

EARLY CROP PEST MANAGEMENT PRACTICES IMPACTING QUALITY OF STORAGE CROP

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If we are to maintain a healthy, profitable potato industry, we are going to have to recognize that we are now dealing with more than a fall storage crop. We also have early and mid-season crops, and the requirements for protecting them are not the same.

Unfortunately, the insect control practices used on the earlier crops are impacting the quality of the storage crop. By letting aphid populations go we are creating an opportunity for an expanded insect population that could lead to epidemic levels of potato leaf roll virus (PLRV) and net necrosis in the Russet Burbank crop. Maintaining the quality of the storage crop is absolutely essential to keeping the processing plants open from March until late June, yet the economics in today's industry are no longer there to effectively protect the entire crop like we used to.

The early season crop goes for storage, fresh pack and chipping; the mid-season crop for fresh pack, processing and chipping; and the storage crop primarily for processing, either fries or chips, and fresh pack.

Treated as One Crop

Historically, we have operated under the philosophy that we control insects, particularly aphids, and suppress PLRV across the whole crop as if it were all going into storage. We did that because it was a healthy way of making sure that we did not have that problem develop in the storage portion of the crop that was going to be essential to keeping the processing plants open.

For a long time we have assumed that if we allow aphids to develop in a potato crop that the only negative is the risk of PLRV causing net necrosis. And since the early varieties are not apt to express net necrosis, that has not been a major concern. They are susceptible to the disease, but not to the effects of net necrosis. Because they are processed immediately, there is not enough time for the net to expand down through the tuber after it goes into storage.

The economics dictate that growers of the early and mid-processing crops deal with Colorado potato beetle (CPB) or they won't have a crop. On the other hand, the aphid problem is ignored because there is no visible payback. We use pyrethroids to control CPB, and in doing so remove the beneficials that help keep the aphid population in check. In the process, we actually flare aphid and two-spotted spider mite population.

To deal with this issue, we are going to have to change what we do with the early crop. And to do that we must clearly convince growers that there are concerns beyond PLRV and net necrosis. Neither are major considerations for early growers. From our experience with Russet Burbank, we know that aphids and PLRV can also cause substantial yield loss. We are going to have to do the work and demonstrate that this also is true with early season varieties.

This year we plan to look at Shepody, Atlantic, Russet Norkotah and Ranger Russet. Our goal is to come up with inexpensive control mechanisms for CPB that will not flare aphid and mite populations. If we can do that, there isn't any reason we should need to put additional pesticides on the crop. The goal is to move from using pyrethroids that flare aphid and mite

numbers to products that can meet grower needs without costing more money. We must prove that high aphid numbers and PLRV cause yield losses in early and mid-season crops. Further, inexpensive mechanisms for controlling CPB without flaring aphids and mites or cost-effective mechanisms to control aphid in the early and mid-season crops must be identified.

Struggling to Make Ends Meet

Like everyone else, growers are struggling to make ends meet. When choosing an option for CPB control – an absolute must if there is to be a crop – they look for the most economical control. And today, that means using a pyrethroid insecticide. While there is nothing wrong with pyrethroids in certain situations, in Columbia Basin potato fields they flare aphid and two-spotted spider mite populations. At harvest these populations, which are quite mobile, migrate to the full season potato crop.

If you are producing for fresh pack, you have got to have tubers with good skin, so you are going to kill down with a desiccant or herbicide to allow the skins to mature and take the extra handling. But if your crop is headed for processing, as fries, chips or other processed products, a good firm skin does not matter. That means the cheapest thing to do is pull the water away.

If you come in and kill down the crop, as with Russet Norkotah, you limit the time for additional aphid population expansion. When you only remove the water, the aphid population has time to respond to the gradual reduction in suitability of the host plant. The next generation develops wings and migrates to other potato fields. As has been pointed out, it takes only seven days for a full generation to develop, from the first nymph laid to the adult winged aphid that flies. That's a shorter time span than it takes for a field to dry down. The end result is you have allowed the development of a generation with wings which are all going to migrate to another field because of plant stress.

