IJP (2016), Vol. 3, Issue 5 **(Research Article)**

Received on 17 March 2016; received in revised form, 13 May 2016; accepted, 25 May 2016; published 31 May 2016

COMPARATIVE STUDY ON PROXIMATE AND PHYTOCHEMICAL ANALYSIS OF PROCESSED TWO DIFFERENT GERMPLASM OF *MUCUNA PRURIENS* (VELVET BEANS)

M. Marimuthu *, Uma Sundaram and S. Thirukannan

Nutraceutical Chemistry Lab, Department of Food Process Engineering, School of Bioengineering, SRM University, Kattankulathur - 603203, Tamil Nadu, India.

Keywords:

Mucuna seeds, Phenols, Tannins, Flavonoids, Alkaloids, Saponins

Correspondence to Author:
M. Marimuthu

Nutraceutical Chemistry Lab, Department of Food Process Engineering, School of Bioengineering, SRM University, Kattankulathur - 603203, Tamil Nadu, India.

E-mail: marimtu@gmail.com

ABSTRACT: The present study deals with the qualitative and quantitative analysis of phytochemical and proximate analysis of seed extract of two different germplasms of Mucuna black and white colored seeds (BCS & WCS) were investigated. Between the two seeds studied, the black colored seed which is in raw form registered higher efficiency in proximate composition as well as phytochemical when compared to white colored seeds. This consequence has followed the same in both cooked and soaked & cooking process of Mucuna seeds. Further, mechanistic studies on pharmacological evaluation are needed for commercial exploitation of these legumes as Nutraceuticals.

INTRODUCTION: Mucuna bean is an underutilized tropical legume grown in South America, Africa, and South Asia as a cover crop [1, 2]. They are traditionally used as thickening agent in soup and sauce by Ibos in south-eastern Nigeria. Other than usage in Africa, the seeds are also consumed by Indian tribal sects such as Dravidian and Mundari groups. *Mucuna pruriens* possess a wide range of pharmacologic activities such as anti-fungal activity [3], antioxidant activity [4], anti-lice activity [5], antibacterial activity [6, 7,] Antiprotozoal activity [8], Anti Snake venom activity [9], Antidiabetic activity [10], Antitumor activity [11], Aphrodisiac activity [12] and Anti Parkinson's activity [13]. Mucuna seeds constitute excellent raw material for indigenous Ayurvedic drugs and medicines due to the presence of 3, 4-dihydroxy-L-phenylalanine (L-DOPA), which relief Parkinson's disease [14].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.3(5).229-33

Article can be accessed online on: www.ijpjournal.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.3(5).229-33

Nutritional importance of Mucuna seeds as a rich source of protein supplement in food and feed has been well established [15, 16]. This seed is rich in proteins also have carbohydrates, fats, mineral, and other nutrients, and it has found high functional properties [17]. The seeds of Mucuna beans are less exploited as a protein source in Africa. Improvisation of nutritional quality and effectively utilize dry legumes to their full potential as food, inactivation or removal of antinutritional factors by adopting economically viable processing techniques are needed, which includes soaking, cooking, dehulling, roasting, fermentation, sprouting, toasting have been employed to reduce or destroy antinutrients. Many of these techniques were applied on Mucuna beans [18, 19]. The present investigation was undertaken to evaluate the proximate and phytochemical properties of two different germplasms of Mucuna beans (Black colored and white colored seed).

MATERIALS AND METHODS:

Samples Collection: The *Mucuna pruriens* (velvet bean) were from natural stands of the ecological region of Tamil Nadu, South India.

After drying in the sun, the pods were crushed to separate mature seeds alone. After complete cleaning of broken seeds as well as foreign materials, the seeds were stored in plastic pouches.

Preparation of Raw Seed Sample: Each 200g from different dry, mature seeds of accessions were powdered in a Wiley Mill to 60-mesh size with suitable precaution to prevent cross-contamination of samples. The powders were stored in plastic containers at room temperature (25 °C) until further use. The seeds were first selected, sorted and divided into three groups of 50 grams each. Group A seeds were soaked in water for 12 h and hulled, sun-dried, milled into flour and stored in a container, marked as "Raw Mucuna Seed" (RMS). Group B seeds were soaked in water for 24 h went to the hulling process.

