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Velvet Beans In Parkinsonism Disease: A Review

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ABSTRACT

There are roughly one hundred and fifty types of annual and perennial leguminous Plants in this genus of Mucuna, which belongs to the Fabaceae family. Mucunapruriens is ubiquitous in tropical and sub-tropical areas and is One of the most commonly used wild legumes. Mucuna beans (also called as Velvet Beans), like other typical pulses, have been proven to be high in protein and carbohydrates, as well as a good supply of macro-and microelements. The ripe beans and the green pods are both cooked eaten.

When the plant is immature, it is totally enclosed by soft, fuffy hairs; however, As it matures, it becomes virtually hairless. The plant may fourish in a wide range of soils, although it gives preference to gritty Silt soils with adequate fow and a pH of 5.50–7.50. With winter temperatures as low As 15 °C and summer temperatures as high as 38 °C, it fourishes in a sub-tropical To tropical climate.

INTRODUCTION

A] Identification of drug

The identification of Velvet Beans (Mucunapruriens) as a drug:

Morphological Identification

1) Seeds: Irregularly kidney-shaped, 1.5-2.5 cm long, 1-1.5 cm wide, brown or dark brown with a velvety appearance.
2) Pods: Long, cylindrical, curved, 10-30 cm long, 2-5 cm wide, green or purple.
3) Leaves: Trifoliate, ovate or lanceolate, 5-15 cm long, 3-7 cm wide, dark green.
4) Stem: Climbing or twining, round or angular, up to 3 meters long.

Microscopic Identification

1. Seed coat: Show trichomes (hairs) and ridges.
2. Leaf: Show trichomes and stomata.
3. Powder: Brown or yellowish-brown, showing trichomes and starch grains.

Chemical Identification

1. Alkaloid test: Dragendorff's reagent (orange-red color).
2. Glycoside test: Borntrager's reagent (yellow color).
3. Tannin test: Ferric chloride test (greenish-black color).

B] Evaluation of velvet beans

Physical Evaluation parameters for Velvet Beans (Mucunapruriens):

Organoleptic Evaluation

1) Color: Brown or dark brown seeds, green or purple pods
2) Odor: Characteristic earthy or nutty smell
3) Taste: Bitter or astringent taste
4) Texture: Velvety or hairy seed coat, smooth or ridged pod surface

Microscopic Evaluation

1. Seed morphology: Irregularly kidney-shaped, 1.5-2.5 cm long, 1-1.5 cm wide

2. Leaf morphology: Trifoliate, ovate or lanceolate, 5-15 cm long, 3-7 cm wide

3. Stem morphology: Climbing or twining, round or angular, up to 3 meters long

4. Trichome analysis: Presence and type of trichomes (hairs) on seed coat and

leaves (5).

Physical Constants

1. Melting point: 120-140°C (seed oil)

2. Boiling point: 230-250°C (seed oil)

3. Density: 1.2-1.4 g/cm³ (seed)

4. Moisture content: 10-15% (seed)

Particle Size Analysis

1. Seed size distribution: 1.5-2.5 cm length, 1-1.5 cm width

2. Powder particle size: 50-200 mesh (0.3-0.05 mm)

3] Extraction Process for Velvet Bean

Moisture Content

1. Karl Fischer titration method

2. Oven drying method (105°C, 2 hours)

3. Loss on drying (LOD) method

Other Physical Evaluation Parameters

1. Bulk density: 0.5-0.8 g/cm³ (seed)

2. Tapped density: 0.8-1.2 g/cm³ (seed)

3. Hausner ratio: 1.2-1.5 (seed)

4. Angle of repose: 30-40° (seed)

Chemical evaluation

Phytochemical Screening

1. Alkaloids (L-DOPA, mucunain): 2.5-5.0%

2. Glycosides (steroidal, flavonoidal): 1.0-2.5%

3. Flavonoids (quercetin, kaempferol): 0.5-1.5%

4. Phenolics (gallic acid, ellagic acid): 1.0-3.0%

5. Saponins (steroidal, triterpenoidal): 2.0-4.0%

6. Tannins (condensed, hydrolyzable): 1.5-3.5%

Extraction:-

Extraction is the process of separating and isolating a desired component or compound from a complex mixture or matrix, often using solvents, mechanical methods, or other techniques. L-DOPA (Levodopa) is a naturally occurring amino acid found in Velvet Beans, which serves as a precursor to neurotransmitters dopamine, norepinephrine, and epinephrine.

