EVALUATION OF NEW FORAGE BRASSICA CULTIVARS ON THE CENTRAL PLATEAU

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ABSTRACT

Three field experiments were run on Taupo ash pumice sites over two years to compare yield accumulation patterns of a range of brassica forage crops. The brassica types evaluated were fodder radish, hybrids between Chinese cabbage and turnips, turnip, rape, swede and kale. On clubroot infected land, resistant cultivars such as Simax hybrid, Neris fodder radish, Barkant turnips, Wairangi rape and Kiri swedes produced favourable yields. For producing autumn feed, turnips and hybrids between Chinese cabbage and turnips which matured in 90-120 days had higher yields than the traditionally used swedes and kales. Cultivars with consistently high performance in this role were Barkant turnips, Simax and Pasja hybrids. It is suggested that farmers would benefit by better matching of crop type and cultivar to their particular requirements for a forage crop.

Additional Key Words: Turnips, Rapes, Swedes, Kales, Chinese cabbage hybrids, Fodder radish, Pumice soils, Central North Island, Yield.

INTRODUCTION

Brassicas are still the major forage crops used in the Central North Island although the area sown has declined in recent years (10200 ha in 1983, Anon 1984). Swedes are the major type and comprise about 60% of the crops while turnips and Kales are 22% and 14% respectively. Most brassica crops have a dual purpose and are both part of the pasture renewal programme and a source of autumn/winter forage. Where crop failures occur the major causes are usually poor cultivation, uncorrected deficiencies of boron, nitrogen or phosphorus, or diseases such as clubroot. The cultivars used are generally reliable and have changed little over the past 20 years. The major ones are Doon Major swedes, York and Green Globe turnips, Medium Stem kale and Wairoa brassica.

In recent years there has been some change in emphasis with crops fed more in late autumn than mid-late winter. For autumn feeding the presently grown cultivars may not be appropriate. There are also many newly introduced brassica forage cultivars that have not been evaluated on the Central Plateau. The purpose of the present trials was to evaluate some of these cultivars and improve the awareness of their potential amongst farmers and scientists.

EXPERIMENTAL DETAILS

Three trials were run over a two year period to evaluate a range of early, medium and late maturing cultivars sown in the late spring/early summer period. All sites were on Yellow Brown Pumice soils. Good seedbeds were prepared for all sites, generally by ploughing, discing, harrowing and rolling. The seed was drilled by a cone seeder to a depth of 2 cm. Plot size was 15 x 1.36 m comprising 8 rows 17 cm apart. The sites were sprayed for control of springtails and brassica leaf miner where necessary. Sufficient fertiliser was applied to each site so that fertility was not limiting. Sequential harvesting was used to gain data on yield accumulation. At each harvest a 3 m length of the central 4 rows was taken and the plant material was separated into leaf, bulb or stem fractions. General experimental details are given in Table 1 and the cultivars identified in Tables 3-6.

Site 1

Site 1 was located 15 km south of Rotorua on a Taupo sandy silt soil. It had a slope of up to 5 degrees and had grown swedes and kale the previous winter. The fertility was high with initial soil test values of pH 5.5, Ca 4, K 12, P 71 and Mg 8 (MAF Quicktest). Weeds were controlled using Treflan (trifluralin) applied immediately before sowing at 800 g ai/ha and Fodderkleen (chlornitrogen/picloram) applied one month after sowing at 4 l/ha.

The trial design was a split plot randomised block with 4 replicates. The main plots were the sowing dates, the subplots the main crop types, viz. turnips, rapes and 'others', and the sub subplots the cultivars. For the early maturing cultivars harvesting commenced at 45 days after sowing and continued at regular intervals until 202 days after sowing (for the late maturing swedes and kales). The harvests were taken sequentially along the plot with the starting end chosen randomly. Soil temperature (10 cm) was recorded on site using a data logger, rainfall was recorded at each visit, and soil moisture to 10 cm depth measured gravimetrically at most visits.

