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Therapeutic Potential of Tropical Underutilized Legume; *Mucuna Pruriens*

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ABSTRACT: *Therapeutic applications have become an important study to manage various systemic disorders faced by mankind due to genetic, environmental and lifestyle factors. Medicine systems have been contributing in greater aspect to effectively manage and control the disease at its minimal. However, there is always a need for profound research in finding better and more efficient way for disease management. Plants have been a great source of medicinal value used in various traditional and modern medicine systems. Mucuna pruriens, a tropical legume of Asia and Africa has been well characterized for its medicinal value. Bioactivity studies have shown a plethora of "anti" activities beneficial for therapeutic applications in Mucuna pruriens, making it an interesting plant for biochemical studies. Research findings have shown presence of various bioactive peptides in Mucuna pruriens and comprehensively reported in this review. Presence of bioactivity in plants like Mucuna species makes it a potential source for isolation, purification and characterization of bioactive peptides with high therapeutic value. These bioactive substances can be easily translated for producing bulk drugs for their availability as over-the-counter-drug for easy access to human population for a positive prognosis.*

Keywords: *bioactivity, legume, therapeutics, Genus Mucuna*

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I. INTRODUCTION

Plants are the rich source of bioactive peptides with cereals and legumes contributing a wide range of peptides with significant physiological effects. Cereals like wheat, barley, corn, rice and legumes like pea, beans, alfalfa have shown anti-cancer, anti-inflammatory and cardiovascular protective properties (Malaguti M et al., 2014). These cereals and legumes have become an integral part of the Asian diets which fulfils the protein requirements on a day to day basis. Molecular weights of majority of these bioactive peptides fall under 10 kDa window (Farrokhi N et al., 2008). Legumes belong to kingdom Plantae and classified under Angiosperms-Eudicots-Rosids. It belongs to order Fables and family Fabaceae (Angiosperm Phylogeny Group, 2009). *Mucuna* genus belongs to the climbing legumes (vines and shrubs) of family Fabaceae (Article 18.5, Section 2, Chapter III). The Fabaceae or Leguminosae, also known as legume, pea or bean, are large flowering plants with economic value.

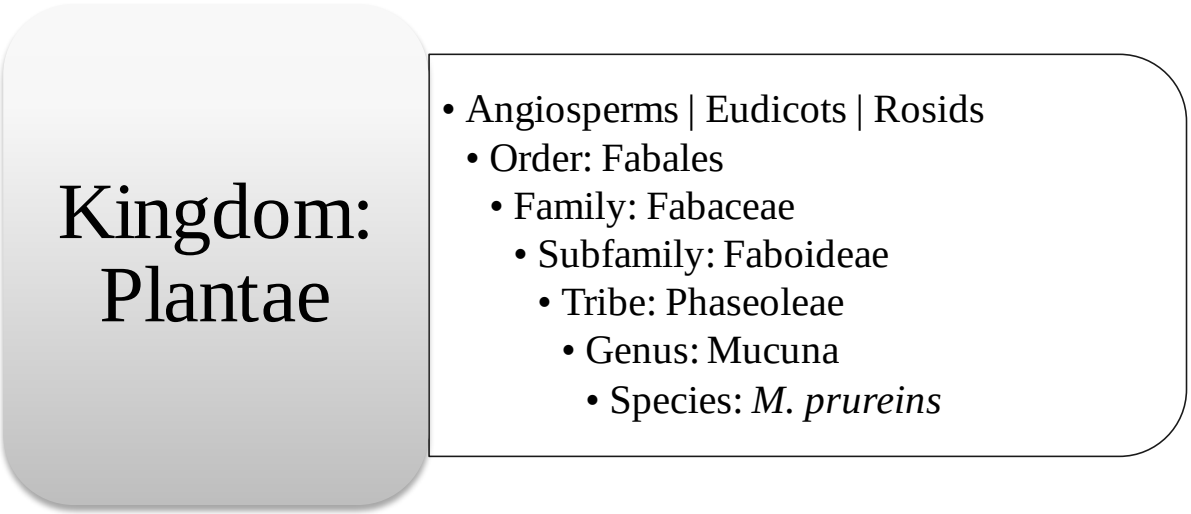

Figure 1: Botanical taxonomy of *Mucuna pruriens* used in identification purposes.

