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# AGRONOMICS OF LUPIN PRODUCTION

**Project:** Investigating the agronomics of lupin production a new high protein pulse crop for Alberta.

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**Background:** There is a great deal of interest in developing a new protein crop for Aphanomyces affected fields in Central Alberta. Lupins is one such crop and is an important crop for livestock and human consumption. As the market develops for this emerging crop, GRO is partnering with other organizations to determine the best lupin variety for our growing conditions. This adaptive trial reviews the production of the latest germplasm of both white (*Lupinus alba*) and blue (*Lupinus angustifolius*) lupins compared to current pea and faba bean varieties. New emerging germplasm is introduced into the trial each year. GRO has had a replicate of this plot since 2022, and usually has some measure of success in this trial. In 2024, however, our plots were hit with hail, and there were no replicated results from the trial, save emergence and plant stand. Consequently, results from some of the other sites for this trial were included in the annual report so that interested producers could see how the newer lupin germplasm performed in 2024, with the understanding that GRO will continue with this trial in 2025.

## Research design and methodology:

In 2024 changes were made for both blue and white varieties in response to industry request and newly acquired germplasm (Fig.2). Coyote, Lawler, AGTP0013 and AGTP0054 blue lupin were added from Australian Grain Technologies (Australia). Bonus, Periwinkle, Snowbird and L2043N white lupin were added from Soy UK (Great Britain). Three faba bean varieties (Fabelle, Malik and Snowbird) were also added in 2024 to provide additional data for comparison to a later maturing pulse crop. The field pea varieties remained the same through all years of testing.

For flowering, all blue and white lupin varieties reached 10% flower at approximately the same time with a few exceptions. Flowering in 2024 at the Lacombe and Namao location averaged 54 days after planting. In 2024, both lupin types flowered at the same time as the faba bean, 5-7 days earlier than the field pea varieties at both locations.

For plant height, both lupin types were significantly shorter than the field pea varieties at both locations. In 2024 there were significant differences between the lupin varieties and field pea and between the lupin and faba bean as expected (Table 3). Plant height for the lupin varieties ranged from 25.0 cm (Coyote) to 38.0 cm (Bonus) at Lacombe. However, there was no significant difference between the faba bean and field pea, or between the two lupin types. This was not expected and is contradictory to the data from the three previous research years. Similar results were seen at Namao where differences were not as expected and contradictory to previous results. This is likely due to the climate conditions in 2024. By harvest time, the field pea varieties had lodged, at a rating of 3-4 out of 7 (where 7 is completely flat) whereas the lupin crops were still standing very well with minimal lodging (1 out of 7). The faba bean plots did not lodge.

At Namao, the earliest blue lupin variety matured 15 days after field pea 4-6 days in 2024. At Lacombe, maturity was variable. The blue lupins matured 6 days after field pea in 2024. The exceptions were Coyote and P0054 in 2024 which matured 19 days later, more consistent with faba bean. White lupin maturity was considerably late and problematic. At Namao in 2024 under very dry conditions, the white lupins matured at the same time as the field pea due to significant moisture stress. At Lacombe the white lupin varieties did not reach physiological maturity before the onset of winter required desiccation.

Yield differences in 2024 were similar to previous years. At Lacombe, there were significant differences between the lupin varieties (Fig.2), and lupin yield was significantly lower than both field pea and faba bean. The highest yielding lupin at this location was a variety called Snowbird (not to be confused with the faba bean variety of the

## LUPIN TRIAL CONTINUED

same name) at 1639.8 kg/ha with the lowest yielding lupin variety being Coyote at 970.7 kg/ha. At Namao, there were significant differences between the blue and white lupin varieties and between the lupins and faba bean but results were poor due to stressed growing conditions. Yields were quite low in 2024, especially at Namao, due to hot, dry conditions with field pea only yielding an average of 4683.2 kg/ha compared to the previous year and faba bean yielding considerably less than normal at an average of 3411.7 kg/ha.

