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KERN VEGETABLE CROPS

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CROP ROTATIONS AS A METHOD OF DISEASE CONTROL

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There are many control methods available to growers that can help to reduce the chance of developing a disease on their crop. Some of these are cultural control methods that aim at eliminating or reducing the amount of the pathogen present in the field. One old, but practical method that most growers are well aware of and frequently use is crop rotation. However, like all pest control methods, it needs to be understood how it works and used correctly to get the most out of this technique.

The goal of crop rotation is to reduce the amount of the pest population present in the soil. Some pathogens that cause diseases survive in the soil from year to year in one form or the other, usually as sclerotia, spores, or hyphae. Continuously cropping the same crop builds up the population levels of any soil borne pathogen of that crop that may be present. The populations can potentially build up so large that it becomes difficult to grow that crop without yield losses. But by growing a crop that is not a host plant for that pathogen will lead to the pathogen dying out and its soil population levels lowering. Most pest populations will decline in 2 to 3 years without a suitable host. Rotating to non-host crops prevents the buildup of large populations of pathogens.

However there a few factors however that limit the effectiveness of crop rotations. These factors really need to be considered before rotating into another crop. First, plants that belong to the same family often share the same pest problems. Therefore using crops that are closely related to rotate with will likely not achieve the goal of reducing pathogen levels in the soil. The botanical classification should be looked at when considering which crop to rotate with. As an example, even though broccoli, cabbage, turnips, and mustard greens appear very different from another, they all belong to the mustard family (Brassicaceae). Therefore they all share some common pest problems. Rotating between these plants will not reduce any disease problems that may be occurring. In fact it will increase the chance of problems with soil borne diseases such as black leg, black rot, Fusarium yellows, and clubroot which these crops all have in common. Rotating to crops from other than those in the mustard family would help to reduce the pest populations in the soil.

Another factor that needs to be considered is crop rotation is not a very effective practice on pathogens that have a wide host range. Examples of these would be *Rhizoctoinia solani*, *Sclerotium rolfsii*, and *Pythium* species. These pests have such a wide host range that it would be difficult to find a suitable crop to rotate with. Crop rotations need to be especially carefully selected to reduce pathogens such as these. Usually small grains can be used.

Lastly, some pests produce resting structures that are able to survive in the soil for long periods of time. Rotations of 3 to 5 years may have very little effect on the population levels in the soil of certain pests. Clubroot of Crucifers can persist in the soil for 7 years while white rot of Alliums can easily survive as sclerotia in the soil for over 50 years and still infect onions and garlic. Luckily most pathogens with long soil resting structures have narrow host ranges so alternative crops can be grown.

Even though crop rotation is a proven method of disease control with a long history of use, growers and consultants should still carefully look at its use. Rotating crop plants not related botanically will help insure that non-host crops are being used. Some pest problems have such a wide host range or are able to survive in the soil for such long periods that other methods of control need to be considered. Crop rotation is still one of the best, widely practiced, and cost effective methods of disease prevention. But there are points that need to be considered when using it to maximize its effectiveness. ■

SOUTHERN BLIGHT

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Warm weather can be perfect conditions for several diseases of vegetables. Most growers and consultants think of cold, wet weather as ideal conditions for plant diseases, but there are a few plant diseases that only become an issue when the weather becomes hot. And the Central Valley of California certainly can become hot in the summer.

Southern blight is one such disease that becomes an issue every summer. Potatoes growers with late fields are all too familiar with this disease. But it can occur on all vegetable crops growing in the summer months. Lately it seems to be affecting tomatoes more.

Southern blight is caused by a soil borne fungus called Sclerotium rolfsii. Sometimes the disease is simply call “rolfsii”. It survives in the soil as small hard bodies of fungal tissue call sclerotia that resemble alfalfa seed. The sclerotia will germinate under warm moist conditions when a host plant is nearby. The fungus will primarily attack a plant at the soil line which makes its identification fairly easy. A tan mass of fungal growth can be seen with a mass of alfalfa seed sized sclerotia. The sclerotia will be initially white in color but become brown as they mature. The sclerotia will be extremely numerous.

As the infection progresses plants will wilt and eventually die. But inspection of the infected plants will show fungal growth and numerous sclerotia on the plant at the soil line. Tomato fruit on the soil surface will also become infected as well potato tubers. But again, Southern blight has a very wide host range and can infest many vegetable plants including, onions, garlic, beans, peppers etc.

Southern blight is often not noticed until it is wide spread in a field. But the disease was likely there previous years. Once the sclerotia become too numerous in a field then disease becomes noticeable. Each infected plant can literally produce tens of thousands of sclerotia. Within a season or two, Southern blight can be serious enough to cause an entire loss of a field. Under warm conditions (86°F and greater) it can progress very rapidly.

