

CAMPDEN FOOD AND DRINK RESEARCH ASSOCIATION  
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BRUSSELS SPROUTS - STUDIES INTO THE CAUSE  
AND CONTROL OF BITTERNESS,  
SENSORY APPRAISAL RESULTS

CONFIDENTIAL REPORT FOR THE  
HORTICULTURAL DEVELOPMENT COUNCIL

Project 11328

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## SUMMARY

- \* The sensory characteristics of fresh Brussels sprouts from an HDC funded trial were assessed at Campden Food and Drink Research Association.
- \* The trial, grown at HRI, Kirton, set out to investigate the affects of fertiliser treatments and irrigation on the quality of produce from four selected varieties Topline, Rampart, Cascade and Stephen.
- \* The sensory assessments comprised a full flavour profile of the samples including bitterness and other flavour characteristics as well as colour and texture assessments.
- \* A description of the sensory characteristics of each variety was produced.
- \* There were no consistent flavour or texture differences related to fertiliser treatment but there was some evidence of colour differences in Stephen and Cascade.
- \* Irrigated sprouts of Cascade and Stephen were consistently deeper green, with less yellow and khaki than non-irrigated samples. Results of the other two varieties were more difficult to interpret.
- \* In general irrigation did not influence sprout flavour but irrigated sprouts sometimes had firmer and less fibrous texture than non-irrigated samples.
- \* It was concluded that variety has a greater influence on Brussels sprout flavour than the fertiliser and irrigation treatments investigated here.



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## INTRODUCTION

The problem of bitterness in Brussels sprouts has been recognised for many years and has been related to variety (Fenwick, Griffiths and Hearney 1983). In trials at Campden Food and Drink Research Association the sensory characteristics of varieties for quick freezing have been described and some which consistently produce bitter frozen samples have been identified (CFDRA Technical Manual No. 14). Others have proved to be more variable in flavour. The flavour of fresh samples of different varieties has also been investigated (Bedford 1990).

It has also been suggested that agronomic practices may influence flavour characteristics. Differences in bitterness at different sites have been reported (Griffiths and Fenwick 1985). Other factors such as fertiliser levels or irrigation may also be involved.

In 1991 a trial at the Horticultural Research Institute, Kirton, funded by the Horticultural Development Council set out to investigate the affects of fertiliser treatments and irrigation on four selected varieties of Brussels sprouts. Sensory appraisal of samples from this trial was carried out at CFDRA. The bitterness and other flavour characteristics of the sample were described as were those of the colour and texture of the samples. Statistical analysis of the results was undertaken in order to identify differences between the treatments.

## MATERIALS AND METHODS

A trial of Brussels sprouts had been grown at HRI Kirton in order to investigate a number of factors which might contribute to bitterness. The factors studied were:

I Varieties                      Rampart  
  Topline  
  Cascade  
  Stephen

### II Fertiliser Nitrogen

1. Control - 250kg/ha ammonium nitrate N in base dressing.
2. 150kg/ha ammonium nitrate N in base dressing.
3. 75kg/ha ammonium nitrate N in base dressing plus 75kg/ha as top dressing.
4. 150kg/ha ammonium sulphate N in base dressing.

### III Irrigation

Irrigated - 50mm water at 50mm soil moisture deficit.  
Non-irrigated.

### IV Harvest Dates

There were three harvests of each variety (Table 1) and each plot was assessed individually so that in some cases different treatments were harvested on different dates.

**TABLE 1**

Variety	Treatment Code	Harvest Date		
		Early	Mid	Late
Topline	1 I	26.11.91	16.12.91	14.1.92
	2 I	12.11.91	3.12.91	14.1.92
	3 I	12.11.91	3.12.91	14.1.92
	4 I	12.11.91	3.12.91	14.1.92
	1 N	12.11.91	3.12.91	14.1.92
	2 N	12.11.91	3.12.91	14.1.92
	3 N	12.11.91	3.12.91	14.1.92
	4 N	12.11.91	16.12.91	14.1.92
Rampart	1 I	26.11.91	17.12.91	7.1.92
	2 I	26.11.91	17.12.91	7.1.92
	3 I	12.11.91	3.12.91	7.1.92
	4 I	26.11.91	17.12.91	7.1.92
	1 N	12.11.91	17.12.91	7.1.92
	2 N	12.11.91	3.12.91	7.1.92
	3 N	12.11.91	3.12.91	7.1.92
	4 N	12.11.91	3.12.91	7.1.92
Cascade	1 I	16.12.91	14.1.92	28.1.92
	2 I	16.12.91	14.1.92	28.1.92
	3 I	16.12.91	14.1.92	28.1.92
	4 I	16.12.91	14.1.92	28.1.92
	1 N	16.12.91	14.1.92	28.1.92
	2 N	16.12.91	14.1.92	28.1.92 *
	3 N	16.12.91	14.1.92	28.1.92
	4 N	16.12.91	14.1.92	28.1.92
Stephen	1 I	16.12.91	7.1.92	4.2.92
	2 I	16.12.91	7.1.92	4.2.92
	3 I	16.12.91	7.1.92	4.2.92
	4 I	16.12.91	7.1.92	4.2.92
	1 N	16.12.91	7.1.92	4.2.92
	2 N	16.12.91	7.1.92	4.2.92
	3 N	16.12.91	7.1.92	4.2.92
	4 N	16.12.91	7.1.92	4.2.92

I = Irrigated

N = Non-irrigated

\* = Samples from two replicates only

### Samples for Sensory Appraisal

A standard size grade of 25-30mm was used for the assessments. A bulk sample from all three replicates was despatched to Chipping Campden on the day of harvest. Upon receipt the following day, the samples were put into chill storage and were tasted within two days of receipt, with the following exceptions:-

- (i) Samples of Stephen delivered 17th Dec, tasted 20th Dec.
- (ii) Samples of Topline delivered 15th Jan, tasted 20th Jan.

### Cooking

Sprouts were prepared for cooking in a standard manner. The wing leaves and one outer layer of leaves were removed from each sprout. Two hundred and fifty grams of each sample was plunged into boiling water and cooked for five minutes, before tasting.

### Sensory Appraisal

Three replicate samples from each treatment were tasted by fully trained panels of at least three assessors. Because of the large number of samples involved, 24 samples for each variety at each harvest, separate panels were allocated to taste the different varieties. When two varieties were tasted together the panels were enlarged and contained the tasters allocated to both varieties.

The samples were assessed using the 'QAV' method of sensory appraisal (Adams *et al* 1981) and the scoring systems in Table 2.

### Statistical Analysis

Results of each harvest date were analysed statistically, using the Mann Whitney 'U' test for non-parametric comparisons.

Where all the treatments were harvested on the same date, the results were combined and Analysis of Variance was carried out.

TABLE 2 : SCORING SYSTEMS FOR QUALITY APPRAISAL OF BRUSSELS SPROUTS

		SCORE				
		1	2	3	4	5
COLOUR	Green	Very pale green	Pale green	Medium green	Moderately dark green	Dark green
	Amounts of other colours (yellow khaki/brown)	Very slight	Slight	Moderate	Considerable	Very large
	Brightness	Dull	Slightly dull	Moderately bright	Very bright	Extremely bright
	Uniformity	Extremely non-uniform	Very non-uniform	Moderately non-uniform	Slightly non-uniform	Very uniform
	Sweetness	Not at all	Slightly	Moderately	Very	Extremely
FLAVOUR	Bitterness	Not at all	Slightly	Moderately	Very	Extremely
	Earthy	Not at all	Slightly	Moderately	Very	Extremely
	Nutty	Not at all	Slightly	Moderately	Very	Extremely
	Hot	Not at all	Slightly	Moderately	Very	Extremely
	Stale	Not at all	Slightly	Moderately	Very	Extremely
TEXTURE	Strength of flavour	Moderately weak	Fairly weak	Slightly weak	Slightly strong	Moderately strong
	Softness	Very soft	Moderately soft	Slightly soft	Slightly firm	Very firm
	Fibrousness	Not at all	Slightly	Moderately	Very	Extremely

## RESULTS

The mean results for each variety at each harvest and over harvests were produced (Appendix A). From these a description of each variety was produced (Table 3).

