

# Fruits and Vegetables

1. Broccoli
2. Cabbage
3. Cantaloupe
4. Carrot
5. Cauliflower
6. Celery
7. Corn
8. Cucumber
9. Hot Pepper
10. Lettuce
11. Parsley
12. Passion fruit
13. Pineapple
14. Pumpkin
15. Salad Beans
16. Sweet Peppers
17. Tomato
18. Watermelon

## TECHNOLOGY PACKS



# PUMPKIN



November 2015

# Background

Production decisions concerning how much effort and resources to invest and which farming practices to follow, have consequences and create opportunities for the farm affecting production levels, input costs, time constraints, and the potentially size of the operation. They also may have implications for resource use and environmental quality.

Numerous information exist on the various aspects of production and handling/ marketing of crops and livestock, the majority of which are outdated, not easily understood and lacking the where with all for addressing present day challenges such as good agricultural practices (GAPs) and food safety and climate change that impact on the environment and rural livelihoods. These issues are also closely related to the importance of the role of primary producers in increasing the earnings of all actors along the value chain in supporting the development of a commercially viable and sustainable agricultural industry.

The production of high quality and easily understood information packages is critical as this forms a basis for farmers to obtain financing from lending institutions and to efficiently increase their production through the availability of modern technology. This will also result in a reduction of rural unemployment and will greatly help in alleviating poverty and other associated social ills.

# TECHNOLOGY PACKS

## **PUMPKIN**



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# Introduction

This Technological Package (Tech Pack) deals with the production and postharvest aspects of pumpkin.

Also included in the Tech Pack are appendices:

- Template for cost of production
- List of recommended pesticides and application rates
- Good Agricultural Practices data record sheet.

Notwithstanding the identification of any specific pesticide for the control of pests and diseases, this decision is for the discretion of the Ministry of Agriculture Area Extension Officer and the farmer.

However, the mention of any pesticides and other products used in the Tech Pack should strictly comply with local regulations and all instructions provided by the manufacturer. Also, the use of trade names in the Tech Pack is for the purpose of citing examples and is not meant to either endorse or discredit any particular product.

# Botanical Description

Pumpkin (*Cucurbita pepo*) belongs to the family Cucurbitaceae. The local name in Creole is Janmou. Pumpkins produce both a male and female flower; honeybees play a significant role in fertilization. The colour of pumpkins is derived from the orange pigments abundant in them. The main nutrients are lutein and both alpha and beta-carotene, the latter of which produces vitamin A in the body. Pumpkin has a sweet taste and is typically used in various Caribbean recipes.

# Ecology and Environmental

Pumpkin plants need to grow in full sun. It can be grown year-round locally. The optimum temperature for growth is about 85°F (30°C). The soil should be fertile and rich in organic matter with a soil pH ranging from 6.5 - 7.5.

# Varieties/ Cultivars

Preferred pumpkin varieties grown by farmers originate from seeds extracted from a range of locally grown cultivars ("Caribbean pumpkin" *Cucurbita mochata* or calabaza). However, the commercially available varieties sold by seed shop outlets are Martinica and Tanker

# Seedling Production

In order to produce strong and healthy seedlings, establish a seedling nursery, specifically for seedling production. The area should comprise two sections:

1. A seed germination section which is covered with solid roof to protect the germinating seeds from sun and rain
2. A hardening section with a transparent roof or netting that allows for the penetration of light for hardening the seedlings. Hardening protects seedlings from transplanting shock when planted in the field.

The entire nursery area should be weed free and preferably totally screened with polyvinyl insect netting to protect seedlings from any insect attack and/or transmitted insect diseases. Seeds are sown either in seedling trays containing peat moss as the growing medium or in peat moss blocks (Plates 1 & 2). Though seeds can be directly sown in the field, the success of germination and survivability of most seeds is not guaranteed as both soil pests and diseases can affect them. To achieve 95 - 100% seed germination and strong and healthy seedlings, seedlings produced in nurseries is the preferred option.



