Gerbera Season Primer

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History of Gerbera

-Native to South Africa

-Classified in 1737 and named after Botanist Traugott Gerber.

-Robert Jameson, a Scottish businessman, took interest in the plant and sent samples to England.

-The head botanist at Kew Gardens named the species after Mr. Jameson, *Gerbera jamesonii*.

-Beginning around 1890, work began in England on development of the modern gerbera.

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Seed Storage

Seed Germination and Storage:

- Gerbera seed are large (7,100 seeds per ounce/250 per gram) compared to many other bedding plant species that we grow. Seed can be stored up to 12 months when held at 41ºF/5ºC if seed is kept at 4.5-5.7% moisture content and at 32% relative humidity.

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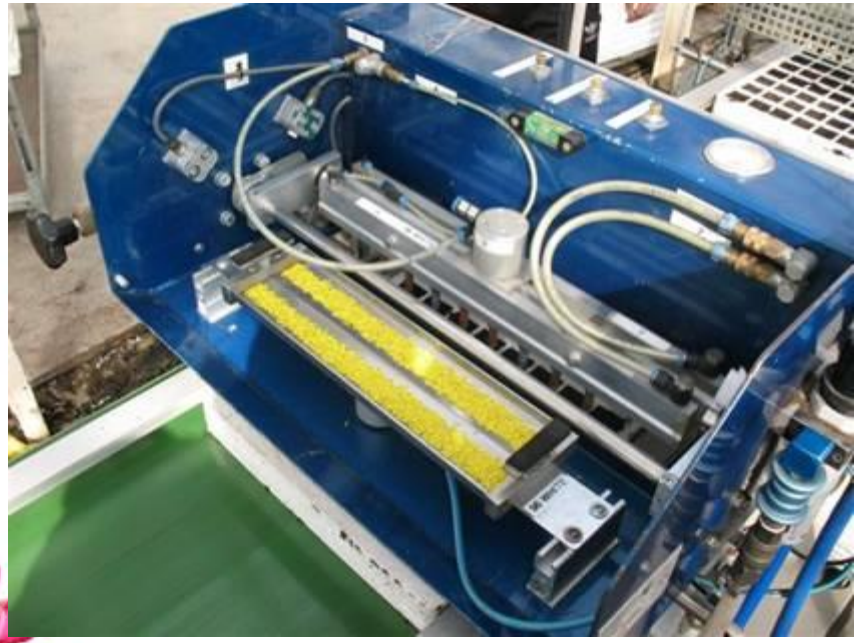
Seed Handling



- Remove from storage only the seed needed for the next 4 hours.
- For seed returned to the seed storage area, leave the packet open overnight to equalize the humidity levels and prevent condensation from forming inside the packet.

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Media

- Provide a media with good aeration for optimal nutrient uptake.
- Select a plug media that is highly aerated. Mixes made with long fiber peat provide excellent structure and nutrient uptake. Do not use media designed for germinating begonias made with finer peat fibers. Alternatively, use a media with a higher aggregate content (perlite).
- Provide an environment that promotes high leaf transpiration.

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200 plug cell

Long fiber seedling mix – Peat lite plug mix

- 5 week old gerbera plugs.
- Long fiber peat yields more usable plugs.
- Long fiber peat eliminates gnarled and stunted seedlings.
- Ideal for mini types that are more sensitive to excess moisture.

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128 plug cell

Long fiber potting mix – Peat lite potting mix

- 8 week old gerbera plugs.
- Transplanted from a 200 cell at 5 weeks.
- Higher aeration in the long fiber/block cut peat promotes quicker growth.

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128 cell Gerbera plugs

Long fiber peat – Peat lite mix

Long fiber peat – Peat lite mix

Evapotranspiration

- Long fiber/block cut peat has more air cavities that allowing for more wet/dry cycles.
- Calcium and boron are taken up passively and only at the root cap.
- Gerbera require high transpiration rates in both the leaf and root area.
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- Higher aeration promotes healthy root hair growth for optimal calcium and boron uptake.

Gerbera require highly aerated media for optimum growth!

