

PERFORMANCE OF FOUR FORAGE TURNIP VARIETIES
AT MADRAS, OREGON, 1986-1987

J. Loren Nelson¹

ABSTRACT

Forage turnips (cv. Purple Top, Rondo, Forage Star, Barive) were evaluated at the Madras site of the Central Oregon Experiment Station for root and top yield 67, 94, 123, and 158 days after planting on August 22, 1986. Maximum yield of fresh tops from 19.6 to 30.7 tons/Acre were obtained 67 and 94 days after sowing. The maximum of 14.8 to 17.9 tons/acre of fresh roots was not reached until the last harvest (January 27). However, maximum total yield of fresh biomass (34.4 to 40.6 tons/Acre) for all varieties was achieved November 23, 94 days from sowing. The contribution of leaf tissue to total yield declined with each harvest and the reverse relationship existed for the root role in productivity. Each component of dry matter yield was highest on December 23, 123 days after planting. Leaf tissue dry matter declined for Barive and Forage Star from November 24 to the end of the season. There was a slight increase during the same period for Rondo and Purple Top which had initiated some new leaf growth because of mild winter temperature. Maximum dry matter yield ranged from 2.4 to 3.2, 1.9 to 2.3, and 4.6 to 5.4 tons/ acre for tops, roots, and tops plus roots on December 23, 123 days from sowing. The highest percent dry matters obtained throughout the season were 13.88 and 10.83 for tops of Purple Top January 27 and roots of Forage Star November 24, respectively.

INTRODUCTION

Forage turnips (Brassica rapa L.) have been used as valuable supplemental fall and winter pasture on irrigated land in central Oregon. They are well adapted to cool climates. However, growers have observed that productivity declines

¹ Research agronomist, Oregon State University, Central Oregon Experiment Station, P.O. Box 246, Redmond, OR 97756.

ACKNOWLEDGMENT: Seed was provided by Alf Christianson Seed Co., P.O. Box 98, Mount Vernon, WA 98273 and Round Butte Seed Growers, Culver, OR 97734.

with deferred planting from late July to September. Apparently the Purple Top variety has been planted most frequently but Rondo, Forage Star, and Barive are also available. No research data are available for these varieties grown in central Oregon.

The objective of this test was to determine the root and top yield of the four varieties listed above when harvested approximately 60-, 90-, 120-, and 160-days after planting.

MATERIALS AND METHODS

Non-treated seed of Purple Top, Rondo, Forage Star, and Barive fodder turnips was sown in 5 feet wide x 20 feet long plots replicated four times in a randomized complete block design at Madras, Oregon. Treflan (1 pound ai/acre) was impregnated on 16-20-0-15 (400 pounds/acre) and broadcast on the field for incorporation during seedbed preparation. Seed was planted 3/4-inch deep at 3 pounds/acre on August 22, 1986. The plot was irrigated as needed. Malathion (1.25 pounds ai/acre) was applied on September 8 for aphid control.

A 9.29 square foot sample was taken from each plot on October 28, November 24, December 23, and January 27, 1987, for 67, 94, 123, and 158 days after planting, respectively. Plant height was measured for the first two harvests. Plants were pulled from the soil by hand and the soil was brushed from the roots. All plants were topped and root and top weighed separately. Root diameter of the largest root for each variety was measured.

Green weight yields (tons/acre) were calculated for each variety. A top and root sample was oven-dried from which dry matter yields were determined. A top/root ratio on a green and oven-dry weight basis was calculated by dividing the top weight by the root weight.

Least significant differences at 5 and 1 percent levels of probability were calculated to test differences.

RESULTS AND DISCUSSION

Fresh Top, Root and Total Yield. The maximum top yield was obtained from 67 to 94 days after sowing (Table 1). However, the maximum root weight was not achieved until the January harvest, 158 days after planting. The maximum total yield (tops and roots) was obtained within 94 days. There was a higher percentage of the green yield comprised of leaf (tops) tissue 67 days after sowing than for subsequent harvest periods. The highest top/root ratios were for the early harvests. The total yield range of the four

varieties was 34 to 40 tons per acre, for the November 24 harvest. Mitchell (4) reported a green weight yield range of 40-80 and 45-85 tons/acre for Purple Top and Barive, respectively, in the Columbia Basin of Washington. Heinemann (3) obtained 32.49 and 10.91 tons per acre fresh weight for roots and aerial parts, respectively, from Purple Top turnips planted August 1 at Prosser, WA.

Green Top Yield Among Varieties. Rondo produced significantly more fresh top yield than other varieties 67 days after planting but for subsequent harvests, Rondo was superior only to Purple Top and Barive.

Green Root Yield Among Varieties. For the first harvest, Purple Top and Barive produced more than Rondo and Forage Star. Ninety-four days after sowing, Purple Top surpassed only Rondo and Forage Star. However, for the next harvest the fresh root weight was similar for all varieties. The only significant difference among varieties in the last harvest was between Barive and Forage Star in favor of Barive.