Plate 1 Seedling production in seed trays



Plate 2 Seedling production in nursery



Plate 3 Hardening seedlings

The following practices should be adopted in the production of strong healthy pumpkin seedlings:

- When purchasing seed material obtain from a reputable source
- Read the label on the seed package. Ensure that the seeds are 90 - 100% viable which must be indicated on the label and is in keeping with the expiry date
- Use seedling trays for sowing seeds. Ensure that they are sterilized by immersing into commercial bleach solution 1 tablespoon/gallon (5 cc/litre) of water
- Use peat moss as the planting medium
- Treat the planting medium with a broad spectrum fungicide, 6 ounces of Banrot in 15 gallons of water (170 g/68 litres), before placing in trays
- Seedling trays should be placed on raised platforms
- Make a planting hole in each cell and plant one seed per hole
- Water seeds to aid germination
- Spread peat moss lightly ensuring that the seeds are covered
- Cover trays with saran netting to hasten germination
- Place trays in the seed germination section of the nursery
- Remove the covering of saran netting at the first sign of germination
- Water seedlings at least twice per day



- Apply plant nutrient as a foliar spray once per week when seedlings are ½ inch (1.2 cm) in height
- Spray seedlings with insecticide and fungicide once per week for pest and disease control
- Apply fertilizer solution, Tropi-Gro 1 tablespoon/gallon (5 cc/litre) of water twice per week when seedlings are 1 inch (2.5 cm) in height
- Harden seedlings by placing them in the hardening section of the nursery for 3 hours during the early morning and late evening, for 2 - 3 days (Plate 3)
- Expose seedlings to full days of sunlight until ready for transplanting
- Transplant seedlings when they are 3 inches (7.6 cm) tall.

## Land Preparation

Land should be ploughed and rotavated to give a fine tilth. Prepare ridges 6 - 8 feet (1.8 - 2.4 m) apart or cambered beds 9.0 feet (2.7 m) wide with mounds prepared in rows 6 - 8 feet (1.8 - 2.4 m) apart (Plates 4 and 5).



Plate 4 Preparing ridges for planting



Plate 5 Making mounds

## Spacing and Planting

Pumpkin seedlings should be planted 6 - 8 feet x 6 - 8 feet (1.8 - 2.4 m x 1.8 - 2.4 m) on the square. On cambered beds, plant two rows per bed (one on each side) with seedlings 6 feet (1.8 m) apart on each row. These arrangements will give plant populations between 700 - 1,200 plants/acre (1,700 - 3,000 plants/ha).

Seedlings are transplanted in the field at the first new leaf stage (12 - 15 days after sowing); larger seedlings do not transplant well. In transplanting, care should be taken not to disturb the roots when removing from seedlings trays and placing in the soil because root recovery is very slow. Seedlings should be watered thoroughly after transplanting.

# Irrigation

Irrigation water, especially from streams and ponds, should be sent for analysis to ensure that the water is not too polluted or saline.

Pumpkins can be grown year-round but perform best in the dry season due to the low incidence of pests and diseases. However, supplemental water is required for optimum production in the dry season. The amount of water and the frequency of irrigation are dependent upon weather conditions and the amount of water the soil can hold. More water and more frequent application will be needed on sandy soils than on heavier soils.

Excessive application of water must be avoided on soils that drain well since nutrients such as nitrates can be leached out of the soil. This can result in low yield. In heavier soils waterlogging should be avoided.

The most efficient method is to supply water using a drip irrigation system (Plate 6). Such a system will provide an adequate supply of water without wetting the foliage, which promotes the development of diseases. Overhead irrigation can also be used but may result in low yields due to flower drop.



Plate 6 Use of drip irrigation for pumpkin production

# Fertilization

Specific kinds and rates of fertilizers must be determined from the results of soil and leaf analyses. Composted manure if available should be applied to the soil to help with the uptake of nutrients from inorganic fertilizers; it adds organic matter to the soil, enhances soil structure and growth of micro-organisms. All manure should be well composted to ensure that harmful microorganisms and weed seeds are destroyed.

