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Pulse Production – Management Practices to Maximize Returns

Barry Rapp, PAg

Agronomy and Seed Manager

Crop Production Services (Canada) - Regina

Although there are many excellent written resources referencing pulse production, nothing substitutes for experience. Over the years I have been very fortunate to work with excellent growers and learn from their experience as we have taken research information and applied it on farm. I have notes on file from meetings hosted in Eatonia, Kindersley and Rosetown in the early 1990's where Dr Slinkard promoted the value of pulses, especially lentil, and how best to grow the crop. We've been at this a long time now but still continue to evolve production practices as new varieties and classes come on stream, as field management systems change (direct seeding), as new production tools become available (herbicides, fungicides), as new pests have to be managed, as crop acres and rotations change and the list goes on. We never stop learning and never finalize the "production recipe". There is never only **one** right way to produce a crop and the best production practices can change from one year to the next and even between fields in the same year. The challenge is to identify production practices that more often than not result in the harvest of a good yielding, high quality pulse crop.

I presently work with growers in the Regina, Moose Jaw and Lumsden areas. A large part of this geographic area is comprised of flat heavy clay soils, well suited to pulse production. Lentil is by far the pulse crop grown on the most acres and of highest long term value to growers. Pea acreage has increased through the years but appears to have peaked a couple years ago and now remains relatively flat. Chickpea acres have fluctuated through the years but have been significant in a few. Growers on the heavy clay, who have years of experience growing pulses and are confident yields can be exceptional if moisture is not limiting, will often "spare no expense" if crop value is anticipated to be good. They are willing to risk higher production costs.

A very common rotation has been lentil-durum-pea-durum. I believe most would agree this rotation is good from an agronomic view, especially considering crop disease and weed management. Substituting an oilseed for one of the pulses may be desirable but most growers in this area are not satisfied with only 25% pulses in rotation. Obviously durum is an important crop in the area. Canaryseed can substitute for durum on some acres as can barley and hard red wheat. Chickpea acres, when they are planted, usually replace peas in the rotation. Canola is increasing in acres as growers look to reduce either pea or durum acres if price outlook or movement is negative. Canola is also being considered to allow the use of different in-crop herbicide chemistry for weed resistance management. There have been years and fields where the frequency of lentil in the rotation has increased. But over the longer term, most growers have come to realize they usually pay the price with increased disease pressure and weed management problems.

All sizes in both green and red lentil are grown. The decision on which variety to grow is usually decided between the grower and the buyer/processor of the seed and/or the seed grower combined with the grower's (or neighbor's) experience with a particular variety. Over the last few years, red lentil acres have increased as have Clearfield lentil acres. Yellow pea is the dominant pea grown in the area. Chickpea acres are now mostly Frontier's although there are still fields of varieties with larger seed.

The pulse production cycle starts the year prior to seeding the pulse. Pre-harvest application of glyphosate the year prior to seeding pulses (usually a cereal) has become a regular production practice. Many growers have recognized it doesn't take long for perennial weeds, especially for the perennial thistles, to increase in density if pulses are a big part of the rotation. Pre-harvest application of glyphosate remains a very effective tool in the battle against perennial weeds. Dandelion is another perennial that has to be watched. Again, the year prior to the pulse, if cropping choice allows, a pre-seed application of Express/glyphosate or PrePass is very common to keep this weed in check.

The pulse production year almost always starts with a pre-seed glyphosate application. Given limited herbicide options in-crop, missing an opportunity to control any weed early can be costly. There is just too much research measuring yield benefits from early weed removal in pulse crops to ignore. Pre-seed glyphosate is the first step in early weed removal.

Pulse acres are usually the first to be seeded. A large percentage of pulse acres are planted with treated seed. I attribute this to a couple main reasons. First, with a large acreage devoted to pulses each year, disease pressure can be high. Second, with early seeding into soils that are often wet and cool due to their clay texture, seed can sit in the soil for some time prior to germination and emergence. There has been a trend to increased seeding rates with most of the crops grown through the area and pulses, especially lentil, is no exception. A one bushel per acre seeding rate for the small lentil is becoming common even though recommended rates are in the 45 pound rate if you do the math.The 3 bushel seeding rate for pea is accepted as desirable for most varieties although it is not always achieved. Chickpea seeding rates are kept close to those recommended due to higher seed cost.