Total Green Yield Among Varieties. For first harvest Barive was significantly lower in yield than other varieties. Rondo was the highest yielding but was also similar to Purple Top 67 days after planting.

Rondo was similar to Purple Top and Forage Star at all harvests except Forage Star in the first harvest.

Top/Root Ratio Among Varieties. Rondo had the highest ratio the first two harvests, followed by Forage Star and Purple Top for harvest one.

Dry Matter (DM) Yields. There was slightly higher top, root, and total yield for all varieties 123 days after planting than the other harvest periods (Table 2). Rondo and Forage Star were similar in top yield for all harvests and both had greater foliage yield than Barive. Purple Top was similar to Rondo and Forage Star for second and third harvests but lower than Rondo on the first and last harvest. Only one significant difference existed for root yield - Purple Top was superior to Rondo at second harvest. Root yields for all other varieties and harvests were similar. Only a few differences existed for total yield.

DM yields from Purple Top planted August 1 at Prosser, WA, were reported to be 2.97 and 1.43 tons/acre for roots and aerial plant parts (3). Evans (1) found at the same location and variety that total DM yield was 3.40, 3.42, and 1.62 tons/acre from plantings made July 10, August 2, and 31, 1976, respectively. Thus, he concluded that seeding at the end of August is a marginal situation in irrigated central Washington. His dry matter yields of Purple Top from

August 1-3 plantings by plant part were 2.64, 3.17, and 5.81, and 1.98, 2.50, and 4.48 tons/acre for top, storage root, and total, respectively, each in 1977 and 1976.

There was no difference in total yield among Purple Top, Rondo, and Forage Star for any harvest. Purple Top was higher than Barive 67, 94, and 123 days after sowing. Barive was also lower yielding than Forage Star at the first and third harvest. The trend was for Rondo and Forage Star to have the highest dry matter top/root ratios but all differences were not significant. For the first two harvests, Rondo and Forage Star were higher than Barive but Purple Top was similar to Forage Star and Barive. Rondo exceeded Purple Top for the first two harvests. Rondo and Forage Star were higher than Barive at the last two harvests.

Plant Height. All other varieties were taller than Barive (Table 3).

Root Diameter. Root diameter increased for Purple Top from first to second harvest but the largest diameter for the other cultivars was not achieved until the third harvest (Table 3).

Dry Matter (DM) Percentage of Tops and Roots. DM for tops of all varieties increased from October to January harvest (Table 3). No significant difference in percent DM occurred among varieties for the first or last harvest. Several differences existed for the other two harvests.

The percent DM change for roots from early to late harvest appeared to be insignificant. The difference between Rondo and Forage Star in harvest two of 1.93 percent was the only significant difference among varieties.

All varieties except Rondo had the highest percent root DM at the November harvest. Root DM of Forage Star and Barive declined from harvest two compared to Rondo which had a slight increase throughout the season. The percent DM for Purple Top showed an irregular pattern although it may not be significant.

The percent DM mean over all varieties for each harvest ranged from 8.48 to 13.06 and 8.45 to 9.75 for tops and roots, respectively.

Other Growth Characteristics. The root shape and portion of root formed above ground varied for the varieties tested. Purple Top has a globe shaped root with a considerable portion above ground. Evans (1) reported as above ground distribution of whole plant dry weight of 44, 36, and 80 percent for top, storage root, and total, respectively. Cattle may readily uproot the plant and consume

virtually all of it. Less loss from broken roots would probably occur in light, sandy soils. Sheep may encounter greater difficulty in securing most of the root than cattle. Heinemann (3) found that Purple Top utilization was not complete nor efficient. In his study, the lambs left about 16.2 percent of the roots and the ewes about 8.6 percent. Presumably ewes and lambs could utilize Purple Top and Barive in a similar manner, but losses may be greater from the globe-shaped roots of Rondo and Forage Star which were set somewhat lower in the soil. Barive has a long oblong-shaped root set extra high above the soil surface so presumably utilization by livestock would be good.

REFERENCES

1. Evans, D.W. 1979. Crucifers - Growth and Yield. pp. 56-63. In Proceedings Symposium Sheep Harvested Feeds for the Intermountain West. Denver, Colo. Colorado State University.
 2. Hannaway, D.B., W.S. McGuire, and H. Youngberg. 1983. Growing turnips for forage. Oregon State University Extension Service. FS 296.
 3. Heinemann, W.W. 1979. Purple top turnip and fodder radish utilization by sheep. pp. 69-75. In Proceedings Symposium Sheep Harvested Feeds for the Intermountain West. Denver, Colo. Colorado State University.
-
4. Mitchell, L.A. 1979. A new forage system. pp. 49-55. In Proceedings Symposium Sheep Harvested Feeds for the Intermountain West. Denver, Colo. Colorado State University.

