New Crops, Old Challenges: Tips and tricks for managing new crops!

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CROP PROFILES

SECTION EXPLANATIONS AND CAUTIONS:
The crops shown in this demonstration plot may not be appropriate for Ontario growing conditions. Some of these crops were selected to demonstrate that not everything will grow under every climate and soil type. It may not be economically viable to grow some of these crops.

Common Names Include: Numerous common names exist for many specialty crops (i.e. different languages etc.). We have selected a few of the more common names.

Latin Name: For some crops (e.g. cole crops), Latin names have changed several times in the past few decades. We have used the most familiar names where possible. For some crops, several Latin names may exist.

Close Relatives: This was intended to provide crops from which you may be able to adapt production practices, and which may have common pests. However, some crops can be within the same family but have very different agronomics. In some cases, we have listed crops that are distantly related, meaning that they may have a few similarities but many differences.

Uses: The most common uses are listed but more do exist.

Traditional Markets: The traditional markets are not always the only market available. The potential exists to expand the crop to new, North American markets. In some cases, they are already expanding in some North American markets.

Current Retail Price (As of...): These are current retail prices from a few markets (e.g. Asian supermarkets in Toronto) and do NOT necessarily reflect the price a grower would receive.

Agronomics: In many cases there is not a lot of information or research available on agronomics of these crops under Ontario growing conditions. The information provided is pulled from a number of sources, many not from Ontario, and should be used only as a starting point when considering growing one of these crops. Further research to refine agronomic practices would be required before growing these crops commercially.

Pests:
- Observed: These are the main pests that were observed in this demonstration plot up to August 18, 2009, or in the same crop in previous years. More minor pests may have occurred that are not listed. The pest complex could differ significantly under other growing conditions and in a commercial field environment (e.g. a warmer summer, larger acreage etc.). Pests occurring in late August and September are not reported.
- Potential: These are pests known to occur on related crops in Ontario, or on the same crop in other regions. They may or may not be a problem in Ontario. Keep in mind that pests often increase as acreage increases and over time. These lists are not comprehensive – other pests may also occur.
- Pest control products may not be registered for the crop shown. Products that are registered on related crops may not necessarily be registered on the specialty crop of interest. It is illegal to apply an unregistered product. Always check the label and/or consult an OMAFRA specialist before applying any pest control product.
AMARANTH

Common Names Include: Amaranth, Callaloo, Calalbo, Tampala, Chinese Amaranth, Chinese Spinach, African Spinach, Indian Kale

Latin Name: *Amaranthus* spp, including *A. tricolor*, *A. cruentus*, *A. dubius*, *A. gangeticus*, *A. hybridus*, *A. hypochondriacus*, *A. lividus*, *A. manogostanus*, *A. spinosus* and *A. viridis*

Close Relatives: pigweed

Uses: Amaranth leaves are a good source of protein, pro-vitamin A, vitamin C, and fibre. Typically fried or cooked with tomatoes, onions and bell peppers, and served as a condiment with meat or fish or served raw in salad dishes.

Traditional Markets: Used in Indian, Chinese, Southeast Asian, Mexican, Andean highland, South American, Eastern African, and Caribbean cuisine.

Current Retail Price (As of Aug 13th, 2009): $3.06/kg for *A. tricolor*

Agronomics:
- Continuous sowing of seed or transplants into soil of 15°C after last frost, in row spacing 4-15 cm, between row spacing 10-50 cm
- 30-60 days to first harvest, multiple cuttings are possible, optimal growing temperatures of 18-24°C
- No Ontario fertility recommendations, moderate N, P, K requirements, pH >6.0
- Growth rates, size, and yield vary among species and varieties; harvesting schedule, planting density, etc. must be adjusted accordingly
- Hand harvest during cooler parts of the day to reduce wilting
- Leaves can be stored for 10 to 14 days at 0 to 2°C, with low air exchange (10 to 15 m3/h), and 95 to 100% relative humidity

Pests:
- Observed: *Insects* - striped flea beetles; *Diseases* – phomopsis leaf blight, alternaria leaf and stem blight
- Potential: *Insects* - lygus bug, fall armyworm, cabbage looper, corn earworm, cowpea aphid, beat leafhopper, weevil, blister beetle; *Diseases* - *Pythium*, *Rhizoctonia*, *Aphanomyces* specifically cause damping off of seedlings and stem cankers
- Some pest control products are available, contact OMAFRA specialists for more information
Amaranth comes in many varieties. Left: ‘Red-C’; Right: ‘W-Green’. This photo was taken at the marketable stage, 65 days after seeding in the greenhouse, 38 days after transplanting.

Tricolour amaranth is a popular variety in Asian markets.
BASIL

Common Names Include: French basil, royal basil, royal herb, Varieties Shown: Sweet basil, Thai basil, Indian basil, Dark Opal, Napoletano, spice basil

Latin Name: Ocimum basilicum, O. sanctum

Close Relatives: No close relatives; distantly related to members of the mint family such as mint, oregano, rosemary, sage, thyme, perilla

Uses: Used primarily for flavouring or as an aromatic. Also used occasionally as a leafy green.

Traditional Markets: Depends on type grown: Sweet, Dark Opal, and Napoletano = Italian, South European; Indian, Thai, Spice = South-east Asian

Current Retail Price (As of Aug. 13th, 2009): not available

General Agronomics:
- All basils are susceptible to frost and must be planted out in the field after all danger of frost has passed; Greenhouse production also possible
- Can be direct seeded, but often transplanted
- Rows 30 cm apart, in-row spacing 30 cm
- Multiple cuts per season are possible; Large fields are often harvested twice – once just before flowering leaving at least 4 sets of leaves (approx. 60 days from transplanting), and again just before flowering the second time
- No Ontario fertility recommendations are available; high fertility reduces essential oils
- Hand harvest during cool parts of the day to prevent wilting. Remove field heat as quickly as possible; Average total yield of 14,000 kg/ha for sweet basil – yield of other varieties unknown
- Can be stored for 1-2 weeks at 10-15°C and high humidity
- Consult the section “Herbs” in Publication 363 Vegetable Production Recommendations for more information

Pests:
- Observed: Insects - Japanese beetles, aphids, leafhoppers, tarnished plant bug; Diseases - alternaria leaf blight, sclerotinia stem rot
- Potential: Insects – cabbage looper, mirid bug, cutworms; Other – slugs; Diseases - powdery mildew;
- Some pest control products are available, contact OMAFRA specialists for more information
Thai basil is common in South-East Asian cuisine. This photo was taken 106 days after seeding in the greenhouse, 70 days after transplanting and the basil normally would have been harvested once or twice by this date.

‘Dark Opal’ basil is European variety similar to sweet basil. This basil is nearing the first harvest and was taken 75 days after seeding in the greenhouse, 40 days after transplanting.
CALENDULA

Common Names Include: Pot marigold, Scotch marigold.

Latin Name: *Calendula officinalis*

Close Relatives: other members of the daisy family

Uses: Flower petals are edible, and flower extracts can be added to poultry feed to darken the egg yolk. Used for the treatment of skin disorders and pain, and as a bactericide, antiseptic and anti-inflammatory. Seeds contain 40-46% oil of which ~50% is calendic acid, which has use in the manufacture of paints and coatings, cosmetics, and some industrial nylon products

Traditional Markets: southern Europe and eastern Mediterranean areas.

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- Seed at ¼” depth or transplant into soil of 15°C after last frost, in row spacing 5-10 cm, between row spacing 15-30 cm. Target plant population should be 60 plants/m². Plants flower from June to 1st killing frost.
- Full sun. Tolerates hot conditions, prefers well drained loam soil with moderate water requirements.
- No Ontario fertility recommendations, moderate N, P, K requirements, pH >5.5 – 7.0
- Growth rates, size, and yield vary among varieties; harvesting schedule, planting density, etc. must be adjusted accordingly
- Harvest method will depend on the end use of the crop. Fresh flowers may be picked all season, but plants stop growing once they begin producing seed.
- Seed harvest is challenging since flowers do not mature at an even rate.

Pests:
- Observed: None observed as of Aug. 18 2009.
- Potential: *Insects* - whitefly, aphids, thrips, plant bugs, cutworms, cabbage looper, cucumber beetles, blister beetles. *Diseases* – leaf spot, alternaria, leaf blight, rust, powdery mildew
- Pest control products may be available, contact OMAFRA specialists for more information. Do not assume that products registered for use on ornamental calendula can be applied when it is used for consumption.
Calendula is sometimes grown as an edible flower. This photo is taken approximately 75 days after seeding in the greenhouse, 50 days after transplanting. Several more weeks would be required for seeds to mature.

‘Erfurter Orange’ calendula in flower.
CELTUCE

Common Names Include: stem lettuce, celery lettuce, asparagus lettuce

Latin Name: *Lactuca sativa asparagina, L. sativa angustana*

Close Relatives: lettuce

Uses: Stem is peeled and used raw, cooked, or stewed with a similar flavour to celery, lettuce, asparagus, or chard. Leaves are less palatable than other greens and therefore are typically not used.

Traditional Markets: Used in Asian cuisine specifically in China.

Current Retail Prices (As of August 13, 2009): 4.34/kg

Agronomics:
- Sow from seed or transplants from April to June, 20-30 cm in-row spacing and 40-50 cm between-row spacing
- Prefers light, sandy loam, well drained soil, or muck soils, pH 6.5-7.8
- Optimal temperature range 13-27°C, 70-90 days to maturity
- Hand harvest prior to flowering to prevent stem becoming hollow
- Storage temperature at 0°C and 95-100% relative humidity, storage life is approximately 10-14 days

Pests:
- Observed: *Insects* – none to date; *Diseases* - downy mildew
- Potential: *Insects* – aphids, cutworms, tarnished plant bug, aster leafhopper, pea leafminer, cabbage looper, nematodes; *Diseases* – damping off, botrytis grey mould, downy mildew, sclerotinia white mould, septoria leaf spot, rhizoctonia bottom rot, corky root rot, bacterial wilt, dry leaf spot, lettuce mosaic virus, aster yellows
- Pest control products are available, contact OMAFRA specialists for more information
Celtuce or stem lettuce is a variety of oriental lettuce grown for its enlarged stem. This variety, ‘Summer 38’, resisted bolting during hot summer weather. The variety ‘VLS112’ bolted while still immature. This photo was taken near maturity 75 days after seeding in the greenhouse, 50 days after transplanting.

