ARBUSCULAR MYCORRHIZAL FUNGI EFFECTS ON WHEAT PERFORMANCE

Canada is a world-leading wheat producer, with 9.9 million mt of spring wheat produced in 2022. However, many regions in western Canada have been experiencing frequent and severe droughts over the last few decades, which can lead to 50% yield losses in spring wheat. Wheat plants can form a mutually beneficial arrangement with a fungus that form tree-like structures (arbuscules) on cortical root cells of the plant. It is well known that mycorrhizal plants are more drought tolerant compared to non-mycorrhizal plants. Earlier studies have shown that some genotypic variability exists for arbuscular mycorrhizal fungi (AMF) root colonization in durum wheat and its subsequent impact on wheat production in Canada. These studies have shown positive responses of AMF for plant biomass, nutrient uptake, and yield. With the current crop rotation in Alberta, non-mycorrhizal crops disrupt the AMF stabilization in the soil. Therefore, effective AMF inoculants may help to re-establish the AMF-plant symbiotic relationship.

Wheat is very sensitive to drought stress at tillering, heading, and flowering. Many reports reveal that AMF effectively improves crop production, especially under drought conditions. AMF are obligate biotrophs, which are associated with 80% of the land plants. AMF forms an extensive fungal network within the soil and explores soil pores, where the plant root system cannot contact, accessing water unavailable to non-AM plants. AMF also improves water retention capacity, which supports plant growth even under drought conditions. AMF modulates protein under drought stress in wheat roots reducing the osmotic stress and maintaining cellular integrity. However, detailed field studies have not been conducted to identify Canadian spring wheat cultivars that encourage AMF and alleviate drought stress under Alberta soil and climatic conditions. Therefore, the identification of spring wheat cultivars for enhanced compatibility with AMF under drought conditions will help wheat producers mitigate the negative effects of drought stress, thus improving plant growth, yield, grain quality, and profitability.

This study was conducted at two locations (U of A and GRO) to assess the performance of six Canadian Western Red Spring (CWRS) wheat cultivars under field conditions. The cultivars evaluated in this study included Go Early, CDC Utmost, AAC Hodge, AAC Hockley, AAC Viewfield, and AAC Brandon. Key parameters examined included root colonization, water-use efficiency, plant growth, nutrient uptake, grain yield, and grain protein production. The preliminary findings presented in this report are based on data collected from the GRO site.

Agronomics:

Seeding Date: May 14, 2024
Seeding Depth: 1 inch
Seeding Rate: 350 plants/m^2
Fertilizer:
- Fall applied by producer: 46-0-0 (coated with Neon Air) @ 163.04 lbs/ac = 75 lbs/ac actual N
- Spring applied:
  - side banded: 18.5-4.6-26.4-4.0 @ 378.55 lbs/ac = 70 lbs.ac actual N; 17 lbs/ac actual P; 100.0 lbs/ac actual K; 15.0 lbs/ac actual S

Pesticide:
- MCPA Ester 600 + Pardner @ 320 mL/ac on June 10
- Prestige A+B @ 710 mL/ac + 600 mL/ac on June 24
- Bison 400L @ 200 mL/ac on June 24

Rainfall: recorded from May 1 - September 15: 221.2 mm
Harvest Date: September 18, 2024

Results and Discussion:

