# Brassica and Beet Crops as Potential Livestock Feedstuffs

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## Story in Brief

A number of Brassica crops such as kale, turnips, rape, swede and beets were studied in 6 × 9 m plots during the 1979 and 1980 growing seasons to evaluate their forage potentials and nutritive values. Dry matter yield varied from a minimum of 2321 lb/A to a maximum of 8661 lb/A. Average protein concentration ranged from 17 to 22 percent in leaves and from 8 to 19 percent in roots while dry matter digestibility ranged from 71 to 82 percent in the leaves and from 47 to 91 percent in the roots.

## Introduction

In many European countries, Brassica crops are an important and integral component of the grazing system, especially for sheep grazing (Greenhalgh et al., 1977). These crops can provide abundant forages for livestock during periods when most of the warm or cool season grasses are not available. Brassica and beet crops are low in dry matter but high in protein and carbohydrate contents, with highly digestible dry matter. When blended with grain crops or grasses, these crops can fill in some of the gaps in the grazing system in Oklahoma and other adjacent states.

This study was undertaken to study the forage production potentials, nutritive characteritics and growth habits of Brassica crops under central Oklahoma conditions.

## Materials and Methods

Seeds of kale, rape, turnips, swede and beets were planted in 6 × 9m plots during the 1979 and 1980 growing seasons in replicated and completely randomized plots. The soil at this site at the USDA-Research Station in El Reno is classified as Dale fine silty, mixed, thermic, pachic haplustolls with a pH of approximately 6.6. At the time of each planting, 35.7 lb N/A and 71.4 lb P/A was applied as a top dressing. Samples for dry matter, crude protein, total nonstructural carbohydrates (TNC), in vitro dry matter digestibility (IVDMD) and neutral detergent fiber (NDF) determination were taken at frequent time intervals during each of the two growing seasons. Samples were taken from a 2-foot row in the center of each plot. Plants were separated into roots and shoots except the first samplings which had not yet developed a sizable root system. Samples were weighed, dried at 70 C for 72 hr and reweighed.

Crude protein was determined by Kjeldahl N × 6.25. In vitro dry matter digestibility was determined by the two-stage technique of Tilley and Terry (1963) as modified by Monson et al. (1969). Total nonstructural carbohydrate was determined by the method described by Smith (1969).

## Results and Discussion

Brassica crops produced dry matter yield ranging from 2321 lb/A to 8861 lb/A during the 1979 and 1980 growing seasons (Tables 1, 2). Contribution to the total dry matter yield was over 50 percent by leaves and 37 to 45 percent by roots. All the Brassica crops were very low in dry matter content, ranging from 8 to 13 percent in leaves and from 15 to 23 percent in the roots. However, the roots and leaves of these crops were very high in TNC and protein contents, respectively (Tables 3, 4). In pure stands, Brassica crops may not be able to provide sufficient dry matter for growing animals. Blending grain crops or grasses with Brassica or beet crops could compensate for their low dry matter contents, and the latter will compensate for the low concentration of protein and carbohydrates in grasses.

Both leaves and roots were quite high in IVDMD (Table 5). In leaves IVDMD ranged from 71 to 82 percent and in roots from 47 to 91 percent. At the same time, the roots of these crops contained higher amounts of TNC (Table 3) than their corresponding leaves. Except for polyeura beets, the leaves of the rest of Brassica crops contained relatively higher amounts of NDF than the roots (Table 6). In leaves NDF ranged from 18 to 25 percent and in roots from 18 to 28 percent.

Many of the Brassica crops were found to be less tolerant to the drought condition during the 1980 growing season. Mako and Marco turnips and Perko and Fora rape were relatively more drought tolerant than the rest of the crops. One of the major problems, especially during hot summer months in Oklahoma, appears to be susceptibility of these crops to hosts of insects and other parasitic diseases.

During 1981, we established three pastures of equal size (0.95 hectare) of three types of turnips (purple top, Sirius and Marco) and allowed pregnant cows to graze these under a 12-hr observation period for about 3 weeks. At the beginning, for about 1 week cows preferred to graze pig weed and then began to graze

**Table 1. Dry matter yield (lb/acre) of different types of Brassica and beet crops during 1979 growing season**

| Type | Date | Roots | Leaves | Leaves & roots |
|---|---|---|---|---|
| Fora rape | July 2 | — | — | 3790 |
| | July 20 | 2314 | 3610 | 5920 |
| | Aug. 15 | 2058 | 3415 | 5473 |
| Perko rape | July 2 | — | — | 3238 |
| | July 20 | 2063 | 3334 | 5396 |
| | Aug. 15 | 1878 | 2263 | 4136 |
| Marco stubble turnip | July 2 | — | — | 3611 |
| | July 20 | 2111 | 2975 | 5086 |
| | Aug. 15 | 1906 | 2339 | 4246 |
| Rova turnip | July 2 | — | — | 5074 |
| | July 20 | 2046 | 3406 | 5453 |
| | Aug. 15 | 1906 | 2415 | 4321 |
| Polyeura beet | July 2 | — | — | 3660 |
| | July 20 | 2303 | 2866 | 5170 |
| | Aug. 15 | 832 | 2638 | 3471 |
| | Sept. 17 | 3778 | 1427 | 5205 |