Celtuce sold in a Toronto market.
CHIA (SALVIA)

Common Names Include: Chia

Latin Name: *Salvia hispanica*

Close Relatives: sage

Uses: Chia seed is high in dietary fibre, rich in omega-3 fatty acids and vitamins and is a source of antioxidants and a variety of amino acids. Recent research has shown that consumption of chia seed has a positive impact on lowering blood sugar levels.

Traditional Markets: Chia is traditionally grown in Mexico, the south-western United States, and South America. Primarily sold as a health food in Canada, but may also be found in specialty ethnic food stores.


Agronomics:
- Seed in the greenhouse in March/April to generate transplants. Plant into the field after the last frost.
- Seed at 6kg/ha with a row spacing of 0.7 to 0.8m after last frost, but plants may not mature if the summer is cool. Seeding depth should be ~3x the diameter of the seed and soil should be kept evenly moist. Full sun and cooler temperatures of the native mountainous environment produce the highest oil yields.
- Seed matures from 120 to 180 days after planting.
- No Ontario fertility recommendations, moderate N, P, K requirements
- Grain can be machine harvested, but some modifications may be needed to improve performance.

Pests:
- Typically, few insect pests are observed. A few plants displayed signs of a basal stem rot in the demonstration plots.
- No pest control products currently registered.
Chia, or salvia grain, appears to require short day lengths to initiate flowering. This chia was planted in June and grew vegetatively until it was nearly 1.5 m tall. Flowers were never initiated.

Chia grain sold in a Toronto market. It is primarily used as a healthy grain.
EDIBLE CHRYSANTHEMUM

Common Names Include: edible garland, crown and daisy chrysanthemum, chrysanthemum greens, chop suey greens, tong hao, shungiku, kikuna, Japanese greens, tangho, antimonio, mirabeles, moya

Latin Name: *Chrysanthemum coronarium*

Close Relatives: asters, daisies, sunflowers

Uses: Native to Europe and northern Asia, it has historically been cultivated as a garden plant, but the young leaves are common ingredients in many Asian salads, soups, and stir-fries.

Traditional Markets: Traditionally used in Asian cuisine

Current Retail Price (As of Aug. 13th, 2009): $4.38/kg

Agronomics:
- Seeds are sown after the last frost into a moist seed bed and can be seeded every 2 weeks. The commercial seeding rate is 30kg/ha in rows 16 cm apart.
- Best grown in the spring or fall, the plant prefers cool conditions and grows poorly at temperatures above 29°C. Flowering will occur during warm weather, but these can be removed to keep the leaves marketable.
- No Ontario fertility recommendations, moderate N, P, K requirements, pH 5.2 to 7.5
- The leaves and stems are ready for harvest one to two months after the seeds are sown. Harvest when the plants are 10-20 cm tall, cutting the entire plant off at ground level. If 2-3 cm of stem are left, the plant will re-grow, providing a second harvest in 1-2 months. Generally, additional fertilizer will need to be added to promote re-growth.
- Harvest and storage: edible chrysanthemum like most Asian vegetables must be harvested when young and should be bunched. Plants should be air dried to remove surface moisture prior to low temperature storage.

Pests:
- Observed: None observed as of Aug. 18 2009
- Potential: *Insects* - whitefly, aphids, mites, leafminers. *Diseases* – powdery mildew. Pests of ornamental chrysanthemum may also attack this species.
- Some pest control products are available, contact OMAFRA specialists for more information
Edible chrysanthemum leaves are used in Asian cuisine. Days to maturity was approximately 50 days, but multiple harvest may be possible.
CILANTRO AND CORIANDER

Common Names Include: cilantro, coriander

Latin Name: Coriandrum sativum

Close Relatives: carrot, parsley, dill, celery

Uses: the leafy part of the plant is referred to as cilantro, and is used in Southeast and Southern Asian, Chinese and Mexican cuisine, and for flavouring soups and salads. The coriander seed is ground into powder and is used to flavour many products such as curries, gin and prepared meats.

Traditional Markets: there is currently a specialty crop market for cilantro and coriander in Saskatchewan and special crop marketing companies offer production contracts for coriander as well as purchase it.

Current Retail Price (As of Aug. 13th, 2009): $2.18/kg. Farm-gate prices for cleaned coriander in recent years have ranged from CDN 35-88¢/kg

Agronomics:

- Coriander can be seeded in late April-mid May, and seedlings have some tolerance to spring frost.
- Germination and emergence may take 21 days or more.
- Best adapted to well-drained sandy loam soils, and does not compete well with weeds.
- Coriander is seeded in rows 15-17 cm apart and at a rate of 33kg/ha in order to achieve 36 plants per metre.
- Harvesting mature crop by combining is the preferred method of harvest, and doing so in moist conditions when the seed pod is not overly dry will help protect against seed shattering.
- Coriander seeds must cure during storage, but hot air drying should be avoided because coriander oil is very volatile.

Pests:

- Observed: Insects – thrips; Diseases - none observed as of Aug. 18 2009
- Potential: Insects - leafhoppers, grasshoppers, cabbage looper; Diseases - aster yellows, damping off and root rot, fusarium wilt and rhizoctonia, blossom blight, sclerotinia, and sooty mould.
- Some pest control products are available, contact OMAFRA specialists for more information
Cilantro (left) and coriander (right) are two different purposes for the same plant. Cilantro is the leafy herb collected before the plant begins to bolt. The cilantro in this picture is near maturity. The name coriander is typically reserved for the seed spice in North America. However, the term coriander can also refer to the leaves. Different varieties are typically grown for the production of coriander versus cilantro. These photos were taken at 49 (left) and 71 (right) days after seeding. The cilantro would be near maturity at this stage, whereas the coriander requires a total of 120 to 140 days to reach maturity.
COLOURED CARROTS

Common Names Include: Coloured Carrots Varieties Shown: Atomic Red, Crème de Lite, Mello Yello, Purple Haze, many other varieties available.

Latin Name: Daucus carota

Close Relatives: celery, parsley, dill

Uses: Same as orange carrots

Traditional Markets: there are no traditional markets noted, but recently research has brought attention to the health benefits of coloured carrots.

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- Carrots are extremely sensitive to environmental conditions such as heat, soil compaction, drought stress and saturation. Continuous high temperatures in the latter stages of plant development may reduce yield, retard growth and produce a strong flavoured, coarse root.
- The minimum soil temperature for seed germination is 4°C; sow as early as soil and weather conditions permit in the spring up to July 1.
- Sow into deep, well-drained muck or sandy loam soils with a pH of 5.5 for muck soils and 6.5 for sandy loams.
- Seed on raised beds (15-20cm high) at a rate of 1-2kg/ha to achieve 26 carrots/m for processing carrots, and 2-4.5kg/ha to achieve 120 to 140 carrots/m for fresh-market carrots.
- On mineral soils, carrots benefit from nitrogen applied at a rate of 70kg/ha pre-plant, and 40kg/ha side-dress. Carrots grown on existing muck soils receive adequate nitrogen and there has been no yield response shown with added nitrogen. Nitrogen is required for carrot production on new muck soils.
- For other fertility recommendations refer to Publication 363 Vegetable Production Recommendations
- Machine harvest, and remove tops to improve storage life. Remove field heat as quickly as possible
- Mature carrots can be stored 4-5 months at 0°C and 90-98% relative humidity.

Pests:
- Observed: Insects – leafhoppers; Diseases - aster yellows
- Potential: Insects - cutworms, wireworms, carrot rust fly, carrot weevil, millipedes, nematodes; Diseases – damping-off and root rots, leaf blights, pythium, crown rot, violet root rot, sclerotinia white rot
- See the section “Carrots” in Publication 363 - Vegetable Production Recommendations for registered pest control products and more pest information
Coloured carrots are grown for both culinary interest and for their added health benefits. Yellow carrots contain high levels of the antioxidant lutein; purple carrots contain high levels of anthocyanins; and red carrots have high levels of lycopene. Pictured above from left to right are ‘Mello Yellow’, ‘Purple Haze’, ‘Atomic Red’ and ‘Crème de Lite’
BITTER MELON

Common Names Include: bitter gourd, foo gwa, balsam pear, cundeamor, fwa-kwa, leprosy pear, bitter cucumber Varieties Shown: New Dah Ding, Canton green

Latin Name: Momordica charantia

Close Relatives: cucumber, squash, gourds, melons

Uses: The immature fruits are often soaked (to remove some of the bitterness), then boiled or fried. They may also be stuffed, pickled, or used in curries, soups or tea. The fruit is very nutritious due to its high nutritional content. Bitter melon is also used medicinally in some cultures to treat various ailments, including diabetes and blood disorders.

Traditional Markets: popular in China, West Indies, India and elsewhere in southern Asia. Used extensively in Okinawan cuisine, but is rarely used in mainland Japan.