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Optimizing Germination

- Gerbera seed germination is enhanced by:
- Daylight/fluorescent light
- Temperatures between 70-74ºF/21-23ºC.
- Uniform moisture
- Light coating of vermiculite
- Supplemental high pressure sodium lighting
- Constant temperature

- Gerbera seed germination is inhibited by:
- Temperatures <70ºF/21ºC or >75ºF/24ºC.
- Non-uniform moisture
- Covering seed with media
- Darkness
- Incandescent light
- Alternating day and night temperatures

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Germination – Stage One

- Well drained media with high aeration. Optimum is pH 5.8 and EC of 0.7 mmhos/cm (1:2 slurry).
- Temperature 70-74ºF/21-23ºC.
- Lightly cover seed with coarse vermiculite.
- Water in well and maintain 95% humidity.
- Covering with remay is an option when germinating in the greenhouse.

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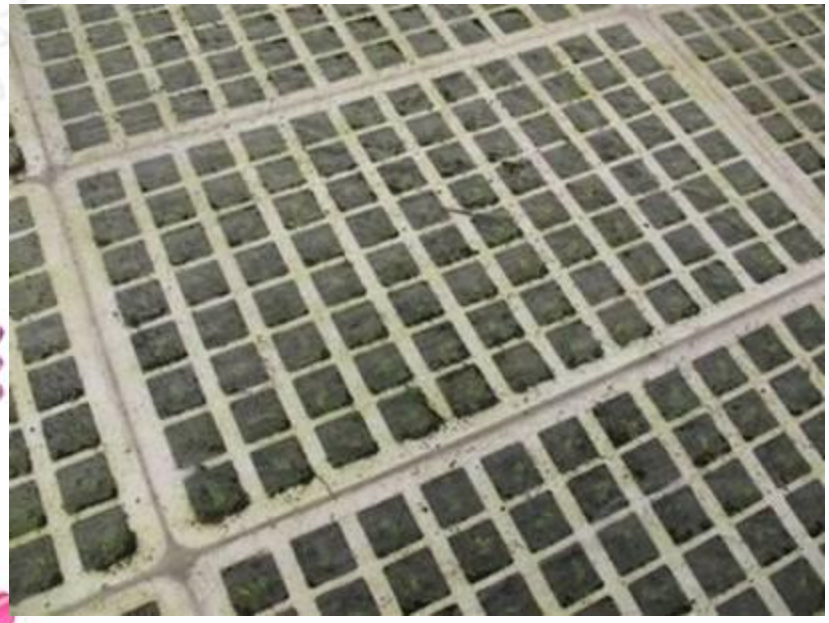

Remay covering

Tent covering

(Remove remay before the cotyledons stick to the material)

Germination - Stage Two

- Seedlings emerge in 4-6 days.
- When cotyledons are up and laying flat allow the media to dry in between watering.
- Lightly feed with 50-75 ppm N from a well balanced calcium nitrate-based formulation.
- Temperature 69-72ºF/21-22ºC.

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Germination – Stage Three

- Increase the fertilizer rate to 100 ppm N.
- Lightly rinse off foliage after feeding with clear water.
- Apply supplemental lighting (300-500 foot candles/3,200-5,300 lux) up to 14 hours per day.
- Under high light (> 7,000 foot candles/74,000 lux) shade to avoid foliage burn and plant stress.

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Germination – Stage Four

- The plugs should have 4 true leaves and are approaching transplant stage.
- Transplant on time to avoid root bound plugs.
- Overgrown transplants take longer to finish and produce flowers on smaller plants.
- Reduce fertilizer levels and lower the temperature down to 62ºF/17ºC.

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Transplant before root wrap!

Beware of Fungus Gnat Larvae

- Fungus Gnat Larvae can attack Gerbera seed.
- Use a sterile media and monitor insect populations.
- Clean and sterile greenhouses