There is a mix of inoculant types used. Liquid still commands a big share due to its ease of application. Peat based inoculants are the most common and granular is popular as well if seeding equipment lends itself to application. Granular, although higher priced, saves time and eliminates the often frustrating job of applying inoculant at the proper rate and with good coverage to the seed just prior to seeding. Lately we've had some discussion on the merits of increasing inoculant rates on fields where large yields can be expected. It could be an inexpensive way of adding a bit more yield in some years. Although pulse crops have been grown for years, no one plants pulses without an inoculant applied in the year of production. Applying a polymer coating over top of applied inoculant has caught the attention of growers in the area the last 2-3 years. Inoculated seed is stored for a period of a few days to 2 to 3 weeks once the polymer coating is applied to provide protection against *Rhyzobium* bacteria desiccation and death. What drives the interest is the ability to seed more acres in a given time while avoiding application of inoculants in often less than ideal conditions. Many articles have been written and some producer group research documented on this practice. I know storage time of inoculants beyond 24-48 hours raises questions, but a number of growers have evaluated the risk and decided the benefits outweigh the risks for their farm operation.

Fertilizer use on pulse acres varies. Over the years we have debated the value of starter nitrogen for pulses and the likelihood of a response to fertilizer phosphorus in the year of seeding. Most pulse acres are seeded without starter nitrogen with the exception of small and extra small lentil. Many growers have observed a small yield boost and easier harvest (taller plant) when applying starter N with the smaller seed size lentil. The yield and height difference may not be huge, and may not even be observed on every field every year, but has been noted often enough that most growers who try this stick with it. When it comes to phosphorus management, growers are aware of research documenting few and usually small responses to phosphorus applied on pulse acres. However, given the value of the crop and the role phosphorus plays in maturity and nodulation, I personally find it difficult to suggest/recommend pulse acres be seeded without phosphorus. Inputs are often high, especially in lentil, and potential returns can be huge. I would argue the risk is too big to go without phosphorus. 15 pounds of phosphorus is usually

the minimum and up to 25 pounds is common depending on opener size and seed safety considerations. Rarely do growers apply sulphur or potash for pulse crops.

In-crop weed control, especially broadleaf weeds, has always been a challenge due to limited herbicide options and crop tolerance issues. This is especially true for lentil and chickpea. The option to apply Odyssey (and related chemistry) has been a welcome addition with the introduction of Clearfield lentil, much like it was for pea many years ago. However, it still has limitations with the spread of herbicide resistant weed populations. In pulse crops, early weed removal results in significant yield increases. In lentil and chickpea this has been an easy sell in the past as crop injury usually increases if Sencor is applied at more advanced plant stages. This often holds true for pea fields where Odyssey is used as well. In Clearfield lentil, the crop is more tolerant to Odyssey at more advanced stages so there is a temptation to wait a bit longer. However, I have argued, and will continue to do so, if the weeds are there don't wait. Sencor continues to be used on non-Clearfield lentil. Given Sencor's limited weed spectrum, crop tolerance issues and variable weed control, interest in using pre-seed Pursuit as researched by the Crop Development Centre is of interest. But unfortunately this remains a non-registered use.

Herbicide choice for control of wild oat and volunteer cereal in pulses is much better than for broadleaf weeds. Where used, Odyssey gives us a group 2 herbicide option to control grassy weeds. This is important as group 1 resistant wild oat is common through the area. With increased size and/or density of wild oat or volunteer cereal it has proven beneficial to make the move to Odyssey DLX. Given the relatively low cost of some of the graminicides, there have been occasions (although rare) when 2 applications have been done in the same year. This has been done even in Clearfield lentil, if the grassy weeds appear either before or after the broadleaf product is applied. Although there can be a benefit to doing this, long term this will only add to weed resistance problems as these are all Group 1 graminicides.

Kochia, specifically Group 2 resistant kochia, is arguably the number one weed problem for pulse growers in the area. Obviously, due to the resistance, the Clearfield production system does not offer any advantage for kochia control in lentil where kochia populations are dominating by the group 2 resistance types. The same is true for Odyssey and related products in pea. The number of acres where Edge is applied prior to pulse production continues to increase every year in an effort to provide some degree of control of kochia. What started as a practice on headlands has spread to entire fields, especially for lentil. Almost all Edge is surface applied with application split between fall and spring depending on workload and weather. Most would consider fall application, although a bit more costly, to offer better weed control compared to spring application. However spring application has worked well over the years as well. Although surface application can result in variable weed control from field to field and year to year, growers have come to accept Edge application as necessary in an attempt to do what they can to control kochia. Although this is not a cheap weed control option, it is one that pays for itself easily if weed populations are even moderate. Growers are just starting to evaluate the fit and effectiveness of Viper and Authority in some pulse crops for kochia control. It is possible, if proven adequate, these chemistries could help with long term kochia control.

Group 2 resistant wild mustard has also been confirmed through the area. Obviously the Clearfield technology doesn't help in this situation. Does this mean we may soon be using Sencor in Clearfield lentils?

