

Mirliton Growers Guide Update 2010

(updated 2018)

Mirliton.Org

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<http://www.Mirliton.Org>

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One of the goals of the Mirliton.Org group is to promote better cultivation techniques for mirliton growing by sharing research. Unfortunately, there is very little “science” on mirliton (*Sechium edule*) growing since it is not a significant commercial crop in the United States and does not attract attention from traditional agriculture research institutions. This means that we need to rely on “participatory research” in which growers develop cultivation techniques through using our own resources and the generous assistance of volunteer botanists and horticulturalists. Many new growers are interested in organic and natural methods, so we also are committed to finding sustainable methods for growers. The notes below are the summation of what we learned this past year and are intended to complement the original growers guide.

Key Lessons from 2009

We have made some progress in the sharp decline of mirliton growing witnessed in the last decade. The key lessons can be summarized in four concepts: proper varieties, well-drained soil, proper pollination, and effective disease control. The five keys to successful mirliton growing are: (1) use “heirloom” mirliton varieties that have traditionally been grown in in the Gulf Coast region and not commercially imported mirlitons; (2) use well-drained soil—better-drained than any other traditional backyard vegetable; (3) be prepared to hand-pollinate your mirlitons; (4) consider the use of organic biofungicides to control strains of powdery mildew that are affecting mirlitons; and (5) planting using overhead trellises and drip-irrigation reduces soil splash-up and reduces diseases significantly.

Mirlitons are primarily pollinated by honey bees (*Apis mellifera*), which are scarce in recent years, so hand-pollinating may be necessary for successful fruiting. This means that you may have to trellis appropriately to not only protect your vine from wind damage, but to also make your vine accessible for hand pollinating.

Finally, soil testing can save growers a great deal of trouble. Backyard growers are often compelled to use the same growing plots every year and this can lead to pH (acidity) and sodium problems that prevent plants from utilizing nutrients. In South Louisiana and the Gulf coastal plains, yard soil is often “fill dirt” brought in off-site from river battures etc. or native sandy acidic pine soil. Parish/County extension services provide inexpensive soil testing (\$8 in Louisiana) and all you have to do is mail in a small sample. Extension agents will then provide free information on soil amendments. See the “growers guide” for a link to the LSU soil test application form. This is another advantage of raised beds in the coastal regions and urban areas constructed on drained swamps—either the soil is acidic or solid clay under a thin layer of top soil—and raised beds allow growers to control drainage and soil composition.

Links to Mirliton.Org

There are internet links to the “Mirliton Growers Guide,” at www.Mirliton.Org, and web-based photo sites that shows the different mirliton varieties, grower site visits, plant pests and diseases, and instructions on propagating, planting, trellising, and hand pollinating.

Heirloom Varieties:

In 2009 we located nine different traditionally grown Louisiana varieties. We refer to these as “heirloom” varieties, but they are, from a horticultural perspective “landraces,” i.e. varieties that have been handed down over the years and not deliberately hybridized. To establish if these are truly “heirloom” varieties, we interview growers and establish that the variety has been grown for at least two decades in Louisiana—before the widespread introduction of imported commercial mirlitons. It is not always possible to trace the history of a variety so sometimes our judgment is based on observation (plant morphology)—if the plant fits the typical physical characteristics of heirlooms, i.e. while imported mirlitons are hybridized for uniformity in shape, size, and color, heirloom mirlitons normally have irregular shapes and colors, spines, deep furrows, ridges and grow vigorously without fungicides. In some ways, the uglier the mirliton, the more likely it is an heirloom.

Many of these heirloom varieties have a natural resistance to regional plant disease and pests; we know this because of interviews with growers who have used the same variety for decades and have not, to our knowledge, used fungicides, pesticides, or nematicides. Our research is not perfect but we do the best we can to establish that the variety has been successfully grown over a period of years. The following are the Louisiana heirloom varieties that we have identified. Research has led us to conclude that some of these are essentially the same variety with a common genetic line (genotype) and in those cases, we have grouped them together. The variety is followed by the Louisiana locale where we collected the variety. These include heirlooms discovered up through 2018.

Mister Rock (Thibodaux)

Papa Sylvest (Cut-Off)

James Cobb (Houma)

Ishreal Thibodeaux (Opelousas)

Sister Morgan (Lafayette)

Fred Fournet and Andre Dore (Lafayette)

J.V. Richard, Buddy Bergeron, Francis Landreneau, Ellis Noel (all of these appear to have originated with the same variety in Opelousas. For purposes of clarity, we refer to these as “J.V. Richard” variety)

Terry Pie (Sunset)

Miss Ruth (Church Point)

Miss Olive (New Orleans)

Shexnayder Variety (St. Rose)

Blackledge, Washington Parish

To view these photographs of these varieties, use the following links go to the mirliton 101 photo section at www.mirliton.org.

Propagating “True-To-Type” Heirlooms: How to Produce Heirlooms identical to the Parent Plant

Mirlitons cross-pollinate very easily, so there are some varieties that are very similar to others. As we successfully promote mirliton growing, we can expect that the varieties that we place with growers will not always produce “true seed.” If honey bees visit your plant, it is possible that the offspring of you vine will be accidentally cross-pollinated with a plant as far away as three miles (the distance bees travel from the hive). If someone is growing an imported mirliton variety, it can accidentally pollinate your plant and it’s offspring may not have the natural disease resistance, fruit characteristics, and general adaptability of the heirloom mother

plant. *This is why we strongly recommend against growing imported mirliton varieties* that might be successfully grown with the use of fungicides etc., but are capable of destroying our heirloom varieties. This has already occurred in Latin America where commercial hybrids have all but eliminated many native varieties of chayote, reducing the genetic diversity of the plant which is crucial to maintaining healthy strains.

We are preserving some pure heirloom strains by having some growers use specific varieties in isolated areas or by growing plants from cuttings, which ensure a genetic clone. All this means is enjoy your mirlitons, give them to friends and neighbors, but be careful not to represent them as a “pure heirloom variety” for people to grow from seed unless you have taken steps to prevent cross pollination between different varieties (horticulturalists call this “intergrading”).

The phrase “propagating true-to-type” simply means that we are creating a plant that is a genetic duplicate of the mother plant--the plant that we collected the seed from. This “true-to-type” plant will have the same desired traits of the heirloom mother plant including the shape and color of the fruit and any genetic resistance to disease and pests. This is not difficult to do with mirlitons because it is a “monecious” plant, i.e. it has both male and female flowers and it does not need to be pollinated by another mirliton. Mirlitons are a “self-compatible” plant that is capable of self-pollination; the male flowers of the vine can provide the pollen to fertilize the female flowers on the same vine. This is called “selfing” and when it occurs the resulting “true-to-type” seed is a genetically identical to the parent plant and will only create offspring with the same traits.

True-to-Type by Controlled Self-Pollination:

One way to ensure that some of your fruit are “true seed” is to employ the technique of “bagging” selective flowers to exclude cross pollination, a practice used in plant hybridization and sometimes called an “enclosing treatment.” This is a simple process since all we are trying to do is ensure that the female flowers on the vine receive only pollen from the male flowers on the same vine. To accomplish this, female flowers (pistillate) are enclosed in small transparent “pollination bags” to protect them from unwanted pollen: when they are in a receptive condition, the flowers are dusted with pollen from the same plant. You can do this to several of your pistillate flowers and tie a piece of floss around the flower to mark it as “controlled-pollinated.” When these fruit mature, you can be assured they will be “true-to-type.” Here are the steps to controlled pollination:

- First, identify a female flower before it opens and wrap it with a 4” X 6” pollination bag (see below, or some translucent, spun-fiber row cover material) which allows the flower

to breath and but does not allow insects or pollen to reach the flower. Female flowers are tiny and hang by themselves, so you can wrap the entire stem gently with the flower inside with the pollination bag (see photo link below to identify flower types and controlled pollination methods). At the same time, place pollination bags over a cluster of male flowers before they have opened.

