Research Article

Variations in Nutritional Composition among Different Selected Medicinal Plants

Mukhan Wati* and M. Khabiruddin

Department of Chemistry and Biochemistry, Chaudhary Charan Singh Haryana Agricultural University, Hisar – 125004, Haryana, India

Abstract

Present study was conducted to find out the nutritional composition of seeds of different selected medicinal plants from two locations. The seeds were separated from their pods manually and milled separately. The powdered samples were analysed for proximate and mineral contents. The result of the experiment showed that seed have moisture (3.1±0.2–12.7±0.3%), ash (2.8±0.1–7.3±0.1%), fibre (3.4±0.3–11.3± 0.1%), protein (17.5±0.2–28.9±0.4%), carbohydrates (9.9±0.5–57.4± 0.8%) and energy value (1542.2±2.4–2171.1±2.8kJ/100g). For mineral analysis the samples of different plants have appreciable amount of minerals such as Ca, K, Na, Fe and P.

Keywords: Nutritional composition; mineral elements; medicinal plants

***Correspondence**
Author: Mukhan Wati
Email: mukhandagar88@gmail.com

Introduction

Shortage of quality animal feeds, especially in developing international locations has necessitated investigations of several novel opportunity sources of feeding substances for viable incorporation into animal diets. There are big wide variety of woodland trees which bear seeds yielding oils of various business importance and the seed cake is used as a fodder for farm animals population.

Plants have now not best supplied mankind with meals, garb, flavors, cosmetic, ornamental, fumigants, insect deterrents and fragrance, but have additionally served humanity in the treatment of illnesses. Approximately three-quarters of the world's population which stay in growing countries rely upon flora for the remedy of many ailments [1]. Plants include micro organism, viruses, fungi, wild fires. Plants life guards them through a chemical defence system [2].

Material and Methods

Seed material

The seeds of *Acacia nilotica, Albizia lebbeck, Melia azedarach, Pongamia pinnata, Cassia fistula* and *Salvadora persica* were collected from the forest area of CCS, Haryana Agricultural University, Hisar and District Palwal. After cleaning, the seeds were ground into fine powdered form.

Chemicals

The commercially available chemicals from Qualigens, Merk and Ranbaxy, of highest purity, were used for various experimental procedures.

Method used

Estimation of moisture content

Two gram of powdered sample of seeds was taken in three replicates and dried at 100-102°C then weight of dried sample was noted until constant weight were obtained [3]. The percentage of moisture content was calculated as follows:

$$\text{Moisture content (\%)} = \frac{\text{Wt of fresh seeds - wt of dry seeds}}{\text{wt of fresh seeds}} \text{x} 100$$

Ash content

Materials

Muffle furnace (600°C), Silica crucible, Desiccators with magnesium perchlorate desicant

Method

A cleaned crucible was placed in a muffle furnace at 600°C for 1h then transferred to desiccators, cooled to room temperature. Empty crucible was weighed quickly to prevent moisture absorption.

Two gram of sample was taken in crucible and placed it in muffle furnace. Temperature was adjusted at 600°C for 6h. Crucible was transferred to the desiccator and cooled to room temp.

Then crucible was weighed quickly. The percentage of ash content was calculated as follows:

$$\text{Ash \%} = \frac{\text{Weight of ash}}{\text{Wt of sample}} \text{x100}$$

Crude fibre

Crude fibre was estimated by the method of [4].

Reagent

1.25% H_2SO_4, 1.25% NaOH, Ethyl alcohol, Petroleum ether (60-80°C)

Method

Two gram dried and fat free sample was digested with 200 ml of 1.25 H_2SO_4 for 30 min. using reflux apparatus. The acid solution was decanted and the residue was filtered through muslin cloth and washed with hot water. The residue was digested with 200 ml of boiling 1.25% NaOH, for 30 min. using reflux apparatus. The residue was filtered through sintered crucible and made free from alkali by repeated washing with hot water and then with alcohol and finally with ether. The residue was dried in an oven at 105°C for 5h and weighed. The dried residue was ignited in a muffle furnace, at 500°C for 6h, cooled and weighed. The difference in weight of residue and ash represented the crude fibre in samples used for analysis. The results are expressed as crude fibre per cent.

$$\text{\% crude fibre in ground sample} = \frac{\text{Loss in wt on ignition}}{\text{Wt of sample}} \text{x100}$$

Crude protein

Nitrogen content was determined by conventional Microkjeldahl's method. Crude protein was calculated by multiplying % N with the factor 6.25.