It is a rich source of dietary proteins however considered to be an under-utilized wild legumes grown in the tropical and sub-tropical regions of the world. *Mucuna* is known to consist of approximately 100 species of which *Mucuna pruriens* are extensively studied and well documented. Variety of *Mucuna pruriens* include *Mucuna pruriens var. hirsuta, Mucuna pruriens var. pruriens, Mucuna pruriens var. sericophylla* and *Mucuna pruriens var. utilis* and *Mucuna pruriens var. thekkadiensis* which are currently being utilized for active research (Pulikkalpura H et al., 2015). *Mucuna* spp. are known to contain anti-nutritional and toxic compounds however compounds like L-dopa are successfully used in the treatment of Parkinson's disease. *Mucuna* is known to have medicinal properties and extensively used for treating various conditions like Parkinson's disease, neurological, constipation, ulcers, elephantiasis etc (Lampariello LR et al., 2012).

Mucuna pruriens has been extensively studied for various properties useful in treating chronic disorders. However, the presence of anti-nutritional/anti-physiological compounds limit their usage due to which their complete utilization is yet to be studied. Hence, *Mucuna* has a great potential in the scientific which needs to unraveled (Pugalenthi M et al., 2005). Various parts of different species of *M. pruriens* have been studied for bioactivity including seeds, leaf, cotyledons and fruit trichomes. *Mucuna* extracts have been shown to contain good concentration of cardiac glycosides, flavonoids, anti-diabetic agents [effective in comparison with glibenclamide] with vast range of free-radical reducing agents (Iauk L et al., 1993, Agbafor K N et al., 2011, Lorenza Bellani et al., 2013, Stephen O Majekodunmi et al., 2011). Antimicrobial activity was observed in the leaf extract of *Mucuna pruriens* (Ogundare and Olorunfemi et al., 2007) which was monitored using broad-spectrum antibiotics. Studies have also indicated significant hepatoprotective action in leaf extract of M. *pruriens*. The extract significantly reduced the levels of hepatotoxicants [ALP, MDA, ALT, AST and bilirubin] in alcohol induced subjects (Mercy B Obogwu et al., 2014). The seed extract has also shown anti-hypertensive effect by inhibiting ACE, relative to levodopa content (Sushil Kumar Chaudhary et al., 2015). *M. pruriens* was also assessed for mycelial growth inhibition and its methanol extract showed highest activity against phytopathogenic fungi (Eugene Sebastian J Nidiry et al., 2011). This plant is widely used for treating male fertility related issues. It is shown to regulate steroidogenesis [T, LH, FSH, PRL, dopamine, adrenaline and nor-adrenaline] and improve libido potency and semen quality including count and motility (Kamla Kant Shukla et al., 2009). *Mucuna* seeds are also studied for the nutritional benefits in human and animal feed. Studies indicate that they lack hemagglutinating and anti-tryptic activity thus suggested to be a potential protein supplement (Adive B I Udedibie et al., 1998).

The following pharmacological activities of *Mucuna pruriens* has been demonstrated in the literature (Medicinal plants of the world, Vol. 1) which has been a stepping stone for advanced research in investigating bioactive peptides from this source:

i. Minimum toxicity (Dhar M L et al., 1968)
ii. Anabolic activity (Jayatilak P G et al., 1976)
iii. Antiparkinson activity (Vaidya A B et al., 1978, Manyam B V et al., 1999, Nagashayana N et al., 2000)
iv. Anticoagulant activity (Houghton P J et al., 1994)
v. Analgesic activity (Iauk L et al., 1993)
vi. Anti-inflammatory activity (Iauk L et al., 1993)
vii. Antigalactagogue effect (Vaidya R A et al., 1978)
viii. Antidiabetic effect (Grover J K et al., 2001)
ix. Antihyperlipemic activity (Iauk L et al., 1989)
x. Antihypercholesterolemic activity (Iauk L et al., 1989)
xi. Cholinesterase inhibition (Nath C et al., 1981)
xii. Bronchodilator activity (Carbajal D et al., 1991)
xiii. Antispasmodic activity (Dhar M L et al., 1968)
xiv. Antiradiation effect (Ohta S et al., 1987)
xv. Antipyretic activity (Iauk L et al., 1993)
xvi. Aphrodisiac activity (Satyavati G V et al., 1976, Bhargava N C et al., 1978, Rao M R R et al., 1978, Jayatilak P G et al., 1976)
xvii. Fertility promotion effect (Madaan S, 1985)
xviii. Hypoglycemic effect (Dhar M L et al., 1968, Pant M C et al., 1968, Dhawan B N et al., 1977)
xix. Hypocholesterolemic effect (Pant M C et al., 1968)
xx. Nematocidal activity (Kiuchi F et al., 1989, Ali M A et al., 1991)
xxi. Prostrate treatment (Mukherjee S et al., 1986)
xxii. Prothrombin activity (Guerranti R et al., 2001)
xxiii. Spermatogenic effect (Solepure A B et al., 1979, Pardanani D S et al., 1976)
xxiv. Gonadotropin, FSH and LH inhibition/stimulation (Jayatilak P G et al., 1976)
xxv. Taenicide effect (Feroz H et al., 1982)

