

Progress Update on the Development of Sweet White Lupin as a New Crop for North Dakota Producers

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Lupins, a legume, are commonly utilized in many regions of the world including Australia, South America and the Mediterranean region, as a food, feed and cover crop. The market for lupin is very diverse. Lupin can be used as green manure or ground into flour to use as a wheat flour alternative. Lupin can also be canned or eaten fresh. Lupins have the nutritional characteristics to become a large player in the plant-based protein market.

For consumers, lupins are a super food.

- Contain all essential amino acids
- High protein and low starch combination mean a low glycemic index
- High fiber and rich in ferritin
- Emulsifying properties to replace allergens like butter and eggs

For producers, lupins provide an alternative legume option.

- Fix nitrogen
- Low phosphate requirement
- Tap root to access deep water during dry conditions
- High harvest ease since pods are not at soil surface

No commercial sweet white lupin varieties are well adapted to North Dakota. To address this gap, the CREC has been screening germplasm, making selections and advancing breeding lines. Lines were evaluated primarily for maturity date, yield, seed size and sweetness. In 2022, fourteen preliminary lines underwent variety trials. Variety trials were planted in Carrington, Dickinson, Hettinger, Langdon, Minot, and Williston. Each trial consisted of three to four replicated plots arranged in a randomized complete block design.



Advanced breeding line selections of sweet white lupin.

In Carrington, the selected lines all reached maturity within 100 days after planting (Table 1). The protein content within the lines was similar with a range of 27.9 to 28.5%. Yield ranged from 2025 to 2630 pounds per acre. To assess the yield stability, variety trials were again executed statewide in 2023 with three additional lines. Yield was compared across all year and statewide locations using yield rank. No single line stood out as superior in the statewide tests as seen by the similar yield means in Figure 1. Individually, line LND0614 had ranked in the top three at both Hettinger and Langdon in 2022 and 2023. Line LND0617 was the most consistent at Carrington with a ranking of 1 and 4.

Table 1. 2022 Carrington Lupin Preliminary Yield Trial.

Line	Days to Maturity DAP	Plant Height inch	Protein %	Seeds/lb	Yield lb/a
LND0127	98	25	28.2	1143	2252
LND0212	98	25	28.1	1182	2112
LND0228	99	25	28.1	1325	2146
LND0229	99	25	28.1	1311	2171
LND0431	100	25	28.5	1233	2075
LND0603	99	24	28.4	1277	2214
LND0605	98	24	28.2	1274	2162
LND0614	98	23	28.5	1242	2233
LND0617	99	24	28.2	1234	2630
LND0619	98	25	28.2	1272	2344
LND0621	99	25	28.1	1250	2348
LND0705	98	26	28.5	1301	2118
LND0727	99	27	28.4	1285	2142
LNDa210	98	26	28.3	1271	2195
Lupro 2085	99	21	28.5	1275	2025
NR55-Baer	100	21	27.9	1187	2226
*Mean	99	24	28.5	1219	1950
C.V. (%)	1.2	17.2	1.4	5.4	13.6
LSD (0.05)	2	7	0.7	109	502
LSD (0.10)	2	6	0.6	91	418

Planting Date = May 24; Harvest Date = September 22; Previous Crop = Corn

*Statistics were calculated from the larger trial.

Since lupin are consumed in various types of products, lines are undergoing further evaluations to aid in identifying the best lines for variety release. For example, in a preliminary test, green pods were harvested, shelled and cooked for four of the lines in the preliminary variety trial. Differences were noted for texture and flavor. Alkaloid testing will continue to ensure the lines

remain sweet under various environmental conditions. As the plant-based protein market space continues to grow, lupins are an excellent option to meet the growing consumer demand for plant-based protein and provide an additional legume option for producers.

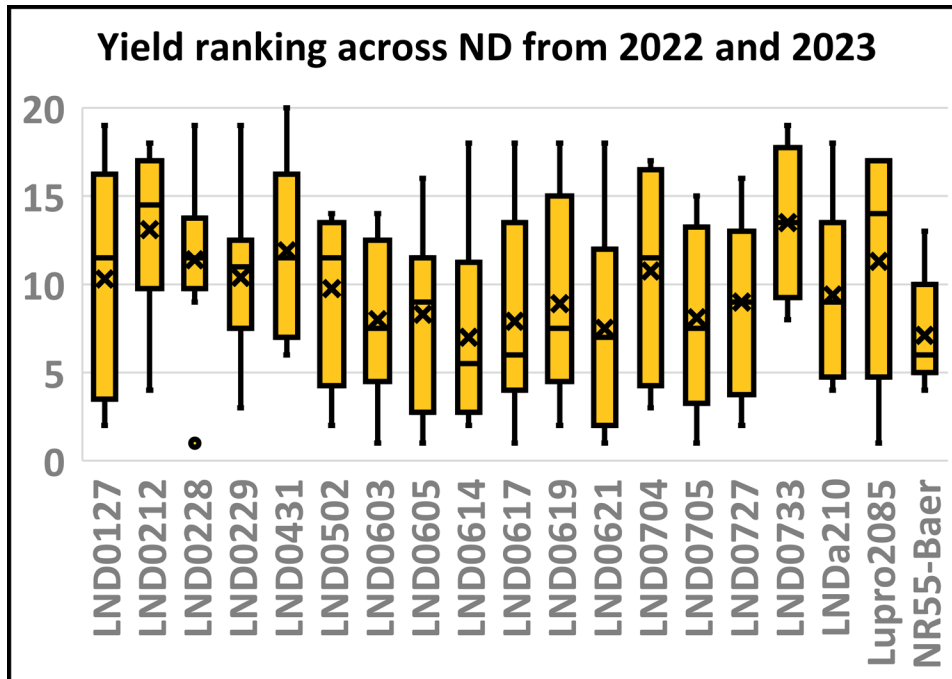


Figure 1. Yield rank results from the 2022 and 2023 statewide preliminary yield trials. Median is denoted by a line across the bar. Mean is denoted with an “x”.

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