**Table 2. Dry matter yield (lb/acre) of different types of Brassica crops during 1980 growing season**

| Type | Date | Roots | Leaves | Leaves & roots |
|---|---|---|---|---|
| Grummer kale | May 27 | — | — | 2690 |
| | June 26 | 301 | 2870 | 3171 |
| | July 10 | 2280 | 1447 | 3728 |
| Mako turnip | May 27 | — | — | 5509 |
| | June 26 | 2658 | 6008 | 8667 |
| | July 10 | 2613 | 2729 | 5342 |
| Marco stubble turnip | May 27 | — | — | 6887 |
| | June 26 | 2011 | 6246 | 8257 |
| | July 10 | 2946 | 3153 | 6099 |
| Texi summer turnip | May 27 | — | — | 6165 |
| | June 28 | 339 | 7796 | 8136 |
| | July 10 | 2896 | 2190 | 5330 |
| Sirius turnip | May 27 | — | — | 8055 |
| | June 26 | 255 | 2351 | 2606 |
| | July 10 | 1401 | 1563 | 2959 |
| Perko rape | May 27 | — | — | 6542 |
| | June 26 | 294 | 7168 | 7463 |
| | July 10 | 1691 | 896 | 2588 |
| Silona rape | May 27 | — | — | 8162 |
| | June 26 | 698 | 6669 | 7367 |
| | July 10 | — | — | — |
| Marrow stem kale | May 27 | — | — | 4355 |
| | June 26 | 1921 | 5432 | 7354 |
| | July 10 | — | — | — |
| Fora rape | May 27 | — | — | 6662 |
| | June 26 | 455 | 5426 | 5879 |
| | July 10 | — | — | — |
| New Zealand sensitive swede | May 27 | — | — | 4708 |
| | June 26 | 230 | 2133 | 2363 |
| | July 10 | — | — | — |
| Doom Major swede | May 27 | — | — | 7896 |
| | June 26 | 339 | 3459 | 3798 |
| | July 10 | — | — | — |
| Mako summer turnip | May 27 | — | — | 6854 |
| | June 26 | 614 | 7380 | 7994 |
| | July 10 | — | — | 7994 |

turnips. Our observations indicated that cows would pull out the whole plants, discard the leaves and utilize the root system more efficiently. At the time cows were allowed to graze these crops the leaves had become very brittle and full of tiny epidermal hairs. At an earlier stage, leaves were not as brittle and were more palatable. We have been able to establish Brassica crops during spring and late fall. These two periods appear to be more critical in the grazing system in much

**Table 3. Total nonstructural carbohydrates (TNC) in Brassica and beet crops during 1980 growing season**

| Type | Roots (%) | Leaves (%) |
|---|---|---|
| Fora rape | 30.86 | 8.58 |
| Perko rape | 30.35 | 12.93 |
| Marco turnip | 32.0 | 9.56 |
| Mako turnip | 32.13 | 12.37 |
| Polyeura beet | 39.05 | 8.73 |

**Table 4. Crude protein percent in the roots and leaves of Brassica and beet crops during 1979 and 1980 growing season**

| | 1979 | | 1980 | |
|---|---|---|---|---|
| Type | Roots | Leaves | Roots | Leaves |
| Fora rape | 8.18 | 17.06 | 11.12 | 22.32 |
| Perko rape | 7.88 | 17.41 | 10.55 | 20.15 |
| Marco turnip | 12.85 | 18.18 | 18.75 | 20.87 |
| Rova turnip | 13.67 | 18.11 | — | — |
| Mako turnip | — | — | 16.38 | 22.35 |
| Polyeura beet | 9.93 | 18.14 | — | — |

**Table 5. In vitro dry matter digestibility of Brassica and beet crops from 1979 growing season**

| Type | Roots | Leaves | Leaves & roots |
|---|---|---|---|
| Fora rape | 46.9 | 81.8 | 64.9 |
| Perko rape | 70.5 | 74.2 | 69.0 |
| Marco turnip | 74.5 | 71.2 | 71.2 |
| Rova turnip | 75.6 | 82.2 | 82.6 |
| Polyeura beet | 90.8 | 79.5 | 90.1 |

**Table 6. Neutral detergent fiber (NDF) in Brassica and beet crops (percent dry weight) during 1980 growing season**

| Type | Roots | Leaves |
|---|---|---|
| Fora rape | 19.07 | 20.44 |
| Perko rape | 20.56 | 25.08 |
| Marco turnip | 18.70 | 25.00 |
| Mako turnip | 17.94 | 18.40 |
| Polyeura beet | 27.81 | 22.62 |

of Oklahoma when warm season or cool season grasses are not available. Brassica crops can fill in these two gaps if properly managed and blended with grain crops, especially in the fall.

## Literature Cited

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# Forage Potentials of Legume-Interseeded Pastures

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## Story in Brief

Old World Bluestems (Bothriochloa sp.) pastures of five cultivars were overseeded with lespedeza and alfalfa during the 1979 and 1980 growing season. There was a significant increase in dry matter production of lespedeza overseeded pastures as compared to the control treatment during 1979, but in 1980, due to severe drought, the legume contribution was relatively insignificant. All the Old World Bluestems cultivars were found to be very poor utilizers of photosynthetically active radiation.

## Introduction

Old World Bluestems (Bothriochloa sp.) or "Asiatic Bluestems" are very productive and nutritionally acceptable grasses in much of Oklahoma and the adjacent states. Two varieties of Old World Bluestems, "Plains" and "Caucasian," and a number of experimental blends have been found to be very high yielding, relatively drought tolerant and winter hardy (Ahring et al., 1978). These grasses respond to high fertility levels and can tolerate both acid and alkaline soils. As a result of increasing cost of fertilizer materials, it is imperative to search for alternative sources of nutrients, especially nitrogen. Legumes that are otherwise compatible with these grasses need to be studied to evaluate their contribution to the nitrogen economy of a grass legume system. This study was untertaken to understand the interactions between Old World Bluestems and legumes in terms of compatibility and the effect of legumes on productivity under dry land conditions.

## Materials and Methods

Ten replicated pastures containing two replicates each of "Plains" (B. Ischaemum L. Keng.), "Caucasian" (B. caucasica C. E. Hubb.) and three blends,