

UTILITY OF TILLAGE RADISHES AS A COVER/FORAGE CROP AND THE SUBSEQUENT IMPACT ON CORN GROWTH AND YIELDS

Leah Sandler

Graduate Student

Chris Dudenhoeffer

Research Specialist

Kelly Nelson

Research Agronomist

Randall Smoot

Superintendent

Tillage radishes are a cover crop and have been promoted to increase soil aeration, suppress weeds, and increase yields of the subsequent rotational crop. Cover crops can provide several benefits for a farmer. By planting something on what could possibly be bare soil, nutrients can be immobilized, soil conserved, and additional forage can be grown for cattle in some instances. Cover crops may also provide winter annual weed suppression. In addition, the radish grows a tuber that once decayed, could possibly leave holes to aerate the soil. The objective of this research was to determine the effect of tillage, planting date, and grazing on tillage radish performance and the subsequent impact on corn growth and yields.

Methods

Tillage radishes were no-till planted or planted following tillage (Tilloll 2x, 29 August 2011, 31 August 2012) in a field that had previously been brown mid-rib sorghum. Radishes were drill seeded at 8 pounds/acre on 1 September 2011 (early planting date) and later on 26 September 2011 (corresponding with the first corn harvested on the farm), on 31 August 2012 (early planting date) and 1 October (later planting date). These treatments were grazed or cattle were fenced out (non-grazed) prior to a killing frost (mid-November to December).

Biomass samples were collected in December both years to determine radish top and tuber growth, and weed samples were collected in the spring to determine weed (henbit and chickweed in 2011 and downy brome in 2012) suppression due to radish interference. Weed suppression was visually rated at a scale of 0 (no control) to 100% (complete weed suppression) in the spring prior to a burndown herbicide application. Corn heights were measured early in the season. Corn chlorophyll measurements were determined at VT and corn was harvested on 20 August 2012. Management details are reported in Table 1.

Results

Tillage radishes

In 2012, an early radish planting date (1 Sept.) increased top (73%) and tuber (91%) fresh weights compared to a late planting date (26 Sept.) (Table 2). The early planting date had dry weight yields of 3,670 lbs/acre for the tops and 2,590 lbs/acre for tubers. There was an interaction between tillage and radish planting date for control of common chickweed and henbit (Figure 1) in the spring, 2012 (Table 4). An early planting of radishes suppressed common chickweed and henbit 76 to 77%, while dry weights were reduced up to 88% on 22 March (Table 4, Figure 1). There was no effect of grazing on common chickweed and henbit control, but total weed dry weight was reduced 47% by grazing.

In 2013, the earlier planted radishes on 31 August 2012 increased top (98%) and tuber (99%) fresh weights when compared with the later planted radishes (1 October 2012). The early planted radishes had dry weight yields of 3,650 lbs/acre of tops and 2,305 lbs/acre of tubers. For the control of common chickweed, there was an interaction between radish planting date and tillage type, with a control of 84%. However, for henbit control and total weed biomass, there was only significance across radish planting dates; with 86% henbit control on the earlier planting date compared to the 43% of the later planted radishes (Table 5).

Corn response

A slight difference in heights between early planted radishes and late planted radishes was observed both years (data not presented). However, there was no difference in chlorophyll meter readings among treatments in 2012 (data not presented). There were no significant grain yield differences among treatments (Table 2).

Table 1. Management of corn planted in 2012 and 2013.

Management information	2012	2013
Planting Date	9 April	4 May
Hybrid	DKC 62-97	DKC 62-97
Population	33,000 seeds/A	33,000 seeds/A
Fertilizer	9 April Anhydrous ammonia at 150 lbs N/acre	1 May Anhydrous ammonia at 160 lbs N/acre
Pest management	12 April N-P-K at 17-80-120 2 April Verdict 5oz/A + Roundup PowerMax at 22oz/A + NIS at 0.25% v/v + 32% UAN 1 qt/A	26 April Roundup PowerMax at 32 oz/A + Sharpen at 1 oz/A + MSO at 1% v/v + AMS at 17 lb/100gal
	5 May SureStart at 2 pt/A + Roundup PowerMax at 32oz/A	21 May SureStart at 2 pt/A + Roundup PowerMax at 1 qt/A + NIS at 0.25% v/v + 32% UAN 1 qt/A
	4 June Roundup PowerMax at 32oz/A + Callisto at 3 oz/A + AMS at 17 lb/100gal + COC at 1 qt/A	

Table 2. Radish yield of early and late planted radishes on 5 Dec. 2011 and corn yield in 2012.

Radish planting date	Tops		Tubers		Corn yield
	Fresh weight	Dry weight	Fresh weight	Dry weight	
	----- lbs/A -----				bu/A
Non-planted control	0	0	0	0	40.8
1 Sept. 2011	36,490	3,670	32,650	2,590	39.3
26 Sept. 2011	9,605	1,250	288	385	41.1
LSD ($P = 0.1$)	4,800	3,840	4,800	288	NS

Table 3. Radish yield of early and late planted radishes on 10 Dec. 2012. Corn yield will be determined in 2013.

Radish planting date	Tops		Tubers	
	Fresh weight	Dry weight	Fresh weight	Dry weight
	----- lbs/A -----			
Non-planted control	0	0	0	0
31 Aug. 2012	12,865	3,650	49,070	2,305
1 Oct. 2012	192	77	48	3.8
LSD ($P = 0.1$)	960	288	2,015	192

Table 4. Weed control interaction between tillage systems and radish planting dates in 2012. Total weed dry weight interaction between tillage systems and radish planting date, and total weed dry weight interaction between grazing system and radish planting date.

Radish planting Date	Weed control [†]				Total weed dry weight [‡]			
	Common chickweed		Henbit		No-till	Tillage	Grazed	Non-grazed
	No-till	Tillage	No-till	Tillage	----- lbs/A -----			
	----- % -----				----- lbs/A -----			
Non-planted control	0	0	0	0	1,730	1,920	1,440	2,400
1 Sept. 2011	33	76	42	77	1,055	290	770	480
26 Sept. 2011	6	4	8	5	1,535	1,630	1,730	1,440
LSD ($P=0.1$)	----- 6 -----		----- 7 -----		----- 384 -----		----- 480 -----	

[†]Henbit had 260 plants/ft² and common chickweed had 40 plants/ft² in the non-treated control.

[‡]Henbit plus common chickweed biomass.

Table 5. Weed control interaction between tillage systems and radish planting dates in 2013. Total weed dry weight of radish planting dates.

Radish planting Date	Weed control [†]		Henbit	Total weed dry weight [‡] ----- lbs/A -----
	Common chickweed	Tillage		
	No-till			
Non-planted control	0	0	0	3,170
1 Sept. 2011	81	84	86	290
26 Sept. 2011	26	44	43	1,250
LSD ($P=0.1$)	----- 7 -----		32	1,730

[†]Henbit had 48 plants/ft² and common chickweed had 41 plants/ft² in the non-treated control.

[‡]Henbit plus common chickweed biomass.



Figure 1. The effect of tillage radishes (left) planted on 1 Sept. 2011 on winter annual weed growth (Top picture on 12 March 2012) and corn emergence (Bottom picture on 1 May 2012) compared to a non-seeded control (right).