Kansas Rural Center
SUSTAINABLE AGRICULTURE
MANAGEMENT GUIDES

BRASSICAS

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Brassicas are cold hardy, produce high yields of leaves, develop roots of high nutritive value, and retain good feed value during cold weather. Early settlers in the United States brought Brassica seed with them to grow as animal forage. Brassica forages can extend the grazing season up to three extra months in northeastern United States (Reid et al. 1994).

Types of Brassicas

Turnips, an excellent late-fall forage, can reach maximum production in 80 to 90 days after establishment. Turnips can range from predominately leaf to root varieties. Purple Top White Globes is a common turnip variety used for grazing (Wikse and Gates, 1987). Turnips can germinate in soil as low as 40°F. They will continue to grow until temperatures drop as low as 15°F (Gompert et al.). Turnips required several days of temperatures continually below freezing to be killed (Rook, 1998).

Kale has the best cold tolerance of the Brassicas with a survival tolerance down to 10°F. Forage rape is a short-season leafy Brassica ready to graze 60 days after planting. Giant varieties are best suited for cattle or sheep grazing; dwarf varieties are best suited for finishing lambs (Thompson and Duncan).

Swede is a long-season plant with a large edible root. It requires 150 to 180 days to reach maximum production and is best suited to late-fall grazing. Generally it has higher yields than turnips (Thompson and Duncan).

Available turnip varieties for fall and winter grazing include Purple Top, Barkant, Sampson, Dynamo and Rondo. Turnip forage types for summer and early fall grazing include Civastro, Rangiora, and Forage Star. Other Brassica forage varieties include Pinfold Kale, Premier Kale, Hobson Rape, Dwarf Essex Rape, Interval Rape and tyfon (Rook, 1998).

Nutrition

Brassicas are high in dry matter digestibility at 85-95% compared to good alfalfa at 70%. Such high digestibility permits increased rate gains over many other forages (Jung). Turnips are 85-90% water. Turnips have excellent nutritional value with high energy content (leaves have 69% total digestible nutrients; roots have 86% total digestible nutrients), and good protein levels (leaves have 12-19% crude protein; roots have 9-12% crude protein). Turnips are highly palatable with 100% leaf utilization and 78% utilization of roots (Wikse and Gates, 1987). Twenty-eight Brassica cultivars were tested at the Kansas State Agricultural Experimental Station in Colby and all but one tested over 30% protein. Brassicas had nitrate levels high enough for possible toxicity but ewes showed no signs of toxicity after grazing (Schwulst and Robertson, 1986).

Pennsylvania turnip trials yielded dry matter accumulation of 178 pounds per acre per day in October. Turnips produced an energy production equivalent of 115 bushels of corn per acre between early August and early November. This suggests turnips can be as productive in October as corn is in August providing a useful stockpiling forage option. By seeding into sod using conservation tillage practices in Pennsylvania, Brassica crops can be grazed in all kinds of weather with little soil compaction. Yields reached 1,000 grazing days per acre (Jung et al. 1983).

Establishment

Brassicas require good soil drainage and a soil pH between 5.3 and 6.8. Seeds should be planted in a firm, moist, seedbed with 6-8 inch rows. Fertility requirements are similar to wheat. Plant rape, turnips, and turnip hybrids in late July or early August for late fall grazing. Swede and kale with stems should be planted in May or June for early fall grazing (Thompson and Duncan). At the Colby Experiment Station, Brassicas were planted in late April with a roller-type grass seeder (Schwulst, 1982).

It is preferable to cover turnip seed as lightly as possible. Planting deeper than ½ inch will suppress germination. The seed may be drilled in rows or broadcast and mixed in the soil with a harrow or packer. Seeding rate is critical. There are about 240,000 seeds per

pound. Optimum plant stands in Nebraska can be achieved with 2.5-3 pounds per acre for irrigated sites and one pound per acre for dryland sites. Higher rates in dryland conditions may give more top growth but restrict root development. Turnips provide little crop residue after grazing. If residue is needed for erosion control, one option would be to mix rape seed with turnips. Rape has a fibrous root system retarding erosion. Another option is to plant turnips with a small cereal grain (Gompert et al.).

In a small grain to turnip rotation, ewes should graze small grain stubble fields removing any volunteer weeds and grasses. Turnips can then be planted into the small grain stubble in early August. Turnips can also be planted into an aging alfalfa field in August for fall grazing. A small grain harvested as hay for silage can be spring seeded to turnips (Rook, 1998).