That's not quite true with Russet Norkotah, because you "kill down," and so the period is less. But it's true to a degree. If you have flared population you are going to release more aphids than you should.

Change in Aphid Types

We are now seeing a dramatic change in what aphid flights look like in the Columbia Basin and in other processing production areas in the U.S. In the past, beginning with Temik in the mid-1970's until sometime in the mid-90's, the aphid populations developed very slowly. We would have small populations of winged aphids in the fields until about the third week in June, and then, sometimes during the third or fourth week of that month, would see a sudden peak in aphid numbers. That population would develop to an average level of about two aphids per plant. At that level it would last a day or two and then drop back down, and by the middle of July you wouldn't find any winged aphids in the fields. You wouldn't see winged aphids again until they started moving out because of stress caused from preparing the crop for harvest or because of the natural inclination of the aphids to move to their winter host, peach trees. That would generally begin in late August, so you would have a period when you wouldn't have serious populations.

In those days, our problem was controlling the wingless form, responsible for the bulk of virus transmission. During the '70's, growers learned how to use Temik very effectively and did a good job of protecting their crop. When I arrived in this area in the mid-1980's, there were virtually no problems with either aphids or CPB. But in 1989, we lost the use of Temik

applications made at “cracking” time or at lay-by. When that happened we had to learn all over how to do the job, and it took us until 1993 or '94 to really become effective again in suppressing aphid populations. In 1999, we did as good a job suppressing wingless aphids as ever before. We had no problem with wingless aphids. Our challenge became the winged type.

Beginning about 1995, because of tightening economics we witnessed a cheapening of aphid control programs on our short-season crops. Growers began turning to pyrethroids for CPB control and let aphid populations go. There were exceptions and differences between growers, but that was the trend. By 1999, aphid numbers were averaging over 20 per plant on a daily basis, and by the time those aphids were ready to fly we saw peak populations of winged aphids approaching 50 per plant. If only 5 percent of those aphids coming into a field were infected that meant that during a three-week period, every plant would be fed upon – by an infected aphid – at least once each day. That makes it very difficult to achieve control, and we did get a substantial amount of PLRV in the potato crop last year.

Avoided Catastrophe

On the positive side, it does appear we are not going to experience a catastrophe with the 1999 crop, but we could have, had there been a severe expression of net necrosis. Hence, this has been a warning year – a warning that we cannot afford to ignore.

These kinds of aphid challenges are difficult to correct within the crop year, because you're dealing with an adult aphid, and adult insects are very difficult to control with insecticides. Our most effective control measures have always been with young, immature insects. They are more easily killed. When aphids mature, particularly in the winged form, they are much more difficult to control and require a lot more insecticide. The foliar insecticides, which adequately controlled wingless aphid in 1999, did not adequately control the winged population migrating into the storage crop. Today, considering economics and available insecticides, it may be nearly impossible to control these winged flights. Certainly none of the insecticide combinations that I tested in 1998 and '99 were adequate to suppress PLRV.

Some of our remaining systemic insecticides are not as effective as they once were. There is still excellent activity in Admire, but it kills slowly during the period when these flights are highest. Last year, Admire, which remains one of our most effective products, allowed transmission of PLRV – even when used at the highest labeled rate. A substantial number of aphids lived long enough after being treated to transmit virus even though the insecticide eventually killed them. At the same time it remained the best-registered insecticide in the trial.

An infected winged aphid can infect a potato plant within minutes. Recognizing that, remember that at that point in the season it takes three days-plus to kill a winged aphid with Admire. You probably are not going to kill it with Temik alone, and by then your Furadan and Thimet have run out, so it is very difficult to kill. That means you are now dependent upon foliar applications on top of whatever else you have done.