Reagents

- Digestion mixture: Prepared by mixing nine volume of sulphuric acid with one volume of perchloric acid
- N/100 H_2SO_4; 40% NaOH; 4% boric acid solution
- Methyl red – bromocresol green indicator (mixed one part of 0.2 per cent methyl red in ethanol with 5 parts of 0.2 per cent bromocresol green in ethanol).

Method

Five hundred mg of sample was weighed and transferred to 250 ml conical flask. After adding 15 ml of H_2SO_4 and $HClO_4$ (9:1) the flask was heated continuously till the solution became clear. The contents were cooled, diluted and volume made to 100 ml with double distilled water. A suitable aliquot (5 ml) of the digest was transferred to conical flask. Ten ml of 40% NaOH was added to make it sufficiently alkaline and then steam distilled. The ammonia liberated by distillation was trapped in 10 ml of boric acid solution containing mixed indicator. The distillate was subsequently titrated against standard N/100 H_2SO_4. A blank was also run under identical conditions. Nitrogen content of the sample was calculated after taking into account suitable dilution.

Carbohydrates value

It was determined by subtracting the total of moisture content, crude fibre, ash content, crude protein and oil content from 100.

Energy value

It was determined in kilojoule/100g by multiplying the percent of crude protein, crude fat and carbohydrates by the factors 16.7, 37.7 and 16.7 respectively.

Mineral contents

Reagents

- Diacid mixture: Nitric acid and perchloric acid was mixed in ratio 5:1 just before use.
- Hydrochloric mixture (1%): 1ml of conc. HCl was added in 50 ml distilled water and final volume was made upto 100 ml with distilled water.

Method

Two gram powdered sample of the seeds was digested with 15 ml of diacid mixture ($5HNO_3$:$HClO_4$) in a conical flask by heating on hot plate in open space till clear white precipitates settle down at bottom of conical flask. The precipitates were dissolved in 1% HCl prepared in double distilled water, filtered and final volume of filterate was made up to 50 ml with double distilled water and analyzed by using atomic absorption spectrometer.

Results and Discussions

Proximate composition of the seeds

Proximate composition of the seeds from Palwal and Hisar locations are presented in the **Tables 1-2**.

Table 1 Proximate Composition of Seeds (Palwal)

Parameters	Acacia nilotica	Albizia lebbeck	Melia azedarach	Pongamia pinnata	Cassia fistula	Salvadora persica
Moisture (%)	3.2±0.2	3.1±0.2	6.3±0.1	10.4±0.2	4.8±0.4	8.9±0.4
Ash (%)	4.2±0.1	4.7±0.1	7.3±0.1	2.8±0.1	4.7±0.0	3.8±0.2
Fibre (%)	10.6±0.1	4.8±0.3	3.4±0.3	7.8±0.0	6.2±0.5	10.5±0.1
Protein (%)	23.4±0.5	28.5±0.6	22.7±0.2	17.9±0.3	20.5±0.7	23.3±0.3
Carbohydrates (%)	45.0±0.6	48.0±0.7	27.1±0.7	21.9±0.4	57.4±0.8	13.3±0.2
Energy (KJ/100g)	1654.2±2.2	1688.4±1.4	2081.6±2.2	2142.5±2.4	1542.2±2.4	2126.7±2.1
Values are mean of three replicates ± standard error						

Table 2 Proximate Composition of Seeds (Hisar)

Parameters	Acacia nilotica	Albizia lebbeck	Melia azedarach	Pongamia pinnata	Cassia fistula	Salvadora persica
Moisture (%)	4.5±0.1	3.5±0.2	6.6±0.1	12.7±0.3	4.1±0.1	10.3±0.3
Ash (%)	4.1±0.1	4.5±0.1	7.1±0.4	2.5±0.1	4.2±0.3	3.4±0.1
Fibre (%)	11.3±0.1	5.2±0.1	3.7±0.1	7.9±0.3	6.8±0.1	11.1±0.4
Protein (%)	24.9±0.2	28.9±0.4	23.1±0.1	17.5±0.2	24.8±0.2	22.8±0.2
Carbohydrates (%)	42.8±0.4	47.4±0.2	21.8±0.5	19.1±0.2	53.2±0.6	9.9±0.5
Energy (kJ/100g)	1598.0±2.5	1670.0±1.8	2171.1±2.8	2130.5±2.8	1562.7±2.6	2148.3±2.4
Values are mean of three replicates ± standard error						

The moisture content was found varied found highest (12.7±0.3% to 10.4±0.2%) in *P. pinnata* than other selected plants. The low moisture content in the seeds of *Albizia lebbeck* (3.5±0.2% to 3.1±0.2%) in both the locations. Low moisture content material within the seeds endorse that they may have a protracted shelf life [5], for the reason that low moisture content may additionally save microbial spoilage and pest assault at some point of garage.

