Turnips, the superior fodder crop in south western Victoria

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Summary. Animal production studies conducted over a 3 year period with sheep and cattle in south west Victoria have consistently indicated that turnips are superior to turnip-rape, chicory and Persian clover for animal growth over late summer and autumn. In all studies. turnips produced the highest herbage mass at time of commencement of grazing: they also gave the highest liveweight gain, although this was not always significant.

Introduction

During summer and autumn when conditions are dry, pastures in south west Victoria normally support only low or negative rates of liveweight gain . Brassica summer fodder crops can supply large amounts of high quality summer feed when the quality of pastures based on subterranean clover, *Trifolium subterraneum*, and perennial ryegrass, *Lolium perenne* is low. Previous studies on Brassica fodder crop production at the Pastoral and Veterinary Institute, Hamilton (PVI), have shown turnips (tops and bulbs) to consistently yield more than rapes and kales (1).

Summer fodder crops are often used in programs of pasture renovation, as use can be made of an area during summer after weed species are sprayed in spring to prevent seed-set. Following spraying or cultivation (or both) in early spring, these areas may be sown with the fodder crop in October when the availability of pasture is not limiting animal production. This ensures that animal production on the remainder of the farm will not be reduced. Sowing in October will also maximise the use of soil moisture by the crop and ensures that the crop makes substantial growth before the dry summer months. The crop thus provides high quality feed between late December and early May. After the crop is utilised, the area can be sown down to new pasture before winter.

This paper reports on 4 studies over 3 years at the PVI in which various summer-growing fodder crops were assessed by measuring the growth of weaner cattle or lambs. The lambs were finished to the 'Elite' specifications of 22-26 kg hot standard carcass weight and a fat score of 2-3, which corresponds to 6-15 mm hot GR (the depth of tissue over the 12th rib, 110 mm from the centre of the backbone).

Methods

Study I

In an unreplicated study conducted in 1990, 12 steers (Hereford over Friesian x Hereford cows) and 12 heifers (Angus over Angus x Hereford cows) were weaned at 9 months of age in early January onto perennial ryegrass subterranean clover silage aftermath where they remained for 4 weeks. They were subsequently rotationally grazed on 2.5 ha of turnip rape, Brassica campestris subsp. oleifera cv. Pasja and 2.5 ha of turnips B. campestris subsp. rapifera cv. Barkant in the sequence shown in Table 1. The crops were sown on 27-28 October 1989 into a prepared seed bed at I kg/ha of turnip seed and 4 kg/ha of turnip-rape seed with 50 kg/ha of double superphosphate (17%P, 4%S).

Study 2

In 1991, Hereford steers of mean weight 270 kg were set stocked from 12 February until 12 June on 1.25 ha paddocks of turnip-rape or turnips arranged in 3 randomized blocks. Four steers were allocated to each plot. The crops were sown on 7-9 November 1990 into a prepared seed bed at 4 kg/ha of turnip-rape seed and I kg/ha of turnip seed with 80 kg/ha of double superphosphate.

Studies 3 and 4

The usefulness of summer fodder crops for finishing 'Elite' lambs was studied in 2 experiments in 1991 and 1992. In both years the 0.7 ha plots were arranged in 3 randomized blocks. The productivity of lambs stocked at 14 lambs/ha was also measured on unreplicated adjacent areas. These contained either lucerne, Medicago saliva cv. WL Southern Special or cv. Cimarron in a 3 paddock rotation (both years) or perennial pasture a mixture of perennial ryegrass cv. Ellett and white clover Trifolium repens cv. Irrigation (1992 only).

In 1991, turnips, turnip-rape, and chicory, *Cichorium intybus* cv. Grasslands Puna were compared. The crops were sown into a prepared seed bed between 30 October and 2 November 1990 at the same rates used for turnip-rape used in Study 2. Chicory was sown at 3.3 kg/ha, and all crops were sown with 80 kg/ha of double superphosphate. Grazing of crops commenced on 12 February . The turnips and turnip-rape were set stocked at 14 lambs/ha and the chicory was rotationally grazed, also at 14 lambs/ha.