Limiting early weed competition with turnips is important. Three-week-old turnips can compete with most other forages and weeds. Timing the seeding with the onset of a good soaking rain is most beneficial. Turnip growth is maximized by 1-1.5 inches of rain every 7-10 days (Rook, 1998).

Brassica seedlings grown in soil temperatures between 54-59°F were yellow-green with slow growth. Seedlings in soils with a temperature of 70°F were dark green with vigorous growth. First crop turnips generally peak 90 days after planting while rape yields peak 120 days after planting (Jung et al. 1983).

Under reduced tillage conditions, Brassicas can be seeded into existing sod by applying 1 quart per acre of paraquat or glyphosate one or two days prior to seeding. This herbicide rate can be reduced when planting in grain stubble. Seeding can be done with a 6-8 inch minimum-till drill, seeded with a forage crop seeder on a conventional seedbed, or broadcast seeded followed by cultipacking (Jung, Brassica Notes).

Turnips and swedes generally are seeded at 1½ pounds per acre. Rape and kale are seeded at 3½ pounds per acre. Under minimum tillage, fertilizers should be applied at the time of seeding to give Brassicas a competitive edge over the existing sod crop. Medium levels of phosphorous and potassium are needed with nitrogen applications around 75 pounds per acre. Insect pressure is significantly reduced in minimum-tillage planting. Rotate Brassicas into other crops at least after the second year of Brassica production to reduce disease and pest problems (Jung, Brassica Notes). A general vegetable crop turnip fertilization recommendation is 40 pounds of nitrogen, 40 pounds of P_2O_5 and 80 pounds of K_2O per acre applied at seeding (Rook, 1998).

Grazing Management

Strip-grazing using temporary electric fencing optimizes forage utilization. Allow 90 days of turnip growth to maximize root development before grazing. It may take several days for animals to become interested in and learn how to graze turnips. If regrowth is desired, save at least two inches of turnip leaf. Since turnip roots are 90% water, they turn into “block ice” limiting intake during extreme cold weather. Warm winter weather temperatures (60-70F) stimulate root spoilage (Rook, 1998).

Forage rape can be grazed 40-60 days following establishment. It should be grazed leaving 6-8 inches of stubble for rapid regrowth. Under favorable weather, forage rape can be regrazed about every 30 days (Rook, 1998). Spring seeded Brassicas should be grazed in August leaving a 5-inch stubble for regrowth and resumed grazing in September or October (Jung, Brassica Notes).

Cattle

In the Pacific Northwest, turnip fields are usually grazed up to 350 steer days per acre. Most turnip-related disease problems with cattle occur during the first two weeks of grazing the turnip leaves. Four diseases are occasionally associated with cattle grazing Brassicas. Polioencephalomalacia is a brain degenerative disorder characterized by twitching of ears, eyes, and skin along with lack of coordination and blindness. Other behaviors include circling and convulsions. Treatment includes thiamin injections. Pulmonary emphysema causes rapid, difficult breathing accompanied by a grunt on expiration. Affected animals stand with extended heads, dilated nostrils, and open mouths with protruding tongues. Death may occur within two days. Surviving animals have a slow recovery over 7 to 20 days. Bloat is caused by free gas from the turnips that causes abdominal distention. Some animals become chronic bloaters. Hemolytic anemia is characterized by red urine, pale mucous membranes, and unthrifty appearance. Some animals collapse and suddenly die (Wikse and Gates, 1987).

Grazing management to prevent the above diseases in cattle include the following strategies (Wikse and Gates, 1987):

1. Avoid abrupt changes to a turnip diet. At least two weeks prior to turnip grazing, put cattle on a diet with levels of energy and protein similar to turnips. Cattle may be put on a diet of good quality hay for two weeks to allow their rumens to build a popula-

tion of microorganisms capable of adequately digesting high amounts of energy and protein available with turnips. Good quality pasture can also be used as a preconditioning diet. Another alternative is to limit grazing to a few hours per day for the first 7-10 days of grazing turnips. Cattle should always have a good fill of dry roughage before initial exposure to turnips.