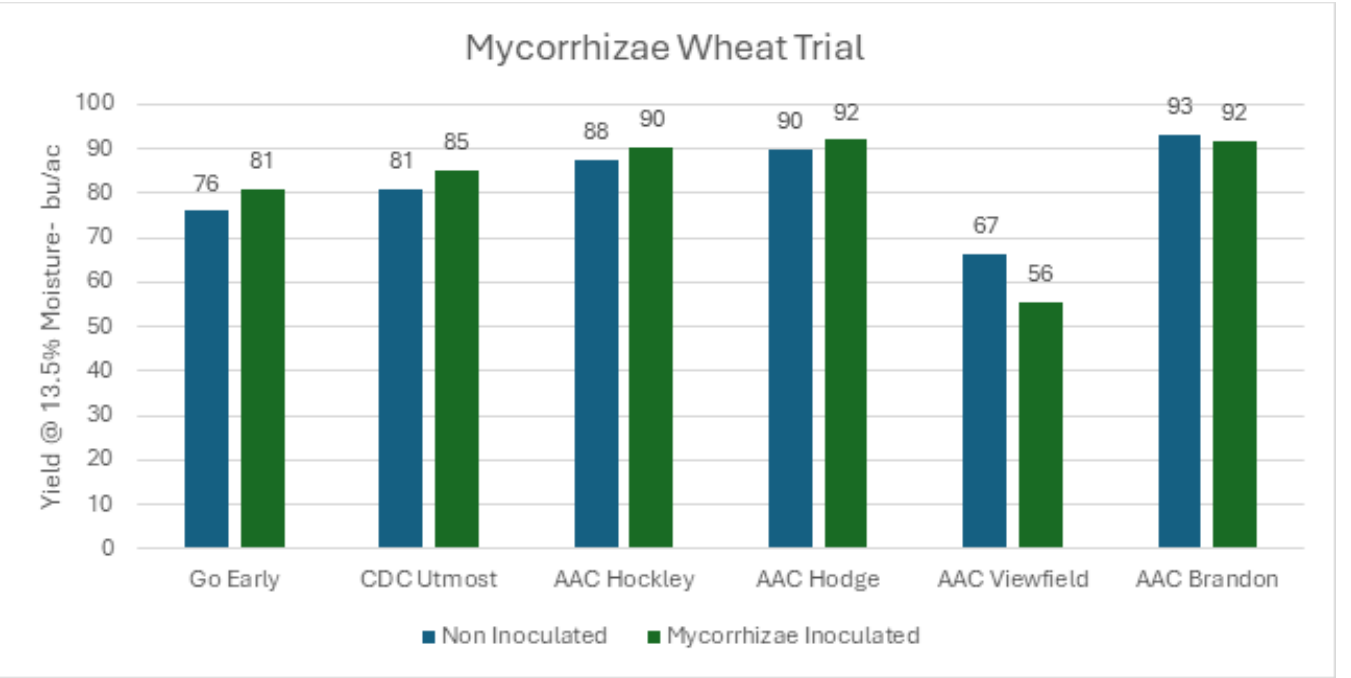
In conclusion, although Mycorrhizae inoculation did not consistently outperform non-inoculated treatments across all evaluated parameters, it exhibited significant benefits in terms of plant height and specific quality attributes. These findings suggest that while Mycorrhizae may not provide an immediate increase in yield, its potential long-term contributions to soil health and overall plant performance require further investigation over multiple growing seasons.

Mycorrhizae Wheat Trial -Westlock - 2024

Trt #	Treatment Name		Height (cm)	Lodging (1-9)	Yield (bu/ac)	Test Weight lbs/bu	Test Weight kg/HL	TKW (g/1000 seeds)	Protein (%)	Gluten (%)
1	Go Early	Non-Inoculated	94 a	1 -	76 d	66.3 bcd	81.8 b-e	51.30 ab	15.8 ab	41.8 -
2	CDC Utmost		85 b	2.3 -	81 c	67.0 abc	82.3 bcd	48.99 cde	15.1 ab	40.0 -
3	AAC Hockley		74 d	1 -	88 ab	67.5 abc	83.3 a-d	50.85 abc	15.5 ab	38.9 -
4	AAC Hodge		80 c	1 -	90 ab	68.5 ab	84.5 ab	49.64 bcd	15.0 ab	41.4 -
5	AAC Viewfield		68 e	1 -	67 e	65.8 cd	81.0 de	47.51 e	16.4 a	41.8 -
6	AAC Brandon		80 c	1.0 -	93 a	68.3 abc	84.5 ab	52.26 a	15.2 ab	40.2 -
7	Go Early	Mycorrhizae Inoculated	96 a	1.3 -	81 c	66.0 bcd	81.5 cde	51.35 ab	15.9 ab	42.4 -
8	CDC Utmost		87 b	2.8 -	85 bc	67.3 abc	83.0 a-d	48.83 de	15.4 ab	41.0 -
9	AAC Hockley		75 d	1.0 -	90 ab	68.3 abc	84.3 ab	50.49 a-d	15.4 ab	38.4 -
10	AAC Hodge		82 c	1 -	92 a	68.3 abc	84.0 abc	50.54 a-d	14.8 b	40.2 -
11	AAC Viewfield		66 e	1 -	56 f	64.3 d	79.5 e	44.54 f	16.2 ab	40.5 -
12	AAC Brandon		79 c	1 -	92 a	69.0 a	85.3 a	51.41 ab	15.4 ab	40.2 -
	LSD P=.05 (% mean diff)		2.87 (4%)	0.50 (40%)	4.08 (5%)	1.58 (3%)	1.75 (3%)	1.3525 (3%)	0.868 (6%)	2.689 (7%)
	Standard Deviation		2	0.35	2.84	1.1	1.22	0.94	0.6	1.87
	CV		2.5	27.5	3.44	1.64	1.47	1.89	3.9	4.61

Means followed by same letter or symbol do not significantly differ (P=.05, Student-Newman-Keuls).

ARBUSCULAR MYCORRHIZAL FUNGI EFFECTS ON WHEAT PERFORMANCE CONT'D



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