THE EFFECT OF HARVEST DATE AND NITROGENOUS FERTILISER ON COOL SEASON FORAGE YIELDS OF CEREALS AND TAMA RYEGRASS IN NELSON AND MARLBOROUGH

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SUMMARY

The effect of harvest date and nitrogen fertiliser on the forage yield of oats, barley, ryecorn and ryegrass was measured in three field trials.

Yields were greater the longer crop growth was uninterrupted by harvesting. Oats yield equalled or exceeded yields from other crops under most harvest regimes. Nitrogen fertiliser increased yields where several nitrogen depletive crops had been grown previously.

INTRODUCTION

Winter pasture production in Nelson and Marlborough is often insufficient to meet the feed requirements of livestock. Consequently it is common practice, particularly on sheep and mixed cropping farms, to provide a greenfeed forage crop for consumption *in situ* during this period. Brassica crops are usually sown during the summer months, while cereal greenfeed crops are favoured after a grain or summer forage crop where sowing must be delayed until early autumn. Tama ryegrass is sometimes sown, either alone or in combination with another forage crop, to provide feed over the late winter and early spring period.

Since no previous work with cereal greenfeeds has been undertaken in the Nelson and Marlborough districts, trials were begun in Nelson in 1974 to compare the yield of Amuri oats, Cape barley, CRD ryecorn and Tama ryegrass when harvested at regular intervals throughout the winter and early spring. Nitrogen was included as a treatment in all trials.

EXPERIMENTAL

Details of sites, cultivar seeding rates, sowing dates and harvest dates are given in Table 1.

TABLE 1: Site details, seeding rates, sowing dates and harvest dates

Site	Appleby	Wakefield	Blenheim
Soil type	Waimea	Motupiko	Waimakariri
Previous Crops			
1972	Pasture, peas	Oats, sudangrass	
1973	Swedes, barley	Barley	Peas
1974			Tama, peas
Cape barley	215 kg/ha	220 kg/ha	110 kg/ha
Amuri oats	220	210	110
CRD Ryecorn	*	190	130
Tama ryegrass	40	45	Not sown
Sowing date	13.3.74	11.3.74	20.3.75
Harvest dates	7.6.74 12.7.74 20.8.74 30.9.74	6.6.74 15.7.74 14.8.74 24.9.74	12.6.75 21.7.75 18.8.75

* ommitted from results due to variations in sowing rate between plots

1974 experiments

Amuri oats, Cape barley, CRD ryecorn and Tama ryegrass were sown with 300 kg/ha of superphosphate using a farm drill. Nitrogen at nil and 50 kg N/ha as ammonium sulphate was applied shortly after crop emergence.

Crops were cut to two heights, 8 and 16 cm, with a sickle bar mower to determine the effect of length of stubble on regrowth production and total yield. However, as some crops remained below the higher cutting height until late winter, yield data presented is confined solely to the lower cutting height.

The experimental design at each site was split-plot with main plots arranged in a randomised complete block design with two replications. Cultivars, nitrogen treatments and mowing height treatments in full factorial combination were applied to main plots and harvest regimes were randomised on sub-plots. Harvest regimes were –

1. First cut June, regrowths cut July, August and September.
2. First cut July, regrowths cut August and September.
3. First cut August, regrowth cut September.
4. Cut September only.

Sub-plots consisted of 7 rows, 18 cm apart and 5 m long. Forage yields were measured by cutting an area of 5 x 0.9 m from sub-plots. Herbage samples for dry matter determinations were collected from each plot.

1975 experiment

Amuri oats, Cape barley and CRD ryecorn were sown with 400 kg/ha of superphosphate using a farm drill. Nitrogen treatments and harvest periods were the same as in the 1974 experiments, except that final harvests were in August.

The experiment was a split – split plot design with main plots arranged in a randomised complete block design with three replications. Harvest regimes were main plots, cultivars sub-plots and nitrogen fertiliser

