Some autumn and winter forage cropping options on the Central Plateau

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Abstract

Large numbers of farmers on the Central Volcanic Plateau of the North Island of New Zealand continue to rely on spring sown brassica crops for late autumn and winter forage. This paper reports on the use of spring-sown mixtures of swede and kale compared to each sown alone, and also the productivity of autumn-sown forage crops.

Dry matter yields of spring sown swede crops at harvests in April, May and July were consistently higher than kale. However, kale generally had higher leaf yields than swede. Further, the leaf of kale was maintained through until July whereas the leaf of swede declined with time. In most instances mixtures of swede and kale gave yields intermediate to either sown alone, except at one site where the mixture was slightly better than swede. The widespread practice of sowing swede/kale mixtures does not appear to provide consistently higher crop yields.

Yields of the autumn sown forage crops at two sites were around 30% of that expected from spring sown crops on comparable sites. Of the crops sown Barkant turnip, Neris and Burton fodder radish, and Pasja chinese cabbage/turnip hybrid gave yields greater than would be expected from pasture over the same period. All of the rape varieties, Kevro tick bean and Ultra-white lupin performed poorly. Autumn sown forage crops cannot be generally recommended for the Central Plateau region.

Additional key words: *brassica, turnip, fodder radish, tick bean, rape, lupin, forage, swede, kale, sowing date, mixtures*

Introduction

Brassica crops have traditionally played an important role on the Central Plateau in providing forage for livestock from mid-summer through to winter. While the area sown to crop has declined they still play an important role in this region in feeding livestock, with a sown area of around 7500 ha in 1985.

The majority of the forage crops sown on the Central Plateau are either swede or mixtures of swede and kale. Lesser areas of turnips, rape and 'forage brassicas' are also found. Nearly all these crops are sown from mid-November to early December. This allows them to become well established before the effects of summer drought.

Most brassica crops are utilised in the period between April and July.

This paper reports on the results of experiments on the Central Plateau to determine yields of swede and kale compared with a swede/kale mixture and also of autumn sown forage crops.

Experimental Work

The experimental programme involved comparisons of swede, kale and swede/kale mixtures at three sites and evaluation of autumn sown crops on two sites, during 1987 and 1988. All trials were in the Rotorua-Taupo area.

Swede/kale comparisons

The experimental objective was to compare the yield accumulation of swede, kale and a swede/kale mixture from spring sowings. The three sites were all from pasture and a normal cultivation programme was followed. Site details were:

Site I, Waikite Valley, Atiamuri sandy silt, flat

Site II, Kaharoa, Kaharoa sand, Flat to rolling
Site III, Reporoa, Taupo silty sand, flat

The varieties used were Doon Major swede and Kestrel kale. All the seed was commercially coated. Plot sizes were 0.068, 0.1275 and 0.17 ha for sites I, II and III respectively. Treatments were replicated twice. Sowing details are given in Table 1.

Three representative areas, each of 2 m^2 were harvested in mid-April, late May and early July. The yield components of leaf, stem and bulb were determined at each harvest. The only harvesting problem occurred at Site III where one replicate was accidently grazed before the final harvest.

Autumn sown crops

The crops evaluated were both brassicas and forage legumes. The two sites were chosen to contrast their stage of pasture development. Site A, at Wairakei Research Station was on an impoverished drought prone soil, Atiamuri sand, that supported a low producing pasture dominated by low fertility pasture species. Site B, near Reporoa, was on Tokiaminga peaty loam and supported a ryegrass dominant pasture.

Both sites were cultivated, rolled and drilled with a cone seeder. The Reporoa site was sown on 8 March 1988 and the Wairakei site on 15 March 1988. The plot' size was 15 m^2 with 4 replicates. All the brassicas were sown at 800,000 viable seeds/ha with the tick bean and lupin at 200,000 and 300,000/ha respectively.

The varieties used are given in Table 2.

Results

Swede/kale comparisons

There was good establishment of all the crops at each site. This was evident in the populations harvested averaging 22 and 41 plants/m^2 for the swedes and kales sown alone, and 9 and 25 plants/m^2 for the swede and kale components of the mixture.