Current Retail Price (As of Aug. 13): $1.99/lb

Agronomics:
- Water soaking and scarification needed for germination. Transplant 15-20 days after sowing with root balls intact after last frost. In row spacing 40-50 cm, between row spacing 1.2-1.5 m
- 60-90 days from seeding to first harvest, optimal growing temperatures 24-27°C. No growth below 18°C. Good soil moisture required in root zone. Irrigate every 7-10 days under dry conditions.
- No Ontario fertility recommendations. Low to moderate N requirements, higher P, moderate K response, optimal soil pH 6.0-6.7
- Check for pollinator activity at early bloom. Introduce honeybees if necessary.
- For maximum yield and optimal fruit shape, grow on stakes or trellises
- Hand harvest 15-20 days after fruit set, or earlier depending on use.
- Fruit does not store well. Can be stored 2-3 weeks at 12-13°C and 85-95% relative humidity.
- This crop can also be grown in the greenhouse. Hydroponic greenhouse production gives optimal yields.

Pests:
- Observed: Insects - cucumber beetles; Diseases – Downy mildew
- Potential: See Oriental Cucumber
- Pest control products may be registered. Consult an OMAFRA specialist for more information.
‘New Dah Ding’ bitter melon has a non-traditional shape. This variety reached maturity 90 days after seeding in the greenhouse, and 65 days after transplanting. Maturity may be faster in warmer weather.

‘Canton Green’ bitter melon is the more traditional shape and the type preferred in China. Bitter melon leaves are also used both for culinary and medicinal purposes. Days to maturity was similar to ‘New Dah Ding’
**BOTTLE GOurd**

**Common Names Include:** calabash, cucuzzi, zuzza, guava bean, yugao, long melon, hulougua, hulu, lauki

**Latin Name:** *Lagenaria sicerari var. clavata*

**Close Relatives:** cucumbers, squash, gourds

**Uses:** Immature fruits are used as a cooked vegetable similar to zucchini. Young shoots and leaves can be cooked and the seeds used in soups. The flesh is sometimes used in making icing for cakes. Mature fruit are dried and used as containers, utensils or pipes. Dried small fruits are used as decorations in eastern Asia. In Japan it is dried, marinated and used as an ingredient in rolled sushi. Note – bottle gourd is sometimes referred to as hairy gourd in Chinese, however it is not the same species of plant.

**Traditional Markets:** Used in Indian, Chinese, Southeast Asian, Mexican, Andean highland, South American, Eastern African, Caribbean and Italian cuisine.

**Current Retail Price (As of Aug. 13th, 2009):** not available

**Agronomics:**

- Soak seeds in warm water for 12 hours prior to starting transplants. Transplant or direct seed into well-drained soil after last frost. in row spacing 60 cm (trellised) or 2.4-3 m (on ground), between row spacing 1.2 m or more.
- 40-90 days to first harvest (variety dependent) optimal growing temperatures of 24-27°C, but can grow in most climates. For many varieties, a warm summer is required for good fruit production.
- No fertility recommendations established for Ontario. Recommendations for Ontario cucurbits can serve as a guide. pH 6 - 7
- This plant requires night-time insects to complete pollination and will not benefit from the introduction of honeybees. Hand pollination can increase fruit set.
- May be grown on the ground or trellised.
- Hand harvest taking care to harvest tender fruits with a green colour. Mature fruits are unfit for consumption and may be poisonous.

**Pests:**

- Observed: *Insects* - cucumber beetles; *Diseases* – None observed as of Aug. 18, 2009.
- Potential: *Insects* – aphids, spider mites, leafhoppers, squash bug ; *Diseases* – downy mildew, powdery mildew, bacterial wilt, angular leaf spot, scab, anthracnose, alternaria gummy stem blight, fusarium wilt, phytophthora blight, virus
- Pest control products are registered. Consult an OMAFRA specialist for more information.
Bottle gourds should be grown on a trellis to ensure proper fruit shape. ‘Beeyiu’ is an unusually long variety. These fruits are not yet marketable.

Bottle gourds growing on a trellis. They are traditionally harvested while still slightly immature. The first fruits of bottle gourd were mature approximately 80 days from direct seeding.
HAIRY GOURD

**Common Names Include:** Chiang Shin, fuzzy melon, hairy melon, fuzzy squash, maogua, mao qua, hairy cucumber, small winter melon **Varieties Shown:** Chiang Shin, Fuzzy Star

**Latin Name:** *Benincasa hispida var. chieh-gua*

**Close Relatives:** cucumber, squash, gourds

**Uses:** The immature fruits have a composition similar to summer squash, but have a stronger, more distinctive flavour. They are prepared and eaten in a similar fashion to summer squash or zucchini. Hairy gourd is the immature fruit of some varieties of winter gourd. Note – bottle gourd is sometimes referred to as hairy gourd in Chinese, however it is not the same species of plant.

**Traditional Markets:** Used in Indian, Chinese, Southeast Asian, Mexican, Andean highland, South American, Eastern African, and Caribbean cuisine.

**Current Retail Price (As of Aug. 13th, 2009):** Mo qua $2.84/kg

**Agronomics:**
- Transplant into soil of 15°C or more after last frost. in row spacing 50-60 cm, between row spacing 1.2 m or more
- 90 days or less to harvest, optimal growing temperatures of 23-28°C
- No fertility recommendations for Ontario. Use recommendations for Ontario cucurbits as a guide.
- Check for pollinator activity at early bloom. Introduce honeybees if necessary. In cold climate, fruit set may be a problem – if this is the case, hand pollination should be considered.
- Trellising is recommended.
- Growth rates, size, and yield vary considerably among species and varieties.
- Begin picking fruits when still covered in silky hairs, sometimes as soon as a week or two after pollination.
- Hairy gourd will not keep in good condition for more than 7-14 days.
- This crop can also be grown in the greenhouse.

**Pests:**
- Observed: *Insects* - cucumber beetles; *Diseases* – downy mildew, alternaria
- Potential: *Insects* – aphids, spider mites, leafhoppers, squash bug; *Diseases* - powdery mildew, bacterial wilt, angular leaf spot, scab, anthracnose, gummy stem blight, fusarium wilt, phytophthora blight, virus
- Pest control products are available. Consult an OMAFRA specialist for more information.
Hairy gourds are immature fruits of certain varieties of winter gourd. However, not all varieties can be grown for both purposes. Take care to ensure that the variety grown matches its intended end use.
LUFFA

**Common Names Include:** Loofah, Dishcloth Gourd, Vegetable Gourd, Sponge Gourd, Chinese Okra  
**Varieties Shown:** Canton pride (ridged), Emerald, Yalu

**Latin Name:** *Luffa cylindrica/Luffa aegyptiaca*

**Close Relatives:** cucumber, squash, gourds

**Uses:** Immature fruit of non-bitter varieties may be eaten raw, cooked (like squash) or in soups and curries. Seeds may be roasted as a snack, or processed for oil. Some varieties are sweeter than others. Bitter types should not be eaten. The dried fibres of mature fruits are used as bath sponges, pot scrubbers, filters, packing material and crafts.

**Traditional Markets:** Popular in Asia and Africa.

**Current Retail Price (As of Aug. 13th, 2009):** not available

**Agronomics:**
- Pre-soak seeds in hot water (45°-55°C) for 20 minutes, then in warm water for 24 hours. Transplanting is recommended for good stand establishment.
- Transplant 4-6 week old seedlings into well-drained soil with full sun after last frost. in row spacing 45 cm-1m, between row spacing 1.5-4 m, depending on production system
- 60-90 days to first harvest for consumption, 120-150 days for sponges, optimal growing temperatures of 25-29°C
- Growth can be increased with raised beds and mulch. Drip irrigation is recommended. Growing on a trellis is recommended for the production of straight, well-formed, disease-free gourds.
- No fertility recommendations established for Ontario. Recommendations for Cucurbit crops in Ontario may be used as a guide. pH 6.0 to 6.8
- Check for pollinator activity at early bloom. Introduce honeybees if necessary.
- Harvest immature fruits of non-bitter varieties for vegetable consumption as for other gourds. For sponge production, mature gourds are dried (on or off the vine), and the skin, pulp and seeds removed.
- This crop can also be grown in the greenhouse.

**Pests:**
- Observed: *Insects* - cucumber beetles; *Diseases* – downy mildew, alternaria, angular leaf spot
- Potential: *Insects* – aphids, spider mites, leafhoppers, squash bug ; *Diseases* - powdery mildew, bacterial wilt, scab, anthracnose, gummy stem blight, fusarium wilt, phytophthora blight, virus
- Some pest control products are available. Consult an OMAFRA specialist for more information.
‘Emerald’ luffa does not have the typical ridges of traditional luffa varieties. This fruit was lying on the ground next to the trellis and was much shorter than the typical luffa. Trellising is necessary for proper fruit shape.

‘Yalu’ luffa has a more traditional shape. These fruits are at the marketable stage if grown as a vegetable. The first fruits were mature about 80 days after seeding. Luffa grown for the production of sponges would require 30-60 days more ripening.
MOUSEMELON

Common Names Include: sandiita, sandia de raton, Mexican sour gherkin, cucamelon, Mexican miniature watermelon, Mexican sour cucumber

Latin Name: *Zehneria scabra/Melothria scabra* Heirloom

Close Relatives: cucumber, squash, melon

Uses: A staple of Mexican and Central American diet for centuries, this tiny melon tastes like a sour cucumber and is used in stir fries, pickled, eaten raw in salads, or chopped and added to salsas.

Traditional Markets: Mexico, Central and South America

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- If transplanting, start indoors one month before planting. Transplant or direct seed into well drained soil after last frost, in row spacing 40-60 cm, between row spacing 1.2-2 m
- 70-90 days to first harvest, a tropical plant which responds well to heat
- No fertility recommendations for Ontario. A heavy user of nitrogen, potassium and calcium, pH 6.0-6.8
- This plant responds well to use of mulch.
- Check for pollinator activity at early bloom. Introduce honeybees if necessary.
- May benefit from staking or trellising
- Use harvest and storage guidelines for cucumber as a guide.

