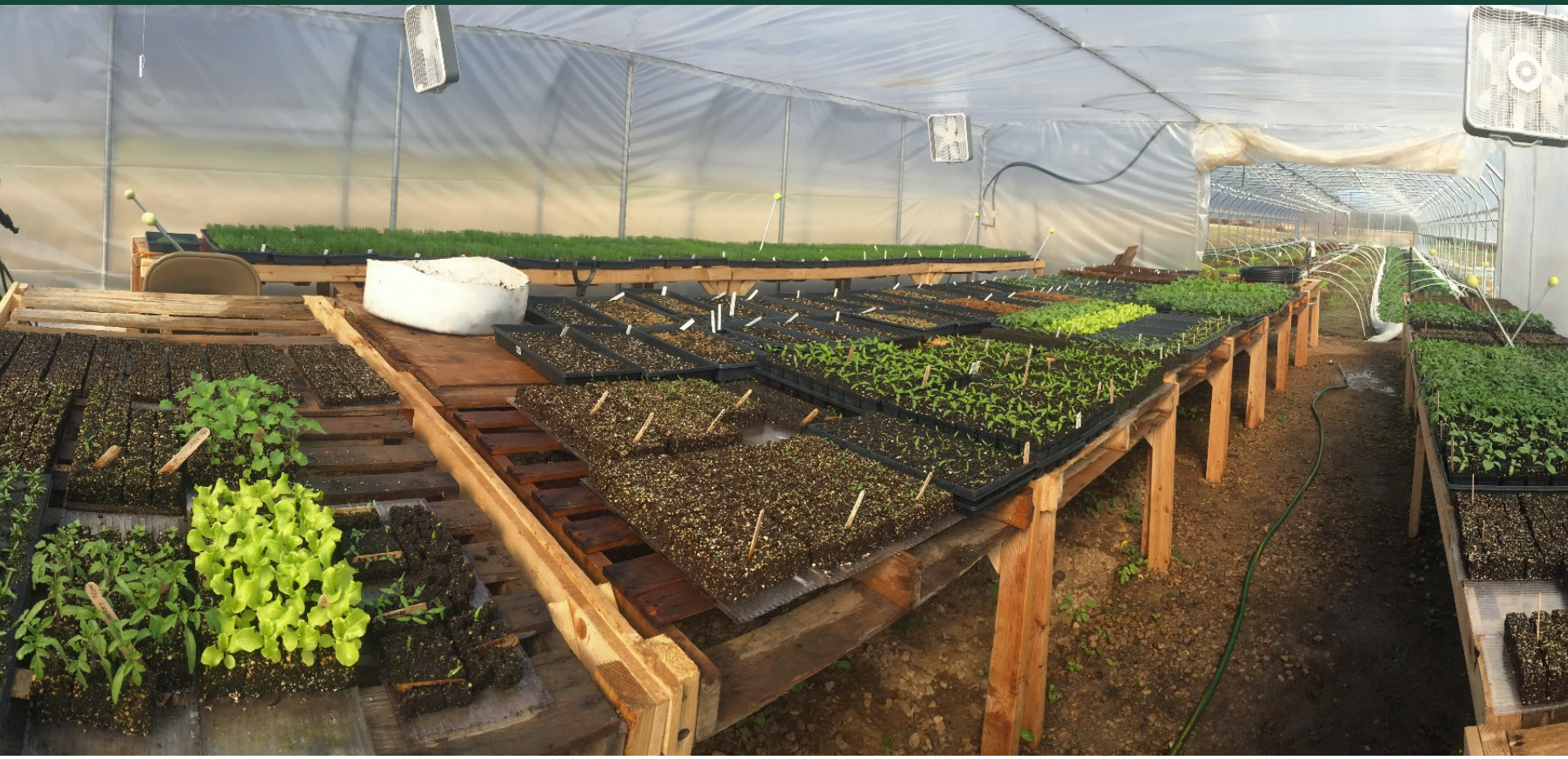
Vegetable Transplant Production



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Why grow transplants?

- Shorten crop field time, which allows production of longer season crops in northern areas;
  - more time for cover crops and SOM;
- Provide quick rotations and replanting for multiple harvests;
- More reliable harvest and predictable harvest dates throughout the season;
- Provide a very uniform plant density which helps provide more predictable yields;
- Provide uniform coverage and faster ground cover thereby reducing the impact of weeds;
- Allow efficient use of seed resources;

Why grow transplants?