Table 1. Green top and root yield of four forage turnip varieties at Madras, Oregon, 1986-1987

Variety	Tops				Roots				Tops and roots				Top/root ratio			
	Days after planting				Days after planting				Days after planting				Days after planting			
	67	94	123	158	67	94	123	158	67	94	123	158	67	94	123	158
	-----tons/acre-----															
Purple Top	25.8	24.6	12.5	13.6	7.5	16.0	11.9	17.2	33.3	40.6	24.3	30.8	3.53	1.54	1.06	0.80
Rondo	30.7	28.0	17.6	18.7	5.1	12.5	9.4	15.6	35.8	40.4	27.0	34.3	6.17	2.26	1.47	1.20
Forage Star	25.9	25.5	15.1	17.3	5.8	12.7	9.1	14.8	31.7	38.2	24.2	32.2	4.69	2.01	1.72	1.17
Barive	17.9	19.6	8.8	12.4	8.0	14.8	10.4	17.9	25.9	34.4	19.2	30.2	2.29	1.34	0.85	0.69
Mean	25.1	24.4	13.5	15.5	6.6	14.0	10.2	16.4	31.7	38.4	23.7	31.9	4.17	1.79	1.27	0.97
CV (%)	9.6	8.3	14.4	8.1	11.9	11.3	18.2	9.9	7.2	8.8	14.4	7.1	16.93	7.72	38.29	10.91
LSD (5%)	3.8	3.2	3.1	2.0	1.3	2.5	3.0	2.6	3.6	5.4	5.4	3.6	1.13	0.22	0.78	0.17
LSD (1%)	5.5	4.6	4.5	2.9	1.8	3.6	4.3	3.7	5.2	7.7	7.8	5.2	1.62	0.32	1.12	0.24

Table 2. Dry matter yield of tops and roots for four forage turnip varieties at Madras, Oregon, 1986-1987

Variety	Tops				Roots				Tops and roots				Top/root ratio			
	Days after planting				Days after planting				Days after planting				Days after planting			
	67	94	123	158	67	94	123	158	67	94	123	158	67	94	123	158
	-----tons/acre-----															
Purple Top	2.1	2.4	3.1	1.9	0.6	1.6	2.3	1.7	2.8	4.0	5.3	3.5	3.62	1.57	1.36	1.16
Rondo	2.5	2.5	3.2	2.4	0.4	1.1	1.9	1.4	2.9	3.6	5.1	3.8	6.03	2.26	1.63	1.67
Forage Star	2.3	2.5	3.1	2.2	0.5	1.4	2.2	1.4	2.8	3.8	5.4	3.6	4.56	1.79	1.43	1.65
Barive	1.5	1.9	2.4	1.6	0.6	1.4	2.2	1.5	2.1	3.3	4.6	3.1	2.34	1.39	1.13	1.12
Mean	2.1	2.3	3.0	2.0	0.5	1.4	2.2	1.5	2.7	3.7	5.1	3.5	4.14	1.75	1.39	1.40
CV (%)	9.6	7.1	8.6	11.6	19.6	13.9	12.8	18.3	9.6	8.0	7.9	9.3	19.92	13.47	12.99	22.88
LSD (5%)	0.3	0.3	0.4	0.4	0.2	0.3	0.4	0.4	0.4	0.5	0.6	0.5	1.32	0.38	0.29	0.51
LSD (1%)	0.5	0.4	0.6	0.5	0.2	0.4	0.6	0.6	0.6	0.7	0.9	0.7	1.89	0.54	0.41	0.74

Table 3. Plant height, diameter of the largest root, and dry matter of tops and roots of four forage turnip varieties, Madras, Oregon, 1986-1987

Variety	Plant ht.		Diameter of largest root				Foliage dry matter				Root dry matter			
	10/28	11/24	10/28	11/24	12/23	1/27	10/28	11/24	12/23	1/27	10/28	11/24	12/23	1/27
	cm		mm				%							
Purple Top	46.0	39.0	60	76	72	70	8.36	9.93	11.55	13.88	8.30	9.83	8.72	9.63
Rondo	48.3	46.3	56	74	82	80	8.23	8.85	9.98	12.55	8.49	8.90	8.27	9.20
Forage Star	46.0	44.3	56	72	83	76	8.97	9.92	10.80	12.73	9.06	10.83	9.70	9.10
Barive	39.0	36.0	53	60	68	68	8.38	9.70	10.68	13.10	7.96	9.45	8.85	8.50
Mean	44.8	41.4	56	71	76	74	8.48	9.60	10.75	13.06	8.45	9.75	8.89	9.11
CV (%)	3.9	3.3	8	11	8	8	6.46	4.59	3.92	6.93	11.51	8.88	10.84	12.90
LSD (5%)	2.8	2.2	7	12	9	9	0.88	0.70	0.67	1.45	1.55	1.38	1.54	1.88
LSD (1%)	4.0	3.1	10	18	13	13	1.26	1.01	0.97	2.08	2.23	1.99	2.21	2.70