



Pharmacognostical Study of *Kapikacchu* (*Mucuna Pruriens*)

Authors

**Dr Santosh Kr Vishwakarma¹, Dr Raman Ranjan², Dr (Prof). Vijay Shanker Dubey³,
Dr (Prof.) Uma Shanker Chaturvedi⁴, Dr (Prof.) Ajay Kumar Singh⁵**

¹Asst. Prof., Dravyaguna Dept., SRTACH, Gaya, Bihar
+91 9304712033, Email: dr.santosh.ayu@gmail.com

²MD (Ay.), AMO, GAD, Raigar, CG

³HOD, Dravyaguna Dept., GACH, Patna, Bihar

⁴Principal, GACH, Begusarai, Bihar

⁵HOD, PG Dept., GACH, Patna, Bihar

Pharmacognosy is “the study of natural product or their molecules that are useful for their medicinal, ecological, gustatory, or other functional properties.” In other words, pharmacognosy encompasses the knowledge of the history, distribution, cultivation, collection, selection, preparation, commerce, identification, evaluation, preservation, and use of drugs affecting the health of man and other animals.

The name of the genus, *Mucuna*, is that of a Brazilian species, and *pruriens* refers to the itching caused on the skin by the hairs. The popular name, variously spelt round the world is mostly of Indian origin. The mature seeds are considered aphrodisiac, believed to be good luck charms in Mexico and Central America, made into buttons, and ground into flour; the roots are used to treat cholera; the hairs covering the pods are used to kill intestinal worms.

Velvet bean, a climbing legume of Asian origin, currently promoted for use as a green manure and cover crop in the humid tropics. Extremely itchy hairs are produced on the ripe pods and this is why this weed is named “*feijão maluço*” (crazy bean)

or “*feijão macaco*” (monkey bean) in in Macossa district of Mozambique.

Initially, velvet bean seed was sold by seed companies in the United States under the name “banana field bean” and was later distributed as velvet bean throughout the tropics by the USDA. The plant was probably introduced as a forage crop in Mesoamerica in the 1920s by the United Fruit Company. Velvet bean was grown in maize by plantation workers on company land and grazed by mules used to transport bananas from the plantations to the railway depots. The plant retained the name “mule bean,” or *quenk mula*, among the Ketchi natives of Guatemala. In Central America, Velvet beans are been roasted and ground to make a coffee substitute, and hence the name “Nescafé” in these regions as well as in Brazil. It also has a long history of use in Indian Ayurveda. The seeds of *mucuna* are known to enhance the mental function, enhance neurosignals, increase the nervine strength, support normal control of physical movements, and strengthen the immune system, but are mainly used for the aphrodisiac purposes. With its documented ability to increase testosterone and

stimulate growth hormone (thereby increasing muscle mass), several companies have launched new products using mucuna beans, including several which are standardized to the L-dopa content.

Taxonomical Classification

Kingdom Plantae– Plants, Subkingdom Tracheobionta– Vascular plants, Superdivision Spermatophyta– Seed plants, Division Magnoliophyta– Flowering plants, Class Magnoliopsida– Dicotyledons, Subclass- Rosidae, Order- Fabales, Family- Fabaceae– Pea family, Genus- Mucuna, Species Mucuna pruriens (L.) DC.

The main characteristics of *Kapikacchu* according to its place in the taxonomic classification are described here:

Tracheobionta - The Subkingdom Tracheobionta encompasses those plants in the Kingdom Plantae that have specialized cells for conducting water and sap within their tissues. Spermatophyta is the traditional seed-plant division of the kingdom Plantae. Flowering plants are usually treated as a division called Magnoliophyta. The main split within the Division Magnoliophyta is between the dicotyledons and monocotyledons. The names come from the number of embryonic leaves, called cotyledons, found within the seed.

Magnoliopsida (Dicotyledon)- Dicotyledons or dicots are flowering plants whose seed contains two embryonic leaves or cotyledons. Dicotyledonous plant species are placed in the Class Magnoliopsida.

Rosidae- Rosidae includes the largest number of families of all the subclasses, although the vast majority of species belong to only 5 large orders, out of which Fabales (Mucuna belongs to it) is the largest order comprising almost 18,000 species. In evolutionary terms it has derived features such as pinnately compound leaves, but few have trifoliolate or palmate leaves too. Unifying characters include showy flowers, perianth parts usually free, and stamens as many as or more than the petals. This subclass of the dicotyledons contains both woody and herbaceous species. Its members usually have

bisexual flowers that often contain numerous stamens, which develop centripetally.

