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Cooperative Extension Service

College of Agriculture February, 1998



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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Edna L. McBreen, Director, Cooperative Extension Service, University of Wyoming, Laramie, WY 82071.

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The purpose of this bulletin is to describe methods of producing and utilizing turnips and other brassicas.

Brassica species

Brassicas include short-season (fast-maturing) crops such as turnips (*Brassica rapa*), rape (*B. napus*), crosses of these with Chinese cabbage, and mustard (*Sinapsis alba*). Full-season brassicas include kale (*B. oleracea*) and swedes or rutabagas (*B. napus*). Related species include stock beets (*Beta vulgaris*) and fodder radish (*Raphanus sativus*). The former is similar in growth habit to sugar beets, however, at least half of the fleshy root protrudes from the ground. The latter includes varieties that are resistant to the sugar beet cyst nematode (SBCN) and, along with varieties of white mustard, are useful in the biological control of the SBCN.

Brassica characteristics

Although turnips and rape are biennials, they usually do not overwinter in the northern areas of

the United States. Plants have high frost tolerance and maintain high nutrient concentration into the fall and early winter. All species of brassicas produce succulent top growth. Turnips and swedes produce significant root growth, which also can be utilized by grazing animals. Because of their high water content, harvesting and storing is not recommended. Rape has a fibrous root system, in contrast to the fleshy roots of turnips. On soils subject to erosion, rape should be used in lieu of, or in combination with, turnips. After grazing turnips the soil surface is bare, whereas un-utilized stems of rape provide some soil protection.

Nutritional characteristics

Turnips and rape contain high nutrient concentrations, even after maturing. There is a slow decline through the fall (see Table 1). The top growth commonly contains 15 to 25 percent crude protein, although the content may be lower under nitrogen deficiency. Brassicas are relatively low in fiber, readily digested, and provide good concentrations of energy for ruminant animals. In vitro dry matter digestibilities are commonly 85 to 95 percent (Table 1). Although water content is often 90 percent or higher, animals seem to consume adequate amounts of forage to meet their energy needs. Brassicas have been used to replace grain for flushing ewes.

Forage	Crude protein	NDF (percent)	ADF (percent)	IVDMD (percent)
Turnip tops				
Oct. 3 (70 days)	17.7	22.7	20.9	90.4
Nov. 26 (124	15.5	25.1	23.6	86.6
fans)6 (166 days)	10.9	26.9	24.6	83.4
Turnip roots				
Oct. 3 (70 days)	13.2	24.9	23.7	85.7
Nov. 26 (124	11.1	25.4	24.0	82.8
Rape				
Oct. 18 (81 days)	16.3	24.1	22.2	87.6
Sugarbeet tops				
Oct. 18	12.3	34.5	23.9	80.4

Table 1. Forage composition and digestibility of brassicas and sugarbeet

NDF = neutral detergent fiber; ADF = acid detergent fiber; IVDMD = in vitro dry matter digestibility. All components are expressed on a dry matter

Uses of Brassicas

Dependent on farm enterprise, brassicas can be planted as a second crop, following small grains; used as a break crop following plow down of alfalfa; and no-till seeded into permanent pastures or meadows (see Table 2).

Planting after small grain is most effective if one of the short-season brassicas (turnips, rape, or Tyfon) is seeded soon enough for adequate growth before heavy frost. If small grains are harvested as silage or hay, the brassicas could be planted sooner. The effect of planting date is shown in Table 2. July planting will result in significantly greater growth than August plantings.

Planting brassicas after alfalfa would allow harvesting a first cutting of hay. Brassicas have relatively high nitrogen requirements and effectively use residual nitrogen from alfalfa. By the following spring, a seedbed is easily prepared for planting a perennial forage or other crop. The production potential of turnips and rape following alfalfa is shown in Figure 1. In this study,

Table 2. Response of turnip and rape, seeded under various conditions and at several locations and planting dates.

