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

CANTALOUPE

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exist on the various aspects of production and handling/ marketing of crops and livestock, the majority of which are outdated, not easily understood and lacking the where with all for addressing present day challenges such as good agricultural practices (GAPs) and food safety and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

CANTALOUPE

November 2015

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Table of Contents

Introduction

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

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

Cantaloupe (*Cucumis melo*) belongs to the family Cucurbitaceae. The local name in Creole is Gouj. It has a net-like (or reticulated) skin, it is a round melon with firm, orange, moderately sweet flesh and a thin, reticulated, light-brown rind. Cantaloupe is normally eaten as a fresh fruit which is rich in numerous health promoting poly-phenolic plant derived compounds, vitamins, and minerals that are necessary for optimum health.

Ecology and Environment

Melons require hot, between 70 – 85 0F (20 - 300C), sunny locations with fertile, well-drained soils.

Varieties/Cultivars

Various varieties of cantaloupes are cultivated, but the most popular is 'Hy-Mark'.

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.

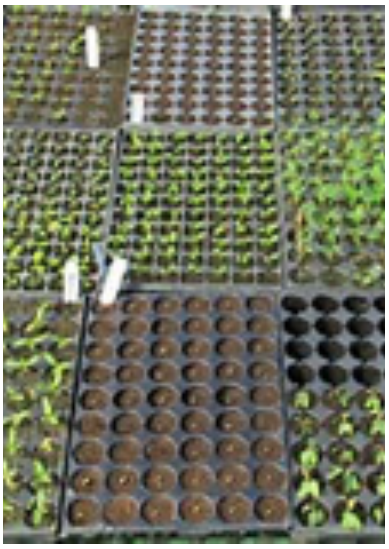


Plate 1 Seedling production in seed trays

Plate 2 Seedling production in nursery

Plate 3 Hardening seedlings

The following practices should be adopted in the production of strong healthy cantaloupe 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 expiratory 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

The land should be prepared by ploughing, harrowing or rotavating to give a fine tilth. Form ridges 3 feet (90 cm) apart or cambered beds 9 feet (270 cm) wide or mounds in rows 3 feet (90 cm) apart. With heavy soils it is important that ridges or mounds are raised at least 1 foot (30 cm) high to facilitate proper drainage, particularly in the wet season. With ridges or cambered beds, plastic mulch can be placed as a ground cover to control weeds and also to prevent fruit rot by contact with soil (Plate 4).

Spacing and Planting

Seedlings should be planted along the ridge spaced at 4 feet (120cm) apart giving a population of 3,500 plants/acre (9,000 plants/ha). Direct seeding is not recommended as birds, rodents and insects can consume the seeds. 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.

Plate 4 Plastic mulch used for growing cantaloupe

Irrigation

Irrigation water, especially from streams and ponds, should be sent for analysis to ensure that the water is not polluted or saline. It must be of good quality for irrigation.

Although cantaloupes grow best in the dry season, the crop requires an abundant supply of water for maximum plant growth and fruit development. 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.

During the dry season soil moisture becomes more important. Excessive application of water must be avoided on soils that drain well since nutrients such as nitrates can be leached out of the spoil. This can result in low yields. In heavier soils water logging should be avoided.

The most efficient method is to supply water using a drip irrigation system. Such a system will provide an adequate supply of water without wetting the foliage, which promotes the development of diseases. Stop supplemental irrigation 2 weeks before the fruit mature. The sugar content may be reduced when cantaloupes are grown under heavy irrigation and/or poor water drainage conditions

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.

Use a complete fertilizer of 12:12:17+2 at planting at the rate of 300 - 500lbs/acre (366 – 560 kg/ha), 2 - 3 inches (5 - 7 cm) to the sides of the seedlings/plants at a depth of 2 - 3 inches (5 - 7 cm). Further side dressings of 28 lbs/acre (31 kg/ha) nitrogen should be applied at intervals of 14 - 21 days as vines begin to spread. It is advisable to irrigate soil after application of fertilizer. This will help dissolve the fertilizer and prevent root injury.

Weed Control

Weeds can be controlled manually, chemically or with the use of polythene mulch. Before transplanting, chemical weed control can be used carried out using Dacthal W75 at the rate of 10.0 lb/acre (11.0 kg/ha). The soil should be moist before application. Diphenamide can also be applied at the rate of 4-10 lb/acre (4-11 kg/ha) before transplanting.

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 plants from herbicide drift by using a shield.

Weeding should be carried out until the crop has attained sufficient size to cover the soil and thus suppress the growth of weeds. Care should be taken when removing weeds close to the base of the plant so as not to damage the shallow roots.

Herbicides should not be used after the crop is well established and the crop canopy has closed and covered the soil; at this stage, only manual weeding should be carried out.