Fabales- Fabales classified in Caesalpinioideae, Mimosoideae, and Papilionoideae as separate subfamilies of a single family, the Leguminosae (Fabaceae). The leaves are usually compound but are also of simple type in few species. Stipules, a pair of appendages subtending the leaf petiole, are usually present. The flowers may be solitary or bunched in leaf axils. The inflorescences, when present, are of various kinds, simple or branched. The flowers are usually perfect (bisexual) but unisexual flowers occur sporadically throughout the family. It is the pistil, or gynoecium, of the Fabales that is unique. The single carpel develops into a fruit (the pod, or legume) that splits open (dehiscence) along one or both edges (sutures) at maturity, releasing the seeds that have developed from the ovules. Legume seeds are sometimes very simple in colour and texture in few varieties and sometimes quite colourful and spotted in others. Fabaceae family ranges in habit from giant trees to small annual herbs, with the majority being herbaceous perennials. Plants have indeterminate inflorescences, which are sometimes reduced to a single flower. The flowers have a short hypanthium and a single carpel with a short gynophore, and after fertilization produce fruits that are legumes. Many Fabaceae host bacteria in their roots within structures called root nodules. These bacteria, known as rhizobia, have the ability of nitrogen fixation. The legume, acting as a host, and rhizobia, acting as a provider of usable nitrate, form a symbiotic relationship.

Leaves- The leaves are usually alternate and compound and often trifoliolate (e.g. mucuna). They always have stipules, which can be leaf-like or thorn-like or be rather inconspicuous. (Fig.1) Leaf margins are entire or, occasionally, serrate. Hypanthium is usually cup shaped. There are normally ten stamens (Fig.2) and one elongated superior ovary, with a curved style. They are usually arranged in indeterminate inflorescences. Fabaceae are typically entomophilous plants (i.e. they are pollinated by insects), and the flowers are usually showy to attract pollinators (Mucuna

mainly depends on bats for the pollination in some parts of the tropics). **Flowers-** The flowers always have five generally fused sepals and five free petals (Fig.3). Dark purple flowers (6 to 30) occur in drooping racemes (Fig.4). They are generally hermaphrodite, and have a short fruit. **Fruits-** The ovary most typically develops into a legume. A legume is a simple dry fruit that usually dehisces on two sides. A common name for this type of fruit is a "pod.

The Morphology of *Kapikacchu* seed can be summarised as: Fruits are curved, 4–6 seeded. The longitudinally ribbed pod is densely covered with persistent pale-brown or grey trichomes that cause irritating blisters. (Fig.5,6,7) Seeds are black ovoid and 12 mm long (Fig.8)

Distribution and Habitat - *Mucuna* is native to Southern China and Eastern India, but now it is widely distributed in the tropics. In India it is found in almost all states including Andaman and Nicobar island. But in abundance it is found in Assam, West Bengal, Jharkhand, Khasi hills, Deccan region and in the east and west coast region.

Synonyms of *Mucuna pruriens* (Baker) - *Dolichos pruriens* (L.), *Mucuna prurita* (L.) Hook, *Mucuna esquirolii* A. Léveillé

Vernacular Names- SANSKRIT: *Kapikacchuh*, *Markati*, *Kandura*, HINDI: *Kavach* ENGLISH: *Cowhage*, *Cowitch*, *Cow itch*, *Itchy bean*, *Wild itchy bean*. KANNAD : *Nasugunni* MALAYALAM : *Naykkurana* MARATHI : *Kuhili*, *Khajkuhilee* TAMIL : *Punaikkali* TELUGU : *Dulagondi*, *Duradagondi* ASSAMESE : *Banar Kakua* GUJRATI : *Kavach*, *Kaucha* ORIYA : *Baikhujnee* PUNJABI : *Tatgajuli*, *Kawach* URDU : *Kanwach*, *Konch* FRENCH : *Pois pouilleux*, *Poil à gratter*. GERMAN: *Juckbohne*. MALAY: *Kacang babi*, *Kacang gatal*, *Kekara gatal*, *Kara-kara gatal*, *Kramé*. SPANISH: *Picapica*, *Chiporro*. VIETNAMESE: *mèo* CHINESE: *Ci mao li dou*, *Mao dou*, *Gou zhua dou*. DANISH: *Fløjlsbønne*, *Floejlsboenne*. DUTCH: *Fluweelboon*. ESTONIAN: *Bengaali rasvauba*. FINNISH: *Samettipapu*. FRENCH: *Pois velu*, *Pois mascate*. ITALIAN: *Fagiolo vellutato*.

