

# COWPEA PRODUCTION IN GUYANA

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## INTRODUCTION

### ORIGIN

The cowpea *Vigna unguiculata* L. Walp is an ancient food crop, whose centre of origin has been reported being in Asia, Africa and even South America. It is now widely distributed throughout the tropics and subtropics.

Because of its high easily digestible protein content, it is regarded as an important food worldwide. It forms the main source of food for vegetarians -and is recommended for babies, the sick and the convalescing.

Agriculturally, it is also of significance due to its ability to fix atmospheric nitrogen. This feature either eliminates or reduces the amount of added nitrogen required in crop cultivation and for this reason it has been recommended as a valuable crop in rotation systems. In addition, cowpea is cultivated as a green manure crop.

### CULTIVARS

There is a wide variation in the characteristics of cowpea cultivars. Most recently classified types are the Blackeye (California No.5) the Crowder and the Cream types.

The Blackeye (California No.5) is the most popular cultivar. It has large white seeds with a black pattern around the hilum.

The Crowder is a type that produces seeds closely crowded together. This group has the largest seeds with a wide variation in shape and colour. The shape is often irregular, distorted or globular while the colour varies from black, speckled, brown to brownish.

The brown seeded crowder is the most popular.

The Cream or White Seeded type has seeds with very tiny or no eyes. It possesses a much milder flavour, more succulent and has a better appearance than the Blackeye or Crowder types.

Cultivars which have been recently introduced to Guyana are:-

#### Minica I

The plant is determinate in growth. The leaves are pinnately trifoliate, dark green in colour and have a characteristic upwardly cupped display.

The pods which are green when immature are straw coloured when dried. They are usually 15 to 16 seeds per pod which matures in 64 to 75 days. The seeds have a creamish white testa with a speckled hilum. They are oval in shape and about half the size of California No. 5.

The average yield is 1400 kg/ha ranging from 800 to 2000 kg/ha.

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#### Minica 2

The plant is indeterminate. The leaves are pinnately trifoliate and dull green in colour.

The pods which are green when immature turn brown when dry. There are usually 12 to 16 seeds per pod which matures in 70 to 80 days. The seeds are tan coloured, rhomboid in shape and about half the size of California No.5.

The average yield is 1500 kg/ha ranging from 800-2500 kg/ha.

#### Minica 3

The plant is indeterminate. The leaves are pinnately trifoliate and dull green in colour. The pods which are light brown in colour are ovoid in shape and a little more than half the size of California No. 5. There are usually 12 to 16 seeds per pod.

The average yield is 1600 kg/ha ranging from 950-2500 kg/ha.

#### Minica 4 (Vita 3)

The plant is indeterminate. The leaves are pinnately trifoliate and dull green in colour. The pods which are green when immature are brown when dry and contain 14 to 16 seeds each.

The seeds are kidney-shaped, dusty red in colour and about the same size as California No.5.

The average yield is 1600 kg/ha ranging from 900-2000 kg/ha.

### **ENVIRONMENTAL REQUIREMENTS**

The cowpea is predominantly a hot weather crop preferring temperatures between 20°- 30°c and rainfall ranging from 600 to 1500 mm per annum. Although generally regarded as being a drought resistant crop, moisture stress after shoot emergence up to flowering can adversely affect production, but low moisture does not have a significant effect on determinate types.

It can be grown on a wide range of soils provided they are well drained. It can be grown on poor soils as it tends also to improve the general status of the soil. For optimum yield, loams are preferred. The cowpea plant cannot tolerate salinity and although reasonably tolerant to acidity, a pH of 5.5 to 6.5 is ideal.

### **CULTIVATION**

#### **LAND PREPARATION**

On clay soils plough twice, harrow and prepare ridges 60 cm apart; on sandy soils, after the removal and destruction of vegetation, rake the soil and prepare furrows 60 cm apart.