Site 2

Site 2 was located 17 km south of Rotorua also on Taupo sandy silt soil. The site had a gentle slope and had been in pasture for about 30 years. In recent years it had received very high dressings of fertiliser, typically about 900 kg/ha of 30% potassic serpentine superphosphate. The

TABLE 1: Major trial details, Central Plateau brassica experiments.

		Site 1	Site 2	Site 3
Location		Rotorua	Rotorua	Taupo
Sowing date(s)		24.11.84, 27.12.84	29.11.85	07.11.85
Number of cultivars	- turnips	7	5	5
	- rapes	7	4	4
	- chinese cabbage x turnip hybrids	2	3	3
	- fodder radish	1		
	- kales	2		
	- swedes	2		
Seeding rate (seeds/m²)		80-120	120	120
Number harvests		3-4	3-4	3
Fertiliser application rates (kg/ha)				
	- superphosphate	1100		1050
	- muriate potash			450
	- urea	100		150
	- borax	20		20
	- 9/5/5/15 cropmix		550	

TABLE 2: Soil moisture, soil temperature and rainfall data from the Central Plateau brassica cultivar trials.

	Period from sowing (days)	Rotorua	Rotorua	Rotorua	Taupo
		Sowing Date			
		24.11.84	27.12.84	29.11.85	07.11.85
10 cm soil temperature (mean C @ 0900 hr)	0-30	17.0	19.6	17.3	16.0
	31-60	19.6	17.6*	19.3	18.7
	61-90	17.6*	13.5*	17.7	19.4
10 cm soil temperature (mean C @ 0.5 hr intervals)	0-30	18.8	22.0	19.7	
	31-60	22.0	19.1*	21.2	
	61-90	19.1*	14.1*	20.8	
Soil moisture (% of dry soil weight)	0-30	66	53	58	77
	31-60	47	43	-	79
	61-90	42	-	-	79
Rainfall (mm)	0-30	181	108	148	219
	31-60	83	70	297	147
	61-90	94	105	90	125

* based on limited data due to malfunction in recorder

design used on this site was a randomised block with four replicates.

Climatic data were recorded as at site 1. Harvesting of the early maturing cultivars commenced at 45 days and other harvests were at 90, 120 and 150 days. Harvest areas within each plot were chosen randomly. The plots were grazed by dairy cattle after the final harvest. Notes were made on the utilisation of each cultivar.

Site 3

Site 3 was at the Wairakei Research Station 8 km NE of Taupo on a soil of Waipahihi gravelly sand. The site had been in pasture for about 30 years, was flat and had initial soil test values of pH 5.5, Ca 2, K 4, P 26 and Mg 5. The design was the same as at site 2.

Harvesting commenced with Perko at 53 and 64 days, then Perko/Pasja/Simax at 78 days, all varieties except Perko were harvested at 89 and 120 days and all except Perko/Pasja/Simax were again harvested at 150 days. The harvests were taken sequentially along each plot and all commenced at one end of the plot. Soil temperature and rainfall data were recorded at a climate station 0.5 km away and soil moistures were determined on-site to 10 cm depth at weekly intervals.

Data analysis

While site 1 was laid down as a split-split plot design, there were a large number of zero yields at the early sowing

date and hence the analysis of variance on the yields was done separately for each sowing date. At site 3 analysis of variance may have been confounded by the systematic method of sampling, but the absence of any obvious fertility gradients made this unlikely.

RESULTS

Growing Conditions

Regular rainfall at all sites ensured that soil moisture was adequate for rapid germination and emergence of all brassicas (Table 2). The 0-30 day soil temperature at site 1 was on average 3 °C lower but soil moisture was higher with the earlier sown crops. While the 1985/86 summer was exceptionally wet at both sites, the porous nature of the soil ensured there was no waterlogging.

Diseases

At site 1 a number of cultivars were severely affected by clubroot (*Plasmodiophora brassicae*) (Table 3). The sowing date had little effect on the incidence of clubroot. Sites 2 and 3 were free of clubroot. At site 1 the turnip cultivar York Globe had the highest infection, followed by Appin. The other turnips generally had less than 5% infection. All rape cultivars except Wairangi had a high infection level. Neris fodder radish and Simax Chinese cabbage x turnip hybrid were the only cultivars free of symptoms. Perko (Chinese cabbage x turnip) was totally infected with clubroot and also had damping off caused by Rhizoctonia. Compared with Kiri, Doon Major swedes had a high incidence of clubroot. Both the kales had moderate infection.

