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COMPARATIVE L-DOPA AND ANTI-NUTRITIONAL CONTENTS IN SEED MATERIALS OF MARKET SAMPLES OF *MUCUNA PRURIENS* (L) DC

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ABSTRACT
Mucuna pruriens (L.) DC. (Papilionaceae) is used in male impotency, as aphrodisiac, in sexual debility, and as nervine tonic. It also possesses anti-parkinson property, possibly due to the presence of L-DOPA. Market samples of 'Atmagupta' (*Mucuna pruriens* (L.) DC) an Indian Ayurvedic and Siddha drug contain seeds of seven taxa. The dried powders of commercial and genuine samples were analysed for anti-nutritional factors and L–DOPA content. Raw *M. deeringiana* seeds were rich in Tannin, Hydrogen cyanide and Phytic acid. *M. utilis* seeds were rich in Phenol. Results showed high L-DOPA content in *M. deeringiana* and *Canavalia ensiformis* showed minimum L – DOPA content. The present findings also suggest that the commercial samples contains different concentration of Anti-nutritional and L-DOPA content.

KEY WORDS: Anti-nutrition**,** L-DOPA, *Mucuna pruriens*

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INTRODUCTION

Mucuna pruriens (L) DC has long been used as a medicinal plant by traditional healers. The seeds of this plant have been used as food, tonic and aphrodisiac[1] by many tribal communities in India since many centuries. *M. pruriens* possess valuable medicinal properties and it has been studied for various activities like anti-diabetic[2]; aphrodisiac, anti-neoplastic, anti-epileptic, antimicrobial activities[3]. It has learning and memory enhancement property[4] and it has aphrodisiac and antivenom activities[5, 6, 7 8]. The seeds of this plant are collected mostly in the wild. Various species of *Mucuna* are being sold in the market under the trade name "Atmagupta". Our preliminary survey in Tamil Nadu[9] also revealed that seeds of seven species *Mucuna pruriens, M. cochinchinensis, M. deeringiana, M. utilis, M. atropurpurea, Canavalia ensiformis,* and *C. virosa* are sold as 'Poonaikali' (Tamil vernacular name of *M. pruriens*).

Mucuna pruriens has been shown to be effective in the treatment of Parkinson's disease, possibly due to the presence of L-DOPA[10]. Although the velvet beans contain high levels of protein and carbohydrate, their utilization is limited due to the presence of a number of antinutritional/antiphysiological compounds, phenolics, tannins, lectins, protease inhibitors, etc., which may reduce the nutrient utilization *Mucuna pruriens* (L.) DC. In the present study, attempts were made to compare the commercial and genuine samples of *M. pruriens* by the anti nutritional and L-DOPA content.

MATERIALS AND METHODS

Seeds of different samples of 'Poonaikali' were purchased from Herbal drug stores from different places of Tamil Nadu like, Kanyakumari, Kalakad, Tirunelveli, Madurai, Thanjavur, Myladuthurai and Chennai. All the samples of seed were sown in Tamil University Herbal Garden, Thanjavur. Botanical identity of the samples was established based on the morphology of the seeds, vegetative and floral parts. The identity was confirmed by comparing voucher specimens available in the Botanical Survey of India, Coimbatore and Calcutta. Two grams of powered samples were used for the analysis of different anti-nutritional factors. The standard procedure[11] was employed in the determination of hydrogen cyanide. Tannin[12], Phytic acid[13] and phenol[14] were assayed by using the standard methods. A selective, precise, and accurate Calorimetric and thin-layer chromatographic (TLC) methods have been developed for the analysis of L-DOPA in chosen seed extracts. The method involves densitometric evaluation of L-DOPA after resolving it by TLC on silica gel plates with n-butanol-acetic acid-water (4.0+1.0+1.0, v/v) as the mobile phase. Densitometric analysis of L-DOPA was carried out in the absorbance mode at 550 nm.

