THE INFLUENCE OF SOWING DATE ON MARROWSTEM KALE PRODUCTION

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ABSTRACT

Medium-stemmed, marrowstem kale was sown monthly from September 1973 to January 1974. After an initial period of growth, each sowing was sampled at 3-4 weekly intervals until June 27.

September and October sowings produced more dry matter than later sowings. Yield differences caused by sowing date depended on harvest time; they were greatest in February and decreased until, at the final sampling in June, plants sown in September/October yielded 15% more (not significant) than November/December sowings and 50% more than those sown in January.

The relationship between dry matter production and the time from sowing to sampling was curvilinear for September to November sowings whereas the relationship was linear for the December and January sowings in which maximum yields were not attained.

INTRODUCTION

Little research on the relationship between sowing date and dry matter production of marrowstem kale appears to have been done in New Zealand. Keenan (1971) recommended sowing in November/December for winter feed or in October for summer feed. In Otago and Southland, however, the crop is mainly grown for winter feed and sowings are made from late November to early January, a practice similar to that recommmended in the United Kingdom by Stubbs (1950).

Fulkerson and Tossell (1972) in Canada compared sowings from May 25 to August 12 (i.e.) late spring-summer) measuring production from September 1 to October 30. They found that delay in sowing date reduced yields in a progressive manner at all harvest times. Scott (1971) in New Zealand also reported higher yields from crops sown in mid October compared with mid December.

In November- and December-sown crops, Stephen (1974) observed that total dry matter production increased linearly from February to July. He postulated that earlier sowings might lead to higher yields and the trial reported here was designed to examine this hypothesis.

MATERIALS AND METHODS

The experiment was carried out in 1973/74 on a Wingatui silt loam with a previous history of wheat and swede crops following pasture.

Prior to each sowing, Treflan was applied to the soil as a pre-emergent weedkiller and 45 kg N/ha as nitrolime 25 kg P/ha as superphosphate and 2.5 t/ha calcium carbonate equivalent as calcium hydroxide were broadcast on the surface of the soil. The plots were then rotary hoed, raked and rolled. Medium-stemmed marrowstem Kale [**Brassica oleracea L.**] was sown using a Stanhay hand unit on September 11, October 10, November 13, December 4 and January 3. Rows were spaced 15 cm apart and each sowing date main plot consisted of 12 rows 34 m in length in a randomised block layout with 5 replicates.

After an initial period of growth, randomised sub plot samples were taken at three to four week intervals for each date of sowing. At each sampling time, all the plants in an area of 4 m x 0.61 m were cut at ground level and separated into leaf and stem. Dry matter was determined in subsamples of leaf and upper and lower portions of stem, the latter two being averaged for use in stem-yield calculations.

TABLE 1: The effect of sowing date on Kale production (kg/ha)

Harvest Date	Sowing Date September 11	October 10	November 13	December 4	January 3
December 10	2170 — d D				
January 11	8220 a A c C	6100 b A d D	2970 c B d D		
February 4	9560 aA bcBC	10440 a A c C	6470 b A c C	1740 c B d E	
February 27	13260 aA abABC	14150 aA bcBC	7860 b B c C	4040 c C d DE	1560 dD c D
March 21	14760 aA a AB	15450 abAB abAB	11660 b B b B	6610 c CD c CD	3000 c CD c CD
April 18	15740 aA a A	15530 aA abAB	13250 b A abAB	9420 c B b BC	5380 d C b BC
May 21	16280 a A a A	15840 a A abAB	1487 a AB a A	10570 b BC b AB	6630 c C b AB
June 27	16060 a A a A	172 aA a A	14930 a A a A	13360 a AB a A	8480 b B a A

Upper Duncans lettering for horizontal comparisons; lower lettering for vertical comparisons

RESULTS

The total dry matter yields from all harvests for each of the five sowing dates are given in Table 1.

At the time of the final harvest on June 27 the yields from the September- and October-sown plots were similar and averaged 15% more than those from the November and December sowings though the differences were not significant, possibly because of the relatively high variability. Dry matter production from the January sowing, however, was significantly less than the yields from all earlier sowings.

At the February, March and April harvests, however, there were significant differences between yields of plants sown at different dates and the trends were similar. September and October sowing gave the greatest yields and the yields from later sowings were each significantly less than those for the sowing date immediately previous. However, whilst the yields on February 27 and April 18 for the September and October sowings, for example, were approximately 82 and 94% respectively of the yields at the final sampling, the yields for the January sowing were only 18 and 63%. In May, the yields of the September, October and November sowings were not significantly different but the yields from the December and January sowings were each successively lower.

TABLE 2: Relationship between Total yields and Sampling date

Sowing Date	Correlation coefficients: Total (r)	Correlation coefficients: Multiple (R)	Regression equations
Sep 11	0.77*	0.860*	$y = -17456 + 268.9x - 0.53x^2$
Oct 10	0.752*	0.837*	$y = -12093 + 256.7x - 0.57x^2$
Nov 13	0.891*	0.940*	$y = -9138 + 225.8x - 0.53x^2$
Dec 4	0.913*	0.912 NS	$y = -2524 + 79.9x$
Jan 3	0.879*	0.884 NS	$y = -1308 + 57.4x$

* Significant at $P < 0.001$

Regressions of yield on the number of days from sowing to sampling were computed for each sowing date and the various equations are given in Table 2.

For the September, October and November sowings, the relationships between crop production and sampling date were curvilinear. For the September and October sowings yields progressively increased until early March after which the yields were not significantly different (Table 1). In the case of the November sowing, however, yields did not level off until mid April (TaBLE /(.

In the December and January sowings the relationships between crop production and sampling date were linear; the non-linear component was not significant. The yields at June 27 were significantly greater than those on May 21 and hence there is no evidence of the yields levelling off within the period studied.

DISCUSSION

The linear increases in the total yields from February to June resulting from December and January sowings confirmed previous results (Stephen 1974). However, the growth curves for the earlier sowings were curvilinear though that for the November sowing was less markedly curved.

It seems likely that the yields from sowings made from September to November were able to reach their maxima before the time of the final sampling partly because of a faster growth rate resulting presumably from a more favourable temperature regime during growth and partly because the period available for growth was sufficiently long. Later sowings experienced lower average temperatures and, with a consequent slower growth rate and shorter period for growth, were unable to attain their maximum yields within the period studied; if sampling had continued beyond June it seems likely that the December-sown yields might have reached the same levels as those attained by earlier sowings. In the case of the January sowing the growth rate was much less and it would be unwise to predict a similar result.

The trial data only partly supported previous work (Fulkerson and Tossell 1972; Scott 1971) and the hypothesis made by Stephen (1974) that earlier sowing resulted in higher dry matter production. The magnitude of the differences in yield from different sowing dates depended on the time that the crop was sampled. Until mid-April approximately, the differences in yields between the September and October sowings and those from November and later sowings, were relatively large. Thereafter however, the yields from the September to November sowings remained approximately the same whilst in the case of the December and January sowings the yields continued to increase thereby decreasing the magnitude of the differences in yields between the five sowings.

On a practical basis it would seem possible to sustain high levels of dry matter production of marrowstem kale for a period extending from late February to the end of July by means of staggered sowings. The acreages sown at different times could be adjusted to feeding requirements over shorter periods such that the animals would move from crop to crop as utilisation of each was completed. For feed requirements up to the end of June there would be an advantage in sowing early — the earlier the feed is required the earlier the sowing date should be. If, however, feed is only required in July and August there may be little advantage to be gained in terms of total dry matter production by sowing before the end of November.

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