THERAPEUTIC POTENTIAL / BIOACTIVITY IN *Mucuna pruriens*

Gonadotropin | FSH and LH inhibition/stimulation | Androgenic activity

Bioactivities related to gametogenic and androgenic functionalities were investigated by Jayatilak P G et al., 1976 in *Mucuna pruriens* which had a drastic effect on improvement in sperm counts and motility. It was also observed that the prostatic function and glycogen metabolism of seminal plasma had positive impacts which were proven clinically. However, follicle stimulating hormone, luteinizing hormone and prolactin did not appear to have any significant effect. This indicates an increase in prostatic secretions with proven andorgen-like action on prostatic functions. However, the sensitivity towards seminal vesicles were comparatively less. The study has shown significant improvement in human spermatogenesis without affecting pituitary function. The extracts of this plant were proven to be effective in improving the sperm affect which indicates it possible use in the treatment of infertility among men.

Antiparkinson activity

Presence of anticholinergics in *Mucuna pruriens* makes it an important component extensively used in traditional and complementary therapies for treatment of Parkinson's disease. The neurorestorative effects observed in this plant have higher antiparkinson activity with increased brain mitochondrial activity. Nagashayana et. al, 2000 have pointed out the use of *M. pruriens* in ayurvedic treatment of Parksinson's disease. Their study has indicated significant improvement in the condition of Parkinson's patients who underwent ayurveda treatment containing M. pruriens. They have noted that L-DOPA contained in their medication may explain the improvement in condition. Statistical significance of this study was carried out using Hoen and Yahr Score. Researchers proved promising activities of Daily Living (ADL) and motor examination score (as per UPDRS rating) among patients who underwent ayurveda therapy compared to those who endured palliative therapy alone.

Anticoagulant activity

Extracts of *Mucuna pruriens* are known to prolong the time taken for blood clotting, enabling it to counter the venom effects. The dose dependant studies were carried out to monitor the response of the anticoagulant effects. Houghton et.al 1994 identified the role of blood clotting in enhancing the venomous effect in human beings. They studied the extracts of *M. pruriens* as an anti-coagulating factor in treatment of snake bite. They analyzed the clotting time among the extract treated samples injected with snake venom and stratified its significance using the Mann-Whitney test using MiniTab software. The researchers observed significant increase in clotting time with extract treated solution. They inferred with the peptides in the venom might complex with tannins and phenols present in the plant extract thus exceeding the clotting time. This effect was independent of the presence of calcium. They noted that the active component in the Mucuna extract may not block the venom action completely indicating partial antagonism.

Anti-inflammatory activity

Inhibition of carrageenin-induced edema were observed in alcoholic extracts of Mucuna pruriens which exhibited the anti-inflammatory effects. The absence of serotonin also contributed to this effect since it being an amine, is involved in inflammation mechanisms. Iauk et. al in 1993 studied this activity on mice by inducing inflammation using carrageenin compound. Different parts of *M. pruriens* were used in this study and experiments indicated that leaf extracts showed significant anti-inflammatory effect on paw inflammation. In addition, these extracts also showed analgesic and antipyretic effects. The sample procedure involved use of ethyl acetate based maceration and storage which was later filtered and administered to the mice.

Antigalactagogue activity

Chlorpromazine-induced hyperprolactinaemia has been observed in the extracts of *Mucuna* which is an antigalactogogue activity preventing the secretion of milk in order to avoid postpartum mastitis in humans.

Antidepressant activity

Studies by Rana et. al 2014 indicated the role of seeds of *M. pruriens* in antidepressant activity. Hydroalcoholic extracts of these seeds were tested on mice for depression related conditions by performing forced swimming test, tail suspension test and chronic unpredictable mild stress. The locomotor activity of the mice were monitored. The phytochemical screening indicated the presence of alkaloid along with carbohydrate and amino acid in seed extracts. Further tests confirmed the antidepressant activity of extracts of *M. pruriens*. This significant antidepressant activity involved bromocriptine (dopamine receptor agonist) and haloperidol (dopamine receptor antagonist which indicates the actions were mediated through the dopaminergic pathways. Monoamine dopamine and D2-like family of dopamine play a crucial role in antidepressant treatments. The

presence of active compounds in the M. pruriens along with L-DOPA is a contributing factor for antidepressant actions.

