UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

Santa Barbara County

CENTRAL COAST AGRICULTURE HIGHLIGHTS

From your Farm Advisors Serving you in the Areas of Vegetables, Small Farms, Strawberries, Field Crops, Livestock and Natural Resources

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Viruses in Peppers

Franklin Laemmlen

Symptoms of Cucumber Mosaic Virus

The Compendium of Pepper Diseases, published in 2003 by the American Phytopathological Society, lists and describes 17 viruses that can occur in peppers (*Capsicum* spp.). Peppers are often referred to as "the virus vacuum sweeper," i.e., if there is a virus around, peppers are very likely to pick it up. Of the more commonly known viruses, Alfalfa Mosaic (AMV), Potato Virus Y (PVY), Cucumber Mosaic (CMV), Tobacco Etch (TEV), Tobacco Mosaic (TMV), and Pepper Mottle (PeMV) are found in peppers throughout California. Beet Curly Top (BCTV) and Tomato Spotted Wilt (TSWV) are also found at times. Of these eight viruses, AMV, PVY, CMV and TEV are aphid-transmitted. TMV is mechanically transmitted, usually on the hands of workers who handle pepper transplants in the greenhouse or on the field transplant machine. BCTV is hopperborne, and TSWV is carried from plant to plant by thrips.

On the Central Coast the most common virus encountered in peppers is cucumber mosaic (CMV). CMV is aphidborne, and during high incidence seasons can be devastating to a pepper crop, causing enough damage to make fields uneconomical to harvest.

Symptoms of CMV in peppers vary, and it is always dangerous to attempt a specific virus diagnosis in the field. Specific identification can only be done in a laboratory. However, some common symptoms that can be associated with CMV are a mosaic pattern and a necrotic line and irregular ring pattern in the leaves. Frogeye necrotic rings may also be present. On the fruit, blister-like rings appear with slightly raised centers and sunken margins. Necrotic tissues may develop between the "blisters." Small sunken depressions may also be present on the fruit. All these symptoms may not appear on one plant, and a number of plants should be examined to get an overall picture before you make an on-site "guess."

Once a plant is infected, there is no cure. Usually the fruit that is produced after infection occurs will show symptoms, hence cannot be harvested.

CMV usually enters a field on winged aphids that are migrating from weeds and other virus reservoir plants to the green, lush vegetations of the growing pepper crop. Aphids carry CMV as a non-persistent contaminant on their mouthparts. As they probe the pepper leaves, the virus is left behind in the puncture wounds. From the time the viruliferous aphid feeds until the first symptoms appear in the inoculated plant is usually seven to ten days. The fact that relatively few winged aphids migrating through a field can leave behind many infected plants, and the fact of the latent period between inoculation and symptom expression explains why growers and pest control advisors often state, "There was and has been no significant aphid population in this field since planting." Yet virus incidence is high.

Most virus control strategies are poor to mediocre. In locations, which have a history of virus incidence, reflective plastic or spray on mulches have been shown to significantly reduce disease losses. Spraying for aphid control for the purpose of virus disease reduction has not proven worthwhile. Roguing has also not been successful in most instances as any winged aphids on rogued plants will quickly move on to new hosts as soon as the rogued plant begins to wilt. The use of "stylet oil" has shown some success. The oil washes the virus from the stylet as the aphid probes the host plant. However, for this control to be successful, the stylet oil must be applied to the plant in anticipation of migrating aphid flights. Something that is difficult to do!!!

Virus-resistant peppers would be the ultimate control. However, sources of virus resistance for pepper breeders are difficult to find and difficult to incorporate by conventional breeding. Genetically-modified (GM) peppers with virus resistance are being developed. However, grower and public acceptance of GM peppers is still a question mark. Hopefully, acceptance will come soon.

P.S. A virus survey of Vegetable and Field Crops was done in northern and central California in 1994 by researchers at U.C. Davis. If you would like a copy of this report, contact Franklin Laemmlen (805/934-6240).

