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PRINCIPLES OF DISEASE CONTROL APPLICABLE TO BULBOUS IRIS

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This circular discusses control of mosaic disease, leaf spots, and bulb rots that may limit the yield and quality of bulbous iris. The control methods suggested may be credited to the State and Government investigations in Oregon and Washington and to observations made by growers who have tried out these methods over a period of years.

MOSAIC

Bulbous iris is affected by strains of a virus which produce mosaic or mottle symptoms in the foliage and sometimes in the flowers. These strains induce various degrees of injury, the height of affected plants varying from 20 per cent to 95 per cent of the height of healthy plants. The amount of injury is more or less proportionate to the degree of mottle so that a careful roguing program will eliminate the serious types whether or not the milder forms are entirely eradicated. The milder forms are exaggerated by forcing; actual forcing of selected samples may be necessary to determine or prove complete freedom from mosaic.

Mosaic control involves a special planting program for two reasons (1) because infected plants do not show any symptoms the season they are infected and (2) to overcome the difficulty of roguing out milder forms of mosaic. The effectiveness of a special planting program in building virus-free mother stock depends on the fact that if a large clump becomes infected during a current season (although no symptoms will show during the period from bloom to ripening) every bulb in the clump will become infected. Therefore, if the clump is planted as a unit all the diseased progeny will be grouped together and the easily recognized appearance of the larger plants will permit diagnosis of the smaller which otherwise could not be detected.

The disease is spread by aphids. Foundation planting stock and mother blocks must be planted at least 100 yards from commercial stock since it is impractical to rogue commercial stock and the virus will spread to the healthy.

Formation of foundation planting stock. Dig iris plants which are to be grown into fundamental planting stock so that the bulbs remain attached. Do not break up the clumps. At planting time hand plant the

selected material in clump units in long rows so that the mother bulb and progeny will be grouped together into unit planting groups representing the original clumps. In performing this operation plant as units only the mother bulbs and progeny that remain attached. The unattached small bulbs should be discarded or planted in an entirely different location. A good practice is to plant the larger bulbs then follow with the smaller bulbs in each clump in a line down the row. The large amount of hand labor involved in this method is compensated for by the fact that all the diseased plants can be removed at one early roguing. Planting stock accumulated by this method can be reduced from approximately 35 per cent mosaic to less than one-fifth of one per cent within one year when the operation is carried out on a commercial scale. Extreme care must be taken to remove not only the mother bulb but all of the lined out progeny of each clump unit which shows mosaic symptoms.

Maintenance and roguing of foundation planting stock and mother blocks. Mother blocks and foundation planting stock must be located at a distance of at least 100 yards from commercial blocks. No exception to this policy is advisable even if a grower has already reduced the virus content of all his stock to less than one-tenth of one per cent. If mother blocks or rows are planted adjacent to commercial stock having percentages above 15 per cent, careful roguing of the mother block may not greatly reduce the mosaic as indicated by the percentage the second year. The maintenance of a properly isolated mother block will avoid the perpetuation of virus infections which yearly accrue from the practice of replanting bulblets sorted from rows of plants that produced commercial rounds.

The planting of bulbous iris within 100 yards of German iris or bulb perpetuated English iris should be avoided to avoid both leaf spot and mosaic. The reason for this is that German and English iris are carriers of the virus that causes a severe form of mosaic. Usually German iris is not injured by the virus and its presence can be detected only in good lighting and under favorable circumstances. The severest form of iris mosaic we have ever induced by inoculation was from a faintly mottled large-leafed German iris to bulbous iris. This point is therefore very important as German iris might serve as an unexpected source of reinfection. English iris is also susceptible to iris mosaic and most varieties show the effects of the disease plainly.

What to rogue and when to rogue. When initiating a fundamental planting stock or cleaning up mother blocks separated from commercial stocks as suggested above, one should rogue all the obviously striped plants at least a month before blooming. Mosaic mottles and streaks are always apparent on the youngest leaves and are usually more apparent on the young foliage than on the old. The prominent white squarish mottle on *Tingitana* hybrids, which is more severe on the outer leaves, is an indication of winter injury and should not be rogued. A second and very thorough roguing should be made when the plants are in bud or in bloom and should eliminate all the mosaic-like mottle in the flower buds.

Care should be taken to distinguish between water marks or spots in the buds produced by dew or water standing in the bud sheaths as opposed to a true mosaic mottle. A final roguing should be made when the plants are in full bloom to eliminate those plants which evidence the virus disease as tear-drop-shaped dark spots in the falls or standards. Since mild forms of mosaic are not easily discernible in cool climates and during unusually cool spring months, it may be necessary to arrange for forcing tests or special southern plantings to determine the health of mother blocks. This is advisable because the mild forms may prove very objectionable when iris is forced under glass.