Where possible analysis of variance was used to investigate fertiliser and irrigation affects for each variety at each harvest. Significant differences are tabulated in Appendix B and are summarised for flavour in Table 4, texture Table 5 and colour Table 6. Tasters comments of off-flavours are given in Table 7.

On the occasions when all treatments were not harvested together (Topline and Rampart harvests 1 and 2) they could not easily be compared. Appendix C gives the results for analysis of each harvest date. Those treatments which were tasted together can be compared and where there were significant differences these are noted in Tables 4, 5 and 6.

## DISCUSSION

### Varieties

Each variety was tasted by a separate taste panel and the results cannot, therefore, be compared statistically. However, a description of the colour, flavour and texture characteristics of each variety was produced.

Topline was moderately dark green. On the two occasions where it can be compared with other varieties (Rampart in Appendix Table C3) and Cascade in Appendix Table C6) it was rated as deeper green than either of these. Rampart, Cascade and Stephen were all described as medium green. Rampart had slight amounts of yellow and khaki, Cascade was more khaki and Stephen more yellow.

The two earlier maturing varieties had very similar flavour profiles with only slight bitterness. Since bitterness is a normal part of sprout flavour profile this is not a disadvantage and breeding to remove it completely would be counter productive (Fenwick, Griffiths and Heaney, 1983). Stephen was described as moderately bitter and at this level problems with consumer acceptability can be expected. The rest of its flavour characteristics were similar to those of Rampart and Topline. Cascade was only slightly bitter but was described as fairly weak in natural sprout flavour. This variety has been noted to have fairly bland overall flavour in previous tastings at CFDRA.

Slight staleness was found in later varieties Cascade and Stephen at all harvests and was noted to develop in the earlier varieties at 2nd and 3rd harvests. These harvests were taken from December onwards. Table 7 shows the presence of sickly sweet off-flavours in mid and late January harvested after periods of frost.

All the varieties were described as having slightly soft texture. Topline had slight fibrousness and Stephen was described as moderately fibrous. Fibrousness of Rampart and Cascade was slight at first harvest and moderate at later harvests.

**TABLE 3 : VARIETAL CHARACTERISTICS**

Topline	Colour	Moderately dark green, with slight amounts of yellow and khaki. Moderately bright and moderately non-uniform.
	Texture	Slightly soft with slight fibrousness.
	Flavour	Slightly weak, with slight sweetness and bitterness, slight earthiness and very slight hot flavour. Slight stale flavours at 2nd and 3rd harvests.
Rampart	Colour	Medium green, with slight amounts of yellow and khaki. Moderately bright and moderately non-uniform.
	Texture	Slightly soft, with slight fibrousness at 1st harvest and moderate fibrousness at 2nd and 3rd harvests.
	Flavour	Slightly weak, with slight sweetness and slight bitterness and slight amounts of earthiness and hot flavours. Slight stale flavours at 2nd and 3rd harvests.
Cascade	Colour	Medium green, with slight amounts of khaki. Moderately bright and moderately non-uniform.
	Texture	Slightly soft, with slight fibrousness at 1st harvest and moderate fibrousness at 2nd and 3rd harvests.
	Flavour	Fairly weak, with slight sweetness and slight bitterness, slight earthiness at 2nd and 3rd harvests. Slightly stale.
Stephen	Colour	Medium green, with moderate amounts of yellow and slight amounts of khaki. Moderately bright and moderately non-uniform.
	Texture	Slightly soft and moderately fibrousness.
	Flavour	Slightly weak, with slight sweetness and moderate bitterness and slight earthiness, hot and stale flavours.

## Fertiliser and Irrigation Affects

In many cases there were no significant differences between the treatments in the various characters scored. Those which were found are discussed below.

### (i) Flavour

There were no consistent flavour differences as a result of the treatments. Although treatment 4 was sometimes seen to have more negative factors (more bitter or stale or weaker), this was by no means always the case. It was sometimes sweeter and in many cases there were no significant differences.

There were significant differences between irrigated and non-irrigated plots on two occasions. Irrigated plots of cascade at first harvest had less hot flavour and those of Stephen at second harvest were less stale.

### (ii) Texture

There was generally no difference between fertiliser treatments but where there was treatment 1 was often but not always softer or less fibrous. There was generally no difference between irrigation treatments but where there was irrigated sprouts were firmer (Rampart 3rd Harvest, Cascade 2nd Harvest and Stephen 2nd Harvest). These harvests were all in the first half of January.

### (iii) Colour

Treatments 3 and 4 produced darker less yellow sprouts than 1 and 2 of Stephen at 1st and 3rd harvests. Treatment 2 produced the palest sprouts of Cascade at 1st and 2nd harvests. Results for Rampart and Topline are more difficult to interpret. Treatment 4 appeared to give darker sprouts of Rampart and treatment one to give darker sprouts of Topline at harvests 2 and 3.

Irrigation consistently produced better colour in Stephen and Cascade (deeper or less yellow or khaki) and at 3rd harvest, samples of Rampart were brighter.

**TABLE 4 : STATISTICALLY DIFFERENT FLAVOUR DIFFERENCES**

<b>Topline</b>	1st Harvest	(12/11 and 26/11) 2 sweetest (Table C1) 4 irrigated most bitter (Table C1)
	2nd Harvest	(3/12 and 16/12) No differences
	3rd Harvest	(20/1) <u>Fertiliser</u> 3 sweeter than 1 & 2 (Table B1) 4 less hot than 1 & 2
<b>Rampart</b>	1st Harvest	(12/11 and 26/11) 4 irrigated more stale than 2 irrigated (Table C3) 2 irrigated stronger than 1 and 4 irrigated (Table C3)
	2nd Harvest	(3/12 and 17/12) R2 non-irrigated most bitter but only significantly different from R3 irrigated (Table C4)
	3rd Harvest	(7/1) No differences
<b>Cascade</b>	1st Harvest	(16/12) <u>Fertiliser</u> 4 sweeter than 1, 2 and 3 (Table B2) <u>Irrigation</u> Non-irrigated more hot flavour (Table B2)
	2nd Harvest	(16/1) <u>Fertiliser</u> 4 less sweet than 2 and 3 (Table B2) 4 and 3 more bitter than 1 and 2
	3rd Harvest	(28/1) No differences
<b>Stephen</b>	1st Harvest	(16/12) No differences
	2nd Harvest	(7/1) <u>Irrigation</u> Non-irrigated more stale (Table B3)
	3rd Harvest	(4/2) No differences

**TABLE 5 : STATISTICALLY DIFFERENT TEXTURE DIFFERENCES**

Topline	1st Harvest	(12/11 and 26/11) No differences	
	2nd Harvest	(3/12 and 16/12) 3 non-irrigated firmest, most fibrous of those tasted 3/12 (Table C5)	
	3rd Harvest	(20/1) No differences	
Rampart	1st Harvest	(1/11 and 26/11) No differences	
	2nd Harvest	(3/12 and 17/12) No differences	
	3rd Harvest	(7/1) <u>Irrigation</u>	Irrigated firmer (Table B4)
Cascade	1st Harvest	(16/12) No differences	
	2nd Harvest	(16/1) <u>Fertiliser</u> <u>Irrigated</u>	1 softer than 2, 3 and 4 (Table B5) 3 softer than 2 and 4 Irrigated firmer (Table B5)
	3rd Harvest	(28/1) No differences	
Stephen	1st Harvest	(16/12) <u>Fertiliser</u>	1 less fibrous than 2 and 3 (Table B6) 4 less fibrous than 2
	2nd Harvest	(7/1) <u>Irrigation</u>	Irrigated firmer (Table B6)
	3rd Harvest	(4/2) <u>Fertiliser</u>	2 softer than 3, 4 and 1 2 less fibrous than 1 and 3

