NEWSLETTER
Diversification Centres

January 2024

Winter Wheat Plants – Source: PCDF

Winter Wheat at PCDF: Sleeping Beneath a Blanket of Snow

It is mid-winter, and the sun dips early beneath the orange horizon. The air temperature immediately begins to drop. The winter has been surprisingly mild so far, but recorded night-time temperatures in Roblin have still dropped as low as -18 °C. Waterlines freeze and vehicles are sluggish to start.

Beneath a thin layer of snow, however, lies a very different world. Acting as a layer of insulation, snow cover prevents cold temperatures from penetrating as quickly and as deeply as it would into soil ground with no snow cover. For crops such as winter wheat, which must maintain a living root in the soil through the long winter months, the ability of snow to insulate against bitter cold is vital. The Parkland Crop Diversification Foundation (PCDF) seeded winter wheat on September 26, slightly later than the recommended ideal window of late August to mid-September.

The soil moisture was poor at seeding, but a shallow seeding depth and a few timely rains helped the plants germinate and develop good-sized crowns.

Two months later, the plants are alive and well, still green beneath their snowy blanket. Manitoba Agriculture's Land Use and Ecosystem Resilience team has set up sensors to monitor soil temperature at PCDF's winter wheat plots. The ambient air temperature recently dropped to -10 °C in Roblin, but the soil was a cozy -3 °C in the root zone. Based on the conditions so far, we anticipate good winter survival.

For more information on the factors that contribute to the successful overwintering of winter wheat crops, check out this valuable resource from Manitoba Crop Alliance: Factors Affecting Winter Wheat Survival.

Winter Wheat Trial Plots at PCDF. The photo was taken after planting on September 29, 2023 – Source: PCDF

Manitoba Diversification Centres to Showcase Research Innovation at Key Agricultural Expos in 2024

The Manitoba Diversification Centres are set to host booths at three prominent agricultural events in 2024, including MB Ag Days, MB Potato Production Days, and the CropConnect Conference. These winter expos, renowned for their focus on agricultural expertise, technology, and equipment, are anticipated to draw exhibitors and visitors from all corners of Canada. Scheduled for January 16 to 18 at the Keystone Centre Brandon, MB Ag Days is a premier showcase of agricultural innovation. Taking place from January 25 to 28 at the Keystone Centre in Brandon, Manitoba Potato Production Days provides a platform to communicate up-to-date and relevant information on potato production and research outcomes to producers. The booth at Potato Days is spearheaded by the Manitoba Horticulture Productivity Enhancement Centre (MHPEC). The CropConnect Conference, slated for February 14 and 15 at Victoria Inn Convention Centre in Winnipeg, is a gathering for producers and professionals in the agricultural industry.

The Manitoba Diversification Centres will host booths at these events featuring the latest advancements in crop technologies, providing a platform for farmers, industry experts, and enthusiasts to explore innovative solutions for their operations. These events are not only valuable for showcasing the expertise and advancements within Manitoba's agriculture sector but also provide a unique chance for the agricultural community to connect, collaborate, and stay at the forefront of industry trends.

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Diversification Centres Test-growing White and Blue Lupins for Food

In 2023, lupins were grown at the Manitoba Diversification Centres for the first time at the Manitoba Crop Diversification Centre (MCDC) and the Westman Agricultural Diversification Organization (WADO). As with most legumes, species specific inoculant is required for successful lupin development. The project aimed to compare blue and white lupins to field peas performance.

Lupins are a type of legume that contain around 36% protein, which is significantly higher than the protein content found in field peas, which is around 24%. In addition, lupins are resistant to root diseases like Aphanomyces and provide stubbles compared to field peas. The results of the 2023 growing season have finally been released, and they appear to be very promising. Blue lupins matured several days earlier than field peas, with white lupins about 8-10 days later. While blue and white lupin yields were less than field pea, but when we factor in protein content, the crops are relatively on par with each other regarding protein yield per acre. This project was conducted in cooperation with Lupin Platform Inc. and funded by the Manitoba Pulse and Soybean Growers Association. The project is scheduled to continue in the year 2024. For project results, please see WADO's Annual Research Report on the Manitoba Diversification Centres' website.

