



Report to: Horticultural Development Council  
18 Lavant Street  
Petersfield  
Hants GU32 3EW

HDC Project Co-Ordinator: A J Whitlock

Project Leader: M B Wood  
HRI Kirton  
Willington Road  
Kirton  
Boston  
Lincs  
PE21 1EJ

Experiment Leader: M J Leatherland

Tel: 0205 723477  
Fax: 0205 724957

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Date of Report: March 1993

**HDC CONTRACT FV96**

**BORECOLE (CURLY KALE) CONTINUITY**

**OF PRODUCTION 1992/93**

**PRINCIPAL WORKER**

M J Leatherland BSc (Hort) MI Hort

**AUTHENTICATION**

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

*M J Leatherland*  
.....  
(Signature)

M J Leatherland

Date *25/3/93* .....

Report authorised by *M B Wood*  
.....  
(Signature)

M B Wood  
Project Leader for:-

Dr M R Shipway  
Head of Experimental Horticulture Stations  
Efford Experimental Horticulture Station  
Lymington  
Hampshire  
SO4 OLZ

Date *26/3/93* .....

## **SUMMARY**

Three varieties of curly kale (borecole) were sown in May, June or July and harvested at intervals from September to March. Of the three varieties only Dwarf Green Curled produced a viable yield from the July sowing and then gave only small quantities in January. The variety Kobolt was disappointing and only produced a modest yield in December from a June sowing. All three varieties produced good yields from the earliest sowing with a peak in October. Yields fell with later harvest due largely to frost damage over the Christmas period. The same conclusion was drawn as for the previous year's trial, that maximum potential yield is obtained by using plants raised from an early sowing held in the field through the autumn. Later sowings would produce an acceptable yield but only with careful choice of variety. All treatments began to bolt in March so late spring harvests seem unlikely to be viable.

## **INTRODUCTION**

In 1991/92 an HDC sponsored trial was carried out at HRI-Kirton to try to establish a continuity programme for curly kale. Five varieties were each planted on three dates from mid June to the end of July 1991. Records were made of yield at harvest as well as features such as curliness, colour and texture after cooking. The most promising result was with the short variety, 'Kobolt' which gave consistently high yields from single harvests. 'Bornick', a taller variety, gave higher yields, particularly later in the season, but this was from two cuts which would probably not be normal commercial practice.

Observations made indicated that the holding ability of curly kale was very good and that better continuity might be achieved using fewer sowings with longer holding intervals to cover the spread of harvests required. It was also noted that earlier plantings gave consistently higher yields with all varieties and holding ability allowed this potential to be fully exploited.

This approach was adopted for a further trial in 1992/93 with a reduced range of varieties sown at four-week intervals and harvested at six-week intervals from October to March in a fully factorial trial.

## **MATERIALS AND METHODS**

### Treatments

Varieties:           A.     Bornick  
                          B.     Dwarf Green Curled  
                          C.     Kobolt

Sowing dates:       1.     8 May (planted 23 June)  
                          2.     5 June (planted 27 July)  
                          3.     3 July (planted 13 August)

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Harvest dates:      1.     15 September  
                          2.     30 October  
                          3.     7 December  
                          4.     21 January  
                          5.     2 March

### Cultural details

Soil type:            Silt loams

Previous cropping:   1990 and 1991 Grass

Soil Analysis:       pH: 7.7; P<sub>2</sub>O<sub>5</sub> index = 4, K<sub>2</sub>O index = 2; Mg index = 4

Fertiliser:           150 kg/ha nitrogen applied as a base of Kaynitro

60 kg/ha nitrogen applied as a top dressing of Nitram 6 weeks after planting

**Cultivations:** 5 December 1991 ploughed, 23 June 1992 cultivated with one pass of a 'Lely Roterra', followed by a Cambridge ring roll to conserve moisture

**Propagation:** Plants were raised to good commercial standards in 308 module trays

**Spacing:** 570 mm x 390 mm

**Herbicides:** 30 June, 3 August, 21 August respectively  
Each planting sprayed with propachlor as Portman Propachlor at 9 l/ha and chlorthal-dimethyl as Dacthal at 6 kg/ha both in 400 l/ha water.

**Insecticides:** All plants in cellular trays drenched pre-planting with chlorpyrifos as Dursban at 10 ml in 1.5 l water as a drench over 1 m<sup>2</sup>.

20 July planting 1 sprayed with demeton-S-methyl as Campbells DSM at 560 ml/ha and cypermethrin as Cypermethrin 10 at 250 ml/ha both in 600 l/ha water

9 October All plantings sprayed with pirimicarb as Aphox at 420 g/ha and cypermethrin as Ambush at 250 ml/ha in 600 l/ha water

**Fungicides:** 17 September, chlorothalonil and metalaxyl as Folio at 2 l/ha and triadimenol as Bayfidan at 500 ml/ha in 600 l/ha water

**Irrigation:** None

## Experimental design and layout

All treatment combinations were represented in a fully factorial design with three replicates. Planting dates were treated as main plots. Combinations of variety and harvest date were randomised within main plots. Each plot comprised four rows of 17 plants of which the centre two rows of 15 plants were harvested.

