2014 Forage Brassica Planting Date Trial

Dr. Heather Darby, UVM Extension Agronomist
Katie Blair, Erica Cummings, Susan Monahan, Julian Post, Sara Ziegler
UVM Extension Crops and Soils Technicians
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2014 FORAGE BRASSICA PLANTING DATE TRIAL

Dr. Heather Darby, University of Vermont Extension
Heather.Darby[at]uvm.edu

Forage brassica can provide a near-concentrate type diet late in the grazing season. This allows for an extra grazing opportunity after annual row crops are harvested, and establishes forage to fill a gap in feed quality and supply. These crops can provide a high-quality feed in a short period of time, fitting well into rotations of other crops, extending the grazing season, and reducing reliance on expensive commercial feed inputs. To graze forage brassica in the fall the crop must be planted in the late summer. Optimum planting dates have not been determined for the Northeast. In 2014, the University of Vermont's Northwest Crops & Soils Program conducted a forage brassica planting date trial to evaluate yield and quality of this annual crop.

MATERIALS AND METHODS

In 2014, a planting date trial was conducted at Borderview Research Farm in Alburgh, VT, in order to determine optimum planting dates for forage brassica (Figure 1). Appin turnip was the variety evaluated in this experiment and the seed purchased from King's Agriseed in Ronks, PA.

Figure 1. Appin turnip just before harvest.

The seedbed at Borderview Research Farm was prepared using standard local practices; including incorporating spring wheat residue with a moldboard plow and finishing with disk and drag harrows (Table 1). The soil was a Benson silt loam. The experimental design was a randomized complete block with four replications. Each plot was 5' by 20', and a Great Plains grain drill was used to plant brassicas at a rate of 6 lbs per acre on 18-Aug, 25-Aug, 2-Sep, and 10-Sep.

Table 1. Agronomic and trial information for the 2014 forage brassica planting date trial.

Location	Borderview Research Farm Alburgh, VT
Soil type	Benson silt loam
Previous crop	Barley & Oats
Tillage operations	Moldboard plow, disking, drag harrow
Plot size (ft.)	5 x 20
Planting dates	18-Aug, 25-Aug, 2-Sep, 10-Sep
Replicates	4
Variety	Appin Turnip
Seeding rate	6 lbs ac^{-1}
Harvest date	27-Oct

All plots were hand harvested on 27-Oct to determine dry matter yields and forage quality. Samples were analyzed using the FOSS NIRS (near infrared reflectance spectroscopy) DS2500 Feed and Forage analyzer at the University of Vermont's Testing Laboratory. The dried and coarsely-ground plot samples were brought to the lab where they were reground using a cyclone sample mill (1mm screen) from the UDY Corporation. Plot subsamples were analyzed for crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF) and 30-hour digestible NDF (NDFD). The CP content of forages is determined by measuring the amount of nitrogen and multiplying by 6.25. The bulky characteristics of forage come from fiber. High fiber is negatively associated with forage feeding values since the less digestible portions of plants are contained in the fiber fraction. The detergent fiber analysis system separates forages into two parts: cell contents, which include sugars, starches, proteins, nonprotein nitrogen, fats and other highly digestible compounds; and the less digestible components found in the fiber fraction. The total fiber content of forage is contained in the neutral detergent fiber (NDF). Chemically, this fraction includes cellulose, hemicellulose and lignin. Because of these chemical components and their association with the bulkiness of feeds, NDF is closely related to feed intake and rumen fill in cows. Recently, forage testing laboratories have begun to evaluate forages for NDF digestibility (NDFD). Evaluation of forages and other feedstuffs for NDFD is being conducted to aid prediction of feed energy content and animal performance. Research has demonstrated that lactating dairy cows will eat more dry matter and produce more milk when fed forages with optimum NDFD. Forages with increased NDFD will result in higher energy values and, perhaps more importantly, increased forage intakes. Forage NDFD can range from 20-80% NDF.

