



The agronomy and use of *Mucuna pruriens* in smallholder farming systems in southern Africa

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Velvet bean—*Mucuna pruriens* var. *utilis*, also known as mucuna—is a twining annual leguminous vine common to most parts of the tropics. Its growth is restricted to the wet-season as it dies at the onset of the cold season. It has large trifoliate leaves (i.e. has three leaflets) and very long vigorous twining stems that can extend over two–three metres depending on growth conditions. When planted at the beginning of the growing season, flowers normally form at the end of March/early April. These flowers are deep purple and appear underneath the foliage. Seeds are large, ovoid shaped (± 10 mm long) and of different colours, ranging from white, grey, brown to black and mottled.



sub-humid regions it can be intercropped with maize to improve soil fertility, maximize grain/herbage yields per unit area and provide mixed crop for hay/silage making. Whether it is grown as a single or mixed crop, the velvet bean provides early dry season grazing or fodder for hay or mixed-crop silage (improving the N content of cereal or grass silage).



Why grow the velvet bean?

The velvet bean can be grown for soil fertility, green manure and as a cover crop in conservation agriculture (CA). The velvet bean is a high yielding leguminous forage crop—high in nitrogen (N)/crude protein content. It is usually sown as an N-fixing ley crop or as a green manure crop to improve soil fertility. In the

The hay and silage can be used as supplementary feed during the dry season to improve the digestibility of poor quality roughages, such as maize stover. *Mucuna* is a prolific seeder and its seed (26% crude protein) can be used in home-mixed rations to replace commercial supplements. However, its grain is not so useful to non-ruminant livestock. It can only be used for human consumption after reducing its toxicity by boiling and discarding the water several times.

Site selection

Climate

Velvet bean performs best in regions with long growing seasons and prefers hot moist areas that receive 650–2500mm of rainfall per annum. It can withstand long dry spells, especially when established early in the growing season. Consequently, velvet bean farming is increasingly being adopted in semi-arid regions (e.g. natural regions IV and V of Zimbabwe). It will grow well into the dry season until frosted or deep soil moisture runs out. Its seeds mature around May and June.



Legume roots with nodules

Soils

Velvet bean grows well in a wide range of soils, including relatively infertile sandy soils.

Cultivation practices

Land preparation

Due to its large seeds, the crop does not require a lot of land preparation. Minimal soil disturbance is encouraged in CA systems using manual or mechanized equipment.

Fertilizer and lime requirements

Application of 500–700 kg/ha lime (preferably dolomitic lime on sandy soils) is recommended to encourage nodulation and efficient use of fertilizers. *Mucuna* will

thrive on soils where available soil phosphorus (P) is low. Application of 200–250 kg/ha single superphosphate (18.5% P₂O₅) is sufficient for optimum herbage and seed production. Alternatively, one can apply 250–300 kg of compound fertilizer (preferably 7 N: 14 P: 7 K).

Legumes do not normally require N (e.g. ammonium nitrate or AN) fertilizer, since they can fix soil N in their root nodules. However, in soils with very low nitrogen level, a single application of no more than 14 AN kg/ha (40N kg/ha) will be necessary to boost plant growth, 3–4 weeks after germination.

Planting

a) As a single crop

Seed is sown at a rate of 35–40 kg/ha in single crops at the beginning of the wet season, using inter-row spacing of 0.9–1 m and within row spacing of 30–40 cm. A lower seed rate (wider spacing) is advisable in semi-arid conditions, to reduce competition for moisture. *Mucuna* seeds are large and should be planted at a depth of 3–7cm.



b) Intercropping with maize or sorghum

The velvet bean is a very vigorous climber. Therefore, it should be planted in-between cereals 3–4 weeks after they emerge (depending on predicted annual rainfall), ideally after the first hand weeding, if farmers are not using herbicides. If planted too early and densely, it can choke the cereal, thereby reducing cereal yield. Planting the velvet bean within the same row as maize and in-between the maize plants facilitates weeding and spraying. However, delaying the planting of legume for more than four weeks after sowing cereals may result in shading by the cereal crop and severe reduction in legume yield. It is advisable to sow one pip per station, at a spacing of 50cm within a row.

Weed, pest and disease control

Farmers are advised to keep the crop weed-free by weeding as soon as weeds appear. This will also reduce pest infestation. The velvet bean is well known for resistance to most pests and diseases. However, there have been reports of complete devastation by leaf-eating caterpillars. Farmers should consult their local extension officer for advice on controlling disease outbreaks or pest damage, including advice on the compatibility of crop chemicals when they desire to use herbicides.

Harvesting time and yield estimates

Mucuna is normally harvested for hay once in the growing season—usually at 50% booting. Its flowers are normally buried in the leaf canopy. Flowering occurs in early March and is triggered by the shorter days and cooler night temperatures (21°C). Due to its profuse seeding ability and the high feeding value of its grain, farmers prefer to harvest it when the pods are mature and dry. Then, they can harvest the foliage residue together with the pods. However, this moribund foliage and the mature pods are hairy and itchy and are uncomfortable to harvest and process.

Mucuna has achieved average herbage yields of 7–11 tonnes dry matter/ha in natural regions II and 4–6 tonnes dry matter /ha in natural regions IV and V of Zimbabwe, when harvested at booting stage. Average seed yields range from 1.5–2 and 0.5–1 tonnes in natural regions II and IV, respectively. At booting, its forage contains 10.4% crude protein, making it a good source of protein for livestock, when fed fresh or as hay. Forage collected after pod maturation in local trials averaged 6.8% crude protein. Mucuna seed contained 25–27% crude protein and the pod shells 7–8% crude protein. The seed is high in L-Dopa (up to 7%), an anti-nutritional factor that causes intestinal disruptions especially in non-ruminants when fed in high doses.

Fodder conservation

As already indicated, mucuna should be harvested for hay making at booting stage. This kind of foliage normally dries to 75–80% dry matter content (safe for storage) in 3–5 days. Intercropped forage is best conserved as silage. No sugar additives will be required if the mixed-crop is harvested when the cereal component is in milk dough stage. Such silage will be high in crude protein compared to silage from maize only or sorghum only.

Seed production

Pods can be hand-harvested and spread on a clean surface, under a shade, to dry before shelling. Hand shelling is done by pounding the dried pods with long sticks. Thereafter, clean seed is obtained by winnowing from a basket. Farmers can use shelling machines.

Mucuna can yield up to 2 tonnes of clean seed per hectare. The weight to weight ratio for shells to grain is normally 1:1. It is not usually necessary to treat mucuna seed against grain weevils or rodents.

Velvet bean seed cleaning



Clean velvet bean seed





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Acknowledgements

The authors are grateful to Barbara Maasdorp at the Crop Science Department of the University of Zimbabwe for editorial assistance. It is a product of the Zimbabwe Crop-Livestock Integration for Food Security (ZimCLIFS) project funded by the Australian Centre for International Agricultural Research. It contributes to the CGIAR Research Program on Dryland Systems.

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ILRI thanks all donors and organizations which globally supported its work through their contributions to the [CGIAR system](#)

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