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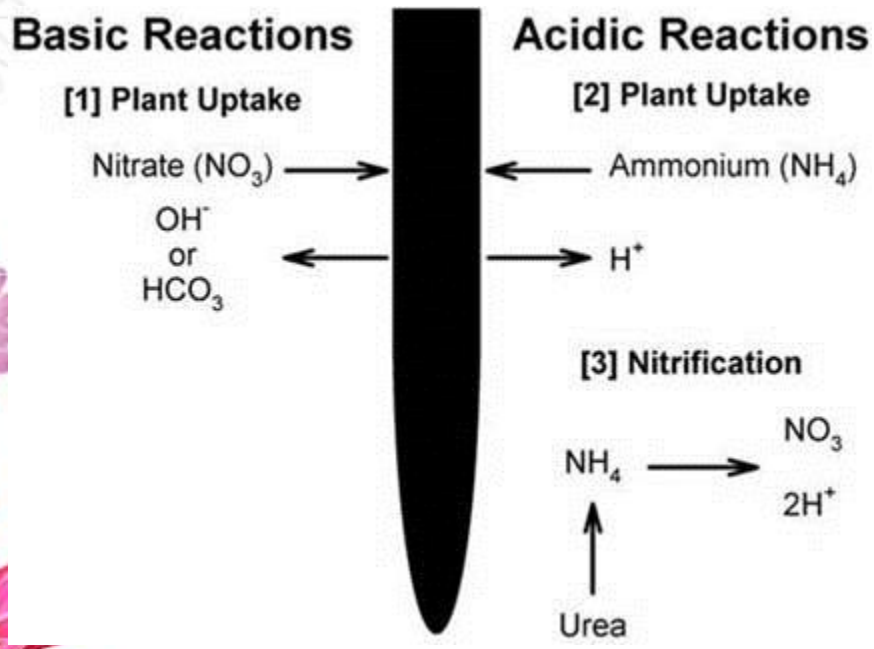
Distortion due to overwatering

Fertilizer



- Cal/Mag specials work well at 150-200 ppm Nitrogen.
- Optimum E.C. is 1.2 to 1.5 mmhos (1:2 slurry).
- Optimum pH is 5.8

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Fertilizer type and timing

- Gerbera should be fed with a fertilizer that is nitrate-based and not ammonium-based.
- Nitrate –based fertilizers will limit leaf elongation and shading, whereas, ammonium-based fertilizer can result in large leaves and a lot of shading.
- The first application of fertilizer should be made about 10-14 days after germination with approximately 75-100 ppm N from 15-5-15.
- In some cases, if foliage is very tender, foliage can burn. If this occurs, fertilizer will need to be washed off routinely after application.

Formulations that provide higher amounts of potassium, such as 15-3-20, build strong plants with high flower bud count.

Nitrogen Fertilization

50 75 100 200 300 400

Magnesium Deficiency

- Magnesium is an important macro element for Gerbera production.
- Being a mobile element, an interveinal chlorosis initially shows on the lower leaves.
- Supply with Magnesium Sulfate at 15-30 ppm CLF (constant liquid feed) or 1 lb. every 14 days. $MgSO_4$ also supplies valuable sulfur.
- The use of dolomitic limestone and Cal/Mag fertilizers often supplies sufficient magnesium without supplementation.

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Iron Deficiency

- Gerbera is an iron inefficient plant and often shows a deficiency when the pH is over 6.2.
- Being an immobile element, an interveinal chlorosis first shows on the upper leaves.
- Supply at 1 ppm (constant liquid feed).
- EDDHA chelated iron is more effective at high pH levels.
- The use of 21-7-7 is highly effective in reducing the media pH.

Low pH

- A pH below 5.5 can cause manganese toxicity characterized by black spotting of the lower foliage.

Boron deficiency

-Boron should be supplied at 0.25 ppm, constant liquid feed. When doing excess leaching with clear water apply trace elements to maintain optimum levels.

Temperature

- Optimum growing temperature is 68-70ºF/20-21ºC
- How fast gerbera unfold leaves, or develop, increases as average daily temperature increases from 55-72ºF/13-22ºC.
- Increasing temperature further, will not result in earlier flowering. For instance, the time from visible bud until flowering (anthesis; shedding of pollen) decreases exponentially from 44 to 18 days as average daily temperature increases from 55-72ºF/13-22ºC.

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Flowering response

- Gerbera Festival is day length neutral, and a facultative irradiant plant.
- Optimum light levels are 7,000 foot candles and 14 mol of light per day.
- Long day conditions with supplemental lighting showed a slight increase in the number of flowers, possibly due to higher irradiance.