- When the female and male flowers open, simply remove the pollination bags and use a small artist paint brush to hand-pollinate the female flower with some pollen from the male flowers (see link below to photo guide on hand-pollination). Then replace the pollination bags and leave some yarn or floss on the female flower stem to remind you that this is a controlled-pollination flower. Pollinate each female flower twice a day for two days. About three days later, if the flower has been successfully pollinated, the petals of the female flower will drop off. You can now remove the pollination bags from the flowers. When that specific fruit matures, you can be confident that it is “true seed” — a genetic copy of your mother plant.
- This process takes a little time, but it means that you will always have a few mirlitons that preserve the heirloom variety in case you want to grow a new plant or give it someone else. You can view these easy steps of controlled pollination at the photo site below. Just follow the slides and read the text below. I used plastic bags in the photo demonstration, but they retain too much heat and moisture, so I recommend using the pollination bags or row-cover material like betalon or delnet. Delnet makes a 4” x 6” pollination bag that is perfect, but they only sell in bulk. You can obtain a ten-pack of the 4 X 6 bags on-line for \$7.25 and they can be washed and re-used at the following link (We do not endorse any specific vendor or product—links are provided only to help clarify product qualities and we encourage growers to compare vendors sites and products)

Controlled Pollination Photos at www.mirliton.org

Here’s the link how to how to hand pollinate, which you will do when using controlled pollination: www.mirliton.org photo section.

True-to-Type by Stem Cuttings:

Mirlitons can also be grown from stem cuttings (vegetative propagation) which will ensure that the plant is a genetic “clone” of the mother plant. Growing from cuttings is the normal way

mirlitons are propagated in Latin America since it (1) ensures uniformity in plant characteristics from generation to generation and (2) cuttings, unlike fruit, are free. Plants grown from cuttings do not produce as much fruit the first year compared to seed-propagated plants, but they will produce the same amount of fruit in subsequent years.

Propagation by cuttings involves taking a stem cutting and removing a few leaves, literally creating a wound in the stem, so that the nodes they emanate from can be coaxed into producing roots (adventitious roots) instead of leaves as the wound heals. Stem cuttings have to develop roots while maintaining stem growth and a few leaves which will provide photosynthesis and ensure the rooted cutting can be successfully transplanted.

The following instructions were gleaned from the article by Dr. Mohar Dutta Sharma referenced in the growers guide:

The secret to successful cuttings is timing:

1. Take cuttings from vines only in the second week of flowering. When plants are flowering, natural plant hormones are concentrated in the plant nodes (where leaves or vine branching occurs). These hormones determine if the node will become a leaf, a male or female flower, or a root. This concentration of hormones during flowering season will promote root growth at the plant node in a cutting.
2. Take a cutting from a mature middle stem vine with at least (1) two leaves on end of cutting and (2) two leaves at the base of the cutting. Remove these two bottom leaves so that the “basal nodes” are exposed. These two basal nodes will produce the roots; the top two nodes with leaves are essential for continuing photosynthesis as the cutting grows. The cutting length will depend on how far apart the four nodes are (two with leaves, two without leaves), but it will be about up to 25 inches long. You may trim half the leaf off to reduce evaporation without hurting the cutting.
3. Dip basal nodes for ten minutes in Indole Butyric acid (Iba) 500 ppm solution. This is a powerful rooting hormone used in a much-weaker form in off-the-shelf rooting powder. You can order IBA to mix with alcohol very inexpensively (a few grams will last years). If you want easier to use water-soluble tablets, just Google for “Rhizopon AA Tablets.” You will only need one liter of solution to soak the cuttings (wear light vinyl gloves when working with IBA). Ask the retailer how much IBA or how many IBA tablets you will need for the 500-ppm solution. Typically, one packet of tablets will make two liter of solution which is more than enough. I use a shallow plastic container for the solution that just barely covers the cuttings and then rock it to keep the solution drenching the cutting.

4. After a ten-minute bath in the IBA solution, remove the cuttings from the solution and dust or mist with sulfur to deter fungi. This is important since one of the drawbacks of cuttings is that they can transfer disease from the mother plant.
5. Allow cuttings to dry for about 20 minutes. Prepare rooting container which can be a standard plastic seed tray with drainage holes or a “deli tray” with a high plastic dome that can accommodate the leaves (you can also use one of the disposable aluminum “roasting pans” with a plastic dome available in grocery stores). Fill with about two inches of perlite and water well. Then make shallow furrows five inches apart and place cuttings horizontally in furrows with leaves sticking out of perlite and exposed. Cover cutting with perlite. Place away from direct sun light.

It is best to cover the cutting tray with a plastic dome if possible. If you cannot, then mist several times a day. The cuttings are at risk of dehydrating if not in a dome. Since you have treated the cuttings with sulfur, an organic fungicide, the plants cannot be exposed to temperatures over 85-degree F. This means the cuttings will probably have to be kept inside and under a grow light or near indirect light. A bottom heating-mat will aid in root growth.

I know this sounds complicated, but these are the steps you need to take to ensure a successful cutting. Of course, you can forgo the fungicide which means you can grow the cuttings outside in indirect light in the heat as long as they are protected from rain and direct sun. Just keep them misted several times a day and you should have some success. The timing of the cuttings, the retention of two leaves, and the IBA dip are the most important steps.

6. The cutting needs indirect light but also needs to be protected from dehydrating. In my first effort to propagate a cutting, I used the clear plastic cover that came with the seed tray, but this was too low and the leaves came into contact with the plastic cover—since the cover condenses water this led to plant disease on the leaf. I would suggest using the larger plastic dome trays mentioned above. The point is that cuttings will only “take” if they have at least two leaves and the leaves have to be exposed to light yet covered in some way. If you are growing more than one cutting, space them 5 inches apart. If the perlite is covered, you may not need to water again. If not covered, keep perlite moist.
7. After about three weeks you will see the roots protruding from the perlite. Once the roots are about 3 inches long, transplant to a good quality potting soil with roots in

below the soil in small containers that will hold the rooted base of the cutting but won't get water-logged. Be careful to gradually introduce the cuttings to shade, then full sun very slowly to avoid shock. Keep watered and transplant to larger 2-gallon container once roots come out the bottom. Overwinter according to instructions below on containers. See my perlite tray and the first rooting at the photo site at www.mirliton.org

Overwintering New Plants and Sprouts

There are three ways of planting seed-mirlitons: (1) direct plant in ground in the fall, (2) container plant for the winter, and (3) overwinter as sprouts and direct-planting in the spring. Each method has its advantages and drawbacks. Because of the shortage of heirloom mirlitons, we have been forced to provide growers with only one seed. There's an 80% chance that if you correctly container plant your mirliton and care for it and transplant it according to instructions, the plant will succeed. But raising one plant from one seed can be tricky; in the past when growers had hundreds of mirlitons, they typically planted several mirlitons in several locations to increase the rate of success. If you have enough seed-mirlitons, keep in mind that although one plant will produce only 40 fruit the first year, most growers plant several plants 10 feet apart on the same trellis to ensure a good crop.