Six replicated treatments were compared in 1992. These were turnip-rape, chicory, Persian clover, *T. resupinatum* cv. Maral (aftermath followed by Persian clover hay made from the same area) stocked at 14 lambs/ha and 3 turnip treatments (14 lambs/ha, 21 lambs/ha and 21 lambs/ha with *ad libitum* hay made from perennial ryegrass-based pasture). The digestible dry matter (DDM) of the hay cut off the Maral treatment was 65.6% and its crude protein (CP) content 16.6%. Forage analyses were conducted using near infra-red spectroscopy (2). The pasture hay fed to the turnip treatment was not analysed. The crops were sown on 25-26 October 1991 into a prepared seed bed at the same seeding rate as the previous year with 150 kg/ha of di-ammonium phosphate (18%N, 20%P) except for the Persian clover which was sown in autumn 1991 into a prepared seed bed at 8 kg/ha of seed with 200 kg/ha of superphosphate (9%P, 11%S). The same plots of chicory used for Study 3 were used in Study 4. The chicory treatments received no further fertiliser following establishment in 1990. The lambs commenced grazing the lucerne, turnip-rape, chicory and Persian clover on 14 January and the turnip treatment on II February. The change in commencement time in 1992 was made to allow each crop or pasture to be grazed at a time suited to its stage of development. The lambs that were not grazing crops between 14 January and 11 February were grazed on pasture to maintain their liveweight.

The lambs used in the experiments were Dorset and White Suffolk cross Border Leicester x Merino cryptorchids bought in from the same source each year and weighed a mean of 39.2 ? 3.2 kg in 1991 and 39.3 ? 3.2 kg in 1992. In 1991, lambs were selected forslaughter when they reached a mean liveweight in any replicate of a treatment of 53 kg full liveweight; in 1992 the target was 50 kg. All lambs were fasted for 24 hours prior to slaughter.

Results and discussion

In Study I (Table 1) in the initial un-replicated trial the cattle grazed on turnips apparently grew faster than when they grazed turnip-rape. The total amount of forage that had disappeared by the final grazing was greater for turnips.

Period	Day0-29	Day29-59	Day59-98	Day98-107	Day107-115
Feed	hay aftermath	turnip-rape	turnip	turnip-rape	turnip
Herbage mass at start (t/ha)	3.0	3.0	5.0	1.0 ^a	0.5 ^a
Growth rate of steers					
(kg/day)	0.36	0.66	1.30	0.95	1.19

Table 1. Growth rate of cattle from 9.1.90 (day 0) to 4.5.90 (day 115) in Study I.

¹¹ estimate

In Study 2 (Table 2). the pre-grazing herbage mass of turnip (50% foliage and 50% bulbs) tended to be greater than that of turnip-rape (foliage only) but the difference was not significant (P>0.05). Crop disappearance (apparent intake) was greater for turnips than for turnip-rape. The major feeding difference

between turnip and turnip-rape was apparently due to the utilization of turnip bulbs late in the feeding period. Steers grazed on turnips had higher liveweight gains (LWG) and produced heavier carcasses than steers grazed on turnip-rape (P<0.05). The highest average LWG from turnip-rape (0.8 kg/day) and from turnips (1.1 kg/day) occurred between the 6th and 9th week of grazing. The herbage mass of turnip-rape, measured on 6 May, consisted mainly of dry residues (DDM 56%, CP 6%) while that of turnip consisted mainly of bulbs (not sampled but DDM 95% and CP 11% on March 22 in an adjacent ungrazed experiment). Steers grazing turnip-rape lost weight from 21 May onwards, while those grazing turnip gained weight although at a low rate during June. This poor performance is likely to be associated with the low availability of the crops and also the poor quality of turnip-rape residues. The growth of steers shown in Table 2 is for the period when all animals were gaining weight.

Table 2. Herbage mass (HM) on 18.2.91 (day 0) and 6.5.91 (day 77), 5 hour fasted liveweight gain (FLWG) from day 0 - 21.5.91 (day 92), hot standard carcass weight (HSCW) and rump fat depth (P8) of weaner steers in Study 2.

