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Idaho Fertilizer Guide

Malting Barley

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The following fertilizer guidelines are based on relationships developed between University of Idaho soil tests and crop yield response. The fertilizer rates suggested are based on research results and are designed to produce above average yields if other factors are not limiting production. Thus, the fertilizer guide assumes good crop management.

The suggested fertilizer rates will be accurate for your field provided that the soil samples are properly collected, representing the area to be fertilized, and crop history and yield information are complete and accurate.

Nitrogen

Nitrogen (N) application rates depend upon previous crops, previous N fertilizer additions, release of N from organic matter, soil type, irrigation management and length of growing season. Enough N fertilizer should be applied to obtain maximum economic yield without significantly increasing protein content of standard malting barley varieties.

Soil Sampling and Testing

Soil testing is the best way to evaluate residual inorganic soil N. Residual soil N results from previous N fertilizer applications or the breakdown of plant residues containing N, such as peas, beans and alfalfa.

Soil samples should represent the 0- to 12-inch and 12- to 24-inch soil depths or the effective root zone. Soil samples should be collected before seeding in the spring to represent the area to be fertilized. At least 20 individual samples per depth increment should be collected per field. Each depth sample should be mixed thoroughly to make up one soil sample weighing approximately 1 pound to be submitted to the laboratory.

Soil test nitrate-N (NO_3-N) and ammonium-N (NH_4-N) values are typically reported in parts per million (ppm). To convert NO_3-N and NH_4-N values to pounds N/acre, add the soil test N values (ppm) for each foot increment and multiply by 4 as shown in Table 1.

Table 1. Example calculation of N in profile using depth samples.

Depth	NO_3-N	NH_4-N	Total NO_3-N and NH_4-N		Total NO_3-N and NH_4-N
(inches)	(ppm)	(ppm)	(ppm)	Multiplier	(lb/acre)
0 to 12	13	2	15	× 4	60
12 to 24	6	2	8	× 4	32
Total	19	4	23	× 4	92

Previous Crop Residue

Nitrogen associated with decomposition of previous crop residues should be considered when formulating N fertilizer needs. Microbes decomposing cereal straw and corn stalks remove N from surrounding soil. About 15 pounds N/acre are needed per ton of these incorporated residues up to a total of 50 pounds N/acre. Wheat returns about 90 pounds of straw per bushel of grain while barley returns roughly 75 pounds of straw per bushel of grain.

Malting barley following beans, peas or alfalfa can obtain considerable N from decomposed residue of these crops. A spring soil sample will evaluate the N released from bean and pea residues since these residues are readily decomposed. Fall-plowed alfalfa stubble will provide an additional 40 to 60 pounds available N for malting barley production which will not be detected by spring soil testing.

Nitrogen Application Rates

Rates of fertilizer N required to produce high-quality malting barley are determined using spring soil test information and the previous crop to estimate the amount of N required (Table 2). For example, a field previously cropped to alfalfa with a soil test indicating 40 pounds N/acre would require the addition of 20 pounds N/acre (Table 2). Note the recommendations for malting barley following alfalfa have been adjusted for the additional N released from fall-plowed alfalfa stubble.

Table 2. Nitrogen fertilizer rates based on spring soil test and previous crop.

Spring soil test (0- to 24-inch depth)	Apply these N rates when following: Alfalfa	Row crop	Grain crop (residue returned)
(N lb/acre)*	(lb N/acre)		
0	60	120	170
20	40	100	150
40	20	80	130
60	0	60	110
80	0	40	90
100	0	20	70
120	0	0	50

*Based on calculation from Table 1.

Fig. 1 summarizes the relationship between grain yield (adjusted as a percent of maximum yield at each location) and residual plus applied N developed from field experiments across southern Idaho. The data indicate that maximum yield will occur at or near 120 pounds N/acre without the danger of excessive grain protein content. Kernel plumpness is highly dependent on variety. Some varieties are more sensitive to excessive N levels than others. Because of varietal differences, the kernel plumpness data presented in Fig. 1 reflect the general malting barley response to increased N availability and should not be used to predict responses of specific varieties.

