PLEASE SILENCE CELL PHONES

Thanks!
Our Vision:

A healthier world through environmental stewardship.

Our Mission:

To support the University of Maryland Extension mission by educating residents about safe, effective & sustainable horticultural practices that build healthy gardens, landscapes, & communities.
Growing Chile Peppers
Presented by Eric M. Wenger
Master Gardener Class of 1996

A guide to successfully growing, harvesting, eating and storing peppers in Montgomery County, MD

University of Maryland Extension
Solutions in your community
1. Know your backyard environment
   - Tolerate some damage
2. Prevent plant problems
   - “Right Plant in the Right Place in the Right way”
3. Monitor plants regularly (weekly)
   - Be sure to flip over leaves
   - Don’t panic!
4. Diagnose accurately
   - 50% of plant problems are r/t cultural or environmental problems, not disease or pests
5. Take action if necessary
   - Least toxic first
6. Evaluate & continue to monitor
TEST YOUR SOIL, IT WILL HELP YOUR CROPS TO BE THE BEST THEY CAN BE AND WILL SAVE YOU MONEY IN THE LONG RUN
HERB OF THE YEAR 2016!

WWW.IHERB.ORG

HOT! HOT! HOT!

THE CHILE PEPPER CALENDAR

CAPSICUM, HERB OF THE YEAR, 2016
ALL ABOUT PEPPERS

- Types
- Seeds
- Plants
- Culture
- Pests
- Harvest
- Eating
- Storing
FRUIT ANATOMY

Anatomy of chiles
Chiles date back thousands of years and are most definitely of “American origin” having been used by native peoples of North, Central and South America before being “discovered” by European explorers and being spread around the world. Most chile pepper species today are the result of millennia of cross-breading and pollination beginning from the humble wild Chiltepin and around 25 other Landrace species. That number has grown exponentially over the years but there are now 5 main domesticated species.

“The Whole Chile Pepper Book” - DeWitt and Gerlach
“Chile Peppers” - Brooklyn Botanic Garden
Species of Capsicums

- **C. annuum** - Ancho/Poblano, Bell, New Mexican, etc...
  - **C. baccatum** - Aji, Aji Lemon, ‘Christmas Bell’, ‘Zavory’
  - **C. pubescens** - Rocoto, Manzano
ZONES - Chiles can grow from Zones 3 to 10, we are in Zone 7 in Montgomery County, MD approximately 100 to 120 growing days.

SOIL - Modestly amended with compost, well drained soil is very important. Chiles will not prosper in heavy or wet soils. Chilies will grow in planters very well as long as they are provided adequate water and calcium.

pH - A pH of around 6.0 is best.

LIGHT - A minimum of 6 hours of full sun is needed for most* chillis to prosper. But most chilly plants can benefit from some afternoon shade in the heat of summer. *Some chillis such as chiltepin and Rocoto can benefit from a shadier, cooler location and will not prosper in full sun and heat.
IRRIGATION - Water consistently in the root zone, not the foliage. Water is needed for chile peppers to expand a grow fully and properly. Conditions that are too dry can result flower or fruit drop as well as abiotic problems such as blossom-end rot.

MULCH - Having a good layer of mulch around your plants will help to minimize evaporation and maintain soil temperature.

FERTILITY - Fertilize modestly, excessive fertilizer can result in overly lush plants with little fruit.

CALCIUM - Very important for chile fruit to mature properly and to avoid blossom-end rot.

WIND PROTECTION - Chile plants are brittle and they can break easily, especially when laden with fruit. Stake and/or cage your plants and protect plants from prevailing winds.
MATERIALS REQUIRED FOR STARTING SEEDS

- Lighting fixtures and bulbs
- Shelves (optional)
- Growing medium
- Containers
- Seeds
- Heating pad (optional)
You can purchase trays or peat-pots to start your seeds or you can use empty egg cartons or small paper cups, just be sure to puncture the base to allow for water to drain out.

Purchase “potting soil” or seed starter mix; do not use topsoil or garden soil.

Pre-moisten planting medium. Seeds can be pre-soaked also and then sown into the planting medium.

Mist lightly and cover with plastic wrap. Keep temperatures around 65 ° to 70 °

Seeds should germinate in 6 to 10 days. Be sure to monitor closely and remove plastic as soon as germination occurs.

Try to start seeds around mid-March to have them ready for transplanting Around mid-May.

ADVANTAGES: Far more variety, especially heirlooms and rare types. Can be less expensive if growing a lot of plants.

