

## **Improving Herbicide Longevity and Effectiveness in Potato Production**

Good afternoon. Today I'm going to talk to you a little bit about improving herbicide longevity and effectiveness. I think this is a cartoon model of what will really change a lot of what we do and how we do it. This is the reason we won't have a potato conference, this winter. And I'm hoping that this presentation and others that Steve pulls together will help you make, give you some good information to take back to your farms and, and, and help you out, as well as to keep you with your CEUs, to keep your your licenses.

I'm going to talk a little bit about physical control methods, I think in some of their limitations for weed management, I'm going to talk a little bit about herbicide fate and environmental fate and thinks that it might affect its effectiveness for you. And then talk a little bit about the importance of rotating and mixing herbicide modes of action or family groups and that sort of thing.

Alright. So this year, it was a year, wasn't it? I'm continues to be one. And it started out dry, very dry and ended dry. So you could have done this would have been the perfect year to utilize some physical weed management. And there may still be times in your work that you might like to employ some of this,

this was also a good year to have had irrigation because if you did spray something, it's very likely that you didn't get very good activation because it was so dry. So if you had irrigation, you could run that bad dog around there, put down a half an inch or an inch of water and incorporate that herbicide into that upper into soil where you really wanted to be. So something to think about.

One of the things that potato culture has always had going forward is that you do disturb that soil a whole lot. And a lot of times you can keep those plants from actually getting to weed seed formation. So that can be a benefit.

Most of you don't do a lot of physical weed management. Many of you haven't done physical weed management in your operation since we are rolling potato barrels down Main Street in Presque Isle and having potato totem poles out there.

But if you do, and there are some of you that do, I just wanted to bring a little bit at this into this discussion today because there are some, some strengths to that ... there are some weaknesses with it.

Some of the tools that you might want to utilize if you're doing physical weed management is to get in when the ground looks like this. And that seems a little counter-intuitive sometimes I know. But you want to get in there and stir that up.

And one typical tool that you might do to do that would be something like a tine cultivator. This tine, cultivator is called a Lely Cultivator.

And when you run it in the field, these tines scratch the surface

and they go down about an inch and they stir that soil up, bringing to the surface thread stage weed seeds.

So you're going to want to do this about five days after you finished your message. Seven days after you have planted your seed pieces, you'd run through there with one of these things and it would do a decent job. You could come through again another ten days later. And then later on if you're still looking to do just all physical weed management,

there are some neat groovy tools out that some precision cultivators, Eric Gallandt has a good one that he's been demonstrating and using a lot in some vegetable production systems.

And then there are even these really cool robotic things out there these days that could be fairly useful to you somewhere down the road, maybe the robot. So go out and do all your weed management and they may just do it on a physical basis because but some solar panels on top of something like this and have it run around program. I think the world is your oyster out there, but but I just wanted to show some of those things because, you know, you never know, right?

But if you're gonna do this, you're gonna wanna do about one or two, pass. One or two passes before you're going to go in and do hilling and whether you do one pass hilling or two pass hilling. I would venture to say if you are trying to do this on an all physical weed management basis, a two pass (hillling) system would obviously make a lot more sense to you.

And and then and you'd want to do that when we're at about ground cracking. When you'd want to go in and do your first hilling. You'll see there's some weeds in here that had germinated and that hilling process should bury those and hopefully bury them well enough that they won't come back. One benefit of doing a, a One Pass system if you do use herbicides

is that you can help lower that weed seed bank in the soil. Because when you go out and disrupt that soil planting your potato seed pieces in there and letting all those weeds germinate and start growing. Then when you come in with your cultivate it with your hiller, you'll, you'll kill all those weeds, reducing that weed seed bank, which can be really important. And it can do a pretty decent job for you.

So here is, this is the one pass hilar that we have going to the field. And you can see how much soil it moves and how deeply it will bury those little germinating weed seeds and makes a really nice hill for our operations.

