



Growing Vegetables Organically

*Disease, Pest & Weed
Control Naturally*

George Bushell

Nine Helpful Organic Vegetable Growing Practices

1 - Using Compost

2 - Using Straw or Hay Mulch

3 - Crop Rotation

4 – Bio-diversity

5 - Inter-Planting

6 - Succession Planting

7 - Double Cropping

8 - Companion Planting

9 - Encouraging Beneficial Predators

Some Specific Disease & Pest Problems

***Blight, Fungus, Tomato Blossom End Rot, Cabbage Worms,
Root Maggots, Potato Beetles, Carrot Weevil, Carrot Rust Fly,
Leaf Minor, Powdery Mildew, Onion Nematodes***

Nine Organic Growing Practices

#1 Use plenty of compost:

- 1) Place as mulch in late June
 - Cools summer soil
 - conserves moisture
 - supplies nutrients
 - reduces weed growth
- 2) Dig into soil in late fall after growing season



Makes plants healthier & more resistant to disease & pests

#2 Use Straw or Hay Mulch*: - Conserves moisture

- May find free straw bales after Halloween
- Can produce some grain & weed growth



* e.g., Ruth Stout; "Gardening Without Work"

#3: Crop Rotation: reduces some diseases & insects

Rotate These Families:

- **Brassicas** (cabbage, cauliflower, broccoli, brussels sprouts, turnips, radish)
- **Solanaceous plants** (tomato, pepper, eggplant, potato)
- **Roots** (carrots, beets, parsnips)
- **Greens** (lettuce, endive, spinach)
- **Legumes** (beans, peas)
- **Cucurbits** (cucumbers, melons, squashes)
- **Corn, Sweet Potatoes, Herbs, etc**



#4: *Bio-diversity:*

- *reduces pest concentrations*
- *attracts more beneficial insects*



False
Sunflowers

99% of All Insects Are Beneficial Or Benign



Parasitic Wasps



Butterflies



Bees



Lady Beetle & Larvae



Ground Beetle

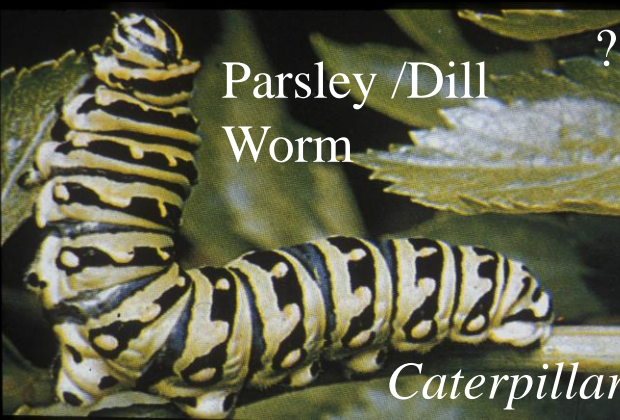


Tiger Beetle



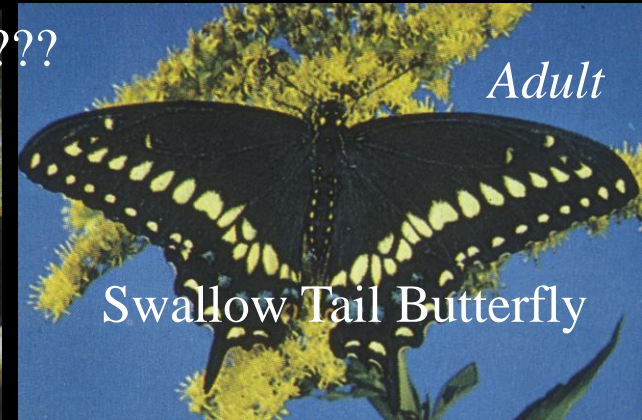
Rove Beetle

Not an Earwig –
has no split tail



Parsley /Dill
Worm

Caterpillar



Adult

Swallow Tail Butterfly



#5 Inter-Planting

*Raises bio-diversity
& can reduce pest
problems*

Increases Output

*Plant lettuce,
radishes & onions
between corn rows
and rows of peas*



#5 Inter-Planting - Example Results

Early Lettuce



**Succulent
onions**



**Mild and worm-
free radishes**

Sweet Corn

#6 Succession-Planting: - *prolongs harvest season*
- *reduces insect damage*
(only one planting affected
by insects)
- *evens out “feast or famine”*
syndrome