Control of Southern blight can be difficult. Deep plowing will bury the sclerotia and get it away from attacking plants at the soil line. Crop rotations to non-host plants such as small grains will help to significantly reduce sclerotia levels in the field. There are fungicides that can be used at planting that help manage this disease. But once sclerotia levels become too numerous in a field then fumigation will need to be considered. Metam sodium will control Southern blight but the costs of fumigation may limit its option in some situations.

Scouting the fields during the summer months to determine if Southern blight is present will allow for options to be taken before the sclerotia levels become too numerous. ■

FOLIAR DISEASES OF CARROTS

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Carrots are grown year round in California by having production in various locations in the state. The Southern San Joaquin Valley is the most concentrated area of carrot production but other areas of production include the southern desert valleys of Imperial and Coachella, the high desert Antelope Valley and Cuyama Valley near the Central Coast. The diverse growing areas allow year round production of carrots for the nation's two largest carrot growers and shippers that are located in Kern County.

Fall is when a major portion of the carrot acreage is ready for harvest in Kern County. Typically a variety of foliar diseases can be found on the fall carrots. The warm fall days and occasional late fall storms can be ideal conditions for foliar diseases to develop. This is particularly true with Alternaria leaf blight (ALB), which can be especially troublesome in some years. This fall is probably one of those years with ALB being found easily in many fields.

Leaf blights can be caused by several different plant pathogens and can be difficult to distinguish from each other. The symptoms may look very similar but can be caused by completely different microbes. Often it is necessary to have the help of a trained person to differentiate the cause of leaf blights. Properly identifying the disease is very important because it determines which treatments are best to use.

The most damaging foliar disease of California grown carrots is Alternaria leaf blight. Although there are effective control methods, it continues to cause considerable losses in some fields. Alternaria leaf blight (*Alternaria dauci*) can cause considerable defoliation. Defoliation reduces yields indirectly due to less green leaf tissue for plant growth. More importantly however, yields are reduced because the carrots cannot be lifted by the tops for mechanical harvest due to the weakened tops. Many carrots are left behind during harvest when the tops are damaged by Alternaria leaf blight.

Individual lesions of ALB appear as dark-brown to black necrotic lesions along the margins of the leaf blade. Lesions on the petioles are more distinctive with a tan lesion with a black border or are entirely black. Symptoms appear first on the older foliage and become more severe as the leaves mature. The lesions can become so numerous and severe that the older leaves defoliate leaving only the small young leaves.

Lesions of early blight of carrot (*Cerocospora carotae*) are circular tan lesions and may be located on any part of the leaf while Alternaria leaf blight is more commonly found on the leaf margins. Early blight also tends to be more of a problem in the coastal areas but can be occasionally found in the interior valleys in years with cool, wet autumns.

Bacterial leaf blight (*Xanthomonas campestris*) is another leaf blight of carrots that can be difficult to distinguish. While Alternaria and Cerocospora are both fungi, Xanthomonas is a one-celled bacterium. Bacterial leaf blight can be very difficult distinguished from ALB. The lesions on the leaves and petioles of bacterial leaf blight are black and appear very similar to lesions caused by Alternaria leaf blight. However bacterial leaf blight lesions tend to be watery or greasy in appearance when they first appear. Often times the lesions will have a slight yellow halo. Examining lesions on the petiole is the best way to distinguish between alternaria leaf blight and bacterial leaf blight. The lesions of ALB will be tan with a black outline or entirely black. The lesions of bacterial leaf blight will be brown slightly water soaked in appearance. Also they may exhibit a shiny ooze that is varnish-like in appearance.

Alternaria and bacterial leaf blight can both be carried on the seed. Using clean seed prevents introducing these pathogens to a field. Most seed companies will provide the disease index for individual seed lots. Hot water soaks along with fungicides have proven to be effective treatments to ensure that the seed is clean and are used by most carrot seed companies today.

These microorganisms may also survive in the soil on previous infected carrot debris. However they cannot survive in the soil on their own. Once the debris is broken down these plant pathogens will die. After harvest the remaining crop debris needs to thoroughly incorporated into the soil so that it may decompose. Rotating out of carrots for 2 to 3 years will assure that no surviving inoculum remains in the soil.

Fungicide treatments may be required for Alternaria leaf blight and early blight when spores are blown into a field from volunteer carrots or other nearby fields. This is true more so in the fall when environmental conditions are often ideal for the disease to occur. An early application of a fungicide at the 3 to 4 leaf stage is commonly used to keep disease pressure low. Frequent scouting of the fields will help determine when and if any other applications are needed.

Bacterial leaf blight is best controlled with copper fungicides. Other types of fungicides will not control bacterial leaf blight. Copper fungicides are sometimes used as a preventive for Alternaria leaf blight and Cercospora leaf blight, but once disease is detected then chlorothalonil, iprodione, or other types of fungicides are needed. Again, properly identifying the pathogen is important in determining which treatment is best to use. ■

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