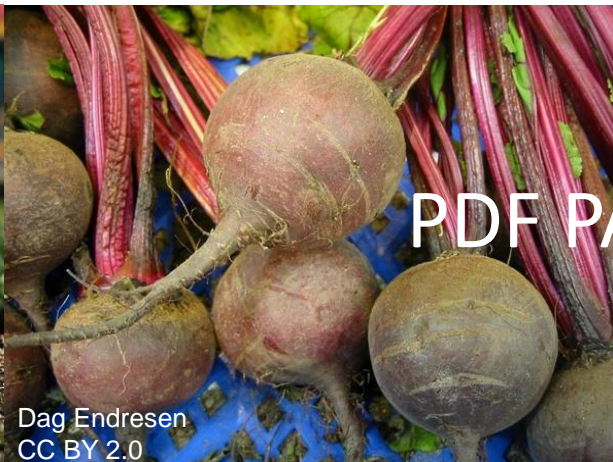


Cool Season Crops for Vegetable Gardens



PDF PART 2

Matt Jones

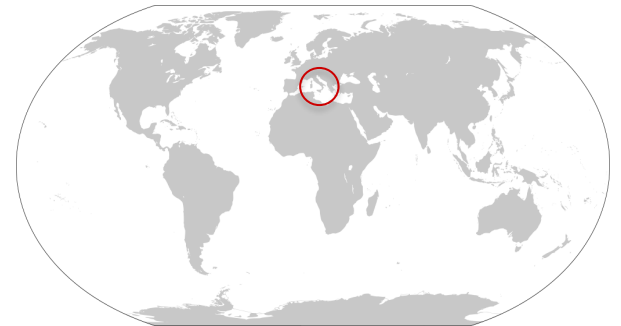
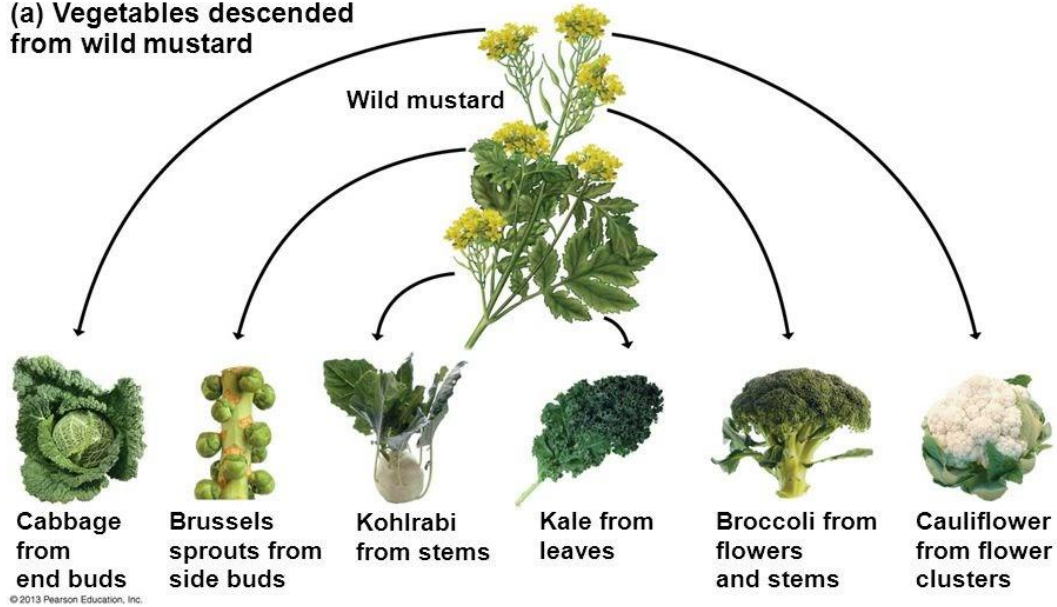
Horticulture Extension Agent
NC Cooperative Extension - Chatham County Center

Broccoli

Brassica oleracea var. *italica* (Brassicaceae)

Figure 1.13a

(a) Vegetables descended
from wild mustard



Relatives: Cruciferous crops (cabbage, mustard, etc.)

What you eat: Immature inflorescence

Planting Broccoli

Start Seeds Indoors

- ¼ in. deep
- Seed heating mat 65-85° F
- 4-6 weeks before planting

Transplants (purchased or grown yourself)

- August-September ideal
 - Spring (Feb-Apr) more prone to crown problems
- Plant as deep as root ball or pot
- 18-24" between plants, 3' between rows



Growing Broccoli

Fertilizer

- Soil Test
 - If unavailable, 2.5 lbs. 10-10-10 per 100 ft²
 - pH 5.8-6.5
- **Side Dressing**
 - 0.3 lb. actual N /100 ft. of row 4 weeks after transplant
 - = 3 lbs. of blood meal
 - = 2 lbs. of CaNO₃ (15.5-0-0)

Watering

- 1" per week equivalent
- Consistent moisture needed for crown development
- Moisten to a depth of 6 inches



