

RESPONSE OF CORN GROWN IN TWO CROP ROTATIONS TO DIFFERENT N RATES AND NITRAPYRIN

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Abstract

Nitrogen fertilization of corn is necessary to obtain adequate yields. Loss of soil-applied NH_4^+ -N fertilizers due to nitrification can decrease corn yield significantly. Nitrate contamination of ground or surface water supplies should also be considered. Use of nitrapyrin may help address these issues, though in fine textured soils response to its use is difficult to predict. A 10-year study was done to determine the effects of annual application of ammonia with nitrapyrin upon the yield of continuous corn and corn following soybean. The experiment was located near Ames, Iowa, on a Nicollet loam (fine-loamy, mixed, mesic Aquic Hapludoll). Treatments were a factorial arrangement of nitrogen fertilizer and nitrapyrin randomized in a complete block design with three replications for the continuous corn rotation and four replications for corn following soybean. The rates of nitrapyrin were 0 and 0.5 lb ai acre⁻¹. Nitrogen rates were 0 to 160 lb acre⁻¹ for corn after soybean and 0 to 200 lb acre⁻¹ for continuous corn. Nitrapyrin and NH_4^+ -N were injected the spring before planting. Grain yield and nitrogen uptake were determined. Beginning in 1997, post-harvest soil samples were collected in one-foot increments to 4 feet from the zero-N plots and the high N-rate plots. NH_4^+ -N and NO_3^- -N were measured.

Nine out of ten years, corn yield had a positive response to nitrogen fertilization in both crop rotations. One out of ten years there was a positive yield response to nitrapyrin in the continuous corn rotation. One of ten years there was a negative response to nitrapyrin application in both crop rotations. Grain yield responded negatively to the interaction of nitrogen rate and nitrapyrin application one year out of ten for both crop rotations. There was no positive yield response for the interaction of nitrogen rate and nitrapyrin application. Nitrogen uptake in grain did not differ due to the nitrapyrin treatments. Ammonia and nitrate levels in soil samples to 4 feet dept (increments of 1 foot) were generally low and did not reveal any specific trend. The differences for nitrapyrin plots were rarely significant. Use of nitrapyrin did not increase simple profit.

For the conditions of this experiment, use of nitrapyrin did not increase corn yield or nitrogen uptake in grain. Nitrapyrin did not affect concentrations of sub-soil nitrate so there was little, if any, environmental benefit from its use. Profits did not justify the use of nitrapyrin.

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