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Yield Responses to Winter Application of Chicken Manure

John D. Holmes
Iowa State University, jdholmes@iastate.edu

David Rueber
Iowa State University, drueber@iastate.edu

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Abstract
During the fall and winter months, many farmers are applying chicken manure as a fertilizer source. Although not desirable, applications have been made to snow-covered fields. In 2000, an experiment was started to evaluate yield response to chicken litter applied to snow-covered fields. The objective of the experiment was to document yield responses to applications made at two different rates, during the winter and spring.

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John D. Holmes, extension field specialist
David Rueber, farm superintendent

Introduction

During the fall and winter months, many farmers are applying chicken manure as a fertilizer source. Although not desirable, applications have been made to snow-covered fields. In 2000, an experiment was started to evaluate yield response to chicken litter applied to snow-covered fields. The objective of the experiment was to document yield responses to applications made at two different rates, during the winter and spring.

Materials and Methods

The experiment layout was a randomized complete block design. Manure was applied in February and April, with urea application made in April. Manure application rates were 3.5 ton/acre in 2000; and 3.5 ton/acre and 1.75 ton/acre in 2001.

For manure applied in 2000, the supplier reported manure analysis of 42–105–98. Application rates were determined to provide the equivalent of 135 lb N/acre. The manure was sampled during the February 2000 application. Analysis of the manure used in 2000 was 106–103–57. Analysis of manure used in 2001 was 45–87–51. Spring applications were incorporated immediately. A late spring nitrate test (LSNT) was taken by collecting eight cores from each treatment plot. Cores from each plot were combined and one sample was submitted for analysis for each treatment. In 2001, stalk nitrate samples were taken from each plot. Plots were machine-harvested, and yields were calculated based on 15.5% moisture.

Results and Discussion

Results for 2000 are given in Table 1. Winter applications were made with only two inches of snow on the ground. Yields for the manure and the urea treatments were statistically the same. The LSNT showed that nitrogen (N) losses were high on the winter manure application. It is difficult to obtain dry chicken manure with a consistent nutrient content, but results of manure analysis at time of application showed that manure content was different than stated by the supplier and that application rates were much higher than the desired rate.

Results for 2001 are given in Table 2. Eight inches of snow was on the ground at the time of winter application. The 3.5-ton/acre application rates were maintained to allow comparison of years. Analysis of manure samples taken at application showed that the full rates were less than the desired 135 lb/acre N results, vastly different than the preceding year. Differences in the amount of actual N applied were due to volatilization losses in winter versus spring applications. Yield comparisons showed that the urea and full-rate spring applications were the same statistically, and that the half-rate spring application was the same statistically as the full-rate winter application. Both winter applications were statistically the same; however, the winter application had a seven bushel/acre greater mean yield than the half-rate application. It is apparent that volatilization losses from applications made on snow-covered ground definitely affect yields.

When manure applications made in 2000 and 2001 are compared, it is obvious that volatilization losses were significant when applications were made to plots with heavy snow cover. Yields obtained in 2000 were statistically the same, regardless of time of application; however, the LSNT did show that losses occurred compared with spring applications. Yields from 2001 directly reflected time and rate of manure applications. These applications were applied to plots with heavy

snow cover, and it is obvious that significant volatilization losses did occur.

It is too soon to reach conclusions regarding winter application of chicken manure, but results appear dependent on depth of snow cover at time of application. This is a three-year study, that is intended to continue at least one more year.

Acknowledgments

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Table 1. Yield response to manure applications made in 2000.

Treatment	Application date	Actual N applied (lb/acre)[1]	LSNT (ppm)	Yield (bu/acre)[2]
Winter manure	February 14	168	17.9	172.5 a
Spring manure	April 26	236	32.7	175.6 a
Spring urea	April 26	138	39.5	168.1 a
Control	---	---	13.8	132.1 b

[1]Value assumes a 30% volatilization loss for winter application and 65% first year nitrogen availability.
[2]Groups signified by the same letter are statistically the same. (P=.05).

Table 2. Yield response to manure application made in 2001.

Treatment	Application date	Actual N applied (lb/acre)[1]	LSNT (ppm)	Stalk nitrate (ppm)	Yield (bu/acre)[2]
Urea	April 27	138	14.9	618 a	176.0 a
Full rate–spring	April 27	100	10.3	37 b	172.9 a
Half rate–spring	April 27	50	5.8	<20 b	146.5 b
Full rate–winter	February 1	72	6.8	<20 b	130.5 bc
Half rate–winter	February 1	36	6.9	28 b	123.0 cd
Control	-----	------	4.7	<20 b	109.5 d

[1]Value assumes a 30% volatilization loss for winter application and 65% first year nitrogen availability.
[2]Groups signified by the same letter are statistically the same (P = .05).