



LOOPING YOU IN ABOUT LUPIN

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Pulses have a long history in human nutrition as important sources of protein, vitamins and minerals. This, coupled with the ability to fix atmospheric nitrogen, significantly reduces the energy consumption required to produce a crop, making pulses particularly suitable for low-input systems. Pulse crops provide an agronomic source of diversification, breaking disease, pest and weed cycles and optimizing nutrient management in standard crop rotations. Recently, pulse crops have gained special interest, as a transition towards plant-protein based diets appears pivotal to ensure global food security and preserve the environment.

Lupin is an annual grain legume that fixes nitrogen biologically, similar to other established pulse crops currently grown in western Canada (field pea, lentil, faba bean, chickpea, and dry bean) and may have potential as an alternative pulse crop for Alberta. Globally, there are over 200 species of lupin, this includes annual and perennial types, wild and domesticated species. The three important species grown as field crops in the genus *Lupinus* are *Lupinus angustifolius* (blue), *Lupinus albus* (white) and *Lupinus luteus* (yellow). These three species are ‘sweet’ lupin, domesticated through breeding efforts to improve harvestability and yield as well as to reduce alkaloid content (lupin has alkaloids such as lupanine, sparteine and anargyrine that can cause bitterness and neurotoxicity, levels of which vary among species).

Sweet lupin is commercially available for use in human and livestock consumption, with about

85% being grown in Australia. Lupin is a competitive choice for producers as they have high protein content (32-35%), excellent nitrogen fixing abilities, are resistant to lodging, have intercropping benefits, and there’s some evidence of tolerance to root diseases such as *Aphanomyces eutiches*. The adapted growing region of Alberta is smaller than that of peas or faba beans since lupin is best suited for higher rainfall areas, such as the thin black and black soils located in central Alberta. This coincides with the regions of the province where pulse crops are severely impacted by root diseases, and strengthens the appeal of lupin as an alternative pulse crop in rotational management.

Previous interest in the crop in the early 2010s waned because of lack of reliable market and limited seed supplies. Renewed interest in this crop via expansion in market opportunities, particularly in the sustainable plant protein space, has placed a spotlight on lupin again. Excitement needs to consider the management practices being developed to address agronomic concerns before the crop is ready for large-scale adoption by prairie farmers. Lupin has a moderately deep, thick tap root



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(species dependent) increasing the crop's ability to scavenge water and nutrients. It is 'solid stemmed' which makes for great standability but may contribute to shatter loss (despite breeding efforts) at harvest. Lupin responds well to moderate temperatures and moderate to high (not excessive), evenly consistent moisture throughout the growing season - drier areas will not be a fit and pH above 7 will have negative affect on the nodulation. White lupin, however, can tolerate higher than 7 pH and may have potential under irrigation but that potential has not yet been tested.

Previous research conducted by Alberta Agriculture, Forestry and Rural Economic Development has focused on blue lupin. Beginning in 2020, the Alberta Pulse Growers Commission with partners funded two new research projects which will help increase knowledge about the range of adaptability with a focus on development of best management practices. The projects will also identify gaps in knowledge that could result in roadblocks for adoption of both blue and white lupin as a potential pulse crop option. Initial results of the study were significantly impeded by dry, hot conditions. Harvested yields from Year 1 of trials were 47 bu/ac for blue lupin and 28 bu/ac for white lupin. White lupin (preferred by food industry due to white flour and low alkaloid content), have a longer growing season compared to blue lupins. Blue lupin's growth is determinant in nature; meaning the plant has a defined number of days that it grows and then ripens. In contrast, the growth of white lupin is indeterminant, and the plant continues to grow and flower late into the growing season until it is terminated with a harvest aid product. The results of the research should help to define the appropriate growing regions for each of these species, and aid in the creation of unique management strategies allowing for maximum



Healthy looking lupin crop at research trial in Sturgeon County, north of Edmonton, in early August 2021.

success for farmers interested in expanding the suite of crops they grow.

When it comes to market end uses, lupin has suitability as a feed and food, as well as having bio-industrial applications. It is often a substitute for soybean in cattle, sheep, hog, poultry, and farmed fish rations due to its higher protein content, low levels of anti-nutritional factors (phytic acid, saponins, lectins and trypsin inhibitors), digestibility and retention of phosphorus and valuable pelleting qualities for feed. Lupin can be an alternative to cereal ingredients, balancing their amino acid profile and as an egg substitute in breads, cakes, biscuits, pancake mixtures and pasta, making these foods more nutritious. The unique functional properties of protein extracts from lupin are being

used cosmetically and in personal healthcare formulations. The opportunities for lupin are endless in the food, therapeutics, and cosmetics market.

In summary, the commercialization of lupin makes a lot of sense on many fronts and will be a welcomed addition to the crop rotation in Alberta, but to ensure longevity and sustainability, we first need to make sure it is a viable crop here. Strategic advances in genetics and management paired with exploration of markets and end-uses must occur in concert, otherwise we risk the long-term sustainability of lupin as a pulse crop option.

Read more about lupin research currently underway in Alberta by searching "lupin" at albertapulse.com.