Regulation of Agricultural Biotechnology Crops and Foods in the United States

Franklin Laemmlen

The subject and science of biotechnology elicits great interest and strong opinions - pro and con - from most persons. To help people become knowledgeable on this subject, the U.S. Government has established a new website, which provides information on the U.S. oversight system for products of modern biotechnology. It includes information on the roles of the regulatory agencies and links to relevant statutes and regulations. The centerpiece of the website is a searchable database containing information on all genetically engineered crop plants intended for food or feed that have completed the recommended or required reviews for food, feed, or planting use in the United States. Construction of the website and database has

been a joint effort undertaken by the Department of State (DOS), the U.S. Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the U.S. Geological Survey (USGS). The website is located at <http://usbiotechreg.nbii.gov>

The University of California has also established a website to help the general public learn about and understand GMOs (genetically modified organisms). Log on to: <http://ucbiotech.org> and learn more about this new and exciting area of research and development.

Current Research Reports

Franklin Laemmlen

To obtain a copy of any of the following reports, contact our Cooperative Extension Office - (805) 934-6240.

- The journal California Agriculture, Volume 58, Number 2, April-June 2004, is completely devoted to articles and information about biotechnology.
- Evaluating Salinity in Irrigation Water by Michael Cahn, Irrigation and Water Resources Advisor, Monterey County.
- Recently identified Downy Mildew Diseases of Concern in Coastal California by Steve Tjosvold, Floriculture Advisor, Santa Cruz County.
- Management of Downy Mildew on Snapdragon by Stephen Wegulo, et al., Plant Pathology Specialist, UC Riverside.
- Strategies for Managing Powdery Mildew on Delphinium by Stephen Wegulo, et al., Plant Pathology Specialist, UC Riverside.
- Control of Garden Symphylid, *Scutigerella immaculata* in Tomato Fields by Benny Fouche, et al., Farm Advisor, San Joaquin Co.
- How Windbreaks Work by James Brandle, Soil Conservation Service, University of Nebraska.
- Injury and Illness Prevention Program - IIPP, All Growers Need One by Steve Sutter, Farm Advisor, Fresno County.

Common Recurring Management Problems with New Blueberry Plantings

Mark Gaskell

Attractive off-season market windows have inspired the recent planting of new blueberry acreage in several areas of central and southern California. Fresh market blueberries are a challenging crop to grow under any circumstances, and adapting blueberries to California conditions offers additional problems. The following are some recurring problems with establishment or cultural practices that have been appearing frequently with new blueberry plantings.

<u>pH Creep</u>

The importance of carefully modifying the soil pH cannot be over-emphasized. For normal blueberry growth and vigor the blueberry plant demands a soil pH between 4 and 5. The plant will grow very little as pH creeps above 5.0, and productivity will fall off dramatically.

The soil is typically acidified by the addition of soil sulfur or sulfuric acid. In the heavier textured, high pH soils in many coastal valleys, the sulfur (S) requirement to lower the pH is often underestimated by tables, and/or the laboratory determination for S requirement. This may be due to inadequate mixing in the soil, slow S availability, or dilution from the bed preparation. Many of the S requirement calculations are based on a six-inch depth of soil. It is not uncommon that 10 inches or more of soil may be moved in the bedding operation, and it is necessary to increase the S requirement accordingly.

The pH tends to creep back up with time in highly buffered soils that have been acidified. Acidifying the water during routine irrigations helps maintain the pH adequately, and topical light applications of soil S can also be made. But the key point is that soil pH should be monitored routinely - at least every 3 months - and light amounts of soil S broadcast on the bed surface once or twice each year during the rainy season. More readily available S materials such as Tiger Sulfur or Dispersul should be used in place of common "popcorn" soil sulfur. The S must be in contact with moist soil to be acted on by soil bacteria. Soil pH is only slowly changed by surface applications of S, so these applications will not have an effect until several months later.

Acidification of irrigation water to pH 5 can also improve the uniformity of soil pH within the field. New plantings grow more uniformly and develop more quickly if the water is acidified. Typically, urea sulfuric acid is used to acidify water, and this amendment also supplies nitrogen when injected into irrigation water. Organic blueberry growers are limited to the use of citric or acetic acid for acidification of the irrigation water, and these are weaker acids and will require larger amounts of acid to lower the pH. In each case, the most reliable means of determining the amount of acid to inject in the irrigation water is to have a laboratory titrate the water sample with the acid that will be used.

