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SOUTH FLORIDA VEGETABLE PEST AND DISEASE HOTLINE

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March has come in like a lion bringing cool wet weather to South Florida. The past few weeks have ended the regions long drought with growers in some areas receiving up to nine inches of rainfall for the period.

Heavy rains caused problems for growers in a number of areas and have lead to questions about the beginning of another El Nino cycle. The current weather pattern has been attributed to the “pineapple express” - a phenomenon whereby the subtropical jet stream directs warm, wet air into California and sometimes further east as we experienced. The moist air originates in the Pacific, often coming from the direction of Hawaii, hence the name “pineapple express”. This air typically contains more moisture than the air contained in colder storms.

Rainfall totals varied by region with Homestead reporting the lowest accumulation at 1.50 inches to Fort Pierce and Bradenton which both reported in excess of 6 inches over the past two weeks. In some areas, rainstorms were accompanied by heavy winds causing problems in places. Rains have impeded field operations and depending on location, growers have reported problems with fertilizer leaching, bed ‘melting’ and an increase in disease. For the most part, most plants look good, especially considering the beating they have had.

FAWN Weather Summary

Date	Air Temp (°F)		Rainfall (Inches)	Hours Below Certain Temperature (hours)							
	Min	Max		40°F	45°F	50°F	55°F	60°F	65°F	70°F	75°F
Bradenton											
2/21 – 3/14/05	44.3	80.4	6.04	0.0	1.0	19.6	4.4	11.0	7.3	43.9	107.2
Ft Lauderdale											
2/21 – 3/14/05	49.2	82.1	2.66	0.0	0.0	2.8	1.3	14.9	24.3	22.9	48.2
Fort Pierce											
2/21 – 3/14/05	43.8	82.4	6.33	0.0	2.0	17.8	2.6	8.7	17.3	25.3	84.4
Homestead											
2/21 – 3/14/05	43.7	83.3	1.50	0.0	6.5	17.7	16.4	1.9	32.0	2.1	32.2
Immokalee											
2/21 – 3/14/05	44.6	83.0	5.37	0.0	0.3	40.0	24.7	16.5	50.0	10.4	74.3

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Temperatures are slowly warming as the season progresses with highs on a several days breaking the 80-degree mark. Daytime highs were ranged in 60's, 70's and 80's with nighttime lows mainly in the 40s and 50s

Crops coming to market include broccoli, cabbage, celery, cucumbers, eggplant, endive, escarole, green beans, lettuce, pepper, potatoes, radishes, squash, strawberries, sweet corn, tomatoes, and specialty items. Quality is mostly good and reports indicate that market conditions have improved somewhat over the past few weeks.

The short-term forecast from the National Weather Service in Miami indicates that another round of rain is on its way to South Florida. Southerly winds will begin to increase ahead of a developing wave moving east across North Florida. As the low moves into the Atlantic rain will begin moving into south Florida on Wednesday night. A strong shortwave aloft moving across South Florida on Thursday will enhance convection increasing the chance of thunderstorms. The shortwave will pull out rapidly Thursday night and an associated surface cold front will push through the area early Friday bringing pleasant conditions through the weekend.

For additional information, visit the National Weather Service in Miami website at <http://www.srh.noaa.gov/mfl/newpage/index.html>

Insects

Leafminers

Reports from the Manatee Ruskin area indicate that leafminer numbers are slowly increasing in the area with a few hot spots being reported.

Growers and scouts around Southwest Florida indicate that leafminers activity is increasing in tomato in a number of places. Problems have also been reported in melons and potato.

Respondents in Palm Beach report persistent high leafminer pressure in many places.

Whiteflies

Around Southwest Florida, respondents indicate that pressure in tomato is sporadic depending on location. Growers and scouts also report finding whiteflies in melons and other cucurbits.

Reports from the Manatee/Ruskin area indicate that whitefly numbers are increasing, with pressure varying widely by location.

Reports from Palm Beach County indicate that whitefly numbers remain mostly low with some increase being reported in a few locations.

Thrips

Respondents on the East Coast report that flower thrips are beginning to swarm in some locations and are building in pepper and tomato blooms. Reports also indicate that *Thrips palmi* are present in few locations and are building in pepper and eggplant.

Around Southwest Florida, flower thrips are increasing and becoming more widespread. Some reports indicate finding over 10 per bloom in some locations. With citrus coming into bloom widely across the area, growers should expect to see thrips pressure increase over the next few weeks.

Pepper weevil

Growers and scouts in Pam Beach indicate that weevils are present in pepper with some hotspots being reported in older plantings.

Reports from Southwest Florida indicate that pepper weevils have become more active in recent weeks with some older plantings showing moderate levels of infested fruit.

Aphids

Respondents in Palm Beach indicate that both potato and green peach aphid have been relatively common in the leafy crops in recent weeks. Potato aphids are either green or pinkish red, have long legs and cornicles and tend to fall off the leaves during your search for insects. They can easily be seen on the muck soils after falling from the leaves.

Aphids are also present at moderate levels in tomato, pepper and eggplant with some scouts indicating that aphid pressure is higher than in the past few years. Dr Gregg Nuessly, Entomologist at UF/IFAS EREC, notes that lots of ditch and canal weeds are going to flower now and this will hasten the aphids (and diamondback moths) to leaf for greener fields.

Around Southwest Florida, respondents indicate that aphids are still around but seemed to have slowed down in some locations.

A few aphids are present in young tomato around the Manatee Ruskin area. Reports indicate that both winged and apterous (wingless) aphids have been reported in peppers.

Spider Mites

Reports from Palm Beach County indicate that a few spider mites are still active on basil, eggplant, pepper and tomato.

Growers around Southwest Florida report that spidermites are also starting to show up on a few spring cucurbits and continue to be a problem in some eggplant.

Broadmites

Respondents in Southwest Florida indicate that broadmites are beginning to be seen in pepper in a few locations.

