

Fall and Winter Hoopouses ©Pam Dawling 2015

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This presentation covers

- ❖ Overview of the hoophouse in fall and winter
- ❖ Tables of cold-hardiness
- ❖ Suitable crops for fall and winter
- ❖ Scheduling
- ❖ Tasks and challenges: Winter hoophouse tasks, Irrigation, Soil fertility, crop rotations, Cold weather pests, Persephone Days and Nitrate accumulation
- ❖ Resources and my contact info

- Our hoophouse keeps night time temperatures about 7F warmer than outdoors, sometimes 10F.
- Plus, plants tolerate lower temperatures – it seems to be the night+day average that counts.

Cold-hardiness table for hoophouse crops

Some starting numbers of **outdoor killing temperatures**, although your results may vary.

- **35°F (2°C):** Basil.
- **32°F (0°C):** some pak choy, peppers, tomatoes.
- **25°F (-4°C):** Chinese Napa cabbage, endive (hardier than lettuce, Escarole more frost-hardy than Frisée), large leaves of lettuce (protected hearts and small plants will survive even colder temperatures), some mustards and Asian greens (Maruba Santoh, mizuna, most pak choy, Tokyo Bekana), some onion scallions
- **22°F (-6°C):** Some arugula, tatsoi (both have varieties which survive much colder than this).
- **20°F (-7°C):** Some beets, celtuce (stem lettuce), Tendergreen, Tyfon Holland greens, radishes, turnips with mulch or rowcover to protect them (Noir d'Hiver is the most cold-tolerant variety).
- **15°F (-9.5°C):** Some beets (Albina Verduna, Lutz Winterkeeper), beet leaves, endive, fava beans (Aquadulce Claudia), Russian kales, kohlrabi, Komatsuna, some lettuce, especially small and medium-sized plants (Marvel of Four Seasons, Rouge d'Hiver, Winter Density), parsley, Asian winter radish (including daikon), large leaves of broad leaf sorrel, turnip leaves, winter cress.
- **12°F (-11°C):** Some carrots (Danvers, Oxheart), most collards, some fava beans, Senposai, some turnips (Purple Top).
- **10°F (-12°C):** chard (green chard is hardier than multi-colored types), Belle Isle upland cress, some endive (Perfect, President), perhaps Komatsuna, Asian winter radish (including daikon) with mulch or rowcover for protection, large leaves of savoyed spinach (more hardy than flat leafed varieties), most tatsoi, Yukina savoy.
- **5°F (-15°C):** Some kale (Winterbor, Westland Winter, perhaps Blue Ridge), some leeks (Bulgarian Giant, Laura, Tadorna), some bulb onions (Walla Walla), smaller leaves of savoyed spinach and broad leaf sorrel, a few unprotected lettuces if small (Winter Marvel, Tango, North Pole, Green Forest).
- **0°F (-18°C):** Chives, some collards (Blue Max, Winner), corn salad, Vates kale (although some leaves may be too damaged to use), Even' Star Ice-Bred Smooth Leaf kale, a few leeks (Alaska, Durabel), some onion scallions (Evergreen Winter Hardy White, White Lisbon), salad burnet, salsify, some spinach (Bloomsdale Savoy, Olympia, Tye).

Remember these are outdoor temperatures. It's warmer inside!

- **In the hoophouse** (7F warmer than outside), plants can survive 14F colder than outside without extra rowcover, 21F colder than outside with thick (1.25ozTypar/Xavan) rowcover.

A test year: Lettuce, Mizuna, Turnips, Russian kales, Senposai, Tye spinach, Tatsoi, Yukina Savoy survived a hoophouse temperature of 10.4°F without rowcover, -2.2°F with. Brite Lites chard got frozen leaf stems.

- For a complete list of cold-hardy crops indoors and out, see my slideshow *Cold-hardy Winter Vegetables on SlideShare.net*

Salad Crops

- **Lettuce heads** may survive an occasional dip to 10°F (−12°C) with inner rowcover
- **Lettuce varieties for fall and winter:** Brune d’Hiver, Cocarde, Esmeralda, Galactic, **Green Forest**, Hyper Red Wave, Kalura, Lollo Rossa, **North Pole**, Red Tinged Winter, Rossimo, Rouge d’Hiver, Sunfire, **Tango**, Vulcan, **Winter Marvel**
- **Baby lettuce mix, Small-leaf lettuces:** Osborne’s Multileafs, Johnny’s Salanovas, Tango, Oscarde, Panisse.
- Many **cooking greens** can be used as salad crops while plants are small.
- Several **small greens** are very winter-hardy: Arugula, parsley, Belle Isle upland cress, winter purslane, salad burnet and mache (corn salad)