**TABLE 6 : STATISTICALLY DIFFERENT COLOUR DIFFERENCES**

Topline	1st Harvest	(12/11 and 26/11) No differences	
	2nd Harvest	(3/12 and 16/12) 2 irrigated and non-irrigated deepest green (Table C5) 1 non-irrigated more khaki than 4 irrigated 1 non-irrigated least uniform	
	3rd Harvest	(20/1) <u>Fertiliser</u>	1 and 2 deeper green than 3 and 4 (Table B7) 1 and 4 less yellow than 2 and 3 1 and 4 less khaki than 2 and 3
Rampart	1st Harvest	(12/11 and 26/11) Non-irrigated - 2 and 4 deeper green than 1 and 3 (Table C2) 3 and 4 more yellow than 1	
	2nd Harvest	(3/12 and 17/12) 1 non-irrigated more khaki than 4 irrigated (Table C8)	
	3rd Harvest	(7/1) <u>Fertiliser</u> <u>Irrigation</u>	3 and 4 less khaki than 1 (Table B8) Irrigated less khaki
Cascade	1st Harvest	(16/12) <u>Fertiliser</u> <u>Irrigation</u>	2 paler than 1 and 3 (Table B9) 2 more yellow than 1, 3 and 4 Irrigated deeper green Irrigated least yellow Irrigated more uniform
	2nd Harvest	(16/1) <u>Fertiliser</u> <u>Irrigation</u>	2 paler than 1, 3 and 4 (Table B9) 2 more yellow than 4 Irrigated deeper green Irrigated more uniform
	3rd Harvest	(28/1) <u>Irrigation</u>	Irrigated brighter

**TABLE 6 (continued) : STATISTICALLY DIFFERENT COLOUR DIFFERENCES**

Stephen	1st Harvest	(16/12)	
		<u>Fertiliser</u>	1 paler green than 2, 3 and 4 2 paler green than 4 1 more yellow than 3 and 4 2 more yellow than 3
		<u>Irrigation</u>	Irrigated darker Irrigated less yellow
	2nd Harvest	(7/1)	
		<u>Irrigation</u>	Irrigated less khaki Irrigated more uniform
	3rd Harvest	(4/2)	
<u>Fertiliser</u>		3 and 4 deeper green than 1 and 2 2 deeper green than 1 4 less yellow than 1, 2 and 3 3 less yellow than 1	
	<u>Irrigation</u>	Irrigated darker Irrigated less yellow Irrigated less khaki	

TABLE 7 : OFF-FLAVOURS

Harvest		Variety			
Date	Number	Topline	Rampart	Cascade	Stephen
12/11	First	None	Cabbage etc.		
26/11	First	None	Cabbage etc.		
3/12	Second	None	Cabbage etc.		
16/12	Second	None			
16/12	First			None	None
17/12	Second		None		
7/1	Second				None
7/1	Third		None		
16/1	Second			Sickly sweet etc.	
20/1	Third	Sickly sweet			
28/1	Third			Sickly sweet	
4/2	Third				None

## CONCLUSIONS

1. Stephen was moderately bitter. The other three varieties were slightly bitter.
2. Rampart and Topline had similar flavour profiles.
3. Cascade was fairly weak in flavour.
4. Topline was moderately dark green. The other three varieties were medium green.
5. Cascade was more khaki and Stephen more yellow than Rampart.
6. Stale flavours were noted in sprouts harvested from December onwards.
7. Sickly sweet off-flavours were noted in sprouts harvested in the second half of January.
8. There were no consistent flavour or texture differences due to fertiliser treatment. However, there was some evidence of colour differences such that Treatment 3 and 4 sometimes produced darker sprouts of Stephen and treatment 2 paler sprouts of Cascade.
9. Irrigation consistently produced deeper green, less yellow and less khaki sprouts of Cascade and Stephen.
10. In general there were no significant flavour differences between irrigated and non-irrigated plots. However irrigated plots of Cascade at first harvest had less hot flavour and those of Stephen at second harvest were less stale.
11. Irrigated sprouts were sometimes firmer and more fibrous than non-irrigated samples.
12. Variety was seen to have a greater influence on perceived bitterness than the other factors examined.

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## APPENDIX A

### Variety Characteristics

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**TABLE A1 : FLAVOUR RATINGS BY VARIETY**

	Harvest	Flavour Attribute						
		Sweet	Bitter	Earthy	Nutty	Hot	Stale	Strength
Topline	1	(2.2)	(2.3)	(1.6)	(1.4)	(1.4)	(1.2)	(2.7)
	2	(2.3)	(2.3)	(1.5)	(1.4)	(1.4)	(1.5)	(2.5)
	3	2.3	2.4	1.5	1.4	1.6	1.9	2.5
Rampart	1	(1.9)	(2.4)	(1.9)	(1.4)	(1.6)	(1.3)	(2.6)
	2	(2.0)	(2.4)	(2.1)	(1.4)	(1.7)	(1.6)	(2.7)
	3	2.1	2.5	1.8	1.4	1.8	1.9	2.7
Cascade	1	2.5	2.0	1.4	1.2	1.4	2.5	2.2
	2	2.3	2.3	1.8	1.3	1.2	2.1	2.3
	3	2.4	2.2	1.7	1.4	1.4	2.2	2.5
Stephen	1	2.0	2.6	1.8	1.1	1.5	1.8	2.6
	2	1.5	3.2	1.7	1.2	2.0	1.6	2.4
	3	1.9	2.8	2.0	1.2	1.6	2.1	2.5

( ) averages of two harvest dates

**TABLE A2 : COLOUR AND TEXTURE RATINGS BY VARIETY**

	Harvest	Flavour Attribute						
		Green	Yellow	Khaki	Bright	Unifo	Soft/ Firm	Fibrous
Topline	1	(3.4)	(2.0)	(1.6)	(3.0)	(3.4)	(3.5)	(2.0)
	2	(3.7)	(1.7)	(1.7)	(3.0)	(3.5)	(3.4)	(2.1)
	3	3.5	1.6	1.7	2.8	3.3	2.9	2.4
Rampart	1	(2.9)	(2.5)	(1.5)	(3.0)	(2.9)	(3.2)	(2.3)
	2	(3.5)	(2.0)	(1.6)	(2.9)	(3.1)	(3.0)	(2.5)
	3	3.2	2.2	2.0	2.9	3.2	2.7	3.2
Cascade	1	3.3	2.2	1.5	3.1	3.0	2.8	2.3
	2	3.2	1.9	1.9	2.9	3.0	2.8	2.7
	3	3.1	2.2	2.1	2.9	2.9	2.9	2.8
Stephen	1	3.0	2.6	2.1	2.7	2.8	3.0	2.6
	2	3.2	2.8	2.0	2.9	3.1	2.8	2.4
	3	2.8	2.9	2.3	2.9	2.7	2.8	2.5

APPENDIX B

Statistically Significant Differences  
of Treatments all Harvested on one Date

**TABLE B1 : TOPLINE SIGNIFICANT FLAVOUR DIFFERENCES**

Third Harvest

		Sweetness			Hot		
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean
	1	2.0	2.1	2.05	1.9	1.8	1.85
	2	1.8	2.3	2.05	1.7	1.8	1.75
	3	2.6	2.6	2.60	1.8	1.4	1.60
	4	2.3	2.3	2.30	1.3	1.4	1.35
		2.18	2.33		1.68	1.60	
Significance	Fertiliser Irrigation	*			*		
Sig Diff	Fertiliser Levels	NS			NS		
		0.355			0.296		