RESULTS AND DISCUSSION

Results of the anti-nutritional factors of 7 seeds are presented in **Table 1**. Estimation of anti nutritional factors the revealed that *M. deeringiana* (8.2%) seeds contain highest amount of tannin and hydrogen cyanide. In *M. pruriens* significant difference in anti-nutritional factors was found between dried and burnt seeds. Thus phenols, phytic acid and hydrogen cyanide were greatly reduced in burnt seeds of *M. pruriens.* However tannin content was found to be increased in burnt seeds in compared with dried seeds. Heating reduces anti-nutritional factors except L-DOPA[15]. The lower content of anti-nutritional factors in burnt seeds of *M. pruriens* is due to the destruction of heat labile compounds like phenol, phytic acid and hydrogen cyanide.

Values for phytate range from 8.9% in *M. atropurpurea* to 5.3% in *M. pruriens* (burnt). Phytate diet of 1-6 % over a long period decreases the bioavailablity of mineral elements in mono gastric animals[16]. Phytic acid can bind to mineral elements such as calcium, zinc, manganese, iron and magnesium to form complexes that are undigestable, thereby decreasing the bioavailability of these elements for absorption[17]. Phytic acid also has a negative effect on amino acid digestibility thereby posing problems to nonruminant animals due to insufficient amount of intrinsic factor phytase necessary to hydrolyze the phytic acid complexes[18].

Highest tannin level was observed in *M. deeringiana* (2.0%) while lowest values were observed in *Mucuna pruriens* (dried) (0.3%) and *Canavalia ensiformis* (0.3%). Though most of the values are low, tannin in seeds impose an astringent taste that affect palatability, reduce food intake and consequently body growth. It also binds to both exogenous and endogenous proteins including enzymes of the digestive

tract, thereby affecting the utilization of protein[19, 20]. Highest phenol content (6.6%) was observed in *M. utilis* and *Canavalia ensiformis* showed lowest phenol content.

Quantitative estimation of L-DOPA in seed samples (**Table - 2**) revealed that *M. pruriens* seeds contain the highest amount (6.5%) among the samples tested. The L-DOPA contents varied significantly in different species and ranged between 0.7 to 6.5% in Calorimetric method. The minimum L-DOPA contents were recorded in *Canavalia ensiformis* and the maximum in *Mucuna pruriens* (dried). By TLC densitometric method L-DOPA content in all the seed samples was very low. This lower estimate of L-DOPA content might be due to precise estimation of L-DOPA in single absorption maxima at 550nm.

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Table 1: Anti – Nutritional Composition of *Mucuna* and *Canavalia*

S. No	Name of the samples	Phenols %	Tannin %	Phytic acid %	Hydrogen cyanide %
1.	*Mucuna pruriens (dried)*	**2.16**	**0.3**	**7.0**	**0.4**
2.	*M. pruriens (burnt)*	**1.26**	**0.8**	**5.3**	**0.35**
3.	*M. cochinsinensis*	**2.1**	**0.6**	**6.2**	**0.56**
4.	*M. deeringiana*	**5.3**	**2.0**	**8.2**	**0.63**
5.	*M. utilis*	**6.6**	**1.3**	**7.4**	**0.46**
6.	*Canavalia ensiformis*	**0.6**	**0.3**	**5.5**	**-**
7.	*C. virosa*	**2.8**	**0.4**	**5.8**	**-**
8.	*M. atropurpurea*	**3.3**	**1.2**	**8.9**	**0.54**

Table 2: L – DOPA content of *Mucuna* and *Canavalia*

Sl.No	Name of the samples	Colorimetric method %	TLC method %
1.	*Mucuna pruriens (dried)*	6.5	1.86
2.	*M. pruriens (burnt)*	6.13	1.33
3.	*M. cochinsinensis*	4.0	1.21
4.	*M. deeringiana*	5.68	0.846
5.	*M. utilis*	5.3	0.759
6.	*Canavalia ensiformis*	0.7	0.03
7.	*C. virosa*	1.5	0.058
8.	*M. atropurpurea*	4.76	1.189

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