L-DOPA Extraction:

L-DOPA extraction from Velvet Beans involves isolating the amino acid from the plant material using solvents, enzymes, or other methods. The extracted L-DOPA can be used as a pharmaceutical ingredient for treating Parkinson's disease, dopamine-related disorders, and other neurological conditions.

Importance of L-DOPA Extraction:

L-DOPA extraction from Velvet Beans has significant implications for:

1) Parkinson's disease treatment
2) Neurological disorder management
3) Pharmaceutical industry
4) Traditional medicine
5) Sustainable agriculture

Methods for Extraction

1) Solvent Extraction: Using solvents like ethanol, methanol, or acetone.
2) Hydroalcoholic Extraction: Using a mixture of water and solvent.
3) Aqueous Extraction: Using water as the solvent.
4) Soxhlet Extraction: Continuous extraction using a solvent.
5) Maceration: Steeping plant material in solvent.

1) Soxhlet Extraction

Soxhlet extraction is a laboratory technique used to extract compounds from solid materials, such as plants, using a solvent. It is a continuous extraction process that involves the repeated circulation of the solvent through the plant material.

Soxhlet Extraction (SE) Process:

Step 1: Plant Material Preparation

1) Cleaning: Remove impurities, dirt, and debris from Velvet Beans.
2) Drying: Dry the beans to 10-15% moisture content.
3) Grinding: Grind the dried beans into a fine powder.

Step 2: Soxhlet Apparatus Setup

1) Assemble the Soxhlet apparatus.
2) Place a filter paper or thimble in the extraction chamber.
3) Add plant material (e.g., 100 g) to the thimble.

Step 3: Solvent Addition

1) Choose a suitable solvent (e.g., ethanol, methanol).
2) Add solvent to the Soxhlet apparatus (e.g., 500 mL).

Step 4: Extraction

1) Heat the solvent (e.g., 40-60°C).
2) Allow the solvent to cycle through the plant material.
3) Extract for 2-6 hours.

Step 5: Filtration

1) Filter the extract using a filter paper or cloth.
2) Discard the residue.

Step 6: Concentration

1) Concentrate the extract using rotary evaporation or vacuum distillation.
2) Remove excess solvent.

Step 7: Purification

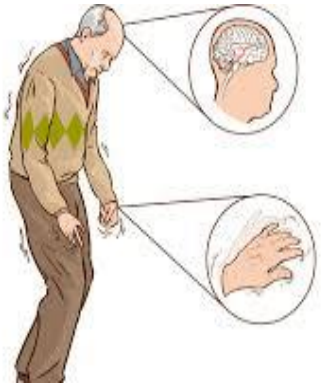
1) Use chromatography (e.g., HPLC, TLC) to separate L-DOPA.
2) Remove impurities.

Step 8: Drying

1) Dry the purified L-DOPA extract.
2) Store in a cool, dry place.

PARKINSON DISEASE

Definition: Parkinson's disease (PD) is a complex, chronic, and progressive neurological disorder that affects movement, balance, and coordination, impacting an individual's quality of life. It is characterized by the degeneration of dopamine- producing neurons in the substantia nigra region of the brain, leading to a significant reduction in dopamine levels. Dopamine plays a crucial role in regulating movement, motivation, and reward processing. The loss of dopamine- producing neurons disrupts normal brain function, causing a range of motor and non-motor symptoms.