**TABLE B2 : CASCADE SIGNIFICANT FLAVOUR DIFFERENCES**

First Harvest

		Sweetness			Hot		
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean
	1	2.6	2.4	2.50	1.3	1.6	1.45
	2	2.4	2.3	2.45	1.4	1.6	1.50
	3	2.2	2.4	2.30	1.4	1.7	1.55
	4	3.1	2.7	2.90	1.1	1.6	1.35
			2.58	2.45		1.30	1.63
Significance	Fertiliser Irrigation	*			NS		
Sig Diff	Fertiliser Levels Irrigation	NS 0.374			* - 0.219		

Second Harvest

		Sweetness			Bitterness		
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean
	1	2.3	2.3	2.30	2.2	2.1	2.15
	2	2.4	2.7	2.55	2.2	2.1	2.15
	3	2.7	2.0	2.35	2.4	2.4	2.40
	4	1.9	2.0	1.95	2.9	2.1	2.50
			2.33	2.25		2.43	2.18
Significance	Fertiliser Irrigation	*			NS		
Sig Diff	Fertiliser Levels Irrigation	NS 0.383			* - 0.221		

**TABLE B3 : STEPHEN SIGNIFICANT FLAVOUR DIFFERENCES**

Second Harvest

		Stale		
		Irrigated	Non-Irrigated	Mean <sup>ns</sup>
	1	1.3	1.6	1.45
	2	1.4	1.9	1.65
	3	1.3	1.8	1.55
	4	1.6	1.8	1.70
		1.40	1.78	
Significance	Fertiliser	NS		
	Irrigation	**		
Sig Diff	Irrigation	0.249		

**TABLE B4 : RAMPART SIGNIFICANT TEXTURE DIFFERENCES**

Third Harvest

		Soft/Firmness		
		Irrigated	Non-Irrigated	Mean
	1	2.7	2.7	2.70
	2	3.0	2.7	2.85
	3	2.8	2.6	2.70
	4	2.9	2.6	2.75
		2.85	2.65	
Significance	Fertiliser	NS		
	Irrigation	*		
Sig Diff	Irrigation	0.195		

**TABLE B5 : CASCADE SIGNIFICANT TEXTURE DIFFERENCES**

Second Harvest

		Soft/Firmness		
		Irrigated	Non-Irrigated	Mean
	1	2.4	2.4	2.40
	2	3.3	2.8	3.05
	3	3.1	2.4	2.75
	4	3.0	3.0	3.00
		2.95	2.65	
Significance	Fertiliser	**		
	Irrigation	*		
Sig Diff	Fertiliser levels	0.349		
	Irrigation	0.247		

**TABLE B6 : STEPHEN SIGNIFICANT TEXTURE DIFFERENCES**

First Harvest

		Fibrousness		
		Irrigated	Non-Irrigated	Mean
	1	2.4	2.2	2.30
	2	2.7	2.9	2.80
	3	2.7	2.8	2.75
	4	2.7	2.3	2.50
		2.63	2.55	
Significance	Fertiliser Irrigation	*		
Sig Diff	Fertiliser levels	NS 0.295		

Second Harvest

		Soft/Firmness		
		Irrigated	Non-Irrigated	Mean
	1	3.1	2.6	2.85
	2	2.9	2.9	2.90
	3	3.0	2.7	2.85
	4	3.1	2.4	2.75
		3.03	2.65	
Significance	Fertiliser Irrigation	NS **		
Sig Diff	Fertiliser levels	0.276		

Third Harvest

		Soft/Firmness			Fibrousness		
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean
	1	2.9	2.8	2.85	2.6	2.7	2.65
	2	2.6	2.6	2.60	2.5	2.2	2.35
	3	3.2	3.2	3.20	2.6	2.8	2.70
	4	2.8	2.8	2.80	2.6	2.4	2.50
		2.88	2.85		2.58	2.53	
Significance	Fertiliser Irrigation	***			*		
Sig Diff	Fertiliser	NS 0.243			NS 0.270		

Third Harvest

TABLE B7 : TOPLINE SIGNIFICANT COLOUR DIFFERENCES

Significance Fertiliser Irrigation Fertiliser	Green				Yellow				Khaki		
	Irrigated	Non- irrigated	Mean	Irrigated	Non- irrigated	Mean	Irrigated	Non irrigated	Mean		
	1 2 3 4	3.7 3.8 3.3 3.1	3.7 3.6 3.4 3.1	3.70 3.70 3.35 3.10	1.4 1.9 1.7 1.3	1.6 1.8 2.0 1.4	1.50 1.85 1.85 1.35	1.7 2.0 1.9 1.2	1.4 1.8 1.9 1.6	1.55 1.90 1.90 1.40	
*** NS 0.299	3.48	3.45		1.58	1.70		1.70		1.68		
* NS 0.322											
** NS 0.325											

**TABLE B8 : RAMPART SIGNIFICANT COLOUR DIFFERENCES**

Third Harvest

		Khaki		
		Irrigated	Non-Irrigated	Mean
	1	2.2	2.3	2.25
	2	2.0	2.1	2.05
	3	1.7	1.9	1.80
	4	1.4	2.3	1.85
		1.83	2.15	
Significance	Fertiliser	*		
	Irrigation	**		
Sig Diff	Fertiliser levels	0.304		
	Irrigation	0.215		

TABLE B9 : CASCADE SIGNIFICANT COLOUR DIFFERENCE

First Harvest

		Green			Yellow			Uniformity			
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean	
Significance Fertiliser Irrigation Levels	1	3.8	2.9	3.35	2.1	2.4	2.25	3.2	2.4	2.80	
	2	3.2	2.8	3.00	2.3	2.9	2.60	3.0	2.8	2.90	
	3	3.6	3.4	3.50	1.7	2.0	1.95	3.1	2.9	3.00	
	4	3.6	2.9	3.25	2.0	2.3	2.15	3.2	2.8	3.00	
		3.55	3.00		2.03	2.40		3.13	2.73		
Significance	*				***				NS		
Fertiliser Irrigation	***				***				***		
Levels	0.350				0.307				-		
Sig Diff Irrigation	0.247				0.217				0.231		

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Second Harvest

		Green			Yellow			Uniformity			
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean	
Significance Fertiliser Irrigation Levels	1	3.4	3.0	3.20	1.8	2.2	2.00	3.0	2.6	2.80	
	2	3.0	2.7	2.85	2.2	2.1	2.15	3.1	2.9	3.00	
	3	3.3	3.2	3.25	1.9	1.9	1.90	3.2	3.0	3.10	
	4	3.6	3.3	3.45	1.6	1.8	1.70	3.1	3.0	3.05	
		3.33	3.05		1.88	2.00		3.10	2.88		
Significance	***				*				NS		
Fertiliser Irrigation	**				NS				*		
Levels	0.280				0.312				-		
Sig Diff Irrigation	0.198				-				0.235		

**TABLE B9 (continued) : CASCADE SIGNIFICANT COLOUR DIFFERENCES**

Third Harvest

		Brightness		
		Irrigated	Non-irrigated	Mean
	1	3.1	2.6	2.85
	2	3.0	3.1	3.05
	3	3.0	2.4	2.70
	4	3.1	3.0	3.05
		3.05	2.78	
Significance	Fertiliser	NS		
	Irrigation	*		
Sig Diff	Irrigation	0.209		

**TABLE B10 : STEPHEN SIGNIFICANT COLOUR DIFFERENCES**

First Harvest

		Green			Yellow		
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean
	1	2.9	2.6	2.75	3.0	2.8	2.90
	2	3.3	2.6	2.95	2.4	2.9	2.65
	3	3.2	3.1	3.15	2.0	2.4	2.20
	4	3.2	2.8	3.00	2.3	2.7	2.50
		3.15	2.78		2.43	2.70	
Significance	Fertiliser Irrigation	*			***		
Sig Diff	Fertiliser Levels Irrigation	***			*		
		0.299			0.316		
		0.211			0.224		

