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Forage Yields of Turnips, Rape and Kale
Under Irrigated and Dryland Conditions at Stephenville

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SUMMARY

Six cultivars of the genus Brassica were seeded September 29, 1981 in irrigated and dryland tests. Yields in the irrigated test ranged from 1693 to 2003 pounds dry matter per acre while dryland yields ranged from 1224 to 1749 pounds per acre. Cultivar yields were not significantly different, but irrigated yields were significantly and unexplainably higher than dryland yields. Forage yields of 'Tyfon' turnip, 'Seven Top' turnip, and 'Dwarf Essex' rape were highest in both tests. Rape survival was 100%, kale survival was 20-40%, and other cultivars were killed by near-record low temperatures. Regrowth of rape averaged 1189 pounds dry matter per acre for two replications. Neither harvesting nor irrigating affected winter survival.

Introduction

Species of the genus Brassica may offer potential as a cool-season forage for livestock. Rape is an annual plant which has been used for hog pasture. Its nutritional value is nearly equal to legumes (1). Several turnip cultivars have been developed to produce large amounts of leaves. Cultivars producing enlarged roots may be desirable since the roots may be consumed by livestock during late fall or winter.

Management is needed to utilize turnip tops and roots. Since bloat is a potential problem, cattle should ingest only 100 pounds of tops per day. Flowers are poisonous to livestock, but those of 'Tyfon' (turnip X Chinese cabbage) are not. Cattle can easily pull turnip plants from the soil causing ingestion of soil and subsequent scours. Another management problem of turnips is that plants will not generate new growth when cut or grazed below the growing point at two inches.

The purpose of this study was to determine forage yield potential, growth patterns, winter hardiness, and protein content of six cultivars of the genus Brassica under irrigated and dryland conditions.

* Tyfon, Mimeo. Report, Pacific Seed Production Co., P. O. Box 1141, Albany, Oregon 97321.

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Materials and Methods

Six annual cultivars of the genus Brassica were established in separate irrigated and dryland tests on Windthorst fine sandy loam. Fertilizer was applied at the rate of 100-60-0 and incorporated by disking. Plots measuring 5X12 feet were seeded September 29, 1981 with a garden-type planter. A carrot seed-plate metered eight pounds of seed per acre into rows spaced one foot apart. The four replications in the randomized complete-block design were separated by alleys four feet wide. Two rows of rape were seeded as border rows on the ends of all replications.

Irrigation at the rate of 1.5 inches per acre was applied to both tests October 1 to insure germination. Abnormally high rainfall of 7.50 inches during October made further irrigation unnecessary.

Plants were harvested November 24, 1981 by hand clipping four row-feet from two of the three center rows of each plot. Largest plants were about twelve inches tall. Clipping height was four inches for the irrigated test and two and one-half inches for the dryland test. Plant material was dried at 70C, and yields per acre were calculated. Following harvest, the plants in the dryland test and in two replications of the irrigated test were cut with a sickle mower to the same height used in hand clipping. Irrigation at the rate of one and one-half inches was applied December 15.

Root yield was determined by harvesting eight row-feet of plants on January 28, 1982. Rotten roots were discarded. Yield was determined on a fresh-weight basis.

The percentage of live plants in each plot was determined on March 8, 1982. Since irrigated rape had a good stand, it was then hand clipped to four inches. Dryland rape yield was estimated as a percentage of the irrigated yield.

Results and Discussion

Dry matter yields of a single harvest ranged from 1693 to 2003 pounds per acre for cultivars in the irrigated test (Table 1). Dryland yields ranged from 1224 to 1749 pounds per acre. Cultivars were not statistically different. 'Tyfon', 'Dwarf Essex', and 'Seven Top' tended toward highest yields since they ranked among the upper three cultivars in both the irrigated and dryland tests. Significantly higher yields of the irrigated test are inexplicable since soil, water, fertilizer, and other management factors were the same for both tests.

All cultivars except 'Dwarf Essex' rape and 'Improved Siberian' kale were killed by freezing temperatures before regrowth was sufficient for a second harvest. The two replications of irrigated 'Dwarf Essex' mowed at the first harvest produced 914 and 1483 pounds dry matter per acre the second harvest. Regrowth yield of rape in the dryland test was estimated

at 20% of that of the lower yielding rape plot in the irrigated test. Irrigation water applied December 15 probably caused the difference.

Winter survival of rape was 100%, kale survival rate was 20-40%, and other cultivars were virtually destroyed (Table 2). Low temperatures of 3F, 4F, 8F, 9F, and 10F on January 10, 11, 13, 16, and 17, respectively, were the lowest of the winter. Survival was the same whether or not the cultivars were mowed November 25. Survival was also the same whether or not irrigation was applied during a dry period.

'Purple Top' was the only cultivar which produced edible roots. When the tops were mowed following the November harvest, root yields were 5.55 and 5.89 tons fresh weight per acre for the irrigated and dryland test, respectively. When the tops were not mowed, root yields were 13.35 tons fresh weight per acre in the irrigated test. Since the average dry matter content of roots is 8 percent, this is equivalent to 2136 pounds dry matter per acre. This may be compared with 1965 pounds dry matter produced by irrigated oats March 23, 1981 at Stephenville.

Acknowledgments

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Literature Cited

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Table 1. Forage Yields of Brassica under Irrigated and Dryland Conditions at Stephenville in 1981.

<u>Scientific Name</u>	<u>Common Name</u>	<u>Cultivar</u>	<u>Pounds Dry Matter Per Acre</u>	
			<u>Irrigated</u> ^{2/}	<u>Dryland</u> ^{2/}
<u>Brassica rapa</u>	turnip	Tyfon ^{1/}	2003	1749
<u>Brassica rapa</u>	turnip	Seven Top	1959	1475
<u>Brassica napus</u>	rape	Dwarf Essex	1920+1189**	1521
<u>Brassica rapa</u>	turnip	Purple Top ^{3/}	1869	1279
<u>Brassica oleracea</u> *	kale	Improved Siberian	1718	1224
<u>Brassica napus</u>	turnip	Shogoin	1693	1403

* variety acephala ** Second harvest only two replications.
^{1/} Chinese cabbage X turnip ^{2/} Cultivars are non-significant at the 0.05 level. Irrigated yields were significantly higher than dryland yields.
^{3/} 'Purple Top' edible root yields were 5.89 and 9.45 tons fresh weight per acre for the dryland and irrigated test, respectively.

Table 2. Winter Hardiness of Six Cultivars of the Genus Brassica Grown at Stephenville, Texas, 1981-82.

<u>Common Name</u>	<u>Cultivar</u>	<u>% Survival*</u>	
		<u>Irrigated</u>	<u>Dryland</u>
rape	Dwarf Essex	100	100
kale	Improved Siberian	20-40	20-40
turnip	Purple Top	0	10
turnip	Seven Top	10	10
turnip	Shogoin	0	0
turnip	Tyfon	0	10

*Determinations were made March 8, 1982 following near-record low temperatures of 3F and 4F on January 10 and 11, 1982, respectively.