AGRICULTURE AND FOOD AUTHORITY

HORTICULTURAL CROPS DIRECTORATE

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SPIDER PLANT *(Cleome gynandra)* GROWERS MANUAL

PREFACE

Kenya has been endowed with an enabling environment for production of horticultural crops that attracts high demand both in the domestic and international markets. Production is mainly by smallholder farmers, many of whom require skills and knowledge on good agricultural practices (GAP) to produce and handle the fresh produce. According to the Economic Survey 2022 published by the Kenya National Bureau of Statistics (KNBS), horticulture is among the leading sub sectors in agriculture. Therefore, enhancing the capacity of these producers could be of immense beneficial to the Kenyan economy.

Agriculture and Food Authority – Horticulture Crops Directorate (HCD) is a government agency mandated to Regulate, Promote and Develop the horticulture industry in Kenya. In carrying out its mandate, the Directorate through the Technical and Advisory Services department (TAS) has developed this grower's manual for its stakeholders. The manual has been designed with a simple language and where necessary photos have been used to highlights all processes from plough to plate. HCD envisages that by using this grower's manual, its stakeholders especially the smallholder farmers, extension staff and trainers would upgrade their knowledge and skills to enable them increase production of the crops thereby improving on food security, household health, as well as create employment and generate income.

The content has largely been developed from the TAS field staff experiences in the 26 stations spread across the country (*Collins & Dinah – Nairobi [NHC], Antonina – Nakuru, Miriam - Nandi, Grace – Homabay, Barnabas- Eldoret & Iten, Carol - Bungoma, Peter- Busia, Charles -Kisumu, Irene - Narok, Lal – Kisii, Victor – Mombasa, Crispin – Kibwezi, Esther Ngutho– Kitui, Esther Kabatha – Nyandarua, Susan – Taveta, Syphrosa – Machakos, Catherine – Yatta, James – Kitale, Julius – Kajiado, Amedeo & Brenda – Meru, Mary – Kericho, David & Delphina – Mwea, Fridah – Nyeri, Emma – Sagana, Sarah – Limuru*), some content were reviewed from literature and images used properly acknowledged. Technical editing and reviewing of the manuals were done by Mary Chacha, Syphrosa Wanyama, Barnabas Kiptum, Antonina Lutta, Carol Soita, Amedeo Muriungi, Peter Mwanja, Victor Omari, Emma Ndirangu, Esther Kabatha, David Makori, Dinah Karimi, Collins Otieno, Dr Jacqueline Oseko the acting Deputy Director, Technical and Advisory Services department and Director Benjamin Tito all of Horticulture Crops Directorate.

SPIDER PLANT *(Cleome gynandra)* GROWERS MANUAL

Common name: Mwangani (Swahili), Sagaa (Kenya)

Introduction

Spider plant belongs to the Capparaceae family, and is used as an indigenous leafy vegetable in Kenya. The vegetable is highly nutritious with high levels of beta-carotene, Vitamin C, Vitamin A and moderate levels of calcium, magnesium and iron, crude protein, lipids and phenolic compounds. It is also used as herbal remedy for various ailments. The fresh leaves and shoots are harvested and cooked either alone or mixed with other vegetables.

In Kenya, Spider plant can be grown anywhere, although it is more common in Kisii, Nyamira, Narok, Bungoma, Kakamega, Busia, Siaya, Kisumu, Homabay, Migori, Vihiga, Uasin gishu, Bomet, Kericho, Trans Nzoia, and West Pokot counties.

Varieties –Only four of the 50 African species of spider plant are edible, and there are many local mixed selections. Improved varieties produced by World Vegetable Center (World Veg- former AVRDC) yield more leaves for a longer harvesting period than the traditional varieties. Based on World-Veg, there are four main landraces of spider plants which can be identified with their unique pigmentation traits: (1) purple stem and purple leaf petiole, (2) green stem and green leaf petiole (3) purple stem and green leaf petiole, and (4) green stem and purple leaf petiole, of which the purple stem and green leaf petiole is more common (Figure 1).