Harvesting Broccoli

Harvest

- 50-90 days after transplant
- Main heads 3-6" diameter
- Cut 6" below top of head

Storage

- 45-50°F 7-10 days
- Freeze



Toshiyuki IMAI
CC BY-SA 4.0

Broccoli Cultivars (Calabrese)

Early Season

- 'Packman'
- 'Emerald Star'

Mid-Season

- 'Emerald Crown'
- 'Patron'

Late Season

- 'Greenbelt'
- 'Marathon'

Full Season

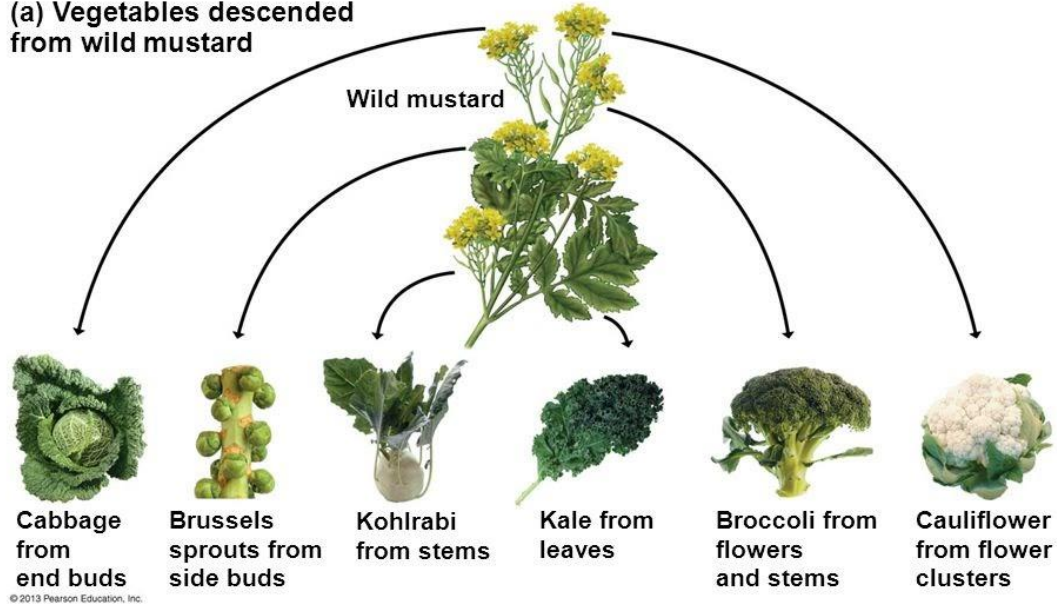
- 'Lieutenant'
- 'Belstar'
- 'Green Magic'

Cabbage

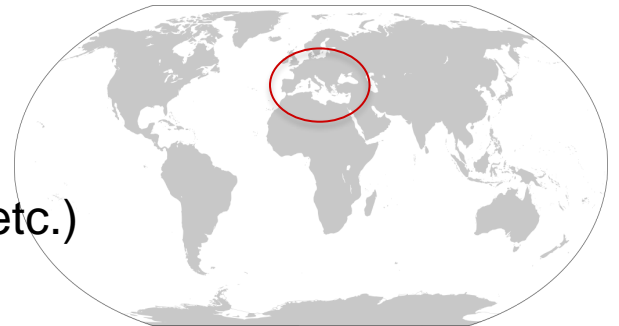
Brassica oleracea var. capitata (Brassicaceae)

Figure 1.13a

(a) Vegetables descended from wild mustard



Martin LeBar
CC BY-NC 2.0



Relatives: Cruciferous crops (broccoli, turnip, mustard, etc.)

What you eat: Leaves and large terminal buds

Planting Cabbage

Start Seeds Indoors or Direct Seed (Fall)

- ¼ in. deep
- Seed heating mat 45-85° F
- 6 weeks before planting
- <https://go.ncsu.edu/veggieseedresources>

Transplants (purchased or grown yourself)

- Feb to Mid-Apr, Mid-Jul to Mid-Sep
- Plant as deep as root ball or pot
- 18-24" between plants, 3' between rows



Growing Cabbage

Fertilizer

- Soil Test
 - If unavailable, 1.5 lbs. 10-10-10 per 100 ft²
 - pH 5.8-6.5
- **Side Dressing**
 - 0.3 lb. actual N /100 ft. of row 4 weeks after transplant
 - = 3 lbs. of blood meal
 - = 2 lbs. of CaNO₃ (15.5-0-0)

Watering

- 1" per week equivalent
- Consistent moisture needed for head development
- Moistened to a depth of 6 inches



Harvesting Cabbage

Harvest

- 50-80 days after transplant
- When heads are of useable size for cultivar
- Cut below a few loose leaves
- Prone to splitting if harvested too late or too much moisture
- Remove from sunlight ASAP