So that's a good system. In terms of non-chemical weed management. Early season effectiveness timing is really important. You don't want to get in there when it's right, when you can kill those weeds. Early season soil disruptions, helpful. Bigger troubles usually come later in the season when you really can't go in there and do much else about things. And the consequence of that will be weed seed rain that could, could happen as a result of those weeds going to seed before you go to harvest.

But I will show, I will say that, you know, you can do a really good job with physical weed management. This is a field from Mark Guzzi's farm. In the Dixmont area He grows about an acre of potatoes. And he does this primarily using these kinds of techniques. So that's, those are some, some things to think about with physical weed management.

In terms of another reason why herbicides have been more effective in potatoes culture than say, corn production or some other production systems is that we have always rotated. And so if you're going to go in and you're going to grow potatoes one year in two, or one year in three or one year in four. That gives you a lots of opportunities to mix up modes of action and do not hitting the field with the same mode of action year after year. That would be a real benefit. You can also go with wide row crops and narrow crops. So if you've got a wide road, potato culture, one-year, go with narrow barley the next year maybe go wide row of soybeans or narrow soy beans in the third year. Or you can under sow your you're barley with a grass like annual rye grass or Clover, and let that cloud regrow the next year without any tillage. All of those are really good, good ways to avoid weed resistance.

So it does come time for us to want to talk about weed management and with chemistries. And so we need to think about some of these things.

And when we realize that our herbicide options out there are, we don't have new, new herbicides coming out on a even really much of a decadal kinda basis anymore. And so we really do need to make sure that the, the herbicides we have last a long time, that we use them effectively. And, and so we're going to talk about some, some pre approaches, some early post approaches. And Discuss a little bit about some post emergence options.

But for most of you, I know what you do. You pretty much you plant your potatoes, you wait for them to come close to the surface and you'll come in and perhaps do your hilling and then spray or sometimes you'll go in and spray and then Hill. I think the benefit of spraying after you hill is that the light that, that seeds get exposed to will allow them to germinate. And then if you come in and kill, put on your herbicide at that particular point in time. Generally speaking, you can get really good control that way. When you are doing at cracking applications, you are spraying onto the soil surface. You're trying to target germinating weed seedlings. And that's an important thing. You're also going to hope to get a little reach back to make sure if you've missed any weeds that, that, that herbicide can get in and get absorbed by that weed and kill it. You gotta consider the soil from a three-dimensional perspective because you're spraying across, cross the surface. But that herbicide needs to get down an inch to an inch and a half to really get those germinating weed seeds. And so what do you need to do that? Well, you could physically till it into the upper inch of soil, which we do have some products, not very many anymore. Or you expect to have rainfall to come in and move that down.

If we look at this particular year that we had, in general, we only had a third of the normal precipitation we typically get in a given year. And so that's going to be a problem. We had normal temperatures but we didn't get any rain.

What happens then is that that herbicide sits on that soil surface. And while we don't have much herbicide volatilization with most of the products that you use. You certainly get photodegradation and that those UV rays hit that soil. It breaks that chemistry down. And if you don't get that inch and a half or rain or into rain in that first ten days, you can pretty much be assured the effectiveness of your herbicide will not be very good.

This is a picture from a study that we did this year looking at a new possible herbicide to come to the market here hopefully in the next couple of years for you all. And we sprayed this whole field with the herbicide that we were evaluating and

we didn't get rain for ten days. We came back in later and sprayed this, this, the first three reps, again with, with a post emergence application. So you can see we got a lot of good control in this first part, but our control in the back was terrible. This back part was not sprayed by the post emergence herbicide. To, to provide some contrast. And you can see how ineffective a soil applied herbicide can be if you don't get any precipitation.

So a half-inch helps a full inch is better. A slow, gentle rain is really what we're looking for.

And that will then help move that soil. It creates more water potential, a higher water potential in that upper part of that soil. And that then forces that herbicide down with the percolating water. And that's what we're really looking for. If we don't get that rain, then we get evaporation off and soil surface, the sun shines on it. We don't get effectiveness.

