A REPORT TO THE HORTICULTURAL DEVELOPMENT COUNCIL
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EARLY SUMMER CAULIFLOWER: FIELD OVERWINTERED

FINAL REPORT

Project Number:	FV115
Project Title:	Early Summer Cauliflower: Field Overwintered
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Date Project Commenced:	Late January 1993
Date Completed:	Late June 1993
Report Date:	September 1993
Key Words:	field overwintered, crop covers, early summer cauliflower

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.

Signature Julie Hembry.....

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Date 30/9/93.....

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Contents

	Page
Relevance to Growers	5
Summary	6-7
Action Points for Growers	8
Introduction	9
Objective	9
Materials and Methods	9-11
Results	12-17
Discussion	18-19
Conclusions	20
Appendix I:	21-22
Appendix II:	23-27

Relevance to Growers and Practical Application

Application

This project aimed to establish the potential yield and maturity advantage from overwintering early summer cauliflower in the field under crop covers.

Cauliflower sown in late September in Hassy 308 modules and planted in the field in early December under perforated polythene crop covers achieved 4 days earlier maturity and similar yields to cauliflower sown traditionally in 6 cm blocks and overwintered under glass.

The technique of overwintering in the field is a cheaper system than overwintering under glass and the quality of curd at harvest is extremely high.

The technique however is reliant upon favourable weather conditions and planting during establishment.

Summary

Objective

The project aimed to evaluate module raised plants, sown and planted in the autumn and overwintered under perforated polythene crop covers in the field compared with plants raised in 6 cm blocks and overwintered under glass and planted in the spring.

Treatments

1. Cultivars:

   Alpha Jubro
   Dok Elgon
   Plana

2. Sowing date, Planting date and Method of propagation:

   Hassy 308 module - Sown 17 September, Planted 20 November
   - Sown 23 September, Planted 10 December
   - Sown 30 September, Planted 10 December

   6 cm Block - Sown 19 October, Planted 22 February

3. Nitrogen Fertiliser:

   Hassy 308 module - 50 kg/ha base dressing + 200 kg/ha top dressing

   - 100 kg/ha base dressing + 150 kg/ha top dressing

   6 cm Block - 100 kg/ha base dressing + 150 kg/ha top dressing

4. Crop Cover:

Perforated polythene (500 holes/m^2 x 10.5 m wide) was applied to those treatments overwintered in the field.

Results

1. High yields of good quality early summer cauliflowers were produced from a late September sowing in Hassy 308 modules and early December planting in the field under perforated polythene crop covers (500 holes/m^2 x 10 m wide).

2. An application of 100 kg/ha nitrogen fertiliser as a base dressing (with 150 kg/ha top dressing) produced more deep heads and fewer loose heads than a base dressing of 50 kg/ha N.

3. Alpha Jubro matured in early June, approximately 2 weeks earlier than Dok Elgon and Plana. Dok Elgon was between 2-4 days earlier than Plana.

4. Overwintering in the field advanced the maturity of Plana and Dok Elgon by 4 days compared with traditional spring planting.

5. Plana produced the highest yield of Class I heads and the highest total marketable yield. Plana also produced more high quality large size and deep heads than either Alpha Jubro or Dok Elgon.

6. Planting of all treatments of this trial were carried out by hand due to water-logging of the soil around the time of planting. Planting by machine would not have been possible until late January.

Action Points for Growers

1. Growers can reduce propagation costs by overwintering early summer cauliflower under crop covers in the field.

2. Field overwintering will advance maturity by 4 days and produce high yields of excellent quality crops.

3. Alpha Jubro matured the earliest but Plana, maturing 2 weeks later in mid June, produced the highest yields and the best quality crop.

4. If wide sheets of perforated polythene are laid by hand over the crop after planting (as opposed to mechanical laying of narrow sheets), the wide sheets could be re-laid following lifting in April to apply control measures for cabbage root fly. This may further advance maturity.

5. Weather conditions must be favourable during autumn/winter to allow mechanical planting and successful plant establishment.

Practical and Financial Benefits

A cheap crop cover, ie perforated polythene will lead to early yields of high quality cauliflower with no requirement for winter propagation space. The technique is fully mechanised but reliant on good soil conditions at planting.