Growers and scouts in Palm Beach indicate that broadmites are present here in there, mostly in pepper.

Worms

Respondents in Palm Beach County report that armyworm pressure has been fairly low over the past few weeks. Dr Greg Nuessly reports that armyworm counts in the pheromone traps at EREC last week were the lowest since the end of October 2004. Specialty producers note that diamondback moth larvae are still a concern in leafy brassicas.

Respondents in the Glades note that except for areas with frost/freeze damage, silk fly populations remain at low levels in corn.

Around Southwest Florida, worm pressure remains mostly low with a few loopers, beet and southern armyworms being reported. Significant numbers of melon and pickleworms are being reported in some locations.

Reports from Manatee County indicate that worm pressure remains low.

Diseases

Rainy weather combined with foggy mornings and heavy dews in many places have helped keep diseases active although scouts note that the increase has been less than expected with recent heavy rains.

Late blight

Late blight remains a major concern to tomato growers around Southwest Florida. Respondents report that late blight really flared up and started moving again following recent rains. Several growers indicate that they thought they had been controlling it pretty well before all the rainy weather started. Others complain that blight will not stop, and note that in some tomato fields new lesions seem to be present in the top foliage on each visit. Several fields have suffered leaf loss and fruit infections. Spread in potatoes has been much slower.

Most observers agree that the incidence and severity is as bad or worse as it has been in many years. Late blight has caused some major yield loss in some fields this season while remaining fairly low in others. Some growers have also reported packing problems from late blight. Incidence and severity remains low to moderate in many places with a few lesions widely scattered across infected fields. But reports indicate that in an increasing number of fields incidence and severity is high with plants displaying multiple stem and fruit lesions and in some hotspots plants have been decimated in fairly large areas of the worst affected fields.

Respondents in Homestead indicate that severe late blight is now present on tomato in a number of locations.

Growers in Palm Beach report that late blight is increasing in a number of locations.

Reports from the Manatee/Ruskin area indicate that late blight has also been found in a few locations, and expectations are that it will increase, especially if the wet weather continues.

Late blight samples have been sent to labs here in Florida and in NY for testing for both type and strain, and for resistance to metalaxyl (mefenoxam). At this point, it appears that all samples to date are most likely the A2 mating type, which rules out several strains.

Although the actual strain has not yet been confirmed, it is not US 8 or US 17, according to Dr. Bill Fry at Cornell. For those who still have it, there was a good discussion on late blight over the last decade by Dr. Pete Weingartner in the 2002 Tomato Institute Proceedings. If you don't have a copy and would like a copy of that article, email Phyllis Gilreath at prgilreath@ifas.ufl.edu. Other publications or sites that may be of interest for more information include <http://plantpath.ifas.ufl.edu/takextpub/FactSheets/pp0006.pdf> and http://vegetablemdonline.ppath.cornell.edu/factsheets/Potato_LateBlt.htm

Few diseases spread as quickly as late blight. The disease can easily devastate a tomato or potato field within a few weeks if it is not properly controlled. The disease thrives under cool and wet conditions. Temperatures between 50 and 80°F combined with moist conditions such as rain, fog, heavy dews, or relative humidity above 90 percent are conducive for disease development. Night temperatures in the fifties with daytime temperatures from the mid-fifties to mid-seventies are ideal for this disease. Temperatures in the lower range stimulate the

formation of many swarm spores (zoospores) from the sporangia. This situation dramatically increases the potential for disease spread.

Over the past few weeks warm days and cool night temperature and consistent nighttime leaf wetness (fogs, heavy dew, etc) along with scattered light showers in some places over the past few weeks have been ideal for late blight. Along with ideal conditions, the combination of two back to back long holiday weekends along with some possible reduction in spraying resulting from falling prices have undoubtedly worsened the situation in places. Even a short break in spray schedules, despite what is said regarding some of the newer fungicides, can result in a dramatic increase in blight under the conditions we have had during the past two weeks. If weather conditions remain mild, we could be in for a blight year.

Since the disease can spread so rapidly, growers should scout their fields thoroughly each day, especially when cool and wet conditions conducive to disease development prevails. Since late blight symptoms may be confused with symptoms of other diseases, the following diagnostic pointers may help growers distinguish between the late blight and other diseases.

Late blight symptoms on leaves appear as irregularly shaped brown to purplish lesions with indefinite border lesions that can span veins. The lesions may be seen any time of day, on any stage of plant growth and on leaves of any age. Velvety, white fungal growth may appear on the lower surface of affected leaflets early in the morning before leaves dry and/or in the lower canopy.

On stems, purplish lesions may be seen any time of day and may be found any where on the stem. Crystalline, white sporulation on stems with lesions can often be seen early in the morning and/or in the lower canopy. Stems with lesions are brittle and break easily. Lesions are confined to epidermis and cortex. Leaf rolling and wilting is often associated with stem lesions and purpling of leaflets may occur in some varieties. Under the microscopic, the characteristic lemon-shaped spores are easily recognizable.

Several control measures including use of certified seed and destruction of culls in addition to careful scouting are absolute necessities if late blight is to be properly controlled. It is critical to keep inoculum levels low during seasons when weather conditions early in the cropping season are favorable for development of late blight (as they have been this year). Remember that prevention is the key to success.

Currently, fungicides are the most effective means of controlling late blight and will remain the primary tool until cultivars with resistance to this disease become available. Fungicides slow the rate at which the disease develops in the field by creating a protective barrier on the foliage. Just applying a chemical, however, does not necessarily equate with effective disease control. Relative effectiveness of a product, coverage, and timing must be factored into the equation for maximum benefit.

Numerous products are being used in rotation including Dithane, Penncozeb, or Manzate, Manex, Maneb, Ridomil Gold Copper, Ridomil Gold Bravo, Equus, Chloronil, Echo, Bravo, Super-Tin, Curzate, Gavel, Headline Quadris/Amistar and Serenade. Special attention should be paid to timeliness and coverage, making sure that calibration is such that a full rate of material is being applied. Check label for use in greenhouse. Several growers report best results where they have applied a tank mix of Curzate and a protective fungicide like manzate on a two – three day schedule.