Yields of swede and kale crops continued to increase until the final harvest in late June/early July. The yield of swede sown alone on average was 25% higher than kale (Table 3). But the leaf component yield of the kale was generally higher than for swede. This effect became larger with time as the leaf of swede declined between April and July whereas the leaf of kale was generally maintained until the final harvest.

The mixtures comprised around 60% kale and 40% swede. The swede component tended to decline with time. At two sites yield of the mixture was intermediate that of either crop sown alone but at the other the mixture had a slightly higher yield than the 'swede alone' (Table 3).

TABLE 2: Varieties of brassicas and forage legumes sown at Wairakei and Reporoa in March 1988.

	Wairakei	Reporoa
Turnips	York Globe Barkant Vollenta Appin	York Globe Barkant
Forage Brassicas	Pasja Frisia	Pasja Frisia
Fodder Radishes	Neris Burton	Neris
Rapes	Wairoa Brassica Wairanga Winfred	Wairoa Brassica Wairanga Arran
Tick Bean	Kevro	Kevro
Lupin	Ultrawhite	Ultrawhite

TABLE 1: Site details for Swede vs. Kale comparisons.

Site	Sowing Date (1987)	Plot Size (m^2)	Seeding rates (kg coated seed per ha) Swede	Kale	Swede/Kale	Sowing Method	Fertiliser (kg/ha NPKS)
I	4/11	680	1.3	7.0	0.75/4.0	Broadcast	12-33-65-49
II	27/11	1275	2.9	7.6	0.85/5.3	Drilled	0-27- 0-33
III	13/11	1660	1.3	6.0	0.85/2.5	Drilled	0-30-75-35

TABLE 3: Production of Swede and Kale crops on the Central Plateau (t DM/ha).

Crop	Leaf Yield April	Leaf Yield May	Leaf Yield July[1]	Total Yield April	Total Yield May	Total Yield July[1]
SITE I						
Swede	4.7	5.5	4.3	10.4	11.1	15.2
Kale	3.7	4.7	4.7	8.2	11.7	13.4
Swede/Kale	4.6	5.0	4.5	10.4	13.2	12.0
SED	1.0 ns	0.8 ns	0.2 ns	2.5 ns	1.5 ns	1.4 ns
SITE II						
Swede	3.6	2.4	2.2	9.8	9.5	10.8
Kale	4.2	4.4	4.5	6.8	9.3	9.7
Swede/Kale	4.8	4.1	3.8	10.1	10.9	11.1
SED	0.6 ns	0.5 *	0.3 **	0.6 **	0.8 ns	0.9 ns
SITE III						
Swede	3.2	1.9	1.3	12.1	13.5	13.7
Kale	4.8	4.7	4.0	7.9	9.1	10.2
Swede/Kale	4.2	3.7	4.2	9.8	10.5	14.5
SED	0.5 ns	0.4 *		1.1 ns	0.6 *	

[1] Late June at Sites II and III

TABLE 4: Production of autumn sown forage crops on the Central Plateau (t DM/ha).

	Leaf Yield Growth Period (days) 70	100	130	Total Yield Growth Period (days) 70	100	130
WAIRAKEI						
York Globe	1.00	0.94	0.60	1.46	1.64	1.97
Barkant	0.89	0.98	1.17	1.31	1.87	2.88
Vollenta	0.70	0.48	0.52	1.02	0.94	1.19
Appin	0.34	0.59	0.52	0.45	0.90	0.90
Pasja	1.49	1.41	1.38	1.49	1.41	1.38
Frisia	0.73	0.79	0.63	1.04	1.52	1.80
Neris	0.85	1.09	1.72	1.17	1.69	2.71
Burton	1.65	1.04	1.45	2.00	1.65	2.60
SED	0.17	0.31	0.22	0.23	0.35	0.43
REPOROA						
York Globe	2.34	1.30	1.21	3.13	2.60	3.13
Barkant	2.28	2.05	2.45	2.82	2.77	3.56
Pasja	2.61	1.78	2.37	2.61	1.78	2.37
Frisia	2.12	1.56	1.74	3.10	2.72	3.33
Neris	2.42	1.96	2.34	3.25	2.86	3.13
SED	0.23	0.29	0.25	0.28	0.30	0.32

Autumn sown crops

Within the 130 day evaluation period the turnips, fodder radish and forage brassica were the highest ranked of the autumn sown crops. The yield rankings were similar at both sites (Table 4). Barkant turnip had the highest yield with 2.9 and 3.6 tDM/ha at Wairakei and Reporoa respectively.

