

High Tunnel Pepper and Eggplant Production



Patrick Byers
MU Extension – Webster County
University of Missouri
byerspl@missouri.edu

UNIVERSITY OF MISSOURI
Extension

Outline

- Introduction
- High tunnels for peppers and eggplant
- Cultivars and types
- Preparing the tunnel for a crop
- Starting seeds and transplants
- The growing environment
- High tunnel pepper culture
- High tunnel eggplant culture
- Pest management

UNIVERSITY OF MISSOURI
Extension

Introduction

- Why grow pepper/eggplant in a high tunnel?
 - Profitable crop, especially “out of season”
 - Higher yields
 - Improved fruit quality
 - Fewer culls
 - Reduction in pesticide applications
 - Adapted to hydroponics, bags, or soil beds

UNIVERSITY OF MISSOURI
Extension



High Tunnels for Pepper/Eggplant

- Customizing the high tunnel
 - Consider sidewall height
 - Consider structural bracing
 - 4 season vs 3 season vs greenhouse
 - Gothic or sidewall vs quonset styles
 - Double layer of plastic
 - Buried insulation around high tunnel
 - Supplemental heat

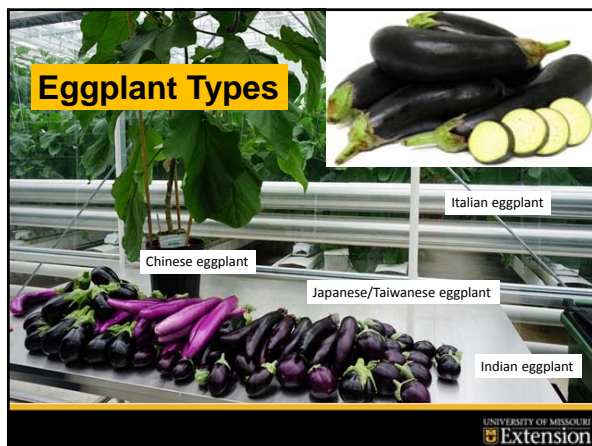
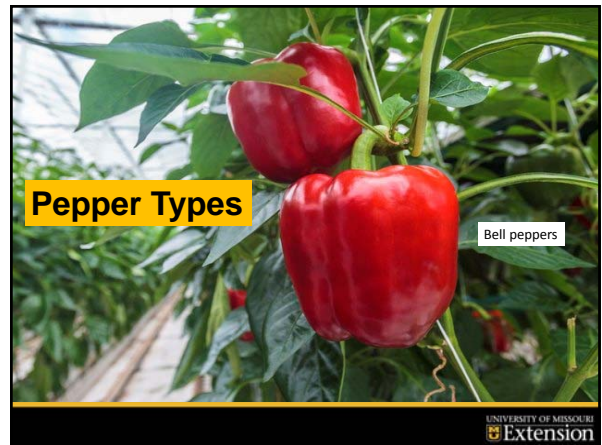
UNIVERSITY OF MISSOURI
Extension





Pepper Types and Cultivars

- Bell peppers
 - Dutch cultivars –best for greenhouses
 - Mexican/Spanish cultivars – best for low tech tunnels
 - Field cultivars
- Other types
 - Snack peppers
 - Italian frying peppers
 - Hot peppers



Preparing the Tunnel/Greenhouse

- New tunnel
 - Submit a soil test and make adjustments as recommended
 - Supplement soil OM with compost
- If you had a solanaceous crop previously in the tunnel
 - Clear away all debris
 - Soil test with salts test included
 - Cover crop? Plastic removal to allow for rainfall? Rotation?