#6 Succession Planting - Example Corn

Only one planting, at most, affected by:



1-Corn Borer



2-Corn Earworm



Most plantings will
be damage free

Raccoons
may still be
a problem

Barbershop
human hair can
deter raccoons



*Electronic
Animal Pest
Repellers*
work as well



#7 Double Cropping

- Doubles output
- Matches plants to their desired weather
- Can reduce pest problems



1-Plant peas about middle of April, pick late June



2-Peas should be harvested by end of 1st week of July



Start brassicas seed outdoors ~Jun 15th

3-Transplant brassicas & plant Chinese cabbage seeds ~ July 10th in pea bed



Cauliflower & Chinese Cabbage

4-Harvest from Sept to Nov



After peak cabbage worm period



#8 Companion Planting



Marigolds
&
Cabbages



Some Claim:

- *marigolds discourage the imported cabbageworm butterfly*
- *nasturtiums repel striped cucumber beetles*
- *catnip foils flea beetles*

I have not found companion planting to be very successful - Ont Agr Dept (Kemptonville) study says we need ~95% companion plants before effective

#9 Encourage Other Beneficial Predators

Wren



Install Bird Houses

Bird Feeders

Bird Baths

Toads & Frogs

Birds

Birds feed larvae to their young

Toads & frogs eat larvae

Install Ponds, etc.



A Few Vegetable Specific Problems

*Blight, Fungus, Tomato Blossom End Rot, Flea Beetles,
Cabbage Worms, Root Maggots, Potato Beetles, Carrot Weevil,
Carrot Rust Fly, Leaf Minor, Powdery Mildew, Onion Nematodes,
Cut Worm, Tomato Hornworm*

Tomatoes

A close-up photograph of a woven basket filled with various tomato varieties. Several large, round, red tomatoes are scattered throughout. In the upper center, a small glass bowl contains several small, round, red cherry tomatoes. In the lower center, another small glass bowl contains several small, round, yellow cherry tomatoes. The tomatoes have a glossy, wet appearance with some water droplets on their skin. The background is dark and out of focus.

Grow Several Varieties For:

- Colour
- Maturity Time
- Size
- Flavour
- Disease Resistance

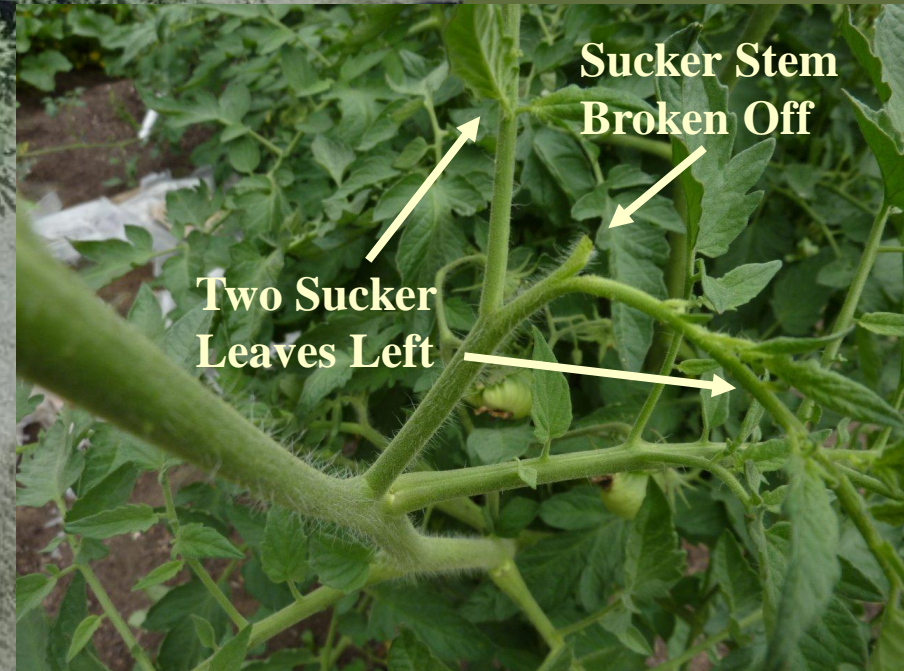
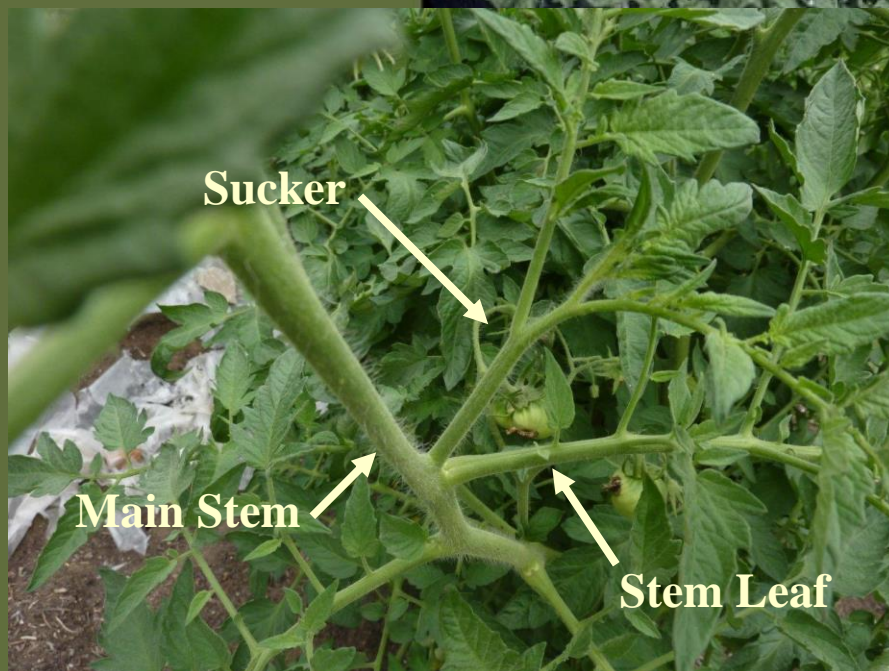
Warm weather plant;
start indoors Apr 1;
transplant outdoors
about May 15th

