JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

PROXIMATE ANALYSIS OF TWO IMPORTANT MEDICINAL PLANTS *MUCUNA PRURIENS* & *PONGAMIA PINNATA*

[1]Hariom Soni, [2]Arun kakkar and [3]Chinmay Sen

[1,2]Natural Products Laboratory, Department of Chemistry, Govt. Science College, Jabalpur (MP) 482001 India

[3]Department of Chemistry, Govt. College, Pathariya, Damoh (MP) 470666 India

ABSTRACT

Present study is focused on Nutritive status of different parts of two important medicinal plants *Mucuna pruriens* & *Pongamia Pinnata* (roots, bark & stem) using standard analytical method (Proximate analysis). Percentage of moisture content, total ash, carbohydrate, protein, crude fat & crude fiber were analysed. Results of present study indicated that these plants have been evaluated for proximate principles to utilize them as a new dietary supplement.

Keywords: Proximate analysis, *Mucuna pruriens*, *Pongamia Pinnata*.

INTRODUCTION

Medicinal plants play an important role in human life & a rich source of medicine. India is rich in medicinal plant wealth & recognizes more than 2500 plant species which have medicinal values. Plants possess primary & secondary metabolites which play a significant role in regulating some of vital functions necessary for plant growth & development. The green leafy plants, consumed as food harbours essential minerals & nutrients such as carbohydrates, proteins, fats & crude fiber. Huge amount of vitamins & hormone precursors are also present in plants[1].

The Significant usage of medicinal plants from ancient period to present date reveals importance in treatment of various diseases. Physicochemical studies deal primarily with adulterants detection & also to ensure quality & purity of drug[2].

Plants are found in every corner of world, except deserts which are used as medicine. Herbal preparations made from traditional medicinal plants are mostly used to treat common diseases. Study showed that a good number of collected plants are used for treatment of multiple diseases. *Mucuna pruriens* & *Pongamia Pinnata* plants has been selected for work which are used for treatment of various diseases. To use these medicinal plants as a supplement for improvement in health status in determination of nutritive value is a basic requirement. Proximate analysis system is conventional method to determine elementary nutritional characteristics of plants[3]. *Mucuna pruriens*, & *Pongamia Pinnata* popularly known as Karanja & kewach respectively commonly available plants in India & are reported to possess various medicinal properties in Ayurveda system of medicine. These plants have been used traditional by many people in India, for treatment of various ailments,

but report on it nutritive composition is scanty. Study was done to determine proximate composition (nutritive composition) of *Mucuna pruriens*, & *Pongamia Pinnata* (roots, bark & stem) using st&ard analytical method. Both plants was collected from Narsinghpur region MP. Whereas stem,root & bark samples of Karanja & Kewanch. Fresh samples of plants were immediately packed in tight polythene bags to avoid loss of moisture.

MATERIALS & METHODS

Collection of Plant material

Dried plants parts of *Mucuna pruriens*, & *Pongamia Pinnata* were used as source of plant material for present study. Plant material (roots bark & stem) was collected guidelines of good agricultural practices (GACP) for medicinal plants from Narsinghpur region of MP. Plant was authenticated by State Forest Research Institute (SFRI), Jabalpur (MP) India.

Processing of plant materials

Collected samples of Karanja (*Pongamia pinnata*) root was cleaned, packed in jute bags & brought to Lab, After washing thoroughly in running water fresh roots were cut into small pieces & dried at room temperature. Shade dried plant samples of above plant roots were powdered using high power grinder mill & stored in air-tight polythene bags for chemical analysis.

Proximate analysis

For proximate analysis, fine powder obtained from dried plant parts as shown earlier were used. Quantitative parameters were carried out using st&ard methods.

Moisture Content

One gr of powdered sample was weighed in a clean crucible/beaker of known weight. Sample was then dried in oven at 105°C for 8 h. Crucible/beaker was cooled & weighted to determine water loss in powdered sample using fwg formula .

$$\text{Moisture}(\%) = \frac{\text{Difference in weight}}{\text{Weight of sample}} \times 100$$

Estimation of fat content (A.O.A.C, 2019)

Apparatus used for estimation of fat is Soxhlet extractor. To determine percentage of fat dried sample of plant was extracted with petroleum ether. It was then distilled off completely & dried. Oil weight & percentage of oil was calculated. Following procedure was used.

1. Thimbles were prepared by rolling filter paper sheet & closing one end by stapling it. Initial weight of thimble was determine as W1.

2. 1.5 g sample was then weighed & transferred in to thimble. Sample weight was assumed to be W. Thimbles were inserted in thimbles holder of Soxhlet extractor.