Vine Pruning

Vine pruning is not usually practiced with cantaloupes except when grown on trellises. In such cases the vines may grow to be 20 feet (6 m) long or longer. The main leader vine will have several lateral branches, which in turn may branch. Some of these can be pruned off. One strong lateral that branches near the base of the vine is selected and allowed to remain. Then the laterals along the main vine are pruned out as far as the eighth leaf node. Laterals from this node on are left to grow, because the cantaloupe plant needs the leaves to produce the sugars that make the fruit sweet. The size and quality of fruits on the remaining vine are improved, and the number of culls (discarded fruits) is lowered.

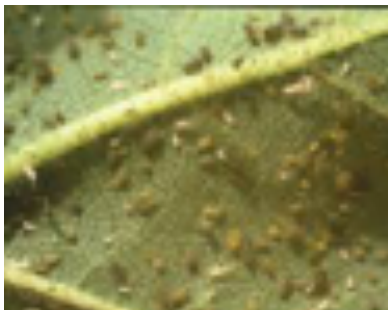
Fruit Thinning

Misshapen fruits should be removed from the vine. When thinning, leave two fruits per vine in varieties, which produced large-sized fruits and 4-6 fruits in the case of small-fruited varieties. This should be done when the largest fruit is 10 cm long and 10 cm in diameter irrespective of small or large fruited varieties.

Pests and Diseases

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

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

Pest & Diseases	Symptoms	Control/ Management
 Plate 5 Aphids	Aphids cause damage by sucking plant sap, which causes heavily infested leaves to curl and stunts plants.	Apply a contact or systemic insecticide.
 Plate 6 Leaf Miner	Leaf Miners are the larvae of various beetles, flies, moths and sawflies. The adults lay their eggs on the leaf and the larvae burrow into the leaf and tunnel through it, feeding and leaving a transparent trail. If you look closely, you can often see a dark dot at the end of one of the lines.	Apply a contact or systemic insecticide.

Pest & Diseases	Symptoms	Control/ Management
 Plate 8 White Flies	Common noticeable symptoms are an abundance of white, waxy material covering leaves and fronds, a sugary substance called "honeydew" produced by the leaf-sucking insects, and excessive dark sooty mold on leaves or fronds that grows on the honeydew.	White Flies have developed resistance to many synthetic pesticides making chemical control difficult. Insecticidal soap, neem oil and botanical insecticides can be used to “knock down” heavily infested areas.
 Plate 9 Mites	Symptoms appear as pale yellow and reddish-brown spots ranging in size from small specks to large areas on the upper sides of leaves. Damage can develop very quickly and the Mites can kill or seriously stunt the growth of plants.	Apply contact or systemic insecticides.
 Plate 10 Fusarium Wilt caused by *Fusarium oxysporum*	The wilt starts out looking like vein clearing on the younger leaves and drooping of the older lower leaves, followed by stunting of the plant, yellowing of the lower leaves, defoliation, marginal necrosis and death of the plant.	This disease can be controlled by: • Use of a number of fungicides. • Use of resistant cultivars • Proper field sanitation • Crop rotation • Proper fertilization • Good irrigation practices • Limited use of pesticides • Regular field inspection • Rogueing • Control of white flies & aphids.

Pest & Diseases	Symptoms	Control/ Management
 Plate 11 Gummy Stem Blight (GSB) caused by the fungal pathogen *Didymella bryoniae*	Symptoms generally consist of circular dark tan lesions that blight the leaf, water soaked leaves, stem cankers, and gummy brown ooze that exudes from cankers. The disease reduces yields of edible cucurbits by devastating the vines and leaves and rotting the fruits.	This disease can be controlled by: • Use of a number of fungicides. • Use of resistant cultivars • Proper field sanitation • Crop rotation • Proper fertilization • Good irrigation practices • Limited use of pesticides • Regular field inspection • Rogueing • Control of white flies & aphids.
 Plate 11 Slugs and snails	Snails and slugs are most active at night. They chew irregular holes with smooth edges in leaves and flowers and can clip succulent plant parts and leave a silvery mucus trail.	Use metaldehyde baits, 4% active ingredient. Do not water heavily for at least 3 - 4 days after bait placement; watering will reduce effectiveness of the bait.
 Plate 12 Powdery Mildew caused by *Golovinomyces cucurbitacearum*	Powdery white spots appear first on leaves, ultimately covering the entire leaf surface. Black, pinpoint-size, fruiting bodies of the fungus occur occasionally. Premature defoliation may follow infection.	Apply fungicides upon advice of your Extension Officer.