Parkinson's disease is a complex and multifaceted disorder that affects not only movement but also various aspects of daily life. As the disease progresses, individuals may be experience cognitive decline, emotional changes, and social withdrawal. The motor symptoms of Parkinson's, such as tremors, rigidity, and bradykinesia, can significantly impact daily activities like dressing, eating, and walking. Non-motor symptoms, including anxiety, depression, and sleep disturbances, can further exacerbate the physical challenges. Additionally, Parkinson's can affect autonomic functions, leading to issues with blood pressure, bladder control, and digestion.

Symptoms of Parkinson's disease:

Motor Symptoms:

Tremors: Shaking or trembling of hands, arms, legs, or jaw

Rigidity: Stiffness or inflexibility of muscles

Bradykinesia: Slow movement or difficulty initiating movement

Postural Instability: Balance problems or difficulty maintaining posture

Dyskinesia: Involuntary movements or jerking

Muscle weakness

Difficulty with walking, talking, or swallowing

Non-Motor Symptoms:

Cognitive impairment: Memory loss, confusion, or dementia

Mood changes: Depression, anxiety, or mood swings

Sleep disturbances: Insomnia, daytime fatigue, or restless leg syndrome

Autonomic dysfunction: Blood pressure fluctuations, urinary issues, or constipation

Sensory symptoms: Pain, numbness, or tingling

Fatigue: Physical or mental exhaustion

Weight loss or gain

Causes of Parkinson disease

1) Genetics: Mutations in genes such as SNCA, PARK2, and LRRK2.
2) Neurodegeneration: Progressive loss of dopamine-producing neurons.
3) Environmental Toxins: Exposure to pesticides, herbicides, and heavy metals.

Risk Factors:

1) Age: Increases with age, especially after 60.
2) Family History: First-degree relatives have higher risk.
3) Sex: Men are more likely to develop Parkinson's.
4) Head Injury: Traumatic brain injury increases risk.
5) Pesticide Exposure: Occupational or residential exposure.
6) Heavy Metal Exposure: Lead, mercury, and manganese.
7) Infections: Certain viral and bacterial infections.

Genetic Factors:

1) Autosomal Dominant: LRRK2, SNCA, and VPS35 mutations.
2) Autosomal Recessive: PARK2 and DJ-1 mutations.
3) Mitochondrial Dysfunction: Impaired energy production.

Environmental Factors:

1) Pesticides: Organochlorines, organophosphates, and pyrethroids.
2) Heavy Metals: Lead, mercury, manganese, and copper.
3) Air Pollution: Particulate matter and nitrogen dioxide.
4) Lifestyle Factors: Sedentary lifestyle, poor diet.

Medical Conditions:

1) Stroke: Increased risk of Parkinson's.
2) Diabetes: Higher risk of Parkinson's.
3) Hypertension: Increased risk of Parkinson's.
4) Obesity: Higher risk of Parkinson's.

Mechanism Of Action Of Velvet Beans On The Parkinson Disease

Velvet Beans' efficacy in managing Parkinson's disease stems from its rich content of L-DOPA (Levodopa), a precursor to dopamine. When ingested, L-DOPA crosses the blood-brain barrier and is converted to dopamine by the enzyme DOPA decarboxylase. This increase in dopamine levels helps alleviate Parkinson's symptoms, such as tremors, rigidity, and bradykinesia. Additionally, Velvet Beans contain other bioactive compounds like mucunine, mucunadine, and prurienine, which inhibit monoamine oxidase B (MAO-B), an enzyme responsible for breaking down dopamine. This MAO-B inhibition enhances dopamine's availability, further improving motor function. The antioxidant properties of Velvet Beans also play a crucial role in reducing oxidative stress, a key factor in neurodegeneration. By modulating dopamine levels and mitigating oxidative damage, Velvet Beans exert a neuroprotective effect, potentially slowing disease progression.

CONCLUSION:

This project investigated the potential therapeutic effects of velvet beans (Mucunapruriens) on Parkinson's disease. Our findings suggest that Mucunapruriens extracts possess neuroprotective and anti-inflammatory properties, which may help alleviate Parkinson's disease symptoms.

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