2023 Crop of White and Blue Lupins – Source: WADO

Crop Maturation and Stubble Formation – Source: WADO

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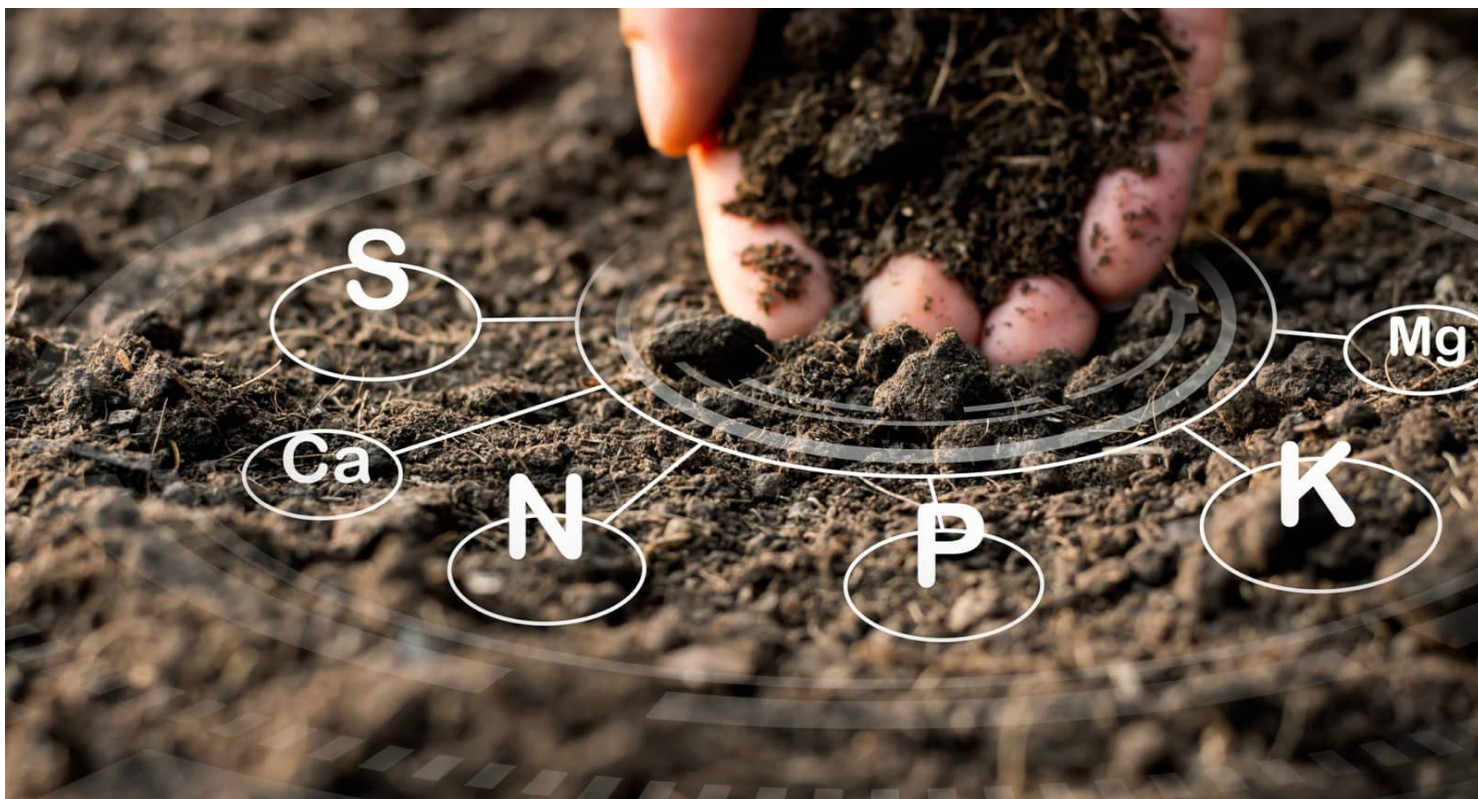# Analyzing Soil Samples Using a NIRS Soil Tester

Photo Credit – SodSolutions

The Near Infrared Reflectance Spectroscopy (NIRS) is a rapid and cost-effective soil analysis technique. Recently, there has been an increased interest in utilizing the NIRS for the analysis of soil parameters, which otherwise require expensive and time-consuming analytical methods. The NIRS is being used widely for the analysis of forages and feedstuffs, but its use in soil analysis is relatively new.

