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SYMPTOMS AND CONTROL OF BOTRYTIS ON STATICE

(The following article -from FLORIDA ORNAMENTAL GROWERS ASSOCIATION NEWSLETTER, vol. 2, no. 5, September 1979- is reprinted in its entirety because of its applicability to botrytis control on the wide-range of host plants in the Northwest.)

Introduction

Botrytis blight, caused by *Botrytis cinerea* Pers. ex Fr., on statice (*Limonium sinuatum* Mill,) can be so destructive that it can be a limiting factor in crop production. *Botrytis cinerea* attacks seeds, seedlings, flowers, flower stalks, foliage, crowns, and stubs left after harvesting flowers. The disease can originate from contaminated seed and be transferred from seedlings to the field on infected plants. Disease spreads by air-borne spores in the field. After the disease becomes well established it is extremely difficult, or impossible, to control, especially when climatic conditions are favorable for development of the pathogen.

Botrytis blight was studied extensively in Florida and Colombia, South America. The climate in Florida is favorable for Botrytis blight development during winter months, especially December, January, February, and March; in Colombia it is ideal year-round. Entire plantings have been reported to be a total loss to this disease.

The objective of this report is to summarize information and experiences about the destructive nature of Botrytis blight on statice, a commercially important flower crop in Florida, California, as well as several Latin American countries, primarily Colombia.

Symptoms

Young leaves on seedlings in propagation are frequently infected. Individual leaves may be completely covered with sporangiophores and spores. Such infections may emanate from diseased seeds and obviously represent a source of disease that may be transferred to the field. These infections presumably also may lead to crown rot on older plants. Mature leaves generally have few lesions unless injured.

Early stages of flower infection are not readily apparent but result in the shattering of flower heads after harvest. As infections advance, portions of entire inflorescences become necrotic (blight). Frequently, the terminal 10-15 cm (4-6") portion of a flower stalk becomes necrotic. The fungus sporulates sparsely between the individual flowers. On the flower stalk, infection

frequently occurs at a node. The lesion develops up and down the stem. Sporulation, if present, occurs in the center of the lesion. Spores apparently lodge in the protected nodal areas and then grow, causing such a lesion. Lesions also develop on the leafy "wings" on the stems. The entire flower stalk, including the "wings," may become chlorotic when stem lesions are present.

Stubs left after flower stalks have been harvested are particularly susceptible to Botrytis infection. The pathogen sporulates abundantly on and in the hollow stubs. The disease progresses down the stub, eventually reaching the crownroot area where a dry rot may develop. As multiple infections of dead stubs develop, the entire plant is weakened and eventually killed if environmental conditions favor the pathogen more than the host. The decay in the crown resembles the dry rot incited by *Rhizoctonia solani* Kuehn in the field. When the crown is split or broken apart, Botrytis frequently is seen sporulating and sclerotia are present in cavities in the crown tissue. The crown rot phase is particularly severe in Colombia.

Seed and seed treatment

Botrytis cinerea is seedborne. The fungus was detected on two percent of the seeds in some of our experiments, therefore seed treatment is mandatory. Seeds may be infested (spores are on the seeds or under the integuments) or infected (the fungus has grown into the seed). Deep-seated infections may escape even the best seed treatments resulting in diseased seedlings. Poor technique in seed treatment may result in a larger number of diseased seedlings.

A mixture of 0.6 gm benomyl 50W plus 1.2 gm captan 50W/liter (0.5 lb plus 1 lb/100 gal) water, respectively is an effective seed treatment. Seeds should be soaked for 15 minutes with the fungicide suspension at a temperature of at least 38°C (100°F) Seeds should be stirred constantly to insure that all seeds are thoroughly wetted and treated. If seeds are placed in a mesh bag to facilitate dipping, care should be taken that small enough quantities are placed in the bag to allow the fungicide to flow freely to all seeds. Seeds should be spread out on clean paper after treatment to dry as rapidly as possible at room temperature and then stored in a dry place for future use. Individuals should wash hands before and after handling seeds. Failure to properly treat seeds can result in the production of diseased seedlings.

Planting treated seeds - seedling production - seedling selection

Treated seeds should be sown in a properly sterilized medium. Handling should be restricted to individuals who take necessary sanitary precautions. Medium should always be sterilized before each crop. Ideally, seeds should be planted in trays with individual cells to keep a chance infected seedling isolated, or they may be sown on open benches. Whatever the method used, plants should be spaced so as to allow seedlings to develop without crowding. This is also important in selecting most vigorous plants to set in the field. Seedlings should be drenched with the benomyl 5OW plus captan 5OW at 0.6 gm plus 1.2 gm/liter (0.5 plus 1.0 lb/100 gal) water, respectively, using sufficient amount of solution to wet the medium in the root zone. This should be done after most of the seeds have germinated.