Storage

- 34°F up to five months
- Ferment into sauerkraut or kimchi



https://go.ncsu.edu/fermentation_pickling



Cabbage Cultivars

Green

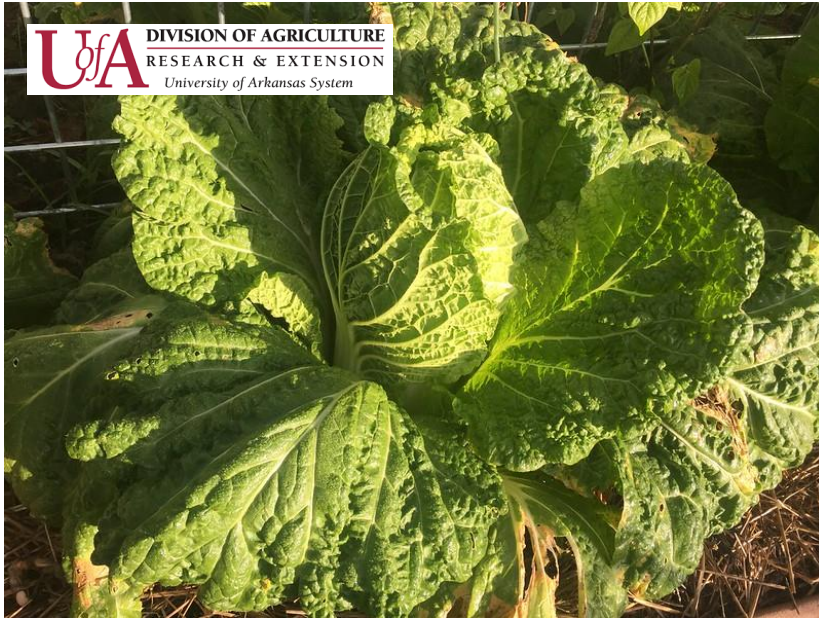
- 'Bravo'
- 'Blue Thunder'
- 'Early Jersey Wakefield'
- 'Platinum Dynasty'
- 'Thunderhead'

Red

- 'Cardinal'
- 'Red Dynasty'
- 'Red Rookie'
- 'Ruby Perfection'

Chinese Cabbage

Brassica rapa subsp. (Brassicaceae)



Napa Cabbage

B. rapa subsp. *pekinensis*

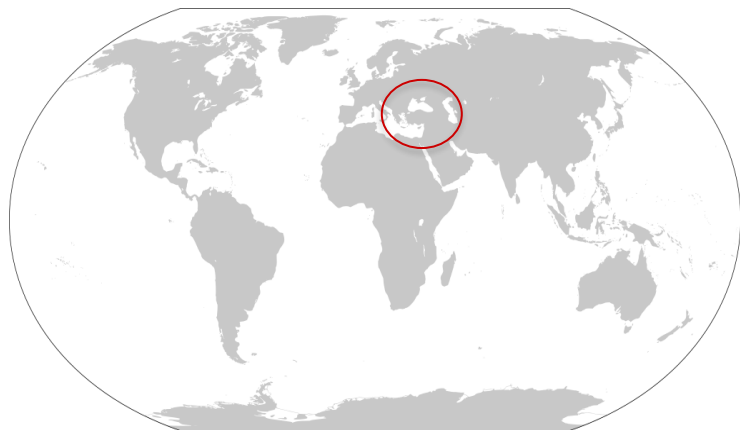


Bok choi, Pak choi, etc.

B. rapa subsp. *chinensis*

Kale

Brassica oleracea vars. (Brassicaceae)



Relatives: Cruciferous crops (cabbage, mustard, etc.)

What you eat: Leaves

Growing and Harvesting Kale

Direct Seed or Transplant

- Mid Feb. to June, Late Aug to mid Oct.
- Seeds: 1-2" apart; 1/2" deep (or scatter!)
- Grow as baby green or to mature leaf size

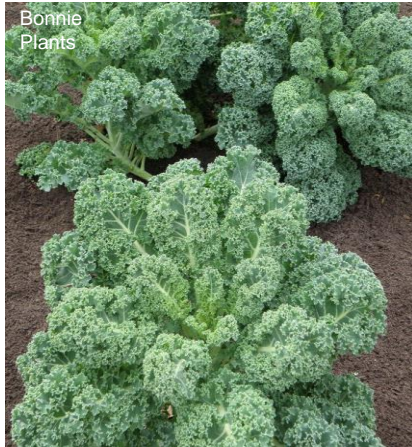
Harvest

- Seeds mature in 40-60 days
- Re-sow every 2-4 weeks
- Harvest when 4-6" tall

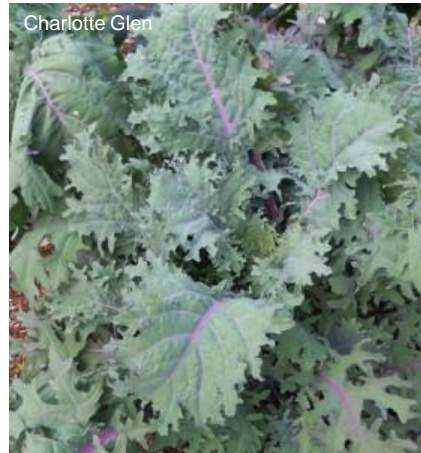


Types of Kale

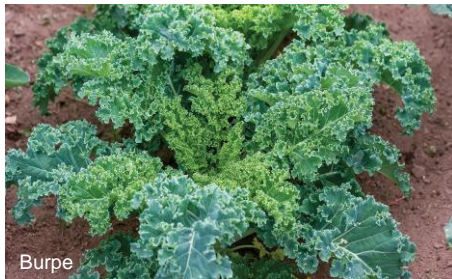
'Winterbor'