Introduction

Traditionally, early summer cauliflower for early to mid June harvesting are sown in 6 cm blocks or 75/80 mm pots in early October and overwintered in glasshouses or frames. The system has many disadvantages however: the plants are expensive to produce, the risk of disease is high, the crop is labour intensive, soil conditions can be difficult at planting and unfavourable weather often delays planting so that plants receive a check that causes buttoning and/or premature heads of poor quality. These small framed plants tend to mature in May when winter hardy cauliflower is still plentiful and therefore provide a poor economic return.

A husbandry system is required that can provide more reliable cropping in June after the winter hardy types have finished. The field overwintering system gives the following main advantages: it can be fully mechanised, soil conditions are usually much better in the autumn, the crop is cheaper to grow and therefore potentially more profitable.

Objective

To evaluate module raised plants, sown and planted in the autumn and overwintered under perforated polythene crop covers compared with plants raised in 6 cm blocks and overwintered under glass and planted in the spring.

Materials and Methods

Site

HRI Stockbridge House, Cawood, Selby, North Yorkshire, YO8 0TZ.

Soil Type

Sandy loam of the Quorndon Series in an open sunny position.

Treatments

Crop:	Cauliflower
Cultivars:	Alpha Jubro
	Dok Elgon
	Plana

Sowing date, Planting date and Method of propagation:

Hassy 308 Module:	Sown 17 September, Planted 20 November
	Sown 23 September, Planted 10 December
	Sown 30 September, Planted 10 December
6 cm Block:	Sown 19 October, Planted 22 February

Nitrogen Fertiliser:

	Base Dressing (kg/ha)	Top Dressing (kg/ha)
Hassy 308	50	200
	100	150
6 cm Block	100	150

Design

The experimental design was a split plot design with three replicates. At the main plot level were sowing/planting dates. Nitrogen fertiliser rates and cultivars were at the sub-plot level.

Spacing

Three rows per 1.83 m bed, 45 cm between rows x 45 cm within rows.

Culture

The field site, following winter wheat, was ploughed and bedded in late October. After soil analysis phosphorus and potassium fertilisers were applied as a base dressing according to standard ADAS recommendations. Nitrogen fertiliser was also applied as a base dressing according to treatments prior to planting. A Leyli cultivator was used to incorporate the fertiliser and to create a loose tilth. Deep furrows (150 mm) were then made prior to planting. All planting was done by hand. After planting, propachlor (as Albrass at 9 l/ha) and chlorthal-dimethyl (as Dacthal at 6 kg/ha) were applied for weed control. The perforated polyethylene crop cover (500 holes/m^2 x 10.5 m wide) was laid on the plots immediately after herbicide application.

The control treatment (6 cm block), was planted on 22 February after the appropriate nitrogen base fertiliser. A herbicide was applied as above.

The crop covers were removed from the overwintered plants on 5 April and chlorpyrifos (as Birlane Granules at 0.4 g/plant) applied as a spot treatment for cabbage root fly control. A nitrogen fertiliser top dressing was applied at the appropriate rate according to treatment.

Records

30 heads were recorded from the middle row of each plot.

Harvest records were taken for:

- maturity
- yield
- quality

Results

Table 1: Maturity dates for cultivars - mean of sowing/planting date x nitrogen rate.

Cultivar	10% cut	50% cut	90% cut	Length of Cut (days)
Hassy 308				
Alpha Jubro	5 Jun	12 Jun	22 Jun	17
Dok Elgon	17 Jun	27 Jun	30 Jun	13
Plana	15 Jun	24 Jun	26 Jun	11
6 cm Block				
Alpha Jubro	5 Jun	13 Jun	21 Jun	15
Dok Elgon	21 Jun	23 Jun	3 Jul	12
Plana	19 Jun	20 Jun	29 Jun	10
SED (38 df)				
Within Hassy 308 method	0.7	0.9	0.8	0.8
Within 6 cm block method	1.2	1.6	1.4	1.3
Between propagation methods	1.5	1.8	1.8	1.1
LSD (P = 0.05)				
Within Hassy 308 method	1	2	2	2
Within 6 cm block method	2	3	3	3
Between propagation methods	3	4	NS	NS

Alpha Jubro was earlier to mature and had a longer cutting period than either Dok Elgon or Plana. Plana was earlier to mature than Dok Elgon.

Dok Elgon and Plana propagated in Hassy 308 modules and overwintered in the field were earlier to 10 and 50% cut dates than the same cultivars propagated in traditional 6 cm blocks. There was no difference in the date of 90% cut or length of cut between propagation systems.

The sowing/planting date of the Hassy 308 modules, and the rate of nitrogen fertiliser application did not affect maturity date and detailed results are therefore not presented.