Precaution: It is very important, especially when making the later rouguings, to remove the plants immediately from the field to prevent aphids migrating from rogued to healthy plants. If the plants are laid down along the rows the aphids will leave as soon as the plants begin to dry. It is a good practice not only to avoid scattering aphids during roguing but to provide a tight container to hold the rogues and prevent the escape of the aphids. If scattering of aphids is not prevented new infections will be initiated which cannot be detected until the following year.

#### LEAF SPOT CONTROL

There are two economically important leaf spots on bulbous iris, one of which is rare, the other common and widespread. These are the *Mystrosporium* and *Heterosporium* spots respectively. The *Mystrosporium* produces very black areas on leaves and flower stems and if left uncontrolled will kill out bulbous iris. It may be bulb borne. *Heterosporium* produces gray lesions on the leaves and stems and causes the foliage to break over. It does not seem to be bulb borne. Rust does not occur in Northwest plantings.

##### Mystrosporium

1. Avoid planting bulbous iris (Dutch varieties) near English iris, especially English iris that is not grown from seed. Likewise avoid planting bulbous iris near *Iris reticulata*.
2. Crop rotation and bulb treatment as for rots are practical measures that tend to eliminate the disease completely.
3. The fungus does not spread rapidly within a planting (unlike *Heterosporium* leaf spot) and is not, therefore, adaptable to control by preventive sprays. Tests with various sprays have supported this viewpoint. Fortunately suggestion No. 2 above has proven effective in commercial plantings.

##### Heterosporium

1. Avoid planting bulbous iris near German iris.

2. Control by preventive sprays. At the first appearance of the disease or when weather conditions and appearance of the crop suggest the probability of infection, spray entire planting with 4-4-50 Bordeaux to which Penetrol has been added at the rate of 1 quart to 75 gallons of spray. Thoroughly emulsify the Penetrol before adding it to the Bordeaux. The number of applications during the season will depend on weather conditions and the tendency of the disease to develop. If warm moist weather conditions prevail newly developed foliage near the ground should be protected with spray.

3. There is no experimental evidence indicating that this disease is bulb borne and hence controllable by bulb treatments. The crop may appear and be perfectly healthy until an invasion of the causal fungus begins.

Iris rust. Iris rust does not occur in Northwest stocks of iris. In our opinion should rust be found the infected plants should be pulled and burned immediately. It has been seen in recent importations. These were destroyed.

#### BULB ROTS

Bulb rots are caused by bacteria and blue mold fungi. The bacterial rots are of the "soft rot" type and are initiated by "soft rot organisms" such as cause the rotting of carrots and other vegetables. These seem to arise from infections during the spring months and are related to local climatic conditions and the abundance of the organisms in the soil flora. The infected plants yellow and die and the bulbs rot completely. Fortunately this disease is of rare occurrence and is usually localized in fields and within certain varieties. The bulbs usually rot completely and are seldom carried over into storage. No control is known for this bacterial rot. Blue mold, on the contrary, becomes established in a stock and requires special treatment.

#### Control of blue mold

1. Avoid bruising the bulbs during cleaning and storage. Do not break up clumps until they are well ripened and cleaning and sorting becomes necessary. Great care should be used when handling planting stock or mother block clumps. Fortunately, if bulbs are stored as clump units during the entire season, the tendency toward blue mold is greatly reduced.

2. Treating is necessary when the stock shows blue mold tendencies. The following method quoted from a U.S.D.A. circular on blue mold rot control has proven very effective:

"Best results in disinfecting iris bulbs at planting have been obtained by a combination treatment consisting of the following steps: (1) soak the bulbs in water 1 to 2 hours;

(2) without drying, transfer them to 1 to 1,000 mercury bichloride solution for 1 hour; (3) immediately upon removal from the bichloride dip them for about 1 minute in a suspension of Ceresan (a proprietary organic mercury disinfectant) prepared by adding 1 pound of Ceresan powder to 8 gallons of water. Small bulbs may be given a somewhat shorter treatment in water and in the bichloride solution. It is absolutely essential to observe two precautions: (1) Do not treat iris bulbs by this method before or during the normal storage period; (2) do not treat bulbs, especially mother bulbs, after root growth has begun, as they are very susceptible to injury by Ceresan at this stage.

"Mercury bichloride solution, 1 to 1,000 is prepared by dissolving 1 ounce of the chemical in 2 quarts of hot water, then adding it to 7 gallons of water. Only glass, crockery or enamel ware or wooden vessels should be used. THIS SOLUTION IS DEADLY POISON WHEN TAKEN INTERNALLY, AND MUST BE HANDLED WITH THIS PRECAUTION IN MIND. The Ceresan solution may be kept in either an iron or wooden vessel. It, too, is poisonous but much less dangerous than bichloride."

This treatment has proven highly efficient in eliminating blue mold rot from stocks but it must be emphasized that the treatment cannot be applied to most varieties if the roots are pushing out. If a stock has once been well freed from the rot by this treatment, it is not necessary to treat every year.