

TECHNICAL BULLETIN



Tomatoes, Peppers and Eggplant



HARRIS® SEEDS
A Grower Friendly Company

Toll-free: 1-800-544-7938
Toll-free fax: 1-877-892-9197
www.harrisseed.com

355 Paul Road, PO Box 24966, Rochester, NY 14624-0966

Growers - We have what you need for a successful and early eggplant, pepper and tomato crop!

From start to finish Harris Seeds has the supplies to help you throughout the growing season.

- Our Jiffy pots provide a great start for transplanting young plants without the worry of transplant shock. - Soon to be OMRI Approved!
- Mulches provide warm, weed free soil for your plants allowing earlier planting and less need for cultivation.
- Our Watering Supplies and Drip Irrigation Kits will allow you to keep the plants watered and healthy.
- Use our organic or OMRI approved Fungicides and Insecticides to fight mildew, fungal and insect problems.

JIFFY PEAT POTS



JIFFY POTS

JIFFY PEAT POTS (ROUND)

Start single plants for sales or field transplant. Retain strength, yet allow root penetration.

Jiffy Pots encourage vigorous plant growth, with no transplant shock, as their roots are not disturbed. The larger 3" and 4" sizes are excellent for quick-growing plants such as squash and pumpkins.

- 04151-851 Jiffy Pots 2 1/4" x 2 1/4", 100 ct.
- 04151-901 Jiffy Pots 2 1/4" x 2 1/4", Case 2815
- 04150-851 Jiffy Pots Extra Deep 3" x 4 1/2", 100 ct
- 04150-901 Jiffy Pots Extra Deep 3" x 4 1/2", Case 860
- 04152-851 Jiffy Pots 3" x 3", 100 ct.
- 04152-901 Jiffy Pots 3" x 3", Case 1400
- 04153-851 Jiffy Pots 4" x 4", 100 ct.
- 04153-901 Jiffy Pots 4" x 4", Case 1050
- 40505-851 Jiffy Pots 5" x 4", 100 ct. **NEW**
- 40505-901 Jiffy Pots 5" x 4", Case 575 **NEW**

JIFFY POLY-PAKS

Convenient Jiffy Poly-Paks are a real time and labor saver! Individual square pots are pre-loaded into a thin plastic handling sheet, which may be placed into a 1020 carrier tray. Three sizes of Poly-Paks are offered.

- 04128-901 Jiffy 2" x 3" Poly-Pak: 50 ct. sq. pots/sheet; 40 sheets/ct.
- 04131-901 Jiffy 3" x 3" Poly-Pak: 18 ct. sq. pots/sheet; 44 sheets/ct.
- 04126-901 Jiffy 3 1/2" x 4" Poly-Pak: 18 ct. sq. pots/sheet; 31 sheets/ct.

SPRAYERS

CHAPIN 4 GALLON BACKPACK SPRAYER

A hands free sprayer for large jobs!

Great for any large spray job that needs to be done at the farm or greenhouse. Use for all types of spray applications including herbicides, pesticides and fertilizers. Sprayer features oversized filler cap for easy filling, four position spray valve for pressure control, and positional pump handle for both right and left handed use. Bonus brass nozzle end included!

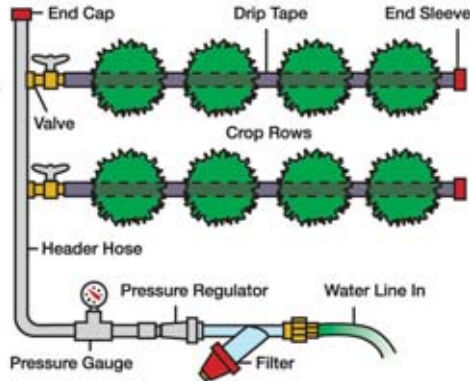
40337-900 Chapin 4 gal. Backpack Sprayer

TOMATO PLANT TWINE

Quickly tie up your tomato plants and other plants that may need extra support. Each roll contains 800' of two ply jute twine. Buy in quantity and save.