More flavorful but less cold-hardy varieties



Classic cold-hardy varieties



'Red Russian'

'Toscano'

'Dwarf Blue Curled Vates'

- Frost improves flavor in most varieties
- Leaves may be damaged in extreme cold, but plants recover

Caterpillar Pests of Cole Crops



Imported Cabbageworm
Pieris rapae



Cabbage Looper
Trichoplusia ni

Caterpillar Pests of Cole Crops



Cross-striped Cabbageworm
Evergestis rimosalis



Diamondback Moth
Plutella xylostella

Caterpillar Pests of Cole Crops

Hosts

- Cruciferous vegetables

Signs & Symptoms

- Windowpane chewing patterns on the undersides of leaves (young larvae)
- Chewing hole (older larvae)
- Frass (droppings)

Management

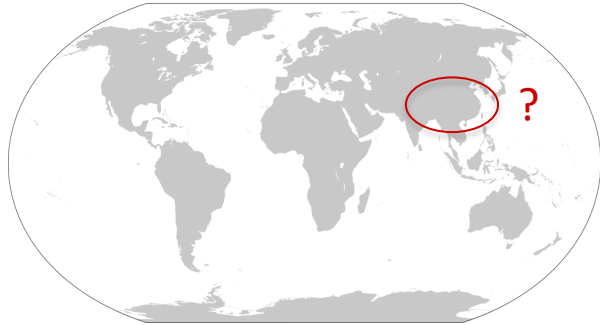
- Handpick
- Floating row covers
- *Bt kurstaki*



Charlotte Glen
NC State University Extension

Radish

Raphanus raphanistrum var. *sativus* (Brassicaceae)



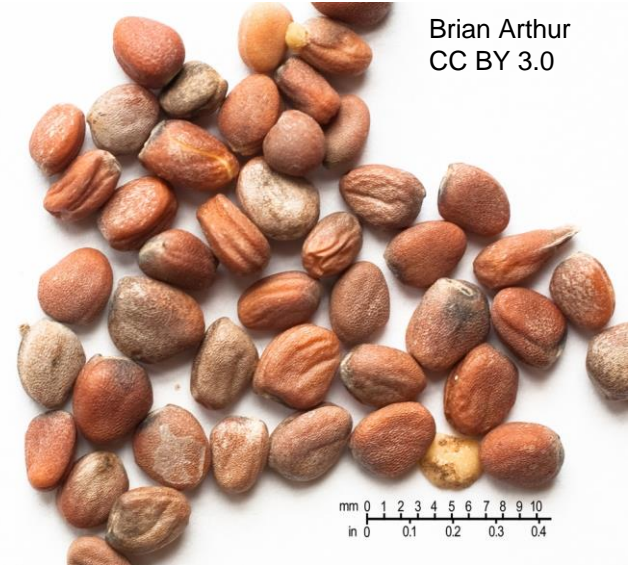
Relatives: Cruciferous crops (mustards, etc.)

What you eat: Storage roots, leaves

Planting Radish

Direct Seeding

- Feb. to June, Aug. to mid-Sept.
- ½ “ deep
- 1” between seeds, 1-2’ between rows
- Thin to 2-3” spacing when at two true leaf stage
- Germinate in a few days
 - Test for compost
- Plant every 7-10 days for continuous harvest



Growing Radish

Fertilizer

- Soil Test
 - If unavailable, 1.5 lbs. 10-10-10 per 100 ft²
 - pH 5.8-6.5

Watering

- 1" per week equivalent
- Consistent moisture needed for root development
- Water stress: tough and poor flavor

Harvesting and Storage

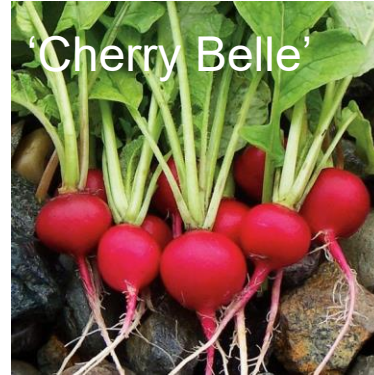
- Ready in 20-25 days
- $\frac{3}{4}$ - 1" diameter
- Remove leaves, refrigerate up to two weeks



Radish Cultivars

European or “Spring” Radishes

- ‘Bacchus’
- ‘Cherry Belle’
- ‘Red Flame’
- ‘Scarlet Globe’



Daikon and Storage Radishes

- ‘April Cross’
- ‘Long Black Spanish’
- ‘Everest’



Beets

Beta vulgaris subsp. vulgaris (Amaranthaceae)



Relatives: Chard, spinach, amaranth, quinoa

What you eat: Storage roots, leaves

Planting Beets and Chard

Direct Seeding

- Mar. to Apr., Aug. to Mid-Sept.
- Soak for 24 hours, plant ½ -1' deep
- 1-2" between , 10-30' between rows
- Thin to 3" spacing when 3-4" tall



Growing Beets and Chard

Beets need full sun!