Pests:
- Observed: None as of Aug. 18, 2009. Mouse melon is thought to be quite resistant to pests.
- Potential: *Insects* – aphids, spider mites, leafhoppers, squash bug; *Diseases* - powdery mildew, bacterial wilt, angular leaf spot, scab, anthracnose, alternaria, gummy stem blight, fusarium wilt, phytophthora blight, virus
- Some pest control products may be available. Consult an OMAFRA specialist for more information.
Mouse melons growing on a trellis. A trellis is required to ease harvest of the tiny fruits.

Mouse melons get their name from their watermelon-like appearance and their extremely small size. Despite their name and appearance, they taste more like a cucumber than a melon.
ORIENTAL CUCUMBER

Common Names Include: oriental cucumber

Latin Name: Cucumis sativus

Close Relatives: Cucumber

Uses: Oriental cucumbers are longer and slender than those traditionally used in North American cuisine, and generally have a milder flavour. Most are eaten raw, added to salads or sandwiches, or used in soup. In southeast Asia, they are sometimes grated, mixed with sugar and eaten as a frozen treat. Some long fruited cultivars (e.g. Chinese Long Green, Kyoto Three Foot) are popular in US domestic markets.

Traditional Markets: China and southeast Asia

Current Retail Price (As of Aug. 13th, 2009): $2.84/kg

Agronomics:
- If transplanting, start indoors one month before planting. Transplant into soil of 15°C (25°C -30°C soil temperatures at planting are ideal) after last frost. in row spacing 30-40 cm, between row spacing 1.2-1.8 m
- 40-60 days to first harvest, optimal growing temperatures of 24-29°C
- Ontario fertility recommendations for fresh cucumber: up to 110 kg N/ha (65 kg/ha preplant broadcast). Refer to OMAFRA Publication 363 for other nutrients. Caution: It is not known if these will apply to Oriental varieties. pH 6.1-6.5
- Check for pollinator activity at early bloom. Introduce honeybees if necessary.
- For maximum yield and optimal fruit shape, grow on stakes or trellises
- Hand harvest daily to every other day by clipping or twisting fruit off vine. Pulling fruits off vines is not recommended.
- Considerable variability among varieties in shelf life and storability, but is approximately 10-14 days. Store between 10-15°C and 50-70% relative humidity.
- This crop can also be grown in the greenhouse.

Pests:
- Observed: Insects - cucumber beetle; Diseases – Downy mildew (severe), angular leaf spot, possible alternaria
- Potential: Insects – aphids, spider mites, leafhoppers, squash bug ; Diseases - powdery mildew, bacterial wilt, angular leaf spot, scab, anthracnose, alternaria, gummy stem blight, fusarium wilt, phytophthora blight, virus
- Pest control products are available. See OMAFRA Publication 363, Vegetable Production Recommendations, or consult an OMAFRA specialist for more information.
Oriental cucumbers are very similar in appearance and cultural requirements to North American varieties.
SPECIALTY MELONS (BRILLIANT MELON)

Common Names Include: Melon, Canary melon, Christmas melon, Casaba melon, many other varieties and cultivars Variety Shown: Brilliant Hybrid

Latin Name: Cucumis melo (various cultivars)

Close Relatives: honeydew melon, cantaloupe, other muskmelons

Uses: Numerous melon varieties/hybrids are grown in Asia, Africa and other tropical regions with different appearance and flavour than typical North American melons, and appeal to different ethnocultural groups. They are typically eaten raw, but may be dried or prepared in similar ways as conventional melons.

Traditional Markets: Asia, Africa, South America and other tropical regions

Current Retail Price (As of Aug. 13th, 2009): Golden Hami melon $2.18/kg

Agronomics:
- Best started indoors 3-4 weeks before planting. Transplant into soil of 15°C (25°C -30°C soil temperatures at planting are ideal) after last frost. in row spacing 50-70 cm, between row spacing 1.2-2 m
- Many melons respond well to plastic mulch, row covers and drip irrigation.
- 70-90 days to first harvest, optimal growing temperatures of 25-30°C (varies with variety). Caution: some varieties may not mature in cool summers without the use of plastic mulch or row covers
- High levels of rainfall and humidity can lead to problems with disease and fruit splitting for some melons (e.g. many honeydew varieties).
- Ontario fertility recommendations for cucurbits: up to 110 kg N/ha. Refer to OMAFRA Publication 363 for other nutrients. Caution: It is not known if these will apply to exotic melons. Soil pH 6.0-6.8
- Check for pollinator activity at early bloom. Introduce honeybees if necessary.
- Hand harvest under cool conditions.
- Considerable variability among varieties in shelf life and storability, ranging from 10 days to 3 weeks when stored under cool conditions and high humidity. Many melons are susceptible to fungal rots in storage.

Pests:
- Observed: Insects - cucumber beetle, aphids; Diseases – virus, gummy stem blight, downy mildew, alternaria
- Potential: Insects – aphids, spider mites, leafhoppers, squash bug; Diseases - powdery mildew, bacterial wilt, angular leaf spot, scab, anthracnose, alternaria, gummy stem blight, fusarium wilt, phytophthora blight, virus
- Pest control products are available. Consult OMAFRA for more information.
‘Brilliant’ melon is an example of a specialty melon.
WINTER GOURD

Common Names Include: winter melon, wax melon, white gourd, tung qwa, ton kwa, Chinese preserving melon, Christmas melon, Chinese wax gourd, dong gua

Latin Name: Benincasa hispida

Close Relatives: cucumber, squash, gourds

Uses: The mature fruit is sold whole, or sold by the slice (in Asian markets). The flesh is most commonly used to make soup. It is also stuffed and baked, stir fried and used to make pickles and sweet candied preserves. The seeds are sometimes fried and eaten like pumpkin seeds. The fruit can be stored for many months. In China, different varieties are preferred for different purposes.

Traditional Markets: China and other parts of Asia

Current Retail Price (As of Aug. 13th, 2009): $2.18/kg

Agronomics:
- Pre-soak seeds in hot water (45°-55°C) for 20 minutes, then in warm water for 24 hours. Transplant into soil of 15°C or more after last frost. in row spacing 60 cm (trellised) or 2.4-3 m (on ground), between row spacing 1.2 m or more
- 90 - >110 days to harvest, optimal growing temperatures of 23-28°C
- No fertility recommendations for Ontario. Use recommendations for Ontario cucurbits as a guide.
- Check for pollinator activity at early bloom. Introduce honeybees if necessary. In cold climate, fruit set may be a problem – if this is the case, hand pollination should be considered.
- Grow on ground for larger fruits; otherwise grow upright on stakes or trellises.
- Growth rates, size, and yield vary considerably among species and varieties.
- Very young fruits can be harvested early (see hairy gourd). For long term storage, wait until gourds are mature and a waxy bloom begins to appear. Hand harvest as recommended for other gourds.
- Mature gourds can be stored for six months to a year, ideally at 13-15°C, under fairly dry conditions.
- This crop can also be grown in the greenhouse.

Pests:
- Observed: Insects - cucumber beetles; Diseases – Downy mildew, alternaria
- Potential: Insects – aphids, spider mites, leafhoppers, squash bug ; Diseases - powdery mildew, bacterial wilt, angular leaf spot, scab, anthracnose, alternaria, gummy stem blight, fusarium wilt, phytophthora blight, virus
- Some pest control products are available. Consult an OMAFRA specialist for more information.
Winter gourd has a large fruit and requires a long growing season. This fruit of ‘Canton Giant’ is near maturity 120 days after direct seeding.

Winter gourd in a Toronto market. Due to its large size, winter melon is often sold in quarters or in slices.
EDAMAME

Common Names Include: edible soybean, vegetable soybean

Latin Name: *Glycine max*

Close Relatives: peas, soybeans

Uses: used in Japanese cuisine and now harvested for the young green-shelled beans, and not for the mature soybean crop. Pods are steamed and young beans are eaten. The shells are not consumed.

Traditional Markets: Japanese

Current Retail Price (As of Aug. 13th, 2009): frozen $4.34-$5.92/kg

Agronomics:
- Soil water content during seeding is very important because seeds can be easily rotted and fail to germinate if over-watered or soaked.
- Edamame are also low temperature sensitive during flowering and persistent low temperatures can cause poorly developed pods.
- Edamame should be seeded at the same rates used for soy bean, within the first 10 days of May.
- Row spacing determines the number of days required to reach full canopy and most edible soybean varieties in Ontario are seeded 19cm in-row with and equal between row spacing.
- Nitrogen fixing, no application required, but a soil inoculum may be needed.
- Edamame can be harvested using the same machinery used to harvest green beans but this can also cause bruising and reduced marketable yield.
- Harvest when pods are still green, immature, and tight with fully developed green seeds.
- Chilling beans for 3-10 hours after harvest helps preserve quality.

Pests:
- Observed: *Insects* - Japanese beetles, leafhoppers, *Diseases* - none observed
- Potential: *Insects* - soybean aphid, two-spotted spider mite, bean leaf beetle, green and brown stink bug, grubs, June beetle, Japanese beetle, wireworms, millipedes, seedcorn maggot, slugs. *Diseases* – seed rot, seedling blight and root rot, phytophthora root rot, rhizoctonia root rot, septoria brown rot, soybean cyst nematode, powdery mildew, downy mildew, brown stem rot, stem canker, sudden death syndrome, white mould, Asian soybean rust, bacterial blight, soybean mosaic virus, bean pod mottle virus, frog eye leaf spot, cercospora leaf spot, purple seed stain, phomopsis seed mould, diaporthe pod and stem blight.
- Pest control products are available. Consult an OMAFRA specialist for more information.
Edamame at maturity approximately 90 days after seeding.