Antidiabetic activity

Extracts containing Mucuna were extensively studied for renal hypertropy and observed that these extracts did not give rise to further condition indicating an antidiabetic effect on the system. Regular plasma glucose levels indicate the progression of the condition and the effect of these extracts. An indication for detailed study on these extracts were indicated. Antidiabetic studies on albino mice by Grover et. al., 2001 indicated the role of *M. pruriens* in treating diabetic condition in streptozotocin induced mice. This study involved careful examination of plasma glucose, body weight, urine volume, urinary albumin levels and renal hypertropy condition in mice. There was an increase in the urine volume, urinary albumin levels and marginal reduction in plasma glucose levels. However, *M. pruriens* did not alter the renal hypertropy condition as compared to the other plants used in this study. This indicates that extensive research on *M. pruriens* can be highly beneficial in understanding the composition of active compounds which can be of a therapeutic value.

Antihyperlipemic | Antihypercholesterolemic acitivty

Studies on mammals indicate reduction in cholesterol and total lipids in plasma after treatment with extracts of *Mucuna* plant. This activity has a potential benefit in reducing the lipid content in the metabolic system thus reducing the negative effects of hyperlipemia based conditions. Coronary heart diseases like hypercholesterolemia is a life-threatening situation requiring immediate medical assistance. Studies by Ratnawati et.al 2011 indicates the role of *M. pruriens* in having a potential anticholesterolemia property along with antioxidant effects. Laboratory rats were used for these studies which were fed with high fat diets. The seeds of M. pruriens are known to contain high amounts of protein, carbohydrates, lipids, minerals and fibers. It is also rich in secondary metabolites like alkaloids, sterols and saponins. Experiments indicated that presence of high amounts of flavonoids with synergistic effects of antioxidant properties is leading to the anticholesterolemia effects. There was a significant reduction in the levels of total cholesterol, LDL-cholesterol and triglyceride levels. An increase in HDL-cholesterol were also observed in the rats. This study also quoted an inhibitory effect of lipid peroxidation / anti-lipid peroxidation property by M. pruriens as studied by Mahfouz & Kummerow 2000.

Cholinesterase inhibition

Studies indicate presence of various phytoconstituents in *Mucuna pruriens* seeds having antioxidant and neuroprotective activities supporting the antiparkison effect. Endocarps of *M. pruriens* has been extensively used in treatments of Parkinson's disease. A study by Manyam et. al 2004 focused on observing the role of these endocarps on neurotransmitters in the brain of rat. These extracts showed effect on dopamine content in cortex region and did not affect the levodopa, norepinephrine or dopamine, serotonin, and their metabolites- HVA, DOPAC and 5-HIAA in nigrostriatal tract. These observations were directly related to the antiparkinson's effect and indicates that this can be roe of levodopa or active compounds present in *M. pruriens*.

Bronchodilator activity

Cardiotonic, hypotensive/bronchodilator screening studies on human population indicated a positive effect from the extracts of *Mucuna pruriens* plant. These extracts were proved to act as promising therapeutic agents for treating conditions with bronchodilator activity. Plant decoctions containing *M. pruriens* were extensively used in treatment of hypertension, congestive heart failures and bronchial asthma. Studies by Carbajal et. al 1991 performed the bronchodilator assay on the seed extract of *M. pruriens* and was found to be inactive till the highest dose was administered. All these studies were performed on guinea pigs.

Antipyretic activity

Presence of ethanolic macerates from *Mucuna pruriens* contributed to the antipyretic activity which demonstrated its effect in 1-2 hours of dosage event. These macerates contained unaltered triptamine derivatives which also contained serotonin and bufotenine. Studies by Iauk et. al 1993 used pyrexia as condition induced to rats to monitor the antipyretic effects of *M. pruriens*. The pyrexia condition was induced through the injection of yeast suspension. The *M. pruriens* extracts were administered to rats and rectal temperatures were recorded. A significant reduction in the temperature was observed after 1 hour treatment which subsided after 2 hours of treatment. This indicates the presence of active compounds in the extract responsible for antipyretic effects.

Aphrodisiac activity

Extracts of *Mucuna pruriens* are known to increase the aphrodisiac effects in humans and is also used as an ingredient in commercially available preparations used in the management of various sexual disorders. Studies using Wister male albino rats by Muthu et. al in 2011 indicated the androgenic effect of *M. pruriens*. These extracts significantly increased the relative weight of the accessory sexual organs like testis and also increase in the levels of testosterone in turn to the protein content and alkaline phosphatase activity. These indications are true effects of aphrodisiac effects of the active compounds present in the samples.