The key messages from trial results indicate that numerous lupin cultivars are well suited to Central Alberta. The blue lupin types that seem best suited for adaptation would be Boregine, Lunabor and Probor with other varieties from Australia showing potential but needing more testing under higher moisture conditions. Some varieties tested, such as AGTP0054 will be removed due to very poor adaptability. Late maturity and resulting low yield of white varieties suggests this type may not be as well suited to these growing areas. High temperatures combined with very dry conditions in 2024 showed that, similar to faba bean, heat and drought extremes are not conducive for lupin success and that this crop is indeed a cool season crop requiring adequate moisture and cool temperatures. The crop stood very well and was easy to harvest. This is due to the solid, thick woody stem which is characteristic of both lupin types. With a higher protein level, resistance to *Aphanomyces* and established markets recently developed, the prospect for lupin remains high.

This plot was replicated as well at the GRO Anderson site in 2024 (see Anderson site agronomic summary for background information). It was seeded on May 9 at a depth of one inch, into good moisture and a soil temperature of 18C, following the rest of the recommended protocol as listed above. Fertilizer applied was 1.37-6.5-27.08-14.7-7.2 Mg @276.96 lbs/ac, side banded, and 11-52-0 @ 23 lbs/ac, seed placed. The plots were growing and thriving until July 24, when a hailstorm hit the site. The blue lupins and peas were already in the pod stage. They were badly damaged and did not recover. The fababeans, which were in the early pod stage, were particularly badly hit and lost all of their pods. The white lupins were just in the flowering stage, and were left to see whether there would be any regrowth. They did rebloom and if the remainder of the season was more favorable, they might have been harvestable, but the results still would not be useable, so they were not combined.

GRO had a similar project to these in 2023 with a few different varieties. While there were some issues with the plots over the season, they were harvested, and some data was taken. Those results are included in the table below. There are some similarities in the results, but more work needs to be conducted to determine the relative suitability of lupins locally, and the net yield, protein, and total return per acre.

The economics of lupin production, compared to other pulses, is somewhat difficult to determine as the market for lupin seed is not well developed. Seed fractionation and product development will eventually determine the value of this disease tolerant, robust, crop with good standability. Continued observation of the development of lupin products is warranted.

### Conclusion

While 2024 was not a successful year due to circumstances beyond our control, lupin varieties, particularly blue lupin lines, continue to hold great promise for north central Alberta. Interest in lupins, their yield, disease resistance and growth pattern in comparison to other pulse crops remains high. It is likely GRO will continue to conduct this trial in 2025, and testing them side-by-side against other pulse crops is beneficial to determine their relative net yield and return.

**Table 1.** Average plant height, maturity and yield data for blue lupin, white lupin, field pea and faba bean varieties at Lacombe and Namao in 2024, and GRO in 2023.

Type	Variety	Lacombe			Namao			GRO, 2023					
		Height (cm)	Maturity (# days)	Yield (kg/ha)	Height (cm)	Maturity (# days)	Yield (kg/ha)	Height (cm)	Yield (kg/ha)				
Blue lupin	Boregine	35	bc	1340.6	def	93	a	1371.1	b	45	b	1293	b
	Lunabor	31.8	bc	1244.5	def	--		1256.6	b	55	ab	983	b
	Probor	27.6	bc	1020.2	f	93	a	849.8	b	45	b	964	b
	Coyote	25	c	970.7	f	--		--		--		--	
	Lawler	25.7	bc	1133.9	ef	--		--		--		--	
	AGTP0013	25.7	bc	1131.4	ef	--		--		--		--	
White lupin	AGTP0054	28.6	bc	1115.1	ef	--		--		--		--	
	Dieta	33.5	bc	1478.5	de	109	c	2837	a	75	ab	590	c
	Volos	36.8	bc	1555.8	de	105.5	c	2889.2	a	75	ab	369	cd
	Bonus	38.5	b	1604	d	106.8	c	3140.3	a	--		--	
	Periwinkle	36	bc	1564.4	de	107.8	c	3120.1	a	--		--	
	Snowbird	35.4	bc	1639.8	d	--		--		--		--	
Field pea	CDC Amarillo	63	a	4572.9	a	108	c	134.8	c	103	a	5526	a
	AC Carver	64.7	a	4657	a	108	c	198.7	c	82	ab	4733	a
	CDC Lewochko	63.8	a	4819.6	a	108	c	150.8	c	88	ab	4367	a
Faba bean	Fabelle	65.1	a	112.3	c	112	b	38.4	c	--		--	
	Malik	59.7	a	112.3	c	112	b	190.9	c	--		--	
	Snowbird	57.7	a	111.5	c	112	b	32.0	c	--		--	