- Important for Organic Certification*
- Assure you have the wide diversity of transplant crops need for direct markets
- Obtain desired varieties
- Achieve desired timing related to season extension and year-round local food
- Potential crop to sell off farm
  - Wholesale to other farmers or retailers
  - Retail at markets

Transplants planted on Aug 15 vs seed sown same day in a high tunnel. (green onions)

Uniform Spacing and Production

No room for weeds; reduced evaporation

What makes a good transplant?

What makes a good transplant?

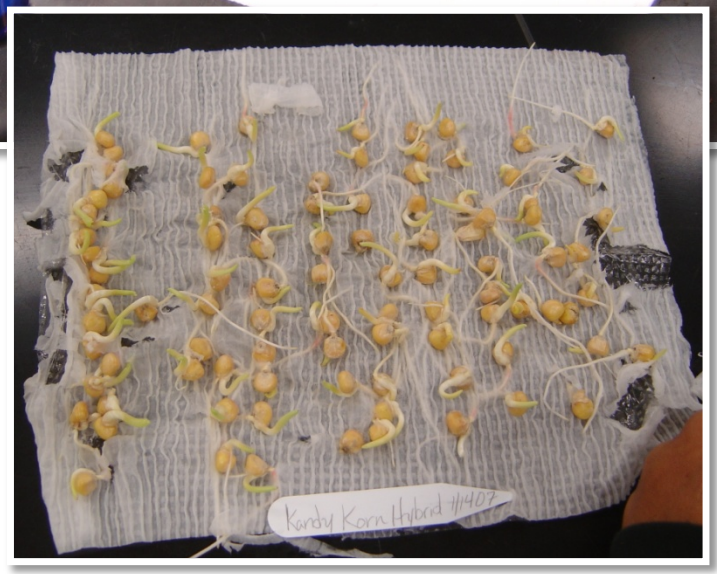
- Large enough to handle easily and quickly without damaging the shoot or roots
- Strong, short stem (hypocotyl); ability to survive field conditions – wind, light, heat
- Actively growing roots and shoot – not nutrient or drought stressed
- Shoot to root ratio near 1 to 1
- Root medium full of roots – easy to remove from container (not needed for soil blocks)
- Color of leaves (green) and roots (white)
- Flower buds or open flowers not present
- Free of insect pests or diseases

Seed Selection, Storage, and Handling

Seed Quality Issues

- Open pollinated (OP) or hybrid
- Purity (seed and non seed material)
- Age
- Size
- Uniformity
- Germination percentage
- Viability – yes or no germination
- Vigor – how well it germinates
  - Vigor is lost before viability

Estimating Germination Percentage

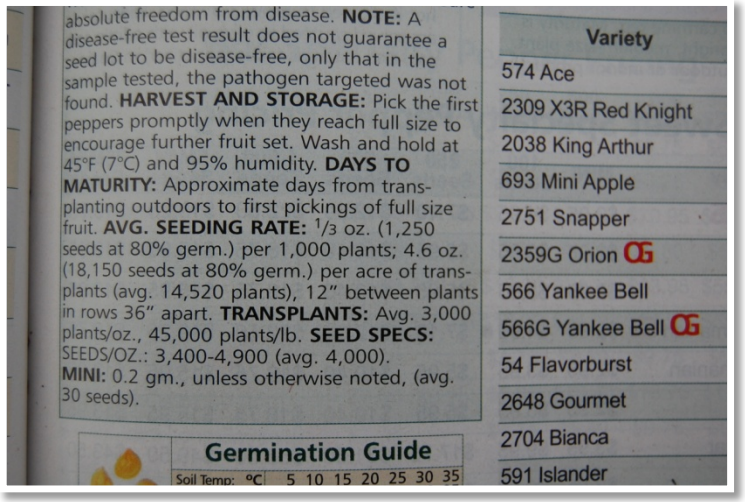


Seed Treatment

(Done by seed company)

- Refining – cleaning and selection
- Sizing - uniformity
- Detail, defuzz or dewing (trim)
  - easier handling with sowing equipment
- Coating – enlarges the seed, easier to handle, or provide some additive
- Pelleting – change shape to make it easier to handle

