Marama bean

- PRODUCTION GUIDELINES -
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Department of Agriculture, Forestry and Fisheries
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General aspects

Classification
Scientific name: *Tylosema esculentum*
Family: Fabaceae
Common names: Gembuck beans, Gemsbokboontjies, Braaiboontjie
Marumama, Muraki, Tamani berry, Morama

Origin and distribution
Marama bean is a wild-growing plant indigenous to the Kalahari Desert and neighbouring areas with poor semi-arid soil in Botswana, Namibia and the northern part of South Africa. It also grows in Zambia and Mozambique.

Production levels

South Africa
No statistical data on the production levels are available because the crop grows naturally in small populations and is not formally cultivated in South Africa.

Internationally
The marama bean plant is a widespread perennial legume that grows naturally in larger numbers in Namibia and Botswana. In the Kalahari, young tubers with a yield of up to 300 kg were reported. The crop is harvested from the wild, consumed and marketed locally. Information on seed yields is not available.

It is also reported that the crop was successfully cultivated under experimental conditions in Texas, US, where fruit and seeds were produced after 3.5 (three and half) years. No statistical data on the production levels are known yet.

Major growing areas in South Africa
Marama bean grows naturally in the arid and semiarid areas of the Northern Cape, Limpopo, Gauteng and North West provinces.
Cultivars
No cultivars have been developed in South Africa as yet.

Description of the plant

Mature plant
A mature marama bean plant has prostrate vines with numerous herbaceous stems which can be up to 6 m and bear Y-shape tendrils. It is commonly found creeping over the soil surface with vine carrying double-lobes leaves.

Stems
The stems are prostrate and trailing, up to 3 m in length.

Leaves
The leaves are alternate, simple, double-lobed for more than half the length, soft and red brown when young, but later turn leathery and greyish-green at maturity.
**Roots**
The roots are deep, tuberous and sugar beet size.

**Flowers**
The flowers are borne in a raceme, up to 25 mm long, yellow in colour and turn reddish when old. The small, yellow flowers produce rounded, oblong pods, which are at first pale-pink in colour, changing to apple green, then to a dark, purplish pink and finally, brown.

**Pods**
The pods are large and squat in shape. Young pods are approximately 6 cm in length and light green in colour. Matured pods are very hard, brown and usually contain two seeds, but up to six seeds can be produced.

**Essential parts**
Seeds and tubers are the essential parts of the plant.

**Climatic requirements**

**Temperature**
The crop occurs naturally at an extremely high temperature of 37 °C in the growing season. It withstands the freezing nights of the Kalahari winter.

**Rainfall**
Marama bean thrives in dry areas receiving less that 100 mm rain annually. The optimum rainfall for growth ranges from 250 to 600 mm.

**Soil requirements**
The plant thrives in desert soil and prefers neutral pH soil. It grows well in sandy loam. Marama bean cannot tolerate waterlogged soil.

**Cultivation practices**

**Propagation**
Propagation is through seed.
Soil preparation

For the cultivation of marama bean, it is important to make sure that the soil is loosened and well drained. This is ensured by ploughing the soil, followed by harrowing it to ensure a smooth and even texture. The soils have to be sandy or loamy, but it is crucial that they easily allow water to seep through fast. Soil treatment with chemical fertilisers is not important, however, specially designed bio-fertilisers can be used. The soil must be ready before the start of the rainy season.

Field layout and design

The field should to be on a generally flat piece of land, which is more conducive to the prostrate nature of the plant than hilly sloping terrain.

Planting

The seed should be scarified for improved germination and should not be soaked as it will die-off. The seed must be planted in moist, neutral to acid soil, preferably not in waterlogged soil. Farmers are advised to put one seed per hole. The seed germinates in warm conditions after rainfall and starts to germinate 9 to 10 days after planting (a week to germinate when the soils are wet). A planting depth of 5 to 15 cm is recommended when the soils are wet and 20 cm when dry.

Fertilisation

The soils in which marama bean occurs naturally are sandy with a low organic matter content and poor nutrient level, especially nitrogen. Despite the species adaptability to low nutrient condition, the application of mineral fertilisers will, however, promote growth and increase tuber yield.

Research conducted in the field and glasshouse shows that supply of nitrogen and phosphorus significantly increased plant growth and tuber yield. Supplying 20 kg N and 40 kg P per hectare is recommended.