Then, these seeds were soaked in distilled water for 24 h, cooked at 98 ºC for 60 min, sun-dried, milled into fine flour, stored in a container labeled "Boiled Mucuna Seed" (BMS). The "C" group was soaked in distilled water for 48 h, hulled and boiled as above. The boiled seeds were then dried on the sun, milled into flour to produce the "Soaked and Boiled Mucuna Seeds" sample (SBMS) which was labeled accordingly.

Proximate Analysis: The moisture content, carbohydrate and crude fiber of the samples were determined by the methods described by Pearson [20]. The crude lipid, protein, and ash were determined by James [21].

Qualitative Analysis of Phytochemicals: The qualitative analysis of flavonoids, alkaloids, saponins, phenols, and tannins in the test samples was determined by Harborne [22].

Quantitative Analysis of the Phytochemicals: The quantitative analysis of flavonoids, alkaloids, and saponins was carried out by the gravimetric procedure of Harborne [22].

Determination of Phenols and Tannins: The concentration of phenols and tannins was determined using the folin- cio Caltean colorimetric method [20].

RESULT AND DISCUSSION: Black colored and white colored germplasms of Mucuna were taken for analysis of proximate composition shown in **Table 1** and **Fig. 1**. Moisture content was accounted high in the raw seeds (both BCS and WCS) in the range of 12.14% and 12.02% respectively then it was followed by cooked seeds as 11.52% and 11.36%; soaked & cooked seeds were observed as 11.48% and 11.32%. Protein presence very low in the cooked seeds for BCS (20.18%) and for WCS (20.12%) when compared to the protein level in soaked & cooked of 21.05% & 21.02% and then finally 28.20% and 27.80% in the raw as high values. The protein in raw seeds generally supported by work reported about *Mucuna pruriens* was 20.2-29.6 % [23].

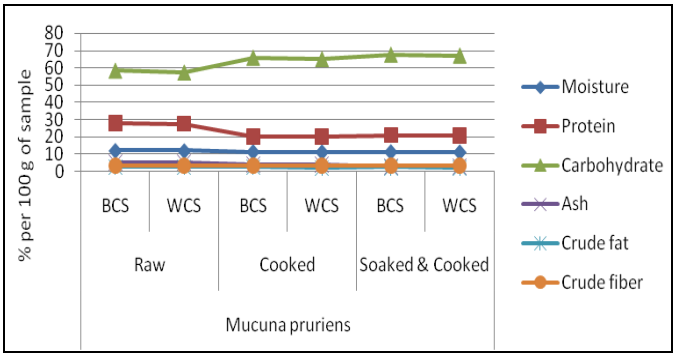

FIG. 1: PROXIMATE COMPOSITION OF RAW, COOKED, SOAKED AND COOKED *MUCUNA PRURIENS* WHITE COLORED AND BLACK COLORED SEEDS

TABLE 1: PROXIMATE COMPOSITION OF RAW, COOKED, SOAKED AND COOKED *MUCUNA PRURIENS* WHITE COLORED AND BLACK COLORED SEEDS*

Proximate composition	*Mucuna pruriens* (%)*					
	Raw		Cooked		Soaked & Cooked	
	BCS	WCS	BCS	WCS	BCS	WCS
Moisture	12.14±0.04	12.02±0.12	11.52±0.14	11.36±0.10	11.48±0.22	11.32±0.11
Protein	28.20±0.12	27.80±0.08	20.18±0.02	20.12±0.02	21.05±0.16	21.02±0.22
Carbohydrate	58.52±0.06	57.42±0.01	65.94±0.05	65.12±0.01	67.63±0.02	67.13±0.12
Ash	5.20±0.22	5.10±0.05	4.25±0.08	4.05±0.32	2.98±0.12	2.93±0.01
Crude fat	2.56±0.01	2.48±0.22	2.45±0.12	2.23±0.05	2.42±0.18	2.12±0.18
Crude fiber	3.75±0.32	3.72±0.10	3.72±0.22	3.70±0.02	3.70±0.04	3.61±0.12