## Assessments

1. Yield assessed by cutting all marketable heads per harvest area and bulk weighing. No attempt was made to cut individual leaves although some immature plants were included in weights if the majority of a plot was harvestable. There were also a number of instances of multiheading where for some reason terminal growing points were lost resulting in a number of smaller shoots. These were similarly cut and weighed as one head.
2. Colour based on a scoring system where 1 = pale green and 9 = dark green.
3. Curliness based on a scoring system where 1 = smooth leaves, and 9 = very curly.
4. Ease of packing based on the weight of a full crate packed without damaging material.
5. Stringiness assessed by cooking 100 g of leaf material from next to the youngest leaves and excluding main ribs, in 1 litre of water, simmering for 3 minutes once water had come back to boiling after adding the leaves.

## **RESULTS AND DISCUSSION**

Table 1 shows the yield from all combinations. This is also expressed graphically in Appendix 1. Kobolt was disappointing from all but the earliest planting. From a May sowing it produced the highest yields harvested up to mid December but did not hold well

beyond the Christmas period when there was prolonged heavy frost. The second sowing of Kobolt in June was much slower to reach a marketable size and by December it was still only just big enough to be regarded as mature. The final sowing did not reach maturity.

The variety Bornick gave its peak yield in October from a May sowing but held slightly better into January than Kobolt. The June sowing produced some marketable material in September but also peaked in October, yield again dropping after Christmas. As with Kobolt the July sowing did not produce a crop. Dwarf Green Curled behaved in a similar fashion to Bornick except for producing some yield in January from the late sowing.

None of the treatments produced a yield in March as originally targeted as by that time all plants had begun to bolt and were considered unmarketable. Dwarf Green curled would probably have given some marketable heads in February but even by then yields were tailing off in comparison with those in January.

The results in general confirm those of 1991/92 that the earliest sowings produce the best yields and can be held in the field to give later yields equal to or greater than those produced from later sown crops. Sowing after June is not worthwhile and even with a June sowing care should be exercised in choosing varieties. Of the ones tested in these experiments Kobolt did not produce a yield from a June sowing until December.

The field holding in general was disappointing with losses in some cases greater than 50%, mainly due to frost damage.

**Table 1**      The effect of sowing date, harvest date and variety on yield (t/ha)

Sowing	Variety	Harvest				
		1	2	3	4	5
8 May	Bornick	24.58	53.96	35.92	10.28	0.00
	*D.G. Curled	23.02	56.14	33.07	14.72	0.00
	Kobolt	36.31	54.58	43.29	4.72	0.00
5 June	Bornick	6.48	35.42	22.79	9.36	0.00
	D.G. Curled	14.66	27.65	24.80	12.29	0.00
	Kobolt	0.00	0.00	28.66	2.26	0.00
3 July	Bornick	0.00	0.00	0.00	0.00	0.00
	D.G. Curled	0.00	0.00	0.00	12.82	0.00
	Kobolt	0.00	0.00	0.00	0.00	0.00

\* Dwarf Green Curled

**Table 2**      The effect of harvest date on yield and percentage plants marketable

Harvest date	Yield (t/ha)	% Marketable
1	11.67	51
2	25.31	55
3	20.95	65
4	7.38	51
5	0.00	0
SED (84 d.f.)	0.763	2.1
L.S.D. (5%)	1.518	4.2



**Table 3**      The effect of sowing date on yield and percentage plants marketable

Sowing date	Yield (t/ha)	% marketable
8 May	26.04	72
5 June	12.29	54
3 July	0.85	7
SED (84 d.f.)	0.842	2.4
L.S.D. (5%)	1.676	4.8

Table 4 shows the effect of treatments on colour, curliness and density. Colour varied from harvest to harvest but in general the variety Kobolt was consistently darker than the other two varieties although all had a slight tendency to darken with prolonged field standing. Kobolt was also earlier than the other varieties. Assessments of density and ease of packing were carried out and there was some indication that Dwarf Green curled was denser and more easily packed than the other two varieties.