No other disease will find farms not taking proper care of their crop like late blight.

Downy Mildew

Growers and scouts report that downy mildew is widely present on cucumber, cantaloupe and squash around Southwest Florida and note that it has become a very aggressive and hard to control disease this season. Incidence and occurrence is moderate to high in a number of locations.

This past season downy mildew resistant cucumbers have been attacked in Florida as well as up and down the East Coast signaling a possible race shift overcoming varietal resistance.

Reports from Palm Beach County indicate that downy mildew is present in cucurbits and has reached very high levels. Scouts note that it is as bad or worse than it has been in many years.

Downy mildew is also present on lettuce and brassicas in Devil's Garden, around Belle Glade and in other parts of Palm Beach County.

Dr Rick Raid, Plant Pathologist at the UF/IFAS EREC in Belle Glade writes indicates that research initiated last year and repeated this year have demonstrated that numerous phosphonic compounds may have significant activity against some of the downy mildew pathogens. Two such fungi, *Bremia lactucae* (lettuce downy mildew) and *Peronospora parasitica* (downy mildew of brassicas), were both held in check using phosphonic compounds (chemistry containing phosphoric acids) in fungicide trials conducted by Dr. Richard Raid (rrr@ifas.ufl.edu). Although the phosphonics are frequently marketed as nutritional supplements, several phosphonic compounds are actually labeled as fungicides. In addition to good efficacy, the phosphonics offer some economic benefits and possess very short pre-harvest intervals. Care should be taken to incorporate them into a rotational or tank-mix program with other fungicides and to follow label directions to avoid potential phytotoxicity problems. (See article under News You Can Use)

Powdery Mildew

Respondents in Palm Beach report that powdery mildew is widely present on squash, tomato and pepper where it is said to be "bad" in some areas.

Growers and scouts around Belle Glade indicate that powdery mildew is increasing in beans particularly in areas where it had been reported earlier. The symptoms consist of a russetting of the upper leaf surface of the older leaves, with mildew evident on the opposite lower surface. It is sometimes quite hard to see the actual mildew.

Dr Rick Raid, Plant Pathologist at the UF/IFAS EREC notes that relatively dry cool weather conditions have made powdery mildew a concern this spring on snap beans. Most evident as a white, superficial powdery growth on the underside of bean leaves, the fungal pathogen (*Erysiphe polygoni*) may also infect the pods, causing stunting and malformation.

Early infections before blossoming may result in significant yield loss. If detected early on, it may be advisable to apply fungicidal sprays for powdery mildew control. Although the broad-spectrum fungicides such as chlorothalonil and copper may provide significant control, the strobilurins, triazole fungicides, and sulfur are more effective against powdery mildew.

Powdery mildew is wide spread on squash around Southwest Florida. Incidence and severity is moderate to high in some places.

Powdery mildew is also present on pepper in several locations around Southwest Florida.

Powdery mildew of pepper is caused by *Leveillula taurica*, which is a very different powdery mildew fungus from that causing powdery mildew on cucurbits.

The fungus, which affects cucurbits *Podasphaera xanthii* (*Sphaerotheca fulginea*) or, occasionally, *Erysiphe cichoracearum*, grows on both surfaces of a leaf and forms haustoria within some epidermal cells to absorb nutrients and produces spores on both surfaces.

In contrast, *Leveillula taurica* grows only within a leaf until it produces spores, a growth habit which is similar to *Alternaria* and most other foliar plant pathogenic fungi. Additionally, *Leveillula taurica* only produces spores on the underside of leaves. *Leveillula taurica* is a species complex that infects over 1000 plant species in 74 families, including tomato and eggplant as well as pepper.

Detecting powdery mildew on pepper can be difficult. The white powdery growth characteristic of powdery mildew diseases occurs only on the underside of leaves and it will turn brown rather than remaining white. Diffuse yellow spotting often develops on the upper surface. Affected leaves tend to drop off the plant, as occurs with bacterial leaf spot.

Bacterial Leaf Spot

Growers in the Manatee Ruskin area indicate that some bacteria spot is present, especially in plantings that went through the recent rainy weather.

Respondents in Southwest Florida note that bacterial spot continues to cause problems in several locations and report finding new infections particularly in pepper in recent weeks.

Growers and scouts in Palm Beach report that bacterial spot is widespread on pepper. Incidence is mostly low with some hotspots being reported.

Target Spot

Scouts in the Homestead area report active target spot in tomato. They note that while cool dry conditions have helped slow bacteria spot they may favor diseases like early blight and target spot.

Reports from around Immokalee indicate that target spot has flared up in some tomato plantings, especially in front of first pick when the canopy is dense and spray coverage weak.

Target spot is present on tomato in Palm Beach; pressure is reported to be moderate to high in some locations with some fruit quality problems being reported.

Early Blight

Growers across the area report low to moderate incidence of early blight on tomato. In some instances lesions are associated with leafminer injury.

Tomato Yellow Leaf Curl Virus

Reports from around southwest Florida indicate that TYLCV is slowly increasing across the area but in most places remains below levels seen last season at this time. Some scattered hotspots have been reported west of Immokalee area where incidence runs as high as 15 –20%.

Growers should take precautions to rogue plants where feasible and practice a complete program of IPM and whitefly management including attention to sanitation and crop destruction.

Growers and scouts in Manatee County report that most fields are still relatively clean although virus is beginning to show up in new plantings. Reports indicate a recurring problem in the Manatee/Ruskin area where a few growers have not done a timely job of crop destruction of the fall crop and virus is now showing up in new plantings. It is hard to say if these growers do not realize the consequences of their actions (hard to believe given the amount of attention this problem has received) or just don't care. Phyllis Gilreath reports that she and others are working on the problem and trying to encourage them to do a better job of crop destruction,

rouging and other control measures that not only safeguard their own new plantings but protect their neighbors as well.