Grasshoppers and aphids dominate field scouting time when monitoring for insects in pulse crops. Growers are very familiar with the damage grasshopper can do in lentil. This is one insect not taken lightly. With lower populations, as grasshoppers move from ditches and grassed areas into fields, it is

common to see insecticides applied to field margins. In some years, this may be enough to limit damage. But with higher populations, as the insect hatches in field or moves quickly into fields from other areas, entire fields will be sprayed with the low threshold number of 2 grasshoppers per square meter well known among seasoned lentil growers. In years of high grasshopper populations, especially with anticipated high crop value, it is not uncommon for entire lentil fields to receive multiple passes of an insecticide. Pea aphid is now on the annual list of pests to scout. Although there are established thresholds and methods for scouting in both pea and lentil, the decision to apply an insecticide for control is not always an easy one to make. This has as much to do with crop staging as it does thresholds. Last year, for example, aphid numbers in lentil fields were 100X and even 1000X referenced thresholds. Because the lentil crop was later to mature in 2009, aphid populations had a long time to build. The question then became one of determining if the crop was past the stage where damage would be significant. Many lentil fields were sprayed last year for this pest and yet I still don't think we know the extent of damage it could have caused. But given the value of the crop in the field, its yield potential and the fact it had come this far, no chances were taken. Many of the pea fields were not sprayed only because they were a bit more advanced when populations exploded.

Disease management in pulse crops starts with rotation. In lentil fields we have observed time and time again, heavier disease pressure (anthracnose and ascochyta) in fields with anything less than a 4 year lentil rotation. For many years fungicides were applied in lentil for ascochyta control when symptoms were present and environmental conditions favorable for disease development. The last few years anthracnose has been the disease of most concern with severe damage noted in some years if fungicides were not applied. There are years and circumstances when the frequency of lentil exceeds once in four years but growers are well aware of the long term benefits of extending years between lentil crops. Disease pressure varies year to year and field to field but most lentil acres are now routinely sprayed at first flower. Although the marketing of the "health benefit" of certain fungicides is well known to local growers, the primary reason for application is preventative although it is much easier to justify application if a benefit is realized even with low disease pressure. The use of a fungicide in pea fields is also increasing as ascochyta is commonly found through the area. Although the intensity of use is no where near that in lentil, higher yields and/or better standability at harvest is well documented through the area. On the chickpea acres growers have accepted the fact the use of fungicides is inevitable, the only question is which fungicide and how often. Chickpea ascochyta resistance to the strobilurin fungicides has raised awareness of the disease resistance issue. But I'm not convinced, at this time, it has influenced how we manage disease in pulse crops other than chickpea. Probably sooner rather than later we should develop an on-farm fungicide strategy in all our pulse crops to manage resistance to fungicides.

One other disease noted in 2008 that previously had not been considered a major problem for our area was root rot. It primarily affected pea but was also found in a few lentil fields. Large areas within fields showed stunted, yellowed plants in late summer and yields were lowered. Documentation since then has shown we weren't alone in noting this disease as many areas of southwest Sask and the northern US States also had significant amounts of the disease. To date this has not resulted in rotational changes but is being monitored a little closer.

Stemphylium has also been noted in 2 or 3 of the last 6 years. So far we've held the view that its impact on yields has been minimal. But in a year like 2009 when the growing season was longer and the disease noted at an earlier crop stage, it raises concerns and questions. Based on overall yields from infected fields it doesn't appear this disease has had significant impact on yield. But if it's even taking a bushel or two we'll eventually be looking for additional research to learn more about this disease.

Desiccation is common for lentil. Although most growers would agree the quality of the lentil seed is usually better if swathed and no adverse weather is encountered, most growers want to get the crop in

the bin as quickly as possible once maturity is reached. With Reglone application we have learned it doesn't pay to cheat on rate, water volume or time of day application. Once the crop has reached this stage and is days from the bin, it makes sense to do things right. Some years, some fields have been harvested in as little as 4 days after Reglone application, but we usually expect 5 to 7 days will be needed prior to combining. This isn't to say swathing doesn't exist for lentil. It does, but the majority of acres are desiccated with Reglone. In pea crops, direct cut without a chemical desiccant is more common although a significant acreage also has Reglone applied.

Looking ahead, some of the bigger challenges or issues we will be dealing with include:

- Weed resistance – group 1 wild oat; group 2 kochia; group 2 wild mustard.
- Disease management and strategies to prevent/deal with fungicide resistance
- Grasshoppers in lentil in years of high populations
- stemphylium in lentil and root rot in pea and lentil

Pulses are, and will continue to be, an integral component of crop rotations throughout western Canada. Production practices continue to be refined as field experience is gained, research continues and field management systems evolve. There is no one right way to produce a pulse crop. But by following proven production practices, anticipating new challenges and paying attention to detail, the value of that pulse crop in rotation will remain high.