## PLANTING

### Inoculation

Before sowing apply Rhizobium inoculant to cowpea seeds particularly if the soil is being used for the first time. Inoculation with Rhizobium bacteria stimulates nodulation on the roots thus causing the plant to provide its own nitrogen and consequently reducing the need for the application of large quantities of nitrogenous fertilizers.

To inoculate seeds first damp them with water and mix thoroughly with the recommended inoculant using 14 g of inoculant to 1 kg of seed. Inoculant can be obtained from the National Agricultural Research Institute at Mon Repos. Contact your Extension Officer for further information.

### Sowing

Sow 2-3 seeds, 2-5 cm deep and 15 cm apart.

Seeds are usually sown at the rate of 10-15 kg/ha (20-30 lb/ac).

## WEED CONTROL

Cowpea is susceptible to weed competition particularly during the first 3-4 wks. Weed control during this period is crucial, hence manual weeding or chemical treatment should be carried out.

If the latter is preferred, then before planting, apply Dual 960 EC or Lasso at the rate of 1.5 litres/ha on sandy soils or 2 litres/ha on clay soils.

## FERTILIZER APPLICATION

It is always advisable to have the soil analysed before applying fertilizers. If this is not done then apply as indicated below:

### Clay Soils:

#### At planting:

**Urea** 2 - 2.5 kg/ha using inoculated seed or 15 kg/ha using uninoculated seed.

**TSP** 100 kg/ha

**Muriate of Potash** 100 kg/ha

### At Flowering

4-5 wks after planting

**Urea** 2 - 2.5 kg/ha using inoculated seed or 15 kg/ha using uninoculated seed.

**Sandy Soils:****At Planting:**

<b>Urea</b>	2 - 2.5 kg/ha using inoculated seed or 15 kg/ha using uninoculated seed.
<b>TSP</b>	130 kg/ha
<b>Muriate of Potash</b>	110kg/ha

**At Flowering**

<b>Urea</b>	2 - 2.5 kg/ha using inoculated seed or 15 kg/ha using uninoculated seed.
<b>Muriate of Potash</b>	110 kg/ha

Fertilizers should be placed in a band 15 cm away from the stem of the plant.

**INSECTS PESTS AND CONTROL**

**The main insects which attack cowpea in Guyana and the method of control are outlined below:**

**Crickets:** *Gryllotalpa spp.* (Orthoptera: Gryllotalpidae)

*Acheta spp.* (Orthoptera: Gryllidae) and

**Cutworms:** *Agrotis spp.* (Lepidoptera: Noctuidae)

Crickets (Figure 1) usually cut the primary leaves or growing points of the plant while the larvae of the **cutworm** (Figure 2), which can be found at the base of the plant and a few meters deep in the soil, cut young seedlings at ground level.



**Fig 1. Adult cricket**



**Fig 2. Larva and adult of the cutworm**

**Control****Cultural Control**

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.
- The areas where vegetables are grown should receive full sunlight; kept clean of weeds and all crop residues should be removed and burnt.
- Proper land preparation serves to control weeds, diseases, and soil insects, and also helps in the destruction of large soil clods, which act as hiding places for cricket.
- Integrated Pest Management

**Chemical Control**

Mix Basudin 60% EC at the rate of 7.5 ml in 4.5 litres water (2 teaspoon/ gal water) and drench soil.

**2. Aphids:** *Aphis craccivora* (*Homoptera: Aphididae*)

These are yellow, green or black pin-head sized non-flying insects (Figure 3) which suck sap from the underside of young leaves or from the tender growing point of the plant.

They cause the leaves to curl and turn downwards. Growth of the plant is seriously affected as a result.



**Fig 3. Aphids**

**Control****Cultural Control**

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.
- Integrated Pest Management

**Biological Control**

- The natural predator the lady bird beetles frequently feeds on aphid. When aphid population is low and lady bird beetles are present, there is no need for chemical control.

**Chemical Control**

Apply Decis - 6 ml 4.5 litre water (2 teaspoon/gal water), or Sevin 85% WP (6 g/litre water).

- Direct spray to the underside of the leaves.