We can also have too much rain. Occasionally happen after we've applied it. And then what happens is

... if the water runs off the soil surface like in this kind of an image. Then we have some additional problems, some really no good problems that can happen. So then we need to really look at what kind of herbicide chemistry we've got. We want to look at how tightly it's bound to the soil. We want to look at how long it sits around. And that will help us to figure out both If it's going to leach out of the system or if it's going to run off with the run off water.

So here we have a few products that we use in potato production. We got dual magnum here, Sencor and Lorox. And you can see both Dual and Sencor, which is a combination that I use a lot in our, in our research operations. These have a high leaching loss and they, and they're not terribly tightly held by the soil. So we can lose those either in runoff or and leaching and that can be a real problem. So if we're going to make our, herbicides be effective? Try to look at the forecast. I know you do this, but look at the forecast, Make sure you not having a heavy rainfall predicted in the next couple of days after you apply this, what you'd like to do is a time your application around a half an inch of gentle, long-term, showery, type of precipitation to an inch. That's ideal. You can't always get ideal, but that's what we're looking for.

Some other things to make that herbicide be effective. We want to make sure that you're not putting it out there on a day that's too windy or dead dead calm. If it's

dead calm, it can just drift and move off site and that's not good as well. If it's blowing and the trees are really moving around, I would recommend that you not apply it then. cause spray drift can really reduce your effectiveness of your product. Get less of what you want to be applying onto that soil surface and that can be an issue. We also need to be thinking about rotating chemistries. Weed resistance it is, is increasingly likely.

And if your potatoes are looking like this, that's not a good situation. So if you're beginning to see lambs quarters coming through and you had good conditions to normally to kill it, to have that herbicide move into that soil and be effective, then it's possible that you have weed resistance and you're going to need that mix into whatever you're using. Another herbicide that's going to pick up that that weed - that weed that you are not getting control of.

So what is resistance? Resistance is when a particular we proliferates extensively in spite of the use of the herbicide that originally would have been effective in this, this phenomenon is called resistance. Thank UPL for that, for these a couple of images here.

So what are some cultural practices that we do that we encourage weed resistance? Well, if we were to go out and grow potatoes year after year after year, which we don't do. That would be one cultural practice that, that would lead to this. That's why we've had triazine resistance in corn production for decades and we have not really had as much problem in potato culture. In corn, another problem that we've had is that we do a lot of no till and we typically go in and spray the same herbicides. So we're not rotating our crops, we're not rotating herbicides. And we run into problems. If we get escapes, not letting those escapes go, go to form seeds is a good practice or letting those weeds go to seed is a bad practice. Not using the right amount of the herbicide. If it, if it recommends two ounces put two ounces, don't go with an ounce and a half. And then. Continuous or repeated use of the same herbicide is definitely not a good practice. We do not want to be doing that. So I think we can think about a lot of things.

We can think about trying to rotate in a crop that's going to, you typically use a different type of an herbicide in that off-season That would be good for growing canola or something. And we want to go in and use Roundup on canola . But we could come back and grow potatoes and use Sencor / metribuzin and something else (to pick up the grasses) that kind of a system would work pretty well. And then if you grow with barley as the third crop, then you're probably going to put a growth regulator on for that. So I think those kinds of strategies I think will go a

long way. In terms of herbicide rotation. If you, if you need to go in and if you are seeing, let's say you had a situation where you had lambs quarters that wasn't being controlled in your canola crop. And you got, and then you're coming back in with potatoes and you're concerned about your Sencor not killing the lambsquarter, then you need to think about rotating a different group of an herbicide family to get that control. You're looking for.