Location	Species/Variety	Planting date	Yield (dry matter)		
Seeded into sm	T/A				
Laramie	Turnip, Green Globe	July 17, 1986	3.20		
Laramie	Turnip, Green Globe	August 8,	1.50		
Torrington	Turnip, Purple top	July ⁶ 26, 1988	5.03		
Torrington	Turnip, Purple top	August 2,	3.77		
Torrington	Rape, Dwarf Essex	1989 August 2,	2.30		
No-till seeded into pasture ²					
Afton	Rape, Rangi	June 5, 1988	2.91		
Afton	Turnip, Marco	June 5, 1988	2.12		

¹Soil test showed adequate phosphorus; 100 lb/A of nitrogen (N) (333 lb/A of ammonium nitrate), was applied; root weights included in yields. ²Soil test phosphorus adequate; 50 lb/A of N (150 lb/A of ammonium nitrate) applied; plants, particularly turnips, were nitrogen deficient; root weights not included in yields.

which was done near Riverton, about half the nitrogen needs of these crops were met by residual soil nitrogen.

Many pastures and meadows produce very little regrowth after the spring-early summer flush of growth. Seeding brassicas following hay harvest or early-season grazing, if irrigation is available, would provide supplemental high-quality forage for fall utilization. Chemical control of sod and a specialized no-till seeder are required. The sod will recover the following spring, or more productive perennial forage species can be planted with minimal soil preparation.

Production practices

Soil

The range of adaptation of the brassicas is not known. Turnips are not tolerant of saline or alkaline soils. Droughty soils should be avoided. Rape has a more extensive fibrous root system, therefore, it is likely to be more productive than turnips on droughty soils. Rape is moderately salt tolerant (equivalent to barley).

Water requirement

Turnips have small root systems and high plant water contents, so they have little drought tolerance. For maximum production, mid-summer plantings should receive a minimum of 8 to10

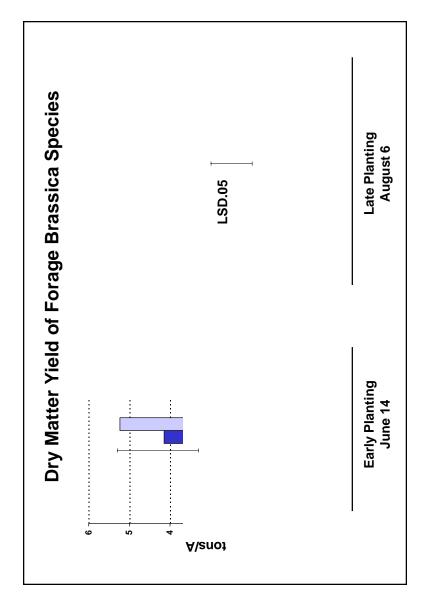


Figure 1. Varieties and seeding rates (lb PLS/A) were: "Premier" kale, 2.7; "Emerald" rape, 3.4; "Tyfon", 4.0; and "Purple top" turnip, 1.8. "Tyfon" was not seeded at the early planting date. The soil was a sandy clay loam with an initial 12 ppm of phosphate and 18 ppm of nitrate. Nitrogen was applied as ammonium nitrate. Weed control was with Treflan EC ® at 1 1/2 pints/A, broadcast prior to sprinkler irrigation. No herbicide was used with the August planting.

inches of water (rainfall and irrigation). May or June plantings should receive at least 12 inches of water. Adequate moisture is critical for establishment; frequent light irrigations should be provided, if necessary. Rape should be substituted for turnips if water is likely to be limited.

Seed and varieties

Although many varieties are imported, seed of several varieties is available in Wyoming. As new varieties are released and tested, recommended varieties will change. Contact your Cooperative Extension agent for the latest information on varieties.

Seeding method

Brassica seed is relatively small and requires a fine and firm seedbed free of weeds. In no-till situations the sod should be 2 to 3 inches or less and suppressed with herbicide before seeding. A notill drill should be used. Avoid seeding into sods with accumulation of dead or matted vegetation on the surface or when soil phosphorus (P) is low, as determined by soil test. Since P fertilizer cannot be incorporated in the no-till method, the brassicas will not be productive in low-P soils. If seeding into small grain stubble, loose straw should be removed before planting brassicas. With broadcast seeding, a following operation to cover and firm soil over seed is necessary. Since only a small amount of seed is used, it can be mixed with fertilizer and spun on. Aerial broadcasting into

standing cereal grain has been successful. Brassica seed should be broadcast before the last irrigation and the soil surface kept moist for at least four or five days. In mid-summer, the brassicas will germinate within two days.