Mirlitons are unique in that the seed is the entire fruit. Most fruit from seed-bearing plants undergo a dehydration which allows the seed to be dried and saved. Mirlitons don't work that way. The mirliton "seed" (or embryo) is enclosed within the fleshy fruit and can't be separated from the fruit and dried out without damaging the seed (although I have succeeded in growing a plant from the inner embryo only—see the photo site). That's why you have to plant the entire mirliton to grow a new one. Mirlitons have no dormant period and the seed quickly germinates after picking and relies on the fleshy fruit (pericarp) for water and nutrients. Within approximately 30 days of picking, the mirliton will send out a shoot and that shoot may last several months depending on the size of the fruit. Traditionally, growers store the seed-mirlitons in a dark space, let them sprout over the winter months and then offer them for planting in the spring.

The drawback to "overwintering as sprouts" is that if the fruit is too small, the sprout won't make it through the winter; or it will expend all its energy stemming and have insufficient water and nutrients to send out roots; or storage in the dark might promote fungus. Storing seed-mirlitons as sprouts is the most space-efficient way of overwintering a mirliton, but not always the most reliable. Every variety is different, and some heirlooms grow quite large (16-32

ounces) by December and can be overwintered as a sprout, while other varieties don't grow much larger than 8 ounces and lack the water and nutrients to sustain them over the winter.

Important note: As a mirliton sprouts the seed (ovule containing the embryo) begins to push toward the large end of the fruit and eventually emerges and sends out a main growing shoot. The bottom of the emergent seed will send out the roots for the plant. These roots normally don't emerge until the sprout is planted in the ground, but they can emerge if the sprouting shoot grows for several weeks or especially if the sprout is kept in damp conditions.

We know that damaging the shoot at the base can kill the sprout, so you need to be careful in handling sprouts. But it is not clear what will result if the root initials are damaged by dehydration, for example if the sprout is allowed to root in open air or if a sprout is transplanted from a damp storage setting. It may be that the seed has only one cycle of "rooting" and if the roots are damaged during that cycle, they won't re-emerge. It is clear that a plant can send out a shoot and look healthy, but if the roots don't emerge and grow, the plant will die.

In selecting seed-mirlitons, choose fruit that is free of bruising and fungus. If it has not already sprouted, allow it to sprout before planting to ensure the fruit has germinated.

Hopefully in the future we can test the effects of damage on initial roots, but to be safe, always plant your mirliton before the roots emerge or if the roots are still look healthy and growing. As always, if your plant fails to grow, dig it up and examine the seed to see what happened with the roots and pass that information along to us.

Direct planting in fall:

Direct planting mirlitons in the fall avoids storage problems but there are problems of pests, excessive fall-winter rains which can drown the roots, and hard freezes. Typically, a grower would plant two or three sprouted mirlitons to increase the odds of survival. You can plant them according to the directions in the grower's guide (also see planting instruction photos)

Plant sprouted mirlitons according to instructions and then mulch with 12-24 inches of hay or oak leaves to protect from cold weather. In the spring, remove some of the mulch and the mirlitons will push up through the remaining mulch. In the past, I have mulched to the base of the plant, but some soil-borne diseases may use this mulch as a path to the plant leaves, so when I notice plant disease rising from the base of the plant (yellow mottling), I have removed

the mulch to allow for more sun to reach the ground and prevent mulch from touching the base. This is not science, but it seems to be working.

Overwintering in Containers:

Overwintering in a container protects the plant from pests and freezes and helps develop root structure for spring transplanting. An advanced root structure is beneficial because first-year plants have a small root structure and may not be able to uptake sufficient water during an exceptionally hot summer. The downside of container gardening is that you will need space to store the plants during cold weather in your home or heated building, which may limit the number of plants you can overwinter. You will have the plants in during cold weather and protect them from excessive rain since the plant can easily receive too much water.

The seed-mirlitons that you obtain in the fall may not be the prettiest thing you have seen. Traditional growers like to leave “seed fruit” on the vine for several months so they will grow large and retain enough water to permit sprouts to be stored for the winter. That avoids having to pot the fruit, but many sprouts may use up their water and nutrient source before the winter is out or develop a fungus. Once you begin to produce a large number of fruit, overwintering as a sprout may make sense even if you lose some seed.

So, your seed-mirliton may be old and tough and a bit banged up. The light brown streaks are lenticels—just a normal part of toughening the skin. Your sprout may have developed some spines (protection from herbivores) and it is normal for the fruit to turn brown in spots and begin to mold—a little of that won’t affect its ability to root and grow, but it always best to select mirlitons with no visible fungus damage. The “seed fruit” does not look much like what will grow on the vine next fall (and after a few years, you will get both a spring and fall crop).

Place the mirliton inside in indirect light and wait for it to sprout. The time for sprouting depends on temperature and the unique qualities of the variety. Once the mirliton sprouts and sends out a shoot, this will ensure that the seed is germinating and ready to plant. Plant the seed-mirliton in a two-gallon container to overwinter it until April 1st when you can safely plant it in the ground or transfer to a larger container if you plan to container-grow the plant. Instructions for container planting are at the photo section of www.mirliton.org. The most important point is that mirlitons don’t like water-drenched soil when they are young; the roots need to breathe. Use a good quality potting soil that is fast draining like Miracle Grow or Jungle Growth. This will give you a lighter, porous and “faster” soil that is ideal for mirlitons. The roots can exchange gasses in this lighter mix and will grow faster since they have to search for water and nutrients.

Once you plant the sprout (large sprouting ending down), leaving at least 1/3 of the fruit above the soil line, give the container a good drenching to get the air-pockets out. You may not have to water it again for weeks until it develops a good root structure and some top growth.

Remember, the mirliton comes with its own water and nutrient source—the fruit itself. It's easy to kill the plant from over-watering and it is easy to bring it back from under-watering. Keep that in mind for planting as well. One thing we have learned this last year from the successful growers is that they planted on well-drained soil. They were often on a grade or next to a bayou with sandy loam. Most of you will be planting on flat terrain, so please consider building up your soil, using lots of organic matter, and even consider deep raised-beds as seen on our photo site. If you are planting in a back yard of fill-dirt, consider digging a 2 feet deep and 2 feet wide hole and replace the fill-dirt with Miracle grow soil. When developers were building new housing divisions, they were not planning agricultural use. You have to build your own mini-farm soil in a few square feet.

You can keep the container plant outside in full sun but protect it from excessive rain by placing it under a roof overhang or a patio table. Constant winter rains can water-log the plant. If you have room, consider wintering the plant inside with an inexpensive clip-on grow light.

Squirrels love mirlitons, especially before they have taken root and sent up a strong shoot, so cover your sprout with metal fabric until it sends up a strong shoot a couple feet high. Once the plant emerges and begins to produce leaves, you will need to keep it from touching the soil which can transfer plant disease. At this point you can take off the predator protection and place two 4' bamboo sticks in the pot and use twine to trellis up the young plant. Bring the plant inside whenever it looks like the temperature may go into the 30s—a freeze will kill the plant—a few days without direct sun will not.

Fertilize very carefully in the pot--if at all. If you are using miracle grow or a good mix it will have enough slow-release nitrogen to provide the plant whatever it needs. The plant develops roots by searching for water and nutrients, so you will get a stronger plant for transplanting if you go easy on water and fertilizer. The initial leaves will be a dark green. If the older leaves begin to turn light green, add a little liquid chemical or organic fertilizer and wait a week to see if that helps.

If you keep your plant inside, sometimes fruit flies will begin to breed on the mirliton seed above the soil line (the endocarp). They won't hurt anything. You can spray the soil only (not the plant) with some flowable sulfur to control them. You can buy sulfur in the garden store in "wetttable" form (though it really won't mix with water—only "flowable" will) and just sprinkle the dust on the soil. Sulfur can be applied to the vegetative growth as a natural fungicide and insecticide, but it will kill the plant if the temperature gets over 85 degrees, so I only use it on the seed when I store them or on the soil to get rid of fruit flies. Little white "mealy bugs" may also grow on seed fruit or a potted plant—these too can be controlled with sulfur.