The lowest ranked crops were also similar at both sites, viz. the rape varieties, tick bean and Ultrawhite lupin. Yield data for these are not presented as none gave worthwhile crops. This was not due to establishment failure. The failure of the lupin at Wairakei was partly due to selective feeding by rabbits.

Of the turnips Barkant was clearly the top variety, with a high proportion of leaf. Yield of York Globe was only a little lower but its main feature was the decline of its leaf between 70 and 130 days. Appin had poor yields. Although Frisia was sown as a forage brassica its physical appearance was much closer to a turnip than a turnip/chinese cabbage hybrid.

Neris fodder radish yields were only slightly lower than Barkant turnip and like Barkant had a high proportion of leaf (Table 4). Yield of Burton fodder radish was slightly lower (but not significantly different) from Neris at the Wairakei site.

The forage brassica Pasja ranked almost as high as Barkant at Reporoa but was poorer at Wairakei.

Discussion

Swede/kale comparisons

While there are obvious limitations in drawing conclusions on swede/kale mixtures from the experiments reported in this paper, some general observations can be made. The initial important comparison is between the 'sown alone' swede and kale crops. The total dry matter yield advantage of swede has to be seen in relation to the leaf advantage of kale.

It is interesting to note that in South Island trials kale yields have generally been greater than swede (Douglas, 1980). Swede yields were consistently high in the present series, indicating the suitability of swede 'to the soils and climate of the Central Plateau.

The importance of the leaf yield advantage of kale over swede is difficult to determine. Previous studies have shown the overall feeding values of both crops to be similar (Ulyatt *et al.*, 1980) but that the digestibility of kale was reduced in varieties with fibrous stems (Mortlock, 1975).

Farmers sow swede/kale mixtures on the expectation that they will have a substantially greater yield than swede alone. This is based on the assumption that a greater depth of crop will have a higher yield. None of the three sites gave any evidence of substantially increased yield from the mixture compared to the swede sown alone. At best there was a small but statistically not significant advantage to the mixture at one site.

On farms we have observed that many swede/kale mixtures contain as little as one kale plant/m^2. What often looks quite impressive from a horizontal view really represents very little yield when looking down into the crop. This low kale component maybe a consequence of the much slower initial establishment rate of kale than swede, causing kale seedlings to be suppressed by swede or increasing their susceptibility to pest and disease attack during establishment.

On the basis of the data presented and general observations there does not appear to be any advantage in farmers using mixtures of swede and kale over swede alone.

Autumn sown crops

Yields of the best crop were less than 50% of that expected from a turnip crop on the Central Plateau sown in November (Percival *et al.*, 1986). Thus yield of the best crop in relative terms was low.

More important though is the question: 'Even with a low yield, is an autumn sown brassica forage crop a viable management option for providing winter feed?'

A yield of 3 tDM/ha is approximately double the normal pasture growth over the same period (McQueen & Baars, 1980). Against that has to be set the costs of cropping. A crop yield of 3 tDM/ha is unlikely to be an economic option compared to other alternatives for providing winter feed such as use of nitrogen fertiliser, buying in conserved forage or grazing stock off the farm.

The use of rape, tick bean and Ultrawhite lupin as autumn sown forage crops on the Central Plateau is not recommended.

Conclusions

The trials confirmed the high yields of spring sown swedes commonly used to provide autumn and winter forage on the Central Plateau. While swedes had a total yield advantage over kale, the reverse applied with the leaf component yield. There was no evidence of any advantage in sowing mixtures of swede and kale. The possibility of using autumn sown brassica crops for winter feed on the Central Plateau was discounted by the poor performance of those crops evaluated.

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