

- PRODUCTION GUIDELINE -

for

# *Bottle Gourd*



agriculture,  
forestry & fisheries

Department:  
Agriculture, Forestry and Fisheries  
REPUBLIC OF SOUTH AFRICA



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*Bottle Gourd*

2016

Printed and published by  
Department of Agriculture, Forestry and Fisheries

Design and layout by  
Communication Services  
Private Bag X144, Pretoria 0001

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## PART I: GENERAL ASPECTS

### CLASSIFICATION

<b>Scientific name:</b>	<i>Lagenaria siceraria</i>
<b>Common names:</b>	bottle gourd, calabash gourd; kalbas; moraka ; segwana; iselwa
<b>Family name:</b>	Cucurbitaceae

### ORIGIN AND DISTRIBUTION

It is generally accepted that *L. siceraria* (previously known as *L. vulgaris* Ser.) is indigenous to Africa and that it reached temperate and tropical areas in Asia and the Americas about 10 000 years ago, with human help or probably as a wild species whose fruits had floated across the seas. Fruits are known to float in the sea for many months without the seeds losing their viability. Independent domestications from wild populations are believed to have occurred in both the Old and New Worlds. African and American land races (subsp. *siceraria*) are morphologically distinct from Asian land races (subsp. *asiatica*). It is uncertain if the seemingly spontaneous populations in Africa are truly wild. However, it is possible that Mary Wilkins-Ellert discovered an unusual free-living plant of *L. siceraria* in a remote region of southeastern Zimbabwe fairly recently. In southern Africa, *L. siceraria* has been collected in Namibia, Botswana, Swaziland and the Limpopo, North-West and Gauteng provinces of South Africa. Most, if not all of these collections probably are from cultivated plants or plants that escaped from cultivation.

### PRODUCTION LEVELS IN SOUTH AFRICA

Not much information is available on the production of bottle gourd, especially in the Southern African context where women are the main custodians of its husbandry. The FAO provides combined production data for pumpkin, squashes and gourds; as such there is difficulty in ascertaining the exact amount of global bottle gourd production. In South Africa the crop is only available as a landrace with no commercially produced seeds.

### Internationally

In Bangladesh, it was reported that yields of 35 t/ha in sub-tropical to tropical conditions and less than 20 t/ha in semi-arid conditions obtained. Hybrid

varieties in Asia have recorded yields of more than 40 t/ha under optimum conditions, while local landrace varieties produced less than 25 t/ha.

## Production areas in South Africa

The crop is mainly produced in the Limpopo, Gauteng, Eastern Cape, KwaZulu-Natal and North West provinces.

## CULTIVARS

No cultivars have been developed in South Africa as yet .

## Description of the plant

### Matured plant

Bottle gourd can be a tree or fence creeper, or it can grow on the ground like most other members of the pumpkin family. It is annual and dies at the end of each growing season.

### Stem

The *Lagenaria* vine stem is deeply grooved and angular (weakly five sided) in cross-section. There are five longitudinal ridges which are deep on the main (1-3cm thick) stems, but smooth out toward the growing tips where the stems are 1 cm thick. The stems are softly pubescent with jointed, gland-tipped hairs. The main stem branches out to 5-6 main laterals

### Leaves

Bottle gourd is an annual herbaceous plant with a prostrate or branching type growth habit. The leaves are alternate and variable, and tendrils are almost always present. Bottle gourd has large, rounded hairy and kidney shaped leaves with a pair of tendrils at the base of leaf stalk.





### *Roots*

Like the vine shoot, the root system is wide spreading. The roots are white to pale cream, smooth and circular in cross-section. The taproot can penetrate down from 60 to 80cm, but the bulk of the root system spreads out and inhabits the topsoil (15 to 30cm, depending on soil depth). In a friable soil one would expect the root spread and mass to at least match those of the top growth, as with most cucurbits

### *Flowers*

Flowers of *L. siceraria* are monoecious in nature, where solitary male and female flowers are found on different plant axis of the same plant, thus cross pollination is highly favourable. Dioecious and andromonoecious sex forms bearing hermaphrodite flowers also exist in wild, non-cultivated types. The large white flowers open at night. Female flowers are short-stalked while male flowers have long stalks (10 cm or longer).