3. Petroleum ether (250 ml) was poured in beaker. System was then switched on & boiling point was 60˚C for 40-45 min. After process time temp was decreased to recovery P.E. Rinsing was done about 5 times in order to collect remaining fat that may be present in sample.

4. Thimble were then taken out from system & placed in hot air oven for drying. After 15-20 min. thimbles were taken out were weighed. Final weight of thimble (W2)was determined by fwg formula .

$$\text{Fat (\%)} = \frac{\text{W2} - \text{W1}}{\text{W}} \times 100$$

Where,

W= Weight of sample,

W1= Final weight of sample,

W2= Initial weight of sample.

Estimation of crude fiber

Crude fiber consists largely of cellulose & lignin (97%) with some mineral matters, 60-70% cellulose & 4-6% lignin.

During acid & subsequent alkali treatment, oxidative hydrolytic degradation of native cellulose & considerable degradation of lignin occurs. Residue obtain after final filtration is weighed, incinerated, cooled & weighed again. Loss in weight gives crude fiber contents.

1. Two g of sample was weighed & transferred in pre weighed crucible/beaker which was then placed on hot extraction unit/s& bath.
2. 150 ml of 1.25% H_2SO_4 is poured in to extractor from top (Acid wash).
3. Instrument was switched on & initial temp is set at 400˚C. Sample was allowed to boil for 40 min in acid.Then acid was drained by filtering suspension through a sintered filtration unit under vacuum. Residue on sintered disc was washed thrice with distilled water & dried.
4. Dried material was shifted to same beaker & 150 ml of 1.25% NaOH was poured in to extractor from top (Alkali wash).
5. Instrument was switched on & initial temp is set at 400˚C. Sample was allowed to boil for 40 min in alkali. Then alkali was drained using sintered filtration unit as described above & samples were washed twice or thrice with distilled water. Residue was dried under vacuum.
6. Then residue was shifted to pre weighed crucible & residue was placed in hot air oven to get rid of any moisture.
7. Crucible were weighed & readings were recorded (CWBA= W1).
8. All crucibles were placed at 550˚C for ashing in a Muffle furnace. Crucible were cooled down after ashing & weighed (CWAA=W2) by fwg formula.

$$\text{Crude Fiber (\%)} = \frac{\text{W3} \times 100}{\text{W}}$$

Sample weight= W

Crucible Weight Before Ashing (CWBA) = W1

Crucible Weight After Ashing (CWAA)= W2

Change in weight W3= (W1-W2)

Estimation of ash Percentage

The crucible were washed thoroughly, dried in hot air oven & cooled in desiccators. 2 g of each sample was poured in crucible & placed in Muffle furnace. Heating was stared gradually until temperature 600˚C was reached. This temperature was maintained for 6 hs. Crucible was then put inside desiccators & cooled. After cooling sample was reweighed & percentage of ash calculated by fwg formula.

$$\text{Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of sample}} \times 100$$

Estimation of Nitrogen percentage

N is a major nutrient required by plants & is essential for cell division, expansion & growth. Sample is digested by boiling with concd H_2SO_4 in presence of catalyst $CuSO_4$. Digestion converts all the N to NH_3 which is trapped as $(NH_4)_2SO_4$. Completion of digestion stage is generally recognized by formation of clear solution. NH_3 is released by addition of excess NaOH is removed by steam distillation. It is collected in boric acid & titrated with standard HCl using methylene blue as an indicator.

1. 50 mg of dried plant powder was taken in Kjeldahl digestion tube (10 ml). 50 mg of catalyst $CuSO_4$ with 2.5 ml of concd H_2SO_4 was added to tube.

2. Digestion tubes were then placed in s& bath digestion unit at 400˚C temp ensuring tubes are placed straight. Digestion was continued till brown or black colour of sample disappears & clear solution is formed for 6-8 hs for completion. Sample was left for cooling at room temp.

3. Steam was generated into Kjeldahl distillation unit (ASGI, India). Once steam is generated at good pace, digested material was poured into distillation tube followed by addition of 10 ml of 40% NaOH slowly. During distillation NH_3 was released due to addition of NaOH.

4. Condenser outlet of distillation unit was dipped in flask which contains 10ml of 4% boric acid & few drops of methyl red indicator. NH_3 is trapped by boric acid & due to change in pH, solution turns colorless. Thus distillation was completed.