Protect Tomato Plants From Blight

(a fungal problem that thrives in dampness)



- Stake plants to keep them off the ground
- Plant single rows for good air circulation
- Water from below so not to wet leaves
- Leave two leaves on every sucker (to encourage young blight resistant growth)



Protect Tomato Plants From Blight

(a fungal problem that thrives in dampness)



- Use raised beds to keep surface soil warm & drier (discourages fungus growth)
- Cover surface with compost to keep fungus from popping to leaves during rain
- Keep plants far away from the ground & fungal blight if possible

*Ripe Tomatoes
from Early July
to Thanksgiving*

Sweet 100,
Sweet Million,
Sweet Chelsea
produce
clusters of
small sweet
tomatoes on
indeterminate
plants



Cut Worm Damage



**Protect stem with
aluminum foil**



Dig to find cutworm



Protect stem with toothpicks

Blossom End Rot



Can affect both green & ripe fruit



Can sometimes
affect Peppers
and Eggplant

Cause:

- *Lack of calcium*

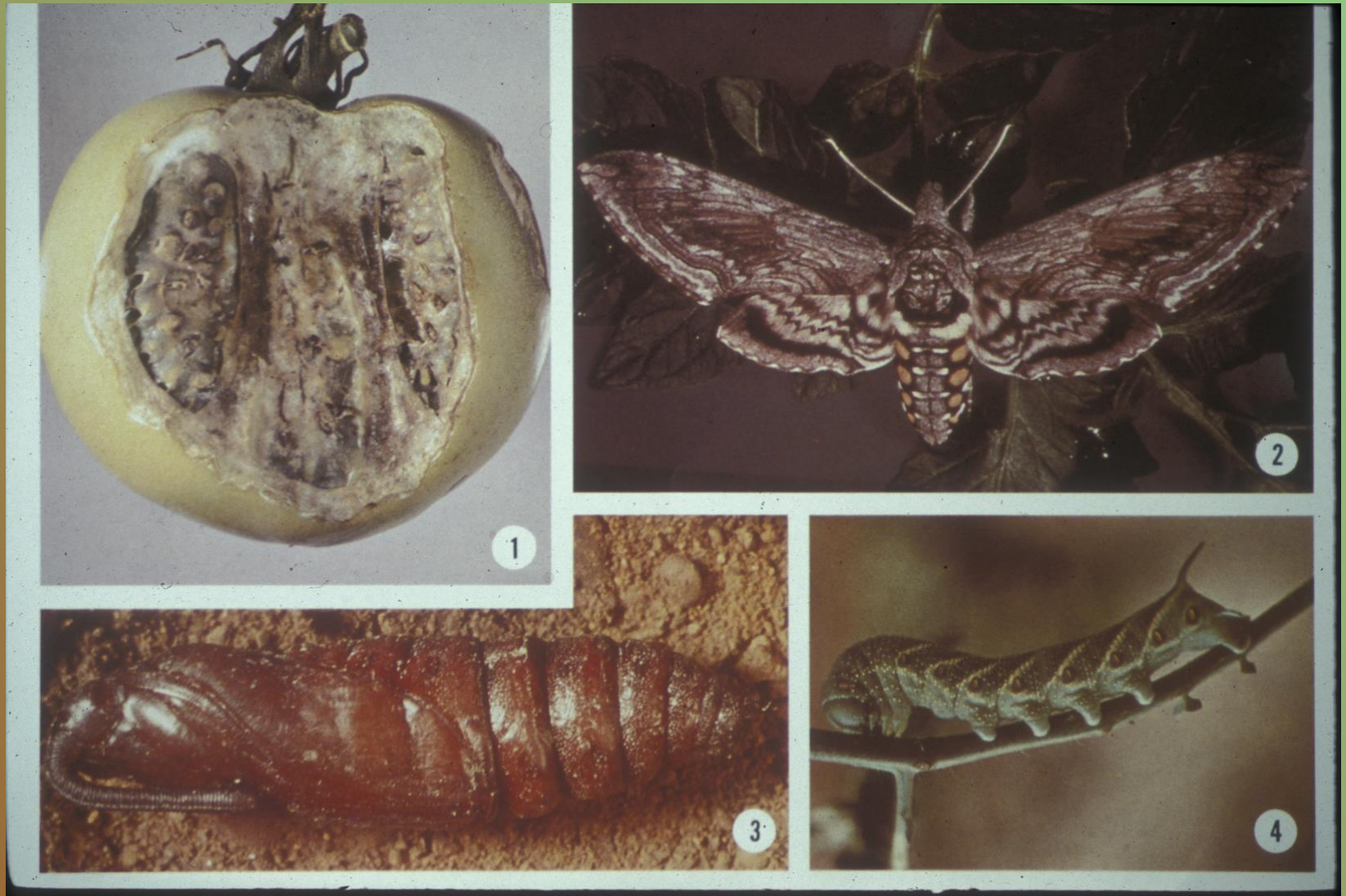
Resulting From

- *Uneven water supply*
- *Too much nitrogen*
- *Cold soil*

Solutions:

- *Water when there is insufficient rainfall*
- *Apply bonemeal to provide calcium*
- *Never apply nitrogen (compost excepted)*
- *Mulch ground in mid June to prevent the soil from drying out (earlier mulching can keep soil cold)*

Tomato Hornworm Damage Unusual in Ottawa*



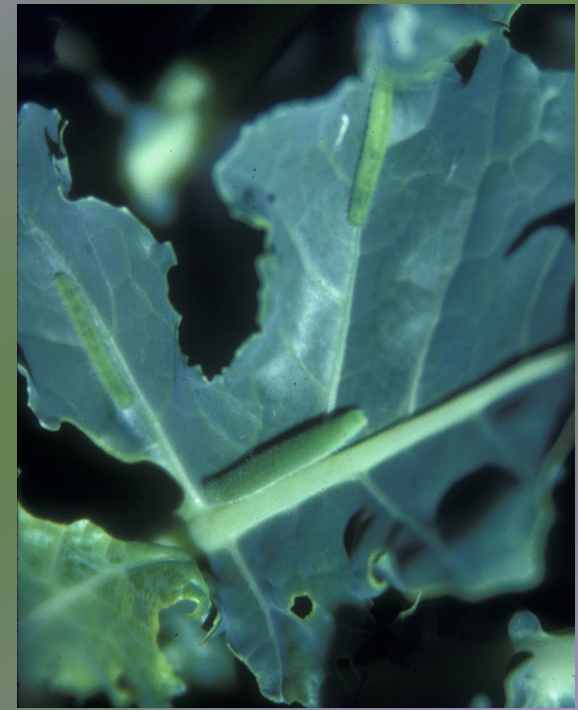
1 – Damage 2 - Adult Moth (~5") 3 - Pupa 4- Larva (~3")