Starting Seeds and Growing Transplants

- Start seedlings in a separate, temperature and light controlled chamber
- All supplies and media should be sterile and new, or thoroughly sanitized
- Use 50-72 cell trays
- Germination conditions
 - Optimum germination
 - Pepper: 82°F
 - Eggplant: 80-90°F (6-8 days)
 - Optimum seedling growth
 - Pepper: 70-75°F day, 68-69°F night
 - Eggplant: 66-72°F day, 64-66°F night
 - 1000-1500 footcandles of light
 - Ventilation
- Transplant into a larger pot (2" is common) before placement in tunnel/greenhouse
- 6-8 weeks from seeding to transplanting into the high tunnel

UNIVERSITY OF MISSOURI
Extension



The Growing Environment

- Supplemental heat
 - Use vented heaters only
 - Make sure that vents are tight and draw well
 - Heat distribution is important
- Consider row covers inside the high tunnel for early crops

UNIVERSITY OF MISSOURI
Extension

Pepper Culture

- Planting design – allow 3.5 plants per square yard for double head plants
 - Spacing between rows: 36-48"
 - Spacing between plants: 6-7" or greater
 - Single or double rows per bed
 - Ex: use a double row of plants, trellised to 2 parallel overhead wires 2 feet apart with walkways 3 feet wide. Each stem is anchored 6 inches or so from the next one

UNIVERSITY OF MISSOURI
Extension

Eggplant Culture

- Planting design – allow 4-8 stems per square yard
 - Spacing between rows: 36-48"
 - Spacing between plants: 12-18"
 - Adjust the density by leaving more stems per plant

UNIVERSITY OF MISSOURI
Extension

Pepper/Eggplant Culture

- Raised beds - 8-10" high with 30-36" width at the top.
- Drip irrigation - 8 or 10-mil tape is acceptable with drippers spaced 4-12" apart. A drip system operates at 8-15 psi pressure.
- Floor management – cover with mulch, plastic, weed barrier, or leave bare.

UNIVERSITY OF MISSOURI
Extension

Pepper/Eggplant Culture

- Establishing a planting
 - Transplanting
 - 6-8 weeks after seeding
 - Pepper – king flower is open
 - Eggplant – 10-12" tall, flowers about to open
 - Be careful in high tunnels - trend is to plant early to allow for early harvest – as early as mid February; increased risk of cold injury and cost of heating

Pepper Culture

- Establishing a planting
 - Greenhouse cycles – long cycle is possible
 - Northern areas: plant in Oct, transplant in early Dec, harvest Mar-Dec
 - Southern areas: flip the cycle
 - High tunnel cycles – similar to tomato cycles
 - Transplanting
 - 6-8 weeks after seeding, king flower is open

Eggplant Culture

- Establishing a planting
 - Greenhouse cycles
 - 12 month cycle is possible – plant in Nov-Dec, transplant in Jan, harvest Mar-Dec
 - Spring crop cycle – plant in Nov, transplant in Jan, harvest Mar-July
 - Fall crop cycle – plant in June, transplant in Aug, harvest Sept to Dec
 - High tunnel cycles – similar to tomato cycles
 - Transplanting
 - 6-8 weeks after seeding, 10-12" tall

Eggplant Culture

- Grafting
 - Start tomato rootstocks as the eggplant scions germinate
 - Start eggplant rootstocks and scions at the same time
 - Follow standard grafting practices

Pepper/Eggplant Culture

- Temperature management
 - Ideal temperatures are 80°F to 85°F during the day and night temperatures above 62°F, but below 72°F
 - Supplemental heating during cold weather
 - Raise and lower side curtains during cool weather
 - Exhaust fans
 - Use shade cloth during warm weather – 40-50% shade is usual

Pepper Culture

- Pruning pepper
 - Split the plant into two leaders – largest fruit
 - The plant will branch at the king flower; remove the king flower, and retain each leader
 - At each succeeding node, the plant will flower and branch; retain the strongest leader and remove the other leader
 - Prune every two weeks, and don't prune on the upper 8" of growth
 - Top the plants 6-7 weeks before removal from the greenhouse/tunnel
 - Thinning flowers?
 - Removing fruit?