Edamame is typically sold frozen in the pod.
EGGPLANT

**Common Names Include:** eggplant, aubergine, brinjal. **Varieties Shown:** New Long Purple, White Princess, Oval Green, and Pingteng Long many other varieties available

**Latin Name:** *Solanum melongena*

**Close Relatives:** Peppers, tomatoes and potatoes.

**Uses:** Cooked and used alone, in salads or in main dishes. Uses vary considerably between different countries and regions depending on the variety grown

**Traditional Markets:** Southern Europe, Middle East, South and East Asia (different varieties/fruit types preferred in different regions)

**Current Retail Price (As of Aug. 13th, 2009):** Long Purple - $2.40-$4.38/kg, Japanese eggplant - $6.58/kg

**Agronomics:**
- Transplant into well-drained sandy loams with relatively high organic matter and a pH of 5.5-6.5
- Eggplant is very susceptible to low temperatures, and is not frost tolerant.
- In row spacing 45-60cm with 90-120 cm between rows
- Apply up to 70kg/ha of Nitrogen (35kg/ha pre-plant, and 35kg/ha side-dress approximately 3-4 weeks later). High P and K requirements. For fertilizer requirements refer to publication 363 *Vegetable Production Recommendations*.  
- Optimal growing temperature 21-30°C  
- 55-80 days to harvest, multiple harvests possible  
- Harvest fruit by hand. Stage of maturity and optimal size depends on the intended market and the variety grown  
- Very limited storage life of up to 1 week at 8-12°C and 90-95% relative humidity  
- For more information see the section “Eggplant” in Publication 363 *Vegetable Production Recommendations*

**Pests:**
- Observed: *Insects* - Colorado potato beetle; *Diseases* - verticillium wilt  
- Potential: *Insects* - cutworms, tarnished plant bug, wireworms, aphids, flea beetles, and nematodes; *Diseases* - damping-off and root rots, anthracnose, early blight, phomopsis blight  
- See the section “Eggplant” in Publication 363 - *Vegetable Production Recommendations* for registered pest control products and other pest information, or consult an OMAFRA specialist for more information.
There are numerous specialty varieties of eggplant, with many local preferences for colour, shape, and maturity. Pictured above are ‘Oval Green’ (top), ‘New Long Purple’ (left), and ‘White Princess’ (right). The first fruits of ‘Oval Green’ were mature 100 days after seeding in the greenhouse, 60 days after transplanting. The remaining varieties matured about 14 days later.
FENUGREEK

Common Names Include: Fenugreek, alholva, chinagreye, fenegriek, greek hay-seed, halva, helba, hu lu pa, kelabat, koroha, shimli, sicklefruit

Latin Name: *Trigonella foenum-graecum*

Close Relatives: Fabaceae (Leguminosae) pea family

Uses: Seeds are used for culinary purpose either ground and cooked in curries and chutneys or sprouted raw. Leaves are used in small quantities for flavouring either raw or cooked. Essential oil from seed is used for confectionary flavouring of maple and vanilla. Vegetation is also used as a forage crop in place of alfalfa and there is potential to use fenugreek as a green manure.

Traditional Markets: Mediterranean, India, France, Argentina, North America

Current Retail Price (As of Aug. 13th, 2009): frozen leaves - $4.30/kg

Agronomics:
- Sow in the field after last frost, pre-soak seed for 12 hours prior to sowing into well drained loamy soil, pH 5.3-8.2
- In row spacing 5-30 cm, between row spacing 10-30 cm, may require an inoculum for nodulation
- 105-140 days to harvest, optimal temperature range is 18-27°C
- Some drought tolerance, nitrogen fixing (low nitrogen required) moderate fertility, No Ontario recommendations
- Seed harvest via combine, Seed should be dried below 12% moisture to prevent spoilage. Leaves are hand harvested. Fenugreek will not mature fully in cool summers.

Pests:
- Observed: *Insects* – tarnished plant bug, Leafhoppers; *Diseases* – alternaria, unknown root rot
- Potential: *Insects* – wireworm, cutworm, aphid, blister beetle; *Diseases* – damping off, root rot diseases, cercospora leaf spot
- Some pest control products are available, contact OMAFRA specialists for more information
Fenugreek can be used either as a leafy herb (above) or as a seed spice. This photo was taken at a young age before numerous pest issues killed all of the plants. Fenugreek may be more adapted to a drier climate.
GLOBE ARTICHOKE

Common Names Include: Globe artichoke, artichoke, cynara

Latin Name: *Cynara scolymus*

Close Relatives: other thistles including burdock, sow thistle and common thistle

Uses: The “heart” or edible portion of the flower bud consists primarily of the fleshy lower portions of the bud. Typically cooked and eaten, artichokes can be frozen, pickled, brined canned or preserved in oil. Artichokes can also be grown as an ornamental flower.

Traditional Markets: Native to the Mediterranean region, but North American market supplied by California. Green globe is the predominant variety grown.

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- Seeds are sown in mid-March for early May transplanting at an in-row spacing of 1m and a between row spacing 1m
- Plants require a chilling period to produce buds, and so should be planted one to two weeks ahead of the average last frost date. Pre-transplanting cold temperature vernalization is recommended.
- Artichoke is a cool-season crop which favours daily temperatures of 24°C and nightly temperatures of 12°C. Hot summer temperatures generally result in fewer, or no buds being formed.
- Well drained, fertile deep soil is preferred, with plants doing less well on heavy clay or light sandy soils.

Pests:
- Observed: *Insects* - slugs, cutworms, aphids; *Diseases* - unknown leaf disease (possible alternaria)
- Potential: *Insects* - aphids, cutworms, slugs, ear wigs and spider mites; *Diseases* - pythium, powdery mildew, verticillium wilt
- No pest control products are currently registered.
Globe artichoke buds are harvested at this stage. They require vernalization (cold period) and moderate air temperatures during the growing season in order to produce the buds. Days to maturity depends on temperature. These plants were seeded in the greenhouse in mid-March, placed into cold storage for 10 days and then transplanted to the field in early May. The first buds were mature by early August.

Artichokes can also be sold as a cut flower.
GOBO / JAPANESE BURDOCK

Common Names Include: Gobo, Japanese burdock, Great burdock, Grass burdock, Bardana, Bardane, Beggars’s buttons, Burrburr, Burrsseed, Clothburr, Cockle button, Hardock, Harebur, Hurrbur, Lappa, Stick-buttons, Ta-li-tzu, Thorny burr, Turkey burr, Wu-shish, Yech

Latin Name: Arctium lappa, Arctium majus

Close Relatives: Common burdock

Uses: Roots are used raw, steamed, or boiled in soups, salads and stir fries. Roots can be steeped for use in tea. Mild flavouring is said to be similar to asparagus. Gobo is also considered to have some medicinal properties such as being used as a detoxifying agent, diuretic, and mild laxative

Traditional Markets: Used in Asian cuisine specifically in Japan.

Current Retail Prices (As of Aug. 13th, 2009): $3.06-$3.72/kg

Agronomics:
- Biennial, sow from seed or transplant from mid-April to end of May, 15-60 cm in-row spacing and 45-90 cm between row spacing
- Optimal temperature range 5-20°C
- Machine dig plants in the fall or early spring to obtain roots and to prevent plant from going to seed in the second year, roots can grow up to 1m in length, so specialized equipment may be needed.
- Roots should be washed and then dried at temperatures between 32-48°C (often cut lengthwise to assist in drying)
- Storage temperatures above 40˚C should be avoided

Pests:
- Observed: Insects - aphid, cucumber beetle, flea beetle; Diseases - none observed
- Potential: Insects - grasshopper; Diseases - mosaic virus, powdery mildew
- Some pest control products may be available, contact OMAFRA specialists for more information.
Gobo, or Japanese burdock, looks very similar to the weedy burdock found in Ontario.

Gobo is sold either as whole roots (up to 1 m long) or as section of roots. These would be harvested at the end of the first growing season.
GOGI BERRY

Common Names Include: Wolf berry, goji, boxthorn fruit, matrimony vine

Latin Name: Lycium barbarum

Close Relatives: other Solanaceae including potato, tomato, eggplant, deadly nightshade, chili pepper, and tobacco

Uses: Gogi berries are nutritious, being rich in vitamin C and other antioxidants. They also have anti-coagulant properties. The berries are typically sold as dried fruit. The root bark is also used in traditional Chinese medicine as a blood treatment.

Traditional Markets: Lycium barbarum is native to the Himalayan region, but is also found in many other areas of Asia, where there are over forty varieties.

Current Retail Price (As of Aug. 13th, 2009): dried - $30.53-$61.63/kg

Agronomics:
- Will grow in almost any type of soil, but tend to flower and fruit better in a well drained soil of moderate quality in full sun.
- Planted as transplants after last frost, but can also be started from seed.
- No Ontario fertility recommendations, soil pH >6.5-7.5. Gogi requires moderate fertilization applied over the course of the growing season. 1st application in the spring, a 2nd 2 months later, and the 3rd 3½ months after planting. Use a fertilizer with an N-P-K ratio of 1:2:2 and apply according to the results of your soil tests.
- Plants produce maximum fruit yields after 4-5 years. Prune yearly to keep plants about 5 feet tall and 3 feet wide. Pruning should be done at the end of the growing season or in very early spring before it breaks dormancy. Plants may also be trellised to make harvesting easier.
- When harvesting, fruit must be handled gently to avoid bruising, which turns the fruit black.

Pests:
- Observed: Insects - aphids, thrips, spider mites (greenhouse); Diseases - none observed.
- Potential: Insects - aphids, caterpillars; Diseases - powdery mildew
- No pest control products are currently registered.
A gogi plant in the second year of production. While some plants produce fruits after 3 years, plants do not reach full production until their fourth or fifth year.