DISADVANTAGES: Takes more preparation and materials. Often many more seeds than needed. Potential for crop loss.
LIGHTING

- **Fluorescent bulbs are required**
  - Compact bulbs for use in standard fixture
    - 30 Watts Fluorescent = 100 watts incandescent
    - 45 Watts Fluorescent = 150 watts incandescent
    - Lesser wattages won’t work as well
  - Shop lights
    - 2, 3 or 4 feet long
  - Cool bulbs and warm bulbs (optional)
    - May want to mix a cold light 6000K with a warm light 3500K
LIGHTING QUESTIONS

Can sunlight or other lights be used for growing seedlings?

- Incandescent lights won’t work—wrong spectrum

- Sunlight is not strong enough nor long enough in early
  I will produce spindly plants
Grow lights are fine, but not necessary and they are expensive
Growing Medium

- Soilless mix is required
  - The lighter the better
- Premixed
  - Seed Starter - Best
  - Potting Soil - Will work but lower germination
- Mix your own (many different recipes)
  - Perlite, Vermiculite, Peat Moss, Lime
  - 1 part 4 parts 3 parts tablespoon
Question –
Can regular garden soil be used for starting seeds?

Answer- No

- Avoid using regular garden soil
  - Weeds and disease are present
  - Too heavy
CONTAINERS

- Plastic trays with 4 - 8 pack cells
- Peat pots
- Flats
  - Plants grow at different speeds and can’t all be kept close to lights
  - Requires transplanting earlier
  - Seeds don’t all germinate at same time
CHOOSING SEEDS

- Use HG70 for recommended Maryland cultivars
- Choose seeds that are interesting and offer special qualities
  - Earliness
  - Improved Flavor
  - Color or shape
  - Disease Resistance IPM (VFN)
HEATING PAD

- Speeds germination, but not mandatory
- Available from catalogs $30 - $80
- Available from CVS for $16
Germination

- 12 to 21 days @ 69.8°F
- 10 days or less @ 80.6°F
- Higher temperatures cut germination time but also decrease percentage of germination
- Pepper seeds do not need light to germinate but light is important as soon as the first leaves appear

*From Jean Andrews

Peppers The Domesticated Capsicums 1984

** Huge thanks to Pat Kenny
BEFORE YOU PLANT YOUR SEEDS

- Read the Packet!!
PLANTING YOUR SEEDS

- Soilless mix is hard to wet—Warm water works a little better than cold
- Spray mist after planting or
- Put water in plastic bag and wait for it to absorb before planting seeds
PLANTING YOUR SEEDS

- Put trays in plastic bag, plastic wrap or cover with a plastic top (Create a mini-greenhouse)
- Bottom heat speeds germination (16 hours/day only!)
- Label your plantings
- Check daily
  - Have seedlings emerged?
  - Have they dried out?
WHEN SEEDLINGS EMERGE

- Remove from plastic bag
- Place under lights for 16 hours/day
  - Not continuous lighting
- Lights 1-2 inches from top of leaves
  - Lights 2 inches from your seedlings give them ¼ as much light compared to 1 inch from seedlings
- Bottom water or spray mist with a sprayer
- Top watering can knock seedlings over
WHEN SEEDLINGS EMERGE

- Adjust lights as seeds grow, always maintaining 1-2 inches distance from leaves (use magazine or move lights)
- Bulbs feel cool to touch, but they can burn leaves
- Daytime temperatures 65-75 degrees. Nighttime temperatures can be 10 degrees less, but check packet for specific conditions
Caring for Your Seedlings

- Cells containing more than 1 plant
  - Transplant
  - Cut off or pull extra seedlings

- Books say transplant after first true leaves (not nurse leaves) emerge

- I transplant 3-4 weeks later - after roots have developed more fully
CARING FOR YOUR SEEDLINGS

- Fertilize at 3-4 weeks and thereafter
  - Fish emulsion
  - MiracleGro or equivalent at 1/4 to 1/2 strength
  - Some soilless mixes already contain fertilizer
DAMPING OFF DISEASE

- Fungi that will kill seedlings at soil line
- Can’t be cured so avoiding infection is only solution
  - Good air circulation. Avoid overcrowded plants
  - Avoid over watering. Let soil dry between watering
  - If reusing pots, disinfect with 10% Clorox solution (1 part Clorox to 9 parts water)
  - Do not reuse soil
  - Avoid high humidity
  - More info at http://www.extension.umn.edu/distribution/horticulture/DG1167.html
DAMPING OFF DISEASE

