Studies On Some Nutritional And Toxicological Properties Of *Mucuna sloanei*

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Abstract

Proximate analysis of seeds of *Mucuna solanei* gave a crude protein content of 28.18± 0.25%, Fat, 4.31± 0.09%, Crude fibre, 9.60±0.05%, Carbohydrate, 53.75±0.28% and Ash, 4.19± 0.01%. Quantitative phytochemical analysis gave 2.78± 0.04%, alkaloids, Phytic acid 314±28mg/100g, Tannins 189.15± 0.21mg/100g HCN 195.75±9.55mg/kg, Flavonoids 1.95±0.07% and Oligosaccharides 23.93±0.05%. Anti nutritional studies revealed 67.38±0.10 Tui/100g as trypsin inhibitor activity, haemagglutinin contents 6250±14.14 Hu/100g. Bioactivity studies using brine shrimp, lethality tests gave an ED_{50} value of 3.98 µg/ml for ethanolic extract and 19.95 µg/ml for the aqueous extract. It is concluded that *mucuna Sloanei* seeds if properly processed could have both nutritional and chemoprotective benefits to man and animals.

Key words: Phytochemical, antinutritional, Bioactivity, *Mucuna Sloanei*

Introduction

Mucuna Sloanei is a relatively under utilized minor legume used as a soup thickener among the Igbos of South Eastern Nigeria in the West African Sub region: Staple diets in this region often involve the processing of starchy roots and tubers into pastes which are eaten with soups. These pastes some times referred to as foo – foo are mainly sources of carbohydrates. The main source of other nutrients in such staple diets is the soup. Soup thickeners increase the palatability of the soup and reduce bulk in the diet (Ezueh 1997). Various workers in west Africa have reported on the proximate composition of mucuna seeds. Ukachukwu and Obioha, 1997 have reported on the nutritive properties of *mucuna cochinchensis,* . while Emenolam and Udebibe have reported on the nutritive properties of *Mucuna ultilis.* These reports suggest that mucuna species have medium to high protein contents, low ether extracts, high nitrogen-free extract and medium crude fiber contents.

Mucuna sloanei has been used in ethno medicinal preparations in some parts of West Africa. They have been applied as antihelmihthic, (Faridah and Van der Maesen 1996) as expectorants for cough and asthma (Prakash and Misra, 1987). The Pod hairs have been used as anti-snake bite agents (Houghton and

Skaris,1994) and as an aphrodisiac (Siddhuraju *et al*, 1996). Extracts from the seeds are used as uterine stimulants (Lorrenzetti *et al*, 1998). The present study aims at contributing to the documented information on the potentials of *mucuna Sloanei*. It is hoped that this will increase interest in *Mucuna* utilization.

Materials and Method

Collection and preparation of plant materials: Seeds of *Mucuna Sloanei* were bought from a local market in Umuahia, Abia State, Nigeria.They were botanically identified at the taxonomy unit of the Forestry Department of Michael Okpara University of Agriculture, Umudike, Nigeria.

The seeds were carefully dehulled using a knife and dried for 24 hrs in an oven at 60°C. They were then milled with a locally fabricated attrition mill to a mesh size of 1.0dmm. The ground samples were further milled into fine powder using a clean milling machine.

Chemical analysis: Crude Protein, crude fibre, and fat contents were determined using methods described by Pearson (1976). Crude protein determinations were done using Kjedhal method, while crude fibre determinations were done using Wendee method. Fat contents were determined using continuous solvent extraction method.
Total Ash Contents were determined by furnace incineration using the method of James (1995).
Carbohydrates were determined by difference using the relationship described by Udoh and Ogunwale (1986).

Phytochemical studies: Alkaloids were estimated using the alkaline precipitation gravimetric method described by Harbourne (1973).
Tannins were determined by the Folin – Deins spectrophotometric method as described by Pearson, 1976. Total trypsin inhibitor activity was determined by spectrophotometric method (Arntifield, *et al*, 1985).
Phytic acid contents were determined by spectrophotometric method as described by Hang and Lantzsch (1983).