Fertilizer

- Soil Test
 - If unavailable, 1 lb. 10-10-10 per 100 ft²
 - Side-dress 0.5 b blood meal 4-6 weeks after planting
 - pH 5.8-6.5

Watering

- 1" per week equivalent
- Consistent moisture needed for root development

Harvesting and Storage

- Beets: 50-70 Days, ≤ 2 " diameter
- Chard: at useable size. Multiple harvests



Beet Cultivars

Beets

- 'Red Ace'
- 'Ruby Queen'
- 'Bull's Blood'(Greens)

Spinach

- 'Bloomsdale Long Standing'
- 'Early Hybrid #7'

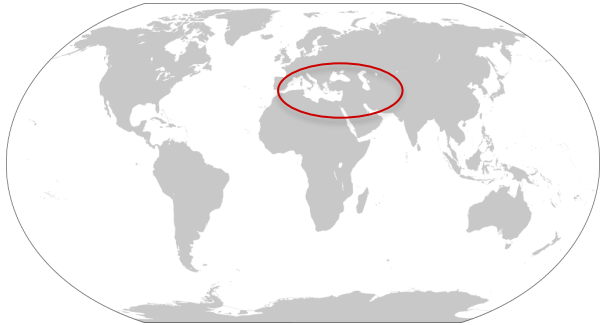


Chard

- 'Lucullus'
- 'Fordhook Giant'
- 'Rainbow Chard'

Carrots

Daucus carota subsp. *sativa* (Apiaceae)



Forest and Kim Starr
CC BY 3.0



Relatives: Parsnip, parsley, coriander, dill, celery, fennel, cumin

What you eat: Storage roots

Planting Carrots

- Feb. to Mar., Mid-June – Mid-Sep.
- Plant ¼- ½” in rows, 12-18” between
- Thin to 2-3 in. by cutting when seedlings 2 in. tall



Growing Carrots

Fertilizer

- Soil Test
 - If unavailable, 1.5 lbs. 10-10-10 per 100 ft²
 - pH 5.8-6.5

Watering

- 1" per week equivalent
- Consistent moisture needed for root development
- **Reduce watering near harvest time**



Weed carefully!

Harvesting Carrots

Harvest

- 75-80 days after planting
- $\frac{3}{4}$ in.-1 $\frac{1}{4}$ in. diameter at shoulder

Storage

- Remove greens!
- Refrigerator for several weeks
- In ground for 2 months



Peterson Garden Project

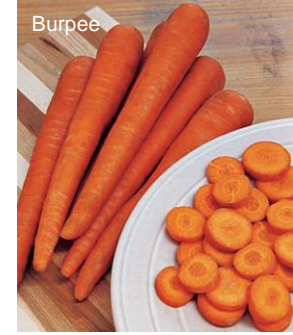
Carrot Cultivars



Imperator



Chantenay



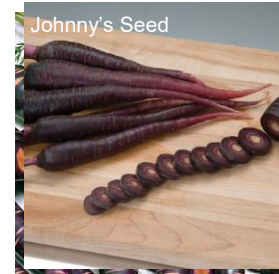
Danvers



Nantes



Oxheart



Deep Purple

Carrot Problems



Aster Yellows

Virus spread by leafhoppers

Kyle Kittelberger Bugguide.net



Macrostelus quadrilineatus



Root-Knot Nematodes



Parsley Worm

= Swallowtail
Leave it alone!



Onions

Allium cepa (Amaryllidaceae)

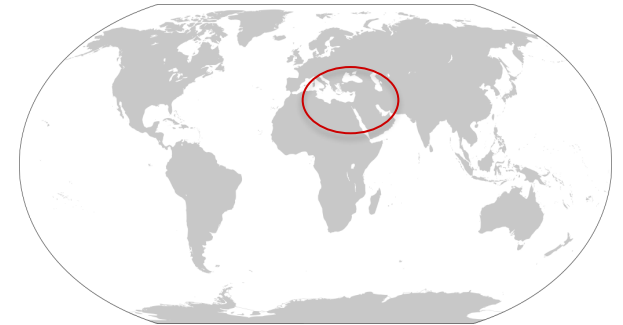
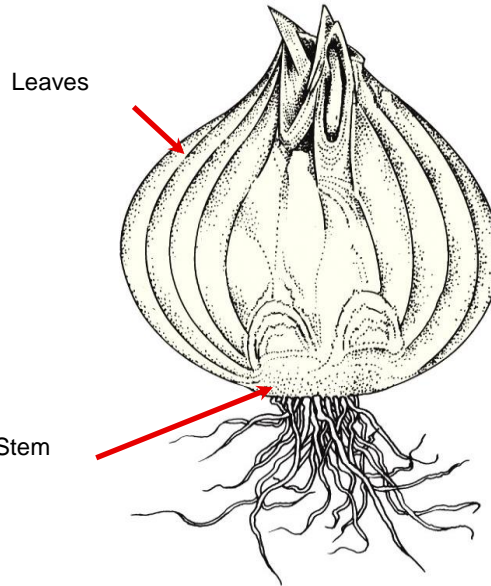