Gogi fruit are often sold dried. There is also a market for gogi juice.
‘KOSSAK’ KOHLRABI

Common Names Include: Kohlrabi, German turnip

Latin Name: Brassica oleracea Gongylodes group

Close Relatives: Cabbage, cauliflower, broccoli

Uses: In Northern European countries it is peeled and eaten both as a raw vegetable and cooked like cauliflower or turnip. Traditional kohlrabi is tough and woody when the stem is larger than 5-10 cm in diameter. The ‘Kossak’ variety is tender at a much larger size of up to 25 cm.

Traditional Markets: Northern Europe, Asia

Current Retail Price (As of Aug. 13th, 2009): traditional kohlrabi $1.74/kg

Agronomics:

- Sown directly in the field or transplanted starting in mid-spring. Will tolerate light frosts like other cole crops.
- Final spacing of 50 cm between rows, 30 cm in rows
- 90 days from seeding to maturity; 60 days from transplanting to maturity
- 2 crops may be possible in one season if grown from transplant
- Ontario recommendations for N, P, and K listed in Publication 363 Vegetable Production Recommendations under “Brassica Crops”. Unknown if these will apply to the ‘Kossak’ variety.
- Optimal temperatures: 21-24°C
- Estimated total yield = 40,000 – 80,000 kg/ha for this cultivar
- Hand harvest and remove field heat as quickly as possible to prevent storage rots
- Can be stored for 2-3 months at 0°C with 95 to 100% relative humidity
- See the section “Brassica Crops” in Publication 363 Vegetable Production Recommendations for more information

Pests:

- Observed: Insect -cabbage looper, diamondback moth, imported cabbage worm, flea beetles; Diseases- none observed as of Aug. 18, 2009.
- Potential: Similar to cabbage, cauliflower, and broccoli – see the section “Brassica Crops” in Publication 363 Vegetable Production Recommendations for pest information
- Some pest control products are available. See OMAFRA Publication 363 - Vegetable Production Recommendations, “Brassica Crops” or consult an OMAFRA specialist for more information.
Kohlrabi is an enlarged stem. ‘Kossak’ kohlrabi is a variety that is tender at a much larger size than traditional varieties. This photo was taken at the marketable stage 90 days after seeding in the greenhouse, 68 days after transplanting.

‘Kossak’ kohlrabi has a high nitrogen requirement. Plants supplied with 0 (left), 100, 200, and 300 (right) kg/ha nitrogen had a total yield of 32.4, 88.5, 105.8, and 113.4 t/ha, respectively.
LEAF AND HEADING MUSTARDS

**Common Names Include:** Leaf mustard, heading mustard, mustard greens, Chinese mustard, Indian mustard, Japanese mustard. **Varieties Shown:** Chinese Mustard, Mizuna, Tendergreen Mustard, Da Ping Pu – many other varieties available

**Latin Name:** *Brassica rapa, Brassica japonica, Brassica juncea crispifolia*

**Close Relatives:** canola, rutabaga, radish, cabbage

**Uses:** Wide variety of uses depending on cultivar and species. Uses range from raw in salads or as a garnish to cooked alone or in mixed dishes to pickled

**Traditional Markets:** South and East Asia

**Current Retail Price (As of Aug. 13th, 2009):** not available

**General Agronomics:**
- Some varieties should be sown directly in the field due to short days to harvest, longer-season varieties can be transplanted or direct seeded
- Rows 45-60 cm apart, in-row spacing 20-40 cm depending on cultivar and species
- 20-65 days from seeding to harvest depending on cultivar and species
- Continuous planting and harvesting is possible for many cultivars, but some do poorly in mid-summer heat.
- Multiple harvests are possible for some types
- No Ontario recommendations for N, P, and K are available but some information can be found in Publication 363 *Vegetable Production Recommendations* under “Brassica Crops”
- Optimal temperatures: 21-24°C
- Total yield varies widely between cultivars and species
- Hand harvest during cool parts of the day to prevent wilting. Remove field heat as quickly as possible
- Can be stored for 2-3 weeks at 0°C with 90 to 95% relative humidity
- See the section “Brassica Crops” in Publication 363 *Vegetable Production Recommendations* for more information

**Pests:**
- Observed: *Insects*- flea beetles; *Diseases*- none observed as of Aug. 18, 2009.
- Potential: similar to other Brassica vegetables – see the section “Brassica Crops” and in Publication 363 *Vegetable Production Recommendations* for pest information. Pests may also be similar to rutabaga.
- Some products are available. See OMAFRA Publication 363 - *Vegetable Production Recommendations*, “Brassica Crops” or consult an OMAFRA specialist for more information.
There are many different varieties of leaf and heading mustards, each with unique cultural and market requirements. Pictured above are ‘Southern Giant’ Chinese mustard (top), ‘Da Ping Pu’ leaf mustard (left), and ‘Mizuna’ leaf mustard (right). These varieties were mature approximately 50 days from seeding.
LOVAGE

Common Names Include: Lovage, love parsley, sea parsley, lavose, smallage

Latin Name: *Levisticum officinale*

Close Relatives: Celery, carrot, parsley, dill

Uses: The leaves are used in salads and as flavouring in soups, stews and stocks. Seeds can be used as flavouring in breads and pastries. Peeled roots can be used in casseroles. As a medicinal herb, leaves, seeds and root are used for digestive difficulties.

Traditional Markets: Market gardens, farmer’s markets, natural health practitioners

Current Retail Price (As of Aug. 13th, 2009): not available

General Agronomics:
- Direct seed in the spring or transplant in the spring. Seeds will germinate within 2 or 3 weeks. Lovage is a large, hardy perennial that will not produce a marketable crop in the first year.
- Rows 45-60 cm apart, in-row spacing 20-60 cm (depending on use)
- No Ontario fertility recommendations are available
- Requires moist but well-drained soil
- Lovage leaves are harvested perennially in early summer before flowering, seeds are harvested once flower heads turn brown in fall, roots are harvested in the fall of the second or third growing season. Roots can be divided with some replanted and the rest sold.
- Leaves and roots can be dried or sold fresh.

Pests:
- Observed: None observed as of Aug. 18, 2009.
- Potential: *Insects*- aphids, leafminers, chewing insects, pests of related crops such as celery, carrot, parsley, and dill; *Diseases* - see related crops.
- Some pest control products are available, contact OMAFRA specialists for more information
Lovage is a perennial plant with several culinary and medicinal uses and is similar in appearance to celery.
Medicinal Herbs

There are over 4,000 medicinal herbs that can be cultivated or grow naturally in Canada and many more that could be grown in a greenhouse. The cultural requirements of medicinal herbs are often very unique and specialized. Many of the herbs have had minimal breeding over the years to overcome problems such as seed germination, consistency from plant to plant, and adaptation to field or greenhouse conditions. Many are adapted to a forest environment and require culture directly in the forest or under artificial shade. In addition, some have developed close associations with organisms in a natural environment and may be very difficult to cultivate elsewhere.

While there are many medicinal herbs that can be grown, their markets are often very limited and specialized. Considerable market research may be required before growing a medicinal herb. Because of the limited market for some medicinal herbs, the entry of one new grower into the market could cause a dramatic decrease in price due to over-supply.

Medicinal herb growers also have to consider the end use of the herb. Trained natural health practitioners are required to prescribe and properly use medicinal herbs because many can be dangerous if used improperly or used in conjunction with other drugs. Proper identification and traceability of medicinal herbs is essential to avoid unintended negative consequences in the end user. Growers also need to keep in mind that the sale of natural health products is governed by Health Canada, under the Natural Health Product Directorate. Medicinal herbs are covered by the regulations if specific health claims are made at the point of sale.

Medicinal herbs also differ from vegetables and culinary herbs in that quality is not necessarily related to visual appearance, but rather to the concentration of medicinally active components in the harvested tissue. These medicinally active compounds are often affected by the growing environment. As a result, growers will have to grow a consistent crop under very specific conditions to achieve maximum quality and price. Laboratory tests may be required to verify product quality.

Since it would be impossible to show or even list the medicinal herbs that can be grown in Ontario, we have shown two examples, skullcap and lovage, which can be considered common “cottage” herbs. These are relatively easy to grow compared with many medicinal herbs. Specifics on these two herbs can be found in this document.

For more information on medicinal herbs, contact Sean Westerveld, Ginseng and Medicinal Herbs Specialist for OMAFRA.
ORIENTAL LETTUCE

Common Names Include: oriental lettuce, Chinese lettuce, pointed leaf lettuce, sword lettuce, yu mai tsai, youmaicai, a-tsai, a-choy, a choi, sword choy

Latin Name: Lactuca sativa, L. sativa longifolia

Close Relatives: Lettuce

Uses: Pick greens when young and crisp and use in salad, stir fry, soup or stew. Seed can be sprouted and used in salads or on sandwiches.

Traditional Markets: Taiwanese and Chinese cuisine.

Current Retail Price (As of Aug. 13th, 2009): $3.06/kg

Agronomics:
- Transplant or sow from seed when risk of frost is low, continuing every 2-3 weeks to ensure a continuous supply of young leaves, 22-30 cm in row spacing, between row spacing 30-40 cm
- Prefers light, sandy loam, well drained soil, or muck soils, pH 5.5-7.8
- Optimum temperature range 13-18°C, hot temperatures will cause bolting and bitterness in the leaves
- Hand harvest young leaves and store at 0°C, 85-100% relative humidity, storage life is approximately 15-20 days

Pests:
- Observed: none observed as of Aug. 18, 2009
- Potential: Insects – aphid, cutworm, tarnished plant bug, looper, leafminer; Diseases – damping off, root rot, botrytis grey mould, downy mildew, sclerotinia white mould, lettuce mosaic virus
- Some pest control products may be available, contact OMAFRA specialists for more information
Oriental lettuce is similar to leaf lettuce. This photo was taken at the marketable stage which was 40 days after seeding.
SPECIALTY HOT PEPPERS

Common Names Include: hot pepper, chili pepper – often named for various types and species (e.g. habanero, Szechuan, pablano, cayenne) Varieties Shown: Szechuan and Habanero – many other varieties available

Latin Name: *Capsicum annuum, Capsicum chinense*

Close Relatives: eggplant, tomato, potato, nightshade

Uses: these spicy varieties have culinary purposes in salsas, chutneys, and marinades: uses are specific to different regions and varieties in some cases

Traditional Markets: Habanero peppers are traditionally used in Mexican and neighbouring cuisines but they have become increasingly popular around the world; Szechuan peppers are a variety preferred in Szechuan cuisine from China.