**N.B.** Sprays should be directed to underside/surfaces of leaves. When Sevin or Malathion are used crops should not be harvested until 7 -10 days after application of chemicals. In the case of Fastac, Decis or Karate, crops can be harvested within 3-5 days after chemical application.

**3. Mites:** *Tetranychus spp.* (*Acarina: Tetranychidae*)

These can cause serious damage in the dry season.

The red spider mite is found on the lower leaf surface and is identified by small red or brown spots on its abdomen (Figure 3).

Feeding damage may be observed as a cluster of pin-point sized white dots on the upper leaf surface.

Continuous feeding causes the leaves to turn rust-brown in colour and later they become covered by webbing.



**Fig 3. Mite**

**Control****Cultural Control**

- Good field sanitation- rid the field of weeds and plant residues from previous crops.
- Integrated Pest Management

**Chemical Control**

- Apply Fenitrothion, 5 ml/4.5 litre water (2 teaspoon/gal water), or Malathion 9 ml/4.5 litre water- (3 teaspoon/gal water). Direct spray to the underside of leaves.

**4. Bean Beetle:** *Cerotoma arcuata Diabrotica sp.*  
(Coleoptera: Chrysomelidae)

This is a black insect, about 6 mm in length (Figure 4) which causes “shot holes” on leaves.

Sometimes, it damages flowers and pods, while serious damage can be caused on young plants. It is also a vector for the mosaic viruses.



**Fig 4. Bean Beetle**

**Control**

**Cultural Control**

- Field sanitation is an important tool in the management of this pest. The removal and destruction of residues from previous crops will greatly reduce adult populations thus lowering the potential infestation of the next crop.
- The removal of alternate hosts through weed management also helps in lowering adult population.
- Integrated Pest Management.

**Chemical Control**

Apply Sevin 85% WP at the rate of 6 g/4.5 litre (2 teaspoons/gal water).

**5. Leaf Miner:** *Liriomyza trifolii* (Diptera: Agromyzidae)

These are very tiny maggots which tunnel between the inner and outer surfaces of the leaves. Damage is done by their feeding habits which leave irregular trails on the leaves (Figure 5).



**Fig 5. Damage due to leaf miner**

**Control**

**Cultural Control**

- Field sanitation is an important tool in the management of this pest. The removal and destruction of residue from previous crops will greatly reduce adult populations, thus lowering the potential infestation of the next crop.
- The removal of alternate hosts through weed management also helps in lowering adult population.
- Integrated Pest Management

**Chemical Control**

Apply Triazophos 40% EC 10 at the rate of ml/4.5 litre water or Fenithrothion (5 ml/4.5l water).

**6. Leaf Eating Caterpillars:** *Spodoptera frugiperda*  
(Lepidoptera: Noctuidae)

Several species of caterpillars (Figure 6) feed on leaves of the cowpea plant. Yields can be seriously reduced if there is severe defoliation.



**Fig 6. Larva and adult of leaf eating caterpillars**

**Chemical Control**

Apply any of the following insecticides may be used:

- Decis, 6 ml/4.5 litre water (2 teaspoons/gal water)
- Ambush, 3 ml/4.5 litre water (1 teaspoon/gal water).
- Karate, 6 ml/4.5 litre water (2 teaspoons/gal water).

**7. Pod Borer:**

*Maruca testulalis* (Lepidoptera :Pyralidae)

The eggs are laid individually or in small batches on flowers or flower buds, sometimes partly covered with scales, and also on terminal shoots of young plants. The egg period lasts an average of 3 days. Several first-instar larvae (Figure 7) may be found together among flowers, thereafter they disperse singly, moving from one flower to another so that each larva damages 4-6 flowers. Young larvae may feed on any part of the flower or foliage, but later-instar larvae are more common in the pods. The pupal stage lasts an average of 6-7 days. **Adults** are inactive during the day and can be found at rest with outspread wings under the lower leaves of the host plant. They live for an average of 6-10 days (Figure 7).



**Fig 7 Larva and adult pod borer**

**Control****Cultural Control**

- Intercropping;
- The use of resistant and tolerant cultivars;
- Host-Plant Resistance;
- Integrated Pest Management.