We do have a variety of pretty good foliar. Over the past 30 years we have depended upon Monitor, but there is a concern with foliar insecticides: they degrade with time. As contact poisons, they remain effective even after drying down. During the first 24 to 48 hours, the bulk of winged aphids landing on a crop treated with Monitor will die. But as the product begins to degrade due to solarization and natural chemical breakdown, there will be periods when the aphids can land and transmit PLRV before being killed by the insecticide. This creates periods when you do not have adequate control.

Winged Type More Difficult to Kill

It doesn't matter much which foliar insecticide you apply, winged aphids are difficult to kill. You hear reports today of aphids becoming resistant to Monitor. That isn't what's happening. The problem is that we're trying to control today's winged aphid populations, which are more difficult to kill. Monitor is still very effective against the wingless form, but is not as effective in controlling the winged aphid population before they transmit PLRV. That's probably true for all of the other generally used insecticides.

Our historical pest is now a much more complex enemy, almost equivalent to adding a new pest to the system. Even more serious, this pest spreads one of the most devastating potato diseases we have.

On the positive side, there is hope that growers will be able to use products, such as Vydate, that are more systemic. The control period is longer, and a new formulation is available which reduces application cost. Provado may work, but must be buffered and used with a good adjuvant, preferably a silicone or oil blend. Other new products are coming on line, including Fulfill. In our earlier testing, at higher rates than current registration allows, Fulfill provided almost total PLRV suppression. We were reapplying Fulfill on a two to three-week basis. But remember, once aphids are exposed to Fulfill they cease feeding and die slowly (3-4 days). This means you may observe aphids on the crop that are in the process of starving.

At this time, I have not conducted the appropriate research upon which to make a recommendation for Fulfill at the currently registered rate. In 1998 and '99, the product was tested at the currently registered rate in combination with other chemicals in IMP-based control programs. IPM programs depend on scouting prior to application. This allows a gap between recognition of the aphid threat and control. In 1998, the combination of products did not suppress PLRV. However, this is likely due to transmission during the gap between recognition and chemical application. The fact is, the 1998 and '99 research provided no basis for recommending Fulfill, but does not mean that growers should not use it. In the past at higher rates we achieved very good virus suppression. Growers will have to decide on the basis of other research. Bob Stoltz in Idaho, David Ragsdale in Minnesota, and Jeff Wyman in Wisconsin have all obtained promising results with Fulfill, although likely under substantially less aphid pressure. I still have high hopes for the product. If at currently registered rates, it effectively stops probing by aphids, it should be an effective tool in suppressing PLRV.

New Leaf-Plus Could Solve Problem

One solution to all of this, of course, is the use of NewLeaf-Plus, which has near immunity to PLRV and has built-in control of CPB. The problem is it's a genetically modified organism (GMO), and GMO's are somewhat suspect by uneducated members of the public. In the U.S., GMO's have not been much of an issue because there is pretty good faith in our government and the process in place for clearing products.

In Europe, that's not the case. There is great distrust of government and of anything that may affect the quality of the food supply. For this reason, Common Market firms have told U.S. processors that they will not buy any GMO potato products. There is no evidence of any kind that GMO's are injurious to one's health. My feeling is that since we know those governments are backing their own genetic engineering research programs, such moves are in part trade barriers erected to reduce competition. At the same time there definitely is a backwash of feeling amongst the environmental population of Europe – and some in the U.S. as well – and it would be foolish not to recognize that.

The sad thing is that decision is being forced upon us, and in lieu of using NewLeaf-Plus we are now going to have to continue using large amounts of pesticide – in excess of 1 million pounds of active ingredient than we would otherwise not need to apply. And while I am proud of the safety record of the pesticides we do use, I would like to have available all possible control mechanisms that potentially could solve this problem. On one hand we're being asked to reduce the amount of pesticides used and on the other we are being turned down on the very approach that could have made the greatest difference – all this when pest population, at least aphids, are at their highest.

There's nothing wrong with the use of pesticides – we have the safest and most abundant food supply in the world – but I do object to someone overseas dictating to us how we're going to produce our food supply. That's an abridgement of trade and of our rights as U.S. citizens.

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