Catalog Information and Technical Support are Very Valuable



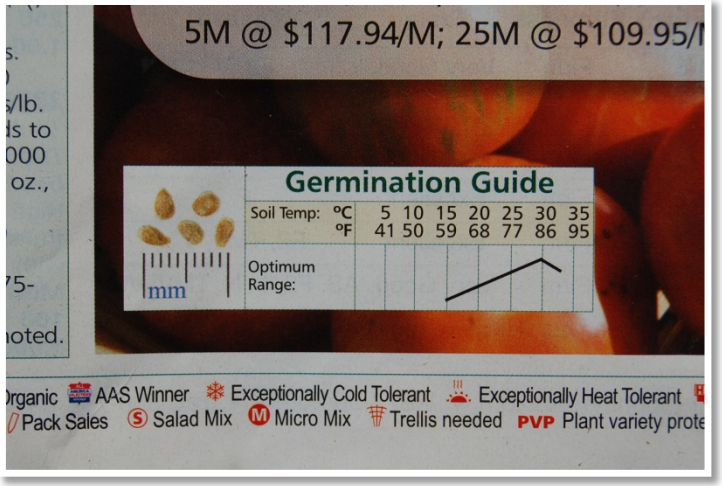
absolute freedom from disease. **NOTE:** A disease-free test result does not guarantee a seed lot to be disease-free, only that in the sample tested, the pathogen targeted was not found. **HARVEST AND STORAGE:** Pick the first peppers promptly when they reach full size to encourage further fruit set. Wash and hold at 45°F (7°C) and 95% humidity. **DAYS TO MATURITY:** Approximate days from transplanting outdoors to first pickings of full size fruit. **AVG. SEEDING RATE:** 1/3 oz. (1,250 seeds at 80% germ.) per 1,000 plants; 4.6 oz. (18,150 seeds at 80% germ.) per acre of transplants (avg. 14,520 plants), 12" between plants in rows 36" apart. **TRANSPLANTS:** Avg. 3,000 plants/oz., 45,000 plants/lb. **SEED SPECS:** SEEDS/OZ.: 3,400-4,900 (avg. 4,000). **MINI:** 0.2 gm., unless otherwise noted, (avg. 30 seeds).

Variety
574 Ace
2309 X3R Red Knight
2038 King Arthur
693 Mini Apple
2751 Snapper
2359G Orion OG
566 Yankee Bell
566G Yankee Bell OG
54 Flavorburst
2648 Gourmet
2704 Bianca
591 Islander

Germination Guide

Soil Temp:	°C	5	10	15	20	25	30	35
	°F	41	50	59	68	77	86	95

Optimum Range:



5M @ $117.94/M; 25M @ $109.95/M

Germination Guide

Soil Temp:	°C	5	10	15	20	25	30	35
	°F	41	50	59	68	77	86	95

Optimum Range:

mm

Organic AAS Winner Exceptionally Cold Tolerant Exceptionally Heat Tolerant
Pack Sales (S) Salad Mix (M) Micro Mix Trellis needed PVP Plant variety prote

GROWING INFORMATION
Capsicum annuum (Unless otherwise noted.)