40420-900 Tomato Plant Twine 800'

DRIP IRRIGATION KIT



DRIP IRRIGATION KIT FOR SMALLER ACREAGE FARMS

An all-inclusive kit, for 1/4 to 1/2 acre, depending upon configuration

For the grower needing to irrigate a small area, this system is ideal, as it includes all components for operation. The 250 ft. of 1" header pipe and 3000 ft. of drip tube (high quality T-Tape brand), punched at 12" increments make for a highly configurable system (You cut the header and drip tube to your specified lengths). The maximum length that each drip line should be cut, is 550 ft., for best water distribution. This system may be used with black plastic mulch. Drip irrigation sends a uniform distribution of water directly to the root zone of plants, avoiding waste and runoff. A system such as this tends to use up to 50% less water than conventional systems, and minimizes such negatives as soil compaction, erosion and weed growth. Its use also tends to minimize leaf burn, and fungal diseases. Please call or write for our Drip Irrigation Brochure, (No. 90002-900), which includes suggested configurations for the field.

Components include: (1)-Roll 1" x 250 ft. Flat tube Header/ Main Line; (1)-Roll 10 mil. X 3000 ft. "T-Tape" Drip Line; (1)-1" pressure Regulator with 1" Adapter (garden hose inlet); (1)-1" Screen Filter with Adapter and clamp; (1)-1" End Plug for Head Line w/ clamp; (1)-Pressure Gauge with Stake; (30)-Drip Line Connectors with Shut-Off Valve; (1)-Hole Punch for Head Line; (30)-Drip Line End Sleeves; (6)-Drip Line Repair couplers.
40131-900 Drip Irrigation Kit

ORGANIC FUNGICIDE



GREENCURE ORGANIC FUNGICIDE

Don't lose your crops to fungal diseases

Developed by Cornell University plant pathologist Dr. Ken Horst; GreenCure is a safer alternative to cure and prevent mildews, blights, molds, and other plant diseases. One 8 oz container

makes up to 16 gallons when mixed. One gallon covers approximately 450 square feet. USDA Organic.

40194-900 GreenCure 8oz Concentrate
40344-900 GreenCure 40oz Concentrate



RED MULCH

Earlier tomatoes and strawberries!

1.0 mil. red mulch film has been shown (in USDA tests) to increase production of first quality early tomatoes from 12 to 20%, relative to black mulch, in the cooler regions of the US. (Not recommended for use in hot growing areas.) This dramatic yield increase results from the film reflecting far red light up into the plant where it triggers a color-sensitive protein within the tomato plant that regulates plant growth and development. Recommended on a trial basis.

05079-900 Red Plastic Mulch 4' x 600'
40358-900 Red Plastic Mulch 4' x 2400'
40359-900 Red Plastic Mulch 4' x 4000'



BLACK PLASTIC MULCH ROLLS

1.0 mil plastic suppresses weeds, reduces water loss, and increases soil temperature. These black plastic mulches represent an economical and convenient method to suppress weeds and reduce water loss in the field. The soil temperature increase provided by the mulch has been shown to increase vegetable yields under both trial and production situations.

40363-900 4' x 600' x 1.0 mil. Black
05085-900 3' x 2000' x 1.0 mil. Black
05086-900 4' x 2000' x 1.0 mil. Black
05087-900 4' x 4000' x 1.0 mil. Black
05088-900 5' x 2000' x 1.0 mil. Black

12" WOODEN STAKES

Best quality untreated wooden stakes, made in Maine. 12 x 1 1/2". Write on with our waterproof pen, listed below.

04543-848 50 Count
04543-855 250 Count

LARGE 18" FIELD STAKES

Use these high quality, heavy duty field stakes for your cut flower, vegetable or other varietal identification.

04547-901 100 Large 18" x 1 1/4" Field Stakes

Visit www.harriseseeds.com
or see our current catalogs
for our full line of growing
supplies and current pricing.

TECH BULLETIN TOMATOES, PEPPERS AND EGGPLANT

SELECTING THE RIGHT VARIETIES

Many factors enter into the picture when selecting a tomato, pepper or eggplant variety to grow. Length of growing season, local growing conditions and consumer preference must be of primary concern when choosing varieties of any of these species. In the case of tomatoes, you also have choices of fruit type, size and color of fruit, determinate (compact) and indeterminate (large) plant. With peppers your choices include color, shape and size of the fruit and hot or sweet types. When choosing an eggplant variety you have to consider fruit size, shape and color. Varieties may also be selected for disease resistance, maturity and whether they will be used for bedding plants, fresh produce or a pick your own operation.

GROWING TRANSPLANTS

Tomatoes, peppers and eggplants are all considered warm weather crops and are usually started as a transplant. Sow seed into a growing media that is fine in texture but also porous enough to allow for adequate air exchange and drainage. The pH of the media should be around 6.2 - 6.5 and it must be sterile to avoid damping-off and other disease problems. Seed will germinate in 1-2 weeks at soil temperatures of 75-80°F.