5. Boric acid with trapped NH_3 was titrated against 0.1 N HCl. Boric acid blank was also run & the titration was carried out like that of the sample. N contents in plant sample were calculated using following formula.

$$\text{N (\%)} = \frac{(\text{S} - \text{B}) \times \text{Normality of HCl} \times 1.4007}{\text{W}}$$

Where,

S= Reading of sample (amount of HCl required for sample).

B= Blank reading of sample (amount of HCl required for blank).

W= Weight of sample in gr used for digestion

Estimation of protein

Protein (also known as polypeptide) is organic compound made of amino acid arranged in a linear chain & folded into a globular form. There is innumerable function of protein in body But primary function of proteins include building & repairing of body tissues regulation of body process & formation of enzyme & hormones. Protein cal^{n} was done using fwg formula.

Protein (%) = Nitrogen (%) x 6.25

Estimation of Carbohydrates

Phenol Sulphuric acid Method (Krishnaveni et al., 1984) is used for carbohydrate estimation (modified Anthrone method). In hot acidic medium, glucose is dehydrated to hydroxyl methyl furfural. This forms a green colored complex with phenol which has absorption maxima at 490 nm.

Reagents:

1. 5% aqueous phenol

2. Carbohydrate st&ard (glucose solution of about 20-200mg/ml)

3. Concentrated H_2SO_4

4. Unknown carbohydrate sample

Procedure:

A standard curve is prepared by dispensing varied volumes of 50 µg/ml solution of standard into labeled tubes. The varied volume of each tube is then made up to 0.4 ml by adding distilled water. 1 ml of phenol is added to each test tube. 1ml concd H_2SO_4 is then carefully dispensed to each tube. Solution was allowed to stand for 20 min before taking readings at 490 nm. Unknown sample was treated in same manner as standard.

1. 100mg of sample was weighed in boiling tube. It was then hydrolyzed by keeping it in a boiling water bath for 3 hs with 5 ml of 2.5 N-HCl & cooled to room temp. after this neutralized with solid Na_2CO_3 until effervescence cases. Solution was centrifuged volume of supernatant was made up to 100 ml.

2. 0.2, 0.4, 0.6, 0.8 & 1ml of standard solution is pipette out in series of test tube. 0.1 & 0.2 ml of sample solution is pipette out in two test tubes. Volume was made up to 1ml with water in each test tube.

3. Blank was set with 1ml of water.

4. 1ml of phenol solution & 1ml of 96% H_2SO_4 was added to all test tubes. After 10 min tubes were placed in water bath at 30˚C for 20min & readings was taken at 490nm.

5. Total carbohydrate present in sample solution was calculated using standard curve.

Absorbance corresponding to 0.1ml of test = X mg of glucose

Nutritive value:

Nutritive value was calculated by using following formula.

Nutritive value (Kcal per 100 g) = (4x Protein%) + (9x Fat%) + (4x Carbohydrate%)

RESULTS & DISCUSSION

Fresh plant parts were collected during in October 2018,air shade dried. It was powdered & stored in air tight polythene bags for further use.

Root & bark of *Pongamia pinnata* (Karanja) & root & stem of *Mucuna pruriens* (Kewanch) was analyzed for proximate analysis. Table 1.1 presents data for proximate analysis of *P. pinnata* roots. It was creamish brown colour. Moisture was found 7.25%, total ash 9.38%, total protein 8.6% & total fat 19.6%. Calorific value was 431.48Kcal per 100 g (Fig 1.1).

Table 1.1: Proximate analysis of *Pongamia pinnata (*Karanj) Root

S.NO.	TEST PARAMETERS	RESULTS
1.	Condition	**Dried**
2.	Colour	**Creamish brown**
3.	Odour	**Characteristic**
4.	Calorie Value	**431.48 Kcal per 100 g**
5.	Carbohydrates	**55.17%**
6.	Total Ash	**9.38%**
7.	Moisture	**7.25%**
8.	Total Fiber	**1.9%**
9.	Total Protein	**8.6%**
10.	Total Fat	**19.6%**

