

Effects of Nitrogen Fertilization on Corn Grain Quality

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Introduction

Much of Iowa's corn is fed to livestock for energy and protein. Management practices that would increase the protein and/or energy content of corn could increase its value. This study was to determine what effect nitrogen (N) fertilization had on the protein and oil content of corn grain.

Materials and Methods

The experiment was a split-plot in a randomized complete block design with three replications. The study was conducted in 1999, 2000, and 2001. In all years, the previous crop was corn that had been fall chisel-plowed. Two corn varieties (Mycogen 2654 and 2655) were planted at 33,000 seeds/acre in 1999 and 2000, and at 35,000 seeds/acre in 2001. The sidedress N was incorporated with a row cultivator. In 1999 the sidedress treatments were based on the late spring N test; in 2001, a preplant zero-N treatment was added. Grain was mechanically harvested, then analyzed with a Foss–Tecator NIR analyzer for protein and oil.

Results and Discussion

Grain yields and protein and oil content for 1999 through 2001 are shown, respectively, in Tables 1, 2, and 3. In 1999, grain yields were high but were not affected by preplant rates of N fertilizer. Preplant N rates also had no effect on protein or oil content of the grain. Although not statistically different, sidedressing increased yield slightly. Sidedressing N increased protein content but decreased oil content. In 2000, there was no yield response to treatments; protein and oil content did not change with the various rates.

Yields in 2001 were the lowest of the three years. The addition of the 0 lb N/acre treatment showed that there was a response to N in yield; but again, the preplant N rates did not differ

statistically from each other. The 80 lb N/acre sidedressed plots yielded the highest—significantly more than the 80 lb N/acre preplant. Protein content followed the yield pattern, with the 0 lb N/acre being the lower and the two sidedressed plots being the highest. The check plots had the highest oil content. The rest followed no clear trend.

Maximum increases in protein content were only slightly more than one half of 1%; maximum decreases in oil content were only about one-fourth of 1%, due to nitrogen rates. Year-to-year differences in protein were greater. In the two years having a response in protein to sidedressed N, the month of May was wet and the late spring N test indicated that additional N was needed. For the one year with no response, May was more normal and the late spring N test indicated that no more N was needed.

Based on these results, sidedressing N may result in higher protein content if applied after an extremely wet May. However, oil content tends to decrease with application of N.

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