Soil is a very heterogeneous medium, and its complex properties pose a challenge to use the NIRS for soil analysis. Contradictory results for given soil properties have been reported and can be attributed to a lack of standardized methodology in relation to (i) sample preparation, (ii) spectrum acquisition, (iii) spectrum pre-treatment, (iv) soil texture, (v) geological heterogeneity of soil, (vi) reference method, and (vii) calibration method.

Sample preparation is very important for analyzing crops or plants for NIRS predictions, and it may account for 60 to 70% of all prediction errors. The preparation of soil samples is also expected to affect the accuracy of NIRS predictions, given the heterogeneous nature of the material. Preparing soil samples includes sampling, blending, subsampling, removing foreign material such as roots and rocks, drying when samples are not analyzed ''as is'' or ''as received,'' sieving or grinding, and storing. Changes in the moisture content or particle size of soil samples are also known to affect the NIRS spectrum quality.

Contact us: info@mbdiversificationcentres.ca

The performance of NIRS-based soil analysis is determined by calculating the coefficient of determination (r^2) and the RPD (Ratio of standard error of Performance to standard Deviation). The RPD is equal to the SEP (Standard Error of Prediction) divided by the standard deviation of the samples' compositional values (determined via wet chemistry) in the test set. Simultaneous consideration of these statistics is recommended. Table 1 shows the standardized guidelines for assessing the accuracy of NIRS predictions of soil attributes.

Table 1. Standardized guidelines for the assessment of the accuracy of NIRS predictions of soil attributes

Calibration performance	r^2	RPD
Very reliable	*>0.9*	*>3*
Reliable	*0.7-0.9*	*1.75-3*
Less reliable	*<0.7*	*<1.75*

During 2023, the Prairies East Sustainable Agriculture Initiative (PESAI) tested a handheld NIRS tester to analyze soil samples for macronutrients, organic matter, pH and cation exchange capacity (CEC). This NIRS tester is reported to be calibrated based on more than 1,700 soil samples from North America. We analyzed the same soil samples using a NIRS tester or sending them to a commercial soil testing laboratory. For N, P, K, and S, 16 soil samples were compared, whereas for organic matter, pH, and CEC, only 10 were compared.

The results are presented in Table 2. We calculated r^2 to find any correlation between NIRS testing and laboratory results for different soil parameters. The r^2 values for all tested soil parameters were less than 0.7, suggesting that both analyzing methods are not comparable. The r^2 values were significantly correlated only for sulphur determination. Nitrate (lbs/acre) values among different soil samples varied from 57-84 for NIRS testing, whereas this range was 4-122 from laboratory results.

Table 2. Coefficient of determination between both soil analyzing methods for different soil parameters.

Soil attribute	NO_3	P	K	S	OM	pH	CEC
r^2	*0.047*	*0.239*	*0.392*	*0.603*	*0.026*	*0.104*	*0.011*
P value	*0.416*	*0.055*	*0.463*	*0.000*	*0.656*	*0.363*	*0.767*

Information Source: Nduwamungu, C., Ziadi, N., Parent, L.E´., Tremblay, G.F. and Thurie`s, L. 2009. Opportunities for, and Limitations of, Near Infrared Reflectance Spectroscopy Applications in Soil Analysis: A Review. Can. J. Soil Sci. 89: 531-541.

Nirmal Hari Presenting at SICTC Grain Info Day

Nirmal Hari, Applied Research Specialist with Manitoba Agriculture, is presenting at South Interlake Grain Day on January 4, 2024. The South Interlake Crop Testing Committee (SICTC) at Clandenboye will host this grain information day. Nirmal's presentation will focus on "PESAI Research Program – Crop Research Results from the Interlake."

View our videos on YouTube: www.youtube.com/@manitobacropdiversificatio5457