At site 2 a soft rot affected bulb yield in the turnips at 150 days. M6 was the cultivar worst infected while Appin and Green Globe showed the least infection. By 150 days leaf spots were prevalent on some of the turnips and other earlier maturing crops. Simax, Perko, Pasja, Appin and Green Globe had light infection, Barkant was moderate, with M6 and Manga severely affected.

TABLE 3: Incidence of clubroot 60-120 days after sowing (% of plants with symptoms).

Type	Cultivar	Sowing Date 24.11.84	27.12.84
Turnips	Barkant	3	3
	York Globe	40	72
	Civasto	3	1
	Ponda	2	1
	Manga	1	2
	Vobra	9	5
	Appin	25	15
Rapes	Rangi	99	95
	Winfred	94	65
	Wairangi	7	4
	Wairoa Brassica	95	92
	Giant	100	97
	Kentan	100	96
	Baraska	99	97
Fodder Radish	Neris	0	0
Hybrids	Simax	0	0
	Perko	100	100
Swedes	Kiri	23	22
	Doon Major	82	84
Kales	Maris Kestrel	38	31
	Bittern	51	15

Turnip Yields

There were large differences in the total, and leaf and bulb yields between turnip cultivars (Table 4). At site 1 the yields of all cultivars except Vobra and York Globe were generally higher from the earlier sowing. The effects were smallest at 90 days. Vobra performed well from the later sowing and had the highest yield at the final harvest.

Over the 3 sites Barkant had consistently high total and leaf yields, and was either the highest or second highest yielding cultivar in 12 out of 14 harvests. It also had a high proportion of leaf with small easily detached bulbs. At site 1 Civasto and Ponda performed well from both sowing dates.

The leaves on Manga senesced early (after 120 days) but Manga retained high bulb yields up to at least 150 days. Its bulbs tended to be buried in the soil and were not easily detached. M6, a highly clubroot resistant derivative of Manga, was inferior to Manga from 120 days on.

Appin germinated quickly at all sites, and had rapid early growth. After 65 days leaf yields were high and were retained in good condition up to 150 days after sowing, though total yields were lower than for Barkant. Appin had small bulbs that were not easily detached and also a high proportion of leaf.

York Globe was the poorest turnip evaluated at site 1, particularly at the early sowing date because of the extensive clubroot infection on the bulbs. Green Globe matured later than most cultivars and developed large bulbs. At site 2 it was lower yielding than Barkant at 90 and 120 days but not at 150 days. At site 3 Green Globe produced at least as well as Barkant.

Rape Yields

Most rape cultivars reached maximum yield at 120-150 days, there being differences in maturity between sites (Table 5). The leaf yields of most rapes generally showed little change over the period 90-150 days. At site 1 despite good emergence, all cultivars except Wairangi failed to produce good crops from the earlier sowing. Wairangi was therefore substantially higher in yield than the other six cultivars. The only exception was Wairoa Brassica which produced a high yield 130 days from the later sowing.

At site 2 Kentan and Baraska had higher yields at 120 and 150 days than Wairangi, which was similar to Wairoa Brassica. At site 3 Wairangi had the lowest yield and Wairoa Brassica the highest.

Leaf yields gave a similar pattern to total yields (Table 5). Wairangi had a higher proportion of leaf and fleshier stems than the other cultivars. Baraska and Wairoa Brassica had particularly woody stems. The utilisation of these by dairy cattle at site 2 after the final harvest was lower than that of Wairangi.

Early Maturing Crop Yields

Neris fodder radish was the earliest maturing cultivar. It accumulated dry matter rapidly 40-50 days after sowing

TABLE 4: Development of leaf and total yields of turnip cultivars on the Central Plateau (t DM/ha).