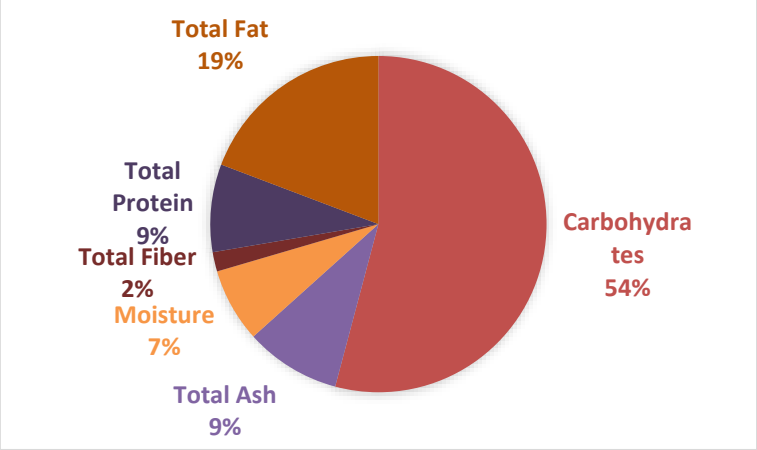

Fig 1.1 : Percentage of various compoanents in Karanja root

Table 1.2 presents data for proximate analysis of *P. pinnata* stem bark. Bark was creamish brown in colour. Moisture was found 5.68%, total ash 8.76%, total protein 21.6% & total fat 10.8%. Calorific value was found 396.24Kcal per 100 g (Fig 1.2).

Table 1.2: Proximate analysis of *Pongamia pinnata (*Karanj) Bark

S.NO.	TEST PARAMETERS	RESULTS
1.	Condition	**Dried**
2.	Colour	**Creamish brown**
3.	Odour	**Characteristic**
4.	Calorie Value	**396.24 Kcal per 100 g**
5.	Carbohydrates	**53.16 %**
6.	Total Ash	**8.76%**
7.	Moisture	**5.68%**
8.	Total Fiber	**2.1%**
9.	Total Protein	**21.6%**
10.	Total Fat	**10.8%**

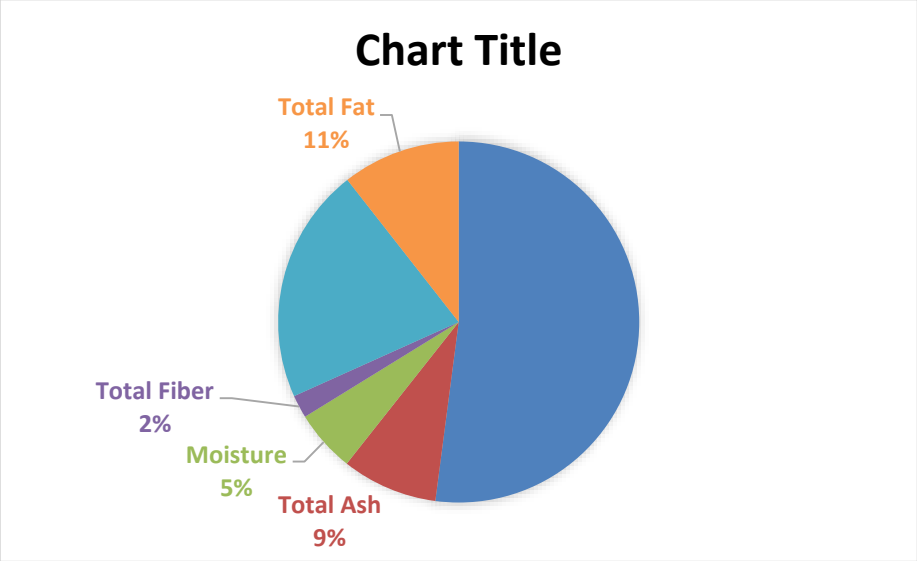

Fig 1.2 : Percentage of various compoanents in Karanja bark

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Table 1.3 presents data for proximate analysis of *M. pruriens* root. Data shows that dried root was brownish black in colour. Moisture was found 8.52%, total ash 4.88%, total protein 20.7% & total fat 3.4%. Calorific value was 363.4 Kcal per 100 g (Fig 1.3).

Table 1.3: Proximate analysis of *Mucuna pruriens (*Kewanch) Root

S.NO.	TEST PARAMETERS	RESULTS
1.	Condition	**Dried**
2.	Colour	**Brownish Black**
3.	Odour	**Characteristic**
4.	Calorie Value	**363.4 Kcal per 100 g**
5.	Carbohydrates	**62.5 %**
6.	Total Ash	**4.88%**
7.	Moisture	**8.52%**
8.	Total Fiber	**7.4%**
9.	Total Protein	**20.7%**
10.	Total Fat	**3.4%**