Variations in yield and quality can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among treatments is real or whether it might have occurred due to other variations in the field. All data was analyzed using a mixed model analysis where replicates were considered random effects. At the bottom of each table, a LSD value is presented for each variable (e.g. yield). Least Significant Differences (LSDs) at the 10% level (0.10) of probability are shown. Where the difference between two treatments within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of 10 chances that there is a real difference between the two values. Treatments listed in bold had the top performance in a particular column; treatments that did not perform significantly worse than the top-performer in a particular column are indicated with an asterisk. In the example at right, treatment A is significantly different from treatment C, but not from treatment B. The difference between A and B is equal to 400, which is less than the LSD value of 500. This means that these treatments did not differ in yield. The difference between A and C is equal to 650, which is greater than the LSD value of 500. This means that the yields of these treatments were significantly different from one another.

Planting date	**Yield**
A	**1600***
B	1200*
C	950
LSD (0.10)	500

RESULTS

Using an onsite Davis Instruments Vantage Pro2 Weather Station at Borderview Research Farm in Alburgh, VT, weather data are summarized for the 2014 forage brassica growing season (Table 2). August was slightly cooler than the historical average (1981-2010), with September being average temperature, and October slightly warmer. The warm October resulted in 90 more growing degree days than the 30-year average, as calculated with a base temperature of 32°F. The 2014 fall growing season was slightly more wet than the historical average, in August and October, but September received much less rain than the 30-year average. This led to 1.57 fewer inches of rain than normal between August and October.

Table 2. Summarized weather data for 2014, Alburgh, VT.

Alburgh, VT	August	September	October
Average temperature (°F)	67.6	60.6	51.9
Departure from normal	-1.2	0	3.7
Precipitation (inches)	3.98	1.33	4.27
Departure from normal	0.07	-2.31	0.67
Growing Degree Days (base 32°F)	1108	860	622
Departure from normal	-31	2	119

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger. Historical averages are for 30 years of NOAA data (1981-2010) from Burlington, VT.

Average plant height differed significantly between planting dates (Table 3, Figure 2). The 18-Aug planting date resulted in the tallest biomass (39.9 cm) and was significantly taller than forage brassic from all other planting dates.

