Trap-Crop Radish Use in Sugar Beet-Malt Barley Rotations of the Big Horn Basin

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Trap crops are specially bred varieties of radish (*Raphanus sativus*) and mustard (*Sinapis alba*) that have the potential for controlling the sugar beet cyst nematode (SCN) (*Heterodera schachtii*). Varieties with trap crop potential are unique because, like a true host, they stimulate eggs of the SCN to hatch but, unlike other hosts of the SCN, do not allow them to reproduce. With proper use and management, trap crops can reduce soil populations of the SCN and reduce or eliminate the need for nematicide (8,9). Due to groundwater contamination, nematicide use has been greatly restricted in Europe, and trap crop varieties bred in Germany have been used successfully in lieu of nematicides for several years; however, growing conditions, crops, soils, and management in the Big Horn Basin are considerably different than those in Europe.

The SCN is the most damaging and costly sugar beet pest in the Big Horn Basin (4). Crop rotation and nematicides are the current SCN control methods. Lengthening the rotation means there are fewer acres on which to grow sugar beets in any given year. Nematicides are costly, pose a hazard to applicators and the environment, and need to be applied every time a sugar beet crop is grown. An alternate control, if effective, might reduce reliance on nematicides and maintain relatively short sugar beet rotations.

The primary purpose of growing trap crops is to reduce SCN soil populations. Trap crop radish and mustard varieties also might provide animal forage. In a previous study radishes were grazed, although the variety used was not one of the recently released nematode-reducing varieties (5). The study was conducted in Washington, and radishes produced similar amounts of forage and daily weight gains as turnips (*Brassica rapa*). This is the only published report on animal performance from radish grazing. Even though classified as fodder radishes, the SCN-resistant trap crop radish varieties have not been evaluated for grazing. In Europe, where the trap crops have been used successfully for SCN control, most sugar beet-growing areas do not have livestock, and the trap crops are plowed down as green manure. Trap crop radishes are grazed by sheep, to some extent, in northern Spain (2); however, sheep performance is not reported. Grazing with adequate animal performance would help defray costs of growing trap crops.

Trap crops grow rapidly and are cold-tolerant; therefore, the most promising use of trap crops in sugar beet rotation would be to follow malt barley. Other crops are harvested later and would not allow as much time for trap crop growth and SCN control (6). Using the full season would increase the cost of growing trap crops.

Preliminary forage analyses show that radishes are a high-quality forage (unpublished data), which would be available in late fall when the quality of other forages is generally low. If grazing is delayed until trap crops have completed growth (late October or early November), there should be no negative effect on their ability to reduce SCN populations.

Several growers in Wyoming plant turnips for fall grazing. Turnips are highly susceptible to the SCN and, consequently, increase nematode populations. Trap crop radish varieties could be substituted for turnips, particularly on land infested with the SCN and on which sugar beets are grown.

These studies intend to evaluate the potential of trap crop varieties under Wyoming sugar beet growing conditions for SCN control and forage utilization. The effect of trap crops, compared with nematicide, on sugar beet yield also was studied.

Methods

Standard trap crop studies

Studies were conducted on five SCN-infested fields (four cooperating sugar beet growers) in Washakie and Big Horn counties (Table 1). Trap crop radish was seeded and irrigated as soon as possible after harvesting malt barley. All fields received a second irrigation. Good soil moisture is important, not only for trap crop growth, but also for movement of the SCN to trap crop roots. Due to the irrigation method (furrow) and the randomized nature of the experiment, it was not practical to leave the unseeded plots unirrigated – the usual fallow practice.

Soils were sampled before planting radish and in late fall at plow-down to determine SCN soil populations. Trap crop plant stand and dry matter production of trap crop and volunteer barley was determined. Sugar beets were planted the following spring, and yield and quality factors were determined on four of the fields.

Pegletta radish was planted on the two Hefenieder fields and Adagio radish was planted on the other fields (Table 1). Radish seeding rate was 20 to 25 pounds per acre. Radish planting dates are shown in Table 1. Nitrogen fertilizer was applied on all fields at the rate of 60 to 75 pounds nitrogen (N) per acre as ammonium nitrate. Soil analysis prior to planting radish indicated adequate levels of phosphorus.