If the plant grows out of control, prune it back. That won't hurt it and the tendrils can be used in stir-fry and soups and are the most nutritious part of the plant. I use only one pair of scissors to prune the plant and don't use that pair on any other plant, which prevents the spread of disease. Wipe the scissor blades with bleach after pruning the plant to give added protection.

Prepare your plant bed in advance according to the instruction in the growers guide and look for a well-drained high place in your yard. If you don't have one, make a raised bed: any size bed will do, but the more root space, the easier the plant can weather a draught, the more nutrients it can absorb, and the more yield will result. If you make a raised bed, make sure you use a good quality, well-drained potting soil.

Note: If you have kept your plant in indirect light, indoor light, or artificial light, it is important that you "harden off" (acclimate) the plant before transplanting into the ground. Sudden exposure to long periods of direct sun and wind can kill a new young transplant. Take ten days to expose the plant to an hour of direct sun daily, and increase by one hour a daily until you are up to a least eight hours. If your container plant has been sheltered inside, start by placing plants in a sheltered, shady spot outdoors. Leave them for a few hours and increase the time spent in the shade by a couple hours a day; after three days, move from shade into full sun and increase by one hour a day.

Overwintering as Sprout:

If you choose to overwinter as sprouts, select the largest mirlitons available as late in the season as possible, but before temperatures drop below 55 degrees F. which can damage the fruit. Treat the seed-fruit with sulfur to prevent disease. You can safely handle the sprout but sulfur can be an irritant so wash your hands immediately after handling. You can buy Safer Garden Fungicide in mixed or concentration at: <http://www.planetnatural.com/site/safer-garden-fungicide.html>. Wrap each sprout in news paper and store large-end up in a cool dark space—under the sink or in a closet. Leave room between mirlitons and use more shredded paper for layering to aid in air circulation and shoot growth. If you can find excelsior (shredded wood packaging), this will work fine between layers.

The seeds will begin to send off shoots after a few months which is normal—they will grow long and wispy. I have found that you can trim these shoots back to a few inches without damaging the plant and it makes them easier to handle without breaking off the shoot entirely—which

can kill the spout. Test this method on one sprout before you try it with all your seed-mirlitons—if the pruned spouts will transplant and produce, then it is safe to use this technique with your variety. In the spring before you plant the sprouts, trim the shoot down to three or four inches and plant the mirliton “shooting end” down in the ground.

Cultivation Techniques.

Raised beds:

We received 26 inches of rain in New Orleans in the month of December in 2009! That’s one reason people often have trouble growing mirlitons: for 60 million years these plants were creeping vines that thrived on hillsides with well-drained soil. To plant one in your back yard where there is not a lot of drainage is working against mother nature. Mirlitons are not native to Louisiana so it takes some care to replicate the environment where they grow naturally.

I think one of the biggest problems is that people plant where they live and often that is a filled yard that is level with no natural grade for drainage. The best vines I have seen (that produce 3,000 mirlitons) are in well drained soil, usually at the top of a grade. I recently dug up a two-year-old plant and the primary roots were only 18 inches deep and within 24 inches of the plant. There were a few thin roots that ran 5 feet, but I think a raised bed that is 4' x 4' and 24 inches deep would work fine (maybe not as deep if you are building on top of soil that is not sealed off). I would make sure the potting soil that you use is good quality so it drains well. Just experiment with the dimensions.

Shade for New Plant:

Last summer during the heat wave all the young first-year mirlitons were struggling. They simply did not have enough root structure to keep up with the loss of water through the leaves. I used garden shade cloth for my container plant. Be careful that you don’t reduce the sun too much.

Trellising:

Francis Landreneau in Eunice has a unique trellis. It is overhead, about 7 feet tall, but narrow enough that he can use a short ladder to reach all the flowers and plants on top. This is a useful

design because (1) if you don't have bees, you may have to hand-pollinate; (2) overhead trellises save space and expose mirlitons to more sun and air which inhibits plant disease and (3) the ability to reach all parts of the trellis permits you to inspect for pests and weave the stems into the wire mesh as they grow, securing the vine to the trellis. **Normally a mirliton will only connect to the trellis by its fragile tendrils and a strong wind can blow the vine off the trellis. Such wind trauma can reduce if not end flowering. By occasionally guiding the tip of a growing stem underneath the mesh—and then letting it find its way back in top, the vine is woven into the trellis.** The narrow trellis also allows the grower to easily drape it with plastic to protect it from an early freeze. See the Landreneau trellis at the photo site.

Alternative Pollinators:

European honey bees are the primary pollinators for mirlitons, but some horticulturalist believe that native bees, most of which are solitary and live in the ground, can be used effectively to pollinate crops that currently depend on commercial bee hives. This involves creating diverse habitat for native bees which is not easy for urban growers. See the ATTRA publication on alternative pollinators at: <http://attra.ncat.org/attra-pub/nativebee.html>

Mulching:

The root path on a mirliton can extend six feet in all directions, especially if the plant is more than three years old. This should be taken into consideration when fertilizing and mulching, since it means that you may want to fertilize along the root path and mulch that area to protect against a hard freezes.

Submerged container growing:

One novel way of growing mirlitons was recommended to me by Louisiana grower Eno Guillot. To conserve water and make water more readily available to the roots, Guillot uses a technique that has been employed for some years in South Louisiana which is essentially a form of container gardening inside the ground. He takes a plastic five-gallon container and cuts out the bottom. He digs a hole in the ground large enough to hold the container, and places the container in the hole so that the lip of the container extends about two three inches above the soil. He then fills the container with a mixture of potting soil and rabbit manure and plants the mirlitons as usual.

The plastic container will restrict the roots but the advantage is that the container conserves water and the container lip around the base of the plant serves as a water reservoir. We don't know what happens with the roots—if they grow out the bottom of the container, but I have seen this technique produce a healthy plant and it is especially useful if your plant is some distance from a water source and have to carry water to the plant. It also reduces how much watering has to be done in general. The only problem Guillot reports is that the containers tend to get fire ant infestation, which can be treated with pesticide. His success with this method proves the point that mirlitons can be container-planted and that even though the roots spread naturally, the root ball can be confined and the plant will still produce. The only difference between above-ground and below ground planting is that below-ground containers are less susceptible to heat and better regulate water distribution. See Guillot's "bucket system" and the early flowering of his vines, as a result of the bucket system of naturally high nitrogen in his alluvial soil at www.mirliton.org photo site.

Papa Sylvest Methods:

The Danos-Arceneaux families of Cut Off, Louisiana have generations of experience growing mirlitons. They have one plant that is 50 years old. Mrs. Arceneaux is the daughter of Sylvester A. Danos who is the first recorded grower of the mirliton variety that we have named the "Papa Sylvest Mirliton Variety." I interviewed her to determine her growing methods:

- She plants using mounds only to avoid root-rot. The mounds are approximately three feet wide and two feet high.
- She says to cut back the plants to the crown before the freeze or the freeze damage to the vegetative top growth will damage the crown and root system. Two of her existing plants are at least ten years old. The only time she has lost plants was due to summer heat and drought. She does not water the crown of the plant—which she believes will make the roots "bust"—instead she saturates the ground at least 24 inches from the root crown on her established plants. This promotes root growth which promotes plant growth. "You want to make the plant work for you," says Mrs. Arceneaux, "not you work for the plant."
- She has not had problems with root-knot nematodes (and there were no signs of lack of nitrogen uptake in her vines) or other pests or plant disease. Last year was the first time that she had pests on the vines--leaf footed stinkbug, but they did not affect the crop. She does not let grass and weeds grow near the vines to prevent the spread of plant disease and pests and she keeps these areas cut or mulched. She does not know how

many mirlitons she produces in the fall crop on average, but she has picked as many as 55 dozen (600) in one week.