Fertility promotion effect

Mucuna pruriens is used as an important constituent of the commercial tablet for treating infertility and found to have positive effect in treatment. It is know n to increase the sperm count and motility along with faster conversion of spermatocytes to sperm. Madaan et. al 1985 conducted studies on the effects of extracts containing *M. pruriens* on treating infertility conditions. Various reasons affect the infertility condition some of which are related to genetic factors, environmental effects, endocrine functionalities, accessory sex glands etc. These extracts were administered to the male patients to check for the increase in the sperm counts and motility patterns. It was observed that there was a rapid increase in the conversion of spermatocytes to sperms.

Hypoglycemic effect

Supplements of *Mucuna* extracts has a synergistic effect in significantly reducing the cholesterol and blood sugar levels. It has been proved to be an excellent source for treating hypoglycemic condition. Anusha et. al 2008 demonstrated the hypoglycemic effects of *M. pruriens* in rats having normal, glucose load and streptozotocin-induced conditions. There was a significant decrease in the blood glucose (mg/dl) levels in rats after the treatment with the extracts which also had suitable controls. Studies indicate that the presence of active compounds in M. pruriens can be a potential reason for the hypoglycemic effect which may be related to its association with the insulin pathways and its mechanisms.

Taenicide effect | Nematocidal | Anthelminthic activity

High amounts of nematocidal effects were found in the extracts of Mucuna on larval studies. This indicates the effect of the active constituents towards the anthelmintic activity associated with the plant. Kiuchi et. al 1989 conducted studies on second stage larva of *Toxocara canis* for nematocidal activity of extracts of *M. pruriens*. These extracts showed strong nematocidal activity with a RM value of 100, 100 and 95 for 3h, 6h and 24h of exposure on the larva. Review by Mali et. al 2008 also confirmed the presence of nematocidal/anthelminthic activity on *Pheretima posthuma*, *Taenina canina* and *Phamphistomum cervi* along with some of the selected trematodes.

Prostrate treatment

Clinical studies indicate that patients with benign prostrate hypertrophy with lateral lobe enlargement showed significant improvement after treatment with extracts containing *Mucuna*. Studies by Mukherjee et. al 1984 involved evaluation of effect of extract containing M. pruriens on patients with prostatism. Difference prostatic condition like fibrotic, malignant, median lobe enlargement and lateral lobe enlargement were monitored with administration of this extract. Patients with benign hypertrophy of prostate (especially with lateral lobe enlargement) showed satisfactory results with the extracts. This indicates the presence of active compounds which can be therapeutically beneficial for prostrate treatments.

Prothrombin activity

An increased procoagulant activity was found in the seed extracts of *Mucuna* which prevents the protein in coagulation cascade to cause severe bleeding and hemorrhage. This indicates a prothrombin activity by *Mucuna* species. Snakebites are one of the common incidence responsible for instant death due to venom effects. Guerranti et. al 2001conducted studies on antivenom / prothrombin activity in the extracts of *M. pruriens* on *Echis carinatus* venom containing a mixture of protein responsible for coagulative cascade which results in bleeding and haemorrhage. Tests involving in vivo protective tests against toxic effects of EV, in vitro assay, chromogenic assay of prothrombin activation, clotting assay and protein determination by SDS-PAGE were conducted to assess the prothrombin activity. Lectin is one of the important protein identified to be playing an important role in anticaogulation event. The carbohydrate recognition domain of this protein may help in preventing the binding of PLA2 protein to coagualation factor. This property can also be explored for drug discovery in treating coagulation disorders.

Spermatogenic effect

The role of magnesium in flagellar movement of sperm is important which is achieved through the activation of ATPase pathway. Extracts containing *Mucuna* has been known to influence this activity in providing beneficial effects on prostate glands. Studies of patients by Solepure et. al 1979 on their sperm content and quality along with the treatment with extracts containing *M. pruriens* gave an insight into the role of these extracts in determining the yield of anabolic glycolysis, an important energy yielding process. The active components present in the extract are known to play a role in the energy yielding systems thereby making the sperm more motile by flagellar movement. Overall, the M. pruriens extract support the spermatogenic effects in humans.

Anticataleptic | Antiepileptic activity

Studies by Champatisingh et. al 2011 indicated the anticataleptic and antiepileptic activity in M. pruriens extracts. The studies were conducted on adult albino rats which included the study of haloperidol-induced catalepsy, scoring methods, maximum electroshock methods, pilocarpine-induced status epilepticus followed by statistical analysis ANOVA and Dunnett's t-test. The presence of 5-HT and dopamine in the extracts were significantly responsible for the anticataleptic and antiepileptic activity. The active compounds present in these extracts can be a potential therapeutic supplement for patients with neuroprotective requirements.

