



FIGURE 1. Upward cupping or rolling of leaflets indicates seed-borne leaf roll.

Potato Leaf Roll and the Green Peach Aphid in 1968

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A Situation Report for Commercial Potato Producers

Potato leaf roll is the most serious virus disease of potatoes in Idaho. The disease affects both the commercial potato producer and the certified seed potato grower. Reductions in yield in commercial fields have been reported to be in excess of 60% when leaf roll infected seed stock was planted. Leaf roll is one of the major causes for the rejection of seed potatoes from certification.

The spread of leaf roll virus in the potato producing areas of Idaho during 1967 was much higher than in recent years. This spread is indicated by the excessive amount of tuber net necrosis observed in the 1967 crop by the State-Federal Inspection Service. Therefore, potatoes used for seed stocks during 1968 have the potential for a high incidence of leaf roll virus infection. This source of inoculum along with infestations of the green peach aphid vector could result in extensive current season leaf roll spread. Thus, a severe problem of net necrosis in commercial tubers at harvest time and during storage could occur in 1968.

SYMPTOMS

Seed-borne leaf roll. is recognized in the field by the upward cupping or rolling of the leaflets. Only the lower leaves are affected at first, but finally all the leaflets on the plant exhibit this symptom (Figure 1). The leaflets point more or less upward and are stiff and leathery. Yellowing of the leaves is obvious, particularly after the first irrigation. Infected plants are stunted from the time of emergence and scarcely half as tall as healthy plants at the time of maximum vine growth. There is a tendency for symptoms to be masked when the level of soil nitrogen is high. Tubers produced by such plants are smaller in size and fewer in number.

Current-season leaf roll. Potato plants infected during the growing season first exhibit a rolling of the new leaves. The margins of such leaves become yellow and sometimes tinged with red. The leaves on the rest of the plant gradually become rolled until symptoms are similar to those described under seed-borne leaf roll. In eastern

Idaho, plants infected after August 15 may not exhibit foliage symptoms.

In Idaho, the green peach aphid (Figure 2) is the only important means of leaf roll spread in the field from a diseased plant to a healthy plant. When this aphid feeds on the leaves of a diseased plant, it picks up the leaf roll virus in the plant sap ingested. When the aphid moves to a healthy plant to feed, it transmits the virus during the feeding process. Disease symptoms may appear in 10 to 14 days if the plant is infected early in the growing season. Infected plants may be symptomless if infection occurs after mid-season. The virus multiplies within the potato leaves and is eventually transported through the stem and stolons to the tubers.



FIGURE 2. The green peach aphid. Note winged form in center of picture.

Tubers produced by plants infected during the growing season often develop an internal discoloration called net necrosis (Figure 3). This discoloration appears as dark brown, scattered strands at the stem end and sometimes extended through the tuber. Tubers infected early in the season often show net necrosis at the time of harvest. Tubers infected later in the growing season may not exhibit net necrosis until placed in storage. The degree of net necrosis increases with length of storage time. Some infected tubers never show net necrosis, but if used for seed will produce leaf roll plants.

CONTROL

For commercial potato producers, planting the highest quality seed available is the only practical means of controlling potato leaf roll. Non-certified "year out" seed stocks or "eliminators" from commercials usually contain tubers infected with leaf roll virus. When these tubers are planted they give rise to plants which exhibit the

symptoms of seed-borne leaf roll and provide virus inoculum for green peach aphid transmission to healthy plants. Potatoes produced in commercial areas during 1967 that could be used as non-certified seed stocks in 1968 are likely to contain a high percentage of tubers infected with the leaf roll virus. Planting such seed potatoes could result in a complete crop loss from a severe net necrosis problem at harvest or in storage in 1968, and a reduction in yield and quality. There is no way to detect leaf roll infected tubers from their external appearance. Internal net necrosis is too variable to be used as a guide in selecting virus-free seed stock.

Volunteer potato plants are often infected with leaf roll virus. They should be eliminated when found growing in the vicinity of potato fields.

The use of Di-Syston (disulfoton) at planting time will help protect fields planted with certified seed stocks. The Di-Syston treatment reduces current season leaf roll virus spread by inhibiting or preventing build-up of the green peach aphid in individual fields.