Irrigation Management

Blueberries are intolerant of moisture stress from dryness or waterlogging due to poor drainage. Blueberries are generally shallow rooted, and root systems are concentrated in the upper 6"-12" of soil. Newly established plantings will need to be monitored carefully and irrigated to assure availability and uniform distribution of moisture. As young plants establish, it is important that they expand the rooting area uniformly to match the growth of developing tops. Check for uniform wetting throughout the drip line. If tensiometers are used, data reported from Florida suggests that 20 millibars be used as the point to begin watering. Moisture content will vary some between soils at this moisture tension, but it is the best guide we have until more thorough studies have been done on different California soils.

All of the blueberry plantings should be mulched on the surface with wood waste. Heavier textured soils should be amended with wood waste, and there is evidence that blueberries respond to high amounts of wood waste incorporation, but it is important to monitor carefully for uniform moisture throughout the rooting zone. Recent trials, reported by Tulare Co. Farm Advisor Manuel Jimenez at the Kearney Ag. Center in Parlier, indicate that young, transplanted blueberry plants grow very vigorously in pure wood waste added in a V-slit down the center of a raised bed. Blueberries are grown similarly in pure wood waste in many parts of Florida and seem to adapt well to this system, but it is important to ensure uniform moisture distribution in these situations.

Nutrient Management

Young blueberries respond markedly to nitrogen (N) if other major macro- and micronutrients are not limiting. Applications of phosphorus, potassium and other nutrients should be made based on soil tests and prior to planting when the land is prepared.

Nitrogen will need to be applied on a recurring basis throughout the growing season. In the early

years, relatively high N application will favor rapid plant development. In the first year, application rates of 10 - 15 lbs N per acre per month are probably adequate and increasing as plants grow to 25 lbs per acre per month in mature plantings. Nitrogen application can be suspended during cooler periods from November to February. Also there is some anecdotal evidence that high N applications in early spring may stimulate vegetative flushing at the expense of flowering and fruit set in evergreen planting systems. For producing acreage, spring N application - between January and May - should probably not exceed 5 - 10 lbs N per acre per month.

Iron chlorosis induced by high soil pH is another nutrient problem in newer plantings or those where the pH has risen above 5.0. In these cases the new developing leaves - and occasionally extending to older leaves - are pale green or yellow. This is a sign of the pH creep discussed earlier and is only solved long-term by lowering the soil pH. Growers may solve short-term chlorosis problems by applying iron chelate to the foliage or as a soil drench. Micronized sulfur products such as Thiolux can also be used to drench the soil around the plants for a rapid localized adjustment of soil pH.

Frost Protection

Success with a newly established blueberry planting will depend on timing the production to hit early season market windows with higher prices. Early season prices typically peak in mid-April and then fall off during mid- to late May. Selection of early producing varieties - also with relatively low chilling requirement - is important for timing of production. And the early producing varieties will need to be protected from the not uncommon early spring frost that can come in January or February. A night of radiative frost that takes the temperature into the mid-20s for even brief periods will cause the flowers and developing fruit to abort. This means that harvest will be delayed at least 70 days from that point, and much of the early season production will be lost.

The two most effective ways of protecting against frost are selecting frost-free areas to plant or using sprinkler irrigation or wind machines to prevent the plant tissues from experiencing the freezing temperatures. Parcels on a hillside with good air drainage or those close to the ocean with good air circulation will be the most promising for frost-free conditions.

Sprinkler irrigation can also be used effectively for preventing freezing temperatures. The ice formed by the freezing water actually releases heat to the plant tissue. It is important with sprinklers that the flow of water be adequate (typically between 0.10 and 0.15 inches of water per hour). More water is required for lower temperatures or windy conditions. Water will need to run from the time temperatures dip below 30º F until they come above freezing in the morning. Wind machines may also be an effective frost protection alternative depending upon acreage and location.

Weak Variety Mix

Growers who have planted in recent years have been limited by the availability of plant material and/or reliable performance information in selecting their mix of southern highbush varieties to plant. Ideally, a variety selected for southern and coastal California off-season production will have the following characteristics:

- Low chill requirement
- Early producing
- Good horticultural traits

Variety trials are on-going in several parts of California, but the process is slow because blueberries take several years to establish and show their production potential. Nevertheless, several newer varieties appear to be more vigorous and productive than some of the older, more traditional varieties. The following varieties currently appear to be the most promising for areas of southern and coastal California:

Emerald	Jewell	Millenia
Misty	Sharpblue	Star
Windsor		

Several additional varieties are continuing to be evaluated, and this list will be updated as new information comes available.