- She fertilizes with compost and “3-16” fertilizer (the exact formulation was not clear, but it is obviously a low-nitrogen and may be bone meal or 3-16-16). In the spring, she cleans the vine crown area and spreads about 4 inches of compost around the plant and adds approximately 2 cups of 3-16 fertilizer in a shallow trough around the plant and covers. They make the compost themselves at the farm, using a bulldozer on the back end of the farm. It includes plants, decayed cypress trees and manure from cattle, so this would be an acidic compost. The compost pile sits for at least three years. She fertilizes only once, in the fall, and the plant receives slow release nitrogen from the manure-compost mixture. They add several inches of compost to the mound itself annually; we can assume that this addition of organic matter on a yearly basis means that the soil is aerated and acidic, but I did not ask if she ever limed the soil.
- She does not over-winter her seed-mirliton as sprouts, as many people do. She prefers direct planting mirlitons in mounds (3 of them to a mound, completely buried as shown in the photographs of the site I took) in the fall and spring when she picks the fruit.

Insect Pests

We normally don't have insect pest problems with mirlitons in Louisiana, but in recent years the leaf footed stinkbug (*Leptoglossus phyllopus*) has proliferated causing problems for citrus and mirlitons. These bugs will feed on mirliton flowers and fruit and can cause flower damage and fruit bruising. The good news is that they can be easily treated by mechanical means or with natural pesticides such as pyrethrum. This is another good reason to make trellises that permit you to inspect and treat vines.

Fact sheet on leaf footed stinkbug:

<http://insects.tamu.edu/fieldguide/aimg65.html>

Chart of stinkbugs:

http://ipm.ncsu.edu/AG295/pics/stink_bugs_and_leaffooted_bugs.gif

At mirliton.org, click on the photos and use the magnifying glass icon to zoom in and move around.

These are photos of an immature fruit that died. I saw the leaf footed bugs feeding on the flower but not the fruit. There are some immature fruit in the same area that they did not reach that are doing well, and I hand pollinated this pistil, so I can conclude the insects had some effect. Either they caused the flower to malfunction and the pollen never made it to the ovule, or they introduced plant disease to the fruit by way of the flower; or they fed on the fruit when I was not observing, introducing disease or causing damaging the fruit with their enzymes.

Several of the growers tell me that chickens eliminate the leaf footed bugs.

Nematodes:

Root-Knot nematodes continue to be the principal insect pest for mirlitons. Our mild and damp climate and soil type encourages their growth. Normally, they can infest the roots of mirliton within three years to the extent that a new plant needs to be planted. Nematodes are deceptive in that they don't kill mirlitons vines, they simply drain them of nutrients so that the most frequent symptom is little growth and low fruit yield. I have seen several vines that are 5-10 years old that are not producing and the grower often thinks it is the lack of fertilizer or the soil pH is off.

If your vine begins to slow down in growth, it is time to check for nematodes. You can gently excavate the root base of the plant to get a look at roots. The second link below explains what to look for. The first link shows a mirliton plant with nematode damage. The plant was doing well, even with this infestation of some of the principal roots—I just decided to change plants. You will also see one of the “runner roots” that extended five feet from the base and was only one-inch under the soil.

Ideally, my option would be to plant a new plant at the other end of the bed which I had solarized (see growers guide) the summer before. Instead, I chose to treat the bed with “beneficial nematodes” (also called entomopathogenic nematodes) of the *Steinernema felitae* variety that can destroy root-knot nematodes. I used Biologic's “scanmask” brand, but there is no science if these work for mirlitons and how many applications it will take. They only work in soil temperatures under 85 degrees F., so that means a spring and fall application.

I am hoping that we can arrange some trials tests with growers in coming years. There are no industry-enforced standards to ensure that you get the right variety of “beneficial nematodes” and that they arrive live, so you have to do your own research on the companies to determine which one is reliable. I followed instructions I obtained from the Biologic company on counting nematodes and viewed them with a 30X hand lens to determine the percentage alive.

Photos of mirliton roots with root-knot nematode galls:

<http://bit.ly/nematodes>

This is an excellent short article on root-knot nematodes

http://www.uaex.edu/Other_Areas/publications/PDF/FSA-7529.pdf

A good article on entomopathogenic nematodes that destroy root-knot nematodes and list of suppliers:

<http://www.nysaes.cornell.edu/ent/biocontrol/pathogens/nematodes.html>

Biologic's Scanmask site

<http://www.biologicco.com/products/L&G%20scanmask.htm>

Dr. Edwin Lewis, UCal-Davis Nematology Department offered the following advice on beneficial nematodes (entomopathogenic nematodes) as a way of controlling root-knot nematodes:

1. Entomopathogenic nematodes residence in the soil is transient—if you apply them in the spring, it is unlikely that they would be around all summer, and so would not provide control. Entomopathogenic nematodes that you would apply would last in the soil for a month or so, and if they do not find an insect to infect in that time, they will die. Considering the seasonality of root-knot nematodes (RKN), and the lifespan of entomopathogenic nematode infective juveniles, more than one application would be best.
2. The tolerance of the mirliton for infection is key. If they can withstand fairly high RKN populations, then maybe entomopathogenic nematodes would work. However, if only a few nematodes significantly reduce yield, then entomopathogenic nematodes won't do enough.
3. Entomopathogenic nematodes move after application, it is hard to say what is a good treatment area. The nematodes will move toward the roots in the soil anyway. Also, entomopathogenic nematode populations become very patchy almost immediately after being applied....they don't stay where you put them.

Nematodes and Acidic Soil and Manure:

Nematodes don't do well in highly acidic soils nor do they do well if treated with hog manure. High-acid soil will inhibit mirliton growth, but may possibly inhibit nematodes. The trade-off is a plant that lives longer but produces less. The Danos-Arceneaux family has a vine that is 50 years old, but they use a very acidic mulch and cow manure, so either the variety is naturally nematode resistant, or the acidic soil and manure are the key factor. Again, we need to conduct trials using these varieties and growing methods.

The following information on nematode control was provided by Dr. Charles Overstreet- LSU Extension Nematologists:

Apparently, at least two species of root-knot nematodes (*Meloidogyne incognita* and *M. javanica*) are reported as causing problems on mirlitons. The most common root-knot species that we have in Louisiana is *M. incognita*. Unfortunately, it is widespread and occurs in sandy areas throughout the state.

Management Practices for Vegetables

Once a nematode problem has been identified, then a producer should begin a program to prevent losses. No single method is so effective that it should be the only one used with most crops. Try to use several methods that can help you manage the nematode population. Remember it is virtually impossible to eliminate a nematode once it has become established. Gardeners should plan on using methods that will keep populations low enough that nematodes cannot injure plants. If populations of nematodes are high, then use a method that can lower the numbers to avoid possible damage.

Crop rotation

Most of the problems with nematodes arise because producers tend to put susceptible crops in the same area each year. Unfortunately, root-knot nematode attacks just about every crop grown in our state.

Solarization

Soil solarization is a method of using the natural energy of the sun to sufficiently heat the soil to temperatures high enough to kill many soil pests. A clear plastic tarp is used to cover the soil, trapping the heat beneath. Pests that may be killed by solarization include nematodes, plant disease organisms, and weeds. Most nematodes are killed when the soil temperature goes above 118° F. However, several weeks may be required to sufficiently heat the soil to a depth of 6-8 inches where most nematodes are found. The hottest months are the best time for solarization and include June, July, and August. Because many spring vegetables are finished by May or June, the soil can be treated before it is time to plant fall crops. These procedures should be followed to ensure success with soil solarization.

