A comparison of six autumn sown Brassica forage crops in the Manawatu

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Abstract

Six autumn sown forage crops, Appin stubble turnip, Emerald rape, Neris fodder radish, Pasja turnip x rape hybrid, Winfred kale x turnip hybrid and York Globe turnip were compared during the autumn and winter of 1992. Dry matter yields were measured 76 and 133 days after sowing, and protein percentage and metabolizable energy at 133 days after sowing. After grazing by ewes, residual dry matter was assessed by visual scoring. Yields differed significantly at both intervals. Final yields were: Neris, 6562 kg DM/ha; Emerald, 6198 kg DM/ha; Appin, 6020 kg DM/ha; Pasja 5440 kg DM/ha; York Globe, 4798 kg DM/ha and Winfred, 4400 kg DM/ha. Protein contents were high, ranging from 22.5% to 26.9%. However cultivar differences were not significant. Cultivars differed slightly in metabolizable energy content. Values ranged from 11.1 MJME/kg DM to 11.7 MJME/kg DM and were negatively correlated with post grazing residual score (r = -0.70). Neris fodder radish had high yield and high acceptability, making it very suited for autumn sowing in the southern North Island.

Additional key words: *yield, protein content, metabolizable energy.*

Introduction

Mixed arable farmers in the southern North Island utilize forage crops between summer cash crops for various livestock enterprises, the most important being lamb production. This farming system has been described by Coulson (1978). Brassicas are the most common forage crops used in this system. Brassica is used as a general term in this paper and includes fodder radish, which is not a true brassica. Sowing occurs after harvest of the previous cash crop, with most sowings being completed before the end of March. Subsequent utilization depends on crop growth and demand from grazing animals. These paddocks are normally returned to another cash crop in the following spring.

There is very little published information available on the relative merits of many of the brassicas used in the southern North Island. Many are overseas cultivars and have not been evaluated locally. This paper reports the results of an autumn sown trial comparing the yield and quality of six brassicas commonly grown in the southern North Island.

Methods

Appin stubble turnip (*Brassica campestris*), Emerald rape (*Brassica napus*), Neris fodder radish (*Raphanus sativus*), Pasja hybrid(*Brassica campestris x Brassica napus*), Winfred hybrid (*Brassica campestris x Brassica oleracea*) and York Globe turnips (*Brassica campestris*) were direct drilled, following glyphosate herbicide (3l/ha) at Massey University on 26 March, 1992. Plots were 20m x 8m, sown in a randomised complete block design with four replicates. Sowing rate for all plots was 3 kg/ha except fodder radish which was sown at 7 kg/ha. Soil type was a Manawatu silt loam. The area had been in a forage millet crop and a forage brassica crop during the previous year, following permanent pasture. 100 kg/ha DAP (18 : 20 : 0 : 2) fertiliser and 3 kg/ha Counter 20g (200 g/kg terbufos) insecticide to control springtails, was applied at sowing. At canopy closure (early May), 70 kg/ha of nitrogen (N) in the form of urea was applied with a spinning disc spreader running across the plots.

Yields were measured on 10 June, 76 days after sowing (DAS) and 6 August, 133 DAS. Five 0.15m^2 samples were taken from each plot. Cuts were taken at ground level in all plots. After weighing, a representative subsample was taken for calculation of dry matter (DM) content. For the 6 August harvest further subsamples were taken for determination of N content and metabolizable energy (ME) (Roughan and Holland, 1977). Nitrogen analysis was done using micro kjeldahl digestion (Anon., 1987). Crude protein was calculated

by multiplying N% by 6.25 (Wickham *et al.*, 1986).

Immediately after the final harvest all plots were grazed with mixed aged ewes (lambs being unavailable). Grazing was done one block at a time with access to all brassicas in each block. Ewes were shifted every three days because by this time they had become restless. This allowed some selectivity. Grazing intensity was approximately 500 ewes/ha. Post grazing residuals were assessed by visual scoring of each plot. Scores were based on estimating the % utilization. The maximum possible score was 10 (ungrazed plots) and the minimum possible score was 0 (100% grazed).

Results

All plots established evenly with emergence beginning 8 days after sowing. Some leaf minor (*Scaptomyza flava*) damage occurred, particularly in the Pasja plots, but no control measures were taken. Dry matter yields for both harvest times are detailed in Table 1. Neris fodder radish achieved the highest yields at both harvest dates and Winfred the lowest at both harvests. At 133 DAS, Neris had accumulated over 6500 kg DM/ha resulting from an average growth rate of 49.3 kg DM/ha/day between sowing and harvest at 133 days. Yield rankings were similar at both harvests, the major exceptions being Emerald and Pasja. At 76 DAS Emerald yielded significantly less than Neris but was not significantly different at 133 DAS. Pasja yielded significantly less than Neris at 133 DAS whereas at 76 DAS, its yield was similar to Neris.

