ON THE EFFECTIVENESS OF COVER CROPS FOR EROSION CONTROL*

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Introduction

The dairy industry is important to Wisconsin's economy. Corn silage is commonly used to feed dairy cows because of its dietary value. However, very little residue is left on the soil surface after corn silage harvest, increasing the risk for erosion. Manure is often applied to fields after corn silage harvest, which exacerbates the erosion problem by increasing the likelihood of phosphorus (P) losses. Practices such as no-tillage and cover crops have been shown to reduce erosion and P losses under different cropping systems (Sharpley et al., 1992; Dabney et al., 2001), but others have found conflicting results (Griffith et al., 1977; Mueller et al., 1984). Therefore, there is a need to obtain quantitative information on the impact of cover crops and no-tillage in corn silage systems. A study was conducted to determine if no-tillage and cereal rye as a cover crop can reduce erosion and P losses from corn silage production in Wisconsin.

Methods

A rainfall simulation study was conducted on a private farm at a site near Arlington, WI. The work presented here is part of a larger study that was established in 2013. Treatments consisted of two tillages, conventional (CT) and no-tillage (NT), and two cover crops, no cover crop (NCC) and cereal rye cover crop (CC). The CT management consisted of a single pass with a vertical tillage implement in the fall, and a spring soil finishing operation. Additionally, liquid dairy manure was injected into every plot after silage harvest, which created some soil disturbance. Cereal rye was seeded using a no-till drill at a 90 lb/ac rate. Rainfall simulations were performed three times to capture different time points in the cropping cycle during the 1st week of June 2016, 3rd week of October 2016, and 2nd week of April 2017. Metal frames (3-ft by 3-ft) were inserted into the ground into each plot. A tower with an oscillating nozzle at a 10-ft height was placed over each frame to generate the simulated rainfall event. Water was applied at a 3 inch/hr rate for 60 minutes. Runoff was collected into a graduated collection tank using a vacuum system. After each simulation, a composite runoff sample was collected for P analysis.

Results and Discussion

The impact of the rye cover and tillage varied for each simulation timing. For example, runoff was reduced with the NT CC management only in June, while in October there were no treatment differences (Figure 1). However, the cereal rye cover crop reduced runoff by about 50% regardless of tillage during the April rainfall simulation event. These findings highlight the importance of having soil surface coverage for reducing runoff. Sediment losses followed a similar pattern to runoff (Table 1). Also, P losses were reduced by the cereal rye cover crop but the impact varied depending on the time of the tear when the simulation was conducted. Tillage had a limited impact on reducing P losses, but this might be related to the soil disruption created by the manure injection in the no-tillage management, and the addition P with the manure to the soil.

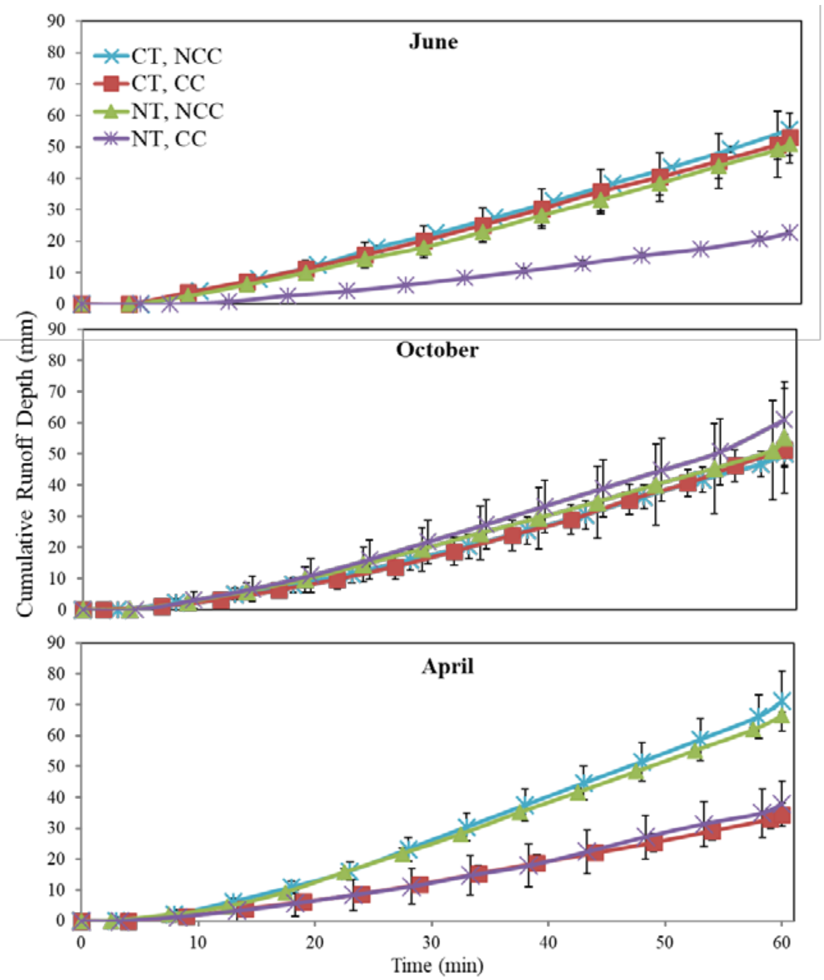

Figure 1. Cumulative runoff amounts during three different rainfall simulation timings (1st week June 2016, 3rd week October 2016, and 2nd week April 2017) for two tillage managements (CT – fall vertical tillage/spring finisher, and NT – no-tillage), and two cover crop treatments (NCC - no cover crop, and CC – cereal rye as a cover).

Table 1. Total sediment losses after three different rainfall simulation timings (1st week June 2016, 3rd week October 2016, and 2nd week April 2017) for two tillage managements (CT – fall vertical tillage/spring finisher, and NT – no-tillage), and two cover crop treatments (NCC - no cover crop, and CC – cereal rye as a cover).

Treatments		Sediment load		
Tillage	Cover crop	June	October	April
		------------ tons/ac ----------		
CT	NCC	2.1	0.8	2.3
	CC	1.3	1.3	0.6
NT	NCC	1.6	2.8	2.2
	CC	0.4	1.4	0.7

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