Gummy Stem Blight

Growers and scouts around Southwest Florida report finding gummy stem blight on watermelon in a number of locations. In a few places infections have been present on transplants causing significant stand reduction.

In Florida, gummy stem blight (black rot) is a serious disease that occurs annually on watermelons. Cucumbers, muskmelons, cantaloupes, squash, and other members of the cucurbit family may also be infected with gummy stem blight. Cucurbits may be infected at any time from seedlings to mature vines with fruit.

Infection and symptoms may occur on all plant parts except roots. Symptoms appear as light to dark brown circular spots on leaves or as a light to dark brown to black, often gummy, lesions on stems. Prior to the occurrence of chlorosis or necrosis, tissues may appear water soaked. Wilting, followed by death of young plants may occur. Stem lesions enlarge and slowly girdle the main stem resulting in a red-brown-black canker that cracks and may exude a red to amber gummy substance. Vine wilting is usually a late symptom. Use of a hand lens will reveal small, clear white (when young) to black (when old), pimple-like pycnidia embedded in older diseased tissue.

Gummy stem blight typically progresses from the central stem of the plant to growing tips. Leaf spots are variable in shape, red-brown in color and initial infections are generally seen on leaf margins and veinal areas.

Because other plant disorders can cause exudation of a gummy substance, “gummy-ness” should not be relied upon for diagnosis of gummy stem blight. Anthracnose and inadequate liming can both cause stem lesions and gumming.

The fungus (*Didymella* sp) that causes gummy stem blight produces two spore stages, a sexually produced spore (ascospore) and an asexually produced spore (pycnidiospore). The ascospore is windborne and can be disseminated from field to field serving as a primary source of inoculum. The pycnidiospore functions mainly in secondary spread of the disease. Pycnidiospores are released in a gummy substance that makes them more adaptable for spread by splashing water.

Growers often comment on this disease occurring “overnight.” What they are actually seeing are the results of secondary spread, which is more difficult to control than primary spread simply because of increased spore numbers with increased diseased tissue.

Nighttime temperatures and moisture conditions are ideal during much of the growing season in Florida. Gummy stem blight is most severe in wet years since moisture from dew, rain or irrigation is necessary for spore germination. The optimum temperature for infection is 61 to 75 F. After a spore germinates on a susceptible host, the fungus penetrates the plant tissue and symptoms can appear in 7 to 12 days. Wounds assist in promoting infection.

Gummy stem blight can be successfully managed if the grower utilizes a combination of control strategies. Control of primary sources of inoculum is important. Growers should purchase clean seed from reputable companies produced in arid western locations and avoid transplants that have gummy stem blight or other diseases.

In addition to seed, the most important source of primary inoculum is organic debris from previous cucurbit crops. After harvest, crop debris from should be plowed under to reduce inoculum. Volunteers and

wild cucurbits provide an additional source of inoculum. Crop rotation and destruction of weed hosts are important for gummy stem blight control.

Multiple applications of fungicides are necessary to control gummy stem blight. It is important to begin a fungicide program prior to the first sign of gummy stem blight. In south Florida, the spray program should be initiated soon after emergence. Bravo, Echo, Equus, ChloroGold, Amistar, Cabrio, Pristine, Dithane, Manex, Maneb, Penncozeb, Manzate, or Topsin applied preventatively have given good results locally. In other areas of the state, fungicide spray programs can be initiated when the vines begin to “run.”

When vines are small, band applications of fungicide over the crown area are effective and help reduce application costs.

Rust

Common bean rust is reported to be high in some bean growing areas of South Florida and will likely be present for the duration of the spring on rust-susceptible varieties. Although many commercial varieties are resistant or tolerant to the races of bean rust currently prevalent in Florida, rust does have the potential for decreasing yield on susceptible varieties. While the strobilurin fungicides are very effective against bean rust, the sterol inhibitors and chlorothalonil are also effective. Either may work as nicely as rotational products. Rotations or tank-mixtures are generally recommended to slow or prevent the development of fungicide resistance.

It should be noted that sulfur is far more effective against powdery mildew than against rust, and should not be relied upon solely for rust control under high inoculum pressures. As for soybean rust on snap beans, there is little information regarding the susceptibility of snap beans to the soybean rust pathogen. Reportedly, snap beans may become infected by *P.pachyrhizi* but it is believed that the severity of the disease would be less on snap beans than that which might be observed on soybeans. As of this date, soybean rust has not been reported on snap beans in south Florida.

Fusarium

Around Southwest Florida, fusarium crown has increased after recent rains with several tomato plantings suffering significant wilt just prior to first harvest or right after harvest.

Respondents in Palm Beach report that fusarium crown rot incidence is high in tomato in some locations. Scouts also report some problems with fusarium crown rot on pepper.

Sclerotinia

White mold is widely present on beans in a number of locations around South Florida.

Around Southwest Florida, sclerotinia has slowed but is still common in several pepper fields and at lower levels in tomatoes.

Sclerotinia is typically a cool and moist-weather disease and quite possible being encouraged by the cool foggy mornings over the past few weeks. Free moisture is important in the disease cycle. The fungus overwinters in special survival structures call sclerotia which look like mouse droppings. Affected plants often wilt, either the whole plant or just certain stems, depending on where infection started.

White mold growth can be seen on the tan stem lesions and if the stem is split, the sclerotia can be found inside. These sclerotia can survive for up to 7 years in the soil without a host until conditions are right for

germination. The disease is then spread by airborne ascospores, carried by wind currents to potential host tomatoes (or other hosts which include peppers, beans, eggplant, potatoes and many other crops).