Pepper Culture

- Training pepper
 - Generally not lowered and leaned – stems too brittle
 - Straight up a twine
 - Stake and weave is possible

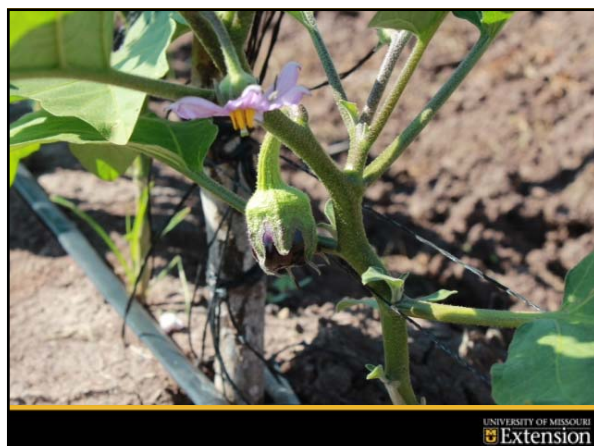
UNIVERSITY OF MISSOURI
Extension



Eggplant Culture

- Pruning eggplant
 - Split the plant into at least two leaders
 - Save the sucker below the first flower cluster
 - If you want more suckers, save strong shoots near the head of the plant
 - Trimming side shoots
 - Allow shoots to develop until flowers are visible
 - Cut the sucker off just beyond the flower(s)
 - Thinning flowers?
 - Leaf removal

UNIVERSITY OF MISSOURI
Extension



Eggplant Culture

- Pruning eggplant in a low house
 - Split the plant into at four leaders
 - Snap the growing point off each leader 6 weeks after transplanting; leave all suckers during the week preceding snapping
 - Leave the strongest sucker per stem, and remove other suckers beyond the flower cluster as usual

UNIVERSITY OF MISSOURI
Extension

Eggplant Culture

- Training eggplant
 - Stake and weave is possible
 - Trellising is possible
 - Straight up a twine
 - Lowering and leaning eggplant

UNIVERSITY OF MISSOURI
Extension



Pepper/Eggplant Culture

- Pollination
 - Peppers and eggplant are self pollinated, and do not need pollination
 - Bumblebee pollination is generally not needed



UNIVERSITY OF MISSOURI
Extension

Pepper/Eggplant Culture

- 2-3 month before transplanting
 - Collect and submit soil sample
 - Adjust soil pH as recommended using lime, broadcast over the tunnel, and incorporated into the soil
 - Use dolomitic lime if Mg is deficient
 - Add micronutrients, if indicated by soil test and previous foliar analyses

UNIVERSITY OF MISSOURI
Extension

Pepper/Eggplant Culture

- Preplant N application, in advance of bedding and laying plastic (based on soil test)
 - Soil test report will have a seasonal nitrogen recommendation, based on crop, soil type and soil organic matter content
 - Apply 1/3 to 1/2 of recommended amount preplant
 - Consider a non-ammoniacal form – calcium nitrate

Pepper/Eggplant Culture

- Preplant N application, in advance of bedding and laying plastic (based on soil test) – **organic production**
 - Composted manure is the best source of nutrients for organic production in tunnels
 - Composted dairy manure: 2700 lbs of compost (fresh weight basis) per 1000 square feet.
 - Composted poultry manure: 900 lbs of compost (fresh weight basis) per 1000 square feet
- Based on supplying about 100 lbs of available N per acre
 - assume 30% total N is available for poultry compost or
 - 14% of the organic N is available for dairy compost.
 - A moisture content of 55%

Pepper/Eggplant Culture

- Preplant K application, in advance of bedding and laying plastic (based on soil test)
 - Soil test report will have a seasonal potassium recommendation
 - Apply 1/3 to 1/2 of recommended amount preplant
 - Consider potassium nitrate (16-0-44)