BCS-Black colored seed; WCS- White colored seed; Values are mean ± SD from duplicates
Values are expressed in % per 100 g of sample*

Soaked & cooked germplasms of Mucuna found the maximum content of carbohydrate 67.63% (BCS) and 67.13% (WCS) and lower values found in the range of 58.52% and 57.42% in raw seeds of Mucuna. This value obtained for carbohydrates in raw seeds similar to 59.20-64.88% [2]. Ash content of raw Mucuna BCS and WCS obtained was 5.20% & 5.10%. It was followed by cooked then soaked & cooked at the least. It is agreed with the report depicted as 2.9-5.0% [23, 24] for raw germplasms of Mucuna. The crude fat content of all three processed Mucuna was range from 2.42% to 2.56%, the high level rather WCS accounts in drastic variation form of 2.12% to 2.48%. In Raw seeds, the similar results were found as 2.8-4.9% in Mucuna [24, 25].

The crude fiber content of both BCS and WCS found as similar in the range between 3.61% to3.75percent. It is agreed in raw seed crude fiber content of 4.19% in *Mucuna cochinchinensu* [2]. For cooked and soaked & cooked of Mucuna seeds the study has supported for all proximate composition [26].

The qualitative and quantitative phytochemical analysis of seeds of Mucuna BCS & WCS registered the presence of alkaloids, tannins, flavonoids, phenols, and saponins **Table 2** and **Fig. 2**. Between two germplasms, phytochemical compounds *viz*., alkaloids, tannins, flavonoids, phenols, and saponins were found to be present higher levels in raw BCS *i.e*., 1.05%, 0.25%, 0.39%, 2.78% and 0.45%, while lower level of phytochemical present in raw WCS *i.e*., 1.03%, 0.22%, 0.35%, 2.70% and 0.43% respectively. In cooked Mucuna seeds, black color seeds account good form than WCS in all phytochemical compounds such as alkaloids, tannins, flavonoids, phenols, and saponins. Especially BCS saponins content at 0.357% while WCS saponins are 0.35%. In the case of flavonoids, BCS found the value as 0.32% and WCS value as 0.30.

In the soaked & cooked method, the phytochemical value of BCS and WCS as follows flavonoids (0.30>0.28), alkaloids (0.42>0.40), saponins (0.39>0.35) and tannin, as well as phenols, accounts the same value of 0.06 and 0.21 respectively for both BCS and WCS). For raw, cooked and soaked & cooked germplasms of Mucuna seeds the study has agreed with Nwaoguikpe [26] for all phytochemical composition.

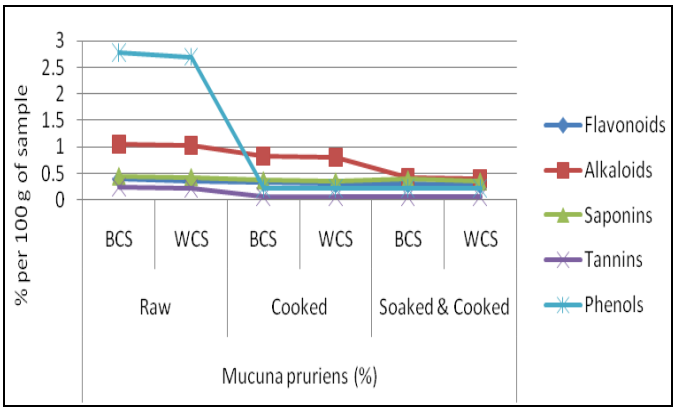

FIG. 2: PHYTOCHEMICAL COMPOSITION OF RAW, COOKED, SOAKED AND COOKED *MUCUNA PRURIENS WHITE* COLORED AND BLACK COLORED SEEDS

