

FIELD EVALUATION OF LEAF ROLL RELATED TO CROP USE

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The insidious recurrence of net necrosis caused by leaf roll virus and the baffling, variable factors affecting its cause and control is a serious problem for potato growers in the Columbia Basin.

In raising a marketable crop, a grower knows that he doesn't want any net necrosis. This defect, added to other internal discoloration factors, usually causes severe limitations to the advantageous marketing of his crop. In certain years, due to heavy pressure by aphid vectors of leaf roll, or large numbers of chronic disease plants as volunteers, the grower finds it necessary to "live with" net necrosis while keeping the damage within marketable limits.

Unless the aphid vectors are kept under control, a serious situation can develop most years and a disastrous one any season conditions are right for spread of current-season leaf roll. How to deal with this threat, how to know when to expect a serious situation and how to remain flexible in the control of aphids as flights vary within the season is one of the challenges. In general, however, the knowledge and materials are at hand to cope with the problem. Regretably, the proper use is not always made.

This leaves the grower who is conscientious wanting to know: "How do I keep my situation under control, no matter what happens?" This is the GROWERS'DILEMMA and properly leads to a look at:

The Controversy on Control

It is nothing less than astounding that while the state recommendations, through the work of USDA entomologists, lay down a very precise and workable aphid control program many growers ignore rather than follow it.

Some growers actually honestly feel they cannot afford to carry out a thorough program as recommended. Yet the possibility of spending \$30.00 or so per acre for control to guard against a much greater potential loss seems to speak for itself. More difference in cost per acre can be incurred when the price of seed rises to the level of 1965 compared to more normal years. Perhaps the cost of seed having been around longer is easier to put into perspective than the cost of insecticides.

One philosophy in aphid control seems to be to get by with as few sprays as possible -- or to secure field service from those who can get you by cheap. Another approach used is that of keeping the aphid count at a certain level, beyond which the necessity to spray is to be

considered. These methods may save the grower a few dollars some years and cost him many more in others.

Perhaps the reason this difference exists between the recommendations and actual practice is a lack of understanding among growers in general of the complexity of the leaf roll disease and its spread. Most seasons, much greater efforts are necessary in certain areas than in others. The importance of getting control of the aphids early seems to lack appreciation among growers. The intensity of aphid flights vary with seasonal factors beyond the control of growers and therefore require a flexible approach to combat. Great efforts need to be made by those concerned with the potato industry to see that growers, shippers, and processors have a better understanding of the leaf roll disease and its progress during each season.

Like many other problems, this one is neither black nor white. Aphid control is never perfect. There are always chronic disease plants. Therefore perfect control practiced in one small area will not necessarily protect even that area due to the mobility of the aphid vectors. On the other hand, good control practiced over a large area is almost certain to be successful and benefit an even larger area. If the potato industry in the Columbia Basin is suffering because of a questioning of control practices, perhaps we should consider:

Putting Research into Practice

In relatively large local areas in the Columbia Basin, through use of the existing recommendations and other basic research data available to everyone, good seasonal control has been realized where "hot spots" prevailed in the past. This is not to say there were not instances of failure for reasons sometimes discernable and occasionally inexplicable. But, in general, results were good. Marketability of the crop was greatly increased and I am sure a larger area of crops benefited.

Having found that good control could be maintained but that it was not perfect, and desiring to assure its efficiency through harvest to increased marketability, we found something lacking. A method was needed to evaluate the effectiveness of the control program while the crop was growing. Such a method we felt could very well be:

A Missing Key to Success

Most ways of evaluating control of leaf roll and resultant net necrosis were too inconclusive. After all, net necrosis in the tuber is not only irreversible but progressive. Eventually, we want to be able to know precisely what to expect from control measures and to predict with assurance that the job was done. Therefore, we tried to develop a quick method, which could be repeated at intervals to show a progressive picture of the situation during the growing season. This

method was used only in 1965 and certainly will be improved. At the time of need it was a:

Practical Solution

To make any evaluation technique valuable enough to be used in decision making, it is desirable to assemble other pertinent data, preferably into a table. This should include: field number, planting date, seed source, chemical treatment dates and estimated dates for vine removal, digging and the predicted use of the crop. Then, make weekly evaluations beginning approximately one month following the last effective aphid control. Enter these readings into the table and plan vine removal, digging and use of crop accordingly.

The following method, however crude, was used in 1965 by one grower in Othello, for example, with 85% success in predicting the use of potatoes from thirty-two fields. No doubt the method can be refined for better results. After gathering data on potatoes put into storage for processing through the 1965 - 1966 season, I feel that we can hope to predict the quality of the potatoes growing in July through May of the following year with reference to the amount of net necrosis. The better control of aphid vectors in the area, the more effective this evaluation should be.

Set up four laths to cover five rows for a distance of ten feet along the rows, roughly a square, and for each stem showing distortion count the symptoms separately as light, moderate and severe*. Then proceed as in the following example:

If there are 90 stems with symptoms:

$$90 \text{ divided by } 360^{**} = \underline{25\% \text{ Estimated Symptoms in Field}}$$

Then, dig one hill each of light, moderate and severe symptoms plants grading the tubers with net necrosis from trace to over 5%. Next, divide the number of tubers infected by the total number of tubers dug:

If 5 tubers were infected of 25 dug:

$$5 \text{ divided by } 25 = \underline{20\% \text{ net necrosis in tubers dug}}$$

This 20% times the 25% Estimated Symptoms above = 5%

This is the Estimated percent of Net Necrosis in the Field.

Finally, the number of tubers over 5% net necrosis found in the grading is related to the Estimated % of Net Necrosis in the Field.

Thus, continuing the above example: If the Estimated % of Net Necrosis in the Field is 5% and one tuber of the five is infected over 5%, then:

The Estimated Level of Net Necrosis Over 5% = 1%

The importance of weekly evaluations is indicated by a progression, in some cases, of from 50 to 100% per week from the latter part of August in the amount of net necrosis over 5%. In the example above, it is possible that within three weeks this field could go out of grade for packing fresh potatoes.

Vine removal by beating was used to slow the progress of net necrosis when readings indicated this was necessary.

Fairly close correlation between field evaluations and actual readings during packing operations were observed -- usually field readings were higher due to the older, rough tubers more likely to have net necrosis being thrown into the culls. The need for accurate record keeping cannot be overemphasized to achieve close correlation with final grade.

If this, or any other method of evaluation, fills a need there still is left:

More Work Ahead.

Before leaf roll is effectively coped with, much is to be done by all concerned: Research has already provided us with most of the knowledge of fact -- and has pinpointed the unpredictable factors. Further projects are necessary to test new chemicals and methods of control. Basically, however, the big job right now is for researchers to communicate the adequate knowledge available to those who can put it to use.

Individual potato growers must take more interest in learning about the problem and then assume the responsibility for their share of the fight against the disease.

Processors must take more responsibility in the form of an active part in requiring leaf roll control.

Shippers must look at their future markets in the light of increased marketability of disease free potatoes.

* Separate these symptoms in order to observe trend toward severe in later evaluations.

** This is the estimated number of stems in the area measured for local conditions on the late crop. Adjust this number for other growing conditions, although exact accuracy is not important to the relevancy of repeated correlations with actual readings at packing.