Table 2: Marketable yield for sowing/planting dates - mean of cultivar x nitrogen rate.

Sowing/ Planting Date	Yield (crates/ha) Class I	Class II	Total Mkt.	No. of Cl.I heads as % of total mkt.	Total no. of mkt. heads as % of no. planted*
Hassy 308					
17 Sep/20 Nov	1893	93	1986	95	60 (75)
23 Sep/10 Dec	2264	49	2313	98	71 (88)
30 Sep/10 Dec	2168	104	2272	95	68 (85)
6 cm Block					
19 Oct/22 Feb	2115	147	2262	93	71 (88)
SED (5 df)	76.2	36.6	60.0	1.9	2.5
LSD (P = 0.05)	196	94	154	5	6

* Angle transform (actual percentage).

The earliest module sowing reduced the total number of marketable heads at harvest compared with all other treatments. This was mainly due to a higher percentage of missing heads at harvest (see Table 4 for details). As a result of fewer marketable heads the earliest module sowing produced a lower total marketable yield and a lower yield of Class I heads than all other treatments.

All treatments produced a high percentage of Class I heads. The 23 September module sowing produced a higher proportion of Class I heads than the 6 cm block with a reduced yield of Class II heads.

Table 3: Marketable yield for cultivars - mean of sowing/planting date x nitrogen rate x propagation method.

Cultivar	Yield (crates/ha) Class I	Class II	Total Mkt.	No. of Cl.I heads as % of total mkt.	Total no. of mkt. heads as % of no. planted
Alpha Jubro	2004	96	2100	95	67
Dok Elgon	1921	136	2058	93	64
Plana	2404	63	2468	97	72
SED (38 df)	69.1	23.5	63.9	1.3	2.0
LSD (P = 0.05)	140	48	129	3	4

Plana produced a higher yield of Class I heads and a higher total marketable yield than the other cultivars. Plana also produced a higher percentage of Class I heads than Dok Elgon and a higher total percentage of marketable heads than Dok Elgon and Alpha Jubro.

Nitrogen fertiliser application rate had no significant effect on marketable yield or quality and detailed results are therefore not presented.

Table 4: Head characteristics for sowing/planting dates x cultivar - mean of nitrogen rate.

Sowing/ Planting Date x Cultivar	No. of heads as % of the number planted - angle transform* Buttons %	Size 4 %	Size 5 %	Size 6+7 %	Deep %	Loose %	Missing %
Hassy 308							
17 Sep/20 Nov							
- Alpha Jubro	10	20	33	37	17	7	18
- Dok Elgon	4	5	28	38	45	4	18
- Plana	3	10	29	48	63	11	15
23 Sep/10 Dec							
- Alpha Jubro	6	19	41	36	14	5	14
- Dok Elgon	4	12	31	45	62	12	7
- Plana	4	13	28	52	68	5	7
23 Sep/10 Dec							
- Alpha Jubro	2	11	39	37	18	7	22
- Dok Elgon	2	10	36	42	59	5	9
- Plana	4	7	29	55	72	8	8
6 cm Block							
19 Oct/22 Feb							
- Alpha Jubro	10	19	41	34	34	16	14
- Dok Elgon	4	22	35	39	39	17	16
- Plana	3	11	29	29	53	12	11
SED (38 df)							
To compare cultivars:							
between different propagation dates	3.7	3.5	4.0	3.9	4.9	4.0	5.0
within same propagation date	3.4	3.5	2.7	3.6	3.9	3.9	3.4
LSD (P = 0.05)							
To compare cultivars:							
between different propagation dates	NS	7	NS	NS	10	8	10
within same propagation date	NS	7	6	7	8	NS	7

* See Appendix I, Table 6 for actual percentages.

Overall, Alpha Jubro produced more small (Size 4) heads than other cultivars although in 6 cm blocks Dok Elgon and Alpha Jubro were comparable. Sowing Dok Elgon in Hassy 308 modules led to fewer small heads than sowing in 6 cm blocks.

Plana and Dok Elgon produced fewer size 5 heads than Alpha Jubro. Plana also produced more larger (size 6+7) heads than Alpha Jubro. Both Plana and Dok Elgon produced many more high quality deep heads than Alpha Jubro. Plana also produced slightly more large heads than Dok Elgon. The number of deep heads of Dok Elgon was lower for the 17 September sowing in Hassy 308 modules.