Сгор	HM on day 0 t/ha	HM on day 77 t/ha	FLWG day 0-day kg/day	92 HSCW kg	P8 mm
Turnip-rape	3.0	1.0	0.65	174	7.5
Turnip tops + bulb	5.4	0.7	0.83	186	7.2
l.s.d. (P=0.05)	3.02	0.8	0.094	7	2.6

In the 'Elite' lamb finishing experiments (Studies 3 and 4, Table 3), turnip set stocked at 14/ha produced higher LWGs than the other treatments. In 1991, the difference between the turnips and the turnip-rape was not significant (P>0.05). The period from sowing to grazing for turnip-rape appears to be shorter than it is for turnips, as a considerable number of leaves had senesced when grazing commenced. With this in mind. in 1992 lambs were put onto the turnip-rape in mid January (10 weeks after sowing) and the turnips one month later. No senescence had occurred in either crop at the commencement of grazing. Turnips stocked at 14/ha from the 11 February 1992 gave significantly higher (P<0.05) LWG (261 g/h/day) than all other treatments. Turnips supporting a 50% higher stocking rate (21/ha) produced similar LWG to turnip-rape and thus produced more lamb carcass weight/ha. When compared to the Persian clover and chicory, all turnip and the turnip-rape treatments produced faster (P<0.01) LWGs. The poorer performance of the lambs on Persian clover was highly significant (P<0.01).

Lambs grazing Persian clover hay aftermath gained 88 ? 54 g/day for the first 41 days but when the standing feed was finished and the Persian clover hay from the same area was fed. LWG dropped to 36 ? 21 g/day. The LWG on Persian clover regrowth compared favourably with the gain of 65 g/day achieved on similar forage with wool breed lambs (3), however the growth of sheep fed Persian clover hay in this experiment was considerably lower than the liveweight gain of 160 g/day achieved by wool breed lambs fed *ad libitum* Persian clover hay as a sole ration (4). The poor performance of the lambs when fed the Persian clover hay was most likely due to a decline in the quality of the hay, which became mouldy following rain after baling.

Table 3. Herbage mass at start, 5 hour fasted liveweight gain (FLWG), final fasted liveweight (FLW), hot standard carcass weight (HSCW), dressing percentage (Dress %) and tissue-depth over 12th rib (Hot GR) for grazing lambs during late summer and autumn of 1991 (Study 3) and 1992 (Study 4). Stocking rates were 14 lambs/ha, except where indicated.

Treatment	Herbage mass	FLWG	FLW	HSCW	Dress%	Hot GR
	t/ha	g/day	kg	kg		mm
Study 3 (1991)						
Turnip-rape	3.9	140	49.3	25.0	50.4	12.6
Chicory	1.4	107	47.8	24.1	50.4	12.3
Turnip	4.9 (57) ^b	177	51.4	24.4	49.2	12.7
Lucerne*	3.5	93*	47.8*	24.1*	50.3*	9.8*
Study 4 (1992)						
Persian clover	3.0	49	45.1	21.5	47.5	11.3
Turnip-rape	4.5	191	51.4	26.1	50.7	17.2
Chicory	а	105	48.5	24.9	51.2	15.0
Turnip	5.0 (46) ^b	261	49.0	23,9	48.8	13.8
Turnip (21/ha)	5.0 (46) ^b	209	49.9	24.7	49.6	16.5
Turnip (21/ha)+hay	5.0 (46) ^b	209	49.9	25.2	50.5	17.0
Lucerne	3.2	79*	49.2*	24.2*	48.8*	15.9*
Pasture	а	71*	48.8*	23.4*	47.8*	12.8*
l.s.d. (P=0.05) 199	1	50.9	2.18	1.56	2.11	0.85
1993	2	38.4	2.53	1,28	0.84	1.67

a measurements not made

^b percentage tops, balance bulbs

* not replicated; l.s.d.s do not apply

We conclude that for late summer and autumn in south west Victoria, turnips are superior to turnip-rape, chicory, lucerne or ryegrass pasture for finishing sheep or cattle for slaughter.

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