CULTURE: Well-drained, fertile soil with adequate phosphorus and calcium is best.
GROWING SEEDLINGS: Sow seed in shallow flats 4 weeks in. 1/4" deep, in late March or if possible, maintain soil temperatures 80-90°F (27-33°C). Pepper seeds germinate very slowly in cooler soil. When the first true leaves just show, transplant 2-3" apart in flats or 2" cell-type containers. (The use of 2", or larger cells will produce larger plants with better-developed root systems.) Grow plants at approx. 70°F (21°C) day and 60°F (16°C) nights.
COLD TREATMENT: Exposing the seedlings to controlled cold treatments can increase the number of flowers and fruits. When the third true leaf appears, grow the plants at a minimum night temp. of 53-55°F (12-13°C) for 4 weeks. The plants should receive full sunlight. After 4 weeks adjust temp. to 70°F (21°C) day and night. If this technique is used, peppers should be seeded 1-2 weeks earlier than usual.
TRANSPLANTING: Transplant out after frost when the soil is warm and weather is settled. Ideal seedlings have buds, but no open flowers. Set plants 12-18" apart in rows 24-36" apart, or 2 rows on polypaper mulch, 18" between plants. Water-in transplants using a high phosphorus solution. **ROW COVERS:** Cold weather is buffered and earliness increased by using plastic mulch, especially in combination with a slitted row cover or lightweight fabric row cover supported by wire hoops. (See Mulch and Row Covers in Index.) Remove row covers when in sunny weather above 85°F (29°C) to prevent blossom drop and heat damage. **INSECT PESTS:** Control climbing cutworms with Dipel, or with paper cylinder collars. Control tarnished plant bugs, aphids, and flea beetles with rotenone or pyrethrin. **DISEASES AND PROBLEMS:** To prevent bacterial spot and phytophtora, drip irrigate only, plant only in well-drained soils, minimize soil compaction, follow a 4-year crop rotation. Sunscald is caused by inadequate foliage. Prevent blossom end rot with adequate soil calcium and regular moisture. Big bushy plants with few peppers can be caused by an excess of nitrogen, hot or cold temperature extremes during the flowering period, tarnished plant bug injury, and choice of late, poorly-adapted varieties.
BACTERIAL SPOT NOTICE: Bacterial spot can be seed borne. All Johnny's pepper seed lots are tested for bacterial spot, and we chlorine wash any positive lots. No treatment can insure absolute freedom from disease. **NOTE:** A disease-free test result does not guarantee a seed lot to be disease-free, only that in the sample tested, the pathogen targeted was not found. **HARVEST AND STORAGE:** Pick the first peppers promptly when they reach full size to encourage further fruit set. Wash and hold at 45°F (7°C) and 95% humidity. **DAYS TO MATURITY:** Approximate days from transplanting outdoors to first pickings of full size fruit. **AVG. SEEDING RATE:** 1/3 oz. (1,250 seeds at 80% germ.) per 1,000 plants; 4.6 oz. (18,150 seeds at 80% germ.) per acre of transplants (avg. 14,520 plants), 12" between plants in rows 36" apart. **TRANSPLANTS:** Avg. 3,000 plants/oz., 45,000 plants/lb. **SEED SPECS:** SEEDS/OZ.: 3,400-4,900 (avg. 4,000). **MINI:** 0.2 gm., unless otherwise noted, (avg. 30 seeds).

693 MINI APPLE (F1): 60 days green, 80 days red ripe. ***Thick-walled miniature bell pepper.*** Small fruits avg. 2 1/2" x 2 1/2" and are mostly three lobed with a few that have 4 lobes or have a slight cone shape. Sturdy, thick-walled fruits are excellent for stuffing and baking.

2751 SNAPPER (F1): 62 days green, 82 days red ripe. (PMV, TMV, TEV, BLS 1-3) ***Phytophthera resistance!*** Big, sturdy plants produce heavy yields of large, uniform 3-4 lobed fruits. Widely adapted, Snapper has performed well from the Northeast and Midwest to Florida.

2359G ORION (F1): OG 65 days green, 85 days red ripe. (BLS) ***Jumbo-sized hybrid bell from organic seed.*** Widely adapted to warm locations in the North, and in Florida for fall and spring plantings. Bountiful, smooth, blocky, thick-walled fruits on a plant with good cover.

Open Pollinated

YANKEE BELL: 60 days green, 80 days red ripe. ***Open pollinated bell for Northern growers.*** Blocky 3-4 lobed fruits are medium sized and a bit smaller than our hybrids. Better quality and uniformity than most OP's. **Choose organic or nonorganic seeds.**

NEW! **566G** Organic **OG**
566 Nonorganic

Colored Bells

54 FLAVORBURST (F1): 67 days green, 87 days yellow ripe. ***New last year! Vibrant yellow.*** Initial color is lime green, turning to yellow when ripe. Excellent, sweet flavor. Medium-large fruits are mostly 3-lobed and slightly elongated.

2648 GOURMET (F1): 65 days green, 85 days orange ripe. (TMV) ***Early orange bell has thick juicy walls and fruity sweet taste.*** Medium-large, very blocky fruits are bigger than Corona and easier to grow under a wider variety of conditions.