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Flower Bud Initiation

-Gerbera flowers form between the 7th and 26th leaf node, depending on cultivar.

- Since many leaves are too small to see when flower bud initiation occurs in the shoot tip, flower initiation actually occurs when 1-2 leaves have unfolded on the seedling.

-Use of plug trays with greater space between seedlings enables a quicker and more uniform flower bud initiation.

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Effect of delayed transplanting on Gerbera Festival Golden Yellow w/Eye

L-R Festival Golden Yellow w/Eye transplanted from a 72 cell plug tray at

8 – 10 – 12 – 14 – 16 weeks from sowing

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Detrimental effects of delayed transplant on Gerbera

- Delayed flowering
- Uneven flowering
- Shorter flower stems
- Smaller flowers
- Bud abortion
- Split crowns
- Weaker plants

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Selected plants showing expected delayed plant development due to late transplanting

Left to Right: Festival Golden Yellow w/Eye in 5 inch pots transplanted from a 72 cell plug at 8 – 10 – 12 - 14 weeks after sowing.

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Shading causes bud abortion and splitting

- It is critical to transplant on time and avoid shading of the crown by neighboring plants.
- A leaf covering the crown of an adjacent plant will absorb infrared light and allow far red light to pass through to the crown. Far red light promotes bud abortion resulting in delayed flowering and unevenness.

Single Crown

Normal crown development yields a uniform crop for bench run efficiency.

Split Crown Due to Shading:

(288 plug transplanted at 6 weeks)

Due to shading the tip aborts resulting in a split. The end result is more flower buds but delayed and uneven flowering.

Height Control / DIF

- Gerbera height is easily controlled using day/night temperature manipulation and B-Nine (daminozide) application.

- Gerbera leaf expansion and scape elongation (flower stalk) increase as the difference (DIF) between day and night temperature increases. Gerbera leaf expansion and scape elongation are also very sensitive to morning temperature drops.

- Therefore, growers can reduce leaf expansion and scape elongation by trying to grow crops with a 0º DIF and dropping temperatures
- (5-7ºF/3-4ºC) during the first 3-4 hours of the day.

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B-Nine - Handling

- B-Nine by nature is an acidic material when mixed with water. It will have a low pH of around 4.5 to 5.0 depending on water quality. For this reason, B-Nine WSG should not be applied with or within 7 days use of a metallic based fungicide such as copper. The use of copper based fungicides along with B-Nine will result in more readily available copper ions and could then result in copper toxicities to the crop.

- B-Nine WSG will mix readily with many water qualities. Very cold well water may increase the solubility time, using warm water will shorten the time needed to dissolve it. Normal water temperatures of 50ºF/10ºC will soubise the product in a matter of minutes. There is no need to add any surfactant to a B-Nine mix as the product contains a very good wetting agent.

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B-Nine - Application

- Gerbera elongation can be easily reduced by applying B-Nine.
- Apply B-Nine at 1,500-2,500 ppm / 15-25% as needed to control elongation.
- Over-application of B-Nine can result in flowers blooming in the foliage rather than above the foliage.
- In general, the first B-Nine application should be made about 3-4 weeks after germination depending on tray size.
- The second application is generally applied about 10-14 days after transplanting seedlings to the final container.

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Application prior to flowering

Last chance to spray

Too late to spray

Late application of B-Nine

Left: Late application of B-Nine resulted in excessively short stems.

- Applying B-Nine too late results in excessively short flower stems.
- Do not apply after the flower buds separate and begin to lengthen.

Avoid Deep Transplanting

- Transplant plugs slightly high in the pot to avoid burying the crown.
- Deep transplanting results in blindness, delayed flowering and malformed flowers.

