. Antioxidant analysis of anthocyanin extracted from *Musa acuminata bract*, *Journal of Pharmacy Research*, 4 (5), pp.1488-1492.

Khizar Abbas, Ghazala H. Rizwani, HinaZahid and Ayesha Asif 2015. Pharmacognostic Evaluation of *Musa Paradisiaca L.* Bract, Flower, Trachea and tracheal fluid,

*World Journal of Pharmacy and Pharmaceutical Sciences*, 4(4), pp.1461-1475.

Meenashree. B, V.J. Vasanthi and R. Nancy Immaculate Mary 2014. Evaluation of total phenolic content and antimicrobial activities exhibited by the leaf extracts of *Musa acuminata* (banana), *International Journal of Current Microbiology and Applied sciences*, 3(5), pp. 136-141.

Narayana.C.K, K.J. Jeyabaskaran and M.M. Mustaffa 2017. Chemical and Mineral Composition of Four Cultivars of Banana *(Musa sp.)* Belonging to Different Genomic Groups Grown in India, *International Journal of Current Microbiology and Applied Sciences*, 6(9), pp. 2862-2867.

Narasinga Rao V. 2014. Biochemical and Phytochemical Analysis of The Medicinal Plant*, Kaempferia Galanga* Rhizome Extracts, 3(1), pp 18-20.

Ogbonna Obiageli A., Izundu A. I, Ikeyi Adachukwu Pauline and Ohia Geraldine Ukamaka 2016. Proximate Compositions of fruits of Three Musa Species at Three Stages of Development, *IOSR Journal of Dental and Medical Sciences*, 15(6), pp. 107-117.

Okorie DO., Eleazu CO. and Nwosu P. 2015. Nutrient and Heavy Metal Composition of Plantain (*Musa paradisiaca*) and Banana (*Musa paradisiaca*) Peels, *Journal of Nutrition & Food Sciences*, 5 (3), pp. 1-3.

Sathyadevi M. and Subramanian S. 2014. Extraction, Isolation and characterization of Bioactive Flavonoids from the Fruits of*Physalisperuviana Linn Extract*, *Asian Journal Pharmaceutical Clinical Research,* 8, pp. 152-157.

*******