A split-plot design with six replications was used on the two Hefenieder fields and at the Snyder field. Main plots were established after harvesting malt barley and were either radish-seeded or fallow (unseeded check). In 1992, at Hefenieder's, loose straw was baled and removed and the stubble was disked twice. In 1993, on a different field at Hefenieder's, straw was burned. At Snyder's in 1994, there was a 75 percent loss of the malt barley crop due to hail. Straw was baled and removed. The field was irrigated to encourage seed on the soil surface to germinate and, just prior to radish seeding, Roundup® at one quart per acre was applied. Sub-plots were applied the following spring to all fields when sugar beets were planted and consisted of three treatments: (1) check (no nematicide), (2) half-label rate of Temik® 15G, and (3) full-label rate of Temik® 15G. Temik® was banded beside the seed row at planting. An additional subplot, Telone II® at 15 gallons per acre, was applied at Snyder's. Main plots were 40 by 40 feet and subplots were 10 by 40 feet.

The same treatments, design, and replication were used at the Mosegard and Wiley farms, except main plots were in strips across eight-acre and six-acre fields, respectively. An additional main plot, lambs grazing radish, was established on the Mosegard field. After malt barley was harvested, the field was burned. Radish seed was mixed with ammonium nitrate fertilizer and broadcast with a spinner-spreader. Radish was planted in eight-inch rows with a no-till drill without straw removal or tillage on the Wiley field. The study was terminated fall 1994 because sugar beets were not planted in 1995. Sethoxydim (Poast®) was applied on both fields at one quart per acre in a mixture with one quart per acre of crop oil when volunteer barley was two to three inches high and radishes were in the first true leaf stage.

Cultural studies

Trap crop varieties, nitrogen fertilizer rates, and seeding methods were evaluated in 1992 on the Hefenieder field. All studies were planted with a disk drill five days after malt barley was harvested. Before planting the trap crop variety study, loose straw was baled and removed, the field was disked twice, and 50 pounds per acre of nitrogen as ammonium nitrate was applied. Trap crop varieties with SCN reduction potential were compared in a randomized complete block with four replications (Table 3). Radishes were planted at 23 pounds per acre, mustard at 17 pounds per acre, and buckwheat at 47 pounds per acre on July 29. The plots were furrow irrigated twice. A tank mix of Poast® and crop oil at one quart plus one quart was applied when barley was in the two- to three-leaf stage and radishes were in the first true-leaf stage.

Seeding methods and fertilizer rates were evaluated in a split-plot design with four replications. Main plots were seeding methods: (1) stubble planting with disk drill following glyphosate application at one quart per acre, (2) tilled prior to disk drill seeding (no herbicide), and (3) stubble planting with disk drill without herbicide. Sub-plots were nitrogen fertilizer rates 0, 50, and 100 pounds N per acre as ammonium nitrate broadcast before seedbed preparation. Seeding methods and fertilizer rates were factorially arranged. No postemergent herbicide was used.

Radish grazing studies

Trap crop radish, Adagio, was grown at the University of Wyoming Research and Extension Center at Powell and on the Wayne Mosegard farm near Manderson, Wyoming, in 1994 and 1995. Radishes were grown as a second crop following cereal crop harvest. All radishes were irrigated within two days following planting.

At the University of Wyoming Research and Extension Center at Powell, Adagio radish and Purpletop turnip were compared. The experimental design was a randomized complete block with three replications of 0.50-acre plots. Oats and peas were harvested in the soft dough stage and early pod-fill stage, respectively. A five-inch stubble was left. Radishes were planted on July 20, 1994, and August 2, 1995, after applying Roundup® at one quart per acre to reduce competition from oat and pea regrowth. Radish and turnip were planted at 24 and 2.2 pounds per acre, respectively, with a disk drill at six-inches row spacing following harvesting oats and peas. Fertilizer was applied at the rate of 60 pounds N per acre in 1994, 75 pounds N per acre in 1995, and 50 pounds P_2O5 per acre both years. Columbia-Rambouillet cross-bred, seven-month-old lambs (ewes in 1994 and wethers in 1995) with an average weight of 85 pounds started grazing October 6, 1994, and October 24, 1995. Lambs were weighed initially, at mid-point (34 to 42 days in 1994 and 1995) and at the end of grazing (December 14, 1994, and January 15, 1996).

Eight acres of Adagio radish were planted on the Mosegard field in 1994. Establishment methods and experimental treatments were as explained earlier. One hundred fifty mixed breed lambs were randomly selected from the farmer's flock, weighed, and placed on radish diets on October 13. They grazed until November 2, 1994. Average initial weight was 74 pounds. Radish plots were not grazed on the Mosegard farm in 1995.