**Table 4**      The effect of treatment on colour, earliness and density

Treatment	Colour				Curliness				Density (kg/crate)			
	Harvest				Harvest				Harvest			
	1	2	3	4	1	2	3	4	1	2	3	4
<b>Bornick</b>												
May	4	4	5	5	4	6	6	6	9.39	10.95	6.30	9.35
June	-	5	6	7	-	6	6	6	-	10.20	5.70	7.25
July	-	-	-	-	-	-	-	-	-	-	-	-
<b>*DGC</b>												
May	6	5	7	7	5	5	6	8	12.84	14.35	9.45	10.70
June	-	3	7	7	-	5	6	7	-	10.15	9.30	9.25
July	-	-	-	7	-	-	-	7	-	-	-	9.25
<b>Kobolt</b>												
May	8	7	7	7	8	8	8	8	11.60	10.90	8.80	9.70
June	-	-	7	7	-	-	8	9	-	-	7.00	9.00
July	-	-	-	-	-	-	-	-	-	-	-	-

Key: Colour      1 = Pale green      Curliness      1 = no curl  
                      9 = Dark green                                      9 = very curly

\* Dwarf Green curled

**Table 5**      The effect of treatment on stringiness after cooking

Treatment	Harvest	1	2	3	4
<b>Bornick</b>					
May		9	8	8	8
June		-	9	8	8
July		-	-	-	-
<b>*DGC</b>					
May		8	8	7	6
June		-	8	7	5
July		-	-	-	7
<b>Kobolt</b>					
May		4	7	6	7
June		-	-	7	7
July		-	-	-	-

Key: 1 = Tough

9 = Very tender

## **Conclusions**

The varieties Bornick and Dwarf Green Curled both gave peak yields in October from a May sowing. Later sowings could be used but probably not after June. The variety Kobolt gave the higher early yield and best colour but did not give acceptable crops from sowings made after May. Maximum yields would be obtained from May sowing and could be harvested from September onwards. At the end of the season, delay in cropping resulted in increased field losses mainly from bolting.

## **Recommendations for further work**

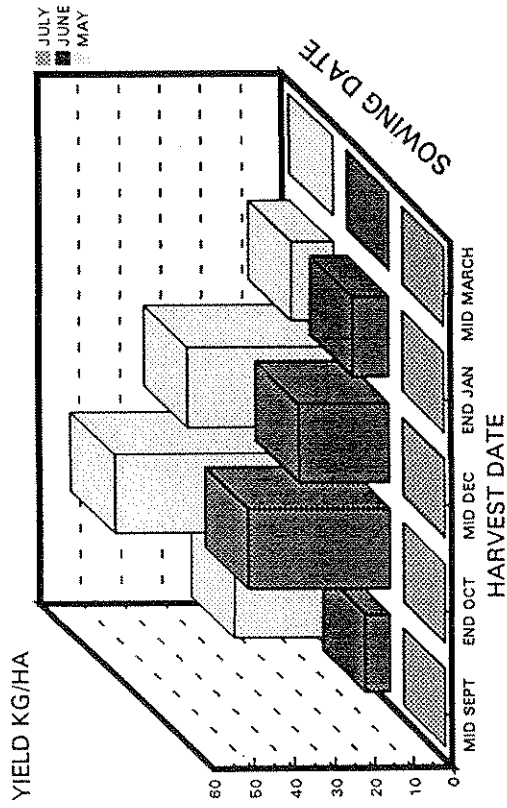
- 1) Try earlier sowings to increase yields in September.
- 2) Examine the effect of age and size (influenced by propagation temperature and module size) of transplant on performance.
- 3) Test a wider range of varieties for late season cropping - December.
- 4) After a further year's work on 1, 2 & 3 put together a range of varieties and agronomic practices into a comprehensive test of a continuity programme based on taking weekly harvests.

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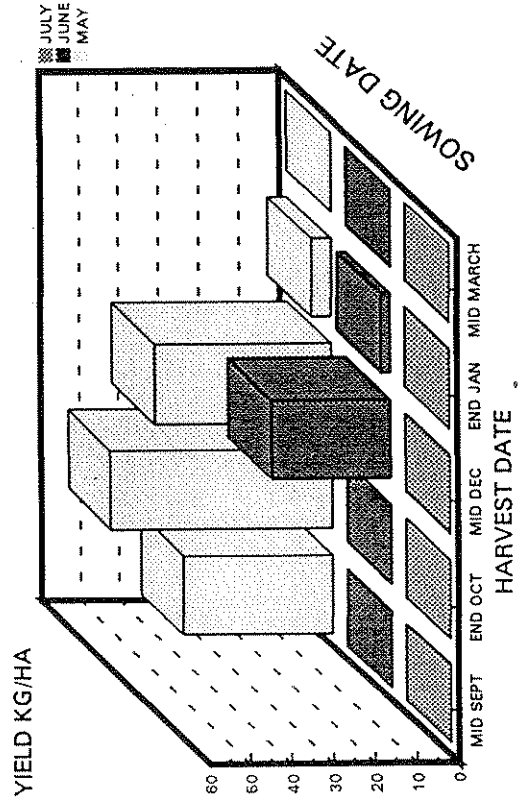
# APPENDIX 1

## CURLY KALE YIELDS 1992/93

### BORNICK



### KOBOLT



### DWARF GREEN CURLED

