CANADIAN PRAIRIES

High Yielding Barley Production

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Spring barley (*Hordeum vulgare L.*) is the third most common crop grown on the Canadian Prairies, occupying approximately 9.2 million acres. The barley is grown principally for livestock feed and malt production. Next to oats, it is the highest yielding of the cereal crops grown in the region, with yields averaging from 60 to 80 bu/A.

Spring barley responds to improved management practices, including pedigreed seed and tillage systems to conserve surface moisture. While nitrogen (N) and phosphorus (P) are key, potassium (K), sulfur (S), and other nutrients also contribute to increased yields.

The yield potential of barley is higher than that of hard red spring wheat, as barley produces more tillers and heads and has a higher rate of kernel dry matter accumulation. Achieving this increased yield potential requires that the crop's nutritional needs be met. As a result, farmers report that they manage barley with higher levels of fertility than wheat or oats. A survey of top barley producers by Alberta Agriculture found that there were a number of common management practices being used to achieve high yields. These included:

- Avoiding seeding barley on barley stubble reduces the negative effects of leaf and root diseases.
- Completing most of the tillage in the fall minimizes the tillage required for crop establishment in the spring. This is critical to managing surface soil moisture and allows for shallow seeding (less than 2 inches deep).
- Almost 50 percent of top barley producers used pedigreed seed, much higher than the 15 to 20 percent more common among the general farm population.
- Seed was treated to minimize the impact of seedling rot, blight, and covered and loose smut.
- Farmers sampled their fields to evaluate soil nutrient status at least once every four years.
- Timing of fertilizer N banding was equally divided between fall and spring, with most farmers indicating they prefer the fall application as a means of minimizing spring soil disturbance.

Westco Fertilizers Ltd. of Calgary, Alberta has worked for a number of years to evaluate the crop management strategy that would be required to achieve a 200 bu/A barley yield. Using the cool, sub-humid growing conditions of central Alberta as their trial ground, they were successful in almost achieving this yield

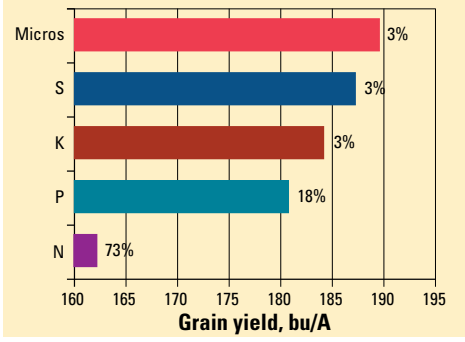

Figure 1. Westco barley yield response to macro and micronutrients. Number in percent represents the portion of total response attributable to individual nutrients. Check yield was 86 bu/A.

TABLE 1. Soil test information.

Depth, inches	Texture, hand	pH	EC mS/cm	N	P[1]	K	S	Cl
				lb/A				
0-6	Loam	7.7	0.77	66	18 (L)	208 (M)	24	24
6-12	Loam	8.4	0.53	24	2	176	22	30
12-24	Clay	8.5	1.09	20	0	352	124	20

[1]Miller and Axhley
L = low; M = marginal

goal in 1990, with a recorded yield of 190 bu/A.

Using the six-row feed barley cultivars, a series of 19 experiments was conducted between 1990 and 1998 to evaluate high yielding barley management. The trials were designed to determine the incremental effect on barley yield of adding each of the macronutrients and a blend of micronutrients. The crop was seeded at a rate of 2 bu/A (96 lb/A or about 28 seeds per square foot), with fertilizer N (urea) rates pre-seeding banded at 0, 72, 144, and 216 lb N/A. Phosphorus (triple superphosphate) was applied at a rate of 54 lb P_2O_5/A, with 50 percent in the seedrow with the seed and 50 percent with the pre-seeding N band. Potassium (KCl) was applied at the same rate (54 lb K_2O/A) and method as P. Sulfur [ammonium sulfate, $(NH_4)_2SO_4$] was pre-seeding band-applied at a rate of 21 lb/A sulfate-S (SO_4-S) with the N, and N rates were adjusted for the N in the $(NH_4)_2SO_4$. A blend of micronutrients...boron (B), 2 percent; copper (Cu), 4 percent; iron (Fe), 4 percent; manganese (Mn), 8 percent; and zinc (Zn), 18 percent...was seedrow applied at a rate of 12 lb/A of product. The foliar fungicide Tilt (propiconazole) was applied to the entire test area at flag leaf emergence for control of leaf spotting diseases.

The maximum barley yield of 190 bu/A was achieved in 1990 and is an average of the three N rates (72, 144, and 216 lb/A), in combination with the P, K, S, and micronutrient additions (**Figure 1**). The barley cultivar Virden was used. It is a late maturing variety with very good lodging resistance. The trial site had a high level of background N fertility (**Table 1**), resulting in a check yield of 86 bu/A. Considering each of the nutrients added, N was responsible for 73 percent of the yield increase over the check, P for 18 percent, while K, S and micronutrients each contributed 3 percent. These responses reflect the dominant role that N and P play in correcting the bulk of crop nutrient deficiencies on the Canadian Prairies.

Barley is also grown for silage production in many areas of the Northern Great Plains. While cultivar selection can have some effect on the final forage yield harvested, there is a strong relationship between grain yield and total crop biomass yield. Related research in Alberta evaluating barley cultivars and nutrient management for silage found that optimum N and P fertility was a cornerstone to achieving both high silage yields and high quality.

Achieving high yields of barley requires careful attention to both the agronomic and nutrient requirements of the crop. While farmers have little control over year-to-year variability in environmental conditions, they can implement management strategies that will ensure they optimize production in any given year. BC

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