Before beginning to graze, lambs were treated for parasites (IVOMEC®) and vaccinated for overeating disease. Free-choice water and minerals were provided during grazing periods.

Crop samples were collected before and after grazing with a 10 ft^2 - quadrant (four per replicate and treatment) to determine forage availability and utilization. Forage composition was determined according to published procedures for crude protein and vitro dry matter digestibility (1, 3).

Growing degree days (GDDs) were calculated as the accumulated heat above the thresholds for radish growth and for nematode activity (40 degrees Fahrenheit and 50 Degrees Fahrenheit, respectively) from the date radishes were planted until they were evaluated in late fall. In general, the greater the number of GDDs the greater the amount of radish shoot growth. Although root growth amount is more closely related to SNC control than shoot growth, there is generally a positive correlation between shoot and root growth; however, root growth was not measured.

The average frost-free (32 degrees Fahrenheit) growing season at Powell (near the UW Research and Extension Center) and Worland (near Hefenieder and Snyder farms) is 137 days and 131 days, respectively. The Mosegard farm is about 18 miles from Worland. There is no weather station at Manderson. The frost-free dates at Powell are May 13 to September 27 and they are May 11 to September 19 at Worland. About half the annual precipitation, eight inches, occurs during this period. On average, peak rainfall is in late May and early June. Elevations at study sites are Powell, 4,378 feet, Manderson, 3,890 feet, and Worland, 4,061 feet.

Table 1. Trap crop radish growth following malt barley and corresponding SCN reduction on five fields.

Cooperator	Radish variety	Planting date	GDDs[1]		Radish top growth	Volunteer barley	SCN[2] reduction
			Base 40°F	Base 50°F			
					lb/acre	lb/acre	%
Hefenieder	Pegletta	7-28-92	1758(+212)	774	1394	595	50
Hefenieder	Pegletta	8-12-93	1171(+46)	515	1510	78	75
Wiley	Adagio	8-13-03	1142(+45)	502	1138	807	56
Mosegard	Adagio	8-04-94	1653(+146)	727	2248	433	69
Snyder	Adagio	8-23-94	1054(+243)	464	555	1292	19

[1] Growing degree days during period of radish growth and – in brackets – deviation from long-term average.

[2] Values are the percent reduction in soil populations from radish seeding to plowdown. Prior to planting radishes, population of eggs and juveniles/cc of soil was as follows: Hefenieder (1992), 2.9; Hefenieder (1993), 18.3; Wiley (1993), 7.7; Mosegard (1994), 14.6; and Snyder (1994), 3.6. The estimated damage threshold is 2.8.

Results

Radish growth

At the time of evaluation in late October, there were at least 10 radish plants/ft^2 on all fields. The total accumulation of GDDs declined as the planting date was delayed (Table 1). In all three years, the number of GDDs for the radish-growing period was greater than the long-term average. Later radish planting resulted in fewer GDDs available, less radish growth, and less increase in subsequent sugar beet yields (Tables 1 and 2).

Although there were few weeds, volunteer barley was very competitive and, unless treated with herbicide, it severely suppressed radish growth. Radishes grew until late October as they are very frost tolerant and are able to grow when the temperature is above 40 degrees Fahrenheit; therefore, late-season radish growth, while desirable for grazing, may not be effective in reducing SCN soil populations.

In 1992, radishes were somewhat stunted due to the very heavy soil, which may have maintained extremely high soil moisture levels at Hefenieder's farm. In 1993, radishes grown on a different test site produced more growth than the previous year, even though they were planted later and had fewer growing-degree days (GDDs), base 40 degrees Fahrenheit. Soil conditions, particularly moisture, were more favorable.

Establishment and volunteer control

Seeding with the disk drill into barley stubble produced consistently good stands, whether straw was baled or removed or burned. Although adequate stand and SCN reduction were obtained on the Mosegard field in 1994, the broadcast seeding method, used again in 1995 on an adjacent field, resulted in complete radish seeding failure and the study was abandoned. Broadcast seeding of radishes would facilitate timely seeding; however, there is a need for a subsequent light harrowing and/or cultipacking to ensure an adequate stand.