Figure 25-47a
Raven Biology of Plants, Eighth Edition
© 2013 W.H. Freeman and Company

Relatives: Garlic, leeks, chives, shallots

What you eat: Storage leaves (bulb), green leaves (scallions)

Planting Onions

Direct Seed

- August-March (Bulb)
- Sept., Feb. to Mar. (Scallions)
- ½ " deep, 1" in row, 1-2' between rows
- Thin to 3" spacing for bulbs, harvest others as green onions

Onion Sets (Bulbs for Transplanting)

- March
- 3" spacing, planted 1.5" deep



Growing Onions

Need full sun!

Fertilizer

- Soil Test
 - If unavailable, 1 lbs. 10-10-10 per 100 ft²
 - pH 6.0-6.5
- **Side Dressing (bulb)**
 - When plants are about 12' tall
 - 0.5 lb. 10-10-10 or organic equivalent
 - 1.5 Tbsp sulfur per 100 ft²

Watering

- 1" per week equivalent
- Stop watering a week before expected harvest (bulb)



Harvesting Onions

Harvest

- 60-80 days after planting
- Harvest when $\frac{3}{4}$ of leaves fallen over
- Harvest in morning, leave on surface until afternoon
- Cut off all but top 1.5 in. of leaves

Storage

- Cure outside 2-3 weeks
- Knock off soil
- Store in cool, dry place



Types of Onions

Bulb Onions

- Bulb formation induced by changes in day length
- Long Day
 - Northern climates only
 - Store well
- Short Day
 - Best for NC
 - Sweeter
 - Do not store well
- Intermediate Day
 - Sweeter than long day
 - Can grow in NC

Green Onions

- Harvest leaves before bulb formation
- Any variety can be grown for green tops
- Some bred for green tops

Onion Cultivars

Short Day

- ‘Granex Yellow’
- ‘Texas early Grano 502’
- ‘Texas Grano 1015Y’

Intermediate Day

- ‘Hiball’

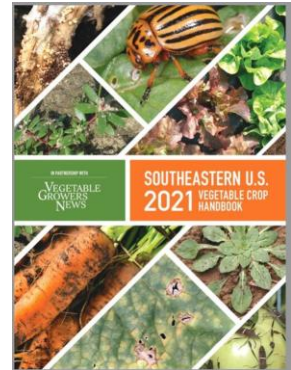


Green (Scallions)

- ‘Beltsville Bunching’
- ‘Evergreen Bunching’
- ‘Ishikura Improved’

Many vegetable cultivars:

<https://go.ncsu.edu/seveggiehandbook>



Onions Problems

Onion Thrips

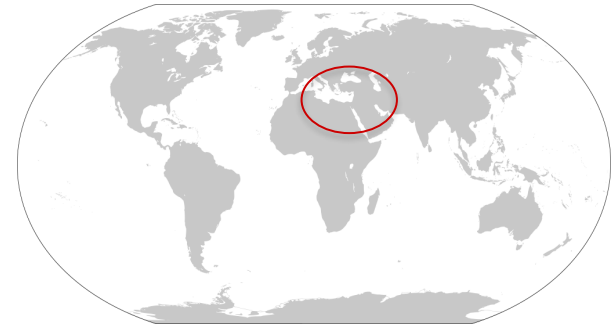


Onion Maggots



Garden (English) Peas

Pisum sativum vars. (Fabaceae)



Relatives: Austrian winter pea, beans, southern peas; redbud, *Baptisia* (distant)

What you eat: Immature pods, seeds

Planting Peas

Direct Seeding

- Jan. – Mar.
- Fall planting challenging
- 1' deep, 1-2" apart
 - Double rows
- Simple Trellis (3-4')
- Plant every 3 weeks
- Optional: soak 6-8 hours
- Optional: *Rhizobium leguminosarum* inoculant



Cory Tanner, ©2010 Clemson Extension SCT

Growing Peas

Fertilizer

- Soil Test!
 - pH 6.0-6.5
 - Lacking test, 1.5 lbs. 10-10-10 per 100 ft²

Watering

- 1" per 10 days equivalent
- Need well draining soil



Rasbak
CC BY-SA 3.0

Harvesting Peas

Harvest

- 55-80 days after planting
- Two-hands!
- **Garden:** pods plump, before seeds visible or pod is yellow.
- **Snap:** pods plump and 2-3" seeds small (<50%)
- **Snow:** pods flat, seeds tiny

Storage

- Eat, freeze, or can ASAP
- Fresh: 2-3 days in fridge
- Allow garden peas to dry on pod and shell