When seeds are sown in open benches the best practice is to transplant the seedlings to containers with individual cells for each plant. A good transplant container (also one to plant

seeds into directly) has cells with a diameter of 2.5 cm (1 inch) that taper toward the base and have a hole in the bottom to allow drainage of water and permit air pruning of roots. These trays are available commercially. They should allow pulling or removing the seedlings without disturbing the root systems, This is extremely important, because when plants are pulled for a seedbed or a container and the roots are severely disturbed, they require a week or more to become re-established in the field. During the re-establishment period, the plants wilt and some of the leaves die. Botrytis fungus is a good saprophyte, i.e. it grows well on dead tissue. Therefore, on seedlings the presence of dead or dying leaves, a weak or injured root system that may result in death of leaves before the plant becomes established in the field are more easily attacked by the disease.

Planting in the field

Strong, vigorous seedlings should be carefully removed from containers and planted in the field with least root disturbance as possible. Occasional chlorotic, necrotic or blemished leaf should be removed. Plants that wilt for several days before becoming established usually develop leaves that become chlorotic and die. This situation predisposes the plant to Botrytis blight.

The soil in which seedlings are to be planted should be of seedbed tilth to encourage early root growth. It should have had prior treatment with an acceptable soil fumigant to control diseases, nematodes, insects and weeds. One day following planting in the field, they should be drenched for disease control with 473 ml (1 pt) per plant of a solution containing benomyl 50W plus captan 5OW at 0.6 gm plus 1.2 gm/liter water (0.5 lb plus 1.0 lb/100 gal) respectively.

Botrytis control in the field

Botrytis control is best accomplished through an integration of methods involving culture, sanitation and chemicals:

Cultural Control - Wet plants, high humidity, dew, rainfall, and cool temperature (below 25°C (77°F) are factors that encourage the growth, development and sporulation of *B. cinerea*. Therefore, any practice that helps keep the plants dry or shortens the duration of wetness, such as growing under cover, aids in disease control. Watering should be done in a manner to keep foliage and flowers dry as best as possible. Overhead watering is discouraged, as is watering late in the day which keeps the plants wet and the humidity high during the night. Standing water in between rows and adjacent areas should be drained to reduce humidity. Where practical, growing under cover, any practices such as polyethylene barricades that prevent the flow of cool, moisture-laden air at night or the use of fans and polyethylene tubing to force air through the area to reduce humidity to keep plants dry, are helpful. Beneficial practices including increasing the distance between plants (reduces plant density.) and keeping growing area weed free.

Sanitation - Old flowers, plants, and in general, dead vegetation in and around the statice fields are excellent inoculum sources. They should be raked, hauled away and buried or burned. Severely diseased flowers and/or plants should be promptly removed from the field. Old

plantings should be removed immediately after harvest is completed. Severely diseased plantings should also be removed.

Chemical Control - Chemical control is a supplement to the partial control provided through proper cultural procedures and sanitation practices. Experience indicates that chemicals alone will not provide adequate control when other practices are not followed.

Thorough spray coverage is extremely important in controlling Botrytis blight. Spray must penetrate inflorescence to cover tissue between individual flowers. The stalk, with the ridges and/or highly susceptible wings, must be thoroughly covered as well. Spray must be directed around and into the hollow flower-stalk stubs which are point of entry spots for Botrytis.

Fungicides effective for control of Botrytis blight on statice include the following, applied as preventive maintenance sprays before blight becomes established:

Fungicides (including tank-mixes)	lb/100 gal water	gm/l water
Benomyl** 5OW plus Chlorothalonil 75W (Benlate 5OW plus *Daconil 2787 75W)	0.25 + 0.75	0.3 + 0.9
Benomyl 50W plus Captan 50W (Benlate 50W plus Orthocide or Captan 50W)	0.25 + 0.75	0.3 + 0.9
Chlorothalonil 75W (Daconil 2787 75W)	1.5	1.8
Captan 50W (Captan 50W or Orthocide 50W)	1.5	1.8

*An equivalent amount of Daconil 2787 Flowable may also be used.
**Benomyl should not be used if resistance to Botrytis is known or even suspected.

After disease becomes established, and especially when the weather is conducive for blight development (temperature below 25C (77F), and plants are frequently wet with dew or rain), the rates of the fungicide should be increased. In the tank-mix combinations, benomyl 5OW should be increased to 0.6 gr/1 (0.5 lb/100 gal) and captan 50W or chlorothalonil 2787 75 W to 1.2 gm/l (1.0 1b/100 gal) or equivalent in other formulations. When chlorothalonil 75W or captan 50W are used alone, the rates should be increased as the label indicates for Botrytis control to 2.4 gm/1 (2.0 lb/100 gal) of water. Benomyl 50W should not be used alone because of the risk of increasing resistant strains of the pathogen.

Application frequency is dictated by the amount of diseases present and climatic conditions. It is necessary to increase the frequency from a weekly preventive spray to several times per week

under severe disease weather conditions. Spraying should always be accompanied by sound cultural and sanitation procedures.