Site	Sowing Date	Cultivar	Leaf Yields				Total Yields			
			Period from sowing (days)							
			65	90	120	140/160	65	90	120	140/160
Rotorua	24/11/84	Barkant	5.3	5.6	5.9	4.8	7.1	8.6	10.5	9.2
		York Globe	1.5	0.5	1.2		2.9	1.1	4.4	
		Civasto	4.6	4.1	5.2	3.9	6.6	6.7	9.5	9.1
		Ponda	4.6	4.1	5.1	4.0	6.4	6.7	9.0	8.2
		Manga	3.8	3.6	3.8	3.1	6.2	7.2	8.8	10.1
		Vobra	4.1	3.2	3.4	3.2	6.0	6.2	7.0	7.1
		Appin	5.4	4.7	5.4	5.1	6.6	6.3	7.4	8.4
		SED	0.9	0.6	0.9	1.0	1.0	0.8	1.1	1.7
	27/12/84	Barkant	4.2	4.8	3.7	4.4	6.2	7.6	5.8	8.0
		York Globe	2.0	2.5	1.6	1.5	3.7	5.0	4.3	4.5
		Civasto	4.4	4.2	4.3	4.1	6.2	6.3	6.5	7.3
		Ponda	3.9	3.8	3.4	2.8	5.5	6.4	6.3	5.4
		Manga	3.1	4.1	3.8	3.2	5.4	8.1	8.1	8.6
		Vobra	4.1	3.7	3.9	4.4	5.9	5.8	6.5	9.2
		Appin	4.0	4.2	4.0	4.7	5.0	5.7	5.3	7.0
		SED	0.5	0.5	0.7	0.5	0.7	0.9	0.9	1.1
Rotorua	29/11/85	Barkant		5.1	4.4	3.7		8.6	8.9	7.8
		Green Globe		4.0	3.4	3.1		7.1	7.2	8.1
		Manga		2.5	3.1	1.6		6.0	8.0	7.3
		M6		3.3	1.7	1.2		6.2	4.9	4.3
		Appin	4.6	4.9	4.3	3.8	5.6	7.1	6.9	6.2
		SED		0.5	0.6	0.5		0.6	0.8	0.9
Taupo	07/11/85	Barkant		3.2	4.4	2.7		6.7	8.6	8.6
		Green Globe		4.2	3.6	2.7		7.1	8.7	10.1
		Manga		3.3	2.1	1.8		5.7	6.8	9.1
		M6		2.5	2.2	1.1		6.2	6.7	5.4
		Appin	3.1*	5.0	3.8		4.5*	7.1	6.2	
		SED		0.8	0.7	1.1		1.1	1.2	2.5

* 78 days after sowing

and flowered at 65-70 days after sowing (Table 6). The amount of leaf declined rapidly thereafter.

At site 1 Perko germinated quickly at both sowing dates but from the earlier sowing the effects of disease were so severe that its yield was very low (Table 6). At the later sowing Simax yielded higher than Perko. At sites 2 and 3 Pasja, Simax and Perko yielded well, especially Pasja. All of the hybrids reached their maximum yields at around 90 days after sowing. A few plants of Pasja bolted (0.25% of plants at 90 days on site 2). At site 2 all the hybrids were grazed poorly compared with Wairangi rape and Barkant turnips.

Swede/Kale Yields

Doon Major swedes germinated well but produced poor crops at both sowing dates (Table 7). Kiri swedes outperformed Doon Major by a substantial margin and reached its maximum yield around 150 days after sowing. These yield differences reflected the varying susceptibility of Doon Major and Kiri to clubroot.

Of the two kales Maris Kestrel had higher yields than Bittern (Table 7). At the earlier sowing on site 1 Maris Kestrel had the highest yield of any cultivar. The kales matured later than the swedes producing maximum yields 170-200 days after sowing. The leaf yields of both kale and swede declined after 120 days giving them a proportionately higher amount of stem or bulb.

DISCUSSION

The Disease Factor

While clubroot was the main factor affecting yield of many cultivars at site 1, its importance on the Central Plateau is unknown. At site 1 the infection levels were similar from both sowing dates but the disease caused less damage at the later sowing. Development of clubroot is favoured by high soil moisture and soil temperatures from 18-24 C (Brien & Dingley, 1956). Either the higher soil temperatures or lower soil moisture in the 30 days after the

TABLE 5: Development of leaf and total yields of rape cultivars on the Central Plateau (t DM/ha).