- Can be prevented ahead of time with RootShield, Trichoderma harzianum T22

- Can also be prevented by covering top of container with milled sphagnum moss, which contains a natural fungicide
Plants can’t go from indoors to harsh sunlight. Sunscald will kill them.
Start process 10-14 days before planting outdoors.
Start sunlight for 1 hour/day and increase over a week.
Temps < 50 degrees can cause injury, e.g. misshapen tomatoes. Melons are susceptible.
Be careful of heavy rains.
TRANSPALNTING YOUR SEEDLINGS

- Ideally, transplant on a cloudy day. Even better, transplant when cloudy conditions are predicted for several days
- Make sure plants are well watered before transplanting
- Dig hole for plant that is sufficiently large
- Most plants should be planted at the same level they were growing at before being transplanted. Exception to this rule is tomatoes, which can be planted much deeper
Pepper plants have become very popular in recent years and many more varieties are available than have been in the past. Especially at hardware stores and garden centers.

Many mail order catalogues will send plants that are ready to go into your garden at the appropriate time.

Keep plants properly watered until they go into your garden or planter.

Plants like peppers, which produce large fruit or pods require plenty of available calcium. So be sure to amend the soil with plenty of pulverized limestone worked into the soil to a depth of 4 to 12”- 1 to 2 cups per plant.

**ADVANTAGES:** Plants are ready to grow when you are ready to go. You can purchase exactly how many plants you want. Removes some risks of early crop failure.

**DISADVANTAGES:** Less variety and subject to supply and demand. Is the variety you are purchasing, actually the variety you are purchasing?
CHECK PLANTS FOR INSECTS AND DISEASE AT THE TIME OF PURCHASE
MULCH PLANTS
IRRIGATION AND MULCH
PLANTS CAN GROW VERY WELL IN PLANTERS
PESTS AND PROBLEMS

- **INSECTS** - Cutworms, European Corn Borers, Flea beetles, Fruitworms, Green Peach Aphids, Hornworms, Leaf Miners, Leafhoppers, Pepper Maggots, Pepper Weevils, Thrips, Whiteflies

- **MITES** - Spider Mites, Cyclamen Mites

- **THRIPS**

- **NEMATODES** - Root knot nematode is very small worm

- **BACTERIAL DISEASES** - Bacterial spot, Bacterial Soft Rot, Bacterial Wilt

- **FUNGAL DISEASES** - Anthracnose, Early Blight, Cercospora Leaf Spot, Gray Mold, Phytophthora, Southern Blight, Verticillium Wilt, White Mold

- **VIRUSES** - There are around 45 viruses that infect chiles and more than half are transmitted by aphids.

- **ABIOTIC** - Blossom-end Rot, Sunscald
Abiotic - caused by fluctuating moisture and lack of calcium during pod development

http://www.chilepepperinstitute.org/
PATHOGENS CAN BE SPREAD BY PEOPLE, INSECTS AND WATER SPLASHING FROM SOIL

TOBACCO MOSAIC VIRUS

BACTERIAL LEAF SPOT

http://www.apsnet.org/edcenter/intropp/lessons/prokaryotes/Pages/Bacterialsport.aspx
Difficult to control
Prevention is the best control
Keep water and soil from splashing on foliage
Control Flea Beetles with diatomaceous earth, flour, soaps, row covers and parasitic nematodes
TOMATO HORNWORM

Hand pick, Bt
Natural predators

Oklahoma State University, Dept. of Entomology

UC Statewide IPM Project
© 2000 Regents, University of California
Adult parasitic wasp
Native and Brown Marmorated Stink Bug
Hand pick, kaolin clay
Aphids are common vectors of viruses and diseases. Controlled by natural predators, but plants may be infected before control is attained.
MOSAIC VIRUS SYMPTOMS
Often misdiagnosed, may require a 10x hand lens to identify.
Oils and soaps are effective as are natural predators such as lacewings.
Very common on Red Cherry type peppers. Row cover is effective.
ROW COVER
Floating Row Covers
Diatomaceous Earth
Horticultural Soaps
Neem Oils
Horticultural Oils
Bacillus Thuringiensis (Bt) and other beneficial bacterium
Beneficial Nematodes
Pyrethrums
PURE CAPSAICIN RANKS AT 16,000,000 SCOVILLE UNITS

ALKALOID COMPOUNDS - CAPSINOIDS (LESS PUNGENT) AND CAPSAICINOIDS (MORE PUNGENT) 14 different types can be distinguished by humans according to the University of Georgia

- CAPSAICIN
- DIHYDROCAPSAICIN
- NORDIHYDROCAPSAICIN (least pungent/irritating)
- HOMODIHYDRO CAPSAICIN (most pungent/irritating)
- ETC...
WHAT USE ARE THEY?