The disease requires dead plant tissue for infection to occur, quite often dropped flower blooms or leaves which lodge in leaf axes. One reason that the disease is seldom seen in the Ruskin area is that during the time environmental conditions are right, plants in the area are still young. Pre-bloom infection may sometimes occur in tomato, but usually this is a result of frost damage or some other mechanical damage that serve as substrates for initiation of the disease. It could also be that the hurricanes from last fall played a role in providing more favorable conditions for this disease to occur in some areas.

Typical protective fungicides will do little for control of this disease. Topsin M has a Section 18 label for fruiting vegetables in Florida and has shown good control of Sclerotinia. Good control has also been obtained with Endura. Amistar, Cabrio and Quadris are also labeled for Sclerotinia.

Mosaic

Reports indicate that mosaic is widely present on squash around South Florida.

Alternaria Leaf and Pod Spot

Alternaria leaf and pod spot of beans is widely present in beans growing areas of South Florida. Infection on the pods has been reported as moderate to high in some areas.

Lesions on pods usually appear as very small, dark-brown to black flecks. When examined with a hand lens, these flecks are somewhat raised and cone-like. When only a few flecks occur on a pod, the damage may be insufficient to result in rejection at the packinghouse. Large numbers of unsightly flecks, however, can result in rejection of the entire lot, especially at lower market prices.

Leaf symptoms first appear as small, water-soaked flecks that rapidly develop into circular to irregular spots with pale-brown centers and reddish-brown borders.

Faint, concentric rings may occasionally be visible in older lesions. As the disease progresses, leaf lesions may merge together leading to large, blighted areas and premature leaf drop.

Several species of *Alternaria* have been reported as attacking beans but the consensus is that *Alternaria alternata* is probably responsible for most outbreaks in Florida. Normally this species is a weak pathogen and not as aggressive as *Alternaria solani*, which, causes the devastating early blight of potato and tomato. Ideal conditions for the development of Alternaria leaf spot include high relative humidity, rainfall, and cool temperatures (60 -75 degrees F for daytime highs). Under these conditions, Alternaria leaf spot can result in major losses in snap bean. Severe outbreaks of the disease can be expected from January through March in Homestead, Belle Glade and Devil's Garden growing areas of southern Florida.

For scouts and others with access to a microscope, the multi-celled, pigmented spores that have both transverse and longitudinal septa (cell walls) and a short "tail" or "beak" are diagnostic of the disease.

Beans that are nutritionally deficient in nitrogen and/or potassium are most susceptible as are those planted at high densities with can result in more frequent disease incidence and greater disease severity.

Management of Alternaria leaf and pod spot consists of maintaining adequate crop nutrition and avoidance of close between-row and within-row plant spacing. Fungicides also play a major role in the integrated management of this disease.

It is particularly important that effective fungicides be applied when pods are small (pin pod stage) in order to avoid infections that will be evident later as pods mature. Strobilurin fungicides have given good results but should be applied according to the label and rotated with materials with other modes of action to avoid potential problems with resistance. Reports indicate that best control seen in areas that received two applications of Quadris/Amistar.

Pythium

A number of growers have reported problems with pythium following recent rains. In some cases significant stand reduction has been observed.

Phytophthora

Growers in Palm Beach are reporting some scattered problems with Phytophthora on pepper and cucumber.

Tomato Spotted Wilt

East Coast growers are reporting scattered problems with tomato spotted wilt virus in St Lucie and Martin Counties.

News You Can Use

Phosphorous Acid: When All P are not Equal

While growers are familiar with phosphorus-containing fertilizer, the abundance of terms apparently similar (such as phosphoric acid and phosphorous acid) may create some confusion on the actual content and efficacy of these products. Some common phosphorus-containing compounds are listed in Table 1. Some claims found in commercial literature and product descriptions refer to phosphorous acid as a “supplemental fertilizer,” while others present it as a fungicide (Table 2). The purpose of this article is to explain what phosphorous acid is and to examine both the fungicidal activity and nutritional value of phosphorous acid.

Phosphorus (abbreviated P) is one of the essential elements for normal growth and development of plants. In fertilizers, it is normally found in the form of phosphoric acid (H_3PO_4 , Table 1), which readily disassociates to release hydrogen phosphate (HPO_4^{2-}) and dihydrogen phosphate (H_2PO_4^-). Both these ions may be taken up by the plant, but H_2PO_4^- more readily. Once inside the plant, both ions are mobile.

How much phosphorus a fertilizer contains is represented as the middle number on the bag (5-10-15, for example) expressed as P_2O_5 (the first number represents the nitrogen grade, and the third number potassium grade as K_2O). The P_2O_5 unit used to represent P content in fertilizer is a conventional unit (in reality, there is little or no P in the form of P_2O_5 in fertilizer).

Phosphoric acid should not be confused with phosphorous acid (H_3PO_3). A single letter difference in the name of a chemical compound can make a difference in its properties. Phosphorous acid releases the phosphonate ion (HPO_3^{2-} ; also called phosphite) upon disassociation. Like phosphate, phosphonate is easily taken up and translocated inside the plant.

Phosphorous acid and its related compounds are commonly often referred to as phosphonate, phosphate, and phosphonic acid. One of the breakdown products of fosetyl-Al is mono-ethyl phosphonite, which may be taken up by the plant. Inside the plant, fosetyl-Al may ionize into phosphonate, and therefore fosetyl-Al belongs to the same group of phosphorous acid compounds.

Phosphoric Acid as Fertilizer?

Phosphorous acid does not get converted into phosphate, which is the primary source of P for plants. In contrast, some soil bacteria are capable of transforming phosphonate into phosphate. However, this process is so slow that it is of no practical relevance. To date, no plant enzymes have been described that could oxidize phosphonate into phosphate. This explains why phosphonate is stable in plants and does not get converted into phosphate. Because phosphorous acid and its derivatives do not get metabolized in plants, claims that phosphonate can contribute to phosphorus nutritional needs of the plants should be taken with caution. Phosphorous acid has properties useful in agriculture. Like in many other publications investigating efficacy of phosphorous acid against oomycetes, Förster *et al.* found that phosphite is capable of controlling *Phytophthora* root and crown rot on tomato and pepper. These authors also investigated the ability of phosphorous acid to act as a nutrient source for plant growth, and found that P-deficiency symptoms developed when plants were grown hydroponically with phosphorous acid as the sole source of P (without phosphate).