Site	Sowing Date	Cultivar	Leaf Yields				Total Yields			
			Period from sowing (days)							
			70	90	120/130	150/160	70	90	120/130	150/160
Rotorua	24/11/84	Rangi		0.8				1.1		
		Winfred		2.0	2.3	2.3		2.5	3.3	3.9
		Wairangi		4.8	5.4	4.5	5.1	6.4	8.8	8.1
		Wairoa Brassica	1.4					1.9		
		Giant		1.2				1.5		
		Kentan		1.0	1.6			1.4	2.3	
		Baraska		1.2	2.1	1.2		1.6	3.0	2.3
		SED		0.4	0.9	1.0		0.6	1.4	1.4
	27/12/84	Rangi	3.1	2.6	2.0	1.4	4.3	4.1	3.2	2.6
		Winfred	3.4	2.6	2.7	2.2	4.9	4.6	4.6	3.7
		Wairangi	4.0	4.0	4.0	4.0	5.5	6.3	6.0	6.6
		Wairoa Brassica	2.9	3.0	5.3	2.1	4.1	5.0	7.8	3.7
		Giant	3.0	2.3	2.1	2.1	4.5	4.0	3.2	3.7
		Kentan	3.6	3.0	2.9	1.7	5.3	5.4	4.7	3.2
		Baraska	3.1	2.6	3.3	2.1	4.7	4.2	4.9	3.9
		SED	0.3	0.4	1.6	1.0	0.5	0.7	2.2	1.6
Rotorua	29/11/85	Wairangi		4.9	4.7	4.0		6.8	7.5	7.5
		Wairoa Brassica		4.5	4.0	4.0		6.7	7.5	7.9
		Kentan		4.7	4.2	5.9		7.1	7.8	11.1
		Baraska		4.1	4.6	4.1		6.5	9.1	8.5
		SED		0.5	0.6	0.5		0.6	0.8	0.9
Taupo	07/11/85	Wairangi		2.7	2.3	2.5		3.6	3.8	5.2
		Wairoa Brassica		4.9	4.4	5.0		7.4	7.6	11.5
		Kentan		3.7	4.1	3.5		5.6	7.6	8.8
		Baraska		3.3	3.2	3.6		5.7	6.2	8.8
		SED		0.8	0.7	1.1		1.1	1.2	2.5

later sowing appeared to reduce its effect on the susceptible cultivars.

The differences between the rapes at site 1 were almost entirely due to clubroot resistance. The lower incidence in the turnips may have been a function of the cultivars evaluated or a build-up of races of clubroot (Lammerink, 1986) in the preceding swede crop which were particularly virulent to the rapes (J. Lammerink pers. comm.). Irrespective of the reason the performance of Wairangi rape in the presence of a high of clubroot inoculum load was excellent.

Where there is a known risk of clubroot or where the paddock history is unclear susceptible cultivars should not be sown. A number of commonly used susceptible cultivars are listed below. It is of note that this list includes most of the brassicas commonly sown on the Central Plateau.

Turnips:	York Globe, Green Globe
Rapes:	Rangi, Winfred, Wairoa Brassica, Giant, Kentan, Baraska.
Hybrids:	Perko
Swedes:	Doon Major

Comparisons between Crop Types

In comparing the highest yielding cultivars of each type, a general pattern of the time required to reach maximum leaf or total yields emerged (Figure 1). Neris fodder radish was clearly the earliest crop, followed by the Chinese cabbage x turnip hybrids, then the turnips, rapes, swedes and finally the kales. The consideration of leaf or total yield is a limited basis for comparing crop types. There are many other important factors, including dry matter content, palatability, toxicity, ease of utilisation, drought tolerance and regrowth potential.