Sowing in Hassy trays and overwintering in the field tended to reduce the number of loose heads compared with 6 cm blocks.

The earliest September sowing of Plana and Dok Elgon in Hassy 308 modules led to a higher number of missing heads than the two late September sowings. In general there were more missing heads for the cultivar Alpha Jubro.

Table 5: Head characteristics for nitrogen rates - mean of sowing/planting dates x cultivar.

Nitrogen Application	Buttons %	No. of heads as % of the number planted - angle transform* Size 4 %	Size 5 %	Size 6+7 %	Deep %	Loose %	Missing %
Hassy 308							
50 kg/ha base + 200 kg/ha top	6	12	33	42	44	9	14
100 kg/ha base + 150 kg/ha top	3	12	32	44	49	6	12
6 cm Block							
100 kg/ha base + 150 kg/ha top	6	18	35	42	42	15	14
SED (38 df)							
To compare nitrogen application:							
between different propagation methods	2.2	1.8	2.8	2.3	3.2	2.2	3.4
within same propagation method	1.6	1.7	1.3	1.7	1.9	1.8	1.7
LSD (P = 0.05)							
To compare nitrogen application:							
between different propagation methods	NS	4	NS	NS	7	5	NS
within same propagation method	NS	NS	NS	NS	NS	NS	NS

* See Appendix I, Table 7 for actual percentages.

Hassy 308 modules with 100 kg/ha N as a base dressing produced more deep heads than a 50 kg/ha N base dressing or the traditional 6 cm block. Hassy modules with either 50 or 100 kg/ha N base dressing produced fewer loose heads than the 6 cm block, and fewer small (size 4) heads. There were no other significant differences in head characteristics.

Discussion

Results from this trial showed that high yields of excellent quality could be achieved from cauliflower propagated in Hassy 308 modules and overwintered under perforated polythene in the field. Yields from late September sowings in modules were similar to yields from the traditional 6 cm block, which is overwintered under glass and planted in late February.

The earliest sowing in Hassy 308 modules (17 September) reduced yields due to a higher percentage of missing plants at harvest. There were few significant differences in yield and quality between the two later sowing dates, but there was some evidence to suggest that the 23 September sowing increased the percentage of Class I heads.

Nitrogen application rate had no affect on yield or maturity date. When applied as a base dressing of 100 kg/ha N however, the percentage of deep heads was improved for the field overwintered module compared with the 50 kg/ha N base dressing and the 6 cm block.

Field overwintered modules of Dok Elgon and Plana advanced maturity by 4 days compared with 6 cm blocks. Alpha Jubro reached maturity approximately 2 weeks earlier than either of the other cultivars, but the maturity date of Alpha Jubro was not improved by overwintering in the field.

Overall, Plana produced a higher yield of marketable heads than the other cultivars, with a higher percentage of large sized and deep heads. Overwintering in the field did not affect yield or quality of cultivars propagated in modules compared with the traditional 6 cm block.

The technique of field overwintering cauliflower under crop covers is a commercially viable method of producing high yields of excellent quality heads for an early-mid June harvest. The technique is fully mechanised if narrow (2 m wide) sheets of perforated polythene are used. Alternatively, wide sheets of 10 m wide (or above) can be laid

by hand. If wide sheets are used, there is the possibility of re-covering the crop following cover removal in early April to top dress and to apply pesticides for cabbage root fly control. Re-covering would advance maturity considerably.

At present, the 2 m wide polythene used for overwintering has perforations of 200 holes/m^2. This polythene is also available in 10 m+ widths, but due to its unavailability until early in the new year, 500 holes/m^2 polythene (10.5 m width) was used during this trial. It did not, however, seem to prove detrimental to crop survival or yield.

The weed control provided by an application of propachlor and chlorthal-dimethyl after planting was very effective. Some weed was present at cover removal in April, but this was removed by steerage hoe.

The only disadvantage of the overwintering technique is its dependency on good weather conditions around the time of planting and establishment. During the previous year of this trial (FV115, 1992), persistently low temperatures and freezing fog soon after planting killed above 30% of plants. During 1992-93 however, heavy rainfall throughout November resulted in water-logged soil which meant it was not possible to plant be machine. Instead, for the purpose of this trial, modules were planted by hand into extremely poor soil conditions. Planting by machine would not have been possible until mid January at the earliest and it is difficult to predict the result of such a late planting. Despite poor soil conditions and very cold temperatures however (see Appendix II), the plants established well and survived to produce an excellent crop.