Fall and Winter Hoophouse Crops

- **Leafy cooking greens:** Spinach, Napus kales (Russians, Siberian), Swiss chard, Asian greens: senposai, komatsuna, Napa and Michihili Wong Bok cabbage, Tokyo Bekana, Muruba Santoh, pak choy, tatsoi, Yukina Savoy, Mizuna, ferny mustards Ruby Streaks, Golden Frills, Scarlet Frills, Red Rain.
- **Roots:** Turnips, carrots, beets, radishes,
- **Onions:** scallions, bulbing onions
- **Peas and beans;** dwarf snap peas, fava beans
- **Bare-root transplants:**
 - In October we sow “filler” greens and lettuce to use in the hoophouse during the winter
 - In November we sow bulbing onions to plant outdoors 3/1
 - Jan 24 we sow kale, collards, spinach to plant outdoors in March

Fall Hoophouse Planting

- ❖ **Early September :** We clear and add compost to one of the beds and sow sprouted **spinach** seed, **radishes**, **scallions**, **Bulls Blood beet greens** and **tatsoi**.
- ❖ **Sept 15 and Sept 24:** We make **outdoor sowings** of crops to later transplant into the hoophouse at 2–4 weeks old.
 - ❖ **Sept 15:** about ten varieties of hardy **leaf lettuce and romaines**, **pak choy**, **Chinese cabbage**, **Yukina Savoy**, **Tokyo Bekana**, **Maruba Santoh**, **chard**.
 - ❖ **Sept 24:** another ten varieties of **lettuce**, **Red and White Russian kales**, **Senposai**, more **Yukina Savoy**, **mizuna** and **arugula**.
- ❖ At the **end of September** we clear summer crops from one more bed, add compost and work it in. We transplant **Tokyo Bekana** and **Maruba Santoh** at 2 weeks old, **Chinese cabbage**, **pak choy** and **Yukina Savoy** at 3 weeks.
- ❖ **Early October**, we sow more **radishes** and some “filler” greens, (**spinach**, **lettuce** and **Asian greens**) to fill gaps later. We try hard to keep all the space occupied, mostly using lettuce and spinach.
- ❖ By **mid-October** we clear and prepare another bed and transplant **lettuce** at 10" (25 cm) apart, and **chard**.
- ❖ **Oct 15** we sow our first **turnips**.
- ❖ Our neighbor Gary Scott sows beet plugs in **mid Oct**, transplants them in the hoophouse and harvests from mid-March. *Ace* in 72 plug trays. He loves Johnny's *Babybeat*.
- ❖ **Late October** we sow more “filler” greens, baby **lettuce mix**, our second **spinach**, **turnips** and **chard**, and more **radishes**.
- ❖ In the **fourth week of October**, we clear and prepare more beds and transplant the **Senposai**, **mizuna**, the 2nd **lettuce**, **kale**, **arugula** and **Yukina Savoy** at 4 weeks old.
- ❖ **Nov 10** we sow more **turnips**, **mizuna** and **arugula**, more filler **lettuce** and **spinach**, and our first **bulb onions** for field transplanting as early as possible in the new year.
- ❖ **Nov 11-20** we sow **scallions**, **tatsoi**, **radishes**, more **bulb onion** starts.
- ❖ From **Nov 10** on we aim to keep a fully planted hoophouse, and as each crop harvest winds down, we immediately replace that crop with another.
- ❖ During **December** we use the “Filler” greens plants to replace casualties and heads of **Chinese cabbage**, **Pak choy**, **Yukina Savoy** each day as soon as we’ve harvested them.

Persephone days and scheduling winter hoophouse crops

- When daylight is shorter than 10 hours a day not much growth happens. Dates depend on latitude.
- In Central Virginia, latitude 38° North, this period lasts two months, from 11/21 to 1/21.
- Soil temperature also matters. December 15–February 15 is the slowest growing time for us.
- To harvest in the darkest days of winter you'll need to plan a good supply of mature crops to take you through. What has already grown before this period will provide *most* of your harvests.
- For most of the winter, our hoophouse plants *are* actively growing, not merely being stored for harvest (as happens in colder climate zones and outdoors), so we can continue sowing new hoophouse crops even in December and January.

To keep nitrate levels as low as possible:

- ✓ Grow varieties best suited for winter;
- ✓ Avoid animal fertilizers; use organic compost.
- ✓ Ensure soil has sufficient P, K, Mg and Mo
- ✓ Water enough but not excessively;
- ✓ Provide fresh air as soon as temperatures reach 68°F (20°C), so that carbon dioxide levels are high enough;
- ✓ Harvest after at least four (preferably six) hours of bright sunlight in winter;
- ✓ Avoid harvesting on very overcast days;
- ✓ Avoid over-mature crops and discard the outer leaves. Harvest crops a little under-mature, rather than over-mature;
- ✓ Refrigerate immediately after harvest, store harvested greens at temperatures close to freezing;
- ✓ Use crops soon after harvest;
- ✓ Mix your salads; don't just eat spinach.