**Chemical Control**

- For effective level of control of pod borers and a higher yield, Decis, Fastac Karate, Ambush, Pestac, Abamectin, Newmectin, and Vertimec are recommended.



## 8. Pod sucking bugs

*Nezara viridula* (Hemiptera: Pentatomidae) *Phthia picta*

(Hemiptera: Coreidae) are species of plants bugs; they actually do the same type of damage, by puncturing and sucking the sap from leaves, flowers and fruits. Affected fruits become discoloured, hardened and deformed.

*Nezara* commonly known as “**stink bugs**” are green in colour and about 1.5 – 2 cm and are recognized by their shield shape body (Figure 8), and awful protective odours emitted when molested. The *Phthia* are brownish – black bugs with a red band across the back of the thorax and are about 2-2.5 cm in length. Both the adult and nymphs of this pest do incur economic losses. The life cycle ranges from 35-70 days.

### Control

#### Cultural Control

- **Good field sanitation-** rid the field of weeds and plant residues from previous crops.

#### Chemical Control

- Among the insecticides which may be used are Fastac, Decis, Karate and Ambush at 6 mls to 4500 mls water, and Sevin at 10 gms to 4500 mls water.
- Integrated Pest Management.

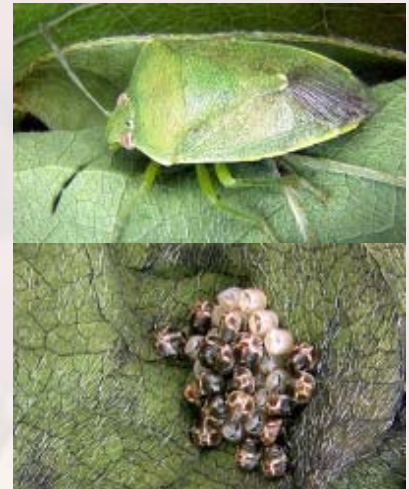
## 9. Thrips:

*Frankiniella* sp. (Thysanoptera: Thripidae)



**Fig 9. Adult thrips and damage caused.**

Thrips are yellow, tiny, elongated insects about 1mm in length and can be found on the upper and lower surfaces of leaves (Figure 9). Infestations are more severe in the dry season. Both young and adult suck the sap from leaves and cause them to lose their colour (Figure 9). If attack occurs early the young leaves become distorted. Older tissues become blotched and appear silvery or leathery in affected areas, thus hindering photosynthesis. Flowers and fruits are also affected, thus yields are reduced. Infected fruits are discoloured, distorted and hardened. Thrips are also vectors or major viral diseases. The lifecycle may be completed in about 14-21 days.



**Fig 8. Nymphs and adult stink bug**

## Control

### Cultural Control

- **Good field sanitation-** rid the field of weeds and residue of all previous crops;
- Crop rotation;
- Overhead irrigation will help in reducing population of infestation during the dry season;
- An Integrated Pest Management approach is recommended for the management of thrips.

### Chemical Control

- Among the insecticides which may be used are Regent (Fipronil), Admire, Abamectin and Vydate L at 5 mls to 4500 mls water, to both surfaces of leaves for effective control.

**N.B.** Spray should be directed to both surfaces of leaves for effective control.

## DISEASE MANAGEMENT

### 1. Damping-Off: (*Pythium sp.*)

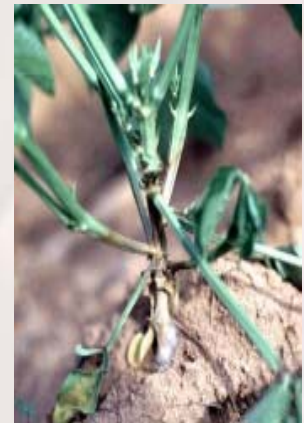
Grain legumes are very susceptible to this disease particularly on wet clays.