Current Retail Price (As of Aug. 13th, 2009): fresh - $13.18/kg, dried - $88/kg

Agronomics:
- Peppers grow well in a variety of well-drained mineral soils, at a desired pH of 6.0-8.0.
- Peppers are very sensitive to low temperatures, and do not tolerate frost.
- Cultivars in Ontario require approximately 60-76 days to progress from transplanting but days to maturity depends on the variety and the preferred harvest stage (green or mature)
- Transplants are planted at a spacing of 45cm in-row and 1m between rows.
- Optimal growing temperature 21-35°C
- The recommended N rate is 35kg/ha pre-plant, and 35kg/ha side-dress. Peppers have relatively high P and K requirements. For full fertilizer recommendations consult Publication 363 *Vegetable Production Recommendations*.
- Peppers are hand cut from the plant approximately 30-40 days after pollination, adding 20-25 days for ripe colour to develop.

Pests:
- Observed: Insects - aphids (in greenhouse)
- Potential: Insects - cutworms, tarnished plant bug, wireworms, European corn borer, pepper maggot; Diseases – damping-off and root rots, anthracnose, botrytis, alternaria blight, powdery mildew, bacterial spot, verticillium wilt, and viruses such as cucumber mosaic virus, tomato spotted wilt virus, etc.
- See the section “Peppers” in Publication 363 - *Vegetable Production Recommendations* for registered pest control products and other pest information, or consult an OMAFRA specialist.
Habanero peppers are often advertised as the world’s hottest pepper and are used in Central American cuisine.

‘Szechuan Early’ peppers are a hot pepper variety preferred in East Asia.
ORIENTAL RADISH

Common Names Include: Oriental radish, Chinese radish, daikon, luo bo, Japanese radish, Korean radish, lo bok  Varieties Shown: New White Spring, Mantanghong, Green Luobo – many other varieties available

Latin Name: Raphanus sativus

Close Relatives: radish, mustards, rutabaga, cabbage

Uses: Oriental radishes are traditionally used raw in salads, pickled or as a condiment, or cooked in variety of methods alone or in mixed dishes.

Traditional Markets: East Asia

Current Retail Price (As of Aug. 13th, 2009): white - 86¢/kg, green - $2.18/kg

General Agronomics:
- Oriental radishes have similar growth requirements as other radishes but often are grown to a larger size and require more space.
- Direct seed in moist, fertile soil in spring and late summer. Many varieties grow poorly in the heat of mid-summer, but some heat tolerant varieties are available.
- Rows 20-40 cm apart, in-row spacing 2-30 cm depending on cultivar and the intended size
- 50-80 days from seeding to harvest depending on the cultivar
- Continuous planting and harvesting is possible for many cultivars, but some do poorly in mid-summer heat.
- Ontario radish recommendations for N = 60 kg/ha N on mineral soils, 40 kg/ha on muck soils. Consult Publication 363 Vegetable Production Recommendations for P and K analysis and recommended application rates. Although Oriental radish is the same species as traditional radishes grown in Canada, some large varieties may require higher N fertility due to longer days to harvest.
- Although most radishes are frost and freeze tolerant and can germinate at temperatures as low as 4°C, some Oriental radishes require higher temperatures for germination and may not be as freeze tolerant. Optimal growing temperatures: 15-20°C
- Total yield varies widely between cultivars and species
- Hand harvest and remove field heat as quickly as possible
- Can be stored for up to 4 months at 0°C with 95 to 100% relative humidity
- See the section “Radishes” in Publication 363 Vegetable Production Recommendations for more information

Pests:
- Observed: Insects – flea beetles, caterpillars, millipedes
• Potential: *Insects* – aphids, cutworms, cabbage maggot, cabbage looper; *Diseases* – downy mildew, fusarium wilt, root rot, damping-off, black root, scab, viruses
• See the section “Radishes” in Publication 363 - *Vegetable Production Recommendations* for registered pest control products and more information, or consult an OMAFRA specialist.
'Green Luobo’ radish is one of many different varieties of Oriental radishes that can be grown. The cultural requirements are very similar to the radishes traditionally grown in North America, but are often grown to a larger size. Many varieties are not adapted to hot summer temperatures.

Daikon radishes sold in a Toronto market.
PERILLA

Common Names Include: Perilla, Korean Perilla, Beefsteak Plant, Chinese Basil, Purple Mint, Bhanjira, Shiso, Egoma, Shisonoha, Tsu Su

Latin Name: *Perilla frutescens*

Close Relatives: Lamiaceae (Mint family)

Uses: Young leaves are used raw or cooked while mature leaves are used for flavouring meats and colouring preserves. Seeds can be eaten cooked or used to produce cooking and industrial oils. Leaf extract has been used as an herbal treatment for inflammation and in the treatment of some ascertained to have sedative properties. Historically it was enjoyed as an ornamental plant similar to Coleus.

Traditional Markets: Culinary use in Japanese, Korean, and Indian cuisine and as an ornamental annual bedding plant or potherb.

Current Retail Prices (As of Aug. 13th, 2009): not available

Agronomics:
- Chill seeds at 5°C for 3 days in moist soil prior to sowing in a well-drained sandy loam soil
- Can be sown *in situ* or by transplants as soon as possible after last frost, in-row spacing 15-30 cm, between row spacing 30-45 cm apart
- Keep seedbed moist, 60 days to first harvest of leaves, optimal growing temperatures of 18-24°C
- Light to Moderate fertility, pH>5.5

Pests:
- Potential: *Insects* – flea beetle, aphid, cutworm, looper, wireworm; *Diseases* - verticillium wilt, anthracnose, powdery mildew
- No control products available, contact OMAFRA specialists for more information
RUSSIAN DANDELION

Common Names Include: Dandelion

Latin Name: Taraxacum kok-saghyz

Close Relatives: Common dandelion

Uses: The root of the Russian dandelion is a source of a high quality latex, used in making rubber, that is comparable to the latex produced by the Hevea brasiliensis rubber tree. In the 1930’s, Russia produced ~30% of their domestic rubber from 67,000 hectares of this plant. The roots are harvested prior to the first fall frost, and can be stored fresh or dried for longer term storage prior to latex extraction. Dandelion roots also contain substantial amounts of the starch inulin, which can be fermented to produce fuel ethanol.

Traditional Markets: None.

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- Russian dandelion is less hardy than our common dandelion, and little information is available on cultivation of this plant.
- Taraxacum kok-saghyz not self fertilizing, so relies on insect pollination from neighbouring plants.
- Native dandelion seeds can be planted directly in the ground in the fall, 45 cm (18 in) apart and 1 cm deep. Plants will also regenerate from mature root pieces, particularly the upper, thicker portions of the root. Root pieces should be planted vertically in loose soil, with the large end pointing upwards, at a depth of 10cm.
- Roots can be harvested from cultivated fields using digging equipment (i.e. carrot digger), that can go to a depth of at least 25 cm.
- Harvested roots can be dried for storage prior to processing for latex.

Pests:
- Observed: Insects – none, Diseases – none
- Potential: unknown
- No pest control products currently registered.
Russian dandelion is very similar to the weedy dandelion growing in lawns.
SEA BUCKTHORN

Common Names Include: sea buckthorn, Siberian pineapple, sea berry, sandthorn or swallowthorn

Latin Name: *Hippophae rhamnoides* L.

Close Relatives: Other members of the buckthorn family

Uses: Used in ancient Greece as a fodder for horses to promote weight gain and a shiny coat. In fact, the generic Latin name “Hippophae” literally translates to “shiny horse”. Sea buckthorn has been used for centuries as food (juice from the berries, teas from the leaves), and for its pharmaceutical properties. Topical application of sea buckthorn oil has been reported for skin therapy including sun, heat, chemical and radiation burns, eczema and poorly healing wounds. Oil from the sea buckthorn fruit is rich in vitamin E, carotenoids, phytosterols and essential fatty acids, all of which have beneficial medicinal properties for the treatment of internal and topical maladies

Traditional Markets: Throughout Europe and Asia.

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- Sea buckthorn is a woody shrub to small tree hardy to Zone 3 (-40°C) that rapidly develops an extensive root system capable of fixing nitrogen. It is adapted to a wide variety of soils, and will grow on marginal land with poor nutrient and water retention capacities. Sea buckthorn thrives on well drained, light to medium sandy loam and requires full sun.
- A minimum of 400 mm of annual precipitation is required to ensure good fruit yield.
- No Ontario fertility recommendations, moderate N, P, K requirements, pH >6.0 to 7.0
- Typical orchards have about 1400 to 2500 plants per hectare, with 1 male for every 7 female plants
- Hand harvesting of berries is very labour intensive. Mechanical harvesters are used in Europe. Berries may be either stored at low temperature (4 to 6°C, shelf life up to 2 weeks), or flash frozen if immediate processing is not feasible.
- Berries can be processed into a variety of products, including jelly, juice extracts and bread made from the pomice following juice extraction

Pests:
- Observed: Insects – tent caterpillars, gypsy moth, fruitworm; Diseases – None observed.
- Potential: Insects – aphids, leaf rollers, tick, scale, thrips, mites; Diseases – verticillium wilt, fusarium wilt, damping off, fusarium die-back, scab
- Some pest control products are available, contact OMAFRA specialists for more information
A sea buckthorn orchard in fruit. Sea buckthorn plants can grow into small trees.