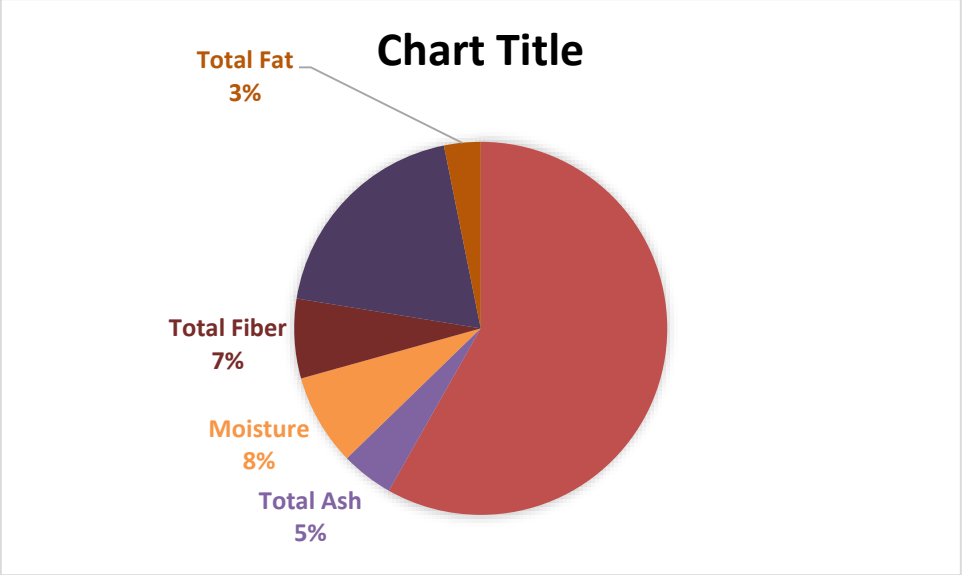

Fig 1.3 : Percentage of various compoanents in Kewanch root

Table 1.4 presents data for proximate analysis of *M. pruriens* stem. Dried root was brownish black in colour. The moisture was 7.86%, total ash 5.18%, total protein 18.8% & total fat 2.6%. Calculated calorific value was found 360.84 Kcal per 100 g (Fig 1.4).

Table 1.4 : Proximate analysis of *Mucuna pruriens* Kewanch Stem

S.NO.	TEST PARAMETERS	RESULTS
1.	Condition	**Dried**
2.	Colour	**Brownish Black**
3.	Odour	**Characteristic**
4.	Calorie Value	**360.84 Kcal per 100 g**
5.	Carbohydrates	**65.56 %**
6.	Total Ash	**5.18%**
7.	Moisture	**7.86%**
8.	Total Fiber	**5.9%**
9.	Total Protein	**18.8%**
10	Total Fat	**2.6%**

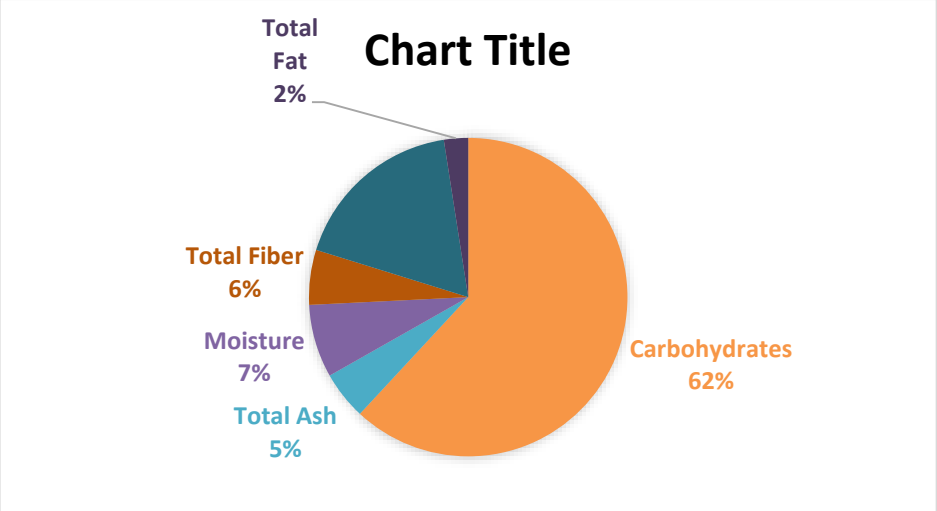

Fig 1.4 : Percentage of various compoanents in Kewanch stem

Result also shows that these plants can provide essential nutrients to human beings & animals though feeding trials are required to verify.

Conclusion

Study evaluation revealed that these plant parts may prove a good dietary supplement for their medicinal use as reported & can compensate traditional sources which are in shrinking state. This present work on nutritional content of *Mucuna pruriens* & *Pongamia Pinnata* has some differences among proportion of tested parameters in leaves & bark, both parts have recommendable nutritive values for both animal & human nutrition. Their uses can be viewed as a good source of nutritional & therapeutic elements that can be explored in field of nutritional & pharmaceutical industry.

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