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GENERAL

Classification

Scientific name: *Cleome gynandra*
Family: Capparaceae
Common name: Cleome, Cat's whiskers, Oorpeultjie, Lude, Rirudzu, African cabbage, Lerotho, Murudi, Amazonde, Spider plant

Origin and distribution

Cleome is reported to have originated in tropical Africa and South East Asia. It is probably a native of Africa and now widely distributed throughout the world in tropical and subtropical regions. Cleome is a common, wide-spread herb occurring in southern Africa from the Limpopo to Namibia. Being semi-cultivated, as for instance in the Kentani District of the Eastern Cape, has probably expanded its distribution area.

Production levels

South Africa

Cleome is not formally cultivated in South Africa, but rather found commonly growing naturally under disturbed soils, especially in the homestead backyard. Women have occasionally raised it as a natural weed population by broadcasting seed or by practising selective weeding. Production levels are not known yet.

Internationally

Other countries that are producing/consuming the crop are Kenya, Uganda, Botswana, Zambia, Zimbabwe, Malawi, Cameroon, Namibia, Swaziland, Tanzania and Ghana. Production figures are not known as the crop is not formally cultivated as a commercial crop yet.

Major production areas

Major production areas in South Africa are the KwaZulu-Natal, Free State, Northern Cape, Limpopo and North West provinces.

Cultivars

No cultivars have been developed in South Africa as yet.

Description

Mature plant

Cleome belongs to the Capparaceae family. This herbaceous, erect, and annual plant that grows to a height of between 0,5 m and 1,5 m, depending on the environment. It is a branched plant, sometimes becoming woody with age.

Roots: It has a long taproot which has few secondary roots with root hairs.

Stem: The stem is glandular and rarely hairless, with longitudinal parallel lines. Pigmentation varies from green to pink or violet to purple.

Leaves: Cleome has compound and lobed leaves with 3 to 5 leaflets.

The leaf stalk is 20 mm to 50 mm long with glandular hairs. The leaves vary from obovate to elliptic in shape and are 2 cm to 10 cm long and 2 to 4 cm wide. They are sparsely hairy and their leaf margins are toothed or round.

Flowers: The flowers are showy, white or purple in a long terminal flower cluster with separated flowers attached by short, equal stalks at equal distances along a central stem, up to 30 cm. The inflorescence is a terminal raceme, many flowered, elongating in fruit; the bract is trifoliate, resembling the leaves but smaller and sessile. The flower stalk is 10 to 20 mm long with glandular hairs. Petals are white, sometimes fading to rose pink, 10 to 20 mm rounded at the apex, abruptly narrowed to a basal claw. The capsule is linear, sub-erect to spreading, 3 cm to 15 cm long and 2.5 to 5 mm wide; the persistent style is 2 mm long and the valve is thin textured, glandular with hairs.

Seeds: The seeds are brown, circular in outline measuring 1.5 mm in diameter, with an obscurely netted surface.

Essential parts

The essential parts are the leaves and the growth tips.

Climatic requirements

Temperature

Cleome is sensitive to cold and does not grow well when temperatures drop below 15 °C. It grows well in summer when the temperature is above 27 °C. Because of its tropical origin, cleome is believed to be day-length-insensitive, but some cleome species are facultative long-day species (not restricted to a particular function). It grows well up to about 1 000 m above

sea level in semiarid, subhumid and humid climates. The plant performs poorly when shaded and is unable to compete with weeds.

Rainfall

Cleome grows best when adequately supplied with water. It does tolerate a degree of water stress, but prolonged water stress hastens flowering and senescence. Therefore, cleome can grow in areas with short periods of useful rainfall. Water stress reduces leaf yield and quality. The plants cannot withstand flooding.

Soil requirements

Cleome prefers well-drained medium-textured soils and does not grow well in poorly drained or heavy clay soils. It also prefers sandy loam soils, rich in organic matter and responds well to well-decomposed manure. Flowering is delayed when adequate manure is available, allowing more, larger leaves to develop. Cleome is adapted to many soil types and a pH range of 5,5 to 7,0. The soil types range from sandy loam to clay loams.

CULTIVATION PRACTICES

Propagation

Cleome types are cultivated from seed.

Soil preparation

Though adapted to many soil types, the soil has to be prepared to a deeper depth and harrowed to a fine tilth and it must be well drained. Level the seedbed before planting.