ACE Inhibitory | Hypotensive | Antioxidant Properties

Angiotensin I-converting enzyme inhibitory activity was observed by performing biochemical assays which involves hydrolysis of Hippuryl-L-histidyl-L-leucine (HHL) to give hippuric acid and histidyl-leucine. The hippuric acid is colorimetrically measured to determine the inhibitory activity. Hypotensive properties were studied in normotensive rats and the antioxidant properties were studies using trolox equivalent antioxidant capacity. These studies by Francisco et. al 2014 indicate the therapeutic potential of these extracts in management of hypertension and oxidative damage related disorders.

Sl.No.	Bioactivity	Biological Effects
1	Gonadotropin | FSH and LH inhibition/stimulation | Androgenic activity	Improves gametogenic and androgenic activities
2	Antiparkinson activity	Improves neurorestorative effects
3	Anticoagulant activity	Protects against venom side effects
4	Anti-inflammatory activity	Protects against inflammatory conditions
5	Antigalactagogue activity	Prevents excessive milk production postparitum
6	Antidepressant activity	Reduced depression and used as antidepressants
7	Antidiabetic activity	Controls blood glucose levels
8	Antihyperlipemic | Antihypercholesterolemic activity	Controls hyperlipemic and hyper cholesterolemic conditions
9	Cholinesterase inhibition	Counteracts Parkison’s disease condition
10	Bronchodilator activity	Beneficial in bronchodilation conditions
11	Antipyretic activity	Beneficial in controlling pysiological temperature
12	Aphrodisiac activity	Helpful in management of sexual disorders
13	Fertility promotion effect	Benefits fertility condition
14	Hypoglycemic effect	Helpful in hypoglycemic condition
15	Taenicide effect | Nematocidal | Anthelminthic activity	Beneficial in treating anthelminthic conditions
16	Prostrate treatment	Helpful in treating prostrate hypertrophy

17	Prothrombin activity	Helpful in treating hemorrhage
18	Spermatogenic effect	Management of prostate glands and spermatogenesis
19	Anticataleptic | Antiepileptic activity	Manages neuroprotective properties
20	ACE Inhibitory | Hypotensive | Antioxidant Properties	Manage hypertension and oxidative damage related disorders

Table 1: List of bioactivity features extensively studied in *Mucuna pruriens* with its therapeutic potential and benefits.

II. CONCLUSION

The bioactivity present in *Mucuna pruriens* has a promising value in various therapeutic applications. This tropical legume widely grown in Asia and Africa for the purpose of tribal consumption can be translated into meaningful drug substances for treatment. This is also seen as an opportunity for extensive research on bioactive compounds present in *Mucuna pruriens* which may be still undiscovered. Biochemical studies on *Mucuna pruriens* has vast applications in isolating, purifying and characterizing candidate substances with distinct bioactivity which can be profiled for therapeutic applications. Successful scale-up and production of these active substances can be used for treating the condition on large scale. Further research for identifying bioactivity like anticancer, inhibitor activity and related conditions can be conducted.

REFERENCES

[1] Adive B. I. Udedibie and Celia R. Carlini, Brazilian *Mucuna pruriens* Seeds (Velvet Bean) Lack Hemagglutinating Activity, J. Agric. Food Chem. 1998, 46, 1450-1452.

[2] Agbafor K. N., Nwachukwu .N, Phytochemical Analysis and Antioxidant Property of Leaf Extracts of Vitex doniana and *Mucuna pruriens*, Biochemistry Research International Volume 2011, doi:10.1155/2011/459839.

[3] Angiosperm Phylogeny Group, "An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III". Botanical Journal of the Linnean Society 2009; 161 (2): 105–121. doi:10.1111/j.1095-8339.2009.00996.x.

[4] Anusha Bhaskar, V.G. Vidhya, M. Ramya, Hypoglycemic effect of seed extract on normal and streptozotocin-diabetic rats, Fitoterapia, Volume 79, Issue 7, 2008, Pages 539-543, ISSN 0367-326X, http://dx.doi.org/10.1016/j.fitote.2008.05.008.

[5] Article 18.5, Section 2, Chapter III, International Code of Nomenclature for algae, fungi and plants, International Association for Plant Taxonomy.