### *Fruits*

There are many forms, shapes, and varieties of gourds each producing a different-shaped and sized fruit, from small and round to large some with an elongated, narrow neck. The fruit is green at first, but becomes pale brown when it ripens and dries out. The dry fruit are popularly known as calabashes. (1 cm) wide. They have six thin petals. A single female flower is found at the base of a male flower stalk. The flowers are mostly unisexual and white or yellow; they occur on the same plant (monoecious) or on separate plants (dioecious). Male flowers are fascicled, very small, and much shorter than the hispid petiole whereas female flowers on longer peduncles.



### Seeds

The seeds of bottle gourd are flat, more or less rectangular to narrow trapezoidal, whitish to dark brown at the distal end. They develop inside the fruit and show great diversity in shape and size



## CLIMATE AND SOIL REQUIREMENTS

### Temperature

Bottle gourd like plenty of sunlight and do not grow well in shady areas. The plant grows well under warm temperatures (25 to 35°C). Under frost-free, low temperature conditions it will also grow well provided the plants have attained sufficient vegetative growth before the onset of cool weather. Optimum germination temperature is between 20 and 25°C. Temperatures below 15°C and above 35°C reduce the germination rate.

### Rainfall

In South Africa, bottle gourd grows well in areas with rainfall of between 400 to 600 mm per annum and that are 245 to 1265 m above sea level; however,

moderate, rather than excessive soil water is desired for good crop growth. Therefore, bottle gourd is intolerant of water logging

## **SOIL REQUIREMENTS**

This cucurbit has been observed to do well in a range of soils, which are fertile and well-aerated. In the wild it grows on a variety of soils, from sand to clay.

## **PART II. CULTIVATION PRACTICES**

### **PROPAGATION**

Depending on weather conditions, seed can be sown directly or it may be raised in the nursery and then transplanted. In the case of transplanting, seeds can be sown in poly pots filled with mixture of soil and compost manure and transplanted at four to five leaf stages. With some variation, seedlings are transplanted with inter-row spacing of 1,5 to 2 m, and intra-row spacing of 1 to 2 m. During the rainy seasons, bottle gourd is usually planted on mounds and during the dry season in depressions. The seed should be soaked in water overnight, so that they absorb water which softens the seed coat.

### **SOIL PREPARATION**

Plough the field to fine tilt and dig pits of the 30 x 30 cm size at 2,5 x 2 m spacing.

### **FIELD LAYOUT AND DESIGN**

Form raised beds of 120 cm width and place laterals in the centre of bed. The recommended spacing for bottle gourd is 2,5 x 2 m.

### **PLANTING**

In the absence of specific information on bottle gourd, information on convention cucurbits that have been well-studied could be used as a starting point. Planting of cucurbits can commence after the danger of frost occurrence because they are highly sensitive to frost. This can be early to late spring. This period coincides with the start of the rain in South Africa which is also crucial for crop growth and development. Sow at the start of the summer rainfall season in September to early December. They germinate quickly, emerging 4 to 5 days after sowing.

## FERTILISATION

All species of Cucurbitaceae family respond well when organic and inorganic fertiliser is applied. The dose of fertiliser depends on soil type, climatic condition and systems of cultivation. Due to these variation and the lack of literature on application rate of fertiliser on different soil types and climatic conditions, it is difficult to give specific recommendations on the amount of fertiliser to apply per hectare in order to obtain maximise yield and reduce cost associated with production of bottle gourd landraces. However, the Institute of Vegetable Research of India Council of Agricultural Research recommended applying fertiliser at a rate of 50-100 kg N, 40-60 kg P<sub>2</sub>O<sub>5</sub>, 30-60 kg K<sub>2</sub>O /ha in cucurbits. However, this can vary from soil to soil and can be affected by climate conditions.

## IRRIGATION

Calabash Gourd requires little attention when growing under normal rainy season conditions. Watering every three to four weeks will be necessary during a dry summer.

## WEED CONTROL

Weeding can be done by hoeing as and when necessary.

## DISEASES CONTROL

In South Africa, powdery mildew can be prevalent under humid conditions during summer and can quickly spread to all seedlings in a nursery net house. Control is achieved by spraying with copper oxychloride

## PEST CONTROL

Gourds protect seeds from most pests. Gourds on the ground should be protected from damp by placing a pad of dry grass underneath. Damp will discolour the gourd with black blotches.