JAPANESE: *Hasshou mame*. MALAY: *Kacang babi*, *Kacang benguk*, *Kekara juleh*, *Kara benguk*. Properties and actions - *Rasa: Madhura, Tikta, Guna: Guru, Snigdha, Virya: Sheeta, Vipaka : Madhura, Doshaghata : Vatashamak, Karma : Kaphanashaka, Vatashamana, Vrishya, Pittanashaka, Raktadoshanashaka, Brihana, Balya*

Therapeutic uses - *Angamarda, Antravridhi, Atisara, Gulma, Kasa, Ksaya, Raktapitta, Sita-pitta, Sosa, Sidhma, Svasa, Vandhyatva, Vrana*.

Parts Used- Seeds

Dosage: - Seed powder 3-5 gms / day.

Important formulations - *Brhat Masa Taila, Krounch paka* etc.

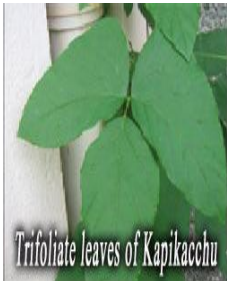

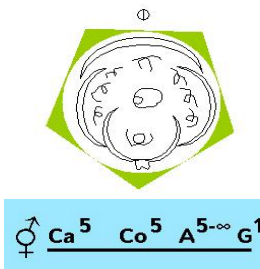






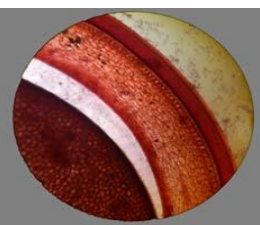
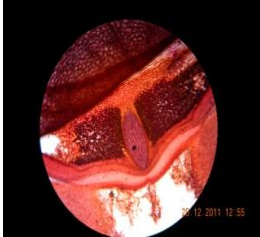
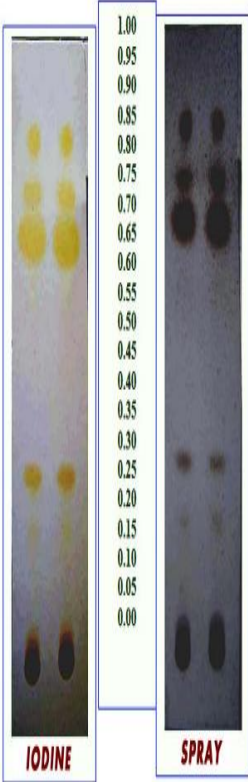
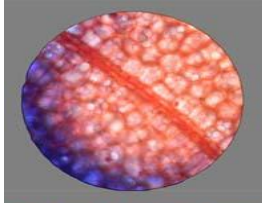

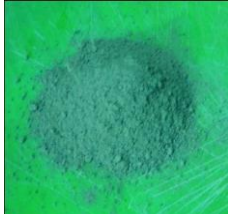
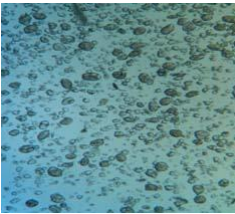
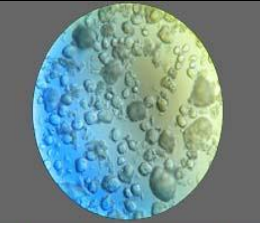

Pharmacognostical Study (Done at Regional research institute of Ayurveda, Lucknow, Uttarpradesh)

a) Macroscopic- Seed ovoid, slightly laterally compressed, with a persistent oblong, funicular hilum, dark brown with spots; usually 1.2-1.8 cm long, 0.8-1.2 cm wide, hard, smooth to touch, not easily breakable; odour, not distinct; taste, sweetish-bitter. **b) Microscopic** Mature seed shows a thin seed-coat and two hard cotyledons (Fig.9); outer testa consists of single layered palisade-like cells; inner testa composed of 2 or 3 layers, (Fig.10) outer layer of tangentially elongated, ovoid, thin-walled cells, inner 1 or 2 layers of dumb-bell or beaker-shaped, thick-walled cells; tegmen composed of a wide zone of oval to elliptical, somewhat compressed, thin-walled, parenchymatous cells; some cells contain starch grains; cotyledons composed of polygonal, angular, thin-walled, compactly arranged, parenchymatous cells (Fig.11,12,13), containing aleurone and starch grains; starch grains small, simple, rounded to oval measuring 6-41 μ in dia., but not over 45 μ in dia.; a few vascular bundles with vessels showing reticulate thickening or pitted present, Powder pale cream coloured (Fig.14); aleurone and starch grains small (Fig.15, 16), simple, rounded to oval (Fig.17) measuring 6-41 μ in dia., but not over 45 μ in dia.