- 1) The soil should be well tilled and free of clods or sticks that could tear the plastic. Try to keep the soil surface relatively flat to ensure a tight fit by the plastic covering.

- 2) Adequate moisture should be present in the soil. Moist soils will conduct heat better than dry soils. Irrigate, if necessary, before treating. If conditions are extremely dry, it may be advisable to run some type of irrigation or soaker hose under the plastic to water during the course of the treatment.
- 3) Use a clear plastic or polyethylene cover that is between 1- 4 mils thick. White or black plastic does not transmit enough solar radiation to provide sufficient heat. The thicker plastics may hold up better in the garden. Patch any holes immediately with tape to prevent heat loss.
- 4) Stretch the plastic tight on the area you are treating, and seal the edges with soil.
- 5) Leave the plastic tarp on the area for 4-8 weeks. Longer is better, particularly if there have been prolonged periods of cloudy weather.
- 6) Carefully remove soil for the cover edge and remove the cover. Avoid contaminating the treated soil with soil from other parts of the garden.
- 7) Plant crops that are susceptible to nematodes. Fall crops could include cucumber, squash, okra, tomato, potato, melons, carrot, cabbage, and beet.

The high temperatures that develop beneath the plastic tarp will kill many of the common pests found in the soil. Since the temperature of the soil will decrease with depth, several weeks of exposure to the sun are required to reduce pests that are deep within the soil. Solarization can never eliminate nematodes, weeds, or soil diseases but can certainly reduce their incidence. This treatment should allow a successful planting of a susceptible crop for at least one growing period. Currently, there are no nematicides available for use in the home garden. Solarization can be a useful management tool to protect vegetables in the garden.

Trap crops and antagonistic plants

There are only a few plants that have been found to produce substances known to be detrimental to nematodes. Asparagus, pangola grass, neem, castor bean, and marigold produce substances that are toxic to at least one or more kinds of nematodes. Marigolds are known to be particularly effective against root-knot nematode. However, most of the effect of marigolds is not from these natural nematicides but the plants acting as a trap crop. The nematode enters roots of the plant but is unable to develop further in its life cycle or may be actively killed by the plant when it attempts to feed.

Most marigold varieties could probably be used against our common root-knot nematode.

Varieties of the French marigold appear to be the most effective in suppressing nematode populations. The variety 'Tangerine' appears to be an exceptionally effective selection since it doesn't appear to support any reproduction by the root-knot nematode. Unfortunately,

one type of small-flowered marigold (Signet -Tagetes signata or tennifolia) lacks this natural resistance and shouldn't be used when root-knot is present.

Although planting marigolds as companion plants for susceptible crops sounds like a good idea, it just doesn't work. The nematodes that enter the marigolds are killed but not the ones that enter the susceptible crops. Eventually they will build up on the suitable host and cause problems. The best way to use marigolds is as a cover crop in the rows or area that you want to reduce the nematode problem. After about three to four months of being in continuous marigolds, you can successfully plant a susceptible crop. Don't expect the influence of the marigolds to be good for more than one crop or maybe one season. Nematodes are quite prolific and populations will quickly return.

Clean transplants

Although many of our home landscapes or gardens are naturally infested by nematodes, it's easy for them to be introduced on infected transplants. Also, infected plants may reduce the effectiveness of other management measures. Most commercial nurseries use clean potting soil, lessening the likelihood that plants will have nematodes present. The greatest danger comes from transplant beds that are in the same area year after year or if unsterilized soil from the garden is used in a homemade potting mix. If a permanent transplant bed is used, then during the off-season use several cultural methods to reduce nematodes in this area. Small amounts of soil can be made free of nematodes either through drying for 30 minutes to one hour in the oven at low heat or freezing several days in the freezer (0°F). Freezing will not eliminate other soil pathogens.

Fallowing

Allowing the land to lay idle without a crop has been a practice used for thousands of years. Clean fallow, which involves keeping the soil free of weeds or grass, has been used to starve nematodes of a food source and reduce the populations. Many of the common weeds found growing in a garden such as chickweed, henbit, morning-glory, crabgrass, pigweed, or teaweed are also hosts for the southern root-knot nematode. The only major drawback to clean fallowing is that it is detrimental to soil (both through erosion and in structure) and should be used only infrequently. A cover crop is preferred over that of fallowing, assuming the cover crop will not build up the nematode.

Fertilization

Most of the influence of fertilization is indirect. The damage caused by a light infestation of nematodes may be reduced by the increase of higher rates of fertilizer. Since you are

improving only the growth of the plant, nematode levels may be much higher on these plants at the end of the growing season. If any nutrient is already low in the soil, damaged roots by nematodes will certainly make it much more difficult to obtain. Soil test to determine the levels of various nutrients, and make sure adequate levels are present. However, don't use excessive amounts because of a salt buildup or pH problems from too high levels of fertilizer.

Organic mulches

Adding organic amendments to the soil is an effective method of reducing damage by nematodes. These amendments may have an effect on the nematode population or plants in several ways. These organic amendments may stimulate microorganisms in the soil that attack nematodes and reduce the populations of the pest nematode. Many different types of organisms use nematodes as a food source. One group in particular, called the nematode trapping fungi, has been of great interest because of their unique ability to form trapping structures to catch and kill nematodes. Several of these nematode trapping fungi are very common in Louisiana. Organic amendments may improve soil structure, water holding capacity, and plant nutrition which makes for better growing conditions for plants. Plants growing in a good soil environment may be able to tolerate nematode injury before symptoms begin to develop.

As some organic materials decompose in the soil, they may produce chemicals such as ammonia which can kill nematodes. Organic amendments that are fairly high in nitrogen such as animal manures, shells of crawfish, crab, or shrimp, green manures, and hays from leguminous crops may provide better nematode control than some of the other amendments which are low in nitrogen.

Rotavation

Some nematodes found in coarse textured soils (containing a high percentage of sand) may be injured by abrasion if the soil is intensively tilled. Although it may reduce some of the nematodes, it may not be sufficient to prevent damage.

Sanitation

Included under this category are such things as weed control, crop residue destruction, and disinfection of equipment. Since many weeds are hosts of nematodes such as root-knot, it is important that management practices include a good weed control program. Plants should be tilled up or removed as soon as they are through producing to prevent any further nematode development. Plants that have badly galled roots should be

removed from the garden for disposal. Don't add them to a compost pile unless you are sure that the temperature will get high enough during composting to destroy nematodes. Nematodes can be killed by heat when temperatures reach 111-118°F for a short time. Nematodes in the infected roots can also be killed by exposure to the sun. Equipment can spread nematodes from one area to another. If nematodes are a problem in one area, it may be a good idea to wash off equipment before moving to another location.

Site selection

If sufficient land is available, gardeners with nematode problems should try to rotate their plant site every few years. Try to select areas which have been in pasture or grasses. Many gardens or ornamentals can be planted in only one area. Even if you cannot move the site, plan to use a careful rotation of the crops that you plant.

Pests – Animals

Several people have asked about protecting mirliton roots from armadillos, raccoons, etc. Most of the root structure is within 24 inches of the plant, though older plants can send out thin roots 6 feet. You can protect most of the root structure by laying down a wire cloth “root protector” over the primary root structure like the standard 1/4-inch mesh (number 4) “wire cloth” or “hardware cloth.” This can be purchased in small rolls at most hardware stores for under \$20. Here’s a link to give you an idea of what it looks like.