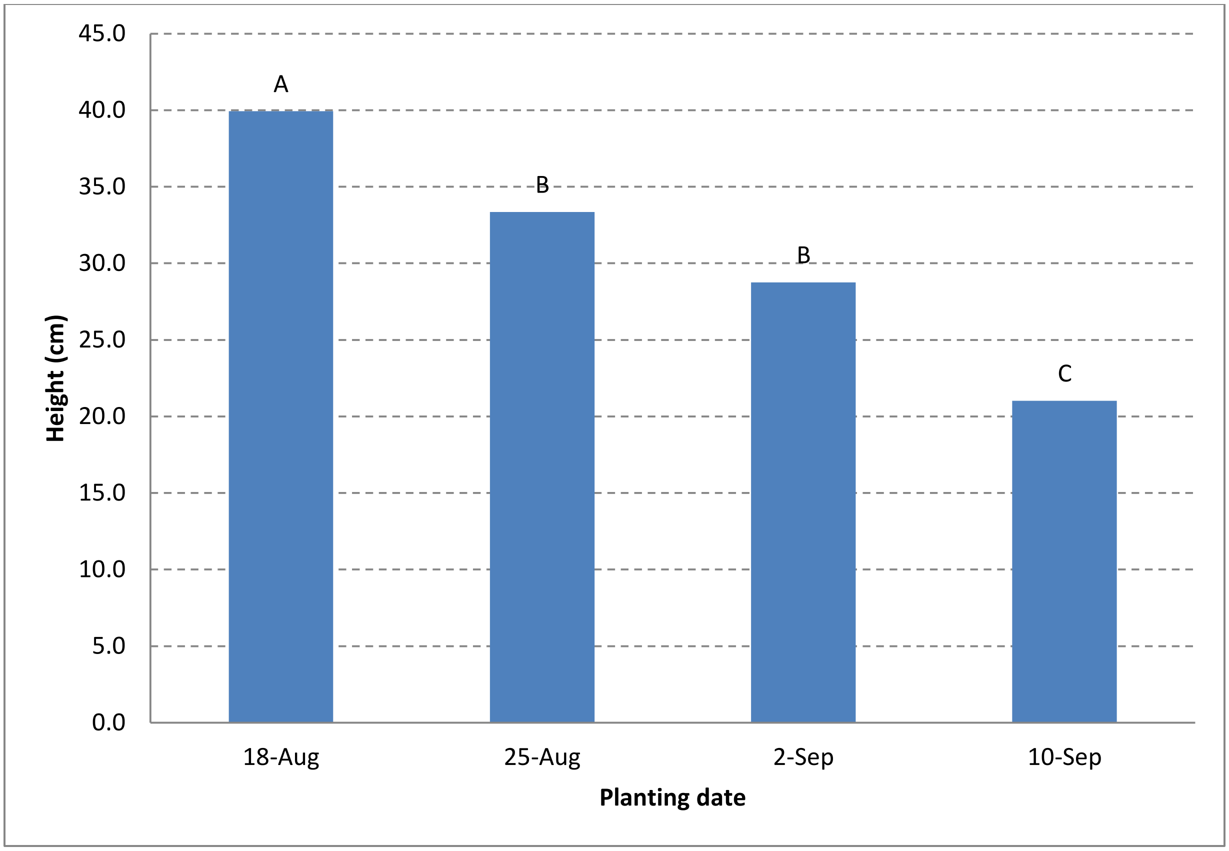

Figure 2. Average plant height of forage brassica on 3 planting dates, Alburgh, VT, 2014.Treatments with the same letter did not differ significantly from one another (p=0.10).

Brassica varieties differed significantly in forage quality characteristics, yield and harvest dry matter (Table 3). The average yield for the brassica trial was 1911 lbs of dry matter per acre (Figure 3) with the 18-Aug producing more biomass than all other dates. The CP concentrations average 23.9%. The low fiber levels and high fiber digestibility are characteristic of this crop. Percent cover was not significant different between treatments.

Table 3. Yield and forage quality characteristics of forage brassica at 3 planting dates, Alburgh, VT, 2014.

Planting date	Soil cover	Plant height	DM Yield	Dry matter	Crude protein	ADF	NDF	NDFD
	%	Cm	lbs/ac	%	%	% of DM	% of DM	% of NDF
18-Aug	87	**39.9**	**3302***	86.5	19.1	12.9	13.5	79.6*
25-Aug	98	33.4	1886	91.1	20.5	**11.6**	**12.4**	**88.1***
2-Sep	98	28.8	1476	93.8*	26.5	13.2	14.1	77.9
10-Sep	97	21.0	981	**96.2***	**29.7***	15.7	16.6	69.1
LSD (0.10)	NS	4.9	655	2.8	2.4	1.5	1.5	9.9
Trial Mean	95	30.8	1911	91.9	23.9	13.3	14.1	78.7

Treatments indicated in **bold** had the top observed performance.
* Treatments indicated with an asterisk did not perform significantly lower than the top-performing treatment in a particular column.
NS – No significant difference was determined between treatments.