Apply a complete fertilizer (NPK) at time of transplanting at a rate of 150 lbs/acre (170 kg/ha) by band placement 2 - 3 inches (5 - 7cm) to the side of the seedling at a depth of 2 - 3 inches (5 - 7cm). As vine growth increases apply nitrogen fertilizer at the rate of 50 - 70 lbs/acre (55 - 80 kg/ha) and at flowering apply a complete fertilizer at a rate of 150 lbs/acre (170 kg/ha). Irrigate the soil after application of fertilizer as this helps to dissolve the fertilizer and prevents root injury.




# Weed Control





Weed control is very important for producing a successful crop. At the early stages of growth it is necessary to weed until the vines cover the ground. Large weeds should be pulled by hand. Chemical weed control can be effective but must be carried out correctly. Dacthal W-75 can be applied at the rate of 10 lb/acre (11 kg/ha) before transplanting. However the soil must be moist at the time of application. During the early stages of crop growth young plants should be round weeded with a hoe or cutlass followed by chemical weed control with a contact herbicide between the rows. It is important at this stage to protect the vines from herbicide drift by using a shield.

# Pests and Diseases

The major pests and diseases, symptoms and control/management affecting pumpkin are indicated in Table 1.

Table 1 Causal agents, symptoms and control of pests and diseases of pumpkin

Pest & Diseases	Symptoms	Control/ Management
 <p>Plate 7 Melon Worm larva</p>	<p>The pest is identified by the presence of a white stripe extending the length of both sides of the body of the larva. Melon Worm larvae prefer foliage but with severe infestations they may feed on pumpkin flowers and fruits. Infestation levels are higher after a period of rainfall.</p>	<p>Keep land free of weeds and host plants to reduce the population, and destroy crop residues. Use contact and systemic insecticides.</p>
 <p>Plate 8 Banded Cucumber Beetle</p>	<p>Stunted seedling; damaged leaves, stems and/or petioles; reduced plant stand; plants may exhibit symptoms of bacterial wilt; scars on fruit caused by beetle feeding damage; adult beetles are brightly colored with either a green-yellow background and black spots or alternating black and yellow stripes.</p>	<p>Application of appropriate insecticides.</p>
 <p>Plate 9 Aphids</p>	<p>Symptoms are stunting, deformation, gall formation, withering and dying of plants. Leaves may become curled, wrinkled or cup-shaped. The symptoms may be due to the feeding or viral diseases spread by the aphids. Honeydew secreted by the aphids encourages the growth of sooty mold (black in colour) on the leaves.</p>	<p>There are a number of organic solutions that can be very effective. Aphids can be controlled using contact or systemic insecticides.</p>

Pest & Diseases	Symptoms	Control/ Management
 <p>Plate 10 Root Knot Nematodes</p>	<p>Characteristic symptoms occurring on underground plant parts. Infected roots swell at the point of infection and form knots or galls.</p>	<p>Control is by practicing crop rotation, use of resistant varieties and application of nematicides.</p>
 <p>Plate 11 Downy Mildew caused by the fungus <i>Pseudoperonospora cubensis</i></p>	<p>Symptoms are angular, chlorotic lesions on the foliage. Crop rotation is not an effective control measure for this disease.</p>	<p>The disease can be controlled using resistant varieties, and chemical control using both protectant and systemic products.</p>
 <p>Plate 12 Phytophthora fruit Rot caused by the fungus <i>Phytophthora cactorum</i></p>	<p>Symptoms include soft, water soaked spots on fruit with signs of white yeast-like growth. The disease favours warm, wet conditions.</p>	<p>Rotation with non-host crops. Also an important control strategy is to manage soil moisture by selecting well-drained fields, avoiding low-lying areas, sub soiling, preparing raised beds and not over irrigating.</p>
 <p>Plate 13 Cucumber Mosaic Virus &amp; Water Melon Mosaic Virus</p>	<p>Symptoms are mottling of both leaf and fruits.</p>	<p>Some level of management can be achieved by control of vectors (aphids) with insecticides and control of weed hosts with herbicides.</p>

Good Agricultural Practice (GAP) related to the use of pesticides, requires farmers to maintain up to date records on the application of pesticides to the crop. These records should include trade names, application rates and dates of application. During the harvesting period use pesticides with a very short harvest interval.