## HARVESTING

### Harvest maturity

The fruits are ready for harvest 60 to 120 days after sowing depending on the variety. Fruits are harvested at tender stage and before 100 % maturity. They

can usually be harvested at the end of the summer growing season when the plant loses most of its leaves during the period from March to May.

## **HARVESTING METHOD**

Leave the gourds attached to the vine until the fruit stem turns brown. Even after most of the leaf has died the fruit may still be maturing if the fruit stalk is green. Cut the fruits from the vines carefully, using pruning shears or a sharp knife leaving 8 to 10 cm of stem attached.

## **PART 3: Post-harvest handling**

After harvest the gourds need to be stored out of the weather for another six months to allow for "curing". The outer green epidermis will decay and the gourd will lose 90 % of its weight as water evaporates from the fruit.

## **SEED HARVESTING**

Only when you hear the seeds rattle when shaken can you cut the end and use a wire loop to remove the seeds and dried tissue from inside the gourd. At this stage the remnants of the epidermis can be washed and brushed from the hard shell. Cleaned seed should be sundried for a short while before storing. Viability is lost if left in the open for longer than a month.

## **GRADING**

No established grades. Quality is determined by the market.

## **STORAGE**

Store seeds in a dated brown paper bags in a cool, dry, insect free area. Otherwise leave the seeds inside the uncut calabash in a cool dry area where they will remain safe from pests until the planting season.

## **MARKETING**

Small holder farmers in Pretoria are reported to supply fresh market retailers such as Fruit Stop with fresh green bottle gourds.

Calabash gourds are grown on a restricted scale for the commercial curio market. The main curio items for which they are used for resonating boxes for hand xylophones (thumb pianos) and bottle and ladle gourds are decorated with beads. Most products are mostly offered for sale at roadside stalls and

are used for ornaments, often in flower arrangements. As an attractive natural container, calabashes are put to many practical or decorative uses in and around the house

## PRODUCTION SCHEDULE

ACTIVITIES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Soil sampling												
Soil preparation												
Planting									X	X	X	X
Fertilizations												
Irrigation												
Pest control												
Disease control												
Weed control												
Pruning												
Leaf sampling												
Harvesting			X	X	X							
Marketing			X	X	X							

## Part 4: Utilisation

The leaves and young growing shoots are harvested and used as vegetables. The green fruit are sliced and fried, steamed or boiled as a vegetable in much the same way as baby marrow is cooked. The leaves can also be dried and stored for later use. The mature fruit can be used as a container to serve and store liquids, and food and to fashion pipes and musical instruments. In Asia, the bottle gourd is used as a rootstock in winter production of water melons and squashes to prevent root-borne pathogens such as *Fusarium oxysporum*. However, the hard dry shell of it is often used in utensil and instrument making. In Southern Africa, the leaves are commonly consumed as a vegetable relish and at times mixed with other vegetable plants. They can also be added fresh to maize porridge. In Botswana, Zimbabwe and South Africa, oil is extracted from the seed and used as an alternative to vegetable oil. In India different plant parts, especially the fruit juice can be used as medicine to cure stomach ailments. The seeds are popular snacks in Africa and are reported to contain high proteins as is the case with the seeds of its closest relative pumpkins.

Bottle gourd is mainly grown as a vegetable for human consumption. However, hard dry shell is often used in utensil and instrument making, hence calabash gourd. Furthermore, in India different plant parts, especially the fruit juice can be used as medicine to cure stomach elements .In many parts of the world the young green fruit is a popular cooked vegetable. The extract from the plant seed was found to contain antibiotic properties and the fruit juice is helpful in constipation, premature greying hair, urinary disorder and insomnia. To date, the crop has been found to contain high levels of choline which is compound reported to heal mental disorder.



## ACKNOWLEDGEMENT

The University of KwaZulu-Natal is acknowledged for providing invaluable information and pictures for the development of the production guideline.

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[www.plantzafrica.com](http://www.plantzafrica.com)

Further information can be obtained from:

Directorate: Plant Production

Private Bag X 250

Pretoria, 0001

Tel.: + 27 12 319 6072

Fax: +27 12 319 6372

E-mail: [Thabo.Ramashala@daff.gov.za](mailto:Thabo.Ramashala@daff.gov.za)

[www.daff.gov.za](http://www.daff.gov.za)