TABLE 2: PHYTOCHEMICAL COMPOSITION OF THE RAW, BOILED, SOAKED AND BOILED *MUCUNA PRURIENS* SEEDS

Phytochemical composition	Mucuna pruriens (%)*					
	Raw		Cooked		Soaked & Cooked	
	BCS	WCS	BCS	WCS	BCS	WCS
Flavonoids	0.39±0.01	0.35±0.32	0.32±0.10	0.30±0.20	0.30±0.01	0.28±0.14
Alkaloids	1.05±0.22	1.03±0.12	0.82±0.12	0.81±0.15	0.42±0.04	0.40±0.10
Saponins	0.45±0.02	0.43±0.02	0.37±0.16	0.35±0.21	0.39±0.10	0.35±0.02
Tannins	0.25±0.14	0.22±0.08	0.07±0.06	0.06±0.01	0.06±0.18	0.06±0.05
Phenols	2.78±0.05	2.70±0.12	0.22±0.11	0.21±0.04	0.21±0.32	0.21±0.03

BCS-Black colored seed; WCS- White colored seed; Values are mean ± SD from duplicates
Values are expressed in % per 100 g of sample*

CONCLUSION: This study has established the presence of physiochemical and anti-nutritional factors in raw and processed seeds of both the velvet beans (BCS & WCS). From the study it is evident that various analyses, it could be adequate processing would go a long way in reducing the level of phytochemicals/ anti-nutrients present in the Mucuna seeds. Between the two sgermplasm studied, black colored seed which is in raw form, registered higher efficiency in proximate

composition as well as phytochemical when compared to white colored seeds. This consequence has followed the same in both cooked and soaked & cooking process of Mucuna seeds. The further mechanistic study is needed to isolate the specified compounds to assess the bioactivities *in-vivo*.

ACKNOWLEDGEMENT: We express our thankfulness to Prof. & Head, Department of Food Process Engineering, SRM University for his support. We also express our gratitude to Dr. C. Muthamizhchelvan, Director (Engg. & Technology) of SRM University for his continued encouragement towards the project.

CONFLICT OF INTEREST: Nil

REFERENCES:

