2021 Pulse Agronomy Workshop

Day 2: Follow-up Questions

WEED MANAGEMENT

Dr. Charles Geddes, Agriculture & Agri-Food Canada

Can the seeding direction of E/W vs. N/S provide a competitive advantage for wild oat (or other weeds) control? Is it crop-specific?

This technique has been well documented in Australia; however, I am not aware research on this technique in Western Canada. I recommend reading this article to start: Australian Herbicide Resistance Initiative (AHRI) (uwa.edu.au). About four years ago, AAFC colleagues had a research proposal submitted to assess the impact of seeding direction on weed management and crop productivity in Western Canada. Unfortunately, the proposal was not funded, so the work could not progress. I do think that it is a good idea and it is something that we need to evaluate further under our conditions in Western Canada.

If desiccating using diquat in lentil crops during late August or early September, is the expectation that there will be an impact on seed viability?

We haven't looked at diquat specifically, but one of our projects is looking at glyphosate + saflufenacil as a pre-harvest treatment. Our (very preliminary) results suggest that the pre-harvest application 10 days prior to harvest did reduce viable seed production if it is applied when kochia is actively producing seed (mid-September). However, we need more data to say this definitively. There was less of an effect during earlier harvest dates around the end of August. This is yet another example of why weed phenology is an important consideration when it comes to effective weed control.

If growers/agronomists suspect group 4 resistance, what are the next steps? Can they submit samples and any advice on best way to collect the seeds?

If a farmer or agronomist suspects group 4 resistance in kochia, they can contact me at Charles.Geddes@agr.gc.ca to get the sample tested. I have an information sheet that I can send which lists important considerations for collecting the seed sample. For kochia, it is best to wait until October to collect seeds so that we can be sure they are mature. Immature seed does not work well for resistance testing. We generally need at least 2000 seeds total collected from more than 10 plants in the field.

Any indication that intercropping may be slowing the progression of herbicide resistance in weeds?

We don't have the data to show this, but it makes sense to me. Intercropping can help the crop be more competitive by taking advantage of greater niche space that would otherwise be exploited by weeds. Anything that can make the crop more competitive will help reduce selection pressure for herbicide resistance. Of course, where this does not hold true is if the intercrop limits herbicide options leading to greater application of a limited number of herbicide modes of action.

Why might we be seeing such a rapid increase in resistant red root pigweed relative to other weeds?

This is a really good question, and one for which I won't have a good answer until we finish the survey. The increase in group 2-resistant redroot pigweed could be due to several factors, including the biology of the species, the fact that redroot pigweed can spread quickly through high seed production, efficient seed dispersal, application frequency of group 2 herbicides in regions where the species is well adapted, among others. We have observed a similar increase in resistance in other species in the past, but this is usually associated with species that exhibit efficient outcrossing (e.g., kochia). I will be looking further into the increase in group 2-resistance in redroot pigweed, and I hope that when we analyze the management information, we will have a better idea of the potential contributing factors.

FERTILTY MANAGEMENT

Dr. Jeff Schoenau, University of Saskatchewan

In the long-term will we see any benefit from a high plant matter crop as it breaks down?
The N in plant material will eventually be released into plant available inorganic forms through decomposition, but short-term (weeks or couple months) effects observed will depend on the C:N ratio. If C:N is greater than about 30:1 there will be an initial period of available N tie-up (immobilization) followed by net release (mineralization). If N rich residue like a young legume plough down (C:N less than 20:1), available N is released right away.

If we have a field with high residual N that is too high for effective nodulation and that field that will be established as a pulse crop in 2022, what is the expected production on that crop if it is planted uninoculated with supplemental N fertilizer compared to production of it as an inoculated crop in a more normal year?
Inoculation is important even on soils that test high in available N according to composite sample, since there likely are areas within that field of lower available N content than the mean level found in the bulk sample, and in which one would want to maximize the possible contribution of biological N fixation. I think for the pulses that are frequently grown like lentil, pea, chickpea, faba and that are good N fixers and inoculated properly and not compromised by disease, drought etc., that under more normal conditions of low available N, yields would be achieved that would be equivalent to conditions of high available N.