Flavonoids were determined using acidification and ethyl acetate extraction (Harbourne, 1973) Heamagglutinins were determined using the method of Arntifield *et al* 1985. The presence of saponins were tested using the froth formation and emulsion test describe by Haborne, (1973). Oligosaccharides were determined using the method described by Ojiako and Akubugwo 1997, while Hydrogen cyanide content was estimated by alkaline titration method (AOAC, 1990).

Bioactivity Studies were carried out using brine shrimp lethality test as described by Mclaughin *et al* (1991).

Results and Discussion

Our results on table 1 indicate that the protein contents (28.18±0.25g %) of *Mucuna sloanei* seeds falls within the range reported by Boulter (1997) for other legumes. It therefore promises to be potential food that could augment the critical protein shortage especially in African food stuffs.

Table 1: Nutrient composition of *Mucuna sloanei* Seeds

Nutrients	% Composition
Crude Protein	28.18± 0.25
Carbohydrate	53.73± 0.28
Fat	4.31± 0.09
Ash	4.19±0.04

The carbohydrate content (53.73 ± 0.28g %) compares well with that reported for other legumes (Farinu and Ingrao, 1991). Both the % fat and ash are lower than that reported by Ukachukwu and Obioha 1997 for other Mucuna species.

Table 2: Phytochemical composition of seeds of *Mucuna soanei*

Phytochemical	Component Unit Value
Alkaloids	2.78 ±0.40 g%
Heamagglutinins	6250±14.14 Hu/100
Trypsin inhibitor	67.38±0.99 Tui/100g
Phytic acid	314±2.83 mg%
Tannins	189.15±0.21 mg%
HCN	195.75±9.55 mg/kg
Flavonoids	1.95±0.07 g%
Oligassacharides	28.93± 0.05 g%

Phytochemical analysis indicates the presence of saponins. Saponins are known to have hypocholestrolemic properties (Price *et al,*1987).This could confer some chemoprotection against heart diseases to users of *mucuna solanei.* Also these non – nutrient components could confer chemoprotective benefits to users of Mucuna Sloanei. Also flavonoids, which have been associated with free – radical scavenging activity and their anti – carcinogenic potential, occur in fairly high concentrations (1.95g %) (Parke and Ioanides, 1994). The high content of alkaloids 2.78 g% could well account for the use of the seeds as stimulants and aphrodisiacs. A more detailed study of the alkaloidal classes present may well give an indication as to the active ingredients in its action as a uterine stimulant.

The high concentration of antinutritional factors viz – phytates, trypsin inhibitor activity, Hydrogen cynanide and oligosaccharide may well account for the very low ED_{50} obtained for both the aqueous fraction (19.95µg /ml) and ethanolic fraction (3.98 µg/ml). This indicates that much of the active ingredients reside in the ethanolic fraction and would be fat soluble substances. The Hydrogen cyanide content is however lower than that reported by Okolie and Ugochukwu, 1989 for most legumes. The low ED_{50} also indicates that very low doses of these seed extracts will be required to achieve medicinal effect. This has advantageous effects when the metabolism of xenobiotics and the effects on the liver are considered.

Conclusion

Our work further indicates that increased use of well processed *Mucuna Sloanei* seeds could offer not only nutritional benefits to its users but also medicinal and chemo protective benefits to its users.

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Table 3: Results of bioactivity studies on aqueous extracts of *Mucuna sloanei* seeds

Concentration µg /ml	Log Concentration	24 hr cumulative mortality	% Mortality	% Probit kill	ED_{50} 19.95 µg / ml
Control	0.0	0.0	0.0	0.0	0.0
200	2.30	30	100	7.00	
100	2.0	25	83.3	5.9	
50	1.69	18	60.0	5.25	
20	1.30	14	46.6	4.95	
10	1.0	11	36.6	4.65	
5	0.69	10	33.3	4.55	

Table 4: Results of bioactivity studies ethanolic extracts of *Mucuna sloanei* Seeds

Concentration µg /ml	Log Concentration	24 hr cumulative mortality	% Mortality	% Probit kill	ED_{50} 19.95 µg / ml
Control	0.0	0.0	0.0	0.0	0.0
20	1.3	26	86.6	6.15	
10	2.0	23	76.6	5.75	
5	1.0	17	56.6	5.15	
1	0.69	11	36.6	4.65	

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