SF-723 (Revised)

Fertilizing **Malting and Feed Barley**

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Malting barley, like other small grains, responds well to nitrogen fertilizer when grown on soils testing low in nitrate-nitrogen. However, malting barley quality is affected by protein content. It is desirable to have low protein (13.5% or less). Care must be taken to adjust fertilizer rates with soil test levels, management practices and realistic yield goals.

Date of Planting: Research has shown early planting will improve the chance of obtaining low protein malting barley. Figure 1 shows the relationship between seeding date and nitrogen levels on the protein content of malting barley. The nitrogen fertilizer recommendations in Table 1 assume that the planting date will be before May 15.

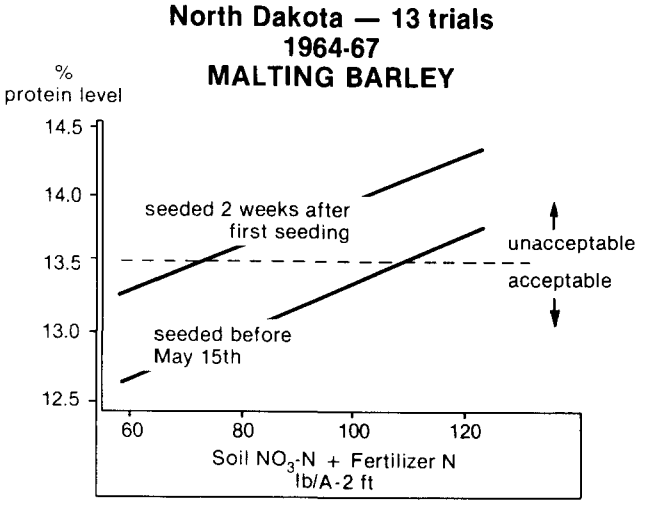

Figure 1. Effect of Seeding Date and Nitrogen Level on Protein Content of Malting Barley.

Yield Goals: The most efficient rate of fertilizer will depend on the residual soil nutrient level as determined by a soil test and the yield goal. Yield is influenced by: 1) the local climate; 2) the soil type; and 3) management (timeliness of planting, plant population, variety, weed control, etc.). Yield goals should be realistic and usually based on long-time averages and on the management ability of the grower but adjusted to conditions expected for the upcoming year (see Circular SF-822).

Excessive fertilizer use, especially nitrogen and phosphorus, has potential to degrade ground and surface water quality. Establishing realistic yield goals, carefully soil sampling fields and fertilizing crops according to soil tests will help preserve water quality.

Fertilizer Recommendations: Table 1 shows the amount of soil nitrate-nitrogen in the top 2 feet of soil plus nitrogen fertilizer needed to meet the crop requirements for various yield goals. These data are based on nitrate-nitrogen levels in soil samples taken between September 15 and April 1. If soil samples are taken between July 1 and

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September 15 subtract 0.5 pounds of nitrogen from the recommendation for each day prior to September 15 that the soil was sampled. These adjustments are automatically included in recommendations received from the North Dakota State University Soil Testing Laboratory.

The phosphate (P_2O_5) and potash (K_2O) recommendations in Table 1 are for **broadcast application.** To convert the broadcast recommendations for P and K in Table 1 to band rates reduce the broadcast rate by one third on very low testing soils. Drill-row applications of $N + K_2O$ should not exceed 30 pounds per acre. When using urea as the N source, drill-row applications of $N + K_2O$ should not exceed 15 pounds per acre with a 6-7 inch row spacing. When using a wider row spacing do not apply any urea with the seed.

Since phosphorus and potassium move very little in the soil it is possible to "build up" or increase the available level of these nutrients in the soil. The application of approximately 20 pounds of P_2O_5 per acre will increase the phosphorus level by 1. In other words, if your phosphorus soil test level is 5 and you prefer to operate at a test level of 12, the application of 140 pounds of P_2O_5 (305 pounds of 18-46-0) per acre thoroughly mixed in the top 6 inches of soil will raise the soil test level by 7. Likewise, the application of 10 pounds of K_2O per acre will increase the potassium soil test by 1.