#### Symptoms

In seedlings, reddish brown lesions occur on the hypocotyl just above the soil line. Seedlings topple at the point of infection and die consequently. In some cases the hypocotyl appears greengrey and water-soaked (Figure 10).

#### Chemical Control

- Treat seeds with Thiram or Captan at 2-3 g/kg seeds.
  - Land preparation should ensure that effective drainage is provided, thereby preventing water-logging.
- Sterilize soil every 2-3 years with a soil disinfectant.



**Fig 10. Symptoms of damping-off disease**

### 2. Powdery Mildew: (*Erysiphe polygoni*)

This is one of the most common diseases of cowpea in the humid tropics. This disease can be serious depending on the age of the plant.



**Fig 11. Symptoms of powdery mildew**

#### Symptoms

Creamy to white coloured superficial fungus can be seen during the leafy stage of the plant (Figure 11). Fungal growth can be seen on the underside of the leaves which eventually dry up and fall off.

### Chemical Control

Apply

- Dinocap at 0.5 g/litre of water, or
- Benlate 1 g/litre of water, or
- Bavistan 1 g/litre of water.

Apply these chemicals when the disease is present in more than 10% of the field.

### 3. Pod Rot: (*Choanephora cucurbitarum*)

This disease occurs during the pre-harvest period around 2-4 weeks before harvesting. The damage caused by pod rot during this period is probably the major constraint to cowpea production in Guyana.

### Symptoms

Water soaked appearance of infected pods with whitish-greyish mycelia.

### Chemical Control

Apply same treatment as for Powdery Mildew.

### 4. Ashy Stem Blight (Wilting Disease): (*Macrophomina phaseolina*)

This disease causes wilting symptoms even though the plant may not die. Some cankers (decayed spots) may be found at the collar region. Root rotting may occur or graying lesions from the root level. These lesions move upwards and display small dot-like black bodies (Figure 12).



Control

Fig 12. Symptoms of ashy stem blight.

### Cultural Control

- Provide adequate drainage since poor drainage encourages the development of disease.

### Chemical Control

- Prior to sowing, treat seeds with Thiram, Captan or Carbendazim (Bavistin, 50 wp) at 3-4 g/kg seed (3-4 oz/100 lb seed).
- When the disease is observed in the field, spray Carbendazin 50 WP @ 0.1% (9 g/gal water) by directing spray at the root level of the plant. Repeat treatment after 2-3 weeks if the symptoms still persist.

### 5. Cercospora Leaf Spot: (*Cercospora* spp.)

#### Symptoms

Lower foliage becomes marked by irregular tan spots (Figure 13). Severe infection causes defoliation and plant stunting. Infection is most severe during periods of extended rainfall and high humidity.

#### **Control**

##### **Cultural Control**

- Use an integrated crop management approach.
- No resistance exists among varieties.

##### **Chemical Control**

Fungicide sprays should begin at first sign of disease.



**Fig 13 Cercospora leaf spot symptoms**

### 6. Root Rot: (*Rhizoctonia solani*)

Cowpea seed may rot in soil or the young seedling may become stunted due to poor root development (Figure 14). A reddish-brown canker is formed on the stem. Cankers may completely girdle the stem or may only partially girdle it, causing severe stunting.

#### **Control**

##### **Cultural Control**

- Field sanitation;
- Cowpea should be planted in the dry season;
- Crop rotation cowpea should follow forage crop;
- Use an integrated crop management approach.

##### **Chemical Control**

- Banrot, Manzeb and Dithane M 45 are recommended for the chemical control.

### 7. Pod Blight: (*Diaporthe phaseolorum*)

Symptoms Pod blight of cowpea is first observed as brown pustules of irregular shape on the leaves. Lesions grow to one-fourth to three-fourths of an inch in diameter. During the latter part of the growing season, the fungus spreads to nearby pods, where it causes a pale watery spot. The spot enlarges and becomes darker with age. On pods the spot is marked by dark brown to black pustules on the surface arranged in a ring (Figure 15).