[6] Carbajal, D., A. Casaco, L. Arruzazabala, R. Gonzalez and V. Fuentes. Pharmacological screening of plant decoctions commonly used in Cuban folk medicine. J Ethnopharmacol 1991; 33(1/2): 21-24.

[7] Champatisingh D, Sahu P K, Pal A, Nanda G S. Anticataleptic and antiepileptic activity of ethanolic extract of leaves of Mucuna pruriens: A study on role of dopaminergic system in epilepsy in albino rats. Indian J Pharmacol 2011;43:197-9

[8] Dhar, M. L., M. M. Dhar, B. N. Mehrotra and C. Ray. Screening of Indian plants for biological activity. Part 1. Indian J Exp Bioi 1968; 6: 232-247.

[9] Eugene Sebastian J. Nidiry, Girija Ganeshan and A. N. Lokesha, Antifungal Activity of *Mucuna pruriens* Seed Extractives and L-dopa, Journal of Herbs, Spices & Medicinal Plants, 2001,17:139–143, DOI: 10.1080/10496475.2011.581135.

[10] Farrokhi, N.; Whitelegge, J.P.; Brusslan, J.A. Plant peptides and peptidomics. Plant Biotechnol. J. 2008; 6, 105–134.

[11] Feroz, H., A. K. Khare and M. C. Srivastava. Review of scientific studies on anthelmintics from plants. J Sci Res PI Med 1982; 3: 6-12.

[12] Francisco Gilberto Herrera Chalé, Jorge Carlos Ruiz Ruiz, Juan José Acevedo Fernández, David Abram Betancur Ancona, Maira Rubi Segura Campos, ACE inhibitory, hypotensive and antioxidant peptide fractions from proteins, Process Biochemistry, Volume 49, Issue 10, 2014, Pages 1691-1698, ISSN 1359-5113.

[13] Grover. K., V. Vats, S. S. Rathi and R. Dawar. Traditional Indian anti-diabetic plants attenuate progression of renal damage in streptozotocin induced diabetic mice. J Ethnopharmacol 2001; 76(3): 233-238.

[14] Guerranti, R.,]. C. Aguiyi, E. Errico, R. Pagani and E. Marinello. Effects of *Mucuna pruriens* extract on activation of prothrombin by Echis carinatus venom. J Ethnopharmacol 2001; 75(2-3): 175-180.