2704 BIANCA (F1): 65 days white, 85 days red ripe. (TMV) ***Add another color to your pepper basket.*** These ivory-colored peppers are medium-large, 4-lobed, and blocky. The fruits have a mild taste and ripen to scarlet red. Sturdy plants yield well; good leaf cover protects the fruit from sun scald.

591 ISLANDER (F1): 56 days lavender, 81 days red ripe. (TMV) ***Light lavender skin, pale yellow flesh.*** 3-lobed, medium-size, thick-fleshed peppers with a mild, lightly sweet taste. Fruits ripen through a showy stage of violet, yellow and orange streaks, eventually turning a rich, very dark red. Strong, medium-tall plants yield well.

579G SWEET CHOCOLATE: OG 58 days green, 78 days brown ripe. ***Rich chocolate-brown pepper.*** Remarkable earliness, heavy set, and tolerant of cool nights. Smooth, medium-small, tapered, "snub nose" (blunt end) bells with long fruit stems. Very mild flavor, medium thick flesh. The flesh under the skin is brick red. Developed by the late E.M. Meader, Univ. of New Hampshire.

Sweet Bell Pepper Pricing

Variety	MINI	100 Seeds	250 Seeds	500 Seeds	1,000 Seeds	5M/M Seeds	25M/M Seeds
574 Ace	$2.95	$5.50	$8.95	$15.00	$27.00	$22.50	$18.00
2309 X3R Red Knight	$3.95	$11.15	$20.90	$37.80	$70.00	$60.25	$53.50
2038 King Arthur	$3.95	$11.55	$20.90	$37.80	$70.00	$60.25	$53.80
693 Mini Apple	$4.95	$14.95	$31.50	$57.20	$107.00	$90.60	$83.15
2751 Snapper	$3.95	$10.95	$18.30	$34.30	$63.95	$55.55	$48.85
2359G Orion OG	$3.95	$12.95	$24.95	$44.00	$82.00	$73.00	$64.35
566 Yankee Bell	$2.95	$4.94	$8.00	$13.50	$24.00	$20.25	$16.25
566G Yankee Bell OG	$3.95	$6.75	$9.75	$16.20	$13.00	$9.90	$7.00
54 Flavorburst	$3.95	$11.25	$19.95	$36.00	$65.65	$56.45	$49.67
2648 Gourmet	$3.95	$10.95	$18.30	$34.30	$63.95	$55.00	$48.85
2704 Bianca	$4.95	$14.95	$31.50	$57.20	$107.00	$90.60	$83.15
591 Islander	$4.95	$14.95	$31.50	$57.20	$107.00	$90.60	$83.15
579G Sweet Chocolate OG	$3.95	$7.00	$9.00	$15.00	$29.40	$25.20	$18.00

Germination Guide

Vegetables 73

Which Variety?

- Cultivars may have variations in
  - distinct growing characteristics
  - adaptations to certain geographical regions
  - fruit and leaf sizes, colors or flavors
  - tolerance or resistance to insects or diseases
  - production times (days to harvest)
  - other features.
- Cultivar selection can have a dramatic effect on success and profitability.

What Quantity of Seed?

- Seed company data on seeds per ounce or some unit of measure
- Seed company packaging methods
- Quantity discounts? – usually significant when going from the smallest sample or packet size to larger quantities
- Percent germination? – make adjustments for crops with lower germination rates
- Longevity in storage? – some only good for one year, others for many years if properly stored

Seed Storage

- Low, steady temperature and moisture
  - Less than 40F & 40% relative humidity
  - Temperature: 10F less can double life
  - Moisture: 1% less in seed can double life
    - Seeds have less than 5% moisture
- **DO NOT KEEP SEED IN THE GREENHOUSE**
- With much $ invested, protect the seeds