**Fig 15. Symptoms of pod blight**



**Fig 14. Symptoms of root rot**

**Control****Cultural Control**

- Crop rotation;
- Use disease resistant seeds;
- Use an integrated crop management approach.

**Chemical Control**

- Follow a fungicide (Kocide, Mankocide) programme to control the disease when it occurs consistently.

**8. Rust: (*Uromyces phaseoli*)****Symptoms**

Small reddish-brown pustules form on the lower side of leaves (Figure 16). The fungus lives in crop residue.



**Fig 16. Symptoms of rust**

**Cultural Control**

- If rust has been severe, crop rotation should be practiced.
- Disease resistant seeds should be used when past experience indicates rust to be a problem.
- Use an integrated crop management approach

**Chemical Control**

- Apply approved fungicides (Kocide, Mankocide) at first sign of infection.

**9. Root Knot Disease: (*Meloidogyne javanica*)****Symptoms**

The nematodes stimulate the formation of root galls (Figure 17), which interfere with the plant's water supply, resulting in stunted and chlorotic growth, poor fruit setting and yellowing. The females lay several hundred eggs which are released into the soil. They enter the plant tissues, such as the root tips and stimulate the formation of galls.



**Fig 17. Symptoms of root knot**

**Control****Cultural Control**

- Use an integrated crop management approach;
- Resistant cultivars can limit the spread of the infection;
- Crop rotation is sometimes successful;
- Insects can be treated with hot water to kill larvae;
- Bury the residues of infected plants, to reduce the level of infection.

**Chemical Control**

Spray with approved nematicide-Nemacur.

**10. Fusarium Wilt:** (*Fusarium oxysporium*)**Symptoms**

This pathogen infects many crops. Acid soils and high temperatures encourage this disease to spread. This is a soil-borne disease, often invading plants through roots or wound.

The vascular system is infected, toxins are produced and the xylem turns brown (Figure 18). Seedlings may rot, leaves turn yellow and wilt. Plants may eventually die.



**Fig 18. Symptoms fusarium wilt**

**Control****Cultural Control**

- Use an integrated crop management approach;
- Rotate crops, plant in disease free soil and use clean planting material;
- Burning of crop debris and the planting of resistant cultivars is recommended.

**Chemical Control**

- Spray with approved fungicides –Cuprasan and Kocide.

**11. Anthracnose:** (*Colletotrichum lindemuthianum*)**Symptoms**

This is a seed-borne fungus which attacks all above ground portions of the plant. Infected seed are marked by dark, sunken lesions that extend through the seed coat. Stem lesions are oval and sunken. The center of the lesion is dark brown with purplish to red borders. In early stages, the fungus develops along the veins and becomes purplish to red in color. In advanced stages, leaves become ragged (Figure 19). Infection of the pods results in small, reddish, elongated spots. Older spots are sunken and have brown to reddish-brown borders.



**Fig 19. Symptoms of anthracnose**

Pods are infected mainly through wounds. Pods that are infected rot. This results in serious crop losses.

**Control****Cultural Control**

- Use an integrated crop management approach;
- Rotate crops and remove and destroy all remnants of crop after final reaping; Seeds from areas where the disease has occurred should not be used for planting, as the agent is seed borne;
- Use clean seeds, rotate crop and remove infected plants to reduce damage.

**Chemical Control**

- Spray with a fungicide.

## 12. Viral Disease

**Mosaic Virus:** Leaves become puckered and mottled with light and dark-green areas (Figure 20). Infected plants become stunted. The virus is seed-borne and can be spread by aphids.

**Curly Top Virus:** Infected plants are stunted and have distorted foliage.

**Symptoms:** Diseased plants are usually stunted and produce little or no crop. Flowers may fall off, but if they produce pods they are usually mottled and ripen unevenly with a mixture of white and green spots on the mature fruits.

### Control

#### Cultural Control

- Losses can be reduced by growing resistant varieties and following an approved aphid control program;
- Use resistant varieties.

#### Chemical Control

- Pesticides can be used to control the vectors of the various viruses



**Fig 20. symptoms of  
Viral disease**