Generally, when the first set of true leaves has expanded, it is time to transplant the seedlings from the seedling tray to whatever you have chosen to finish them off in. Handle seedlings by the seed leaf with care when transplanting as injury to the stem is permanent and can be fatal. Smokers should wash their hands well with soap to deactivate any tobacco mosaic on their hands before touching plants at any stage. Take care to minimize root loss. Keep the transplants shaded and moist for a few days to reduce transplant shock. Grow plants on for another 6-8 weeks with air temperatures of 70-75°F.

Transplants should be hardened off before transplanting to minimizing the shock of being moved from the greenhouse to the field. This can be accomplished by lowering the air temperature to 60-65° F for a few days.

PROBLEMS YOU MAY ENCOUNTER DURING TRANSPLANT CULTURE

<u>Problem</u>	<u>Possible cause(s)</u>	<u>Suggested remedy</u>
Plants are off color, appear light green.	<u>Low nutrient level</u>	<u>Apply complete liquid fertilizer. Check total salts.</u>
	<u>High soluble salts</u>	<u>Leach if level is too high</u>
	<u>Waterlogged soil</u>	<u>Raise packs to improve drainage</u>
	<u>Temperature too low</u>	<u>Raise temperature</u>
Chlorosis with interveinal yellowing	<u>Root injury</u>	<u>Apply iron but try to cure underlying cause</u>
	<u>Improper media pH</u>	<u>Have media analyzed and make adjustment</u>
	<u>Over or under watering</u>	<u>Correct watering practices</u>
	<u>High soluble salts</u>	<u>Leach the media</u>
	<u>Trace element deficiency</u>	<u>Apply trace elements</u>
	<u>Ammonium toxicity</u>	<u>Raise temperature or use nitrate nitrogen form</u>

<u>Problem (cont.)</u>	<u>Possible cause(s)</u>	<u>Suggested remedy</u>
Uneven growth	Non uniform distribution of fertilizer and or water	Use liquid fertilizers and proper watering practices
	Non uniform moisture levels at transplanting	Pre-wet containers 24 hours before transplanting
	High soluble salts	Leach the media
Purple leaves	Poor grade of seedlings	Select uniform-sized seedlings for each pack
	Phosphorus deficiency	Test media prior to transplanting. Add high P fertilizer
	Temperature too low	Check minimum night temperatures in the greenhouse
Seedlings fall over	Damping off	Use only sterile media or use a fungicide drench before transplanting. Improve the air circulation
Slow growth	Low nutrient level.	Test media and apply appropriate nutrient level
	Temperature too low	Increase temperature especially at night
	Moisture too low	Water more frequently
Tall and spindly growth	Too much nitrogen	Test the media. Check calibration of proportioner
	Temperature too high	Lower temperature and improve ventilation
	Excess water	Reduce watering
	Low light intensity	Keep covering clean or replace. May need artificial lighting

Transplanting to the field

Transplants may be set in the field 2-3 weeks after your average frost date. When choosing a field to set out transplants, there are some factors of primary concern that you should first consider. The first would be the soil type. Peppers and eggplant prefer well drained sandy loam soils. Tomatoes will do well in both sandy loam and gravelly soils that are well drained. A soil analysis should be done to determine if lime should be added to the soil to adjust the pH to be between 6.0 and 6.8. The soil test will also help you determine what rate of phosphorus and potassium you will need to be using for each specific crop. Nitrogen recommendations are based on crop needs, and along with phosphorus and potassium, recommendations should be discussed with your Extension Agent and/or chemical supplier. These two valuable sources of information should be consulted for other nutrient needs as well as pesticide recommendations, exposures, residues and crop rotations after pesticide usage.

Fields should be selected according to what type of protection they can offer to prevent wind and frost damage for early plantings. Preferably, the location should have an available water source, as timely irrigations are very important most years. Proper drainage is an important concern should the growing season become a wet one.

Verticillium Wilt is a serious problem with eggplant. Because of this, crop rotation is very important when choosing a location for transplanting eggplant. Try to select a location that has not been planted in tomatoes, peppers, eggplant or strawberries within 5 years, preferably 10. Crop rotation is something that should also be considered for tomatoes and peppers. Planting in locations where tomatoes, peppers and eggplant were not planted the year before decreases the chances of soil borne disease problems.

Plant spacing is another consideration. Recommended plant spacings are: tomatoes - 18-30" between plants and 3-6' between rows; peppers - 15-18" between plants and 18-36" between the rows; eggplants - 18-24" between the plants and 24-30" between the rows. The actual spacing used is dependent upon the plant size and type and also upon individual cultural practices.