<http://www.hardwareandtools.com/inv/4105136>

There is also a plastic Duronet brand of mesh:

<http://delstartech.thomasnet.com/viewitems/naltex/duronet?&forward=1>

Cold Climate Growing Methods

I am often asked if mirlitons can be grown in colder climates than South Louisiana. The answer is yes, if the flowers and fruit can be protected from frosts and temperatures below 55 degrees F.

Container Growing in Cold Climates:

See the section below on container growing. Below is a link to a photo of a tub-planted mirliton in Lafourche Parish which has produced for several years. I would guess this is at least 25 gallons. The grower drilled holes in the bottom and used a screen to keep the soil in. He drags the container out to a fixed trellis every year, and then cuts it back to the crown in the fall and stores it inside for the winter. This would work for very cold climates that might freeze the

roots. Container growing of mirlitons is a standard way of growing them in Nepal, but we have yet to work out the best methods for our climate.

The advantage to growing mirlitons in a tub in colder zones is that the average mirliton produces 40 fruit the first year, and then double that every year after. So, yield is related to root structure. If you leave a first-year plant in the ground, it will probably freeze, so that entails planting a new plant every spring. Nothing wrong with that except it limits yield. Planting in a large, well-drained tub and then cutting it back at the end of the season will allow growers to winter the plant in a warm area and start each year with a mature plant. This means more fruit.

It is also possible to induce flowering by manipulating the amount of light the plant receives (the photoperiod) which is much easier to do with container plant that can be draped (see section on "light" below).

Protecting Plants from Cold and Frost:

Since temperatures under 55 degrees F. damage immature fruit, the best method for cold climate growing is to grow a vine on a low narrow trellis that could be converted into a temporary "greenhouse" by covering the structure with a plastic or a hoop tent when cold weather threatens. A heat source can be as simple as Christmas lights and the temperature can be monitored and controlled by an inexpensive remote temperature gauge and thermostatic electrical boxes.

Thermostat at:

<http://kkontrols.com/ecpoth.html>

Heaters, controls, greenhouse plastic (custom cut):

<http://www.littlegreenhouse.com>

Creating a temporary greenhouse means covering your mirliton with a good quality clear plastic to the ground. Depending on daytime temperatures, you might have to remove the plastic during the day. There are remote thermometers on the market that would allow you to track the temperature inside the tent throughout the day.

There are several plans on the internet for this kind of temporary "hoop house" greenhouse. I have one link here below. It is more elaborate, but a simple temporary greenhouse can be made following it's concepts: using a stake in the ground like large pvc pipe or metal bar to secure the 20-foot pvc pipe at 4-foot intervals; arch the 20-foot pipe over the trellis in a hoop, then run a 2 x 1 board along the side about knee high on each side to support the hoops. These side supports can be attached to the pipe with wood screws. Pretty easy to disassemble and use again if necessary.

<http://westsidegardener.com/howto/hoophouse.html>

Frost and Freeze Protection and Early Flowering

One problem for mirliton growers in North America is cold fall temperatures. Since mirlitons tend to begin flowering at the end of September, and early frost can damage flowers or kill the vines. Extended temperatures below 55 degrees F can damage immature fruit and bruise mature fruit. The two solutions to this problem are (1) induce early flowering or (2) use structures to protect the vine from cold temperatures.

Early Flowering:

There are several hundred varieties of mirlitons in the world. Since most are not carefully hybridized, horticulturalists refer to these as “landraces” or “cultigens” rather than “variety.” The difference between a “landrace” and a “variety” is simply a matter of how much deliberate breeding has gone into a plant, so for our purposes we will refer to different mirliton landraces as “varieties.” There is wide variation among these varieties in their adaptability to climate, resistance to disease, and length of growing season. Some mirliton varieties may flower earlier than others. By keeping careful records, growers can help determine which of the traditional Louisiana varieties flower earlier in the season.

Through observation in the last few years, I have noticed that plants that have been subjected to a heavier nitrogen regimen tend to bloom as early as the first week of September. These are “bull plants” that have a great deal of vegetative growth, which means they won’t produce as much fruit as a plant treated with a low-nitrogen regimen as we normally recommend. The sequence of flowering sometimes is off, probably due to the high-nitrogen, so that female flowers appear before male flowers—the reverse of a normal plant. Nonetheless, I have seen these plants produce fruit that matures by the end of September, well before the threat of a frost. We are conducting some trials this year to determine the relationship of nitrogen fertilizer to the onset of flowering.

As always, we already have a problem with nitrogen run-off which contributes to the dead-zone in the Gulf, so growers should make special efforts to minimize excessive nitrogen run-off into drainage canals and waterways, which can be accomplished with raised beds, mini-berms, etc.

Freeze and Cold Protection:

After years of experimenting, we have concluded that sprinkler systems applied during weather below 45 degrees is the most effective and economical. The evaporating water lowers the leaf

temperature and the sprinkler needs to only be run late at night and until morning frost threat is over. See the mirliton.org photo site for examples.

Container Planting

Container gardening of mirlitons is ideal for people who don't have garden space. Several growers are experimenting with container size and soil mixes. One has been growing the same plant for several years in shallow 40-gallon "lick block" tub filled with potting soil, with drain holes drilled in the bottom and a layer of screen wire to prevent the soil from draining out. He moves it in the shed for the winter and takes it out under a trellis in the spring. This would be perfect for photoperiod experiments since you could drape the plant part of the day before it starts to trellis to promote early flowering, or you could control the trellis for draping (see the section below on "light"). I would suggest putting the container on casters to keep it elevated for drainage, up from ground diseases, and easier to move. Large hardware stores have inexpensive plastic tubs that would work well.

Diseases

Disease is a tricky part of mirliton growing in recent years. Plant pathogens like fungi are constantly mutating and occasionally a new variation on a plant fungus will occur and devastate crops. For years, the only plant disease that presented problems with mirlitons in Louisiana was anthracnose which many of the local varieties seem to have some resistance to. It is not unusual for anthracnose to appear on a vine, do some damage, and then recede. Temperatures in the high 90s deplete the water in the plants and generally, combined with the UV rays of the sun, beat back the disease by late August.

Last year we developed a new problem—powdery mildew (*Podosphaera xanthii*) was found on mirliton plants. Dr. Raghuwinder Singh from LSU documented this occurrence (see below). Powdery mildew is much more of a problem and although it can't kill a mature plant, it can kill young plants and on older plants it can kill stems and dramatically reduce fruit production. It is an "airborne" pathogen which means that the spores are released by other plants and carried by wind or insects to your plant, but contaminated dead leaves and vines on the ground can produce the fungus as well. The fungus lands on the leaf and sends down little roots (haustoria) that feed on the plant cells.

Powdery mildew in mirlitons may not have the characteristic white powder appearance on the leaf top. See the photos below:

<http://www.flickr.com/photos/sechium/3477353719/>

<http://www.flickr.com/photos/sechium/3478154172/>

Close-up of powdery mildew growing on mirliton leaf:

<http://www.flickr.com/photos/sechium/3752850167/sizes/l/in/set-72157621688741807/>

<http://www.flickr.com/photos/sechium/sets/72157621688741807/>

In the link above, you can see the mycelia under the leaf and then some dark spots that are probably “fruiting structures” that hold the spores and await dry temperatures to release them. I use a 30X hand lens to view the mycelia, but even with a 10X you can see the white filament-looking material. Leaves with anthracnose will turn yellow but you won’t see the white filaments underneath the leaf. Here’s a link to Dr. Singh’s study of powdery mildew on mirlitons:

<http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-93-12-1348A>

The good news is that there have been advances in organic fungicides and some, especially bicarbonates like Milstop, Cure Green, and Kaligreen, appear to be effective if used at first sign of disease and applied at seven-day intervals throughout the spring and early summer growing season. These should be sprayed early in the morning or late in the day so that the plants are not exposed to extreme heat while the fungicide is in damp form. Spray both the top and bottom of the leaves. The rule of thumb is to start preventative spraying at the sign of disease in the first leaf.