Seed Storage

in a refrigerated display case

Seed Storage Options

Seed Germination

Four Stages of Production

Stage 1 – Germination

Stage 2 – Emergence

Stage 3 – Growth

Stage 4 - Hardening

Four Stages of Production

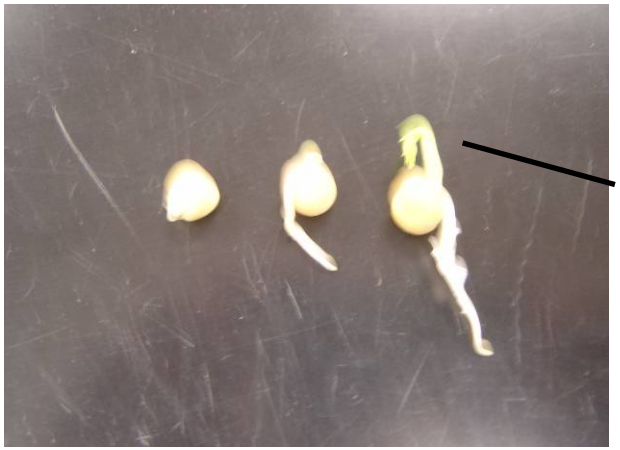
Stage 1 – Germination

- Sowing of seeds to radical (root) emergence

Four Stages of Production

Stage 2 – Emergence

- Root to hypocotyl (shoot) and cotyledon leaves



Four Stages of Production

Stage 3 – Growth

- Multiple true leaves, root development, increase in overall size

Four Stages of Production

Stage 4 – Hardening

- Reducing ambient temperature or limiting watering, introducing new stresses

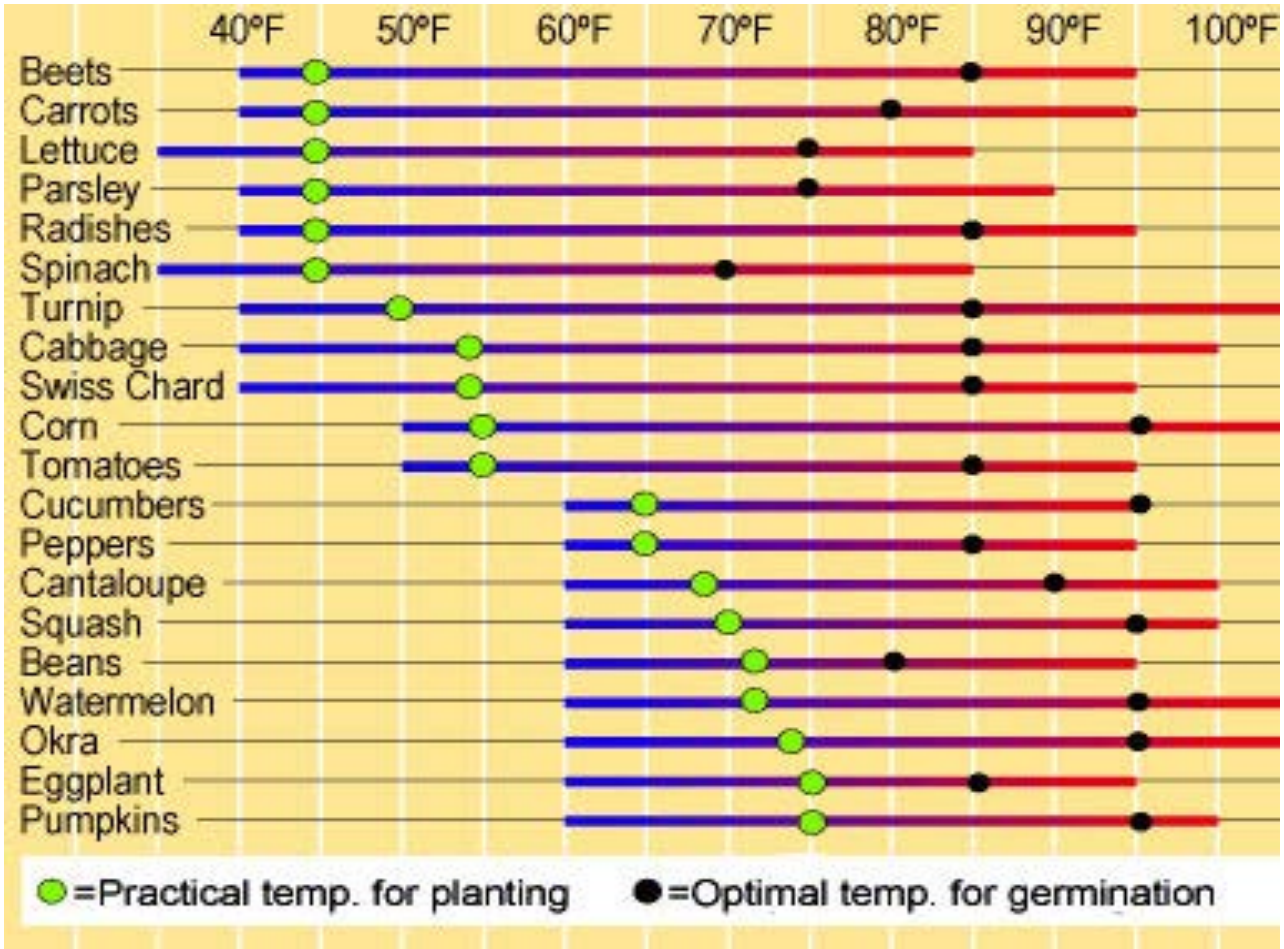