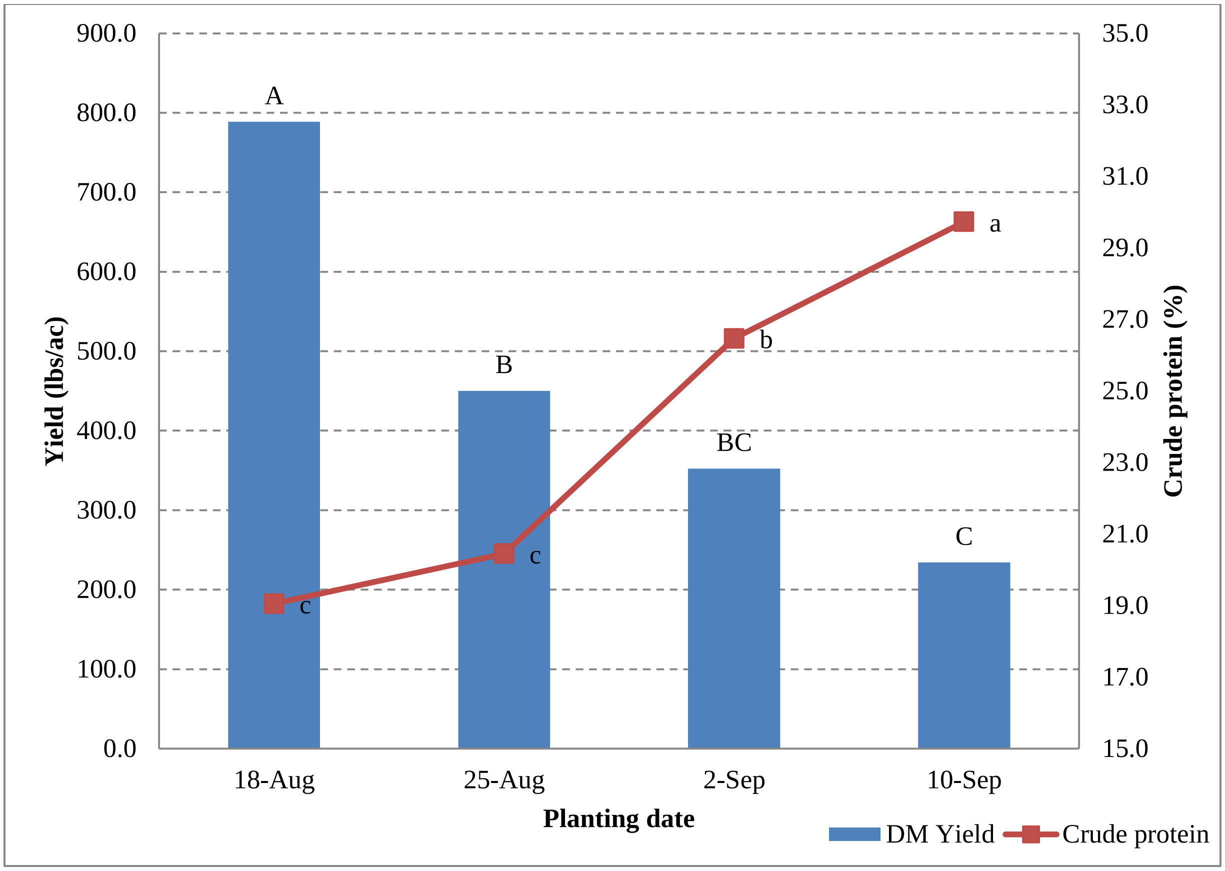

Figure 3. Yield and crude protein for forage brassica planting dates, Alburgh, VT, 2014.Treatments with the same letter did not differ significantly from one another (p=0.10).

DISCUSSION

Forage brassicas have great potential as an additional grazing crop in the Northeast. Extending the grazing season in the fall could improve the overall viability of a farm. Planting forage brassica in the late summer is critical to high yields. As planting dates progressed into late-August, the yield declined significantly.

Forage brassicas are known for the high CP content, energy and level of digestibility. The average CP for this trial was 23.9%. The average ADF for this trial was 13.3%, the average NDF was 14.1%, and the average NDFD was 78.7%. CP, ADF, and NDF had the highest levels in the last planting date on 10-Sep. NDFD was highest in the second planting date, 25-Aug, and was 88.1%. Caution should be taken when grazing these high quality crops. It is important to note that the data presented here reflect results from only one season and one location. This research should be combined with experience managing dairy animals and research from other regions and across years, as well as recommendations from nutritionists.

ACKNOWLEDGEMENTS

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