On the Snyder field, radish seeding was delayed in an effort to sprout the large amount of barley seed on the soil surface as a result of the hail storm. Although treating with Roundup® before planting controlled barley that had already sprouted, a portion of the seed was evidently delayed in germinating. A postemergent application of Poast® was not applied at this site. In this situation, moldboard plowing and earlier seeding would likely have resulted in better volunteer control, radish growth, and reduction in SCN.

Poast's® effectiveness in controlling volunteer barley was variable, as indicated by the amount of barley growth (78 to 807 pounds per acre), according to studies in which it was applied (Table 1). Volunteer barley was more effectively controlled on the

Table 2. The effect of trap crop radishes, nematicides (Temik® and Telone II®), and grazing on sugar beet yields the following year. Means are averages of six replications.

	Sugar beet yield			
	Hef 93	Hef 94	Mos 95	Sny 95
tons/A				
Radish[1] effect				
Unseeded fallow	14.13 b	5.79 a	18.6 b	22.7 a
Radish seeded	18.04 a	4.92 a	23.5 a	23.4 a
Nematicide (Temik®) effect				
Untreated	16.83 a	5.47 a	18.6 b	22.6 a
Half rate[3]	15.66 a	5.11 a	-[2]	24.2 a
Full rate[3]	15.76 a	5.50 a	20.4 a	23.8 a
Telone II® effect	-[2]	-[2]	-[2]	
Untreated				22.6 a
Telone II® at 15 gal/A				23.6 a
Grazing effect	-[2]	-[2]		-[2]
Ungrazed radishes			23.7 a	
Grazed radishes			23.3 a	

[1] Trap crop radishes were grown following malt barley harvest the previous year.

[2] Not determined at this location

[3] Half and full label rate, 14 and 28 lb/A of Temik® 15G. Values in columns followed by the same letter do not differ at the P=0.05 level.

Hefenieder field in 1993 and on the Mosegard field in 1994. With both fields, straw was burned following barley harvest. This no doubt enhanced spray coverage. Volunteer barley was poorly controlled on the Wiley field where radishes were no-till seeded without straw removal. The heavy straw cover may have interfered with herbicide coverage.

Radish effect on SCN population

The reduction in soil populations of SCN in the late summer and fall after radish planting varied from 19 to 75 percent (Table 1). The reduction was more closely related to radish growth than to planting dates. The relatively small reduction in SCN on the Snyder field was due to delayed planting and reduced radish growth as a result of competition from volunteer barley. With all studies, numbers of SCN were variable from plot to plot, as experienced in other studies.

Radish versus nematicide effect on sugar beet yields

On the Hefenieder field (1992 to 1993 study), Temik® did not affect sugar beet yield (Table 2). This might be expected since the SCN population, even on the unseeded plots, was below the estimated damage threshold (EDT) at sugar beet planting. Sugar beet yields increased nearly four tons per acre as a result of growing radishes in 1992. In 1994 there was no radish or nematicide effect on sugar

Table 3. Performance of trap crop varieties planted July 29, 1992, following malt barley harvest, on a field infested with the sugar beet cyst nematode on the Hefenieder farm.

Variety	Seeding rate	No. plants per ft^2	Dry weight of tops
	lb/A		lb/A
Adagio radish	23	5.2	1087
Pegletta radish	23	4.3	1258
Maxi mustard	17	8.3	835
Metex mustard	17	12.3	1353
Prego buckwheat	47	4.8	428
LSD.05			254

beet yield on the Hefenieder field due to severe hail injury, which resulted in poor beet yields.

There was nearly a two-ton per acre increase in sugar beet yield with the full label rate of Temik® on the Mosegard field, compared with nearly five tons per acre increase with radish. Grazing radishes in the previous fall, compared with plowing down as green manure, did not affect sugar beet yield. There was essentially no difference in SCN reduction with grazing compared to ungrazed radishes (70 versus 68 percent) (data not shown). This was expected since radishes were not grazed until near termination of radish growth on October 13. At sugar beet planting, SCN population in plots that were not seeded with radish was considerably above the EDT of 2.8.

On the Snyder field, even though there was a 1.6-ton per acre increase in sugar beet yield due to the half-label rate of Temik®, the increase was not statistically significant ($P>0.05$), nor was the 1-ton per acre increase due to Telone II® or the 0.7-ton per acre increase due to radish. On this field at sugar beet planting, the SCN population of plots not seeded with radish the previous fall was 3.3 eggs and/or juveniles/cc of soil, slightly above the EDT of 2.8; therefore, large sugar beet yield increases were not expected. Sugar beets were not planted on the Wiley field in 1994. There were no effects of radish or nematicides on sugar beet quality factors, beet nitrates, or sucrose content with any of the studies (data not shown).

