

Utilization of Ethanol By-products as Nitrogen Fertilizer in Corn (*Zea mays* L.)

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Introduction

- Increased ethanol production has increased ethanol by-products

- Proper disposal of by-products might cause future economic and/or ecological problems

- Land application has potential if nutritive value can be established

Objectives

- Compare the use of Dry Distiller's Grain (DDG) and ash (by-product of distillation) against urea as nitrogen source in corn

- Compare DDG and ash with no-till and tilled

Materials and Methods

- Three locations over three years in Kansas, Doniphan (2007), Riley (2008), and Marshall County (2009)

- Corn planted at 75 000, 60 000, and 75 000 plants ha⁻¹ respectively

- Ash no-till, ash tilled, DDG no-till, DDG tilled (tillage was just prior to planting in the spring), and urea were applied in a split-plot design

- Rates of 45, 90, 135, 180 kg ha⁻¹ applied as nitrogen
 - No ash used at Doniphan
 - Ash 135 and 180 kg ha⁻¹ not applied in Riley

- All data were analyzed using Contrast in SAS Proc Mixed



Table 1.
Proc Mixed Contrast Doniphan 2007

Nitrogen Source	Pr > F
Urea vs. DDG no-till and tilled	0.1035
Nitrogen Rate (kg ha ⁻¹)	
Zero vs. All	0.0028
Zero vs. 45	0.0372
Zero vs. 90	0.0084
Zero vs. 135	0.0090
Zero vs. 180	0.0005

Table 2.
Proc Mixed Contrast Riley 2008

Nitrogen Source	Pr > F
Urea vs. ash no-till and tilled	<.0001
Urea vs. ash no-till	<.0001
Urea vs. ash tilled	<.0001
Urea vs. DDG no-till and tilled	0.1638
No-till vs. Tilled	0.3670
Nitrogen Rate (kg ha ⁻¹)	
Zero vs. All	0.0085
Zero vs. 45	0.5304
Zero vs. 90	0.0702
Zero vs. 135	0.0008
Zero vs. 180	0.0003

Table 3.
Proc Mixed Contrast Marshall 2009

Nitrogen Source	Pr > F
Urea vs. ash no-till and tilled	<.0001
Urea vs. ash no-till	<.0001
Urea vs. ash tilled	<.0001
Urea vs. DDG no-till and tilled	0.2345
No-till vs. Tilled	0.7233
Nitrogen Rate (kg ha ⁻¹)	
Zero vs. All	0.0002
Zero vs. 45	0.1028
Zero vs. 90	0.0037
Zero vs. 135	0.0001
Zero vs. 180	0.0005

Results

- No differences in yield were found between DDG (no-till and tilled) and urea across all locations

- Yields were different at all locations with Doniphan being the highest

- No differences in yield were found between tillage treatments (no-till and tilled)

- Ash yields at all rates and tillage were lower than urea

- Land application does have potential merit for ash and DDG

- Due to the high volume of material (2% and 4% nitrogen respectively), disposal might be preferred over fertilizer replacement

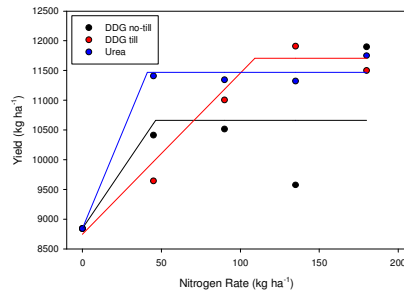


Figure 1. Corn Yield vs. Nitrogen rate with DDG and urea at Doniphan 2007

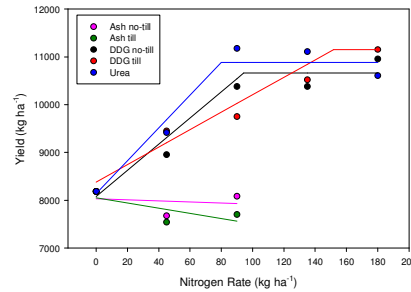


Figure 2. Corn Yield vs. Nitrogen rate with Ash, DDG, and urea at Riley 2008

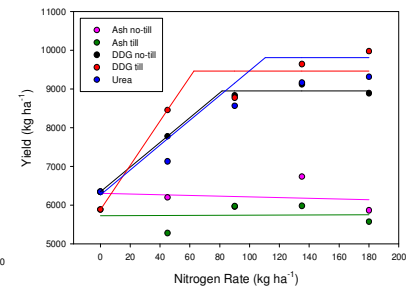


Figure 3. Corn Yield vs. Nitrogen rate with Ash, DDG, and urea at Marshall 2009

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