Irrigation

Irrigation is not recommended for marama production. The plant thrives in dry areas receiving less that 100 mm rain annually. However, when the plant has reached physiological maturity after two rainy seasons, early resprouting can be triggered by watering, which will result in early flowering and reaching
harvesting early. This is not advisable because if the rainy season is poor, more water is required and it becomes costly to the farmer. It is recommended to allow the natural resprouting to occur.

Weed control

Weed control is very important to minimised unnecessary crowding of plants in the field with plants and competition for space and nutrients. A marama field should to be free from weeds especially at planting and at harvesting time. The intensity of weeding can be reduced during the 12 to 24 months period. No weed control chemicals have been tested so far, and therefore none is recommended.

Pest and disease control

The most problematic pests for marama bean are leaf eaters and pod borers, which can be sprayed with standard sprays. It was reported that these pest problems have been minimal in marama bean production.

The marama field, like any field, is also prone to various diseases. However, the impact of diseases on yield is minimal. Fungal diseases associated with leaf blotch or pod rot were observed in marama fields. Spraying with general fungicides is recommended to avoid the spread of the fungi.

Other cultivation practices

Farmers are encouraged to keep small rodents, springhares, squirrels and birds like ostriches and others at bay. These can eat the seeds before germination or before harvest. Marama growing soils must drain easily and be loose enough to allow the plant to establish a big root tuber system. After 10 to 15 years the plant may die-off and cause collapse of the soil round it. Farmers should then fill-up hole be created by this collapse.

Harvesting

Harvesting starts when the pods are brown in colour, usually at the onset of winter temperatures (April to June).
HARVESTING METHODS

The seeds and tubers are collected by hand (picking and hand-digging respectively).

Post-harvest handling

After harvesting, place the pods in aerated storage. The pods should be left to discolour to brown (100%) and when the first pods start to crack open, then farmers can start manual or semi-manual shelling of the pods. The dry seeds can then be picked up from the shelling floor and placed into storage in jute or sisal bags. The seeds can then be stored in a cool storage house. Because of the oily nature of the seeds, always avoid exposure to direct sunlight.

SORTING

Frequently the seeds do not follow the normal development process and as a result there may be some too small, malformed seeds. These must be removed.

Currently, sorting is done manually to keep the fully formed mature seeds separate from the malformed seeds as the latter will not be useful for the market. This malformation is at a very low level. It is caused by insect damage to the immature pods while in the field.

GRADING

Marama seeds can be graded according to colour, which can be light brown, brown or dark brown.

PACKING

The marama seeds can be packed depending on the intended use. Pack the seeds unto 1 kg plastic bags for nuts and 50 to 90-kg bags for cold pressed oil. When the seeds have been roasted they can be packaged into as small as 200-g packets and sold as nut snacks.

STORAGE

Marama seeds can be stored in sisal or jute bags in a well-ventilated room. If stored in a room where the temperatures are high or where there is direct access to sunlight rays the seeds will easily become rancid owing to the breakdown of the fatty acids in the oil-rich seed. In a cool, well-ventilated room, long-term storage of up to 4 years is possible.
TRANSPORT

Transportation of marama seeds to the market is possible by the standard methods of low-cost transportation. It is recommended that during transport, the seeds be covered by a sun-proof cover in a well-ventilated cabin. If possible transport can be done at sun down to minimise exposure of the oily seeds to the sun’s radiation.

Marketing

Surplus beans are sold on the local market. Because small quantities are usually collected, marama beans are generally channelled into household consumption, but small and medium-scale farmers also sell marama (uncooked or roasted) to the people nearby villages. The market is limited to the areas where the plant is grown. It is sold throughout the year. Price variations occur between villages and are determined according to weight (or the use of a container such as a cup as a standardised volume). Price also depends on whether the beans are shelled or unshelled, fresh, raw roasted and may increase slightly if the beans are sold in a neighbouring town. Wild marama beans are still part of the informal market system and an important source of food security for the rural population.

Production schedule

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<th>Activities</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
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Utilisation

The seeds are virtually inedible straight from the pod. Immature seeds are used as a vegetable, while mature seeds are either boiled or roasted. The roasted seeds can be used to make butter and coffee or cocoa-like beverages. Cooking oil can be pressed from mature seeds. Young tubers (less than 2 years) can be eaten raw, baked, boiled or roasted.
Acknowledgement

The Department of Agriculture, Forestry and Fisheries acknowledges the University of Namibia, Department of Biological Sciences for providing valuable information.

References


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