Cultural studies

Among trap crop varieties, Pegletta radish and Metex mustard produced the greatest amount of top growth (Table 3). There was no difference ($P>0.05$) between Pegletta and Adago radish in top growth. About 10 to 20 percent of Pegletta radish plants had flowered at sampling on October 23, but none of the Adagio radish plants had flowered. Metex significantly outyielded Maxi mustard ($P>0.05$). All radish and mustard varieties displayed very good cold tolerance. There was no sign of die-back from frost injury at the October 23 evaluation date.

Prego buckwheat produced little growth, mainly because it started blooming almost immediately after emerging. Buckwheat plants were killed by a light frost the last week of August and, consequently, the dry matter determined was stems only. Buckwheat may be more suited to full-season production or to spring planting.

The following year, Pegletta and Adagio radish were compared on fields at the Hefenieder Farm (different field than 1992) and at the Faegler Farm (Torrington). Adagio out-yielded Pegletta radish by approximately 10 percent (data not shown).

The need for and effectiveness of nitrogen fertilizer at planting was investigated at the Hefenieder Farm in 1992. Nitrogen in the form of ammonium nitrate at 50 pounds per acre increased trap crop growth 34 percent when seeding into barley stubble follow-

Table 4. The effect of nitrogen rate and seeding methods on establishment and growth of Pegletta radish seeded July 29, 1992, at the Hefenieder farm following malt barley harvest. Nitrogen was in the ammonium nitrate form.

Seeding method[1]	N rate	No. plants per ft^2	Dry weight of tops
	lb/A		lb/A
Stubble, following Glyphosate	0	8.1	644
	50	6.7	860
	100	7.4	982
Mean		7.4	829
Tilled, no herbicide	0	7.6	451
	50	7.1	638
	100	8.4	669
Mean		7.7	586
Stubble, no herbicide	0	6.8	308
	50	8.4	502
	100	6.8	478
Mean		7.3	429
LSD.05		n.s.	157

[1] Stubble seeding involved planting with a disk drill directly into barley following loose straw removal. Tilled plots were tandem disked twice before planting.

ing glyphostate; 41 percent when seeding into tilled seedbed; and 63 percent when seeding into stubble without herbicide (Table 4). An additional 50 pounds of nitrogen (100 pounds per acre) further increased growth of the stubble seeding (without herbicide), but it provided very little additional growth with the seeding into a tilled seedbed or the stubble seeding without herbicide. Radish growth was less, overall, with stubble seeding and no herbicide due to competition from volunteer barley.

Growth response to nitrogen following malt barley would be expected since nitrogen fertilization is closely monitored to avoid the detrimental effects of excess nitrogen on the quality of malt barley grain. In the same study, the seeding method did not affect radish stands; however, stubble planting (following straw removal and Roundup® application) improved radish top growth.

Radish grazing

In a preliminary grazing study, Pegletta radish was compared with Purple Top turnip at the UW Research and Extension Center at Powell in 1992. Although radishes and turnips were planted relatively early (August 6) and a good stand was obtained (>13 plants/ft^2), both radishes and turnips produced poor growth (Table 6). As a result, lamb production per acre was low. Plants showed chlorotic symptoms of nitrogen deficiency, as well as purplish coloring of leaves typical of phosphorus deficiency. The field was fertilized with 50 pounds per acre of nitrogen, but no phosphorus fertilizer was applied. The phosphorus deficiency was confirmed with a soil analysis. Typically, turnips tested at this location in previous studies have had 14-to 16-percent protein and over 200 pounds of lamb gain per acre have been obtained with a similar planting date. Radishes appeared to be more tolerant than tur-

Table 5. Crude protein content and digestibility of Adagio radish and Purple Top turnip forage at beginning of grazing period, 1992 to 1994, at two locations.

	N rate			Manderson	
Crop	1992	1994	1995	1994	1995
Crude protein, percent					
Radish tops	12.3	12.7	11.0	20.9	19.5
Turnip tops	9.7	11.5	12.1	-	-
Turnip roots	7.0	7.2	9.6	-	-
In vitro dry matter digestibility, percent					
Radish tops	83.7	80.0	85.8	83.4	85.5
Turnip tops	82.1	81.2	85.9	-	-
Turnip roots	84.9	88.0	89.1	-	-

nips of low soil fertility as they had higher protein content (Table 5) and produced more dry matter per acre (Table 6). This illustrates the need for a soil analysis prior to trap crop planting.

