

UCSU 20/6.22/0.555
c.2

SERVICE

RECEIVED

Grain protein content
as an indicator of
nitrogen fertilizer needs
in winter wheat
in eastern Colorado

Goos, D. G. Westfall and
A. E. Ludwick^{1/}
no. 555

IN ACTION
MAY 24 1990
COLORADO STATE LIBRARY
State Publications
COLORADO STATE UNIVERSITY EXTENSION SERVICE

COLORADO STATE PUBLICATIONS LIBRARY
UCSU20/6.22/0.555 c.2 local
Goos, R. J./Grain protein content as an



3 1799 00013 1474

Quick Facts

- Fields consistently producing grain with protein contents less than 11.1% are very likely to have nitrogen deficiencies that limit yields and protein content; the fields should receive more nitrogen fertilizer than is currently being applied.
- Fields producing grain with protein contents between 11.1 and 12.0% may need additional nitrogen fertilizer.
- Fields producing grain with protein contents greater than 12.0% probably have adequate nitrogen for present grain production levels.

The overall nitrogen fertility status of many wheat fields in Colorado is declining. Years of cropping, fallowing and erosion have depleted the organic matter (humus) reserves of most soils. Because of this depletion, there is not enough nitrate-nitrogen released from organic matter decomposition during the fallow period to meet the nitrogen needs of the following wheat crop. If insufficient available nitrogen is present, yields will be reduced and grain protein content will be low.

Research conducted throughout eastern Colorado over a four-year period has shown that grain protein content is a reliable indicator to determine if nitrogen nutrition was a limiting factor for wheat production. In other words, it is now possible for wheat farmers, using the guidelines presented here, to make post-harvest evaluations of their nitrogen fertilization programs by observing the protein levels of their grain. Guidelines are shown in Table 1.

Table 1: Guidelines for interpreting winter wheat grain protein-nitrogen nutrition levels in eastern Colorado.

Protein level	Interpretation
less than 11.1%	Yields may be significantly limited by nitrogen deficiency. More nitrogen fertilizer would probably increase yields and protein content.
11.1-12.0%	Yields may have been limited by nitrogen deficiency. Applying more nitrogen fertilizer may increase yield but will increase protein content.
greater than 12.0%	Yields were probably not limited by nitrogen deficiency. Application of more nitrogen probably will not increase yield but will increase protein content.

Fields that consistently produce grain protein levels of 11.1% or less generally are not receiving enough nitrogen to achieve maximum yields of high protein content grain. Increased amounts of nitrogen fertilizer should be applied. The amount of nitrogen fertilizer that would have been needed cannot be determined by the level of the grain protein. Research has shown that fields producing 10-11% protein grain need anywhere from 25-75 pounds additional N/A* to reach maximum yields while fields with protein contents of less than 10% usually needed at least 50 lbs additional N/A.* This amount is dependent upon the level of residual NO₃-N that is present in the soil and the actual amount of nitrogen needed can only be determined by soil testing.

Fields producing grain protein contents between 11.1-12.0% are in a zone where it is difficult to predict whether or not yields were limited by nitrogen deficiency. A grower who is consistently producing grain in the 11.0-11.5% range should consider increasing nitrogen rates by 11-20 lbs/A.*

A realistic protein goal for every winter wheat producer in eastern Colorado is 11.5-12.0%. It takes 20-30 lbs N/A* to increase protein content by 1 percentage point. This added nitrogen will increase protein content regardless of the present level. This increase in protein occurs in the 12% content range even when yields are not increased. Fields that never have been fertilized and still produce grain protein levels of 12% or higher should not require fertilization until grain protein levels begin to fall below 12%.

The guidelines in Table 1 generally work very well. They should, however, be considered as a "rule of thumb" to alert growers of the general nitrogen status of their crops. They can determine if their existing nitrogen fertilizer programs are adequate or if they need to be changed in the future. The only way to obtain a reliable nitrogen fertilizer recommendation for a future crop is through soil testing. For information on soil sampling and on the soil testing services available through the CSU Soil Testing Laboratory, contact your county extension agent for Service in Action sheets, .500, *Soil sampling—the key to a quality fertilizer recommendation* and .501, *Soil testing for fertilizer recommendations—what's behind a reliable test.*

*To convert to metrics, use the following conversions: 1 pound=.45 kilogram; 1 acre=.4 hectare.

^{1/}R. J. Goos, assistant professor, agronomy, North Dakota State University; D. G. Westfall, CSU extension associate professor, department of agronomy; A. E. Ludwick, western district director, Potash Phosphate Institute, Davis, Calif. (revised 7/1/84)