Pea Cultivars

Garden

- 'Alaska'
- 'Mr. Big'
- 'Maestro'
- 'Green Arrow'
- 'Novella'
- 'Wando'
- 'Lincoln'

Snap

- 'Sugar Super Snap'
- 'Sugar Bon'
- 'Early Snap'

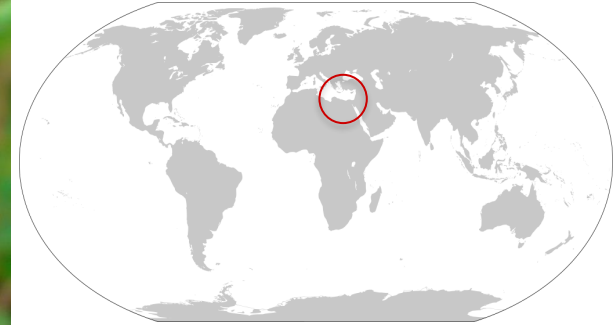
Snow

- 'Snowbird'
- 'Oregon Sugar Pod II'
- 'Dwarf Gray Sugar'

Lettuce

Lactuca sativa (Asteraceae)

pfaf.org



Relatives: Cruciferous crops (broccoli, turnip, mustard, etc.)

Pl. 194. *Lactuca virosa*. *Lactuca virosa* L.

Types of Lettuce



Loose Leaf Varieties

- 'Simpson Elite'
- 'Red Sails'
- 'Prizeleaf'
- 'Oak Leaf'

Romaine a.k.a. Cos

- Upright, tighter heads
- Leaf bases more flavorful

Butterhead a.k.a. Bibb

- Attractive yellow-green leaves
- Good flavor
- 'Tom Thumb' miniature and grows quickly

Growing and Harvesting Lettuce

- Feb-Mar., Aug.-September; survives to 30 F
- Plant densely 2-3" apart in containers
 - Romaine and buttercrisp – 8" spacing
- Seed: ¼ in. deep
- Use fresh seed – does not store well
- Even watering critical

Loose Leaf Varieties

Cut with scissors (1" above soil) in about 30 days

- Should be about 5-6 in. tall
- 2-3 successive cuttings possible
- Plant every 2-3 weeks for continuous supply until frost



Lettuce Problems

- No tolerance for hot weather
- Poor competitor against weeds
- Tip burn

Insects:

- Cabbage looper and other caterpillars (B.t., hand pick)
- Aphids (insecticidal soap)

Diseases:

- Stem and root rots, leaf gray molds



NC STATE

EXTENSION

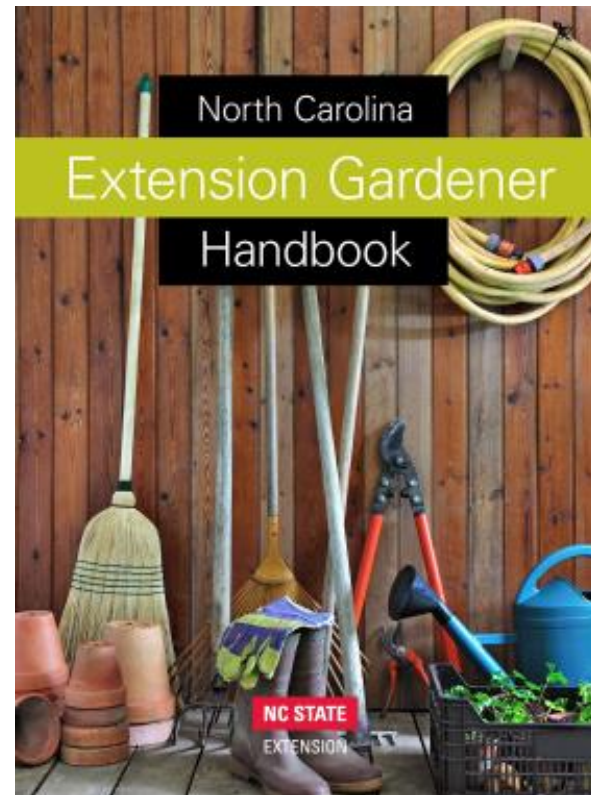
NC Extension Gardener Handbook

<https://go.ncsu.edu/eg-handbook>



Free Online!

Hard copy – UNC Press (\$60)



**NC STATE
UNIVERSITY**

Extension Gardener

Plant Toolbox



<https://plants.ces.ncsu.edu/>

Select

‘Find a Plant’ -> ‘Resistance to Challenges’ -> Deer

The screenshot shows the homepage of the NC State Extension Gardener Plant Toolbox. The header features the NC State Extension logo and a banner for the North Carolina Extension Gardener Plant Toolbox. The main navigation includes Home, Find a Plant, Identify a Plant, Design Gallery, Help, Give Now, and Contact. A search bar is located in the top right corner.

Home

The North Carolina Extension Gardener Plant Toolbox contains detailed descriptions and photographs of 4,522 plants that grow in and around North Carolina.