Research with aphids in individual leaf cages at Aberdeen has shown that a period of two weeks or longer may be required for aphids to accumulate a fatal dose of Di-Syston after entering treated fields. This probably explains, in certain instances, the ineffectiveness of the insecticide in preventing leaf roll virus spread in areas with high green peach aphid numbers. In other words, aphids entering the field with the virus could infect many plants. The virus could also be picked up by aphids from infected plants within treated fields and transmitted to healthy plants.

The following examples show what could happen when Di-Syston is used in conjunction with "good" seed stocks or "poor" seed stocks during 1968.

Example I. Seed potatoes with little or no leaf roll virus and with a Di-Syston treatment at planting.

- A. There should be no aphid build-up in the field.
- B. Current season virus spreads from seed borne virus sources within the field will not be a problem.
- C. Virus spread from nearby fields with a high incidence of leaf roll virus would be possible. Winged aphids entering the Di-Syston treated fields could transmit the virus for periods of several days to two weeks or longer before accumulating a fatal dose of the insecticide.

Example II. Seed potatoes with little or no leaf roll virus and no treatment with Di-Syston.



FIGURE 3. Leaf roll infected tubers may show symptoms of net necrosis.

- A. Aphid build-up in the field could occur.
- B. Virus spread from sources within the field should not be a serious problem unless the season is unusually favorable for aphid development.
- C. Introduction of virus from other fields by infected winged aphids could occur.

ected plants within the field only a few aphids would be necessary to cause a high percentage of current season virus infections.

- C. Additional introduction of the virus by infected winged aphids could occur.

Example III. Seed potatoes with a high incidence of leaf roll virus and with a Di-Syston treatment at planting time.

- A. There should be no aphid build-up in the field.
- B. Spread of virus from within field sources could be a very serious problem. With a large number of virus source plants within the field only a few aphids would be necessary to cause a high percentage of current season virus infections.
- C. Additional introduction of the virus by infected winged aphids from other fields could occur.

Example IV. Seed potatoes with a high incidence of leaf roll virus and no treatment with Di-Syston.

- A. An aphid build-up could occur.
- B. Spread of virus from field sources could be a very serious problem even if the season were not favorable for aphid development. With a large number of virus in-

APPLICATION OF DI-SYSTON

Di-Syston is applied to potatoes at planting time as a 10 percent granule at the rate of 25 to 30 pounds ($2\frac{1}{2}$ to 3 pounds actual toxicant) per acre. Higher rates have resulted in damage to young plants. Lower rates have not been effective. The most convenient method of application is with a potato planter attachment that distributes the granules near the seed pieces in the row.

Post-emergence or side dress application of Di-Syston extend the life of the insecticide slightly longer into the growing season and when followed by an irrigation or by rain, the insecticide enters the plant and becomes effective within a few days. Without added moisture the insecticide enters the plant slowly and may not be toxic to insects for a week or more. **Side-dress applications have the disadvantage of not protecting plants early in the season. This is especially important in leaf roll virus control since young plants are most susceptible to infection.** Additionally, the process of side-dressing destroys many side roots. Do not apply Di-Syston within 75 days of harvest.

Di-Syston applications will give effective control of the Intermountain potato leafhopper, the potato aphid, thrips, and other sucking insects that occasionally feed on potato plants. Control of the Colorado potato beetle is inconsistent since

the material is effective against only very young larvae and for only a short time after the plant emerges. When the beetle is abundant, an addi-

tional insecticide treatment is often required to prevent serious damage even though Di-Syston has been applied.

CAUTION — POISON

All insecticides are poisonous and must be handled with care to protect the operator, livestock, adjacent property and the consumer. **Di-Syston** in the **granular form** is **moderately hazardous** and must be used with caution. **Di-Syston**

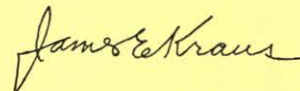
in the **liquid form** is **extremely hazardous** and should be used only when all precautions listed on the label are strictly followed. Read and follow the label carefully each time a material is used. Keep accurate records of the pesticide you apply.

PESTICIDE RESIDUES

These recommendations are based on the best information currently available for the chemical listed. If followed carefully, residues should not exceed the tolerance established for any particular chemical. To avoid excessive residues, follow recommendations carefully with respect to dosage

levels, number of applications and minimum interval between applications and harvest.

THE GROWER IS RESPONSIBLE FOR residues on his crops as well as for problems caused by drift from his property to other properties or crops.



JAMES E. KRAUS, Director