Figure 1: Gynandra stem and petiole colour variation; A–purple stem and petiole, B– green stem and petiole, C–purple stem and green petiole, D– green stem and purple petiole. Source: Shilla O., WorldVeg-ESA.

Ecological requirements

1. Temperature range – 18° C to 25° C
2. Rainfall - Annual 1500mm
3. Soils – Well drained fertile sandy loams at optimal pH (5.0-7.0)
4. Altitude- 0-2400m above sea level
5. Sunlight- It cannot grow in the shade.

Good agricultural practices (gap)

Horticulture industry in Kenya is guided by a code of practice (KS1758-2016 part II) which is a food standard for vegetable, fruits, herbs and spices for both local and export market. The standard aims at ensuring food safety, environmental sustainability and social accountability by following good agricultural practices from production,

processing, transportation and marketing of fresh produce. In addition, ensure documentation and record keeping of all farm operations for traceability purposes.

Propagation materials

Certified Spider plant seeds can be acquired from seed companies such as Kenya Seed Company, research institutions such as KALRO, Universities, rural outreach program in Butere, various farmers' seed banks, and World Vegetable Centers.

Land preparation

First and second ploughing is done, and thereafter, harrowing to fine tilth.

Planting

Organic manure (10 tons per acre) is applied and worked into the soil one to two weeks before planting. During planting, apply 35kgs of DAP into the rows and incorporate into the soil. Seeds are mixed with sand at a ratio of 1:10 or 1:15 and sowing is then done by drilling in rows 30 cm apart. Cover with a thin layer of soil about 1 cm deep and water immediately.

Thinning

Thinning should be done when the plants have four to five leaves or a month after sowing. Allow 10-20 cm between plants within the rows. During thinning, the diseased, off type and less vigorous plants are removed. Thinned plants can be consumed or sold.

Pinching

Pinching can be done shortly after thinning to encourage lateral growth and increase yields.

Deflowering

Deflowering should be done continuously throughout the growing season to encourage vegetative growth, especially if not targeting seed production.

Weeding

Timely weeding at an early stage should be done to minimize competition for food and light and also reduce pest and disease infestation. The field should be kept weed free all the time.

Soil testing

Soil testing is recommended before planting to guide on fertilizer and manure application.

Fertilizer and manure application

Spider plant grows vigorously, resist pests and diseases and yield better, with organic manure than with artificial fertilizers. Flowering is delayed when adequate manure is available in the soil. Manure application is recommended at the rate of 10 tons per acre. However, after thinning at 3–4 weeks, a top dressing of up to 40kg/acre (100 kg/ha) of calcium ammonium nitrate (CAN) is recommended. Nitrogen applications delays the onset of flowering and will thus ensure a longer harvesting period.

Irrigation

Good moisture is important during the whole growing season and it is advisable to water at least twice a week during the dry season. Water stress reduces the yield, quality and enhances senescence. Flooding is not tolerated.

Pest management

Integrated crop management (ICM) is the best option for food safety. These methods include scouting for pests, field hygiene, proper spacing, and physical methods like use of traps, pheromones, biological methods and others that will only give use of pesticides as a last option.

Major pests of spiderplant		
Pests (Insects)	**Symptoms**	**Control**
1.Aphids (*Myzus persicae*)  source : world vegetable center	-Aphids feed by sucking plant sap resulting to leaf curls. -Heavily infested plants usually have wrinkled leaves, stunted growth and deformed pods.	-Use of predators, e.g. ladybird beetles, lacewings, parasitic wasps, etc. -use insecticidal soap, horticultural oil, or neem oil, pyrethrins -intercrop with garlic and chives repels aphids -Crop rotation with non-host plants -Proper weed control -Use of plant protection products selectively-the synthetic pesticides as the last option.
2.Flea beetles *(Phyllotreta mashonana)*	-The larvae generally feed on the plant roots, but usually do not cause economic damage.	-Weeding in and around fields may help to eliminate flea beetle shelters and breeding sites,