Hoophouse Succession Planting

Crop		Planting Dates	Harvest Dates	Notes
Chard	#1	transplanted Oct 15	Dec 11–April 9	
	#2	sown Oct 26	March 6–April 9	
Lettuce mix	#1	sown Oct 24	Dec 11–Feb 21	
	#2	sown Feb 1	March 20–April 20	3 cuts if we're lucky
Lettuce heads		until October	November to February	Harvest leaves from the mature plants
			Dec 6–March 31	Cut the heads
Mizuna	#1	transplanted Oct 24	Nov 1–Jan 25	
	#2	sown Nov 10	Jan 27–March 6	
Onions (bulbing)	#1	sown Nov 10		Transplanted outdoors as early as possible in March
	#2	sown Nov 22		
	#3 backup	sown Dec 6		
Radish	#1	sown Sept 6	Oct 1–Nov 15	
	#2	sown Oct 22	Nov 25–Jan 29	
	#3	sown Nov 27	Feb 12–March 13	
	#4	sown Dec 27	March 2–April 1	
	#5	sown Jan 27	April 2–April 15	
Scallions	#1	sown Sept 6	Dec 25–March 20	
	#2	sown Nov 13	March 19–May 15	Following radish #1
Spinach	#1	sown Sept 6	Oct 30–April 9	Sprouted seeds sown
	#2	sown Oct 24	Nov 20–May 7	
	#3	sown Nov 10	All these later sowings are harvested until May 7	We keep planting to fill gaps and pulling up finished plants
	#4	sown Dec 27		
	#5	sown Jan 17		
	#6	sown Jan 24	Until mid-May	To transplant outdoors in February
Tatsoi	#1	sown Sept 7	Oct 30–Dec 28	
	#2	sown Nov 15	Feb 15–Feb 28	
Turnips	#1	sown Oct 15	Dec 4–Feb 20	
	#2	sown Nov 10	Feb 25–March 10	Thinnings Jan 11
	#3	sown Dec 10	March 5–March 20	Only worthwhile if thinned promptly and eaten small. Greens are a very sweet and beautiful hoophouse crop
Yukina Savoy	#1	transplanted Oct 10	Dec 30–Jan 22	
	#2	sown Oct 24	until Jan 29	Only one week extra

Resources

ATTRA attra.ncat.org:

- Market Farming: A Start-up Guide,*
- Scheduling Vegetable Plantings for a Continuous Harvest,*
- Season Extension Techniques for Market Farmers.*
- Cole Crops and Other Brassicas: Organic Production*

SARE www.sare.org A searchable database of research findings:

- Season Extension Topic Room*

- extension.org/organic_production The organic agriculture community with eXtension. Publications, webinars, videos, trainings and support. An expanding, accessible source of reliable information.
- Growing Small Farms: growingsmallfarms.ces.ncsu.edu/ Debbie Roos keeps this site up to the minute. Click Farmer Resources
- Penn State Extension High Tunnels site: extension.psu.edu/plants/plasticulture/technologies/high-tunnels
- HighTunnels.org: hightunnels.org/category/for-growers/growing-in-high-tunnels Lots of info, also a Listserve.

Many of my presentations are available at www.Slideshare.net. Search for **Pam Dawling**.

- Cold-hardy Winter Vegetables*
- Producing Asian Greens*
- Production of Late Fall, Winter and Early Spring Vegetable Crops*
- Succession Planting for Continuous Vegetable Harvests*

Other slide shows I recommend:

- Alison and Paul Wiediger** : www.slideshare.net/aunaturelfarm/high-tunnel-1-why-grow-in-high-tunnels and at least 11 more.
- Mark Cain** *Planning for Your CSA*: www.Slideshare.net (search for Crop Planning)
- Tom Peterson** *Farm Planning for a Full Market Season* yabf.files.wordpress.com/2013/02/tom-peterson-farm-planning-for-a-full-market-season.pdf
- Brad Burgefurd**, *Cultural Practices And Cultivar Selections for Commercial Vegetable Growers*. www.slideshare.net/guest6e1a8d60/vegetable-cultural-practices-and-variety-selection
- Walking to Spring, Using High Tunnels to grow produce 52 weeks a year*, Alison and Paul Wiediger
- Knott's Handbook for Vegetable Growers*, Maynard and Hochmuth
- The New Seed Starter's Handbook*, Nancy Bubel, Rodale Books
- The New Organic Grower*, Eliot Coleman, Chelsea Green
- Grow Your Own Chinese Vegetables*, Geri Harrington, 1984, Garden Way Publishing. Includes the names for these crops in different cultures.
- Growing Unusual Vegetables*, Simon Hickmott, 2006, Eco-Logic books, UK.
- Oriental Vegetables: The Complete Guide for the Garden and Kitchen*, Joy Larkham, revised edition 2008, Kodansha, USA
- Wild Garden Seeds www.wildgardenseed.com
- Even 'Star Farm' <http://www.localharvest.org/even-star-organic-farm-M9994> specialize in cold-tolerant varieties.
- Evergreen Seeds' helpful clickable list of Asian greens: <http://www.evergreenseeds.com/asveglis.html>

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