

# CANOLA FERTILITY TRIAL

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## Introduction

Nitrogen and sulfur are two of the thirteen essential nutrients that plant roots absorb from the soil. Nitrogen is not only an essential component of all proteins, but is also taken up by the plants in large quantities. Its deficiency often results in slow and growth stunted plants along with chlorosis. Being a secondary plant nutrient, sulfur is also required in higher quantities by the plants. Apart from being a structural component of the amino acids, proteins, vitamins and enzymes, sulfur is also essential for the production of chlorophyll.

Since canola is especially responsive to sulfur, North Dakota State University fertilizer recommendations for nitrogen and sulfur are 130 to 150 pounds of nitrogen and 15 to 30 pounds of sulfur in sulfate form ( $\text{SO}_4^{2-}$ )/acre for a yield potential of 2000 to 3000 pounds of canola per acre for the Langdon area. (North Dakota Fertilizer Recommendation Tables and Equations, 2010. SF-882, Revised).

In order to fulfill these nutritional requirements, producers often apply physical blends of urea and ammonium sulfate (AMS). While a physical blend may have the nutrient quantities applicators would be aiming for, once spread on the field it may result in uneven nutrient streaking. Another option could be a homogenized blend of macro and secondary-nutrients such as nitrogen (N), potassium (K) and sulfate-sulfur ( $\text{SO}_4\text{-S}$ ), containing optimum quantities of these nutrients suitable for most soils.

## Objectives

Considering the high nutritional requirements of canola versus most crops, a fertilizer trial was conducted at the Langdon Research Extension Center in 2024. The trial was sponsored by UKT Chicago. The objective of the trial was to compare the effects of two homogenized new fertilizers, NKS (28-0-5-6 $\text{SO}_4\text{-S}$ ) and NKS (26-0-7-9 $\text{SO}_4\text{-S}$ ) versus straight fertilizers such as urea and AMS. The nitrogen in the new fertilizers is in the ammonium ( $\text{NH}_4^+$ ) and nitrate ( $\text{NO}_3^-$ ) form, so unlike urea, they are not subject to ammonia volatilization losses. The study used three different rates of nitrogen, potassium and sulfate-sulfur ( $\text{SO}_4\text{-S}$ ) and measured yield and quality of canola seed. A uniform application of P was made to all treatments based on soil available P results.

## Trial Location

Trial site was located at the NDSU Langdon Research Extension Center, Langdon, North Dakota.

## Treatments and Replications

Based on the soil analysis results, all treatments received a full rate of phosphorous that was 72 pounds per acre, whereas straight fertilizer treatments (T2, T3 and T4) that received a combination of urea and AMS did not receive any potassium. However, these treatments did receive equal amounts nitrogen and equal or close amounts of  $\text{SO}_4\text{-S}$ . Since the homogenized fertilizers NKS 28 and NKS 26 had potassium in them, T5 to T10 treatments received potassium in addition to nitrogen, phosphorus and  $\text{SO}_4\text{-S}$ . In addition, in T2 to T4, urea was treated with urease inhibitor at the rate of 14 ml for 10 pounds, and all fertilizers were applied as a surface broadcast. Details of fertilizer and nutrient types and quantities are in Table 1.

## Soil Analysis Results

A two-foot deep composite soil sample separated into 0-6 and 6-24 inch depths was taken on April 11, 2024 by taking three cores. The soil N and P levels were low, whereas K and  $\text{SO}_4\text{-S}$  levels were medium and organic matter was high in

the 0-6 inch soil depth. All of the fertilizer was hand broadcasted to individual treatments or plots followed by a shallow pass of a cultivator on May 29, 2024. Details of soil analysis results are in Table 2.

### Planting Details

At the time of planting, plot sizes were five-feet wide (with two extra rows on the outside that were pulled out on August 30, 2024 before harvest) and 22-feet long. On June 26, 2024 borders and alleyways were made that left the plot length as 15.25-feet. Final plot sizes at the time of harvest were 5.16-feet X 15.25-feet. Canola variety that was planted was BASF InVigor L340 PC. Seeding rate was 10 live-seeds per square foot (435600 live seeds per acre).

Table 1. Treatments and fertilizer/blend types and nutrients quantities per acre for the UKT Chicago trial.

Treat. #	Fertilizer Type / Blend	Explanation	N (lb/ac)	P (lb/ac)	K (lb/ac)	SO4-S (lb/ac)
T1	TSP	Full rate of P only (control)	0	72	0	0
T2	Urea + AMS	1/3 rates of N & SO4-S, full rate of P and no K	50	72	0	11.0
T3	Urea + AMS	2/3 rates of N & SO4-S, Full rate of P and no K	100	72	0	21.0
T4	Urea + AMS	Full rates of N & SO4-S, and P with no K	150	72	0	32.0
T5	NKS 28 (28-0-5-6S)	1/3 rates of N, SO4-S & K and full rate of P	50	72	9.0	11.0
T6	NKS 28 (28-0-5-6S)	2/3 rates of N, SO4-S & K and full rate of P	100	72	18.0	21.0
T7	NKS 28 (28-0-5-6S)	Full rates of N, SO4-S & K and P	150	72	27.0	32.0
T8	NKS 26 (26-0-9S)	1/3 rates of N, SO4-S & K and full rate of P	50	72	14.0	17.0
T9	NKS 26 (26-0-9S)	2/3 rates of N, SO4-S & K and full rate of P	100	72	27.0	35.0
T10	NKS 26 (26-0-9S)	Full rates of N, SO4-S & K and P	150	72	40.0	52.0