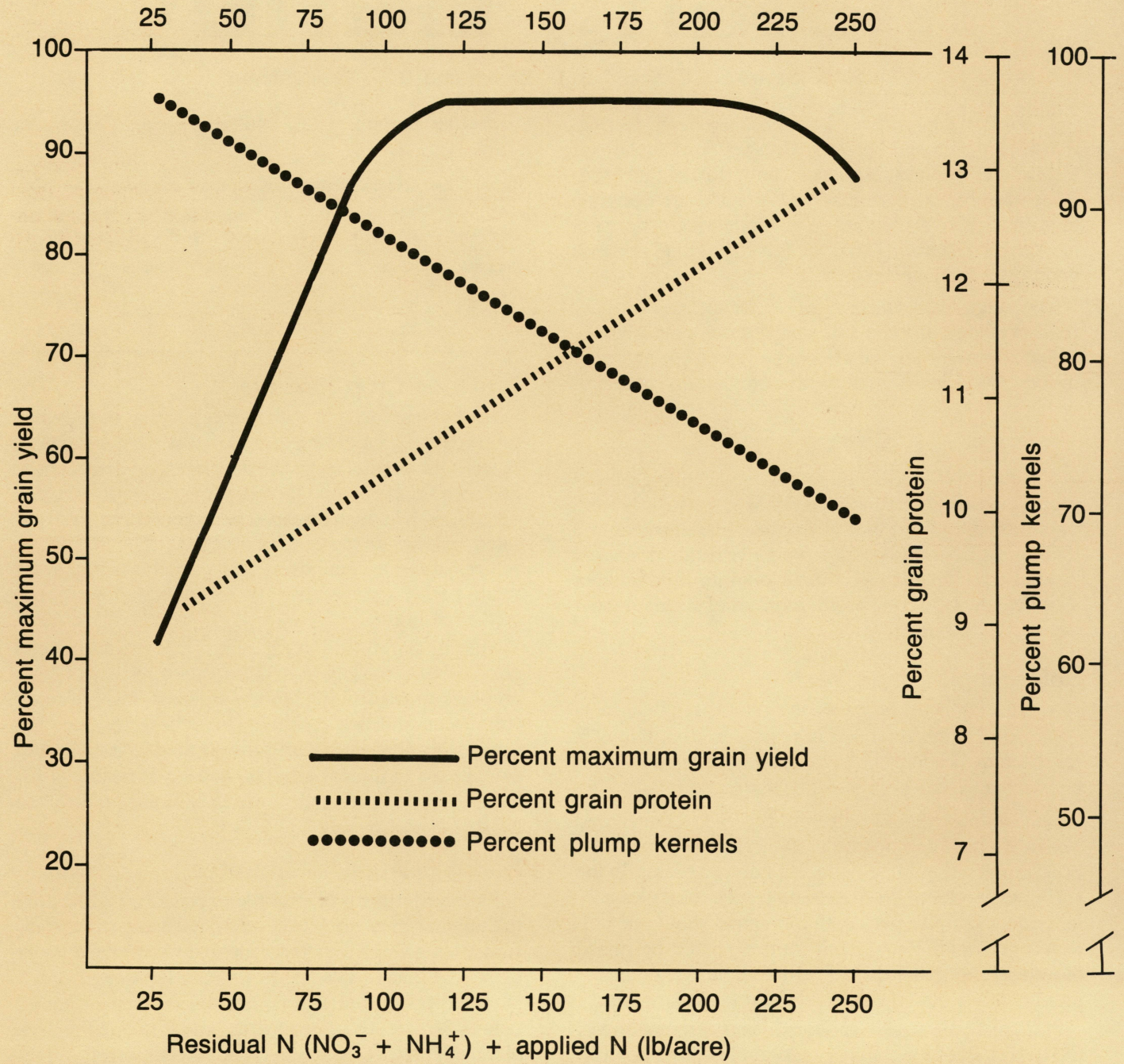

Fig. 1. Percent relative yield, percent protein and percent plump kernels as a function of residual plus applied N.

Phosphorus

Malting barley is not as responsive to applied P as most row crops but, at low soil test P levels, malting barley will respond to P applications. Table 3 shows test levels and rates of P to apply.

Table 3. Phosphorus fertilizer rates based in soil test.

Soil test P (0- to 12-inch sample)	Apply lb/acre
(ppm)*	(P_2O_5)**
0 to 3	160
4 to 6	120
7 to 10	60
Over 10	0

*P test by $NaHCO_3$ extraction.

**P_2O_5 x 0.44 = P

Sulfur

Sulfur (S) fertilizer needs will vary depending on soil texture, soil organic matter level, leaching losses and sulfur content of irrigation water.

Areas irrigated with Snake River water should not experience a shortage of S. High rainfall mountain valley and foothill areas of southern Idaho are most likely to respond to S fertilizer applications.

A soil testing less than 8 ppm SO_4-S in the 0- to 12-inch soil depth and soils in areas known to be deficient in S should receive 20 to 40 pounds S/acre.

Potassium

Malting barley has a lower demand for soil potassium (K) than crops such as alfalfa and potatoes. Table 4 shows soil test levels and rates of K fertilizer to apply.

Table 4. Potassium fertilizer rate based on soil tests.

Soil test K (0- to 12-inch sample)	Apply lb/acre
(ppm)*	(K_2O)**
0 to 22	240
23 to 45	160
46 to 68	80
Over 68	0

*K test by $NaHCO_3$ extraction.

**K_2O x 0.83 = K

Micronutrients

Micronutrient deficiencies have not been observed in malting barley in southern Idaho. Reponses from micronutrient applications would not be expected unless the crop is planted on severely scraped or eroded soil areas.

General Comments

1. Nitrogen fertilizers may be applied in the fall on medium-textured soils if leaching and soil erosion are not hazards.
2. Nitrogen applied in the spring during seedbed preparation will be used more efficiently by the barley plant, especially on sandy soils in areas having heavy winter precipitation.
3. Nitrogen applied to the crop after the boot stage and application of excessive rates of N can result in undesirably high protein levels and may also increase lodging.
4. Nitrogen leaching from over-irrigation is a hazard on all soils. Losses of N through leaching is particularly severe on sandy-textured soils.
5. Irrigation, weed and disease control can influence the effectiveness of fertilizer applications.
6. Avoid a heavy first irrigation on spring-planted malting barley to prevent waterlogging the soil which reduces tillering and increases nitrogen leaching losses.

If you have any questions regarding the interpretation of this information, please contact your University of Idaho County Agricultural Extension Agent.

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