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Water Infiltration following Land Rolling of Soybeans

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Water Infiltration following Land Rolling of Soybeans

Abstract

Land rolling of soybean fields has become a popular practice in north central and northwest Iowa during the past five years. Although this technique was first utilized to push rocks into the ground to avoid combine damage and aid in harvesting lodged crops in Canada, producers in Iowa quickly learned that pushing corn root-balls flat at the time of planting and pushing small rocks into the ground can increase harvest efficiency. Typically fields are rolled shortly after planting. One disturbing trend that was noticed, however, was that rolled fields tended to have more water standing between the rows after moderate or heavy rain events. This would imply that water infiltration was slower in fields that had been rolled compared with fields that had not been rolled. Infiltration measurements were taken on a few plots in 2010 at the ISU Northern Research Farm. It seemed that water infiltration was less on the rolled plots. However, we wanted more measurements before publishing any results. In 2011 infiltration measurements were taken on the research farm and on neighboring farms where soybeans had been rolled. The goal was to determine if water infiltration had been reduced by land rolling.

Keywords

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Disciplines

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Water Infiltration following Land Rolling of Soybeans

RFR-A1188

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Introduction

Land rolling of soybean fields has become a popular practice in north central and northwest Iowa during the past five years. Although this technique was first utilized to push rocks into the ground to avoid combine damage and aid in harvesting lodged crops in Canada, producers in Iowa quickly learned that pushing corn root-balls flat at the time of planting and pushing small rocks into the ground can increase harvest efficiency. Typically fields are rolled shortly after planting. One disturbing trend that was noticed, however, was that rolled fields tended to have more water standing between the rows after moderate or heavy rain events. This would imply that water infiltration was slower in fields that had been rolled compared with fields that had not been rolled. Infiltration measurements were taken on a few plots in 2010 at the ISU Northern Research Farm. It seemed that water infiltration was less on the rolled plots. However, we wanted more measurements before publishing any results. In 2011 infiltration measurements were taken on the research farm and on neighboring farms where soybeans had been rolled. The goal was to determine if water infiltration had been reduced by land rolling.

Materials and Methods

Experiment conducted on the research farm. Soybeans were planted May 11 using a John Deere 7100 planter with fluted coulters. The preceding crop was corn. The field was rolled May 16 using a 20 ft Degelman roller pulled by a John Deere 7410 tractor. Infiltration measurements were taken using a Cornell sprinkle infiltrometer on May 19.

Measurements were taken on rolled and unrolled areas and replicated four times. Care was taken to avoid taking measurements in wheel tracks. The soil type was a Canisteo silty clay loam, 0 to 2 percent slope.

On-farm experiments. Three neighboring farmers who use land rollers on their soybean fields were contacted and asked to leave an unrolled strip in their fields so measurements could be collected. The preceding crop in all the fields was corn. The farmers planted their soybeans from May 16 through May 18 and rolled their fields within two days of planting. The rollers were 45 ft or longer. Infiltration measurements were taken using a Cornell sprinkle infiltrometer in two places in each rolled and unrolled strip. Care was taken to avoid taking measurements in wheel tracks. The soil type on the Rietema farm was Clarion loam; the Christians farm was Canisteo silty clay loam; and the Schwab farm a Webster silty clay loam. No yield information was collected because the majority of the fields were rolled within a week following planting and yield responses were decreased in the 2010 experiment only when the soybeans were rolled at stage V6.

Results and Discussion

Experiment conducted on the research farm. The average infiltration rate of the unrolled soils was 0.11 cm/min, and the average infiltration for the rolled soils was 0.07 cm/min (Figure 1). The soil type in the plot area was Canisteo silty clay loam. This is a poorly drained soil. It appears that the roller may have compacted the soil or crushed the aggregates in the surface soil thus reducing water infiltration. Measurements taken in 2010 showed a similar trend.

On-farm experiments. Although there was considerable variability, infiltration rates were

lower in the rolled plots. Table 1 provides a summary of the results. Measurements taken on the Rietema farm had an infiltration rate of 0.05 cm/min in the unrolled plots and 0.12 cm/min in the rolled plots. Measurements taken on the Christians farm had an average infiltration rate of 0.19 cm/min in the unrolled strips and 0.12 cm/min in the rolled strips. Infiltration rates on the Schwab farm were an average of 0.27 cm/min in the unrolled strips and 0.05 cm/min in the rolled strips (Figure 2). The differences on the Schwab farm were determined to be statistically significant. The measurements on the other two farms did not have statistically significant differences between the infiltration rates of the rolled vs. unrolled strips. The soil on the Rietema farm was a Clarion loam that has a higher landscape position and is a well-drained soil. The soils on the Christians and Schwab farms are Webster and Canisteo soils, respectively. These soils are lower on the landscape and are poorly drained. It appears that the poorly drained soils may have been compacted more by the roller and infiltration rates reduced. The

well-drained soil actually had lower infiltration rates in the unrolled strips. Apparently soil compaction was not an issue on the well-drained soils.