* Federal Department of Agriculture

Imported Cabbage Worm



Butterfly lays eggs on most brassicas



Larvae do the damage
(June thru summer)



Cabbage, Broccoli & Cauliflower affected most



Kohlrabi affected least (Grand Duke)

Controlling Imported Cabbage Worms



Hand pick eggs and larvae



Marigolds unlikely to ward off butterflies



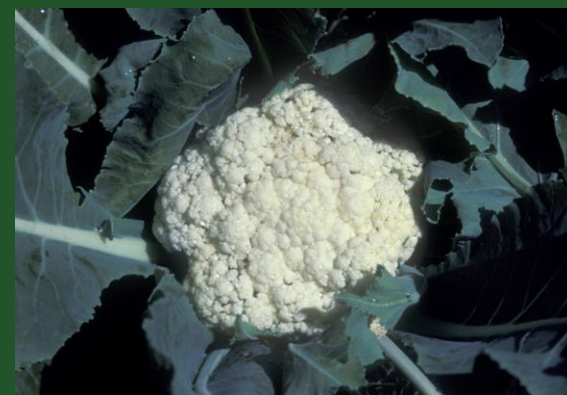
Floating row covers to prevent egg laying



bT to kill larvae



Cover cauliflower to prevent yellowing



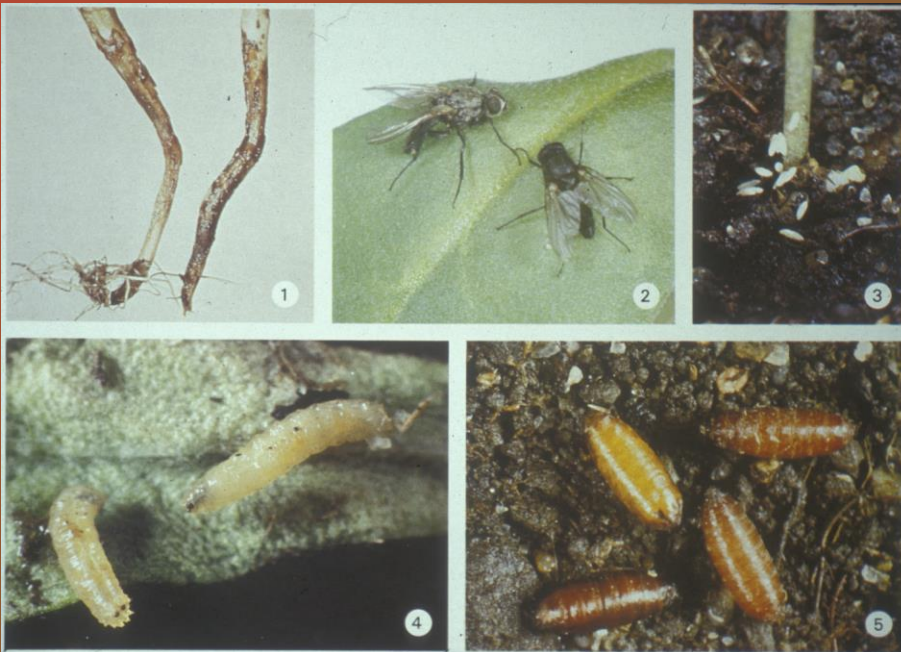
Bright white cauliflower

Root Maggots (two similar types)



Larvae damage brassicas, onions, radishes & turnips/rutabagas

Life Cycle



1-Root damage

2-Maggot fly

3-Larvae-

(most damage over
by June 10th)

4-Larvae-

5-Pupae

Federal Department of Agriculture

Root Maggots (control)



Cover storage onions & radishes with floating covers until early June



Plant winter turnips/rutabagas & brassicas after June ~15th (refer to Double Cropping for brassicas)



Re Early brassicas:
Obtain some cereal box cardboard



- Cut into 2" squares
- Create centre hole
- Cut slit from side to centre hole



Place cardboard around stem to prevent egg laying

Egyptian Onions

- Plant small bulbs from a few plants in September
- Harvest as green onions very early in spring
- Let a few plants mature for bulb planting in September