According to the European Journal of Pharmacology

Elsevier 1/10/2011

“Recent advances in study on capsaicinoids and capsinoids”

Xiu-Ju Luo, Jun Peng, Yuan-Jian Li

Capsinoids and capsaicinoids possess biological properties of:

- Antitumor,
- Antioxidant
- Antiobesity

Also:
Many anti-arthritis and anti-inflammation products are sold both over-the-counter and by prescription containing the active ingredient capsaicin and derivative compounds

Can you say “endorphin rush”?

And: They taste good!
SO MANY CHILES, CHILIES, CHILLIS
THERE IS NO ABSOLUTE CORRECT SPELLING

- **Sweet**
  - Bell
  - Aji dulce
  - Cubanelle
  - Pimento
  - Sweet Hungarian
  - Sweet Banana

- **Heat**
  - Jalapeno
  - New Mexican
  - Serrano
  - Cayenne
  - Habanero
  - Naga/Bhut jolokia
  - Carolina Reaper
  - Trinidad Scorpion
Wilbur L. Scoville

A pharmacologist with Parke Davis in 1912, developed the Scoville Organoleptic Test - using extracts of chile peppers that used a panel of five tasters to determine pungency.

Highly subjective!

In 1980, James Woodbury of Cal-Compack Foods developed a much more accurate method to determine pungency using High Pressure Liquid Chromatography (HPLC) that is still used today.
There is much confusion about what the actual origin of these varieties are.
CAPSICUM CHINENSE - HABANERO
(100,000-580,000 SHU)

TRINIDAD MORUGA SCORPION
2+ MILLION SCOVILLE UNITS
SMOKIN' ED'S CAROLINA REAPER® IS A SUPER HOT PEPPER DEVELOPED BY ED CURRIE IN HIS ROCK HILL, SOUTH CAROLINA GREENHOUSE. MEASURING OVER 1.5 MILLION ON THE SCOVILLE HEAT UNIT SCALE, SMOKIN' ED'S CAROLINA REAPER® WAS AWARDED THE GUINNESS WORLD RECORD IN NOVEMBER OF 2013. HP22BNH7
NAGA JOLOKIA/BHUT JOLOKIA
C. CHINENSE X C. FRUTESCENS

Eric M. Wenger
IS THIS A HABANERO?

Eric M. Wenger
HABANERO - *C. CHINENSE*
100,000 TO 250,000 SHU
MUSHROOM IS A TYPE OF HABANERO
IS THIS TRINIDAD SCORPION?
1,000,000 + SHU

Trinidad Scorpion

Eric M. Wenger
BHUT JOLOKIA/NAGA JOLOKIA
C. CHINENSE X C. FRUTESCENS
1,000,000 + SHU

Eric M. Wenger
SCOTCH BONNET - C. CHINENSE
CAN BE YELLOW OR RED
100,000 + SHU

Eric M. Wenger
SERRANO
PEUBLA AND HIDALGO, MEXICO
10,000 TO 25,000 SHU

Eric M. Wenger
BULGARIAN CARROT
5,000 TO 30,000 SHU
CAPSICUM BACCATUM - AJI AMARILLO
(30,000-50,000 SHU)
SOLD AS BURPEE ‘LEMON PEPPER’
AJI CRISTAL - C. BACCATUM
CURICO, CHILE (10,000 SHU)

Eric M. Wenger
Capsicum Annuum-Cayenne
(30,000 to 90,000 SHU)

Benefits of Cayenne Pepper

- Improve Circulation
- Sinus Relief
- Relieve Constipation
- Digestive Aid
- Lower Blood Pressure
- Relieve Pain
- Treat Stomach Ulcers
- Toothaches
- Reduce Inflammation
- Arthritis
- Kill Garden Pests
- Wounds
- Detoxification
- Fever
- Fight Cold & Flu
- Weight Loss
- Lower Blood Sugar
- Head Aches
- Heart Conditions
- Psoriasis
- Prevent Heart Attack
- Congestion

www.NaturalHealthcareStore.com

http://dietcheryfu.atspace.eu/
CAPSICUM ANNUUM
JALAPENO AND SERRANO
(5,000 TO 30,000 SHU)

MUCHO NACHO
BIKER BILLY
CONCHOS
EL JEFE
ETC...