## Harvesting/ Maturity

Harvest pumpkins when they are mature. Maturity is indicated by the loss of surface sheen or gloss, and the dieback of the tendril nearest to the fruit. Fruits should not be harvested from dead or dying vines. Harvest fruit with sharp knives or secateurs leaving 1 inch (2.5 cm) of stem attached.

## Field Handling

Harvested fruit should be placed in mesh bags or field crates for transporting to market or storage facility. Out-grade fruits in the field to remove pumpkins affected by disease, insects or damage.

## Preparation for Market

Though mature pumpkins can be marketed soon after harvesting, fruits should be cured in storage in a well-ventilated room under ambient conditions for about a week to toughen the skin before being marketed.

## Yields

Yields vary from 17,000 - 19,000 lb/ha (18,000 - 20,000 kg /ha).

# Storage

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Before storing the fruit:

- Wash the pumpkins in a very mild chlorine solution, 1 teaspoon of chlorine to 1 gallon of water (50 ml of chlorine to 1 L of water). This will destroy bacteria, which may cause the fruit to rot. Allow the pumpkins to dry completely.
- Store the pumpkins in a cool, dry and dark place (if possible)
- Avoid hot and humid places, even if storing for only a couple of weeks.
- Pumpkins are best stored on a board or piece of cardboard.
- Do not store the fruit on a cement floor, as they tend to rot.

For long-term storage pumpkins should first be cured at 80 - 85°F (28 - 30°C) and 80 - 85% relative humidity for 10 - 20 days depending on the cultivar, in well ventilated covered rooms to optimise quality and shelf life. Pumpkin has a long storage life of 30 - 90 days.

# APPENDICES





**APPENDIX I: TEMPLATE FOR COST OF PRODUCTION ANALYSIS: PUMPKIN**

	<b>Input</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Cost</b>	<b>Total Cost</b>
<b>1.</b>	<b>Seedling production</b>				
	Seed material				
	Seedling trays				
	Peat moss				
	Saran netting				
	Fungicide, plant nutrient, insecticide, fungicide, fertilizer (specify names used)				
	<b>Total cost for seedling production</b>				
<b>2.</b>	<b>Land preparation</b>				
	Land preparation costs (e.g. equipment rental)				
	<b>Total cost for land preparation</b>				
<b>3.</b>	<b>Crop maintenance</b>				
	Water/irrigation				
	Fertilizer (specify types used)				
	Weed control (specify chemicals etc used)				
	Pest and disease control (specify chemicals etc. used)				
	<b>Total cost for crop maintenance</b>				
<b>4.</b>	<b>Harvest/storage</b>				
	Bags/crates				
	Other materials (e.g. chlorine etc.)				
	Transport to market				
	<b>Total cost for harvest/storage</b>				
<b>5.</b>	<b>Labour</b>				
	Seedling production				
	Land preparation				
	Crop maintenance				
	Harvest/storage				
	<b>Total cost for labour</b>				

**APPENDIX I: TEMPLATE FOR COST OF PRODUCTION ANALYSIS: PUMPKIN**

	<b>Input</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Cost</b>	<b>Total Cost</b>
<b>6.</b>	<b>Rent/insurance</b>				
<b>7.</b>	<b>Miscellaneous costs</b>				
	<b>Total cost of production</b>				

**Notes**

1. It is recommended that the above data be completed on a per crop basis.
  
2. The cost of any fixed structures should be considered. For example if a seedling nursery is solely used for to produce pumpkin seedlings in the year and is expected to last for 10 years, then one tenth of the cost of construction (plus any annual maintenance) should be added at item 7. If, however seedlings for other crops are also produced then these also need to be considered. If pumpkin seedlings account for half the seedlings in a year, then the annual cost calculated as above needs to be divided by 2. Similar considerations should be given to the cost of an irrigation system.
  