 *world vegetable center*	-The characteristic symptom of an adult flea beetle attack is the presence of small, round holes all over the leaf surface. -Damage may be of importance when flea beetles are present in large numbers, especially during the seedling stage.	reducing crop damage. -Covering the seedbed with a fine-mesh material is useful to protect seedlings. - Use recommended insecticides e.g. Deltamethrin
3. Root-knot Nematodes (*Meloidogyne* spp.)  https://commons.wikimedia.	**-**Swellings of the roots which are commonly referred to as galls -This deformation of the root system inhibits the translocation of water and mineral salts thus resulting in stunted plant growth	**-**Crop rotation -Keep weed free land fallow for one or two seasons -Intensive use of manure -Soil Solarization (48-60^{0}C)
Major diseases of spider plants		
1.**Powdery mildew** (*Sphaerotheca fuliginea* and *Oidiopsis taurica*)	Infected plant show patches of white powdery fungal growth on leaves, flowers and pods.	-use of certified seeds and good crop hygiene, -Thinning and weeding to open and create well-aerated fields, reduces powdery mildew incidence. -Regular watering
2. Leaf spots (*Cercospora uramensis*)  https://ag.umass.edu/greenhousefloriculture/photos/cleome-alternaria-leaf-spot	-Brown spots on leaves -stunted growth	-Cultural control measures (crop rotation, weed control removal of crop debris, irrigation) -Treat with protective fungicides at regular intervals as the last option.

Harvesting

- Harvesting begins 25 days after direct seed sowing in the field
- Actual harvesting starts when plant is 15 cm corresponding to about 4 – 5 weeks after seedling emergence and lasts about 4 – 5 weeks
- Harvesting operation involves uprooting entire plant, topping, cutting back to ground level or picking individual leaves or leafy branches at frequent intervals
- Frequent picking and deflowering encourages lateral growth therefore extending the harvesting period
- Weekly removal of tender leaves results into regeneration of branches

Postharvest activities

Packaging of harvested fruits should be done to maintain quality, preferably in crates and transported in closed trucks as per the crops (Horticultural crops) Regulation 2020.

Sorting: Avoid insect damaged and diseased leaves, the shoots or leaves are bagged after harvesting in the evenings.

Grading: Grade the leaves by size, bunching those of the same size and tying in small bundles before packing in well ventilated container for transportation to markets

Drying: Value addition involves blanching and solar drying for supermarkets and export markets. Dried leaves can be vacuum packed and stored for up to six months. The leaves can also be precooked and frozen for supermarkets.

Expected yields

Spider plant vegetables can yield 4 to 6 tons of leaves per acre. Weekly leaf yields increase until about the 7th week of growth and then start to decline. The leaf bitterness increases with age as well.

Gross margin analysis per acre (2023)

ITEM	UNIT	QUANTITY	COST PER UNIT	TOTAL COST
Yield in kilograms	kg	5000	60	**300,000**
Land preparation				
Ploughing	acre	1	3,500	3,500
2nd ploughing/harrowing	acre	1	3,000	3,000
Inputs				
Seeds	kg	1	3000	3000

Fertilizers				
-Organic manure	tons	10	2000	20000
-DAP/NPK	Kgs	35	120	4200
-CAN	Kgs	100	80	8000
Insecticides	Lts	1	2,000	2000
Fungicides	Kgs	1	1500	1500
Labour Requirements				
Planting	Man days	6	500	3,000
Weeding	Man days	6	500	3,000
Spraying	Man days	4	500	2,000
Harvesting	Man days	6	500	3,000
Total Variable Costs				**56,200**
Gross margin/Profits				**300000-56,200=243,800**

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