One particular product that I was looking at this past summer at the Rogers Farm is a new formulation that uses metribuzin and sulfentrazone as a combination product. And again, this label is pending registration from the EPA will probably not be available in '21 but. I expect it will be available in '22. But what, what that, what this particular product does is it has two groups and it has a group five, which is a metribuzin and a group 14, which is sulfentrazone And the sulfentrazone can pick up any of the broadleaves that might be resistant to metribuzin. And it also has some additional grass control. So it's a nice combination that should be a very effective product for you. So if you're thinking that if, if in '21 you go out (and spray) and you get the right kind of conditions, you still get weeds coming through and coming through too early and you were using the same rates you've always used. You might want to consider something different in '22. I would not judge the 2020 year that as a great year (to show or evidence) weed resistance because of the fact that we didn't have the moisture to do that, to move that herbicide into the soil.

Alright, so improving pre-emergence herbicide effectiveness, timing that application at the right time, avoiding heavy, heavy rains when their forecast, because you could lose that herbicide in soil runoff. Don't cut corners on rates. If that rate says put two ounces, go ahead and put two ounces, that says put two pints, go, go with two pints Don't try to cut corners. If it's dry and you have irrigation, go ahead and apply it. Go ahead and apply it and make sure that herbicides effective out there. I think that's a good move. Then rotating and mixing herbicide chemistry groups is really important as well.

If we are going to be doing a post emergence application, your target then is a growing weed. If that weed is just sitting in there in really dry soil and it's just fighting ya like crazy. And it's still growing even though it's dry, if you try to go out and kill it, then that herbicide might not work. So you want to make sure that there's enough soil moisture so that that herbicide can get sucked up by the plant. And you also want to make sure you've read that label and have applied the right stickers and the right adjuvants to make it particularly effective, whether that be liquid nitrogen or some other stickers.

And again, in that same image that I showed you earlier, we applied the herbicide in this part of the field in, in July.

When we look at the rain that we got in July, we got an average amount of rain and we got rain within two days of application ... actually we got a rainfall one day after application in this particular instance. And we hadn't rain two days before this application. So there was enough soil moisture, the weeds were growing well, we got great control in that type of situation. So that was good.

And so some things will want to think about check the rain fast period before you apply it. If you think that you've got four hours and there's rain coming, you know, the rain fast period on that herbicide, it says it's gotta have for hours without rain. And you, and you can see as a thunderstorm on your phone come in your way, you best not apply it. So think about that.

You also want to think about rotating your post emergence chemistries. If you used one product last year, you might want to rotate into something different this year. And of course, calibrating your sprayers. I mean, everybody, this is as common as the day as long but you gotta keep mixture that, you know, all of your nozzles are spraying the same amount. Do them at the start of the season and check it maybe every year as I think it's just a really, really good practice.

And then of course, when you're spraying a post emergence product over the years, we've found that some products are better on some weeds post emergence than others. And so if you know you've got a, got a Lambsquarters problem out there. Make sure that whatever you're spraying postemergence is going to be effective on that particular weed.

And if you got grass problems, you gotta know what kind of grass you got. All grasses are not equal. And when we go to apply an herbicide post emergence to kill a grass problem in a potato field.

You're going to realize that, you know, if, if you have fall Panicum as your problem, as your problem weed out there. Or if you got crab grass, for example, ... Matrix is not particularly effective on crab grass and sencor (metribuzin) isn't either. And maybe that's why you're running into a problem. So you need to add something to your sencor to pick up crab grass. But if for example. But if you, but if you add select to your, to your post emergence product, it seems to be good on all of them. So knowing what your weed is in the field is important. And making



sure the combination that you want to use post emergence is going to pick up all of the weeds that you have present in that field.

And if you do that, then I think you'll find that your weed management is, is really doing what you want it to do. You get that control that you're looking for. And that's the name of the game. So with that, I will wrap up my my talk a minute or two early and we can give you your test for here. So with that, I'll say thank you and know that I will miss seeing you all at the potato Conference this year. I, it's always a pleasure to have the chance to, to share a beer with my young farmers and see what's happening with you all, what's new. So hopefully 2022, we'll be back in business at the Caribou Inn and Conference Center. So with that, I'll say thanks.