In 1994, radishes planted July 20 produced more than two tons per acre at UW Research and Extension Center at Powell and 1.25-tons per acre when planted two weeks later at Manderson (Mosegards). In general, production of trap crop radishes and lamb gain per acre were greatest with earlier planting. Volunteer barley (Mosegards) and oat regrowth (Powell) contributed a significant amount to total forage (Table 6). Oats contributed 1,502 pounds per acre and volunteer barley, even though treated with herbicide, contributed an additional 237 pounds per acre. Since the field was burned, there was very little straw at Mosegards.

Lamb performance on radishes, over all studies, was 0.32 pounds per day, and turnips gave the same results. At Powell, where lambs were weighed halfway through the 69-day grazing period in 1994 and halfway through the 83-day grazing period in 1995, they performed somewhat better in the first half than in the last half of the grazing period. Average lamb weight gain per acre was 270 pounds and 282 pounds per acre for radish and turnip grazing, respectively. In all grazing studies, radishes primarily produced leaves. Lambs used 50 to 89 percent of total forage available. Lambs did not eat radish roots; however, they nearly completely consumed volunteer and regrowth of small grain and ate a significant amount of straw.

Volunteer cereal and straw contributed an average 20 percent of total forage available with radish grazing studies. These components may have contributed to the performance in lambs. In a previous study[7], lambs performed better when those grazing rape (*Brassica napus*) were fed low-quality orchardgrass comprising 30 percent of their diet compared with those consuming a straight rape diet. The suggested reason for this difference was that, although rape is high-quality forage, it is succulent and low in fiber. The fiber content may be too low for normal rumen function and the high moisture content may limit intake. Trap crop radish, analytically, is similar to rape and, therefore, availability of a higher dry matter and higher fiber forage might improve lamb performance. Fiber easily can be provided by giving lambs access to an adjacent field of crop residue or grass, or lambs can be given free-choice access to baled hay or straw.

Grazing was completed by November 2 at Manderson, allowing time for the field to be fall-tilled for early spring planting. At Powell, grazing continued until December 14, 1994, and January 15, 1996, limiting the possibility of field preparation. If fall

Table 6. Forage dry matter production and lamb performance while grazing trap crop radishes and turnips.

		Forage availability[1]			
Location/year	Seeded species	Seeded species	Total	Lamb ACG[2]	Lamb gain/acre
		lb/A	lb/A	lb	lb
Powell, 1992	Radish Turnip	1134 985	1318 1313	0.39 0.31	98 77
Powell, 1994	Radish Turnip	4196 5202	5935 7029	0.28 0.26	262 243
Powell, 1995	Radish Turnip	2654 3628	4303 5382	0.32 0.37	310 320
Manderson, 1994	Radish	2225	2713	0.37	237
	Average, radish Average, turnip			0.32 0.32	270 282

[1] Total forage availability includes oat regrowth and straw at Powell and barley regrowth at Manderson
[2] ADG = Average daily gain

field preparation is important, larger numbers of animals, as at Manderson, should be used.

Summary

The currently available variety, Adagio radish, performed well when planted in July and early August following malt barley harvest, particularly when at least 50 pounds per acre of nitrogen was applied, it was well-irrigated, and volunteer barley was controlled. In four of five studies, during an eight and 10-week period following harvest of malt barley, trap crop radish reduced the soil population of SCN 50 percent or more. Failure to control volunteer barley severely limited trap crop growth and its ability to control the SCN.

Lamb gain per acre with fall grazing of radish was greatest with earlier planting. Lamb gains while grazing radish were similar to those grazing turnip. There are no studies on trap crop grazing reported in the literature with which to compare these results. Grazing is, therefore, a means of partly or wholly defraying costs of growing trap crops without affecting SCN control or impact on sugar beet yields the following year. Potential exists for using two or two and a half months of growing season following barley harvest to produce high-quality, fall-available forage with which value can be added before marketing lambs.

Further work is needed on the methods used to establish trap crops, including varieties of mustard. Additional work is needed to more consistently control volunteer barley, and grazing with cattle also needs to be evaluated.

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