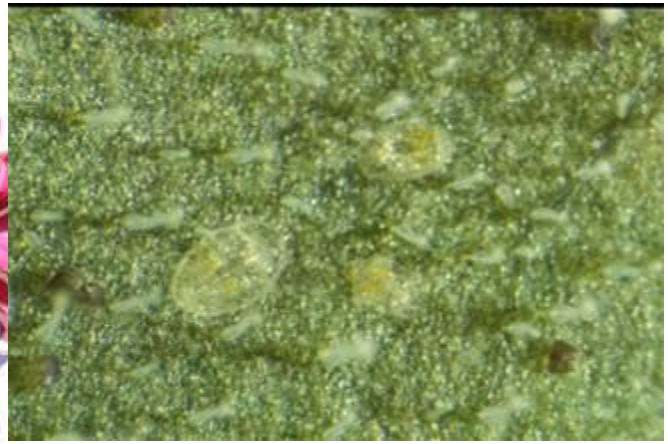
Major Insects

- Western Flower Thrips
- Whitefly
- Leaf Miner
- Fungus Gnats
- Two Spotted Spider Mites
- Broad and Cyclamen Mites

Western Flower Thrips

- Western flower thrips (*Frankliniella occidentalis*) feeding on Transvaal daisy leaves results in leaf scarring, necrotic spotting, distorted growth, and sunken tissues (primarily on leaf undersides).
- Western flower thrips (WFT) adult feeding on flowers or un-opened buds may result in flower bud abortion or deformation of flowers.
- Flowers and leaves have a characteristic white or “silvery” appearance. Black fecal deposits may be present on leaf undersides.

Whitefly



- The major whitefly species that attack Transvaal daisy include the greenhouse whitefly (*Trialeurodes vaporariorum*) and silverleaf whitefly (*Bemisia argentifolii*), which is synonymous with the sweet potato whitefly (*Bemisia tabaci*) B-biotype.
- A majority of the whitefly life stages (eggs, nymphs, pupae, and adults) are located on the underside of Transvaal daisy leaves. The nymphs cause direct plant injury by feeding on plant fluids, which results in leaf yellowing, leaf distortion (curling), and plant stunting and wilting.
- The nymphs also produce a clear, sticky liquid material called honeydew that serves as a growing medium for black sooty mold fungi. The presence of large numbers of whitefly adults can be a visual nuisance, which may impact salability of a Transvaal daisy crop.

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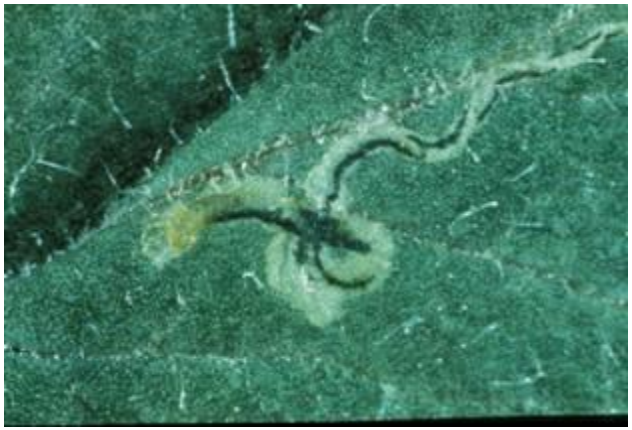
Leafminer



- The serpentine leafminer (*Liriomyza trifolii)* is the main species that attacks Transvaal daisy although other species may also occur in the greenhouse depending on geographic location.

- Leafminers cause plant damage primarily when in the larval stage since the larvae feed between the leaf surfaces in the mesophyll layer of cells, creating serpentine mines or trials.

- The damage caused by leafminers is primarily aesthetic or visual as Transvaal daisy plants are rarely killed from a leafminer infestation.

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Fungus Gnats

- Fungus gnats (*Bradysia* spp.) can be a problem when growing Transvaal daisy for several reasons. First, large populations of adults flying around may affect crop salability.
- Second, both the adult and larval stages are capable of disseminating and transmitting diseases.
- Third, larvae cause direct plant injury to roots and create wounds that may allow secondary soil-borne pathogens to enter.
- Finally, larvae may tunnel into the crown of a Transvaal daisy resulting in plant death.

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Two Spotted Mites

- Twospotted spider mite (*Tetranychus urticae*) tends be located on the older leaves of Transvaal daisy feeding on leaf undersides within plant cells removing chlorophyll (green pigment) with their stylet-like mouthparts.
- Twospotted spider mite generally feeds near the midrib and plant veins although they will feed on the entire leaf.
- Damaged leaves appear stippled with small silvery-gray to yellowish speckles.
- Leaves heavily infested with twospotted spider mite may appear bronzed, turn brown, and fall off.

