

A PROGRAM FOR POTATO DISEASE CONTROL

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Potato diseases cost money - lots of it. For example, it is estimated that one disease, bacterial ring rot, cost Columbia Basin potato growers close to $\frac{1}{2}$ -million dollars in 1960. Add to this the annual losses that occur from the many other diseases such as leaf roll, blackleg, scab, leak, water rot, etc., and the enormous cost of potato diseases becomes clear.

In very few cases can growers carry out one specific practice and expect control of a disease problem. In most cases and especially when dealing with diseases that cause heavy or even total losses the control must become a program, one that is an integral and continuous part of each production and marketing operation.

A disease control program does not just come about but it must be developed on an understanding of what the problems are and something about the nature of diseases. Very often a series of non-chemical control methods can be effective and practical. At times this needs to be supplemented by a properly timed chemical control but there is need to stress the "properly timed" and "properly applied".

An effective program for potato disease control includes a series of continuous practices. For convenience, these are presented as important during four stages - planning - planting - growing - harvest and storage. It is based on prevention rather than cure, for with most potato diseases there is no other way.

During the PLANNING stage the following are important.

- (1) Identify your disease problems for organisms that cause diseases are classed as fungi, bacteria and viruses. Other problems can be due to non-parasitic causes referred to as physiological. Learn the symptoms of the disease, the habits of the organism that caused it and the means of spread and transmission. Only then can control measures be applied effectively or at least there will be an understanding of why a control measure didn't work.

Washington State University Extension Bulletin 553, "Diseases and Insect Pests of Potatoes" is highly recommended to all readers.

- (2) Resistant varieties are a most effective means of fighting diseases, if resistant adaptable varieties are available. Everyone is aware that resistant varieties are the only practical way of controlling wheat rust. In the same way if you can't grow Russet Burbank on your land because of scab, the only practical solution might be growing Early Gem which is very resistant to scab.

- (3) Selection of Certified Seed - Fungus, bacterial and virus diseases can be carried in or on the tuber. Certification means that the seed potatoes have a minimum of these diseases according to predetermined standards. Seed growers should also follow a program and not a hit or miss approach. Get to know your seed grower - judge his record - not only on the basis of his current field readings. Check his record of field readings during last 2 or 3 years, together with greenhouse reports and reports of Othello Potato Seedlot Trials where applicable. Some seed areas have an outstanding record for producing certified seed with a minimum amount of leaf roll but others have better records as far as bacterial ring rot is concerned. Decide which of these is more important to you.
- (4) Rotation and Isolation - It is considered a good practice to rotate potatoes with non-susceptible crops so as to eliminate or reduce the potato infecting organisms in the soil by starvation. Different rotations can have different effects and will be discussed at a later stage this afternoon.

Adequate isolation from disease or insect sources is also a very effective method in reducing diseases. This is a specific requirement in seed production.

Before or during PLANTING the operator should incorporate the following practices:

- (1) Soil fumigants or soil chemicals can be effective for such problems as nematodes, verticillium wilt, scab, etc.
- (2) Soil Fertility, Moisture and Temperatures can be important. Excess nitrogen levels with resultant rank vine growth will favor diseases such as early or late blight, sclerotinia, and others. Inadequate soil moisture at planting favors seed piece rot and indirectly blackleg. High soil temperatures favor seed piece rot and low temperatures accelerate the development of rhizoctonia. Growers can affect soil temperatures and moisture levels by irrigation and by varying depth of planting.
- (3) Date of planting can be an important factor in avoiding some disease losses such as net necrosis which is caused by leaf roll. A good rule - determine your planting date and base your disease control program according to your projected harvest date. Over-mature potatoes give rise to problems of water rot, blackspot, etc. Early planting plus early harvest can be used to escape nematode losses in nematode infested fields.
- (4) Sanitation and Disinfection are self-explanatory terms but the role of each in disease control cannot be overemphasized. The transfer of the potato crop's two most serious problems, bacterial ring rot and nematodes, can be avoided or eliminated by adequate sanitary precautions at all times. Adequate sanitation need not involve chemicals for a good and frequent wash-down of areas such as are used for seed cutting will do much good. However, chemicals will help.
- (5) Seed Handling and Seed Treatment are important practices before, during and after seed cutting for these can be the cause of seed piece rot and

poor plant stands. Through the years, a number of chemical methods have been used for seed treatment with the objective of controlling potato diseases on the outside of tubers. Too often this proves of little value since these same diseases are also soil borne. In this area most growers use seed treatment to prevent seed piece rot. In applying seed treatment sanitation practices are most important. Dip seed treatments have been strongly discouraged because of their inherent hazard of spreading bacterial ring rot. This helped the development of dust and spray methods of treatment. All practices are directed at bringing about rapid healing of the cut seed.

The disease control program during the GROWING SEASON calls for the following practices:

- (1) Weed Control is important for its indirect effects on diseases. Some weeds favor the development of insects vectors of potato diseases while others are actual sources of such diseases. The Mares' Tail weed is a major source of the aster yellows virus. Thus weed control in the potato field and along the headlands is an indirect but effective method of controlling diseases. In this sense volunteer potatoes can be classed as weeds that are major sources of many costly diseases in the planted crop.
- (2) Irrigation levels and drainage are important to potato disease control. Excess irrigation favors the development of blights and sclerotinia. Continued excesses produce enlarged lenticels on the potato tubers which provide easy entry for a number of rot organisms such as water rot, leak, etc. Poor drainage or low spots in the field can cause similar conditions. Excess irrigation when plants are mature can lead to serious water rot problems.
- (3) Elimination or destruction of disease sources is fundamental to disease control. This includes roguing of disease plants in planted fields, the destruction of cull piles, etc.
- (4) Sanitation during the growing season should be aimed at preventing the transfer of contaminated soils on the various equipment that moves around and into fields. This specifically refers to nematodes.
- (5) Insect Control plays a particularly important part where virus diseases are concerned. Aphids are vectors of leaf roll, leafhoppers spread aster yellows, and the seed corn maggot plays a role in blackleg.
- (6) Fungicides is what many growers think of when disease control is mentioned. They do play an important role in the control of such air borne diseases as early blight, late blight, and powdery mildew, but are really minor in the overall disease control program.

Additional disease control practices must be incorporated during the HARVEST, MARKETING and STORAGE of the potato crop. These are as follows with the first one no doubt of major importance.

- (1) Care in handling to prevent injury can greatly reduce losses from decay in transit or in storage. This care is important at every stage of handling and must be exercised by all handlers.

Heating, chilling, or freezing of tubers favor the development of decay and the logical remedy is to avoid conditions that lead to such injury.

- (2) Time of harvest may have to be adjusted to avoid losses from some diseases. In fields affected with current season leaf roll, an early harvest may be the only way to escape serious potential losses from net necrosis. Early harvest can also help in nematode infested fields. On the other hand, delaying the harvest of ring rot infested potatoes for periods of 2-3 months has made it possible to harvest and market such potatoes successfully.
- (3) Sanitation is still very important in terms of possible transfer of nematodes in soil, on equipment or in disposal of cull potatoes. It is a good practice to clean and disinfect storages before filling with potatoes.
- (4) Storage management has the primary objective of healing or the formation of natural barriers in injured tissues against rot organisms. However, where rot develops as a problem, low temperatures are employed to check the decay.

These are the tools at your disposal - there are no others that cannot be categorized into any of the approaches presented. If you are faced with considerable losses think back - what did or didn't I do that could have helped avoid the problem.