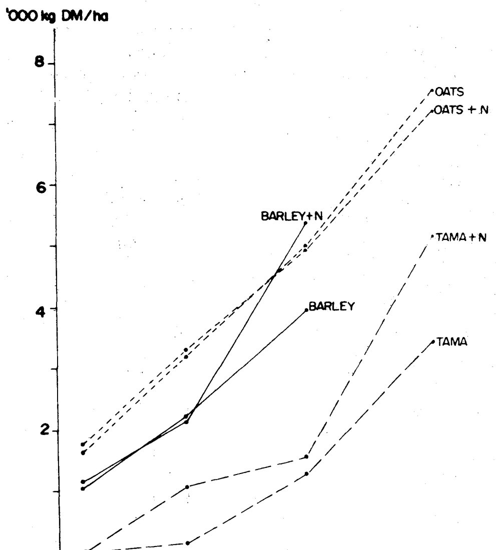

Figure 1 : Accumulated dry matter production : Appleby

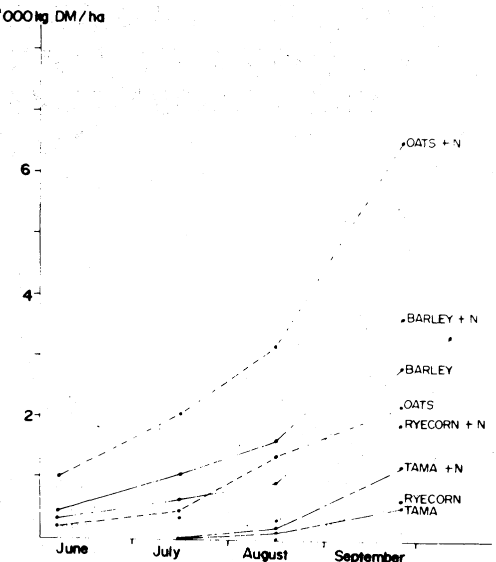

Figure 2 : Accumulated dry matter production : Wakefield

treatments sub-sub plots. The sub-sub plots consisted of 7 rows, 18 cm apart and 5 m long. Forage yields were measured by cutting an area of 5 m x 0.9 m from sub-sub plots, to a height of 3 cm with a sickle bar mower. Herbage samples for dry matter determinations were collected from each plot harvested.

RESULTS

Accumulated production

Accumulated dry matter production at Appleby, Wakefield and Blenheim is given in Figures 1, 2 and 3 respectively.

Oats significantly outyielded other crops at Blenheim and was one of the highest yielding crops at Appleby. At both sites there was little response to nitrogen. At Wakefield there was a large nitrogen response and oats was highest yielding when nitrogen was applied.

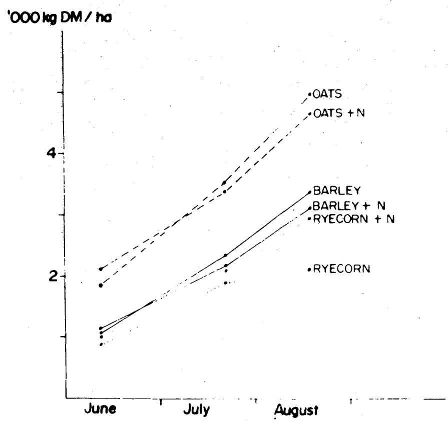

Figure 3 : Accumulated dry matter production : Blenheim

Barley yields were usually lower than those of oats. At Appleby, barley was not harvested in September as the crop had lodged and was considered unsuitable for greenfed purposes. Nitrogen responses occurred at all sites but did not reach significance.

Tama production was less than that of oats and barley, particularly at Wakefield.

Ryecorn yielded less than barley at Wakefield, but at Blenheim yields were similar until August, when ryecorn without nitrogen yielded significantly less than barley.

Nitrogen increased the yields of Tama and ryecorn.

At all sites, the rate of crop growth for most treatments had not decreased at the final harvest and it is likely that higher yields could have been obtained by extending the trial period.

Total yields

Total yields of crops are given in Table 2.

At Blenheim and Appleby, oats was highest yielding when crop growth was uninterrupted until the termination of the trial. The size of the yield differences between oats and other crops decreased however, with an increase in the frequency of cutting and ryecorn and Tama with nitrogen yielded slightly more than oats at these sites when two regrowths cuts were taken. The same trend was evident at Wakefield but the oats plus nitrogen treatment was highest yielding, even under the most frequent cutting regime.

Nitrogen increased the yield of all crops at Wakefield, particularly oats. At Appleby and Blenheim, nitrogen had no significant effect on oat yields but increased Tama and ryecorn yield.

Total oat yields were greater the longer harvesting was delayed, with yields from the single cut regime at Appleby and Blenheim being about double those obtained when crops were harvested in June. Oat yields were also greatly increased by delaying

TABLE 2: Total yields+ (t DM/ha) of crops

Site	Appleby 1974				Wakefield 1974				Blenheim 1975		
First cut	June	July	Aug	Sept	June	July	Aug	Sept	June	July	Aug
Further cuts*	July Aug Sept	Aug Sept	Sept	-	July Aug Sept	Aug Sept	Sept	-	July Aug	Aug	-
Barley	3.25	3.27	3.92		.97 ab	1.09 bc	1.18 bc	2.78 b	1.88 b	2.80 b	3.37 b
					b	b	b	a	b	a	a
Barley, N	3.25	3.47	5.33		1.07 ab	1.43 ab	2.01 ab	3.57 ab	1.80 b	2.70 b	3.08 b
					c	bc	b	a	b	a	a
Oats	3.03 ab	4.15 a	5.27 a	7.52 a	.67 b	.99 bc	1.93 ab	2.16 bc	2.02 b	3.93 a	4.90 a
	c	bc	b	a	b	b	a	a	b	a	a
Oats, N.	3.35 ab	4.24 a	5.11 a	6.69 a	1.72 a	2.52 a	3.56 a	6.45 a	2.34 ab	3.86 a	4.64 a
	c	bc	ab	a	c	bc	b	a	b	a	a
Tama	(2.33) b	2.33 b	2.89 b	3.45 b	(.59) b	(.59) c	.59 c	.53 e	-	-	-
	b	b	ab	a	a	a	a	a			
Tama, N	(4.33) a	4.33 a	3.41 ab	5.16 ab	(.75) b	(.75) bc	.75 c	1.22 cd	-	-	-
	ab	ab	b	a	b	b	b	a			
Ryecorn	-	-	-	-	(.66) b	(.66) bc	(.66) c	.66 de	1.88 b	2.56 b	2.12 c
					a	a	a	a	b	a	ab
Ryecorn, N	-	-	-	-	.85 ab	1.33 ab	1.70 b	1.90 bc	2.70 a	2.93 b	2.96 b
					b	a	a	a	a	a	a
CV %	Main plot 27.4 Sub-plot 24.3 Sub-sub-plot				29.4 16.6				8.1 18.6 11.2		
Significant interactions 0.05 0.01	N x crops, crops x regimes				N x crops crops x regimes				crops x regimes N x crops		