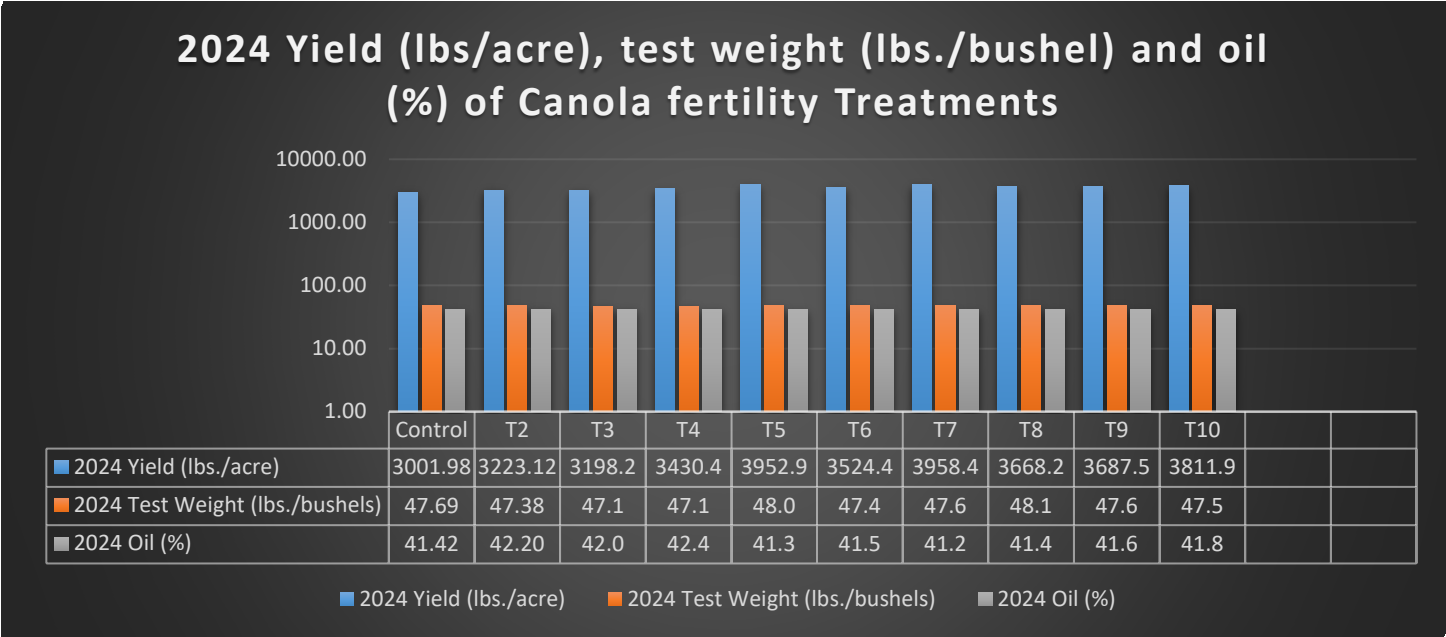
Table 2. The 2024 soil N, P, K, SO4-S, EC, SAR and pH results of the UKT Chicago trial site for the 0-6 and 6-24 inch depths.

Sample ID	Depth (inches)	NO3-N (lbs./acre)	P (ppm)	K (ppm)	SO4-S (lbs./acre)	OM %	EC (dS/m)	SAR	pH
NOK-1	0-6	4	6	435	24	5.0	0.76	1.13	7.1
	6-24	34	2	213	308	2.6	1.02	5.13	7.8

### Results and Discussion

Yields for treatments 5 and 7 had significantly higher yields versus the rest of the treatments. Both T5 and T7 received NKS 28 fertilizer. Overall, NKS 28 treatments had the highest yields followed by NKS 26 and combination of urea and AMS. Control treatment had the lowest mean. Treatment 8 had the highest test weight, whereas, T3 had the lowest. Highest oil percent was observed in T4 and T7 had the lowest. Details are in Figure 1.

Figure 1. 2024 yields, test weight and oil percent of the UKT Chicago canola fertility trial.



**Summary:**

- Best yielding treatments received NKS 28 fertilizer.
- Control treatments had the lowest yield mean.
- Homogenized fertilizers (NKS 26 and NKS 28) out yielded the straight fertilizer (urea and AMS) treatments.
- The best yielding treatments were T5 and T7 (3952 and 3958 lbs/acre). They both received NKS 28 homogenized fertilizer. The main difference between these two treatments was T5 received 50 pounds of nitrogen per acre with the full rate of phosphorus, 9.0 pounds of potassium and 11.0 pounds of SO4-S. T7 received 150 pounds of nitrogen, the full rate of phosphorus, 27.0 pounds of potassium and 32.0 pounds of SO4-S. Given the very small yield difference (5.5 lbs/acre) between T5 and T7, T5 would have the highest rate of return because of the lower nitrogen, potassium and SO4-S rates.