Conclusions

1. Sowing in Hassy 308 modules in late September and planting in early December for field overwintering under perforated polythene (10 m wide x 500 holes/m^2 x 10.5 m wide) produced high yields of excellent quality cauliflower.

2. 100 kg/ha of nitrogen fertiliser applied as a base dressing (with 150 kg/ha N top dressing) produced more deep heads and fewer loose heads than a base dressing of 50 kg/ha N.

3. Alpha Jubro matured approximately 2 weeks earlier than Dok Elgon and Plana. Dok Elgon was between 2-4 days earlier than Plana. Overwintering in the field advanced the maturity of Plana and Dok Elgon by 4 days.

4. Plana produced the highest yield of Class I heads and the highest total marketable yield. Plana also produced more high quality large sized and deep heads than either of the other cultivars.

5. Water-logged soil in early December resulted in hand planting - machine planting would not have been possible until late January. The overwintering technique is reliant on good soil conditions during November-December.

APPENDIX I

Table 6: Head characteristics for sowing/planting dates x cultivar - Mean of nitrogen rate.

Nitrogen Application	No. of heads as % of the number planted - actual percentages						
	Buttons %	Size 4 %	Size 5 %	Size 6+7 %	Deep %	Loose %	Missing %
Hassy 308							
17 Sep/20 Nov							
Alpha Jubro	1	13	29	37	10	3	12
Dok Elgon	0	2	22	38	49	2	11
Plana	1	3	23	56	79	4	8
23 Sep/10 Dec							
Alpha Jubro	2	11	43	36	7	2	7
Dok Elgon	1	6	27	50	76	6	3
Plana	1	7	23	62	86	2	2
30 Sep/10 Dec							
Alpha Jubro	0	6	39	36	12	3	14
Dok Elgon	1	4	34	44	73	2	4
Plana	1	3	23	66	89	3	3
6 cm Block							
19 Oct/22 Feb							
Alpha Jubro	0	4	44	32	3	8	6
Dok Elgon	1	1	33	39	68	8	10
Plana	0	1	23	63	84	4	5

Table 7: Head characteristics for nitrogen rates - Mean of sowing/planting dates x cultivar.

Nitrogen Application	No. of heads as % of the number planted - actual percentages						
	Buttons %	Size 4 %	Size 5 %	Size 6+7 %	Deep %	Loose %	Missing %
Hassy 308							
50 kg/ha base + 200 kg/ha top	1	6	30	46	51	3	8
100 kg/ha base + 150 kg/ha top	0	6	29	49	56	2	6
6 cm Block							
100 kg/ha base + 150 kg/ha top	0	10	34	45	51	7	7

APPENDIX II

WEATHER DETAILS

NOVEMBER 1992

	Max (°C)	Min (°C)	Rainfall (mm)
1	15.0	1.2	2.1
2	13.0	2.0	0.6
3	10.0	2.8	Trace
4	14.4	6.0	0.7
5	15.2	8.5	Trace
6	17.0	6.0	0.9
7	13.3	10.5	0.2
8	11.0	0.0	0.2
9	11.0	2.4	7.2
10	8.6	4.5	4.2
11	8.5	4.1	0.1
12	7.7	3.2	0.0
13	7.9	1.0	0.0
14	5.3	-3.9	8.0
15	6.0	-3.2	0.4
16	6.3	3.0	1.3
17	6.1	1.3	Trace
18	11.0	1.0	1.1
19	7.5	0.9	0.5
20	8.9	1.0	Trace
21	12.2	0.0	9.6
22	14.1	1.6	4.5
23	14.0	9.5	0.8
24	11.9	3.4	1.9
25	9.9	5.0	0.4
26	8.2	3.0	0.0
27	8.9	3.1	0.2
28	8.0	2.1	Trace
29	12.2	-1.3	5.3
30	12.9	2.0	5.2
31			
Total			55.4
Mean	10.5	2.8	