This means that although phosphorous acid can control oomycetes in a number of host-parasite systems, it is not a substitute for phosphorus fertilization. The inverse is also true: phosphate is an excellent source of P for plant growth, but is unable to control pathogen attack by oomycetes other than making the general health of the crop better, thereby improving its natural defense system. Therefore, no real, valid evidence exists for the claim that phosphorous acid improves plant growth.

Control of Oomycetes

It is well documented that phosphorous acid is able to control diseases caused by organisms that belong to the Oomycota (or oomycetes) which cause diseases on agronomical crops. Oomycetes (a group of pathogen that includes water molds and downy mildew) are actually not fungi, but are frequently grouped with fungi, because they form structures (filaments) similar to the ones that fungi make. In reality, oomycetes are fungal-like organisms that differ from fungi in that their cell walls do not contain chitin, but a mixture of cellulosic compounds and glycan. Another difference is the nuclei in the cells that form the filaments each have two sets of genetic information (they are diploid) in oomycetes instead of just one set as in fungi (which are haploid).

For most practical purposes, the oomycetes are grouped with fungi, and compounds that control plant pathogens belonging to the oomycetes are often called fungicides. It is important to distinguish between fungi and oomycetes; however, because chemicals that are used to control one will often not be effective against the other based on their different biology. Several important plant pathogens belong to the oomycetes (Table 3), the most important economically is *Phytophthora infestans*, which causes late blight of potato.

Phosphorous acid has both a direct and an indirect effect on oomycetes. It inhibits a particular process (oxidative phosphorylation) in the metabolism of oomycetes. For instance, phosphonate compounds are ineffective against phosphonate-resistant oomycetes. In addition, some evidence suggests that phosphorous acid has an indirect effect by stimulating the plant's natural defense response against pathogen attack.

Efficacy

A major factor in the ability of phosphorous acid to control oomycetes for long periods of time appears to be its chemical stability in the plant. Phosphorous acid does not get converted into phosphate, and is not easily metabolized. The stability of the different phosphonate-related compounds may depend on environmental factors such as climate or crop type. Because phosphonate is systemic and stable in the plant, it should be applied infrequently. Plants species may differ in uptake and translocation of phosphonate, and there is great variation in sensitivity of individual *P. infestans* isolates to phosphonate compounds, which may negatively impact the effectiveness of phosphonate.

Some of the phosphorous acid-related compounds and research on their efficacy against potato late blight are summarized in Table 4. In most cases, research has been done with foliar applications of phosphorous acid. The compound gets translocated in the plant to the roots, and is therefore effective against oomycetes that affect roots. Phosphorous acid was shown to be effective when applied as a root drench against *P. cinnamomi*, *P. nicotianae*, and *P. palmivora* in lupin, tobacco, and papaya, respectively (Smillie *et al.*, 1989). The efficacy of different phosphonate compounds against nine *Phytophthora* spp. which cause stem rots of *Persea indica* L. and pepper was tested both as a curative or preventive method of control by Ouimette and Coffey (1989a). Seven though sensitivity of each of the *Phytophthora* spp. used in their experiments in the laboratory was variable (Table 4), there was little difference in the ability of different phosphonate compounds in controlling the stem rot of pepper either as a curative or preventive agent in pots. The level of control was better for *Persea indica* L. than for pepper.

Fosetyl-AI is a systemic fungicide that is often used against root pathogens because it is mobile in the plant and gets transferred to the roots. Cooke and Little found that foliar application of fosetyl-AI did not reduce tuber blight on potato caused by *P. infestans*, while foliar sprays with partially neutralized phosphonate reduced the number of tubers which developed symptoms after inoculation with the pathogen. Different host plants may take up, transport and metabolize fosetyl-AI differently. This seems contradictory, since fosetyl-AI releases phosphonate as a breakdown product, but there may be other factors involved, like environmental factors.

Potassium phosphonate negatively affected mycelial growth more than phosphonates that had alkyl groups in general, but some exceptions were noted. None of the compounds used by Ouimette and Coffey were able to control infections by *Phytophthora* spp. completely when they were used as a curative or protective agent. All of the compounds were equally effective when used as a protective agent (by root dip). Potassium phosphate was shown to be effective for control of strawberry leather rot caused by *P. cactorum*. Phosphonate was shown to be effective when applied to potato foliage against *P. infestans* and *P. erythroseptica* (causal agent of pink rot), but not against *Pythium ultimum* (causal agent of Pythium leak. Phosphorous acid also appears very effective against downy mildew on grapes, *Phytophthora* root and crown rot on tomato and green pepper in hydroponic culture.

For control of oomycetes on turfgrass, Riverdale Magellan (a mixture of phosphorous acid compounds) and Chipco Signature (Aluminum tris (O-ethyl phosphonate)) were found to be equally effective against Pythium blight development on perennial ryegrass. Similarly, different commercial formulations of phosphorous acid suppressed Pythium blight on rough bluegrass (*Poa trivialis*) during the 2001-2002 season.

The existence of *Phytophthora* spp. that are resistant against phosphonate has been reported, hence, care should be taken to alternate phosphonates with other effective compounds to prevent a build-up of resistant *Phytophthora* spp. in the field.

Conclusion

A clear distinction exists between phosphoric acid and phosphorous acid: the former is a nutritional source of P for plants, and the latter helps control agricultural epidemics of oomycetes. Claims that suggest that either compound may fulfill the functions of the other are not supported by current literature and are therefore misleading. Since phosphonates are systemic and very stable in plants, they should not be applied frequently. Since phosphonate resistant oomycetes have been described, care should be taken to alternate or mix phosphonate with other effective compounds.