Established plantings can be renovated by replacing unproductive plants with these more promising alternatives. And in many cases the gain in productivity will more than compensate for the additional costs of plant replacement. The plants will begin producing in one to two years from transplanting depending upon timing, management, and transplant size.

BSE Prevention: Myths and Critical Points

Wayne Jensen

Over the past months you have read and heard more about BSE (Bovine Spongiform Encephalopathy, Mad Cow Disease) than you may have ever wanted to know. However, as in previous newsletters, I include factual articles written by Dr. John Maas, our Extension Veterinarian at UC Davis, on topics important to producers.

The following is an excellent source of information, which provides factual information and serves as a means to provide facts, not myths regarding this disease. Hopefully, you can utilize this information, should you talk with the media, local officials, neighbors, consumers and others to answer their questions and concerns.

Does BSE occur spontaneously in cattle?

The message that BSE occurs spontaneously in cattle has been repeated in the media several times. From where does this idea come? There is a disease in humans called Creutzfeldt-Jakob Disease (CJD) which does occur spontaneously. It occurs at a rate of about 1-2 people per million population per year, worldwide. This is the so-called spontaneous CJD. Some have extrapolated this information to the cattle population, saying that BSE occurs spontaneously in cattle just as spontaneous CJD occurs in humans. Therefore, if we have about 100 million cattle in the U.S., we have 100-200 cases of BSE each year. This assumption is the basis for the argument that we should be testing every slaughtered animal for BSE. There is no basis in fact for this assumption, however. To the contrary, there is ample evidence that BSE is not occurring spontaneously.

For example, we have been able to detect cattle diseases with public health significance that occur at a much lower rate than 1 per million and one such disease is rabies. The diagnosis of rabies is dependent on a thorough examination of the brain of the animal. BSE diagnosis is also dependent on the complete examination and testing of the animal's brain. In California, cattle rabies is detected every year or so, and almost every case is associated with significant human exposure. If we were unable to detect this central nervous system disease (rabies), one or more fatal cases of rabies in humans would occur. The fact is, we are able to routinely diagnose rabies, and the same experts are more than capable of diagnosing BSE. Every veterinary diagnostic laboratory in every state is actively looking for BSE and has been since 1986. We are not missing the diagnosis of BSE in cattle in the U.S.

Those who are publicly concerned about spontaneous BSE in cattle and who advocate testing all slaughtered cattle are not at all concerned about beef products imported into the U.S. If BSE does spontaneously occur, it must do so worldwide, thus imported beef products would carry the same or greater risk. It may be that those concerned are interested in selling test kits or have some other motive.

What are the critical control points for preventing BSE in U.S. cattle?

The first step is to prevent the introduction of cattle into the U.S. that might be "incubating" the disease. This is the basis of our ban on the importation of any cattle from countries that are known or suspected of having BSE. For example, we banned the importation of cattle from Britain after 1986 and banned live cattle importation from Canada in May of 2003. Secondly, because this disease is transmitted by the feeding of contaminated meat and bone meal (MBM), the feed ban on feeding ruminant MBM to cattle was put into effect in 1997 in the U.S. Obviously, it is imperative that this feed ban be strictly enforced and this is the responsibility of the Food & Drug Administration (FDA). The third measure is to have an active surveillance program to be sure the other preventive measures are working correctly. The surveillance program must include potential clinical cases of BSE and must also include "at-risk cattle" (downer cattle are part of this "at-risk" group). In the section above we discussed the fact that our veterinary diagnostic laboratories are excellent at detecting various diseases in cattle, especially diseases like BSE or rabies that have public health concerns.