1. Buckles D: Velvet bean: A "new" plant with a history. Economic Botany 1995; 49: 13-25.
2. Ezeagu IE, Maziya-Dixon B and Tarawali G: Seed characteristics and nutrient composition of 12 Mucuna accessions from Nigeria. Tropical Subtropical Agro ecosystems 2003; 1: 129-140.
3. Marimuthu M, Gurumoorthi P and Krishnamoorthi K: Comparative antifungal activity of two different germplasm of Mucuna. Scholars Research Library-Journal of Microbiology and Biotechnology Research 2013; 3: 143-146.
4. Sundaram U, Marimuthu M, Anupama V and Gurumoorthi P: Comparative antioxidant quality evaluation of underutilized/less common south Indian legumes. International Journal of Pharma and Bio Sciences 2013; 4(2): 117-126.
5. Marimuthu M and Muthu K: Comparative anti-lice activity of two Different germplasm of velvet bean (*Mucuna pruriens*), an underutilized wild south Indian legume. World Journal of Pharmacy and Pharmaceutical Sciences 2014; 3(11): 923-928.
6. Marimuthu M, Sundaram U and Gurumoorthi P: Comparative Phytochemical evaluation and Antibacterial activity of two different germplasm of Mucuna. International Journal of Pharmacy and Pharmaceutical Sciences 2013; 5(2): 46-51.
7. Marimuthu M, Ilansuriyan P and Karthikeyan K: Comparative antibacterial activities of two different germplasm of *Mucuna pruriens* seed extract against fish pathogens. International Journal of Pharmacological Research 2015; 5(7): 163-166.
8. Ekanem AP, Obiekezie A, Kloas W and Knopf K: Effects of crude extracts of *Mucuna pruriens* (Fabaceae) and Carica papaya (Caricaceae) against the protozoan fish parasite *Ichthyophthirius multifiliis*. Parasitol Research 2004; 92: 361-366.
9. Fung SY, Tan NH, Liew SH, Sim SM and Aguiyi JC: The protective effects of *Mucuna pruriens* seed extract against histopathological changes induced by Malayan cobra (*Naja sputatrix*) venom in rats. Tropical Biomedicine 2009; 26(1): 80-84.
10. Rathi SS, Grover JK and Vats V: The effect of *Momordica charantia* and *Mucuna pruriens* in experimental diabetes and their effect on key metabolic enzymes involved in carbohydrate metabolism. Phytotherapy Research 2002; 16(3): 236-243.
11. Yerra R, Malaya G and Upal KM: Antitumor activity and *in-vivo* antioxidant status of *Mucuna pruriens* (Fabaceae) seeds against Ehrlich ascites carcinoma in Swiss albino mice. Iranian Journal of Pharmacology and Therapeutics 2005; 4(1): 46-53.
12. Suresh S, Prithiviraj E and Prakash S: Dose and time-dependent effects of ethanolic extract of *Mucuna pruriens* Linn. Seed on the sexual behavior of normal male rats. Journal of Ethnopharmacology 2009; 122(3): 497-501.
13. Kasture S, Pontis S, Pinna A, Schintu N, Spina L, Longoni R, Simola N, Ballero M and Morelli M: Assessment of symptomatic and neuroprotective efficacy of *Mucuna pruriens* seed extract in a rodent model of Parkinson's disease. Neurotox Research 2009; 15(2): 111-22.
14. Prakash D and Tewari SK: Variation on L-DOPA content in Mucuna species. Journal of Medicinal and Aromatic Plant Science 1999; 21: 343-346.
15. Siddhuraju P and Becker K: Preliminary evaluation of Mucuna seed meal (*Mucuna pruriens* var. utilis) in common carp (*Cyprinus carpio* L.): An assessment by growth performance and feed utilization. Aquaculture 2001; 196: 105-123.
16. Bressani R: Factors influencing nutritive value in food grain legumes: Mucuna compared to other grain legumes. In: Food and Feed from Mucuna: Current Uses and the Way Forward (Editors, Flores BM, Eilittä M, Myhrman R, Carew LB & Carsky R.J), Workshop, CIDICCO, CIEPCA and World Hunger Research Center, Tegucigalpa, Honduras 2002; 164-188.
17. Marimuthu M, Sundaram U and Gurumoorthi P. X-ray diffraction and starch analysis of nano-sized seed powder of velvet bean (*Mucuna pruriens*). Indo American Journal of Pharmaceutical Research 2013a; 2231-6876.
18. Dossa CS, Mensah GA, Dossa AD and Adoun C: Influence of various physicochemical treatments of *Mucuna pruriens* seeds on the nutrient chemical composition. Tropiculture 1998; 141: 16-17.
19. Egounlety M: Processing of velvet bean (*Mucuna pruriens* var. utilis) by fermentation. Tropical and Subtropical Agroecosystems 2003; 1: 173-181.
20. Pearson D: Chemical Analysis of Foods. Churchill Livingstone, Edinburgh, UK 1976; 7-14.
21. James CS: Analytical Chemistry of foods. Chapmann and Hall, New York 1995.
22. Harborne JB: Phytochemical methods: A guide to modern techniques of plant analyses. Chapman and Hall, New York 1973; 18-215.
23. Vedivel V and Janardhanan K: Nutrition and antinutritional of Velvet beans. An under-utilized food legume in South India. International Journal of Science and Nutrition 2000; 51: 279-287.
24. Ravindran A and Ravindran G: Nutritional and antinutritional characteristics of Mucuna seeds. Science Food Agriculture 1988; 44: 71-79.
25. Siddhuragu P, Becker K and Makkar HPS: Studies on the nutritional composition and antinutritional factors of three different germplasm seed materials of an underutilized tropical legume, *Mucuna pruriens* var. utilis. Journal of Agricultural Food Chemistry 2000; 49: 3058-3067.
26. Nwaoguikpe RN, Braide W and Ujowun CO: The Effects of Processing on the Proximate and Phytochemical Compositions of *Mucuna pruriens* Seeds (Velvet Beans). Pakistan Journal of Nutrition 2011; 10(10): 947-951.

How to cite this article:
Marimuthu M, Sundaram U and Thirukannan S: Comparative study on proximate and phytochemical analysis of processed two different germplasm of *Mucuna pruriens* (Velvet Beans). Int J Pharmacognosy 2016; 3(5): 229-33. doi: 10.13040/IJPSR.0975-8232.3(5).229-33.