Little or no damage from root maggots



Onions Need To Dry Out for Winter Storage



Flatten
Plants In
August
To Help
Stems
Dry

Dried Onions

*Use at least
a 3 yr
rotational
planting
cycle*



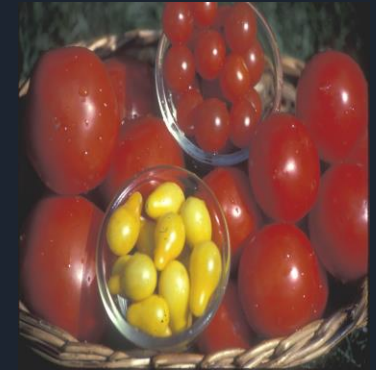
*Rotting during
winter storage
can be caused
by:*

- Mould,
- Asian nematodes
- Not sufficiently dried bulbs

Solution:

*Keep bulbs at
25-30C for ~4 days
before storing at 0C
(destroys mould,
bacteria,
nematodes)*

Colorado Potato Beetle



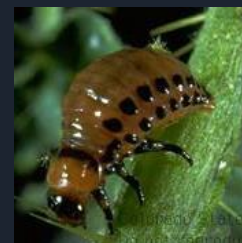
**Attacks: 1-potatoes, 2-eggplants, 3-peppers 4-tomatoes
(solanaceous/nightshade plant family)**



**Adults over
winter in
soil and
emerge in
June**



**Lays eggs on
underside of leaves**



**Larvae eat
plant leaves**

Colorado Potato Beetle (Control)



Hand pick adults, eggs & larvae



Check underside of leaves for eggs and destroy



Destroy larvae



Grow several varieties



-Peppers like moderate temperatures

-Originated at mid elevation on the eastern Andes



- Earwigs like to eat young plants/top leaves at night

Earwigs: Trap Them

Earwigs are nocturnal feeders that hide in crevices and confined areas during the day. Especially like to eat small plants & peppers.



Each female earwig can lay up to 60 eggs per season

Ottawa's species is from Europe

Came to Ottawa ~15 years ago

1-Crumple up pieces of newspaper



2-Place pieces of crumpled newspaper among affected plants



3-Shake newspaper pieces on a patio in the morning and do a dance –return the paper pieces to the plant area



4-Or, place pieces of cut hose among affected plants



5-Or, place the top of a container level with soil, half fill with water & add sardine oil, salmon oil, etc. to attract earwigs

Carrot Problems

Healthy
Carrots



Carrot Weevil Damage

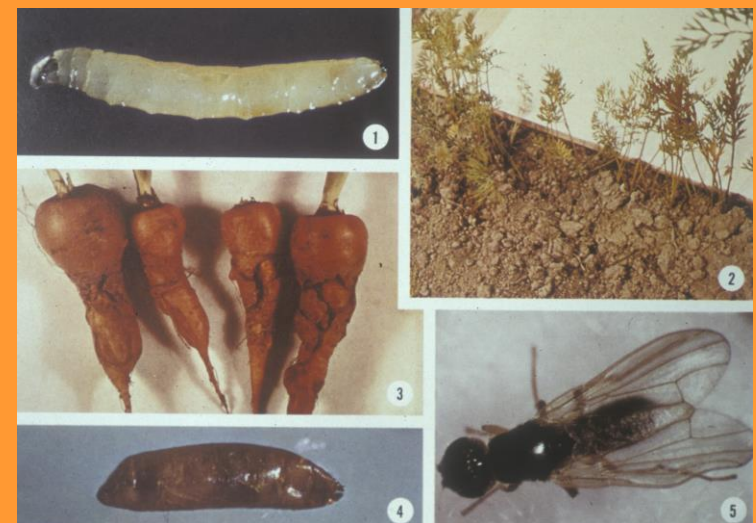
If problems,
plant in June
as eggs are
normally laid
before 1st of
June

Carrot Rust
Fly Damage



Carrot Weevil Life-Cycle

Agriculture
Canada



Carrot Rust Fly Life-Cycle

Growing Healthy Carrots



1-Planted & watered carrots



2-Cover 4 to 5 days for good germination



3-Apply 2" of compost for healthy growth after plants are 3 to 4 inches tall (like a cool soil)



4-Growing Carrots



5-Plant Winter Storage Carrots ~Jun 15

Leaf Minor Damage



Damaged Spinach Leaves

Plant Spinach early to prevent bolting

Protect with floating row cover (e.g., Remay Fabric)