[15] Houghton, P. J. and K. P. Skari. The effect on blood clotting of some West African plants used against snakebite. J Ethnopharmacol 1994; 44(2): 99-108.
[16] Iauk, L., E. M. Galati, S. Kirjavainen, A. M. Forestieri and A. Trovato. Analgesic and antipyretic effect of *Mucuna pruriens*. Int J Pharmacog 1993; 31(3): 213-216.
[17] lauk, L., E. M. Galati, A. M. Forestiri, S. Kirjavainen and A. Trovato. *Mucuna pruriens* decoction lowers cholesterol and total lipid plasma levels in the rat. Phytother Res 1989; 3(6): 263-264.
[18] Jayatilak, P. G., A. R. Sheth, P. P. Mugatwala and D. S. Pardanani. Effect of an indigenous drug (Speman) on human accessory reproductive function. Indian J Surg 1976; 38: 12-15.
[19] Kamla Kant Shukla, Abbas Ali Mahdi, Mohammad Kaleem Ahmad, Satya Narain Shankhwar, Singh Rajender, and Shyam Pyari Jaiswar, *Mucuna pruriens* improves male fertility by its action on the hypothalamus–pituitary–gonadal axis, Fertility and Sterilit Vol. 92, No. 6, December 2009; doi:10.1016/j.fertnstert.2008.09.045.
[20] Kiuchi, F., M. Hioki, N. Nakamura, N. Miyashita, Y. Tsuda and K. Kondo. Screening of crude drugs used in Sri Lanka for nematocidal activity on the larva of Toxacara canis. Shoyakugaku Zasshi 1989; 43(4): 288-293.
[21] K. Muthu, P. Krishnamoorthy. Evaluation of androgenic activity of Mucuna pruriens in male rats. African Journal of Biotechnology Vol. 10(66), pp. 15017-15019, 26 October, 2011.
[22] Lampariello LR, Cortelazzo A, Guerranti R, Sticozzi C, Valacchi G. The Magic Velvet Bean of *Mucuna pruriens*. Journal of Traditional and Complementary Medicine. 2012;2(4):331- 339.
[23] Lorenza Bellani, Stefania Giglioni, Simonetta Muccifora, Protein Characterization of Protein Bodies from Cotyledons of *Mucuna pruriens* (L.) DC, Plant Foods Hum Nutr (2013) 68:47–51 DOI 10.1007/s11130-012-0331-z.
[24] Madaan, S. Speman in oligospermia. Probe 1985; 115-117.
[25] Malaguti, M.; Dinelli, G.; Leoncini, E.; Bregola, V.; Bosi, S.; Cicero, A.F.G.; Hrelia, S. Bioactive Peptides in Cereals and Legumes: Agronomical, Biochemical and Clinical Aspects. Int. J. Mol. Sci. 2014, 15, 21120-21135.
[26] Mali RG, Mehta AA. 2008. A review on anthelmintic plants. Nat Prod Rad.7:466.
[27] Manyam, B. V. and R. Sanchez Ramos. Traditional and complementary therapies in Parkinson's disease. Adv Neuro11999; 80: 565-574.
[28] Manyam, B. V., Dhanasekaran, M. and Hare, T. A. (2004), Effect of antiparkinson drug HP-200 (Mucuna pruriens) on the central monoaminergic neurotransmitters. Phytother. Res., 18: 97–101. doi:10.1002/ptr.1407
[29] Mercy B. Obogwu, Abidemi J. Akindele, Olufunmilayo O. Adeyemi, Hepatoprotective and in vivo antioxidant activities of the hydroethanolic leaf extract of *Mucuna pruriens* (Fabaceae) in antitubercular drugs and alcohol models, Chinese Journal of Natural Medicines 2014, 12(4): 0273−0283.
[30] Mukherjee, S., T. K. Ghosh and D. De. Effect of Speman on prostatism-A clinical study. Probe 1986; 25: 237-240.
[31] Nath, C., G. P. Gupta, K. P. Bhargava, V. Lakshmi, S. Singh and S. P. Popli. Study of antiparkinsonian activity of seeds of *Mucuna prurita* hook. Indian J Pharmacol 1981; 13: 94-95.
[32] Ogundare A.O. and Olorunfemi O.B., Antimicrobial Efficacy of the Leaves of Dioclea reflexa, *Mucuna pruriens*, Ficus asperifolia and Tragia spathulata. Research Journal of Microbiology, 2007; 2: 392-396.
[33] Pant, M. C., I. Uddin, U. R. Bhardwaj and R. D. Tewari. Blood sugar and total cholesterol lowering effect of glycine soja (Sieb and Zucc.), *Mucuna pruriens* (D.C.) and Dolichos biflorus (Linn.) seed diets in normal fasting albino rats. Indian J Med Res 1968; 56 12: 1808-1812.
[34] Pugalenthi M, Vadivel V, Siddhuraju P., Alternative food/feed perspectives of an underutilized legume *Mucuna pruriens* var. utilis--a review., Plant Foods Hum Nutr. 2005 Dec;60(4):201-18.
[35] Pulikkalpura H, Kurup R, Mathew PJ, Baby S. Levodopa in *Mucuna pruriens* and its degradation. Sci Rep. 2015; 5.
[36] Rana DG, Galani VJ. Dopamine mediated antidepressant effect of Mucuna pruriens seeds in various experimental models of depression. Ayu. 2014;35(1):90-97. doi:10.4103/0974- 8520.141949.
[37] H. Ratnawati and W. Widowati, "Anticholesterol activity of velvet bean (Mucuna pruriens L.) towards hypercholesterolemia rats," Sains Malaysiana, vol. 40, no. 4, pp. 317–321, 2011.
[38] Solepure, A. B., N. M .Joshi, B. V. Deshkar, S. R. Muzumdar and C. D. Shiro Ie. The effect of "speman" on quality of semen in relation to magnesium concentration. Indian Practitioner 1979; 32: 663-668.
[39] Stephen O Majekodunmi, Ademola A Oyagbemi, Solomon Umukoro, Oluwatoyin A Odeku, Evaluation of the anti-diabetic properties of *Mucuna pruriens* seed extract, Asian Pacific Journal of Tropical Medicine 2011; 632-636.

[40] Sushil Kumar Chaudhary, Apurba De, Santanu Bhadra, and Pulok K. Mukherjee, Angiotensin-converting enzyme (ACE) inhibitory potential of standardized *Mucuna pruriens* seed extract, Pharm Biol, Early Online: 1–7, 2015 Informa Healthcare USA, Inc. DOI: 10.3109/13880209.2014.996820.
[41] Vaidya, R. A., S. D. Aloorkar, A. R. Sheth and S. K. Pandya. Activity of bromoergocryptine, *Mucuna pruriens* and L-DOPA in the control of hyperprolactinemia. Neurology (India) 1978; 26: 179-182.

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