In general, we encourage people experimenting with heirloom varieties to try growing without fungicides, but use them if necessary. This will help us determine if some varieties have a natural resistance to powdery mildew.

Cornell University Overview of Mildew controls on Cucurbits (mirlitons are in the *cucurbitaceae* family, like cucumbers, so we can infer that some findings on other cucurbits apply to mirlitons)

Cornell University on “Do Organic Fungicides Work?”

The National Sustainable Agriculture Information Service has a database of organic and biocontrols and a great deal of free information on sustainable growing techniques:

www.attra.ncat.org

Milstop fungicide comes with a surfactant already added to help the potassium bicarbonate adhere to the leaf surface. It is sold in five-pound bags (enough for a lifetime for a small grower) by going to the Hummert web site and searching for “Milstop” at:

<http://www.hummert.com/Default.aspx>

Or call them to order at: 800-325-3055

Read more about Milstop from the manufacturer at:

<http://www.growninmyownbackyard.com/MilStop.html>

Milstop is repackaged in smaller amounts as Green Cure, though it has a greater cost-per ounce at Green Cure:

http://www.greencure.net/where_to_buy.asp

Organocide, a sesame oil-based fungicide:

<http://www.gchydro.com/Organocide+Insecticide+and+Fungicide+-+Quart.html>

(Again, we do not endorse any of these vendors or products—links are offered only to assist growers in their own research and evaluation of products. We recommend that you rely on independent studies of products rather than industry-funded studies.)

The options if your plant gets infected is to (1) plant multiple vines at a distance and hope for several plants that compensate for lower yields; (2) use organic or bio-control fungicides; or (3) find some disease-resistant mirliton varieties. That is why it is important to keep records of your plants, since some varieties may have a natural resistance to powdery mildew. Powdery mildew favors cool, damp springs and it tends to be reduced by the heat of late summer. Keeping your plants where they receive a lot of sun and ventilation is helpful. Too much nitrogen can create excessive tender growth which can promote disease

Pruning diseased leaves:

In the first edition of the growers guide we recommend pruning off diseased leaves, especially when infected with airborne powdery mildew. Pruning every single leaf that develops a lesion here and there is not necessary. Prune only heavily infected branches or leaves after they have died and dried out. Sometimes yellow spots on leaves that resemble disease spots may be due to some other factors. Sometimes a plant has a hypersensitive response to a pathogen attack and kills its own cells so that the pathogen cannot grow and cause infection. Wounding the vine by removing every leaf with a tiny spot will provide infection sites for bacteria or fungi. It is best to remove all the diseased leaves and vines and dispose of them in a bag in the garbage so that the living sporelators don't emit more spores in your garden.

Fertilization

The proper nitrogen level for mirliton growing is yet to be determined by any scientific studies. I have been using a leaf nitrogen meter to measure leaf nitrogen levels to determine what is optimum for fruiting, but it really requires controlled trials to determine the best approach. The conventional wisdom is that the greener the leaf, the healthier the plant, but that is not the case for many cucurbits that yield more fruit on a low nitrogen regimen. Low nitrogen chemical fertilizers are available in 8-24-24 formulations from some garden suppliers and Gardentone's online company carries a 3-4-4 organic. Growing organically is different as the nitrogen is not lost and is more slowly available. Only through scientific trials can we determine the nitrogen requirements for optimum mirliton growing and methods for minimizing nitrogen run-off.

Light: Effect on Mirlitons and How to Use Light to Induce Early Flowering

Light Pollution:

Mirlitons are one of the few vegetables that are affected by the length of daylight. In this case, equal day and night periods make them flower and bear fruit as they prepare for dormancy.

But the reverse is true as well. These days we have a lot of "light pollution" with security lights, porch lights, street lights, and even ambient light from house windows. Studies have shown that as little as 2 cft (candle foot lights) of light can disrupt a plants natural circadian cycles—and that's not much light. I don't have any scientific proof, but if your plant is blooming later in the season—past the equinox—it may be a lighting problem that you can control. I have a porch light in front of my vine that I have turned off at night. I will probably switch to a motion activated light. Lights at night help keep us safe, so stay safe first and foremost, but if there is some way of reducing the direct light on your vine, you might want to keep that in mind.

Inducing Early Flowering By Controlling Light:

Those of you in colder climates may want to attempt to induce early flowering to avoid frost or cold damage. Here are two articles about manipulating light to trick mirlitons into producing flowers early in the season. I have yet to try this, but there is no reason that it should not work and the first article documents growing mirlitons this way in Virginia.

Here is the article on how to induce early flowering in mirlitons by manipulating light:

<http://www.springerlink.com/conma tent/a177213375174052/fulltext.pdf>

Heirlooms: How To Obtain

The original grower's guide addressed the issue of heirloom versus imported mirlitons. While this is an important issue in the sub-tropical climates of the Deep South of United States, in other states imported commercial mirlitons may work well. We have reports from dry climates in Southern California that "chayotes" purchased off the shelf produced well and did not suffer any disease. It may not be necessary to use Louisiana heirloom mirlitons in these areas since imported mirlitons don't threaten the existence of our heirloom varieties.

I have attempted to grow many imported mirlitons and found that many suffer from a fungus on the fruit itself that destroys the fruit before it can sprout and send out roots. If you live outside the Deep South, experiment with imported store varieties to see if they will work in your climate. One important difference, though, is that almost all imported varieties are hybridized for "insipid flavor," meaning "no flavor." The Louisiana heirloom varieties like "Mister Rock" have a rich flavor.

To obtain Louisiana heirloom varieties, simply ask to be added to our email list by sending an email to www.mirliton.org and check the "Mirliton Market" classified section of the site. You will receive updates on growing methods and announcements about sources for seed-mirlitons. In the past we have distributed these directly to the public through one site, but because of the huge demand for heirloom varieties, in the future we will experiment with other distribution methods, including a list of commercial growers and nurseries that sell heirloom varieties—direct and online. Unfortunately, some individuals sell imported mirlitons as heirlooms, so we recommend that you obtain your seed-mirlitons from someone you know or contact us for a list of commercial growers who have agreed to sell only heirloom mirlitons.

Fruit Classification

Classifying the shape, color, texture, and other characteristics of mirlitons (fruit morphology) is useful in distinguishing and tracking varieties. Botanists use standard terms to describe fruit, although there is obviously a great deal of latitude in what constitutes "light green" or "dark green." Still, using these standard descriptors can be useful in discussing the variety that you are growing—and also useful in identifying imported varieties that tend to be uniform in shape and color.

Shape: Pyriform (pear-shaped); sub-pyriform (pear-shaped but less-pronounced); obovoid (egg-shaped with narrow end attached to stem); ellipsoid (elliptical shape); oblong; spheroid (round shaped, sometimes referred to as globular/round). Spheroid can also be "flattened" or compressed in shape.

Colors: light green, green, dark green, creme, yellow, white.

Surface features: Smooth; wrinkles (which can be absent, few, or intermediate); longitudinal troughs or furrows (which can be absent, intermediate, deep, wide or narrow); spines (stickers) (which can be absent, few, intermediate, or many; and lenticels--thin strips of brown cellulose tissue that tend to appear late in fruit development (which can be absent, few, or many).

Pulp: texture, smooth, solid, soft, fibrous

Flavor: simple sweet, insipid, tasty, salty

Dimensions: Length, width, thickness, and weight of average mature fruit.