Plant Swiss Chard for summer Greens (does not bolt to seed & is not affected by Leaf Minors)



Leaf Minor damaged beet leaves



Plant beets after June 15th to escape leaf minor damage & mature in cool fall weather

Powdery Mildew

Affects zucchini, squash, cucumbers and pumpkins in late summer and early fall



Early sign of mildew



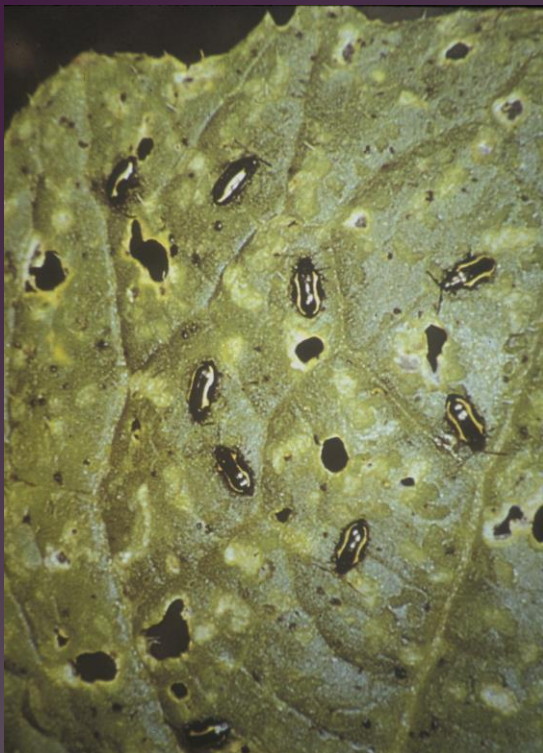
Buttercup Squash

- Do not water from above – keep plants as dry as possible as this fungus thrives in moisture**
- Green Earth Bordo Copper Spray can help**

Growing Green Beans



Flea Beetles



Most damage
done to Radish,
Eggplants &
young
Brassicas



Create a floating
row cover
e.g., Remay
Fabric)



Use natural
insecticidal soap



Spray with
Bacillus
thuringiensis
Kurstaki

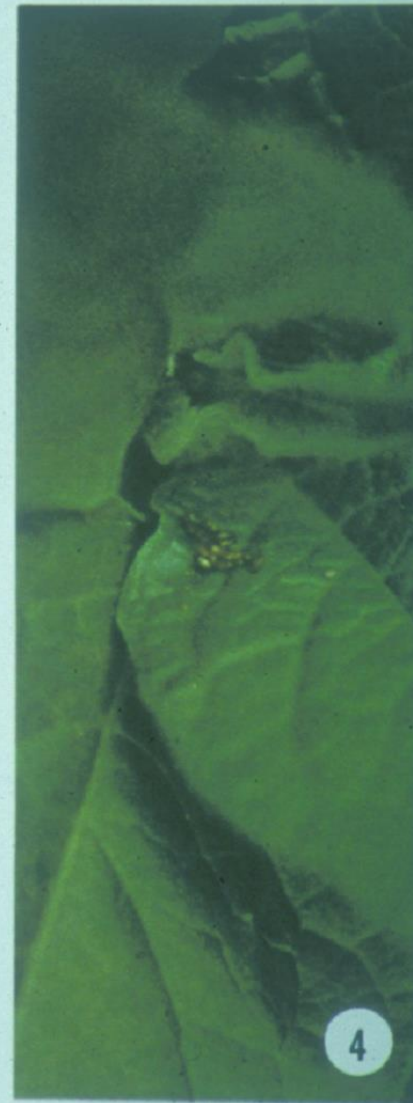
Striped Cucumber Beetle

Affects:

- Cucumbers
- Cantaloupe
- Watermelon
- Squash
- Pumpkins
- Zucchini



Cucumber Beetle Damage (Agriculture Canada)



1 – Adult 2 – Leaf damage 3 – Adults 4 – Eggs
(Roots damaged later by larvae)

Cucumber Beetle



Protect cucs with
Remay Fabric

When flowers appear remove fabric
covers to allow natural pollination



Male



Female



*Or remove fabric in the
morning, hand pollinate,
& replace fabric again*

*Move pollen from the male flower to the female flower
with a small brush or your finger*