Second Harvest

		Khaki			Uniformity		
		Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean
	1	1.8	2.1	1.95	3.0	2.8	2.90
	2	1.4	2.1	1.75	3.2	2.8	3.00
	3	1.8	2.7	2.25	3.3	3.0	3.15
	4	2.1	2.3	2.20	3.3	3.0	3.15
		1.78	2.30		3.20	2.90	
Significance	Fertiliser Irrigation	NS			NS		
Sig Diff	Irrigation	**			**		
		0.337			0.235		

TABLE B10 (continued) : STEPHEN SIGNIFICANT COLOUR DIFFERENCES

Third Harvest

		Green			Yellow			Khaki		
	Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean	Irrigated	Non-irrigated	Mean	
										1
2	2.9	2.6	2.75	2.8	3.2	3.00	2.3	2.5	2.40	
3	3.3	2.8	3.05	2.7	3.0	2.85	2.1	2.3	2.20	
4	3.0	3.0	3.00	2.5	2.4	2.45	1.9	2.4	2.15	
	2.93	2.68		2.83	3.03		2.15	2.40		
Significance	***			***			N S			
Sig Diff	**			*			*			
Fertiliser Irrigation Levels	0.252			0.271			-			
Irrigation	0.178			0.191			0.192			

APPENDIX C

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Table C1

HDC Brussels Sprouts - Topline - Harvested 12-11-91

Significant Characters

Treatment	Sweet	Bitte
T2 Irrigated	2.3	2.3
T3 Irrigated	2.2	2.1B
T4 Irrigated	1.9A	2.8A
T1 Non-irrigated	2.1	2.3
T2 Non-irrigated	2.7B	1.9B
T3 Non-irrigated	2.0	2.4
T4 Non-irrigated	2.4	1.9B
Overall Mean	2.2	2.3

Non - Significant Characters

Treatment	Green	Yello	Khaki	Brigh	Unifo	Soft/	Fibro
T2 Irrigated	3.1	2.0	1.8	2.9	3.1	3.7	1.6
T3 Irrigated	3.2	2.2	1.6	3.2	3.4	3.7	2.2
T4 Irrigated	3.3	1.8	2.0	3.1	3.4	3.6	2.0
T1 Non-irrigated	3.2	2.2	1.7	3.2	3.1	3.4	2.0
T2 Non-irrigated	3.3	1.8	1.1	3.0	3.6	3.7	2.3
T3 Non-irrigated	3.3	2.0	1.7	3.0	3.0	3.3	1.8
T4 Non-irrigated	3.3	2.0	1.7	2.7	3.6	3.1	1.6
Overall Mean	3.3	2.0	1.6	3.0	3.3	3.5	1.9

Treatment	Earth	Nutty	Hot	Stale	Stren
T2 Irrigated	1.8	1.6	1.4	1.0	2.8
T3 Irrigated	1.6	1.3	1.4	1.3	2.7
T4 Irrigated	1.4	1.2	1.7	1.3	2.9
T1 Non-irrigated	1.3	1.2	1.4	1.3	2.4
T2 Non-irrigated	1.3	1.6	1.4	1.2	2.7
T3 Non-irrigated	1.6	1.3	1.3	1.1	2.7
T4 Non-irrigated	1.6	1.4	1.3	1.3	2.6
Overall Mean	1.5	1.4	1.4	1.2	2.7

Confidences of differences from Control.  
 (Confidences are per Column of 6 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C2

HDC Brussels Sprouts - Rampart - Harvested 12.11.91

Significant Characters

Treatment	Green	Yello	Unifo	Tasters Comments
R3 Irrigated	2.4A	2.8A	2.5A	
R1 Non-irrigated	2.6A	2.9AC	2.5A	
R2 Non-irrigated	3.2B	2.4	2.9	Cabbage (2) Fertiliser (2)
R3 Non-irrigated	2.8C	2.3D	3.1B	Cabbage (3) Sl Acid (1) Sl Musty (1)
R4 Non-irrigated	3.7BD	1.8B	3.6B	
Overall Mean	2.9	2.5	2.9	

Non - Significant Characters

Treatment	Khaki	Brigh	Soft/	Fibro
R3 Irrigated	1.7	2.9	3.0	2.1
R1 Non-irrigated	1.8	3.0	3.3	2.2
R2 Non-irrigated	1.8	3.1	3.3	2.7
R3 Non-irrigated	1.3	3.0	3.3	2.8
R4 Non-irrigated	1.7	2.6	2.9	2.8
Overall Mean	1.6	2.9	3.2	2.5

Treatment	Sweet	Bitte	Earth	Nutty	Hot	Stale	Stren
R3 Irrigated	1.9	2.5	1.8	1.4	1.7	1.2	2.7
R1 Non-irrigated	1.8	2.5	1.8	1.5	1.5	1.2	2.8
R2 Non-irrigated	1.7	2.5	2.2	1.3	1.5	1.3	2.7
R3 Non-irrigated	1.9	2.5	1.8	1.3	1.6	1.4	2.7
R4 Non-irrigated	1.8	2.5	1.8	1.3	1.6	1.3	2.5
Overall Mean	1.8	2.5	1.9	1.4	1.6	1.3	2.7

Confidences of differences from Control.  
(Confidences are per Column of 5 treatments  
based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C3

HDC Brussels Sprouts - Topline and Rampart - Harvested 26.11.91

Significant Characters

Treatment	Green	Yello	Unifo	Bitte	Stale	Stren
T1 Irrigated	3.8A	1.6A	3.9A	2.1B	1.1	2.7
R1 Irrigated	2.7BD	2.7BC	2.9B	2.3	1.4	2.4B
R2 Irrigated	3.1BC	2.3BD	2.8B	2.2	1.1A	2.8A
R4 Irrigated	2.9B	2.2B	3.1B	2.5A	1.5B	2.3B
Overall Mean	3.1	2.2	3.2	2.3	1.3	2.5

Tasters Comments

- T1 Irrigated - Mushroom/Aniseed (2)
- R1 Irrigated - Cabbage/Mushroom/Sl Stale/Fertiliser (6)
- R2 Irrigated - Cabbage (2)
- R3 Irrigated - Cabbage (2)

Non - Significant Characters

Treatment	Khaki	Brigh	Soft/	Fibro	Sweet	Earth	Nutty	Hot
T1 Irrigated	1.6	2.9	3.4	2.3	2.2	1.9	1.4	1.6
R1 Irrigated	1.3	3.3	3.1	2.1	2.0	2.0	1.5	1.5
R2 Irrigated	1.4	3.0	3.3	2.0	2.3	1.6	1.7	1.6
R4 Irrigated	1.3	3.2	3.3	2.0	2.1	2.1	1.4	1.5
Overall Mean	1.4	3.1	3.3	2.1	2.1	1.9	1.5	1.6

Table C4

HDC Brussels Sprouts - Rampart - Harvested 3.12.91

Significant Characters

Treatment	Bitte	Tasters Comments
R3 Irrigated	2.1B	
R2 Non-irrigated	2.6A	Fertiliser (4) Cabbage (1)
R3 Non-irrigated	2.3	Cabbage (2)
R4 Non-irrigated	2.4	Cabbage (2) Sl Fertiliser (1)
Overall Mean	2.4	

Non - Significant Characters

Treatment	Green	Yello	Khaki	Brigh	Unifo	Soft/	Fibro
R3 Irrigated	3.4	2.0	1.3	2.8	3.2	3.3	2.3
R2 Non-irrigated	3.6	1.9	1.4	2.7	3.1	3.3	2.3
R3 Non-irrigated	3.4	2.1	1.3	2.9	3.2	3.3	2.3
R4 Non-irrigated	3.5	2.3	1.8	2.9	3.1	3.1	2.0
Overall Mean	3.5	2.1	1.5	2.8	3.1	3.3	2.2

Treatment	Sweet	Earth	Nutty	Hot	Stale	Stren
R3 Irrigated	2.1	2.0	1.7	1.5	1.2	2.9
R2 Non-irrigated	2.0	2.2	1.4	1.6	1.3	2.7
R3 Non-irrigated	2.1	1.9	1.5	1.5	1.1	2.8
R4 Non-irrigated	2.3	1.8	1.5	1.5	1.4	2.4
Overall Mean	2.1	2.0	1.5	1.5	1.3	2.7