Crude protein levels were high ranging from 22.5% to 26.9%, but cultivar differences were not significant (Table 2). Average dry matter digestibility was also high (88.3%) but again there were no cultivar differences. Cultivar differences in ME content and post grazing residual score were recorded and both were highly significant. When sheep were introduced they showed no hesitation in grazing; however grazing was selective. Post grazing residual scores were high for Pasja, Appin and York Globe and low for Neris, Emerald and Winfred. The ME content differences in Table 2 are relatively small but appear to have influenced the voluntary feed intake of sheep grazing these crops. Residual score was negatively and significantly correlated with ME content (r = -0.70).

Table 1. Mean yield (kg DM/ha) for each cultivar at 76 and 133 days after sowing (DAS).

	Yield	
Cultivar	76 DAS	133 DAS
Neris	2791	6562
Pasja	2704	5440
Appin	2416	6020
York Globe	1994	4798
Emerald	1895	6198
Winfred	1344	4400
Significance	0.004	0.002
LSD (0.05)	699	1010

Discussion

The yields obtained in this trial were high, reflecting the productivity of the site. They were approximately double the yields achieved by Percival and Hunter (1990) from autumn sown brassicas grown over similar periods on the Central Plateau of the North Island. However these yields are not unusual for autumn sown forage crops in the Manawatu (Millner, 1984). Average daily temperature over the period April to July 1992 was 9.5°C, 0.9°C less than the 60 year average, and was considered not particularly favourable for crop growth. This trial was also sown relatively late which would have limited yield (Douglas, 1980). The 1992 winter was wetter than normal but the free draining soil meant that this was not a problem.

The high yield achieved by Neris fodder radish is consistent with its known ability to out yield turnip and rape (Withers, 1986). Fodder radish has been found to be high yielding relative to other brassicas in the Rangitikei (Millner, 1984) and the Wairarapa (Douglas, 1980). A decline in yield of Pasja relative to Neris from 76 DAS to 133 DAS has been noted previously (Percival and Hunter, 1990). The poor performance of Pasja from

Table 2. Mean crude protein (%), metabolizable energy (MJME/kg DM) and post-grazing residual score for each cultivar.

Cultivar	Protein	ME	Score[1]
Neris	26.9	11.5	2.0
Pasja	23.1	11.3	5.5
Appin	24.4	11.1	5.3
York Globe	23.1	11.3	6.0
Emerald	24.4	11.6	1.8
Winfred	22.5	11.7	2.0
Significance	NS	0.0026	0.0001
LSD (0.05)	-	0.25	0.9

[1] 10 = ungrazed, 1 = completely grazed

76 DAS may be due to the high incidence of leaf minor and associated leaf senescence observed in this cultivar. This indicates that Pasja does not keep well and should be grazed early. Fodder radish tends to mature quickly and is susceptible to bolting (Douglas, 1980). This is regarded as a disadvantage because of a decline in palatability with the onset of flowering (Garland, 1982). In this trial the palatability of Neris did not appear to be a problem at early flowering. Flowering had begun at 133 DAS. None of the other cultivars were flowering at that time. Emerald rape appeared to be ripe at 133 DAS with the canopy beginning to turn a bronze colour. However, it did not appear to be ripe at 76 DAS and may not have been safe for grazing because of the risk of scald, particularly with lambs (Nicol and Barry, 1980). Given the relatively poor yield at 76 DAS that may not be a serious limitation.

The crude protein levels achieved in this trial are high when compared with the approximate values listed by Ulyatt *et al.,* (1980), particularly for fodder radish, reflecting the high fertility of the site. While high fertility increases the risk of nitrate poisoning in most forage crops (Brookes and Millner, 1991), there was no evidence of toxicity during grazing.

The ME values achieved in this trial are comparable with the approximate values listed by Ulyatt *et al.*, (1980). The correlation between ME and post grazing score indicates that relatively small differences in ME can influence grazing preference. Voluntary intake of animals moved from pasture to grazing brassicas with high digestibility is often less than would be expected (Barry, 1978) and is a major reason for the poor growth rates of animals grazing brassicas. The response of voluntary intake to changes in feed quality for young and adult sheep are similar (Ulyatt *et al.*, 1980). When restricted, the sheep grazing the plots in this trial utilized all feed on offer but were particularly reluctant to consume bulbs from York Globe turnips. However utilization of some brassicas may be low (Percival *et al.*, 1986; Newton *et al.*, 1987) or completely refused (Garland, 1982) by grazing animals even where grazing intensity is high. The presence of toxic factors in brassicas is also known to limit animal production (Barry, 1978).

Conclusion

Autumn sown forage crops which are to be used to obtain high liveweight gain in young animals must establish quickly, have high yields and allow high intakes in grazing animals. All of the brassicas compared in this trial established quickly but only Emerald rape and Neris fodder radish achieved high yields with high acceptability. Emerald is probably not suited to early grazing because early yield was low and because of potential toxicity problems when immature. Neris yielded well at both harvests and was acceptable to grazing animals. It has been found to yield well at other sites in the southern North Island, making it well suited for autumn sowing on southern North Island mixed arable farms.

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