Field layout and design

Seeds are densely sown directly at 30 cm inter-row spacing and later thinned out to 10 cm to 15 cm between plants.

Planting

Seeds are planted at a shallow depth to ensure emergence and a good field stand. Plant seeds in seedbeds or plant directly in rows in the field. Mix seed 1:10 with sand or dry soil before planting. The desired spacing is 25 to 50 cm between rows and 15 cm between plants.

Fertilisation

When using chemical fertiliser, purchase 3: 2: 3 or 3: 2: 1 NPK mixture. Using a hoe, open up a furrow and apply the fertiliser mixture in the bottom of the furrow at the rate of 40 g/m. A normal-size teacup takes about 200 g chemical fertiliser and would cover 5 m. After spreading the fertiliser evenly in the furrow, use a stick to mix the fertiliser with soil. Water the furrow and then make the holes for the transplants. For really good growth, add limestone ammonium nitrate (LAN) at the rate of 20 g/m when the plants have about 5 to 6 leaves. One teacupful of LAN should be spread along a row of 10 m. When applying LAN to the growing crop, open up a furrow with a hoe about 10 to 15 cm away from the row of plants, mix the fertiliser with the soil using a stick, water the furrow and then close it.

When using poultry or pig manure, use a 10-ℓ bucket in a band of about 20 cm wide over a length of 15 m, work the manure into the topsoil, water the band thoroughly and wait one or two weeks before transplanting. When you use kraal manure, follow the same procedure but use a 10-ℓ bucket over a length of 5 m.

Irrigation

Water requirements vary with the crop's growth stage, soil type and weather condition (hot or cold). Frequent irrigation will be required for sandy soils as these drain quickly. Clay soils, on the other hand, drain quite slowly and hold more water than sandy soils. There are few 'rules of thumb' to use as a starting point for irrigation frequency and volume. First, sandy soil should be irrigated three times a week. Second, sandy loam should be irrigated twice a week. Third, clay, clay loam and loam soils should be irrigated once a week. Cleome favours water throughout its growing period and one can apply 6 ℓ of water a day for a plot size of 1 m x 1 m. Irrigation can be applied, using drip and sprinkler irrigation system. Sprinkler and drip irrigation can be used to irrigate cleome; however, water savings with drip are substantial and roughly half as much water can do the same or better job than a sprinkler system. Excess water application leaches nutrients away from the roots of the plants, therefore careful planning of irrigation volume and frequency is required to prevent crop stress to help produce large, healthy green cleome.

Weed control

Cleome does not have dense foliage and therefore it cannot smother the weeds, which renders it vulnerable to weed competition. The critical stage

for weed control is during the first six weeks of development. Weeds can be hand-picked or shallow cultivation can be done, but care should be taken to avoid root damage.

Pest and disease control

The most important pests are beetles and hurricane bugs (also known as bagrada or painted bugs) (*Bagrada hilaris*). The hurricane bug can render establishment virtually impossible. Other pests are: pentatomids (*Acrosternum gramineum* and *Agonoselis nubilis*) and their parasitoids; locusts (*Schistocera gregaria*); nematodes (*Meloidogyne* spp.); flea beetles (*Phyllotreta mashonana* Jacq.); green vegetable bugs (*Nezara* spp.); cabbage sawfly (*Athalia* spp.); cotton jassids (*Empoasca* spp.) and aphids that cause leaf damage.

Bagrada bugs (*Bagrada hilaris*) damage plants by feeding on young leaves. Both adults and nymphs suck sap from leaves, which may wilt and later dry out. Considerable damage is caused to young plants, which may die off or have the growth points severely damaged. Significant damage may also be caused to older plants. The bugs, especially in the early stages of development, gather in masses and suck the sap from plants. Feeding by the bugs causes small puncture marks visible as white patches starting on the edges of leaves. Eventually the leaves wilt and become dry. Heavily attacked plants may have a scorched appearance. Cleome is host to the mildew fungus (powdery mildews *Sphaerotheca fuliginea*, *Oidiopsis taurica* and *Cercospora uramensis*).

Control pests and diseases by regular monitoring of the crop. It is important to detect bagrada bugs before they cause damage to the crop. Crop hygiene is vital, in particular removal of old crops and destruction of weeds. Handpicking and destruction of the bugs help to reduce damage. This is particularly important in the early stages of the crop. Growing strong smelling plants such as garlic, onion or parsley near the crops is reported to reduce infestations. Encourage natural enemies: Eggs of bagrada bugs are parasitised by tiny wasps.