Optimum Germination

Temperature

Range vs. Optimum

Moisture

Light



Optimum Germination

Temperature

Moisture

Light

Maintaining ***consistent and uniform*** moisture:

- Consistent monitoring
- Flood systems (base watering)
- Automated misting systems
- Covering with media
  - Vermiculite = good option
  - Depth = 2-3x seed diameter

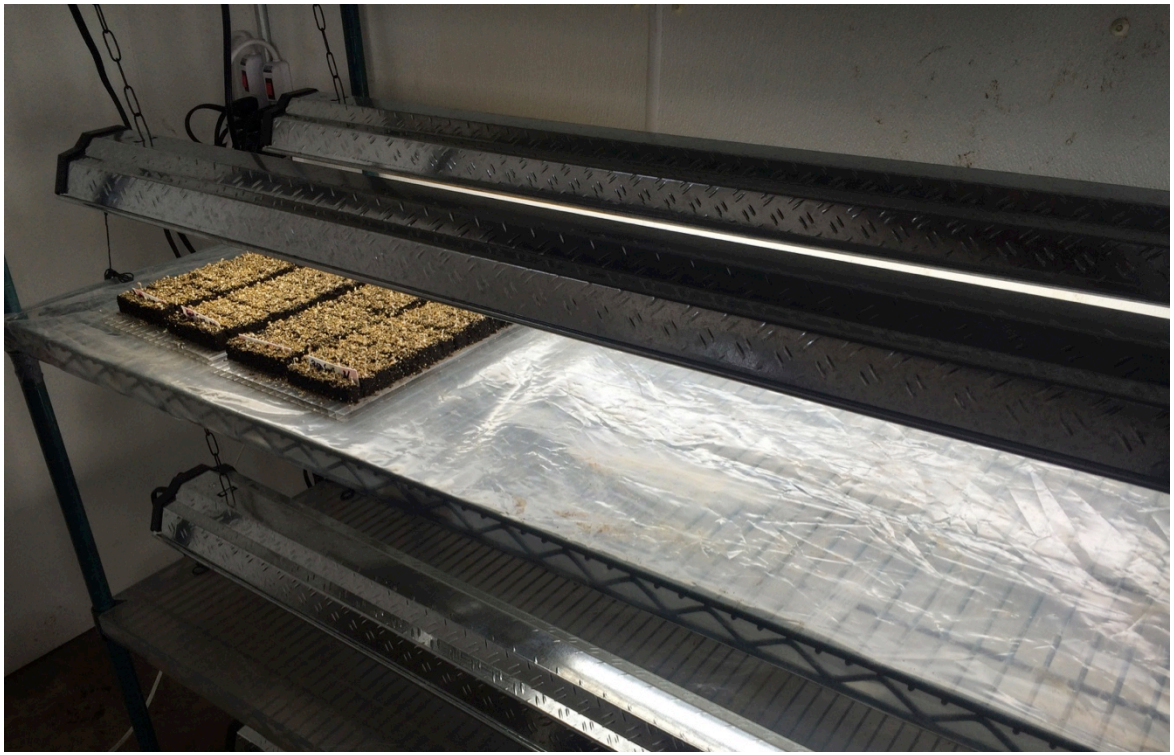
Optimum Germination

Temperature

Moisture

Light

Certain species require light for germination, but most do not.



Changes During Stages 1-4

Light

Increasing (darkness to sunlight)

Temperature

Decreasing (75-80F to 55-60F)

Moisture

Decreasing (near saturation to near wilt)

Questions?

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