Sea buckthorn fruits are produced very close to the stem and are labour intensive if harvested by hand.
SKULLCAP

**Common Names Include:** Skullcap, scullcap, mad dog weed, blue pimpernel, helmet flower, huáng qín  
**Variety Shown:** Baikal – other species and varieties available

**Latin Name:** *Scutellaria baicalensis* (Baikal skullcap), *S. laterifolia* (Virginian skullcap)

**Close Relatives:** No close relatives grown commercially in Ontario; distantly related to other members of the mint family such as mint, oregano, rosemary, sage, thyme, perilla

**Uses:** Roots of Baikal skullcap are use in traditional Chinese medicine to clear heat from the respiratory and digestive systems. Flowering tops of Virginian skullcap are used as a sedative and antispasmodic. It contains flavonoids which are considered valuable for improving liver function, anti-inflammatory, and anti-allergenic effects. **CAUTION:** Different skullcaps have very different medicinal uses. Know the species you are growing and confirm that you are growing the right skullcap for your intended market.

**Traditional Markets:** Herbalists, naturopaths, natural health product manufacturers, Traditional Chinese Medicine practitioners.

**Current Retail Price (As of Aug. 13th, 2009):** dried leaves $87.98/kg

**General Agronomics:**
- Direct seed after danger of frost has passed; does not transplant well but growers may be successful with minimal root disturbance. Transplanting may affect root shape of Baikal skullcap. Skullcaps are perennial.
- Rows 30-45 cm apart, in-row spacing 15-30 cm
- Virginian Skullcap tops are usually harvest twice, once when flowering begins and again in the fall. Baikal skullcap is grown for 3 to 4 years before roots are harvested for medicinal use.
- No Ontario fertility recommendations are available
- Most types require moist soil, but Baikal skullcap is more drought tolerant
- Harvest tops of Virginian skullcap by hand. Harvest Baikal skullcap roots by hand in the fall or spring after 3 or 4 years of growth. Automated harvest may be possible for both types.
- Virginian skullcap sold dried or occasionally fresh; Baikal skullcap usually dried.

**Pests:**
- No major pest problems have been observed. Occasional insect pests have been reported in other countries. Large scale production may increase pest pressures.
- No pest control products are currently registered.
Baikal skullcap is grown for its root, which is harvested after 3 or 4 years of growth. This photo was taken after 3 months of growth. Baikal skullcap has value as an ornamental plant.
RAINBOW SWISS CHARD

Common Names Include: Calico mixed Swiss chard

Latin Name: *Beta vulgaris* subsp. *cicla* var ‘Rainbow’, many other varieties also available

Close Relatives: Amaranth, Beet

Uses: Leaves used in salads, stir-fries, sautéed or in casseroles.

Traditional Markets: European, market garden vegetable

Current Retail Price (As of Aug. 13th, 2009): not available

Agronomics:
- A cool season, frost tolerant crop that should be planted in loose, deep, fertile soils that has lots of added organic matter, with a desired soil pH range of 6.0 to 7.0.
- There are no Ontario fertility recommendations for Swiss chard.
- For commercial growers, sow 3-4kg seeds/acre, with a row spacing of 45 cm, and in-row sow 10 seeds for 30cm and thin to 15 cm.
- Direct seed into ground when soil is 10-30°C for optimal germination in mid-April or early August.
- Hand harvested by cutting individual stalks using outside ones first.
- To store Swiss chard, field heat must be removed as soon as possible. A stored product may last 10-14 days at 0°C and a relative humidity of 95-100%.

Pests:
- Observed: None observed.
- Potential: *Insects*- leafminers, aphids, beet webworm; *Diseases* – beet mosaic virus.
- See the section “Spinach and Swiss Chard” in Publication 363 - *Vegetable Production Recommendations* for registered pest control products and more information, or consult an OMAFRA specialist.
Rainbow Swiss chard is grown solely for culinary purposes. The most intense colours are produced when the plants are large. This photo was taken 77 days after seeding.
TAH TSAI

Common Names Include:  Tah tsai, tat soi, rosette pak choy, wuta cai, spinach mustard, spoon mustard  Variety Shown: Wuta

Latin Name:  *Brassica rapa* var. *rosularis*

Close Relatives:  bok choy, turnip, cabbage

Uses:  Mixed salads and stir-fries

Traditional Markets:  East Asia

Current Retail Price  (As of Aug. 13th, 2009):  not available

General Agronomics:
- Tah tsai, like many Asian Brassicas, is sensitive to day length. When days are long it can bolt more rapidly. Late spring plantings may not reach a marketable size before bolting. Plant in early spring and again starting in July. Can tolerate moderate freezes.
- Mostly direct seeded due to short days to harvest, but transplanting may be possible
- Rows 45-60 cm apart, in-row spacing 20 cm or less depending on harvest size
- Can be harvested young (21 days after seeding) for baby tah tsai or at full maturity (45 days after seeding)
- Continuous planting and harvesting is possible, but will bolt rapidly in late spring and early summer
- No Ontario recommendations for N, P, and K are available; moderate to high N requirements
- Hand harvest during cool parts of the day to prevent wilting. Remove field heat as quickly as possible
- Can be stored for 1-2 weeks at 1°C with 90 to 95% relative humidity

Pests:
- Observed:  *Insects* - flea beetles, caterpillars, millipedes;  *Diseases* - unknown basal rot
- Potential:  *Insects* – aphids, cutworms, cabbage maggot, cabbage looper;  *Diseases* – downy mildew, fusarium wilt, root rot, damping-off, black root, scab, viruses
- Some pest control products may be available; contact an OMAFRA specialist for more information
'Wuta’ tah-tsai reached maturity 40 days after seeding. Tah-tsai is closely related to bok choy and has similar culinary uses.
TOMATILLO

**Common Names Include:** tomatillo, Chinese lantern, fresadilla, green tomato, husk tomato, jamberry, Mexican green tomato, miltomate

**Latin Name:** *Physalis* spp, including *P. philadelphica*, *P. ixocarpa*, and *P. aequata*

**Close Relatives:** tomatoes, peppers, potatoes, eggplant

**Uses:** Used sauces, salsas, and purees which typically accompany chilli or meat dishes. The husk can also be used in tamale and fritter dough to improve texture consistency.

**Traditional Markets:** Used in Mexican and Guatemalan cuisine.

**Current Retail Price (As of Aug. 13th, 2009):** $4.34/kg

**Agronomics:**
- Start seed indoors 6-8 weeks prior to last frost; transplant into final in-row spacing 35-60 cm and between-row spacing 40-75cm
- Plastic mulch and drip irrigation may be used to increase soil temperature, weed control and water infiltration
- 90-100 days to first harvest, optimal growing temperatures 24-32°C
- No Ontario fertility recommendations
- Hand harvest when fruits are firm and husk is papery
- Fruit can be stored in a cool, dry space at 12-15°C with 85-90% relative humidity

**Pests:**
- Observed: *Insects* – tarnished plant bug; *Diseases* – alternaria, unknown yellowing
- Potential: *Insects* – aphids, whitefly, fruitworm, leafminer, Colorado potato beetle, hornworm, cabbage looper, plant bugs; *Diseases* – anthracnose, verticillium wilt, powdery mildew, viruses, early blight, septoria leaf spot, bacterial spot/speck, late blight
- Some pest control products are available, contact OMAFRA specialists for more information
Tomatillos are similar to tomatoes but remain green and grow in a papery husk.

Tomatillos are mature when the husk starts to dry and the fruit begins to burst through the husk. The first tomatillos in our plot reached maturity 110 days after seeding in the greenhouse, 75 days after transplanting.
YARD LONG BEANS

**Common Names Include:** yard long beans, asparagus bean, snake bean, Chinese long bean, long-podded cowpea  **Varieties Shown:** Red Noodle, Green Noodle – many other varieties available

**Latin Name:** Vigna unguiculata subsp. Sesquipedalis

**Close Relatives:** cowpeas; Related to other members of the legume family: beans, peas, peanuts

**Uses:** Pods are cut into sections and used similar to green beans alone or in mixed dishes

**Traditional Markets:** Used in South-East Asian cuisines

**Current Retail Price (As of Aug. 13th, 2009):** $4.36/kg

**Agronomics:**
- Sensitive to frost – sow directly into the field when all danger of frost has passed and the soils have warmed in spring
- Yard long beans are tropical and require much higher temperatures than common beans: Optimal temperatures 25-35°C
- Row spacing 120-150 cm; In-row spacing 15-30 cm
- Plant height can reach 4 m; requires a sturdy stake or trellis
- No Ontario fertility recommendations. All beans are legumes and can fix their own nitrogen from the air. Inoculation with Rhizobium may be required. Low P and K requirements.
- 60 days to first harvest (longer in a cool summer) – continuous harvest required
- Daily hand harvest may be required under hot temperatures because beans grow rapidly. Harvest pods when they have reached their maximum length (40 – 70 cm) but before seeds start to fill pods
- Can be stored for 7-10 days at 4-7°C and 90-95% relative humidity

**Pests:**
- Observed: *Insects* – Leafhoppers; *Diseases* - none
- Potential: *Insects* – aphids, nematodes, thrips, mites, lygus bugs; *Diseases* – sclerotinia white mould, anthracnose, rust, viruses
- Pest control products are available, contact OMAFRA specialists for more information
‘Green Noodle’ yard long beans at the marketable stage. This photo was taken approximately 70 days from seeding. Fruit are continuously produced for a few weeks.

‘Red Noodle’ yard long beans at the marketable stage. Fruit were produced approximately 30 days later on this cultivar compared with ‘Green Noodle’.