The monitoring of clinical cases of BSE has been actively occurring for almost 18 years. Secondly, the surveillance of "at-risk cattle" has also been an active area for a number of years. This is the part of the surveillance program that found the Canadian dairy cow in Washington state last year. In 2003, the USDA tested about 20,000 cattle for BSE. The USDA's surveillance of "at-risk cattle" had focused on downer cattle at slaughter houses. Because downer cattle can no longer be slaughtered for human consumption, the USDA will need to accomplish this part of the surveillance program by other methods. It is still extremely important to monitor this group of animals for BSE. By the time you read this column, the USDA will probably have announced that BSE testing will be done on 200,000 to 300,000 cattle each year. Also, this testing will be accomplished by using the agency's network of 20 regional laboratories, and by the use of the rapid test technology that allows negative results to be reported within 24 hours or less. Additionally, to satisfy our export markets (Japan, South Korea, etc.), it may become necessary to test a percentage of healthy cattle over 30 months of age when they are slaughtered. Therefore, surveillance of cattle for BSE will continue to be an important part of our preventive measures.

An additional preventive measure in the future will be the development of cost effective tests that can be used on live animals. This would allow us to detect BSE-"infected" cattle before slaughter. Sheep also have a transmissible spongiform encephalopathy called Scrapie, and there is a test to detect this disease in the live animal. Also, some sheep are resistant to Scrapie and some are more susceptible. Currently, there are genetic tests available to detect this resistance or susceptibility. To prevent BSE, it would be extremely helpful to have both live cattle tests and genetic susceptibility tests. Hopefully, these tests can be developed and implemented in the future.

What are the critical control points for food safety with regard to BSE?

The main food safety procedure is to prevent BSE in U.S. cattle in the first place. If healthy slaughtered cattle over 30 months of age are tested for BSE, it is essential to have "test and hold" facilities at the plants. The carcasses will have to be held until the negative test results are reported. This would prevent the possibility of large scale meat recalls due to false positives. An additional procedure is to eliminate the "specified risk materials" (SRMs) from the human food chain. This process has already been initiated. The SRMs include the brain, eyes, skull, tonsils, spinal cord, spleen, small intestines, vertebral column (bones of the neck and back that surround the spinal canal), and thymus. For animals over 30 months of age, the SRMs will be removed from the carcass, segregated, and eliminated from the food supply.

We have not found a case of BSE in a native U.S. animal and, hopefully, we never will. However, it is important we continue to have an active process to prevent this disease, maintain consumer confidence, and protect public health. It is also important we base our decisions on facts and not myths or unfounded fears. I hope the information above will help you stay informed and armed with these important facts.

Pythium Root Rot in Seedlings

Franklin Laemmlen

Pythium spp. can cause a severe root rot in many crops. These fungi survive in the soil as oospores (thick-walled survival structures). The oospores germinate to produce fungal strands which attack the root system, causing a progressive deterioration of root tissues. Early symptoms of root rot are afternoon wilting of the seedling, even in the presence of adequate moisture and stunting of the young plants in a very uneven and irregular pattern in the field. An examination of the root system will show that many lateral roots and the tip of the taproot are dead (necrotic) or badly injured. When taking a root sample, use care to dig the roots, as pulling the plant from the soil will leave most of the dead and dying root tips in the soil and may lead to an inaccurate diagnosis.

Other fungi can also cause root rots. *Fusarium* spp., *Thielaviopsis basicola, Sclerotinia* spp., *Phytophthora* spp. and more may produce the above symptoms, so it is best to have laboratory isolations made to determine the specific species involved.

The need to make a specific identification is necessary to determine the treatment for the problem. On the Central Coast a number of growers have had root rot problems in parsley, cilantro, spinach and baby vegetables. These are "fast" crops (30-40 days from seed), and growers tend to "push" production with high fertility and overwatering. Both of these practices make the soil environment favorable for Pythium root rot, especially in the winter and spring when soils are still cold.

Water management is critical in the management of Pythium-caused root rots. Keep soil moisture adequate, but allow some drying time between irrigations, so that some soil aeration and soil gas exchange can occur.

Besides irrigation practices, Central Coast growers have had excellent success using phosphorous acid compounds to control Pythium root rots. The phosphorous acid is applied through the sprinkler or drip irrigation system at medium to high label rates in a "normal" irrigation cycle. The response of the crop has usually been dramatic with new top growth and healthy roots being evident in five to seven days.

Announcements . . .

- **The Biofuels Workshop and Trade Show - Western and Pacific Region** will be held at the Hyatt Regency Hotel in Sacramento from October 25-27, 2004. Log on to <http://www.bbibiofuels.com/biofuelsworkshop> for more information.

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