Identity, Purity And Strength-

Foreign matter 1 %, Moisture content 3.8%, Total ash 4.7 %, Acid – insoluble ash 0.8%, Sulphated ash 5.6 %, Alcohol – soluble extractive 5.4%, Water – soluble extractive 22.7%

Phytochemical studies - Steroids - +ve, Flavones - + ve, Alkaloids - + ve, Carbohydrates - + ve, Glycosides - + ve, Saponins - + ve

| | | | |
|--|--|--|--|
|  <p><i>Trifoliate leaves of Kapikacchu</i></p> <p>Fig.1. Leaves of Kapikacchu</p> |  <p><i>Multiple stamen</i></p> <p>Fig.2. Multiple stamens</p> |  <p>$\text{♀ } \underline{\text{Ca}^5 \text{ Co}^5 \text{ A}^{5-∞} \text{ G}^1}$</p> <p>Fig.3. Floral diagram & floral formula</p> |  <p>Fig.4. Flowers</p> |
|  <p>Fig.5. Unripe pod</p> |  <p>Fig.6. Peeled pod</p> |  <p><i>Pods of Mucuna pruriens</i></p> <p>Fig.7. Ripe pod</p> |  <p>Fig.8. Seed</p> |
|  <p>Fig.9. TS of seed (naked eye view)</p> |  <p>Fig.10. TS of Testa</p> |  <p>Fig.11. TS of raphe</p> |  <p>Fig.18. TLC plates</p> |
|  <p><i>T.S. of seed (Cotyledon with septa)</i></p> <p>Fig.12. TS of cotyledon</p> |  <p><i>T.S. of seed (A portion)</i></p> <p>Fig.13. TS of seed portion</p> |  <p>Fig.14. Powder of seed</p> | |
|  <p>Fig.15. Powder microcopy</p> |  <p>Fig.16. Powder microcopy (high resolution)</p> |  <p>Fig. 17. Starch grains of M. Pruriens seed powder</p> | |

Chemical Test (Fluorescence) for Kapikacchu
[Chase & Pratt, 1949, Kokaski, et al., 1958) with some modification]

| S.N. | Treatment | Under ordinary light) | Under UV - Long (366nm) |
|------|---|-----------------------|-------------------------|
| 1 | Drug as such | Cream | Whitish cream |
| 2 | Drug + Nitrocellulose | Light brown | Light green |
| 3 | Drug + Picric acid | Yellow | Green |
| 4 | Drug + HCl conc. | Brown | Light green |
| 5 | Drug + H ₂ SO ₄ conc. | Orange | Light brown |
| 6 | Drug + HNO ₃ (50%) | Orange | Light green |
| 7 | Drug + 1 N Na OH in Me OH | Brown | Green |
| 8 | Drug + 1 N Na OH in Water | Dark Brown | Light green |
| 9 | Drug + NH ₄ OH | Light brown | Light brown |
| 10 | Drug + FeCl ₃ | Dark green | Green |
| 11 | Drug + Acetic acid Glacial | Light brown | Light green |
| 12 | Drug + Sudan-III | Brown | Dark brown |

Thin Layer Chromatography Of Alcoholic Extract

Spots Visualized in Iodine and after spray of Sulphuric acid reagent & heated 1100 C for 5 minutes. (Fig.18)

| | |
|---|---|
| Stationary phase | TLC Aluminium sheet silica gel 60 F 254 plate |
| Mobile phase | Toluene – Ethyl Acetate-Acetic acid (5: 4: 0.5) |
| Rf value of spots Visualized in Iodine | 0.20, 0.30, 0.70, 0.75 & 0.85 |
| Rf value of spots Visualized after spray of Sulphuric acid reagent & heated 1100C for 5 minutes | . 0.20, 0.30, 0.70, 0.75 & 0.85. |

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