Some special considerations that you may want to explore are black plastic mulches and trickle irrigation. The use of black plastic mulch can be very beneficial for: conserving water, reducing nitrogen loss due to leaching, facilitating weed control, warming the soil and keeping most fruit clean by keeping it from contacting the soil.

Black plastic mulch, especially when combined with trickle irrigation, can significantly increase yields. Plastic mulch should only be applied when there is adequate soil moisture, after fertilization and after the field has been prepared for transplanting. For more information on plastic mulches, please see the inside front cover of this bulletin.

STAKING AND TRELLISING TOMATOES

Staking and trellising tomatoes are very specialized production systems. Advantages include an increase in the number of marketable fruit, ease of harvesting and reduced injury to the plants and fruit during harvesting.

Staked and trellised plants are pruned to remove side shoots. The pruning is done to establish a balance between vine growth and fruit growth. Light pruning results in a plant with a heavy load of small fruit. Moderate pruning results in a plant with fewer fruit but they will be larger and easier to harvest. Pruning can result in earlier maturity of the crown set and improved spray coverage and pest control. Pruning is variety and fertility dependent and can determine the success or failure of the project.

Plants can be staked in one of two ways. The first method is to drive a stake into the ground next to each plant. As the plant grows it is then tied every 6-8" to the stake to prevent it from falling over. The second method is to tie the twine to an end stake, pass the twine along one side of the plants and loop it around each stake until you reach the end of the row. The same process is then repeated on the other side of the plants. The string must be tight enough to support the plants but not so tight as to make harvest difficult or scar the fruit. The first stringing should be done when the plants are 12-15" tall and before they fall over. Start the first string at 8-10" above the ground and continue at 6-8" intervals to keep the plants from falling over. Determinate varieties may require only 3 to 4 stringings while indeterminate varieties will require more depending on the plant size of the variety being used.

Trellising is a process by which a string is tied to a lightweight wire that is strung parallel to the ground at the base of the plants. The string is spiraled loosely around the plant and tied to a wire that is strung 5-6' above the ground. As the plant grows the string is spiraled around the plant. The wire should be held up by sturdy wooden posts at the end of the rows and supported every 20-30' in the row by metal fence posts.

Staking, trellising, pruning and stringing should only be done when foliage is dry to prevent the spread of bacterial diseases and the same precautions apply to smokers that will be handling the plants.

GREENHOUSE TOMATO PRODUCTION

An early summer crop of tomatoes seeded in January to mid-February and transplanted to the greenhouse in early to mid-March appears to have the most promise. A fall crop seeded in late June and transplanted to the greenhouse in late August is less productive due to the shorter days.

Plants should be transplanted into soil that has been pasteurized with steam or a chemical fumigant. To avoid problems with soil-borne diseases you could use a trough or bag culture, which typically contains sphagnum peat moss and vermiculite as a base, with fertilizer added. This method may seem more expensive but it can be used for two crops, although lime may need to be added between crops. Space plants 16-18" apart, offset in two rows that are 16" apart. The space between the double rows should be at least 3 ½ -4'.

Greenhouse tomatoes are usually pruned to one stem and are supported by twine that is loosely looped around the base of the plant and secured to a wire that is 6-7' above the bed. The twine is looped around the plant as it grows. The plant should be pruned every 5-7 days to remove any side shoots.

Since tomatoes are wind pollinated when planted outdoors, you will have to vibrate the flowers to obtain pollination in the greenhouse. Pollination should start when the first flowers open and should be done daily in periods of cool, cloudy weather. A hand held mechanical vibrator with a probe that just touches the flower clusters is the best method. Some growers have developed a system whereby they shake the support wires daily. A backpack air blast blower will provide good pollination after the first two clusters have formed. Caution should be taken when using the latter method as internal combustion engines can cause damage to the plants as well as be harmful to humans. Be sure that there is adequate ventilation of fresh outside air when using this method.

Temperature control is important for obtaining good plant growth, fruit setting and controlling humidity, which in turn reduces the risk of foliage diseases. Maintain daytime temperatures of 70-75°F on sunny days and 65-70°F on cloudy days. For a good fruit set, nighttime temperatures should be maintained at 62-65°F. Keep the relative humidity below 90% if possible by heating and ventilating to minimize problems from leaf mold and other diseases.