3. The revenue obtained from sale of the crop should be compared with the cost of production to determine the profit/loss on the operation.

**APPENDIX II: LIST OF RECOMMENDED PESTICIDES AND APPLICATION RATES**

<b>INSECTICIDES</b>	<b>APPLICATION RATE</b>
Pronto 35 SC	3 - 5 teaspoons/gallon of water
Target	1 - 2 teaspoons/gallon of water
Pirate	½ - 1 teaspoons/gallon of water
Fastac	1 - 2 teaspoons/gallon of water
Caprid	½ - 1 teaspoon/gallon of water
Diazinon (Basudin)	¾ - 1½ pints/acre
Admiral	¼ teaspoon/gallon of water
Dipel	1½ - 2 teaspoons/gallon of water
Aza-direct	1 - 2 teaspoons/gallon of water
Cure	½ - 1 teaspoon/gallon of water
Danitol	1 - 2 teaspoons/gallon of water
Cypro	½ tablespoon/gallon of water
Dimethoate (Perfection, Rogor 40)	1 pint/acre
Phosvel	1¼ - 2 pints/acre
Orthene	3.2 ounces/acre
Permethrin (Ambush)	½ teaspoon/gallon of water
Padan 50 WSP	2 - 3 teaspoons/gallon of water
Lannate	1 teaspoon/gallon of water
Decis	½ teaspoon/gallon of water
Kelthane 42%	1¼ lb/acre
Orthene 75S	1 lb/acre
Malathion	½ - 1 pint/acre
Sevin	1½ lb/acre
BT ( <i>Bacillus thuringiensis</i> )	Label rates
Rotenone	1 - 2 teaspoons/gallon of water
Neem X.	8 - 10 oz/gallon of water
<b>FUNGICIDES</b>	<b>APPLICATION RATE</b>
Bellis	2 teaspoon/gallon of water
Acrobat	2 - 4 teaspoon/gallon of water
Mancozeb (Dithane M45)	1.5 lb/acre

**APPENDIX II: LIST OF RECOMMENDED PESTICIDES AND APPLICATION RATES**

Cabendazim	2 teaspoon/gallon of water
Daconil	1½ - 2 pints/acre
Benomyl (Benlate)	6 oz/acre
Captan	2 - 3 teaspoons/gallon of water
Peltar	3 teaspoons/gallon of water
Manzate DF	2 - 4 teaspoons/gallon of water
Bravo	1½ - 2 pints/acre
Tri-Milttox-Forte	3 teaspoons/gallon of water
Botrilex	5 - 200 lb/acre
Kocide 101	2 - 4 teaspoons/gallon of water
Cupravit	2½ lb/acre
<b>WEEDICIDES</b>	<b>APPLICATION RATE</b>
DCPA (Dacthal W-75)	10 lb/acre
Diphenamide	4 - 10 lb/acre
Paraquat (Gramoxone)	1 - 2 pints/acre
Dymid 80W	5 lb/acre
Atrazine 80 (Gesaprim).	1¼ - 1½ lb/acre
Linuron (Lorox)	1 pint/acre
Prometryn (Caparol)	0.8 - 1.6 lb/acre
Sethoxydim (Poast)	1¼ - 3½ lb/acre
Clethodim (Select)	0.094 - 0.25 lb/acre
Prometryn 50WP (Geagard)	2 - 3 lb/acre
Herbicidal Oil (Stoddard Solvent, Kerosene oil)	40 - 80 gallons/acre

**APPENDIX III: GOOD AGRICULTURAL PRACTICES DATA RECORD SHEET**

<b>Grower name:</b>							
<b>* Name of applicator</b>	<b>Date</b>	<b>Brand and product name</b>	<b>Rate</b>	<b>Size of area/no. of plants treated</b>	<b>Total application (amount of the product used)</b>	<b>Notes/target pest</b>	<b>Start/finish time</b>

\*The applicator should be trained or, if not, supervised by a trained or certified person. Proof of training required.