Squash Bugs



**Summer squash is
not usually damaged**

**Winter Squash & Pumpkin
most susceptible**



Squash Bugs



Adult Squash Bug

**Adults over-winter in
previously infested areas**



**Squash bugs become active
during late spring/early
summer & lay eggs**



**Four generations of nymphs occur
throughout the summer / early fall**



**A few second generation adults develop in early fall
& over winter – nymphs do not over winter**

Adult Squash Bug



Squash Bug Control



Hand pick adults & nymphs



- Hand-pick/crush eggs



Keep base & vine area clear where squash bugs usually seek shelter



Apply organic Diatomaceous Earth / Pyrethrins around base of plants to eliminate hiding adults & nymphs



Organic Diatomaceous Earth / Pyrethrins

Fall Garden (less insects & diseases)



Leaf Lettuce

Green Onions

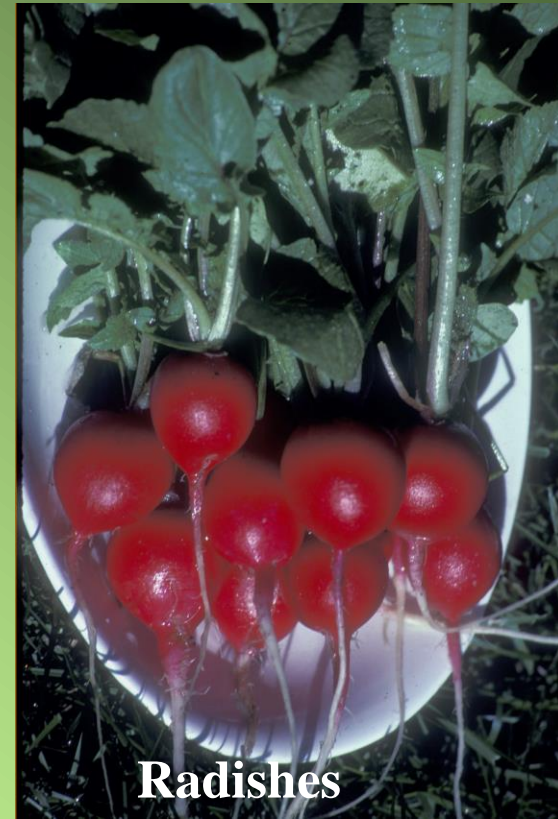


Plant a fall garden around
September 1st after harvesting
early corn / potatoes, etc



Spinach

Cool weather plants
will thrive until early
November – few
insect problems



Radishes

Other Fall Produce



Kale will not usually freeze until late November



Leave some Parsnips in the ground over winter for a spring harvest



Leeks thrive into the late fall



Most root crops & brassicas tolerate cold weather



***Watermelon
Cantaloupe***



Growing Watermelon & Cantaloupe in Ottawa



Start May 1st - keep soil 25 to 30C for germination – grow 2" from light source



Transplant in late May to raised hills



Do not disturb roots when transplanting



Add compost & cover with perforated poly to keep warm & protect from cool winds



Always irrigate with warm water



Remove cover & mulch with straw near end of June to conserve moisture & reduce weeds

Storing Watermelon & Cantalope



- Keep in fridge for 8 wks
- Separate watermelon & cantalope, if possible (melons produce ethylene)





***Have a
Watermelon
And
Wine Party***



***Everyone
Ranks the
Melons
(not the
Wine)***



Growing Sweet Potatoes in Ottawa

Georgia Jet Best Variety

Sweet potatoes are sub-tropical & belong to the Morning Glory family



Georgia Jet Best Variety



Place roots in warm water March 1st



Cut vines into 7" pieces & root in water ~ May 24th



Transplant to raised beds ~June 1st & cover with poly



If available, cover with perforated poly



Uncover at the end of June

*Starting
Sweet
Potatoes in
Ottawa*

* OR order slips from NB: <http://www.mapplefarm.com>

Harvesting Sweet Potatoes



Dig sweet
potatoes in
September
when weather
turns cool

Sweet potatoes usually grow in
clumps just below crown



From 2007
(they like heat)

Curing & Storing Sweet Potatoes



- After harvesting roots, keep moist and warm for 5 days (25 to 30C)
- A 60 watt trouble light and pans of water in the bottom of an old freezer with lid closed to within 1" works well
- Store at basement room temperature for rest of winter (about 15C - 17C)