Ash and Fibre content

In the present study ash and fibre content varied from (2.8±0.1% to 7.3±0.1%), (3.4±0.3% to 11.3±0.1%) of seeds. The highest ash content was found in *M. azedarach* and lowest in *P. pinnata*. Fibre content was highest in the seeds of *A. nilotica* and lowest in *M. azedarach*.

Crude protein

Protein content material is the most essential feed factor that should be taken in to consideration when choosing any material for feed components. In this study protein content varied from 17.5±0.2% to 28.9±0.4%. Relatively higher amount of crude protein were found in seeds of *Albizia lebbeck* 28.5±0.6% and 28.9±0.4% while lower in seeds of *P. pinnata* 17.5±0.2% and 17.9±0.3% in the two locations. There appear no locational variation in the protein content. The protein content in *A. lebbeck* compared favourably with [6]. The crude protein content in seeds considered adequate enough for meeting the maintenance requirements of sheep, goat, for poultry and rabbits.

The carbohydrate values of seeds were found to vary from 19.1±0.2% to 57.4±0.8%. The highest value was in *C. fistula* 53.2±0.6% to 57.4±0.8% while lowest in case of *S. persica* 9.9±0.5% to 13.3±0.2% in both locations and energy value were ranged from 1542.2±2.4kj/100g to 2171.1±2.8 kj/100g which are highest in *M. azedarach* 2171.1±2.8 kj/100g & 2081.6±2.2 kj/100g while lowest in case of *C. fistula* 1542.2±2.4kj/100g & 1562.7±2.6kj/100g in the two locations.

Mineral composition of the seeds

Minerals are required to prompt loads of enzymic reactions inside the frame existence is dependent upon the body's potential to hold stability between the minerals [7]. The mineral contained in those seeds studied may additionally play important role in nutrition. Magnesium, calcium and potassium inside the human have been required for constructing red blood cellular and for body mechanism [8].

Table 3 Mineral composition of seeds (mg/100g) (Palwal)

Mineral	Acacia nilotica	Albizia lebbeck	Melia azedarach	Pongamia pinnata	Cassia fistula	Salvadora persica
Ca	198.0±1.8	280.0±1.7	208.0±2.5	300.0±2.6	720.4±1.8	128.0±1.6
K	110.0±1.1	510.0±2.3	182.0±2.0	551.0±2.9	830.6±3.7	380.0±2.4
Na	25.0±0.3	62.5±1.2	110.0±1.2	65.0±1.2	109.6±1.6	215.0±1.3
Mg	2.5±0.1	7.1±0.4	3.4±0.2	0.3±0.1	7.8±0.5	2.4±0.5
Fe	18.0±0.3	2.3±0.2	50.0±0.5	6.7±0.3	167.0±0.8	24.7±0.3
Zn	2.4±0.0	2.0±0.1	20.0±0.4	2.3±0.1	2.4±0.4	3.5±0.1
Co	1.9±0.1	Traces	Traces	0.3±0.1	0.1±0.0	0.3±0.2
Mn	3.0±0.2	0.2±0.1	0.4±0.1	0.2±0.0	0.2±0.1	0.2±0.1
Cu	0.3±0.0	0.6±0.3	0.1±0.1	Traces	Traces	Traces
P	51.4±1.5	390.0±2.7	50.0±0.3	52.0±0.4	12.0±0.3	88.0±0.4

Values are mean of three replicates ± standard error

Table 4 Mineral composition of seeds (mg/100g) (Hisar)