The whitefly is the major insect problem in the greenhouse. To control this insect you should follow a strict pest control program. Your local Cooperative Extension or chemical supplier can recommend a good program for you.

If possible, greenhouse fruits should be harvested when pink color becomes obvious or later if your market demands it.

PHYSIOLOGICAL PROBLEMS AND POSSIBLE CAUSES

<u>TOMATO PROBLEMS</u>	<u>POSSIBLE CAUSE(S)</u>
Catfacing	Cool weather during fruit set Injury from 2,4-D herbicide
Graywall	Cloudy, moist, cool weather
Internal Browning	High soil moisture
Blotchy Ripening	High nitrogen levels in the soil Soil compaction Low potassium levels in the soil
Yellow Shoulders	Poor foliage cover due to non uniform
Sunscald	moisture and nutrient levels
Sunburn	Poor foliage cover due to variety
Blossom End Rot	Root pruning during cultivation Low calcium levels in the soil Low soil moisture
Fruit Cracking	Excess amount of rainfall or irrigation Frequent low to moderate rainfall, especially following a period of low soil moisture
<u>PEPPER PROBLEMS</u>	<u>POSSIBLE CAUSE(S)</u>
Blossom End Rot	Root pruning during cultivation Low calcium levels in the soil Low soil moisture
Sunscald	Poor foliage cover due to variety Poor foliage cover due to non uniform moisture and nutrient levels Foliage damaged during harvesting

HARVESTING, HANDLING AND STORAGE

TOMATOES

Tomatoes for fresh market are harvested in several picks when the fruit are at the breaker (first pink blush on blossom end) or turning stage (10 to 30% of the surface showing color). Fruit picked at this stage can still ripen normally. Be careful not to harvest any immature green fruit as they never develop good color or flavor upon ripening or may not ripen at all.

Fresh market tomatoes should be dumped from field containers into large tanks of water to prevent bruising. The temperature of the water should be 5 to 10°F higher than the fruit to prevent the movement of bacteria into the stem end of the fruit. Tomatoes are usually washed with a chlorinated water spray immediately after the dumping operation regardless of whether a “wet” or “dry” dumping method is used. Fruit should then be dried with rollers or fans before it is packed.

Tomatoes are susceptible to chilling injury if stored at temperatures below 50°F for more than 24 hours. Continued exposures to these temperatures will prevent normal ripening even after temperatures are elevated. Store tomatoes at 55° F or above depending on how long they must be stored. The speed of color development will increase up to 75°F. Temperatures above 80°F will inhibit color development. The best eating quality, ripening and color development will take place between 65 and 70°F.

PEPPERS

Normal harvest of bell peppers is at the green (immature) stage after the fruit have reached full size and the walls are firm and thickened. Harvest the crop twice a week to achieve maximum yields.

Peppers can be brushed or washed before packing. If peppers are washed, the wash water temperature should be as warm as or slightly warmer than the fruit itself. Cold wash water can create a partial vacuum inside the fruit cavity, which draws some of the wash water (and bacteria) into the fruit. This is an effective mechanism for infecting the fruit with bacteria, which can lead to subsequent breakdown.

Peppers are moderately sensitive to chilling injury. Fruit stored at 45-50° F and 90-95% humidity can last from 2-3 weeks.

EGGPLANT

Eggplant should be harvested when the outside color is a glossy purple and the fruit is firm. In the case of the white-fruited types, they should be harvested before they fully mature and turn yellow. Soft fruit, loss of glossy color and dark colored seeds are signs of over maturity. Fruits should be harvested as they mature to ensure continued fruit set.

Eggplant is highly sensitive to chilling injury. Fruit can be stored up to 1 week at 50° F and 90-95% humidity.



DISCLAIMER

It is expressly understood that any technical information given by Harris Seeds is given gratis. Furthermore, Harris Seeds does not assume any responsibility for the advice given or the results obtained.

We try to mention important points in this technical bulletin as a special service to help you bring in a successful crop. Much of this information has been acquired through many years of experience of our employees and associates. ***However, it is impossible to make recommendations for every possible condition or circumstance that may exist somewhere in the large area served by this technical bulletin and this company.*** Weather norms and extremes, and soil types are often unique to your location and must be considered in your growing plans and seed purchases. Pressure from many types of plant pests and diseases can render a crop unusable. For these and other reasons we cannot be too specific in this technical bulletin and must recommend that you consult your state's agricultural extension service for suggestions related directly to your locale and conditions. ***Although we try to address the unusual situations in this technical bulletin, you alone are responsible for the success or failure of your crop.***