Confidences of differences from Control.  
 (Confidences are per Column of 4 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C5

HDC Brussels Sprouts - Topline - Harvested 3.12.91

Significant Characters

Treatment	Green	Khaki	Unifo	Soft/	Fibro
T2 Irrigated	3.7B	1.6	3.7B	3.4	1.9
T3 Irrigated	3.6	1.7	3.7B	3.2B	1.8
T4 Irrigated	3.1	1.2B	3.1	3.4	1.7
T1 Non-Irrigated	2.9A	2.3A	2.9A	3.1B	1.4A
T2 Non-Irrigated	3.8B	1.8	3.7B	3.6	2.1
T3 Non-Irrigated	3.2	1.7	3.3	3.9A	2.2B
Overall Mean	3.4	1.7	3.4	3.4	1.9

Non - Significant Characters

Treatment	Yello	Brigh
T2 Irrigated	1.7	3.1
T3 Irrigated	1.6	2.9
T4 Irrigated	2.0	3.4
T1 Non-irrigated	2.2	2.9
T2 Non-irrigated	1.8	2.9
T3 Non-irrigated	2.0	3.1
Overall Mean	1.9	3.1

Treatment	Sweet	Bitte	Earth	Nutty	Hot	Stale	Stren
T2 Irrigated	2.1	2.1	1.4	1.4	1.6	1.2	2.7
T3 Irrigated	2.1	2.3	1.6	1.6	1.6	1.2	2.8
T4 Irrigated	2.1	2.3	1.4	1.3	1.4	1.4	2.6
T1 Non-irrigated	2.2	2.3	1.6	1.6	1.6	1.3	2.8
T2 Non-irrigated	2.1	2.2	1.6	1.4	1.2	1.2	2.7
T3 Non-irrigated	2.3	2.0	1.3	1.1	1.3	1.3	2.4
Overall Mean	2.2	2.2	1.5	1.4	1.4	1.3	2.6

Confidences of differences from Control.  
 (Confidences are per Column of 6 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C6

HDC Brussels Sprouts - Cascade and Topline Harvested 16.12.91

Significant Characters

Variety	Green	Yello	Unifo	Sweet
T1 Irrigated	4.3AC	1.1AC	3.4C	2.3
T4 Non-Irrigated	4.6ACE	1.2A	3.8A	2.7
C1 Irrigated	3.8A	2.1B	3.2	2.6
C2 Irrigated	3.2D	2.3B	3.0B	2.4
C3 Irrigated	3.6	1.7F	3.1	2.2A
C4 Irrigated	3.6F	2.0D	3.2	3.1B
C1 Non-Irrigated	2.9B	2.4B	2.4BD	2.4
C2 Non-Irrigated	2.8B	2.9BE	2.8B	2.3
C3 Non-Irrigated	3.4D	2.0BF	2.9B	2.4
C4 Non-Irrigated	2.9B	2.3B	2.8B	2.7
Overall Mean	3.5	2.0	3.1	2.5

Non - Significant Characters

Variety	Khaki	Brigh	Soft/	Fibro
T1 Irrigated	1.7	2.7	3.2	2.6
T4 Non-Irrigated	2.0	2.7	3.4	2.7
C1 Irrigated	1.7	3.0	2.7	2.2
C2 Irrigated	1.6	2.9	2.7	2.3
C3 Irrigated	1.3	3.3	3.0	2.3
C4 Irrigated	1.4	3.2	2.8	2.3
C1 Non-Irrigated	1.6	3.0	2.7	2.4
C2 Non-Irrigated	1.8	3.1	2.9	2.3
C3 Non-Irrigated	1.3	3.1	3.1	2.4
C4 Non-Irrigated	1.3	3.1	3.0	2.6
Overall Mean	1.6	3.0	2.9	2.4

Variety	Bitte	Earth	Nutty	Hot	Stale	Stren
T1 Irrigated	2.6	1.2	1.2	1.4	2.2	2.2
T4 Non-Irrigated	2.4	1.4	1.3	1.3	2.2	2.0
C1 Irrigated	2.0	1.6	1.2	1.3	2.6	2.1
C2 Irrigated	2.3	1.7	1.2	1.4	2.3	2.2
C3 Irrigated	2.1	1.4	1.2	1.4	2.0	2.7
C4 Irrigated	1.7	1.4	1.0	1.1	2.9	1.9
C1 Non-Irrigated	1.8	1.4	1.0	1.6	2.3	2.4
C2 Non-Irrigated	2.0	1.3	1.1	1.6	2.2	2.4
C3 Non-Irrigated	2.1	1.4	1.0	1.7	2.4	2.0
C4 Non-Irrigated	2.0	1.4	1.4	1.6	2.3	2.3
Overall Mean	2.1	1.4	1.2	1.4	2.4	2.2

Confidences of differences from Control.  
 (Confidences are per Column of 10 Varieties  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C7

Brussels Sprouts - Stephen - 16.12.91

Non - Significant Characters

Treatment	Green	Yello	Khaki	Brigh	Unifo	Soft/	Fibro
S1 Irrigated	2.9	3.0	2.3	2.6	2.7	3.0	2.4
S2 Irrigated	3.3	2.4	2.1	2.9	2.7	2.8	2.7
S3 Irrigated	3.2	2.0	1.7	2.7	3.0	3.3	2.7
S4 Irrigated	3.2	2.3	2.1	2.9	2.8	3.2	2.7
S1 Non-irrigated	2.6	2.8	2.3	2.8	2.8	2.7	2.2
S2 Non-irrigated	2.6	2.9	2.3	2.6	2.7	3.1	2.9
S3 Non-irrigated	3.1	2.4	2.3	2.6	2.9	2.9	2.8
S4 Non-irrigated	2.8	2.7	1.8	3.0	2.8	3.0	2.3
Overall Mean	3.0	2.6	2.1	2.7	2.8	3.0	2.6

Treatment	Sweet	Bitte	Earth	Nutty	Hot	Stale	Stren
S1 Irrigated	2.0	2.8	1.8	1.1	1.4	1.9	2.7
S2 Irrigated	2.0	2.8	1.8	1.0	1.4	1.7	2.9
S3 Irrigated	1.8	2.6	1.9	1.0	1.4	1.8	2.6
S4 Irrigated	1.8	2.4	2.0	1.2	1.3	1.8	2.4
S1 Non-irrigated	2.3	2.4	1.8	1.2	1.2	1.7	2.4
S2 Non-irrigated	1.9	2.8	1.7	1.2	1.8	1.8	2.7
S3 Non-irrigated	2.0	2.4	1.8	1.0	1.8	2.1	2.7
S4 Non-irrigated	2.0	2.7	1.9	1.0	1.4	2.0	2.6
Overall Mean	2.0	2.6	1.8	1.1	1.5	1.8	2.6

Table C8

HDC Brussels Sprouts - Rampart - Harvested 17.12.91

Significant Characters

Treatment	Khaki
R1 Irrigated	1.9
R2 Irrigated	1.4
R4 Irrigated	1.3A
R1 Non-irrigated	2.1B
Overall Mean	1.7

Non - Significant Characters

Variety	Green	Yello	Brigh	Unifo	Soft/	Fibro
R1 Irrigated	3.6	1.8	3.0	2.9	2.8	2.7
R2 Irrigated	3.6	1.8	2.9	3.4	3.0	3.1
R4 Irrigated	3.3	1.9	3.1	3.1	3.0	2.7
R1 Non-irrigated	3.0	2.1	2.9	2.9	2.9	2.6
Overall Mean	3.4	1.9	3.0	3.1	2.9	2.8

