

Canola Tissue Nutrient Concentrations As Affected By Temporal Variability

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Introduction

The introduction of winter canola into the Oklahoma grain production system has greatly impacted management strategies utilized by Oklahoma producers. Monoculture winter wheat is the predominate cropping system of the region, with average yields of 2500-2700 kg ha⁻¹. Neither inputs nor management have been intensive. Yet canola, with a value twice that of wheat, requires significantly more management. A popular practice supported by industry is the use of tissue testing to determine nutrient recommendations.

Objectives

- Evaluate the stability of canola tissue nutrient concentrations across time of day, day, and growth stages.

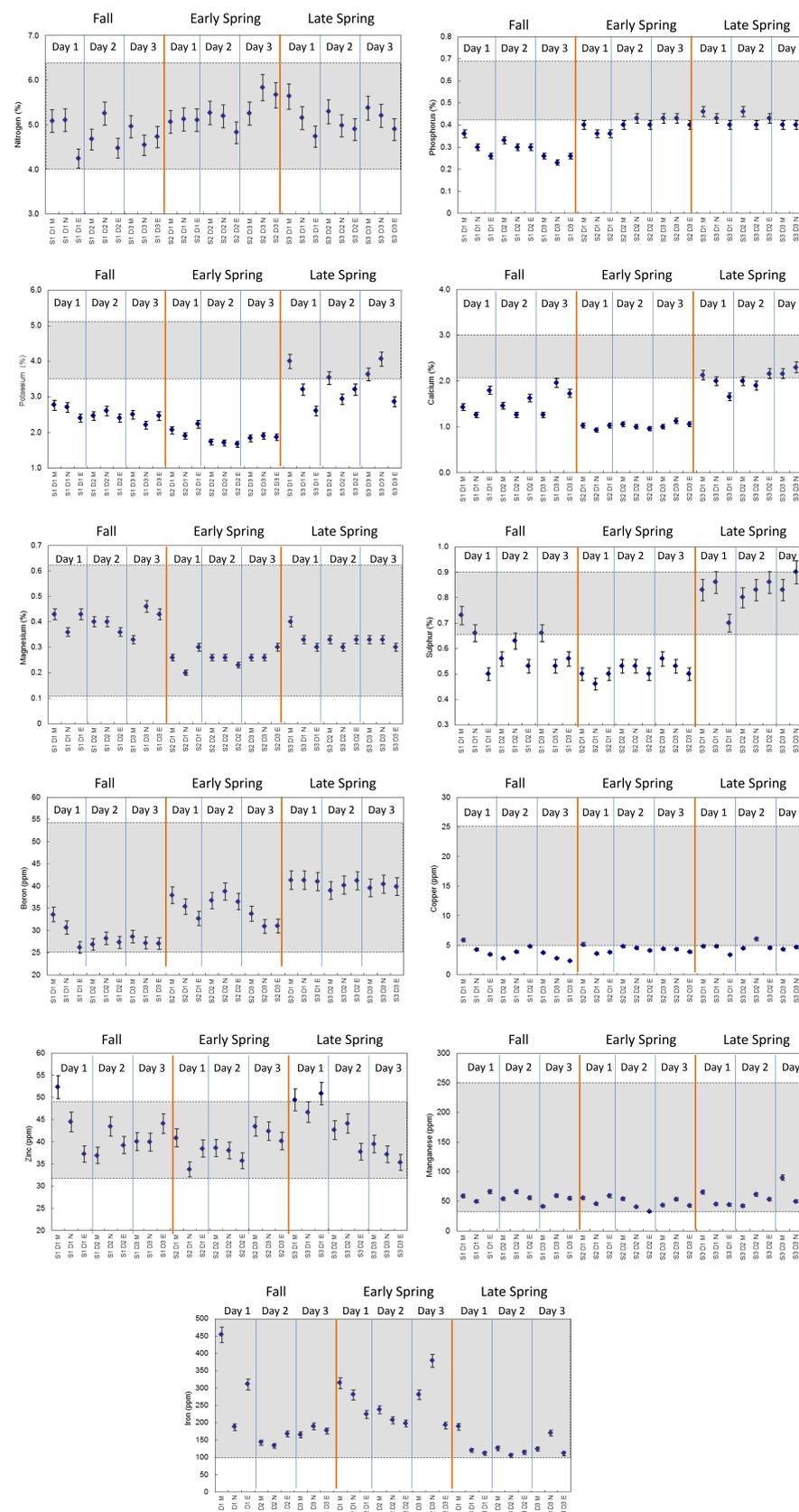
Materials and Methods

- Study was conducted on the Stillwater Research Farm.
- All samples were collected from an area 2.3m x 7.62m.
- Samples were collected by hand by clipping the whole plant at 5cm above soil surface. Fifteen plants were randomly collected from the plot for each sub-sample.
- Samples were collected at three stages: fall (rosette), early spring (after dormancy break), and late spring (pre-bolt).
- During each stage samples were collected over a period of three days.
- During each day samples were collected at morning (approx. 8 am), noon (approx. 12 pm), and evening (approx. 5 pm).
- During each sampling three sub samples were collected.
- A total of 27 samples were collected.
- Weather data was recorded for each sampling period.
- Plant mineral analysis was performed by the OSU Soil, Water, and Forage Analytical Laboratory.
- Analysis of Variance (ANOVA) was performed using General Linear Model of SAS. Fisher's protected LSD's were used to differentiate means.

Table 1. Date of sample collection for each stage.

	Fall	Early Spring	Late Spring
Day 1	12/11/12	3/5/13	4/11/13
Day 2	12/12/12	3/6/13	4/12/13
Day 3	12/13/12	3/8/13	4/13/13

Results



Figures above show the tissue concentration (% or ppm) of each measured nutrient at all sampling times. The error bars represent 5% error. The grey shaded area shows the critical nutrient values for canola (Plank and Tucker, 2000). The orange lines separate seasonal sampling stages while the blue lines separate daily samples. X-axis label; S=Stage, D =Day, M,N and E= Morning, Noon and Evening.

Plank, C.O. and M.R. Tucker. 2000. Reference sufficiency ranges-canola. p. 9-9. In C.R. Campbell (ed.) Reference sufficiency ranges for plant analysis in the southern region of the United States. Southern Cooperative Series Bulletin 394, North Carolina Department Agriculture and Consumer services agronomic Division, 4300 Reedy Creek Road, Raleigh, NC.

Discussion

- Within a day all nutrients, except P, K, and Fe had significant variability from morning to evening sampling.
- Within a stage all nutrients, except P and Cu, had significant variability from Day 1 to Day 3.
- All nutrients levels demonstrated significant difference across stages.
- The nutrient recommendations for P, K, Ca, S, CU, and Zn if based on tissue testing, would have been impacted by sampling time.
- Environment had significant impact on nutrient concentrations. The daily low and high temperatures along with the range between the two impacted nutrient concentration. Cloud cover, i.e. light interception, impacted nutrient concentration levels.



Conclusions

- Prior to this work OSU's stance on using tissue testing was as follows "Plant analysis alone cannot be used to make fertilizer recommendations" exert from the OSU Soil Fertility Handbook.
- Sampling time significantly impacted the plant nutrient concentration of all measured nutrients.
- This work did not evaluate accuracy of the critical values only the stability of canola tissue concentration over time.
- At this time OSU's stance on the use of tissue testing remains unchanged. While the use of plant analysis remains a useful tool in observing crop status, it should not be used for nutrient recommendations.

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