Pepper/Eggplant Culture

- Preplant P application, in advance of bedding and laying plastic (based on soil test)
 - Soil test report will have a seasonal phosphorus recommendation
 - Apply all of the recommended amount preplant
 - Consider superphosphate (0-46-0)

Pepper/Eggplant Culture

- Starter solutions at transplanting
 - Use a fertilizer that has a N:P ratio of 1:3 and no K; example is 10-34-0
 - Typical starter solution: 3 lbs of 10-34-0 in 50 gallons of water
 - Apply ½ pint per plant at transplanting

Pepper/Eggplant Culture

- Fertigation
 - Apply remaining N and K through drip irrigation as indicated by soil test recommendation, starting 2 weeks after transplanting, at a rate of 8-10 lbs per acre per week
 - Recommended forms:
 - Calcium nitrate
 - Potassium nitrate

Pepper/Eggplant Culture

- Fertigation
 - Monitor N and K fertility program with foliar analysis, and adjust as needed
 - Apply magnesium (as epsom salts) as indicated by foliar analysis
 - Apply micronutrients as indicated by foliar analysis and plant observations

UNIVERSITY OF MISSOURI
Extension

Report Number: **11-139-7002**
 Date: **May 24, 2011**
 May 19, 2011

Midwest Laboratories, Inc.
 13011 W. Street - Omaha, Nebraska 68144-2003 - (402) 534-7770 - FAX (402) 534-8127
 www.midwestlabs.com

PAGE 1/1

JOHN J. HERSHBERGER JR.
 889 NW 30TH LN.
 LAMAR MO 64759

PLANT ANALYSIS

SAMPLE ID	REPORT OF ANALYSIS - PERCENT										REPORT OF ANALYSIS - PARTS PER MILLION									
	N	P	K	Ca	Mg	S	B	Zn	Cu	Mn	NO ₃ -N	PO ₄ -P	K	Ca	Mg	S	B	Zn	Cu	Mn
TOMATOES	3.77	0.34	2.08	0.23	1.72	0.99	0.022	102	150	36	9	21								
TOMATOES-2	1	0.1	0	0	0	0	0	1.0	0	0	0	0								
ALFALFA	4.40	0.40	1.30	0.88	1.90	0.90	0.080	180	185	52	20	80								

The nutrient levels are slightly weak for the production. You should be adding a mixture of nitrogen, potassium, magnesium, and calcium with some zinc. Boron and copper can be added if already part of your program.

UNIVERSITY OF MISSOURI
Extension

Pest Management

- Disease problems
 - Botrytis (gray mold)
 - Downy and powdery mildew
 - Soil born diseases
 - viruses
 - Other diseases as per field production

- Arthropod problems
 - Two-spotted spider mites
 - Aphids
 - Thrips
 - European corn borer (P)
 - Flea beetle (E)
 - Other pests as per field production

UNIVERSITY OF MISSOURI
Extension

Pest Management

- Other issues
 - Blossom end rot

UNIVERSITY OF MISSOURI
Extension

Pest Management

- IPM strategies
 - Plant resistant cultivars
 - Proper plant and row spacing
 - Pruning and leaf removal
 - Manage humidity in the high tunnel – vent as needed
 - Consider using anti condensate thermal plastic film to reduce dripping
 - Pesticide applications

UNIVERSITY OF MISSOURI
Extension

Pepper/Eggplant Culture

- Fruit harvest
 - Harvest at desired stage of growth
 - Eggplant: harvest before maturity
 - Pepper: harvest at full maturity (thick walls)
 - Cut the fruit from the plant to avoid damage
- Post harvest storage
 - Pepper: 44-46°F, 95% RH
 - Eggplant: 54-59°F, 80% RH

UNIVERSITY OF MISSOURI
Extension

Any Questions?



- Patrick Byers
- Byerspl@missouri.edu
- 417-859-2044

Eggplant Types and Cultivars

- Italian
- Chinese
- Japanese/Taiwanese
- Indian