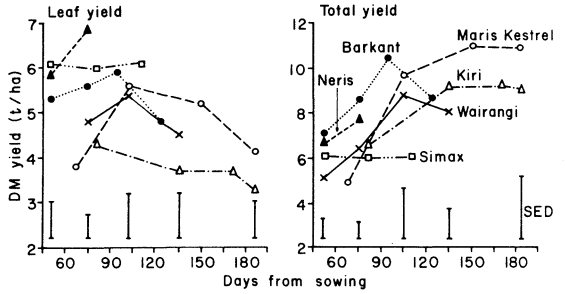
The Chinese cabbage x turnip hybrids, particularly Pasja and Simax had very high leaf yields up to 120 days and may have a wider niche than their present use. However, there have been reports from farmers on low palatability of Perko and there was poor utilisation of both Perko and Simax in a previous brassica crops experiment at Wairakei Research Station (unpublished data). This was reinforced at site 2 where all 3 hybrids were poorly grazed whereas Barkant turnip and Wairangi rape were preferentially eaten. Where stock are not given a choice the

TABLE 6: Yields of early maturing forage crops from three sites on the Central Plateau (t DM/ha) (d = leaf as % of total DM yield).

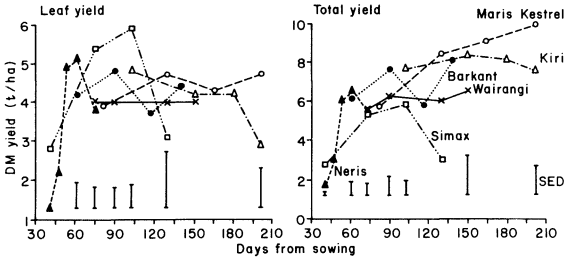
Site	Sowing Date	Cultivar	Period from sowing (days)							
			40/45	53	61	64/69	73/78	90/96	103	120/130
Rotorua	24/11/84	Perko					0.7			
		Simax				6.1		6.0		6.1
		Neris[d]				6.8 (86)		7.8 (89)		
		SED				0.9				
	27/12/84	Perko	1.7		4.5		3.2		3.4	
		Simax	2.8				5.4		5.9	3.1
		Neris[d]	1.8 (74)	6.1 (80)	6.6 (78)		5.5 (69)			
		SED	0.2		0.8		0.6		0.8	
Rotorua	29/11/85	Perko	2.6			5.0		6.2		7.0
		Simax	2.7			4.2		5.3		3.9
		Pasja	2.9			5.3		7.4		6.0
		SED	0.4			0.4		0.6		0.8
Taupo	07/11/85	Perko		1.6		3.4	3.7			
		Simax					3.5	8.1		3.9
		Pasja					3.9	7.0		5.4
		SED					0.7	1.1		1.2

TABLE 7: Development of leaf and total yields of kale and swede cultivars on the Central Plateau (t DM/ha).

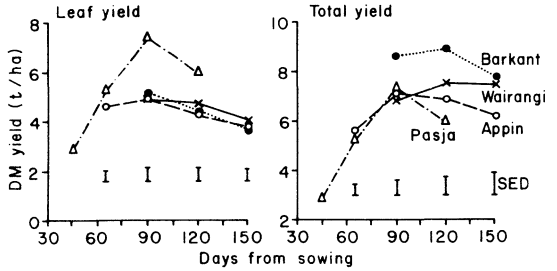
Sowing Date	Crop	Cultivar	Leaf yields						
			80	100	120	150	165	185	200
24/11/84	Swedes	Doon Major		0.5		0.7			
		Kiri		4.3		3.8		3.7	3.3
	Kales	Maris Kestrel	3.8		5.6		5.2		4.1
		Bittern	2.1		3.8		3.2		3.1
		SED	0.3	0.4	0.8	1.5	1.7		0.9
27/12/84	Swedes	Doon Major		2.2		1.6		0.9	
		Kiri		4.8		4.2		4.2	3.0
	Kales	Maris Kestrel	3.9		4.7		4.4		4.7
		Bittern	3.5		4.7		4.1		4.0
		SED	0.5	0.6	1.4	0.9	1.2	0.8	0.6
			Total Yields						
24/11/84	Swedes	Doon Major		0.9		2.9			
		Kiri		6.7		9.2		9.3	9.0
	Kales	Maris Kestrel	4.9		9.7		11.0		11.0
		Bittern	3.0		7.3		8.5		8.8
		SED	0.5	0.3	1.2	2.0	3.9		2.9
27/12/84	Swedes	Doon Major		4.5		4.7		2.9	
		Kiri		7.7		8.4		8.1	7.5
	Kales	Maris Kestrel	5.7		8.4		9.0		9.9
		Bittern	5.2		8.6		9.1		9.4
		SED	0.8	0.8	2.0	1.5	2.6	0.9	1.5