Excerpted from the March 2005 issue of the UF/IFAS Vegetarian Newsletter by Asha M. Brunings, Lawrence E. Datnoff, and Eric H. Simone, see <http://www.hos.ufl.edu/vegetarian/vegetarian.htm> for full article and references.

Table 1. Agriculturally relevant P-containing compounds

Name	Symbol	What is it?
Phosphorus	P	The chemical element indicated with the symbol P that is important for numerous processes in all organisms. It does not occur as a free element in nature
Phosphoric acid	H ₃ PO ₄	Compound normally found in P-fertilizers
Dihydrogen phosphate	H ₂ PO ₄ ⁻	Partially disassociated form of H ₃ PO ₄ , in which P is most readily taken up by the plant
Hydrogen phosphate	HPO ₄ ²⁻	Partially disassociated form of H ₃ PO ₄ , in which P can also be taken up by the plant
Phosphate	PO ₄ ³⁻	Completely disassociated form of H ₃ PO ₄
Phosphor oxide	P ₂ O ₅	Formula used to express P-content of fertilizers
Phosphorous acid	H ₃ PO ₃	Compound normally marketed as a fungicide
Dihydrogen phosphonate	H ₂ PO ₃ ⁻	Partially disassociated form of H ₃ PO ₃
Hydrogen phosphonate	HPO ₃ ²⁻	Partially disassociated form of H ₃ PO ₃
Phosphonate, phosphite	PO ₃ ³⁻	Completely disassociated form of H ₃ PO ₃

Table 2. Marketing of products with active ingredient phosphorous acid or related compounds.¹

Product	Company	Active Ingredient	Marketed as
Terronate wdg	Agrilience, llc	Fosetyl-Al	Fungicide
Aliette®	Bayer Cropscience, lp	Fosetyl-Al	Fungicide
Nutri-Phite®	Biagro Western Sales	Phosphite and organic acids	Fertilizer
CP home and garden fungicide	Contract packaging, Inc.	Fosetyl-Al	Fungicide
Tree tech brand aliette injectable	Florida Silvics, Inc.	Fosetyl-Al	Fungicide
Ele-Max® foliar phosphite		Phosphorus acid ²	Foliar fertilizer
Ele-Max® soil phosphate	Helena Chemical	Phosphorus acid	Soil fertilizer
ProPhyt®		Potassium phosphite	Systemic fungicide
Phostrol®	Nufarm America	Phosphorous acid	Fungicide, biochemical pesticide
Riverdal Magellan		Phosphorous acid	Fungicide
Plant synergists phosphorous acid technical	Plant Synergists, Inc.	Phosphorous acid	Fungicide

¹ Disclaimer: Products and companies are mentioned for educational purposes and are not recommended over similar products in this document.

² It is unclear whether “phosphorus acid” means phosphoric or phosphorous acid. The word “phosphite” in the name implies that phosphorous acid is the active ingredient. However, the fact that the product is marketed as a fertilizer implies that the active ingredient is phosphoric acid.

Table 3. Genus of oomycetes that cause disease on crops and that are likely to be controlled by phosphorous acid

Genus	Disease
	Root rot
<i>Bremia</i> , <i>Peronospora</i> , <i>Plasmopara</i> , <i>Pseudoperonospora</i> , <i>Sclerospora</i>	Downy mildew (Fig. 2)
<i>Pythium</i>	Root rot and damping-off
<i>Phytophthora</i>	Late blight of potato and tomato, foliar blights on peppers and cucurbits, root and stem rots
<i>Albugo</i>	White rust on cruciferous plants

Table 4. Control of potato late blight by phosphorous acid and related products

Compound	Efficacy	Application
Fosetyl-Al	Not good in field	Foliar spray
Phosphonate	Good in field, variable against oomycetes in the lab	Foliar spray
Phosphonate compounds	Good in pots	Root dip
Phosphonate	Variable against <i>P. infestans</i> isolates in the lab	To detached leaves
Phosphorous acid	Good against <i>P. infestans</i> in the field	Foliar spray

Job Opportunity

Harris Moran Product Development Representative - South Florida

Responsibilities include implementing and managing an extensive trial network in South Florida and coordinating trial plans throughout the whole South Eastern region. Will work in coordination with, and act as liaison between sales, research and product management providing detailed information back to these departments and will be expected to play a major role in product advancement in South Florida and in the South Eastern region. Will also be responsible in establishing a strong working relationship with our distributors and key grower/shippers. Position is located in South Florida. Will report to the Product Development Manager based out of Modesto, CA. Requires a BS in Agricultural Sciences or related discipline with a minimum of 5 years related work experience; MS degree is desirable. Requires excellent verbal and written communication skills. Management skills are desirable. Requires computer literacy in all Microsoft Office applications and in Lotus Notes. Extensive traveling required in the territory and in the South East.

If interested please contact Pat Silva at the Modesto facility - 209 549 5207

Up Coming Meetings

Hillsborough County

April 13, 2005

Value Added Workshop 1:00 pm – 5:00 pm
Hillsborough County Cooperative Extension Service Office
5339 County Road 579
Seffner
For more information contact Laura M. Miller at 813-744-5519 x 147

Manatee County

March 22, 2005

Dow AgroSciences Update and Lunch.

For more information, please contact Phyllis Gilreath at 941-722-4524 or prgilreath@ifas.ufl.edu. CEUs will be available.

Palm Beach County

April 13, 2005

General Standards/Core Test Review	8 AM – 10 AM	4 CEUs
Ag Row Crop Test Review	1 PM – 3 PM	2 CEU's

Belle Glade Extension Office
2976 State Road 15
Belle Glade, Florida

Contact Laura Powell at 561-996-1655.