TAMPIQUENO
FISH PEPPER – C. ANNUUM
AFRICA 5,000 TO 30,000 SHU

Eric M. Wenger
According to *Mother Earth News, April/May 2009* William Woys Weaver, re-introduced this beautiful and culturally significant variety.

Historically, this variety was used in Maryland especially around Baltimore and the eastern shore by African-American cooks and caterers who created white paprika used in cream sauces for fish and shellfish.

Prehistoric migration from Southern Brazil or Bolivia north to Central America and Mexico likely by birds, the “bird pepper”. Used extensively by the Tarahumara Indians of the Sonoran Desert in Mexico.

“The Whole Chile Pepper Book”
Capsicum frutescens
Tabasco, Thai Chile, African Birds-Eye
(30,000 to 350,000 SHU)
Grows at high altitude in the mountains of Peru and other South and Central American countries and Mexico. Prefers cooler and shadier conditions than most other chiles.
CAPSICUM ANNUUM
‘TIBURON’ ANCHO/POBLANO
(1,000 TO 2,000 SHU)
OF THE FAMED “HATCH CHILE FESTIVAL”

HATCH, NM CLAIMS TO BE THE “CHILE CAPITAL OF THE WORLD”

CULTIVATED AS EARLY AS THE 17TH CENTURY

NUMEX JOE E PARKER HIGHLANDER

http://www.chilepepperinstitute.org/
ASSORTED SWEET BELL PEPPERS
(0 SHU)
AJI DULCE - C. CHINENSE

Aji Dulce #1

www.chileplants.com
SWEET BANANA

Eric M. Wenger
CUBANELLE - LARGE MILD CHILE
(1-1,000 SCOVILLE UNITS)

http://www.burpee.com/vegetables/
CUBANELLE
<table>
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<th>Scoville Heat Units</th>
<th>Types of Peppers</th>
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<tr>
<td>15,000,000</td>
<td>Pure Capsaician</td>
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<tr>
<td>2,000,000 - 5,300,000</td>
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<td>1,000,000</td>
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<tr>
<td>577,000</td>
<td>Red Savina</td>
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<tr>
<td>200,000 - 350,000</td>
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Scoville Heat Unit Scale copyright AZP Worldwide / All rights reserved
FOR VEGETABLE CROPS

- Buy resistant varieties recommended by your local agriculture extension agent and local universities
- Try to rotate crops by planting non-similar plant species from season to season or year to year
- Test soil on a regular basis
- Avoid overhead watering
- Avoid over fertilization
- Use mulches
- Know your crops
- Inspect frequently
HOW MUCH CAN YOU HARVEST?
IT DOES NOT TAKE A LOT OF CHILE PLANTS TO PRODUCE A LOT OF CHILE FRUIT.

GIVE PLANTS PLENTY OF ROOM FOR AIR MOVEMENT AND GROWTH.
WHAT TO DO WITH ALL THOSE CHILES?
CHILE RISTRAS
STORING

- Canning/Pickling
- Fermenting
- Freezing
- Drying

- Chili Paste
- Chili Powder
- Chili Sauce
- Smoking
Recipes

- Stuffed Peppers
- Peruvian Aji Sauce
- Ceviche
- Chile Rubbed Lamb
- Kimchi

- Chile Rellenos
- Cantaloupe Salsa
- Green Sauce
- Red Sauce
STARTING VEGETABLE AND ANNUAL SEEDS INDOORS (SLIDES 13-49)

Gary Cahn, Master Gardener
RESOURCES

• “The Whole Chile Pepper Book” DeWitt and Gerlach
• “Chile Peppers” Brooklyn Botanic Garden

- http://pepperheadsforlife.com/the-scoville-scale/
These are great resources:

- [http://www.chilepepperinstitute.org/](http://www.chilepepperinstitute.org/)
- [http://extension.umd.edu/](http://extension.umd.edu/)

- GE 117
- HG 70
- HG 57
RESOURCES

- http://www.pepperheadsforlife.com/the-scoville-scale/
- http://www.burpee.com/vegetables/
- http://www.tomatogrowers.com/Peppers/departments/15/
- http://www.chilepepperinstitute.org/
College of Agriculture and Natural Resources

UNIVERSITY OF MARYLAND EXTENSION
Solutions in your community

HOME AND GARDEN INFORMATION CENTER
University of Maryland Extension

GROW IT EAT IT
Maryland’s Food Gardening Network

MASTER GARDENERS
UNIVERSITY OF MARYLAND EXTENSION