DECEMBER 1992

	Max (°C)	Min (°C)	Rainfall (mm)
1	11.5	4.5	6.6
2	12.1	5.4	6.0
3	5.6	2.2	0.5
4	4.6	-0.7	1.3
5	5.4	-0.3	0.3
6	6.0	0.0	8.7
7	7.3	1.0	0.7
8	6.5	4.5	Trace
9	6.4	4.0	0.0
10	8.5	2.3	Trace
11	9.3	2.5	5.5
12	7.4	2.9	0.1
13	11.1	3.7	0.0
14	11.4	6.8	0.0
15	10.9	8.8	0.1
16	8.3	7.1	0.0
17	9.1	-1.0	0.5
18	9.8	-1.0	5.0
19	5.7	0.0	0.0
20	0.5	-2.5	0.0
21	0.3	-5.2	0.0
22	1.6	-5.5	0.0
23	2.0	-2.2	0.0
24	-0.1	-5.0	0.0
25	-0.8	-6.1	0.0
26	3.6	-4.2	0.0
27	4.2	-0.7	0.0
28	2.1	1.2	0.3
29	-1.3	-2.1	0.0
30	0.8	-3.2	0.0
31	2.1	-3.2	0.0
Total			35.6
Mean	5.5	0.4	

JANUARY 1993

	Max (°C)	Min (°C)	Rainfall (mm)
1	2.5	-3.0	0.0
2	0.4	-3.0	0.0
3	0.5	-5.5	6.4
4	7.0	-5.3	2.3
5	8.1	-3.8	0.1
6	3.8	2.6	1.3
7	8.0	-0.1	0.4
8	11.2	0.8	0.1
9	11.5	2.8	1.2
10	12.5	3.5	5.5
11	4.7	2.5	2.2
12	7.2	0.4	0.4
13	6.5	1.9	6.7
14	12.4	2.4	3.2
15	12.8	2.0	0.8
16	14.7	3.9	0.4
17	8.6	6.5	Trace
18	7.4	2.1	1.3
19	13.3	2.0	0.7
20	12.9	3.6	Trace
21	13.4	5.9	0.3
22	7.8	4.5	0.1
23	13.0	3.5	5.5
24	8.0	5.4	3.0
25	5.0	1.0	0.0
26	7.0	-1.0	0.0
27	9.0	-1.1	3.7
28	11.4	0.0	1.9
29	7.2	4.9	0.0
30	7.8	3.8	0.9
31	7.4	4.1	Trace
Total			48.4
Mean	8.4	1.5	

FEBRUARY 1993

	Max (°C)	Min (°C)	Rainfall (mm)
1	6.1	-1.2	0.0
2	10.5	0.0	0.0
3	10.6	4.4	0.0
4	8.4	4.6	0.0
5	9.0	2.2	0.1
6	10.2	5.1	0.1
7	12.8	5.6	Trace
8	11.5	7.8	0.4
9	6.1	5.9	0.2
10	4.7	3.5	Trace
11	5.0	3.5	0.0
12	3.4	1.9	0.0
13	4.8	-0.5	Trace
14	3.6	1.5	0.0
15	8.7	0.4	0.0
16	10.5	3.0	0.0
17	11.8	5.7	0.0
18	8.3	5.2	0.0
19	8.8	4.3	0.0
20	8.1	1.3	0.0
21	6.0	2.8	0.0
22	6.6	-1.0	0.1
23	6.5	-1.8	0.0
24	7.2	0.2	0.0
25	8.0	2.7	2.9
26	5.7	1.0	1.7
27	3.8	-1.6	0.0
28	4.7	-2.0	2.8
29			
30			
31			
Total			8.3
Mean	7.6	2.3	

MARCH 1993

	Max (°C)	Min (°C)	Rainfall (mm)
1	3.5	-2.3	0.3
2	4.0	0.7	0.0
3	3.3	2.5	0.0
4	6.9	0.8	0.0
5	10.6	1.8	0.0
6	11.8	0.9	0.0
7	6.5	-0.1	0.0
8	7.4	4.0	0.0
9	8.4	-2.0	0.0
10	6.2	-2.3	1.4
11	11.4	0.5	0.0
12	13.1	1.0	0.0
13	16.9	4.2	0.0
14	15.4	4.9	0.0
15	17.5	2.5	0.1
16	11.7	7.0	0.0
17	14.9	6.5	Trace
18	10.7	10.0	0.0
19	10.8	3.2	0.0
20	10.9	5.0	0.0
21	12.8	6.2	0.5
22	11.5	5.0	Trace
23	9.0	3.0	0.1
24	11.0	1.3	0.0
25	8.5	-1.9	0.0
26	9.7	-5.3	0.0
27	8.9	-2.7	0.0
28	8.6	3.1	0.0
29	12.1	2.5	0.0
30	13.8	5.0	0.7
31	12.6	-1.0	4.8
Total			7.9
Mean	10.3	2.1	