Broad and Cyclamen Mites

- Broad mite (*Polyphagotarsonemus latus*) and cyclamen mite (*Steneotarsonemus pallidus*) are major pests of Transvaal daisy grown in greenhouses.
- Broad and cyclamen mite require very different environmental conditions than twospotted spider mite. These mites tend to be a problem under cooler temperatures (around 15ºC) and higher relative humidities (70 to 80%), which are conducive for their development and reproduction.
- Both mites have similar developmental and reproductive potential.
- Broad and cyclamen mite feed on young foliage and floral parts such as flower buds retarding growth and preventing flowers from fully-developing. Typical symptoms of feeding by broad and cyclamen mite include bronzing and distortion of plant leaves.

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Major Diseases

- Botrytis
- Phytopthora
- Powdery Mildew
- Pythium
- Sclerotinia

Botrytis

-5 hours of water film, (such as that caused by condensation) and a temperature between 64-77ºF/18-25ºC for infection to take place.

-Difficult post harvest problem because conidia can persist on flower heads and infect whenever there is enough moisture to allow germination.

Phytopthora

-The most serious disease of gerberas in greenhouse culture is the crown and root rot (also called foot rot) caused by *Phytophthora cryptogea*.

-*P. cryptogea* is active from 33-77ºF/1-25ºC. Overwatering aggravates this disease, and symptomatic plants are most likely to be found in low areas where water puddles.

-Roots show tip decay that is indistinguishable from symptoms caused by *Pythium*. Flood irrigation makes this disease much harder to control.

-Removing diseased plants promptly is important for slowing disease spread.

Powdery Mildew

-The species most often reported on Gerbera is *Erysiphe cichoracearum*.

-Powdery mildew is more severe on older plants because they have a denser, humidity-retaining canopy.

-In outdoor grown crops in Florida it is more of a problem in the relatively cool weather of spring and fall.

-Temperatures are optimum for *E. cichoracearum* at 68-77ºF/20-25ºC. Air circulation between plants helps to reduce disease.

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Powdery Mildew Solution

- Weekly sprays of Actinovate SP (Streptomyces lydicus) at 6 - 12 ounces per 100 gallons/45-90 grams per 100 liters is a natural control for powdery mildew. Actinovate SP can also increase plant size, vigor and root mass.

Sulfur Burners

- Sulfur burners are an effective and inexpensive method to control powdery mildew.
- Best used in houses covered with glass, as sulfur decreases the life of plastic.

Pythium

- *Pythium* typically causes a root tip decay in which the outer cortex of the root tip is rotted and sloughs off easily.
- The main safeguards against root rots are employing careful sanitation practices and using a well-drained growing medium. To combat *Thielaviopsis*, which causes black root rot, keep the pH at 5.5-5.8 or lower, as higher pH levels encourage disease development.
- For *Pythium* management, be careful to avoid overfertilization. Control fungus gnats to reduce spread of both of these pathogens.

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Sclerotinia

- Sclerotinia is a type of crown rot caused by oomycetes, not true fungi.
- Overwatering and poor drainage promote disease expression.

Effect of Day length on Stem Elongation

Left – Short Day / Right Long Day

(August flowering with no B-Nine applied)

Plants grown under short days (11 hour photoperiod from spacing) had shorter leaves and less flower stem elongation compared to plants exposed to long day conditions (>14 hour photoperiod from spacing).

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B-Nine vs. Short Days

Left: B-Nine/LD Summer Right: SD Summer

- Plants treated once with 20% B-Nine resulted in a one week delay in flowering compared to untreated plants grown under short day conditions (11 hour photoperiod).

- In this trial, plants treated with B-Nine had fewer flowers but a higher number of leaves.

- B-Nine did not affect flower size.

- Short day treated plants grown in spring had slightly smaller flowers than those grown in summer.

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Missing Petals

-Apetalous appears to be related to high temperatures (>90ºF/32ºC).

- Plants appear to be more sensitive in the last 3-4 weeks when flower buds are growing with increasing speed.

- Some cultivars, like Peach w/Eye, are more sensitive.

- More study is needed to better define the critical temperature and time period that triggers this phenomena.

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