2. Feed dry roughage with turnips. Two to three pounds of hay or straw should be fed to each animal each day. An alterative would be to allow free access to a dry pasture or crop stalks adjacent to the turnip pasture. Place water and salt-mineral in the dry pasture to encourage consumption of dry feed. A small grain can be planted with turnips to encourage a more diverse diet for grazing cattle.
3. Strip graze turnips to reduce trampling and to force cattle to eat both leaves and roots. Do not let cattle graze only roots for a week and then turn them into another strip with leaves. This diet change likely will have reduced the necessary rumen microorganisms for a return to a lush green pasture.
4. Feed an iodized salt-trace mineral mix. Turnips contain a chemical that prevents the uptake of iodine by the thyroid gland. This results in hypothyroidism and goiter. Adverse effects can be overcome by offering cattle and sheep a salt-trace mineral mix with 0.008% iodine.
5. Immunize against enterotoxemia.
6. Reproductive problems such as low conception rates and embryonic mortality have been observed in cattle and sheep grazing kale, a plant closely related to turnips. Thus, it may be wise to avoid grazing cattle or sheep during breeding season or in early pregnancy.

Sheep

Sheep selectively grazed wheat over rape (Robertson, 1983). In grazing trials at Kansas State University Agricultural Station at Colby over several years, turnips ranged between no production to 3,500 ewe grazing days per acre. In 1981, turnips produced 3,434 ewe grazing days during July and October; turnip rape produced 3,434 ewe grazing days per acre during July and August; fora rape produced 3,512 ewe grazing days in July and October; and tyfon produced 2,435 ewe grazing days in July and August. Fora rape has a stout, sturdy stalk which prevents trampling. Tyfon under drought stress is suspected of being unpalatable to sheep (Schwulst, 1982). Sheep fall and winter grazing turnips usually do not need supplemental water (Rook, 1998).

Grazing management of Brassicas should account for the nutritional needs of the livestock. Turnip roots as a sole diet would not provide enough protein for finishing lambs, but roots are consumed in small amounts if leaves are present. Generally, root residues are left for ewes after lamb grazing (Reid et al. 1994). Concentration of minerals in Brassicas were generally more than adequate to meet the requirements of growing and fattening lambs (NRC, 1985).

Brassica forages have given unexplained variable rates of gain for sheep in past research (Reid et al. 1994). Lambs grazed on Brassicas till December 15 in Wyoming resulted in 635.6 lamb grazing days per acre and 297.6 pounds gained per acre. This was an average daily gain of 0.45 pounds per day (Rule et al. 1991). In four years of research trials in West Virginia, lambs gained better on Brassica forages than nitrogen-fertilized tall fescue and orchard grass-red clover pastures (Reid et al. 1994). West Virginia research trials indicated lambs grazed on turnips did less well and gained 0.19 to 0.23 pounds per day (Heinemann, 1979). Poor quality hay fed with Brassica forages contribute more fiber to the diet of lambs improving performance (Lambert et al. 1987). Lambs grazing tyfon seeded in permanent pasture in mid-July gained as well with similar carcass quality to lambs fed alfalfa hay and corn (Koch et al. 1987). Ewes fall grazing turnips over a 60 day period generally gained one condition score (Rook, 1998). Rape hay is not recommended as a predominant feed for ewes due to poor performance (Oktay et al. 1987).

Turnips are high in moisture, protein, and calcium which makes it a good forage match with corn stalks. Allowing spring lambing ewes to selectively graze between turnips and corn stalks can extend the grazing season through February. In Michigan grazing trials, turnips maintained satisfactory feed value into January (Rook, 1998).

There is concern that Brassicas produce metabolic inhibitors such as glucosinolates and S-methyl cysteine sulfoxide that can affect animal health and reduce gains in sheep and cattle (Fitzgerald, 1983). When grazing frozen turnips, the amount of energy required to heat ingested turnips from 5° to 39°C represented 15% of the daily energy intake of the sheep's diet (Reid et al. 1994).

Sheep grazing turnips have not encountered pulmonary emphysema, polioencephalomalacia, and hemolytic anemia. However, there remain cautions about hypothyroidism, goiter, enterotoxemia, and possible reproductive inefficiencies. Follow the preventive management strategies for these problems in the earlier section on cattle grazing turnips (Wikse and Gates, 1987).

Hogs

Hogs graze rape and corn on the farm of Greg and Lei Gunthorp near LaGrange, Indiana. Rape is interseeded in corn fields at three pounds per acre on the last cultivation. A second rotation strategy is to no-till rape and turnips into wheat stubble. Hogs graze this Brassica combination in late fall and early winter (Myers, 1999).

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