\+ Data was $\log_e$ transformed to allow a multiplicative model to be fitted. Back transformed means and CV% are quoted.
Duncan's lettering to one side and below refers to vertical and horizontal comparisons respectively. Parenthesis indicate nil yield at first cut.

harvesting at Wakefield, particularly where nitrogen was applied.

Barley yields were increased by delaying harvest of the crop, but not to the same extent as oats.

At Appleby and Blenheim, Tama and ryecorn yields were not greatly increased by delaying harvesting, particularly where nitrogen was applied. At Wakefield, there was little difference between harvest regimes for these crops without nitrogen, largely as a result of nil growth until late winter or early spring. With nitrogen, a delay in harvesting resulted in a slight increase in production.

DISCUSSION

Of the crops tested, Amuri oats appeared to be best suited to provide feed in June or July, since in all trials oats out-yielded other crops when harvested in these months. However, regrowth production from oats was often inferior to that from other crops, particularly Tama and ryecorn. At Blenheim, this factor was responsible for ryecorn plus nitrogen exceeding the total production of oats after two regrowth cuts, even though oat yields were double those of ryecorn at the first harvest in June. Baars and Douglas (1976) also found ryecorn regrowth yields superior to those of oats in trials where cereals were overdrilled into lucerne. Oats yielded three times as much as Tama in July at Appleby, but Tama regrowth production exceeded that from oats, which resulted in similar total yields from Tama plus nitrogen and oats after two regrowth harvests.

Where only one regrowth cut was taken the poor regrowth characteristic of oats had little effect on the total yield. The regrowth time interval was about one month and this was insufficient for crops with good regrowth production, such as ryecorn and Tama, to offset the higher oat yields obtained when crops were first harvested. These results are in agreement with those of Crouchley and Bircham (1971), who found that cereals outyielded ryegrasses when crops were harvested in the late winter and regrowth cuts made soon after, but ryegrasses outyielded cereals when crops were harvested in late autumn and regrowths cut until early spring.

For oats and barley, the rate of regrowth production from the harvested crop was considerably less than the rate of dry matter accumulation of the unharvested crop which resulted in large total yield differences between harvest regimes.

For crops such as Tama and ryecorn, however, where the rate of regrowth production approached or exceeded the rate of dry matter accumulation, differences between harvest regimes were much smaller and often non-significant.

Similar i creases in cereal yields by delaying cutting until early spring have been recorded by McLeod and Douglas (1976) and Baars and Douglas (1976).

The practical implications of this are that higher yields from crops such as oats can be expected by delaying utilisation from early winter until early spring, but little extra yield can be expected from crops such as Tama and ryecorn.

The need for nitrogen on cereal greenfeed crops appears related to the crop to be sown and the type of crop grown previously.

At Blenheim, where legume crops preceeded the trial (Table 1) there was no response to nitrogen for either oats or barley but significant responses for ryecorn occurred. These results, together with those of Mcleod and Douglas (1976) who found that ryecorn was more sensitive to low nitrogen conditions than wheat, suggests that ryecorn requires higher soil nitrogen levels than other cereals for maximum yields.

At Appleby, there was no response to nitrogen for oats but significant responses for Tama were recorded. Baars and Douglas (1976) also found nitrogen increased Tama yields but had little effect on oat yields.

At Wakefield, where non-legume crops had been cultivated for at least two years prior to the trial being laid down, nitrogen increased the yield of all crops, especially oats. This is in contrast to the other trials, where nitrogen increased Tama and ryecorn yields but had little effect on oat yields. It is likely that soil nitrogen levels were very low at this site and that nitrogen was insufficient for maximum yields of crops such as Tama and ryecorn, even where nitrogen was applied.

CONCLUSIONS

These experiments indicated that Amuri oats will equal or exceed the yield of barley, ryecorn and Tama.

Total yields are greater the longer growth is uninterrupted by harvesting. Nitrogen fertiliser is necessary for maximum yields where several nitrogen-depletive crops have been grown previously.

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