Treatment	Sweet	Bitte	Earth	Nutty	Hot	Stale	Stren
R1 Irrigated	2.0	2.3	1.9	1.0	1.8	2.0	2.8
R2 Irrigated	2.0	2.4	2.1	1.3	1.8	1.6	2.7
R4 Irrigated	1.7	2.7	2.1	1.2	1.9	2.1	2.6
R1 Non-irrigated	2.0	2.3	2.1	1.2	1.9	1.8	2.8
Overall Mean	1.9	2.4	2.1	1.2	1.8	1.9	2.7

Confidences of differences from Control.  
 (Confidences are per Column of 4 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C9

HDC Brussels Sprouts - Rampart - 07.01.92

Significant Characters

Treatment	Yello	Khaki
R1 Irrigatd	2.3	2.2
R2 Irrigated	2.2	2.0
R3 Irrigated	2.3	1.7
R4 Irrigated	1.7A	1.4A
R1 Non-Irrigated	2.6B	2.3B
R2 Non-Irrigated	2.1	2.1
R3 Non-Irrigated	2.0	1.9
R4 Non-Irrigated	2.3	2.3B
Overall Mean	2.2	2.0

Non - Significant Characters

Treatment	Green	Brigh	Unifo	Soft/	Fibro
R1 Irrigatd	3.2	2.8	3.0	2.7	3.1
R2 Irrigated	3.0	3.0	3.1	3.0	3.2
R3 Irrigated	3.2	2.9	3.1	2.8	3.3
R4 Irrigated	3.6	2.8	3.4	2.9	3.3
R1 Non-Irrigated	3.3	2.9	3.0	2.7	3.0
R2 Non-Irrigated	3.1	3.0	3.4	2.7	3.1
R3 Non-Irrigated	3.3	2.9	3.3	2.6	3.3
R4 Non-Irrigated	3.1	3.1	3.1	2.6	3.1
Overall Mean	3.2	2.9	3.2	2.7	3.2

Treatment	Sweet	Bitte	Earth	Nutty	Hot	Stale	Stren
R1 Irrigatd	2.3	2.4	1.7	1.3	1.7	1.8	2.6
R2 Irrigated	2.2	2.7	1.7	1.3	1.6	2.0	2.4
R3 Irrigated	1.9	2.3	2.0	1.3	1.9	2.0	2.7
R4 Irrigated	1.9	2.6	2.1	1.2	1.8	1.9	2.9
R1 Non-Irrigated	2.2	2.3	1.8	1.6	1.8	1.9	3.0
R2 Non-Irrigated	2.0	2.4	1.9	1.3	2.0	2.0	2.8
R3 Non-Irrigated	2.1	2.4	1.9	1.4	1.9	1.9	2.8
R4 Non-Irrigated	2.1	2.4	1.8	1.6	1.7	1.9	2.4
Overall Mean	2.1	2.5	1.8	1.4	1.8	1.9	2.7

Confidences of differences from Control.  
 (Confidences are per Column of 8 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C10

HDC Brussels Sprouts - Cascade - 16.01.92

Significant Characters

Treatment	Green	Soft/	Sweet	Bitte	Earth	Stren
C1 Irrigated	3.4	2.4B	2.3	2.2B	1.9B	2.4
C2 Irrigated	3.0	3.3A	2.4	2.2B	2.0	2.6B
C3 Irrigated	3.3	3.1	2.7	2.4	1.8	2.3
C4 Irrigated	3.6A	3.0	1.9A	2.9A	2.0B	2.6B
C1 Non-irrigated	3.0	2.4B	2.3	2.1B	2.0	2.4
C2 Non-irrigated	2.7B	2.8	2.7B	2.1B	1.2A	1.7A
C3 Non-irrigated	3.2	2.4B	2.0	2.4	1.6	2.2
C4 Non-irrigated	3.3	3.0	2.0	2.1B	2.0B	2.6B
Overall Mean	3.2	2.8	2.3	2.3	1.8	2.3

Tasters Comments

C1 Irrigated  
 C2 Irrigated - Sickly Sweet (2) Metallic (1)  
 C3 Irrigated - Sickly Sweet (3) Chemical (1) Metallic (1)  
 C4 Irrigated - Chemical/Buttery (2)

C1 Non-irrigated - Sl Sickly Sweet/Sl Stale (2)  
 C2 Non-irrigated - Sickly Sweet (4) Cabbage (1)  
 C3 Non-irrigated - Stale/Cabbage/Chemical/Metallic (4)

Non - Significant Characters

Treatment	Yello	Khaki	Brigh	Unifo	Fibro	Nutty	Hot	Stale
C1 Irrigated	1.8	2.0	2.8	3.0	2.7	1.7	1.6	1.8
C2 Irrigated	2.2	1.7	3.0	3.1	2.9	1.6	1.1	2.0
C3 Irrigated	1.9	2.0	2.8	3.2	2.8	1.3	1.1	2.6
C4 Irrigated	1.6	1.9	3.2	3.1	2.8	1.3	1.3	2.0
C1 Non-irrigated	2.2	2.1	2.9	2.6	2.2	1.2	1.1	2.0
C2 Non-irrigated	2.1	2.1	3.0	2.9	2.6	1.2	1.1	2.7
C3 Non-irrigated	1.9	1.8	2.9	3.0	2.6	1.0	1.2	2.2
C4 Non-irrigated	1.8	1.4	3.0	3.0	2.9	1.3	1.2	1.9
Overall Mean	1.9	1.9	2.9	3.0	2.7	1.3	1.2	2.1

Confidences of differences from Control.  
 (Confidences are per Column of 8 treatments  
 based on Fisher's Modified LSD procedure)

\* 95%  
 \*\* 99%  
 \*\*\* 99.9%

Table C11

Brussels Sprouts - Stephen (07.01.92)

Significant Characters

Treatment	Khaki	Sweet
S1 Irrigated	1.8B	1.4
S2 Irrigated	1.4B	2.0A
S3 Irrigated	1.8	1.4
S4 Irrigated	2.1	1.6
S1 Non-Irrigated	2.1	1.6
S2 Non-Irrigated	2.1	1.4
S3 Non-Irrigated	2.7A	1.3B
S4 Non-Irrigated	2.3	1.2B
Overall Mean	2.0	1.5

Non-significant Characters

Variety	Green	Yello	Brigh	Unifo	Soft/	Fibro
S1 Irrigated	3.3	2.9	3.2	3.0	3.1	2.3
S2 Irrigated	3.6	2.4	3.0	3.2	2.9	2.6
S3 Irrigated	3.1	2.6	3.0	3.3	3.0	2.1
S4 Irrigated	3.1	2.8	2.8	3.3	3.1	2.9
S1 Non-Irrigated	3.3	2.7	3.1	2.8	2.6	2.1
S2 Non-Irrigated	2.9	3.0	2.7	2.8	2.9	2.4
S3 Non-Irrigated	3.4	2.6	2.9	3.0	2.7	2.6
S4 Non-Irrigated	3.0	3.1	2.9	3.0	2.4	2.2
Overall Mean	3.2	2.8	2.9	3.1	2.8	2.4

Treatment	Bitte	Earth	Nutty	Hot	Stale	Stren
S1 Irrigated	3.2	1.9	1.1	2.1	1.3	2.6
S2 Irrigated	3.0	1.3	1.2	1.8	1.4	2.7
S3 Irrigated	2.9	1.7	1.3	1.9	1.3	2.4
S4 Irrigated	3.2	1.4	1.0	2.0	1.6	2.4
S1 Non-Irrigated	3.2	1.8	1.0	2.1	1.6	2.2
S2 Non-Irrigated	3.3	1.8	1.1	2.0	1.9	2.3
S3 Non-Irrigated	3.2	1.6	1.3	2.0	1.8	2.6
S4 Non-Irrigated	3.1	1.8	1.1	1.9	1.8	2.2
Overall Mean	3.2	1.7	1.2	2.0	1.6	2.4

Confidences of differences from Control.  
 (Confidences are per Column of 8 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C12