Here are some tips to get you started

Search by scientific or common name:

Search Search

Use [Find a Plant](#) to select the perfect plant for a specific location.

Use [Identify a Plant](#) to determine the name of a plant based on leaf and flower characteristics.

Looking for help?

Have a look at the [Help](#) page to get tips on using the Plant Toolbox, and be sure to check the [Glossary](#) for plant identification terms.

We are diligently working to populate all the data in this new plant database. Please be patient with us as not all features will be fully functional and accurate until this work is complete.

The NC State Extension Gardener Plant Toolbox is based on evaluation of plant databases around the world, surveys of Extension agents, Extension Master Gardener volunteers (EMGVs) plant database users, and focus groups. Based on themes gathered from this data we have created an innovative tool for

Our Partners

NC State Partners

- College of Natural Resources
- Forestry & Environmental Resources
- Herbarium
- Horticultural Science
- JC Raulston Arboretum
- Master Gardener Volunteers
- The Natural Learning Initiative
- NC Sea Grant
- NC State Extension
- Plant Disease and Insect Clinic

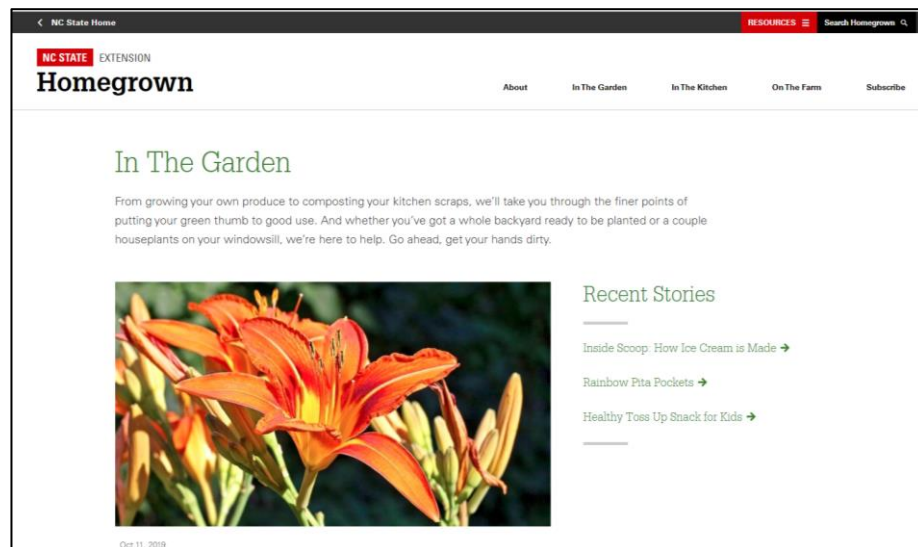
Additional Partners

- NC's Champion Big Tree Database
- NC Forest Service

NC State Extension Homegrown

<https://homegrown.extension.ncsu.edu>

- In the Garden Videos
- In the Kitchen Videos
- On the Farm Videos



Need Help with Vegetable Problems?

NC STATE

EXTENSION

Master Gardener | Chatham County

Plant Clinic: MW 1:00-4:00, F 9:00-12:00

chathamemgv@gmail.com

919-545-2715

(Except during COVID-19, email is preferred)

Send us your problems!

Questions we may ask:

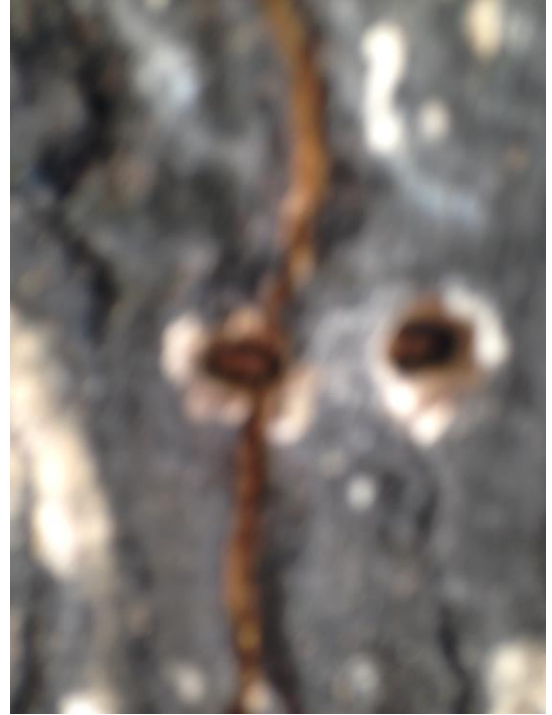
- Crop and cultivar
- Describe signs and symptoms
 - Include photos!
- When you started noticing problems
- Cultural conditions
 - Light, soil, water, planting time etc.



Send Us *Good* Photos!

Photos should:

- Include healthy and unhealthy parts
- Have a scale object
- Be in focus
- Show an up-close image
- Show the whole plant
- The more, the better



Diagnosis: cataracts?

Thank you!

matt_jones@ncsu.edu