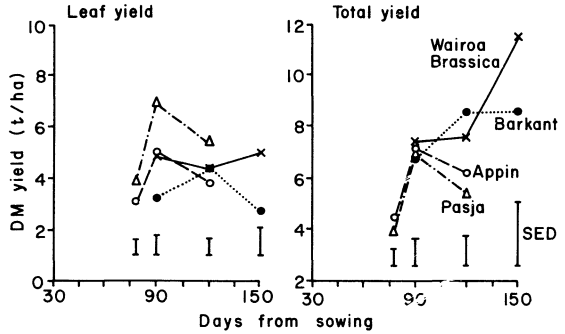
(a) Rotorua : sown 24.11.84



(b) Rotorua : sown 27.12.84



(c) Rotorua : sown 29.11.85



(d) Taupo : sown 07.11.85

Figure 1: Comparisons of leaf and total yields of selected brassica cultivars.

palatability factor maybe less important.

There is such a wide range of turnip cultivars available that it is possible for farmers to select according to their particular needs. Barkant was the outstanding turnip from the trials although its small bulbs may cause cattle to choke if swallowed whole. Appin, a stubble turnip, produced early leaf but was never superior to Barkant. Manga is a useful late variety. It is suggested that Green Globe be only used on low fertility sites without clubroot.

The rape cultivars took longer to reach maturity than the turnips. Their total yields are not necessarily a good indicator of overall merit as the palatability of the stem is an important factor. Thus the lower yield of Wairangi at site 3 was of less significance since its stem palatability is higher than that of the other cultivars. Rape may also be more sensitive to soil type than the turnips. For instance, Wairangi performed well on the finer more fertile soils close to Rotorua but Wairoa Brassica had a higher yield on coarser less fertile pumice at Wairakei.

With brassica crops being used more in the autumn the areas sown to swedes and kales may decline. Data from site 1 showed that several of the turnips produced higher yields over the 90 to 120 day period and for autumn feed may be more appropriate than the swedes or kales. This should be interpreted with some caution as significant droughts occur on the Central Plateau approximately 1 year in 3 but the trials were all conducted in good growing conditions.

Regrowth Potential

Farmers growing rape or Chinese cabbage x turnip hybrids often have expectations of regrowth from the crop stubble. Because so many factors affect regrowth it was beyond the scope of the present trials to measure it. Excellent regrowth was observed from stubble of the hybrids harvested at around 50 days.

Nutritive Value

The question of nutritive value was also not directly addressed in the present trials. There is an extensive New Zealand data base on the feeding value of individual crop types (Nicol & Barry, 1980; Ulyatt *et al.*, 1980). There was no indication that the cultivars evaluated did not follow established trends.

CONCLUSIONS

Farmers are faced with a wide array of forage crops and their apparent reluctance to grow the newer types and cultivars, suggests that there is either insufficient information available to them on their patterns of yield accumulation or that they have not given enough consideration to matching the type of crop and cultivar to their particular needs. The present experiments have indicated the potential advantages of a number of these brassicas and it is important to recognise that no single type or cultivar of brassica is ideal for all situations.

ACKNOWLEDGEMENTS

We thank Miss B. Dow for statistical analyses, Messrs L.J. Cranshaw, M.D. Fraser, T.M. Gee, and Miss C. Hawke for technical assistance, the trustees of Kapenga M

Incorporation and Mr D. Burr for providing trial sites, and Crop Research Division, DSIR and Hodder and Tolley Ltd for providing seed. We also acknowledge the participation of Wrightson NMA Ltd and Dalgety Crown Ltd in running site 1.

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