A mixture of chilli, soap, garlic and paraffin has been shown to be an effective control method in trials in Namibia or spraying plants with a soapy solution (bar soap) has been found effective against Bagrada bugs. It helps to wash off young bugs.

Other cultivation practices

Deflowering is reported to decrease plant height significantly and increase the number of branches per plant and leaf yield. Deflowering also significantly increases leaf ascorbic acid content, but has virtually no effect on leaf beta-carotene and total phenolic content.

Harvesting

Harvest maturity

Leaves: Cleome is harvested in summer during the first rains and can be harvested until autumn. Leaf harvesting starts four to six weeks after seedling emergence and it may last four to five weeks. Leaves can also be picked when the plants have reached a height of about 15 cm.

Seeds: Seeds can be harvested when pods are fully ripe and yellow but before they open naturally to prevent shattering.

Harvesting methods

Leaves: Individual leaves and growth tips can be harvested or the entire plant can be cut back. Cut back the shoots 10 to 40 cm from the ground to form new side shoots. The harvest can be repeated 2 to 4 times and even more, depending on the soil fertility and moisture conditions. The harvested shoots should be kept in a bag without water during the night. Dip the shoots in water for about 30 minutes the next morning.

Seeds: Seeds are threshed by hand and cleaned by winnowing.

POST-HARVEST HANDLING

Preparation methods

Leaves are boiled with a little water for an hour to an hour and a half. Food items added during preparation are mostly tomatoes and salt and sometimes onions, oil and minestrone soup. The leaves are eaten with maize meal or sorghum porridge or peanut butter.

The leaves and flower buds are washed, boiled in water with a little salt and cooked well to remove the bitter flavour. Because the leaves are bitter, they can be cooked with other leafy vegetables such as cowpea, amaranth and black nightshade. In some instances, milk is added to the boiled leaves and the mixture is left overnight to reduce bitterness. Sometimes the leaves are boiled briefly, the water is discarded and the leaves are then

combined with other ingredients in a stew. It is believed in some areas that when this plant is eaten for the first time, charcoal must be eaten first to prevent constipation or stomach upsets.

Preservation

The fresh leaves may be dried in the sun after they have been washed or sun-dried after cooking for consumption in winter. New preservation technology, including the blanching and freezing of leaves, has been introduced.

The harvested seeds are placed on a clean tarpaulin or plastic sheet and allowed to dry in the shade.

Packing and storage

Sun-dried leaves can be packed in fibre bags or pricked plastic bags and stored in a well-ventilated place.

Transport

No specialised transport is required.

Marketing

Cleome is currently sold in the local markets and at taxi terminuses.

PRODUCTION SCHEDULES

Activities	January	February	March	April	May	June	July	August	September	October	November	December
Planting								X	X	X		
Harvesting	X	X	X								X	X

UTILISATION

Cleome is predominantly used as a leafy vegetable. Throughout Africa, the tender leaves or young shoots, and often the flowers as well, are boiled as a pot herb, tasty relish, stew or side dish. In India, it is eaten as a pot herb and used as a flavourant in sauces, and in Thailand it is consumed fermented in a product called “pak-sian-dong”.

Recommended as vitamin and mineral supplement

The vegetable is a rich source of nutrients, especially vitamins (A and C) and minerals (calcium and iron). It also contains some protein, and apart from the normal recommended adult daily allowance of vitamins A, C, the leaves also contain minerals (calcium and iron). They are rich in magnesium, iron and nicotine acid.

Medicinal purposes

In many cultures the boiled leaves of cleome are also regarded as a medicinal meal. Also, sap from the leaves is used as an analgesic, particularly for headaches and earaches, and the leaves also have anti-inflammatory properties. A decoction or infusion of boiled leaves and/or roots is administered to facilitate childbirth and treat stomach-ache, constipation and conjunctivitis or thread-worm infestation. The seeds and roots also have these anthelmintic properties.

Insecticidal characteristics

Cleome has insecticidal, antifeedant and repellent characteristics. The plant has an antifeedant action against the tobacco caterpillar and the extract from the mature seeds is toxic to brinjal aphid and *Heliothis larvae* (*Heliothis armigera*).

The leaves have anti-tick properties, an ethanol extract is toxic to insect pests of cruciferous vegetables and the volatile oils repel diamond-back moth larvae from cabbage leaves.

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REFERENCES

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