Is there a chance that the pulse crop would run itself out of N by pod-fill, if it isn't relying on biological N fixation (BNF)?
This gets more into crop physiology that is outside of my area of expertise. I think if you completely shut down nodule initiation and biological N fixation some way, and low supplies of soil N were all you had to rely on, then the plant could run out of N. Pulse crops don't normally run out of N unless there is inoculant failure and/or there are specific stresses like disease, moisture, etc., especially those that affect the root and activity of the nodules on it like disease or insect coming in and shutting off the supply of photosynthate. As the available N in the soil is reduced, the contribution of BNF is proportionally increased. Much of uptake into the plant by BNF or root absorption happens earlier in growth cycle and then it is redistributed to seeds later on.

Is there any research on carryover rhizobia populations in cropping rotations, such as 3-year breaks between lentils? A few producers are talking about not inoculating or cutting rates of inoculant - would this be an advisable practice?
I am not aware of any recent research. People who work in the soil biology area are more qualified than I to answer this question. I do think using a commercial inoculant that contains selected strains of superior N fixing Rhizobium species is a good practice whenever the crop is grown to ensure populations of effective Rhizobia that contribute to efficient nitrogen fixation, although other less effective populations may exist.

Is there a critical soil test level where phosphorous should be applied to pulses?
The critical level would vary depending on many factors, including the test method used, the type of pulse crop, and the soil (e.g., texture) and environmental (e.g., soil moisture) conditions that exist or are expected. Different recommendation systems in use employ different assessment methods for measuring availability of soil phosphorus, so it is not really possible to give a single level that would apply for all tests for all the different pulse crops under all the different conditions out there. Recommendation systems use the soil test analysis along with other site-specific inputted information to the model like the crop type, target yield, and existing and anticipated soil and environmental conditions to predict fertilizer response and requirement. It is advisable to use a model or system appropriate to the region along with the soil test to most accurately determine the likelihood of seeing an economic response and recommendation for appropriate rate of P fertilizer to apply.

Can you comment on the effectiveness of adding mycorrhizae fungi when seeding pulse crops as a means to increase soil P solubility and uptake?
There is less information on potential effects of mycorrhizae (AM) fungal inoculants on P solubilization than for the penicillium species-based inoculants that have been studied more extensively in Western Canada and that appear to play a direct role in solubility through complexation reactions. The P solubilizing fungal inoculants have shown to produce enhanced P uptake in many instances. Depending on conditions, the increased P uptake may or may not be associated with an increase in yield.

INSECT MANAGEMENT

Dr. Tyler Wist, Agriculture & Agri-Food Canada

Correction: In his presentation (1:28:13 in the recording), Dr. Wist says "In this project we are using Matador, Volium Xpress, and then another one that is the group 28 version of Voliam Xpress with the lambda-cyholthrin taken out." In fact, the active ingredient in Exirel Insecticide is cyantriliprole, while the active ingredients in Volium Xpress are lambda-cyhalothrin + chorantriliprole.

In a season when aphid numbers keep hitting threshold even after interventions, is there a limit to how many separate insecticide applications should be made in faba or lentil crops? At what point does a grower have to just stop spraying?
I'll always start with, "check the label to see if more than one application can be made and make sure that you mind the cut-off before harvest". In a large field, one application of a registered contact insecticide should be enough to stop the population growth. It sounds like the agronomist who asked the question has seen re-infestation by pea aphids though, and I'd like to hear more about what happened.

How do we incorporate beneficials into our spray decisions, especially when it comes to pea aphids? Are there any rules of thumb to help guide when there are sufficient beneficials to keep populations at bay or is that answered by aphid numbers not increasing in following days' sweeps?
This an amazing question and I wish that we would have had time to answer that on the air. I've done several years of surveys in a few of the pulse crops to try to establish which aphid predators and parasitoids are present. I'd love to expand the survey with the help of producer cooperators in the province and look at the suppressing action of some of the beneficial insects. If you recall my 2019 aphid population slides, in our two AAFC fields, the beneficial insects were not able to control the populations.

How do we account for the presence of two pests (such as pea aphid and lygus) in the crop at the same times? Is their effect additive even if below threshold independently?
Great question that we don't have the answer for. With both of these insects sucking pests, their effects could certainly be additive. Lygus though, might be more of a problem after the seeds are set than the pea aphids are so we might have two different crop stages to worry about for these insects. The next few years could be a good time for this type of two pest work in pulses if Lygus continues to be a problem on the prairies.

When pulse crops are simultaneously under drought stress, are the yield impacts of pea aphids/lygus in pulses expected to be worse?
Certainly, drought exacerbates all problems, and if it isn't too hot for pea aphids but the plants are water limited from lack of rain, the added stress will cause plants to wilt faster than under one of these stresses alone.