Mixed species seedings have improved animal performance over straight brassicas. Oats or other small grain can be seeded with brassicas. These



Lambs grazing in the fall on July-planted "Emerald" rape. *Powell Research and Extension Center.*

species are often planted to suppress weeds; however, weeds are rarely a problem with late-summer plantings. To avoid excessive competition, no more than 20 pounds per acre of small grain

should be seeded in alternate rows. Alternatively, small grains can be seeded in a block representing, perhaps, 20 to 25 percent of the field. The need for small grain is less with no-till seedings into pastures or meadows because there will be some sod recovery for grazing. Animals will utilize straw as part of their fiber requirement if brassicas are seeded into stubble.

Seeding rate

With good seedbed conditions, 1 1/2 to 2 pounds per acre of turnip and 2 to 4 pounds per acre of other brassica seed will be required. The higher seeding rate will result in a higher proportion of leaves to roots in turnips and Tyfon. If seeded aerially, a minimum of 5 to 6 pounds of seed per acre will be needed.

Seeding date

To obtain maximum production, short-season varieties should be seeded by mid-July. Production will decrease with each day delay after mid-July. Kale, swedes, and fodder beets require a full season and must be planted in May or early June.

Weed control

Spring plantings will more likely encounter weed competition than later planting. Trifluralin can be used to control many weed species. Although there will be fewer annual weeds with stubble seedings in July or August, regrowth of cereals or volunteer grain may need to be controlled.

Fertilization

The most important need will be nitrogen. Dependent on the soil test, 60 to 120 pounds per acre of N should be applied at seeding. Following alfalfa, 50 to 60 pounds per acre appears to be adequate. Unless fertilizer is incorporated before seeding, ammonium nitrate will be more effective than urea as a source of nitrogen. Phosphorus and potassium requirements of brassicas are high, but fertilizer application should be based on a soil test.

Pasture utilization

Animals should be adjusted to green forage before grazing brassicas. Tyfon, rape, and turnip seedings should not be grazed until at least 60 days following seeding. Kale and swedes require at least 90 days before the first grazing.

Yearlings rather than calves, and larger (75 to 100 pounds) rather than smaller lambs, will more effectively use grazed brassicas because they have larger and more fully developed rumens. Ewes and mature cows could utilize brassicas, but their nutrient needs are much lower than the nutrient content of the brassicas.

Grazing can continue until heavy snow cover. After low temperatures kill the crop (10 degrees Fahrenheit or lower), the brassicas will deteriorate (rapidly with mild temperatures). Early snow cover may protect turnip roots until they can be utilized. Animals will consume frozen brassicas with no apparent adverse effects.

Because they have high energy concentrations, the brassicas can be treated as concentrate feeds. Animals can be limited to two or three hours grazing each day on pure stands. This method might be useful in flushing ewes. Stocking rates will vary with brassica species, time of planting, method of planting, and growing conditions. Forage yields will generally be higher

in prepared seedbeds than with no-till seedings of brassicas into sod. Stocking rates as high as 1600 to 2200 lamb grazing days per acre or five to nine animal-unit months (AUMs)



Yearlings grazing turnips on irrigated center pivot circle at Bill Gross Farm, Pine Bluffs, WY, October.

with cattle have been reported.

As with all forages, there is an advantage to rotational grazing. During the fall, rotational grazing is not as critical, as plants are not apt to regrow. Once utilization is 80 percent or greater, it may be advantageous to remove fattening animals and "clean up" with ewes or cows.

Animals should be properly vaccinated and treated for worms before turning on to brassicas. A complete mineral supplement should be available free choice. Supplementing with poor quality hay or straw should be provided if there are limited amounts of other high-fiber forages.

Summary

These fast-growing, cold-tolerant forages are adapted to fall grazing because they maintain high nutrient content into the fall and winter. With proper management and grown as a second crop, they provide relatively inexpensive forage for high-performance livestock, reducing the need for feeding hay or supplement.