Pest & Diseases	Symptoms	Control/ Management
 Plate 13 Downy Mildew caused by *Pseudoperonospora cubensis*	Early symptoms of downy mildew in melon usually appear water-soaked on the underside of leaves	Apply fungicides upon advice of your Extension Officer.

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

Cantaloupes should be harvested 2 - 3 days before fruit break naturally from the vine at the attachment point. Most fully mature cantaloupe cultivars are covered with a dense, prominent net. Ground spot colour can also be used as an indication of ripeness. Leave 0.5 inches (1 cm) of stem attached to the fruit at harvest.

Field Handling

After harvest, out-grade cantaloupes in the field to remove immature, undersized, damaged, bruised, scarred and overripe fruit. Fruits should be placed in field crates and protected from the sun, rain and wind. Melons should be handled properly. Fruits should be transported from the field in padded field crates to the storage facility to avoid bruising and damage. Avoid harvesting and transportation cantaloupes during heavy periods of rainfall.

Preparation for Market

At the storage facility fruits should be graded according to size and maturity. Reject all fruits that show signs of over-ripeness, decay, rots, soft spots, sunscald, insect damage, excessive scars, cracks, sunken areas, bruises, or other mechanical damage, misshapen or immature. Fruits should be washed to remove soil and dried with a damp cloth soaked in a mild solution of commercial bleach (1 tablespoon/gallon of water, 5ml/L).

Yields

Yields of Cantaloupe will vary depending on environmental factors, the level of management, variety and spacing of the crop. Under optimum conditions yields of cantaloupe can range from 10 - 15 tons/acre (4 – 7 t/ha). Under average conditions yields can range from 6 - 10 tons/acre (2.5 – 4 t/ha).

Storage

After harvest, watermelons can be stored for a few days under ambient conditions. However, if fruits are to be stored over an extended period they should be cooled quickly under appropriate conditions to extend shelf life. Fruits if handled correctly should be stored under optimum store conditions of 50 – 55ºF (10 - 12ºC) for 2-3 weeks at 80 to 90% relative humidity.

Cantaloupe is affected by a number of post-harvest diseases that can result in losses. The majority of which are related to maturity, such as over-ripeness and mechanical damage due to bad handling practices in the field and in storage. Surface damage of the fruit makes them susceptible to microbial infection; therefore careful handling of fruit is important. Leaving 1 inch (2.5cm) of stem attached to the fruit at harvest will help to reduce the incidence of Stem End Rot in storage. Some important diseases that cause post harvest losses in storage are:

Stem End Rot caused by a fungus Lasiodiplodia theobromae. A water soaked area is seen at the stem end and the tissue is soft (Plate 14). When harvesting, a large portion of the peduncle should remain attached to the fruit.

Plate 14 Stem End Rot in cantaloupe

Anthracnose caused by the fungus *Colletotrichum lagenarium*. Fruit symptoms include circular, sunken, water-soaked areas, which expand to become quite large. Black specks may be seen in the center of the lesions (Plate 15).

Plate 15 Anthracnose in cantaloupe

Bacterial Soft Rot is caused by a bacterium *Erwinia carotovora*. Bacterial soft rot begins as a water-soaked, softened area on the fruit, which quickly progresses into a soft, watery rot (Plate 16). The internal flesh disintegrates into a watery mass that oozes out, releasing infective juices and a foul odour.

Plate 16 Bacterial Soft Rot in cantaloupe

APPENDICES

APPENDIX I: TEMPLATE FOR COST OF PRODUCTION ANALYSIS: CANTALOUPE

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

APPENDIX I: TEMPLATE FOR COST OF PRODUCTION ANALYSIS: CANTALOUPE

	Input	Quantity	Units	Unit Cost	Total Cost
	Crop maintenance				
	Harvest/storage				
	Total cost for labour				
6.	**Rent/insurance**				
7.	**Miscellaneous costs**				
	Total cost of production				

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 cantaloupe 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 cantaloupe 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 any refrigerator if the crop is stored at a low temperature and to 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

INSECTICIDES	APPLICATION RATE
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 (Perfecthion, 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 (*Bacillus thruingiensis*)	Label rates
Rotenone	1 - 2 teaspoons/gallon of water
Neem X.	8 - 10 oz/gallon of water
FUNGICIDES	**APPLICATION RATE**
Bellis	2 teaspoon/gallon of water
Acrobat	2 - 4 teaspoon/gallon of water
Mancozeb (Dithane M45)	1.5 lb/acre
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-Miltox-Forte	3 teaspoons/gallon of water
Botrilex	5 - 200 lb/acre
Kocide 101	2 - 4 teaspoons/gallon of water
Cupravit	2½ lb/acre

APPENDIX II: LIST OF RECOMMENDED PESTICIDES AND APPLICATION RATES

WEEDICIDES	APPLICATION RATE
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

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

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