Southwest Florida

March 29, 2005

Vegetable Growers Meeting 6:00 PM
Understanding PACA – Perishable Agricultural Commodities Act

UF/IFAS - SW Florida Research and Education Center
Hwy 29 N
Immokalee, Florida

Contact Gene McAvoy at 863-674-4092

March 29 - 30, 2005

Spanish Pesticide Applicator Prep Classes 8:00 AM

Hendry County Extension Office
1085 Pratt Boulevard
LaBelle, Florida

Contact Gene McAvoy at 863-674-4092 for details

Note: Testing will be conducted in English

March 31 – April 1, 2005 Restricted Pesticide Applicator Classes **Mar 31 – Core, Private**
April 1 – Row, Tree Aquatic

Hendry County Extension Office
1085 Pratt Boulevard
LaBelle, Florida

Contact Gene McAvoy at 863-674-4092 for details

Websites

PESTICIDE.NET is the world's leading source of news and information on conventional, biological and antimicrobial pesticides, with over 10,000 full text documents and around a quarter million visits each month. Go to www.pesticide.net

DTN Soybean Rust Center – for the latest information on soybean rust including recent find in Pasco County. Check it out at <http://www.dtnsoybeanrustcenter.com/index.cfm>

Quotable Quotes

Women will never be equal to men until they can walk down the street with a bald head and a beer gut, and still think they are beautiful.

Most folks are about as happy as they make up their minds to be. -- Abraham Lincoln

Happiness is nothing more than good health and a bad memory. -- Albert Schweitzer

I have never let my schooling interfere with my education. -- Mark Twain

If A is success in life, then A equals x plus y plus z. Work is x; y is play; and z is knowing when to keep your mouth shut. -- Albert Einstein

Correct me if I'm wrong, but hasn't the fine line between sanity and madness gotten finer? --George Price

On the Lighter Side

Hillbilly Carpenters

Billy Bob and Bubba were doing some carpenter work on a house.

Billy Bob who was nailing down house siding, would reach into his nail pouch, pull out a nail and either use it or throw it over his shoulder.

Bubba, figuring this was worth looking into, asked, "Why are you throwing those nails away?"

Billy Bob explained, "When I pull out a nail out of my pouch, about half of them have the head on the wrong end, so I throw them away".

Bubba went ballistic and yelled, "You moron! Those nails aren't defective! They're for the other side of the house!"

Spanish Lesson

A Spanish teacher was explaining to her class that in Spanish, unlike English, nouns are designated as either masculine or feminine. "House" for instance, is feminine: "la casa", "Pencil," however, is masculine: "el lapiz."

A student asked, "what gender is 'computer'?" Instead of giving the answer, the teacher split the class into two groups, male and female, and asked them to decide for themselves whether "computer" should be a masculine or a feminine noun. Each group was asked to give 3 reasons for its recommendation.

The men's group decided that "computer" should definitely be of the feminine gender ("la computadora"), because: No one but their creator understands their internal logic; Even the smallest mistakes are stored in long term memory for possible later retrieval; As soon as you make a commitment to one, you find yourself spending half your paycheck on accessories for it.

The women's group, however, concluded that computers should be Masculine ("el computador"), because: They have a lot of data but still can't think for themselves; They are supposed to help you solve problems, but half the time they ARE the problem; As soon as you commit to one, you realize that if you had waited a little longer, you could have gotten a better model. The women won.

New Virus Alert

There is a new computer virus on the loose. The code name is WORK.

If you receive WORK from your colleagues, your bosses, via e-mail, or from anyone else, do not touch it under any circumstances. This virus wipes out your private life completely.

If you should happen to come in contact with this virus, take two friends and go straight to the nearest bar. Order drinks immediately and after three rounds, you will find that WORK has been completely deleted from your system.

Forward this virus warning immediately to at least five friends. Should you realize you do not have five friends, this means you are already infected by this virus and WORK already controls your life.

If this is the case, go to the bar and stay until you make at least five friends. Then retry. I think I have five friends, but am not entirely positive, so I'm headed for the bar anyway . . . it never hurts to be safe.

Contributors include: Joel Allingham/AgriCare, Inc, Karen Armbruster/SWFREC, Kathy Carbiener /Agricultural Pest Management, Jim Connor/SWFREC, Bruce Corbitt/West Coast Tomato Growers, Dr. Kent Cushman/SWFREC, Dr. Phyllis Gilreath/Manatee County Extension, Fred Heald/Farmers Supply, Sarah Hornsby/AgCropCon, Cecil Howell/H&R Farm, Loren Horsman/Glades Crop Care, Bruce Johnson/General Crop Management, Dr. Mary Lamberts/Miami-Dade County Extension, Leon Lucas/Glades Crop Care, Gene McAvoy/Hendry County Extension, Alice McGhee/Thomas Produce, Jimmy Morales/Pro Source One, Tim Nychk/Nychk Bros. Farm, Chuck Obern/C+B Farm, Teresa Olczyk/ Miami-Dade County Extension, Darrin Parmenter/Palm Beach County Extension, Dr. Ken Pernezny/EREC, Dr. Pam Roberts/SWFREC, Dr. Nancy Roe/Farming Systems Research, Wes Roan/6 L's, Kevin Seitzinger/Gargiulo, Jay Shivler/ F& F Farm, Ken Shuler/Stephen's Produce, Ed Skvarch/St Lucie County Extension, John Stanford/LNA Farm, Mike Stanford/MED Farms, Dr. Phil Stansly/SWFREC, Eugene Tolar/Red Star Farms, Dr. Charles Vavrina/SWFREC, Mark Verbeck and Donna Verbeck/GulfCoast Ag, and Alicia Whidden/Hillsborough County Extension.

The **South Florida Pest and Disease Hotline** is compiled by **Gene McAvoy** and is issued on a biweekly basis by the **Hendry County Cooperative Extension Office** as a service to the vegetable industry.

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