Mineral	Acacia nilotica	Albizia lebbeck	Melia azedarach	Pongamia pinnata	Cassia fistula	Salvadora persica
Ca	203.0±2.2	278.0±2.1	201.0±2.1	350.0±2.8	729.7±1.5	136.0±1.9
K	100.0±1.4	530.0±2.7	188.0±1.7	503.0±2.1	820.5±2.4	350.0±2.0
Na	27.0±0.1	71.2±1.5	108.0±1.0	62.0±1.6	100.4±1.3	224.0±1.0
Mg	2.4±0.1	7.0±0.2	3.7±0.4	0.6±0.1	8.7±0.1	2.3±0.2
Fe	20.0±0.2	2.8±0.1	63.0±0.2	7.8±0.4	170.0±0.3	28.9±0.4
Zn	2.5±0.0	1.4±0.3	16.0±0.2	2.1±0.4	2.0±0.2	3.1±0.1
Co	1.4±0.1	Traces	Traces	0.4±0.1	0.1±0.1	0.4±0.1
Mn	3.2±0.1	0.4±0.1	0.5±0.1	0.2±0.1	0.3±0.2	0.1±0.0
Cu	0.2±0.1	0.3±0.2	0.2±0.1	Traces	Traces	Traces
P	50.7±1.3	350.0±2.5	41.0±0.5	58.0±0.6	10.4±0.2	92.0±0.7

Values are mean of three replicates ± standard error

The nutritionally important mineral content of seeds are presented in **Tables 3-4**. Calcium, potassium and magnesium were highest (720.4±1.8 to 729.7±1.5mg/100g) (820.5±2.4 to 830.6±3.7mg/100g) and (7.8±0.5 to 8.7±0.1mg/100g) in *C. fistula* than other plants. For normal growth and for balancing metabolic fluid, a K/Na ratio of 1 is recommended [9].

In micro minerals iron content ranged between (2.3mg/100g to 170mg/100g). The zinc content of the seeds was in the range of (1.4mg/100g to 20.0mg/100g) and remaining minerals were in lower amount. Similar values for mineral content were found in both the locations.

Conclusion

The seeds of *Acacia nilotica, Albizia lebbeck, Melia azedarach, Pongamia pinnata, Cassia fistula* and *Salvadora persica* have been evaluated forproximate composition. The results of the proximate analysis revealed the presence of high amounts of protein and carbohydrate in the seeds. This study indicates that the plants to be a cheap, reliable,and safe plant-based resource to meet the demand for protein-rich foods. It may provide healthy and useful food by providing many of the nutrients the human body needs, as it is high in mineral composition, ash and fibers, From the present study it is concluded that these plants have good nutritional values and thus based on this these plants are used in feed formulation.

Acknowledgment

We are thankful to the University of CCS HAU, Hisar (India) for continued support of our work and also greatfully thanks to Dr. M. Khabiruddin.

References

[1] O. Akerele, Summary of WHO guidelines for the assessment of herbal medicines. Herbal Gram, 1993, 28, 13-19.
[2] B. E. Van Wyk, N. Gericke, People's Plants a Guide to Useful Plants of Southern Africa. Pretoria: Brizapublications, 2000.
[3] AOAC. Official methods of analyses. Association of Official Analytical Chemists: Washington, DC, 1990.
[4] S. Sadasivam, A. Manikam, In: Biochemical methods for agricultural sciences. Wiley Eastern Limited, New Delhi, 1992, pp. 20-21.
[5] V. A. Oyenuga, Nigerian foods and feeding stuffs: Their chemistry and nutritive values. Ibadan Uni-versity Press, Nigeria, 1968, 36- 87.
[6] N. O. Muhammad, F. O. Jimoh, M. O. Nafiu, O. B. Oloyede, M. O. Salawu, Nutrients and Antinutrients Analysis of Albizia lebbeck Seed. Bioresearch Bulletin. 2010, 4, 161-165.
[7] D. L. Watts, Trace Elements and Other Nutrients: Clinical Application of Tissue Mineral Analysis. 2nd Edn; Trace Elements, USA; ISBN-13, 1997, 182.
[8] WHO, Trace Elements in Human Nutrition and Health. World Health Organisation, Geneva, Switzerland, ISBN- 13, 1996, 343.
[9] J. P. F. G. Helsper, J. M. Hoogendijk, A. van Norel, K. Burger-Meyer, Antinutritional factors in faba beans (Vicia faba L.) as affected by breeding toward the absence of condensed tannin. J. Agric. Food Chem. 1993, 41, 1058-1061.

Publication History
Received 05th Mar 2018
Revised 16th Apr 2018
Accepted 04th May 2018
Online 30th May 2018