HDC Brussels Sprouts - Topline Harvested 20.01.92

Significant Characters

Treatment	Green	Khaki	Earth	Tasters Comments
T1 Irrigated	3.7	1.7	1.4	Sickly Sweet/Cabbage/? (3)
T2 Irrigated	3.8A	2.0B	1.4	Sickly Sweet/Metallic (2)
T3 Irrigated	3.3	1.9	1.7	Sickly Sweet/Cabbage/ Fertiliser (3)
T4 Irrigated	3.1B	1.2A	1.4	Sour/Metallic (2)
T1 Non-Irrigated	3.7	1.4	1.9A	
T2 Non-Irrigated	3.6	1.8	1.6	Sickly Sweet/SI Chemical (2)
T3 Non-Irrigated	3.4	1.9B	1.2B	Sickly Sweet/? (4)
T4 Non-Irrigated	3.1B	1.6	1.7	Sickly Sweet/Buttery (2)
Overall Mean	3.5	1.7	1.5	

Non - Significant Characters

Treatment	Yello	Brigh	Unifo	Soft/	Fibro
T1 Irrigated	1.4	2.7	3.0	2.7	2.4
T2 Irrigated	1.9	2.8	3.3	2.9	2.0
T3 Irrigated	1.7	2.6	3.1	3.1	2.7
T4 Irrigated	1.3	2.8	3.3	2.9	2.3
T1 Non-Irrigated	1.6	3.2	3.4	2.8	2.3
T2 Non-Irrigated	1.8	2.9	3.1	2.9	2.6
T3 Non-Irrigated	2.0	2.9	3.3	2.8	2.6
T4 Non-Irrigated	1.4	2.6	3.4	3.0	2.6
Overall Mean	1.6	2.8	3.3	2.9	2.4

Variety

	Sweet	Bitte	Nutty	Hot	Stale	Stren
T1 Irrigated	2.0	2.8	1.3	1.9	1.9	2.7
T2 Irrigated	1.8	2.6	1.7	1.7	1.9	2.4
T3 Irrigated	2.6	2.3	1.2	1.8	2.0	2.7
T4 Irrigated	2.3	2.3	1.4	1.3	2.0	2.6
T1 Non-Irrigated	2.1	2.3	1.1	1.8	1.8	2.8
T2 Non-Irrigated	2.3	2.4	1.2	1.8	1.9	2.4
T3 Non-Irrigated	2.6	2.4	1.4	1.4	2.1	2.2
T4 Non-Irrigated	2.3	2.3	1.4	1.4	1.8	2.6
Overall Mean	2.3	2.4	1.4	1.6	1.9	2.5

Confidences of differences from Control.  
(Confidences are per Column of 8 treatments  
based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C13

HDC Brussels Sprouts - Cascade Harvested 28.01.92

Significant Characters

Variety	Sweet	Stren	Tasters Comments			
C1 Irrigated	2.3	2.7	Sickly	Sweet (2)	Sour (1)	
C2 Irrigated	2.7A	2.1A	Sickly	Sweet (5)	Cabbage (1)	
C3 Irrigated	2.3	2.4	Sickly	Sweet (2)	Sl Musty (1)	
C4 Irrigated	2.1	2.2	Sickly	Sweet (1)	Cabbage (1)	
C1 Non-irrigated	2.4	2.6				
C2 Non-irrigated	2.4	2.6	Sickly	Sweet (2)	Cabbage (1)	
C3 Non-irrigated	2.0B	2.8B				
C4 Non-irrigated	2.6	2.3	Sickly	Sweet (2)	Sour (1)	
Overall Mean	2.4	2.5				

Non - Significant Characters

Variety	Green	Yello	Khaki	Brigh	Unifo	Soft/	Fibro
C1 Irrigated	3.3	2.1	2.0	3.1	3.0	2.7	2.9
C2 Irrigated	3.0	2.1	2.1	3.0	2.8	2.9	2.6
C3 Irrigated	2.8	2.3	2.2	3.0	3.0	3.2	2.9
C4 Irrigated	3.1	2.1	2.0	3.1	3.1	2.9	2.8
C1 Non-irrigated	2.9	2.3	2.4	2.6	2.9	2.7	2.7
C2 Non-irrigated	3.2	2.6	1.9	3.1	2.9	3.1	2.8
C3 Non-irrigated	2.9	2.4	2.4	2.4	2.3	2.8	2.9
C4 Non-irrigated	3.3	1.9	1.8	3.0	3.1	2.8	2.8
Overall Mean	3.1	2.2	2.1	2.9	2.9	2.9	2.8

Variety	Bitte	Earth	Nutty	Hot	Stale
C1 Irrigated	2.0	1.6	1.4	1.4	2.1
C2 Irrigated	2.2	1.7	1.7	1.3	2.4
C3 Irrigated	2.3	1.8	1.3	1.6	2.2
C4 Irrigated	2.3	2.1	1.1	1.6	2.4
C1 Non-irrigated	2.2	1.9	1.4	1.2	2.0
C2 Non-irrigated	2.2	1.7	1.3	1.3	2.2
C3 Non-irrigated	2.3	1.7	1.4	1.3	1.8
C4 Non-irrigated	2.1	1.2	1.2	1.2	2.2
Overall Mean	2.2	1.7	1.4	1.4	2.2

Confidences of differences from Control.  
 (Confidences are per Column of 8 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

Table C14

HDC Brussels Sprouts - Stephen Harvested 04.02.92

Significant Characters

Variety	Green	Yello	Soft/	Fibro	Sweet	Bitte	Stren
S1 Irrigated	2.5B	3.3A	2.9	2.6	1.5A	2.9B	2.8
S2 Irrigated	2.9C	2.8	2.6B	2.5	1.8	3.0	2.3B
S3 Irrigated	3.3A	2.7D	3.2A	2.6	2.1	2.4A	2.6
S4 Irrigated	3.0A	2.5B	2.8	2.6	1.8	2.8	2.3B
S1 Non-irrigated	2.3BD	3.5AC	2.8	2.7	1.9	2.8	2.4B
S2 Non-irrigated	2.6B	3.2A	2.6B	2.2A	1.9	2.5	2.6
S3 Non-irrigated	2.8	3.0	3.2	2.8B	1.8	2.9B	2.3B
S4 Non-irrigated	3.0C	2.4B	2.8	2.4	2.3B	2.7	2.9A
Overall Mean	2.8	2.9	2.8	2.5	1.9	2.8	2.5

Tasters Comments

S1 Irrigated  
 S2 Irrigated Sickly Sweet/Fertiliser (2)  
 S3 Irrigated  
 S4 Irrigated

S1 Non-irrigated Sour/Cabbage (2)  
 S2 Non-irrigated  
 S3 Non-irrigated Cabbage/Paint (3)  
 S4 Non-irrigated

Non - Significant Characters

Variety	Khaki	Brigh	Unifo	Earth	Nutty	Hot	Stale
S1 Irrigated	2.3	3.0	2.9	2.0	1.3	1.8	1.8
S2 Irrigated	2.3	2.8	2.9	2.3	1.1	1.5	2.3
S3 Irrigated	2.1	2.9	2.5	1.9	1.2	1.4	2.0
S4 Irrigated	1.9	3.2	2.8	1.9	1.3	1.8	2.3
S1 Non-irrigated	2.4	2.9	2.7	1.9	1.2	1.4	2.2
S2 Non-irrigated	2.5	3.2	2.7	1.9	1.3	1.6	2.1
S3 Non-irrigated	2.3	2.8	2.6	1.9	1.2	1.7	2.1
S4 Non-irrigated	2.4	2.7	2.9	1.9	1.3	1.4	1.8
Overall Mean	2.3	2.9	2.7	2.0	1.2	1.6	2.1

Confidences of differences from Control.  
 (Confidences are per Column of 8 treatments  
 based on Fisher's Modified LSD procedure)

- \* 95%
- \*\* 99%
- \*\*\* 99.9%