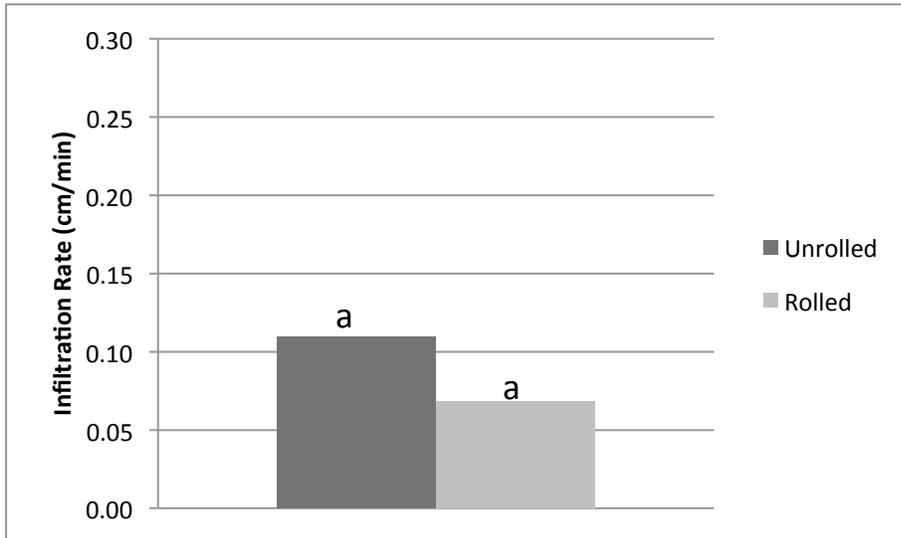
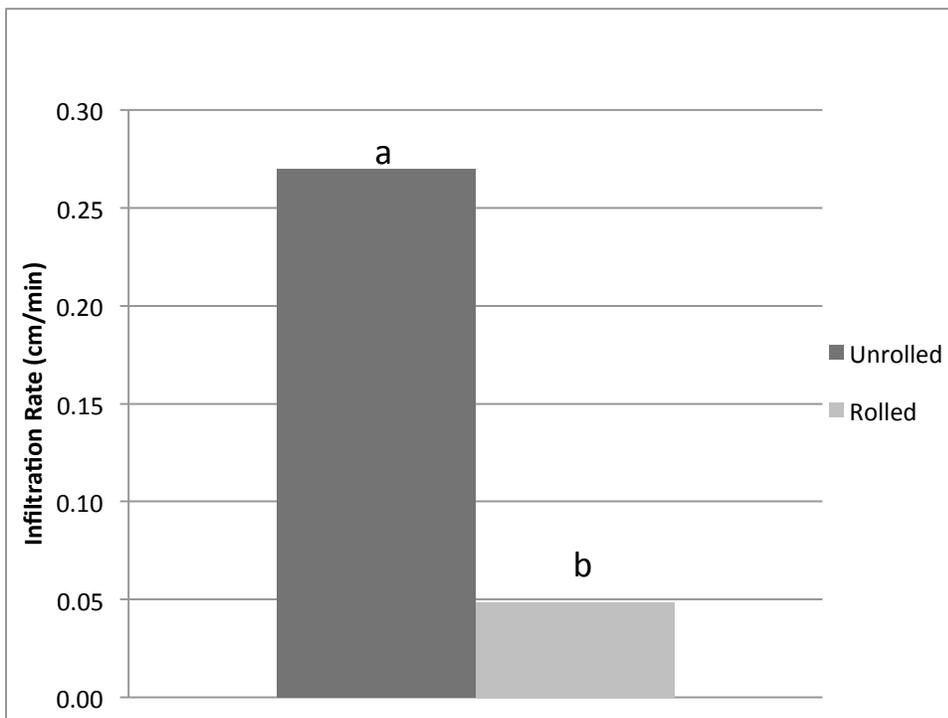
After evaluating infiltration rates on three farms in large plots and on the research farm in small plots, it seems that land rolling reduces water infiltration in poorly drained soils. The infiltration measurements were made shortly after the fields were rolled. It is logical to assume that infiltration rates will become more equal in both rolled and unrolled areas as the season progresses.

Acknowledgements

We wish to thank Custom Made Products, Humboldt, IA, for providing the roller used on the research farm. We thank Wayne Rietema, Ron Christians, and Dennis Schwab who left unrolled strips in their fields and allowed us to take water infiltration measurements. Finally, we thank Dr. Mahdi Al-Kaisi for his assistance in collecting and analyzing the water infiltration measurements.

Table 1. Average water infiltration rates following land rolling on the ISU Northern Research Farm and three neighboring farms.

	Unrolled (cm/min)	Rolled (cm/min)
Northern Research Farm	0.11	0.07
Rietema farm	0.50	0.12
Christians farm	0.19	0.12
Schwab farm	0.27	0.06

**Figure 1. Water infiltration in rolled vs. unrolled plots on the ISU Northern Research Farm. Bars with the same letters do not differ ($P \leq 0.05$).****Figure 2. Water infiltration in rolled vs. unrolled plots on the Dennis Schwab farm, Corwith, IA. Bars with different letters differ ($P \leq 0.05$).**