

## Identifying and Managing Anthracnose in Mirlitons

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The deluge of rain in South Louisiana in June of 2012 certainly underscored the need for what I call "single event gardening." What this means is that in ordinary weather conditions and plant disease and pest environments, we can simply plant a mirliton (chayote, *Sechium edule*) and it will take care of itself. But if we want the plant to thrive and survive as a perennial for several years, we need to plan ahead and make provisions for events that may never occur, but if they do, they will certainly reduce fruit production or even kill the plant. Excessive rain is one of those "single events" and right now all over New Orleans, the only city in the United States where we have to garden below sea level and where there is very little natural sub-surface drainage, vegetable gardens are struggling to maintain sufficient air pore space to ensure plant functions. For those who planned ahead, the 3-5 inches of rain a day pose no problem.

When soil is water saturated and no oxygen is available for roots -- or for gas exchange--plants go through dramatic changes to survive. They are literally in "anoxic" soil like the dead zones in the Gulf of Mexico. They shift from aerobic metabolism to anaerobic metabolism: they have only 5% of the energy efficiency they have in healthy aerated soil; they produce toxic organic and inorganic compounds and they deprive the leaves of potassium crucial to maintaining leaf functions. After 24-48 hours, not only have the roots been damaged making it more difficult for them to uptake water and nutrients; and leaf functions have been weakened and the whole plant is vulnerable to disease. The result can be that even after the rains have subsided, a perfectly healthy looking plant under heat stress suddenly wilts, turns brown and dies to the root.

The solution is very simple. You need two things: a fast-draining, well-aerated growing medium (comparable to high-quality commercial potting mix) and you need to elevate your soil so that the only exit route for excess water is not the saturated ground soil which cannot absorb any more water. This means either a planting hill system using 4-6 cubic feet fast-draining mix or a raised bed that has at least a 5 inch gravel base and 18-24 inches of good-draining soil. Installing a French drain pipe inside the raised bed is also suggested. All these methods are demonstrated on the photo section in "mirlitons 101" on our web site at [www.mirliton.org](http://www.mirliton.org) and covered in the two growers guides. "Hill planting" is the norm in Nepal and the "drain pipe" raised beds are demonstrated at the Ye Old College Inn garden featured in the web site photo section.

Summer plant diseases can be compounded by a dry, cool spring which is conducive to powdery mildew (*Podosphaera xanthii*), a particularly dangerous fungus comprised of at least 28 distinct "races." The fungus seldom attacks mirlitons but can be deadly since most of our locally-grown heirlooms are not resistant to this air-borne fungus. Fortunately, powdery mildew (PM) can be eradicated by the natural fungicide potassium bicarbonate sold as "Milstop" or "Greencure."

The predominant plant disease affecting mirlitons is anthracnose, a disease caused by the fungus *Colletotrichum lagenarium*. It is a chronic problem with mirlitons and it's the main reason plants

die the first year. It is easy to distinguish from powdery mildew (PM) since it is a soil-borne fungus and normally splashes up on the bottom leaves and travels from leaf-leaf in a linear fashion. While both PM and anthracnose start with similar symptoms (yellow splotches on green leaves), anthracnose is a more versatile fungus--the scientific terms for its mode of parasitic activity are biotrophic, saprotrophic, and necrotrophic--which simply means it can live off live tissue or dead tissue.

This means the fungal pathogen will destroy a section of the leaf turning it yellow, then consume the remaining section until it is brown (necrotic) and it will quite literally eat a hole through the plant. The brown hole in the leaf or on the edges is an easy way to diagnose anthracnose. PM, in contrast, is an air-borne spore that can deposit at the top of a plant and is not as versatile; normally the leaf will simply uniformly turn yellow and wilt before dead (necrotic) paper-like spots with holes appear. It is always best to send a leaf sample to your local extension office for a definitive diagnosis, but the photo section of our web site offers several free ways to make a tentative diagnosis.



**Mirliton leaf infected with anthracnose. This is a good example of anthracnose symptoms. The fungus starts on living tissue then lives on dead tissue. Note distinctive anthracnose "shot hole" in middle of now dead tissue where fungus has fed on dead tissue--unlike powdery mildew. Wedge-shaped yellowing or brown (dead) patterns starting at the leaf edges also distinguish anthracnose from powdery mildew. Anthracnose travels through plant cells so tends to follow leaf vein design. Powdery mildew spreads on surface of leaf so there is less conformity to leaf vein structure (initial yellow splotches overlap veins) and more generalized yellowing of entire leaf and browning/wiling of entire leaf simultaneously.**

Normally when anthracnose infects the leaves, petioles, and stems, it will eventually split the stem and that will prevent the flow of nutrients to the ends of the stem. But for every stem lost, a healthy plant in well-drained soil will send up a new shoot. So for the first year it is a tug-of war with the disease but generally the disease will abate in August. Go to the photos site at [www.mirliton.org](http://www.mirliton.org) to see more photos of infected leaves (click on photos to enlarge).

One important discovery we made is that the light-brown "bark" that forms at the crown of the plant is a lignocellulose covering (lignin and cellulose strengthen woody plants) which the anthracnose hyphae "germ tube" cannot penetrate. This protects the base of the plant from the fungus and almost all new growth will originate close to or below this bark. It is important not to cover this protective bark with applications of compost, mulch, or manure since it may weaken the bark (manure can always be spread at least 6 inches from the base since roots will eventually extend up to 6 feet in all directions).

Currently, there are no scientific tests on organic fungicides to treat anthracnose, but there are some biological and soft-chemical treatments that have been tested on other related plants. But keep in mind that mirlitons are unique and the effect of treatments on tendril action is important, since tendril growth (anchoring to the trellis) appears to stimulate meristem growth (shoot tip growth). For now, the best protection against anthracnose is (1) use only locally grown heirloom mirlitons for seed since they are likely to have some resistance to anthracnose or they would not have survived for decades in our region; (2) plant in well-drained, aerated sites; (3) provide plenty of trellis space so leaves on top can spread out and get maximum exposure to sun (a natural fungicide) and air circulation; (4) use an overhead horizontal trellis where possible to avoid leaf crowding; (5) use sanitary practices so as not to transfer anthracnose spores from one leaf to another (watch where you put your hands and disinfect tools) and (5) use ground drip irrigation to prevent splash-up of soil-borne fungi. Once leaves and stems are brown and dead, remove them and dispose away from the mirliton.

Anthracnose creates spore-producing "ascocarps" that contain spores and can live in the soil for up to a year. Successful growers use trellises that minimize leaves from "splash up" of fungus from the ground and use a drip irrigation or simple ground watering to avoid splash.

Finally, play the odds and always plant multiple plants. Raising one mirliton is tricky, but raising several increases the odds that you will make it through the first year. Mirlitons acquire resistance to some plant diseases over time, so there is a benefit to keeping a plant alive for several years. If you treat the soil for root-knot-nematodes (see the guide) and protect the plant from root freeze, each year the plant will become more resistant to anthracnose--more capable of producing new shoots to compensate for damaged shoots.

These are all "single event gardening" guidelines. You can just plant the mirliton and it is possible that none of these environmental or disease problems may occur and your plant will do well. On the other hand, if you take precautions, the health of your mirliton is secured. Given that mirlitons become more resistant to disease as they mature, and given that fruit production doubles every year if maximum root-space and trellis-space is provided (from 40 fruit, to 80, to 160, to 350), the protections to ensure a multi-year plant are worth the time and effort.

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