Methods Of Application: The best method of nitrogen application will depend on the nitrogen source used. For example, to control application loss anhydrous ammonia should be applied 4-6 inches beneath the soil surface, while nitrogen solutions, broadcast urea and other dry nitrogen fertilizer products should be worked into the soil shortly after application. Applying nitrogen fertilizer on well-drained sandy soils in the fall is not recommended because of possible loss by leaching.

Crops growing on soils that test low in P and/or K depend heavily on applied fertilizer. On soils testing medium or above, the crop is much less dependent on applied fertilizer for its needs. Fertilizer is applied on these soils to replace that removed by the crop and/or as a starter to get the crop off to a fast start. On very low testing soils, where the crop depends primarily on the fertilizer for its needs, the method of application will influence the amount of fertilizer plants can recover. **Broadcast** fertilizer is thoroughly mixed with the soil and as a result some is unavailable to plant roots when the soil surface dries. **Band or drill row** fertilizer is applied closer to the seed and can be more efficiently recovered by the crop.

Broadcast applications of phosphate and potash may be more efficient when applied before a deep tillage operation. Recent data indicates a starter application containing phosphorus is effective in a dry year with limited early season root growth. Profitable yield responses have been obtained under these conditions on high phosphate level soils across low rainfall production areas.

Secondary and Micronutrients: Sulfur deficiencies are not common in North Dakota, but may occur early in the growing season on sandy soils. If a crop appears to be deficient in nitrogen but does not respond to nitrogen applications, test for sulfur. **Response to applications of iron, zinc, copper and manganese by small grains are rare in North Dakota.** Small grains are not classed as zinc or iron sensitive.

Barley grown on soil with less than 40 pounds of chloride (Cl) per acre in the top 2 feet of soil may respond to the application of chloride fertilizer. Barley grown on soils with 40 to 60 pounds Cl per acre occasionally responds to chloride fertilization. The chloride soil test can be performed on the same samples taken for the nitrate test. Soil samples to be tested for chloride must be handled carefully to avoid contamination from perspiration.

Nutrient recommendations for malting barley.

Yield goal	Soil N plus fertilizer N required		Soil Test Phosphorus, ppm					Soil Test Potassium, ppm				
			VL	L	M	H	VH	VL	L	M	H	VH
		Bray-I	0-5	6-10	11-15	16-20	21+	0-40	41-80	81-120	121-160	161+
		Olsen	0-3	4-7	8-11	12-15	16+					
bu/a	lb/acre-2'		------ lb P_2O_5/acre ------					------- lb K_2O/acre -------				
40	60		30	20	15	0	0	45	30	20	0	0
60	90		40	30	20	0	0	70	50	30	10	0
80	120		55	40	25	10	0	90	65	40	15	0
100	150		70	50	30	10	0	115	80	50	15	0

Nitrogen recommendation = 1.5 YG - STN + SDA - PCC
Bray-I P recommendation = (0.785-0.039 STP)YG
Olsen P recommendation = (0.785-0.050 STP)YG
Potassium recommendation = (1.2860-0.0085 STK)YG

The abbreviations used in the equations are as follows:

YG = yield goal
STN = soil test nitrogen
STP = soil test phosphorus
STK = soil test potassium
SDA = sampling date adjustment
PCC = previous crop credit

Nutrient recommendations for feed barley.

Yield goal	Soil N plus fertilizer N required		Soil Test Phosphorus, ppm					Soil Test Potassium, ppm				
			VL	L	M	H	VH	VL	L	M	H	VH
		Bray-I	0-5	6-10	11-15	16-20	21+	0-40	41-80	81-120	121-160	161+
		Olsen	0-3	4-7	8-11	12-15	16+					
bu/a	lb/acre-2'		------ lb P_2O_5/acre ------					------- lb K_2O/acre -------				
40	70		30	20	15	0	0	45	30	20	0	0
60	100		40	30	20	0	0	70	50	30	10	0
80	135		55	40	25	10	0	90	65	40	15	0
100	170		70	50	30	10	0	75	80	50	15	0

Nitrogen recommendation = 1.7 YG - STN + SDA - PCC
Bray-I P recommendation = (0.785-0.039 STP)YG
Olsen P recommendation = (0.785-0.050 STP)YG
Potassium recommendation = (1.2860-0.0085 STK)YG

The abbreviations used in the equations are as follows:

YG = yield goal
STN = soil test nitrogen
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STK = soil test potassium
SDA = sampling date adjustment
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