Values followed by the same letter in the same column are not significantly different

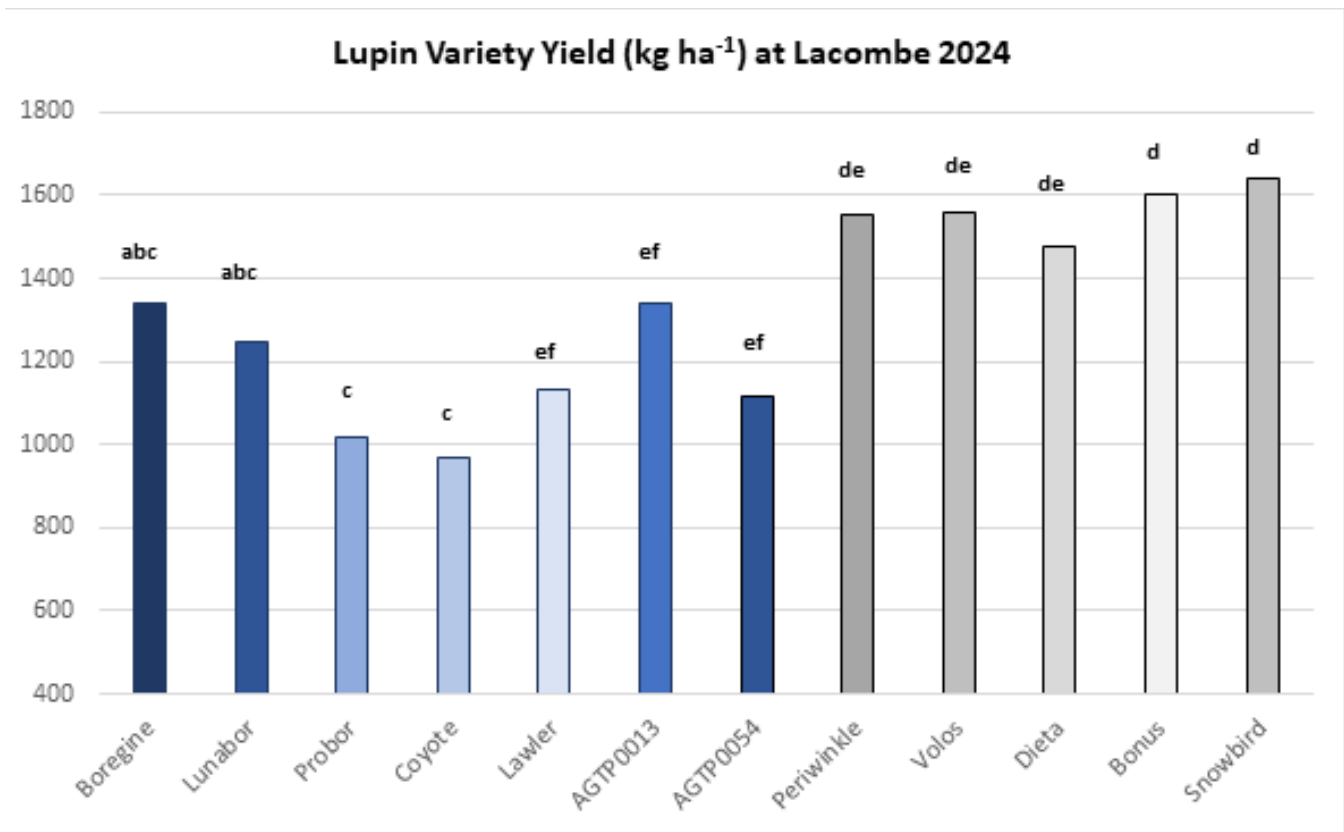


Figure 2. Yield of blue and white lupin cultivars tested at Lacombe, Alberta in 2024



*After hail*