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Asparagus superclone trial results and sensory analysis 1992

A report prepared for
the Clonal Asparagus Committee of the New Zealand Asparagus Council

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CONTENTS

1 PREFACE

This report presents a summary of the second harvest results of 48 asparagus clones and two standards grown in four field trial sites in New Zealand as part of the Asparagus Superclone Trial. It also contains results of the sensory evaluation of four potential clones for commercial release. Flavour and texture of four clones were compared with control spears of Jersey Giant by a trained taste panel.

Data are presented to enable members of the Research Committee of the New Zealand Asparagus Council to identify the best performing clones based on the attributes analysed across sites.

2 ASPARAGUS SUPERCLONE TRIAL RESULTS

2.1 Summary

1. The results summarised below must be interpreted in the context of the seasons experienced at each of the sites, i.e. favourable in the Waikato and unfavourable at all other sites. The effect of season is reflected in both the yield of the crop that was of export standard and the percentage of the harvest that was of export standard. We are confident that an even grading standard was maintained across the sites.

2. Some clones produced approximately double the export yield of Jersey Giant.

3. No single 'best clone' can be clearly identified from these results but there are three that gave good performance across sites and another three with good performance at individual sites. There is broad comparability with the 1991/92 results, with eight of the previous top 10 at Halcombe and six at Waikato and Hastings. The Lincoln results are similar to those obtained at the North Island sites in the first harvest season, reflecting the stage of development of the trial.

4. All high yielding clones had a higher purple score than Jersey Giant (some were very significantly higher), and the weighting given purpleness will largely determine which, if any, clones could be recommended for release. Apart from Clone 7, there are no particular concerns about susceptibility to either Stemphyllium or Phytophthora.

Table 1: Performance and description of most likely candidate clones recommended for release (% of Jersey Giant).

Code	Export yield % JG				% Export				Purple
	Hal.	Wai.	Has.	Lin.	Hal.	Wai.	Has.	Lin.	Mean
3	*181	*150	160	43	57	80	31	11	1.63
♀ 7[1]	124	*143	*168	134	41	90	51	44	2.24
16	76	*178	103	38	47	72	20	12	1.85
27	113	133	*222	128	46	90	46	23	1.93
44	65	54	163	-	39	100	39	-	1.54
45	33	84	*235	71	52	94	76	62	1.85
47	*224	-	-	-	53	-	-	-	1.53
JG	100 1.3 t/ha	100 6.5 t/ha	100 1.74 t/ha	100 1.85 t/ha	51	94	76	62	1.43
UC157	93	66	110	39	51	90	60	41	1.22
♀ 1	74	68	123	125	47	90	59	74	1.05

* = Significantly greater than Jersey Giant (P = 0.05)

[1] = Clone 7 had a significant proportion of rejects for Stemphyllium at Halcombe.

2.2 Introduction

This report summarises the second harvest results of 48 asparagus clones and two standards in four field trial sites in New Zealand, three in the North Island and one in the South Island.

2.3 Method

Four clonal trial sites were planted in the Waikato, Manawatu, Hawke's Bay and Canterbury regions in spring/summer 1989. Preliminary data were collected in 1990 and 1991 to evaluate colour, earliness, spear quality, Stemphyllium resistance and plant numbers. In spring 1991, the first harvest was conducted for a period of six weeks in three of the trial sites and results were presented in a confidential report to the Asparagus Superclone Committee in February 1992 (Asparagus superclone trial results 1991, by H Fraser-Kevern and B Jermyn).

In spring 1992, the second harvest was conducted on three sites and for the first time in Site 4. The length of the harvest season was up to 80 days in all four trial sites, and spears were harvested at 230 mm or greater in length and graded. The criteria used for grading in the 1992 season were:

- export number and weight,
- reject number and weight,
- reason for rejecting the spears was assigned a number:
  1. seediness, opening of the spear head,
  2. Phytophthora present,
  3. Stemphyllium present,
  4. other colours apart from purpling,
  5. other - bent, flat, hollow, fusarium, insect or weather damage, and
- purple score: ranging from 1 = green to 4 = purple blush all the way up the spear.

As recommended in the previous report, the consistently low yielding clones were dropped from the trials in the 1992 harvest season.

2.4 Results

A late start to the asparagus season was experienced throughout New Zealand and the trial sites therefore had different start dates through the season.

Sites 2 and 3 were harvested for the full 80 days but Sites 1 and 4 were harvested for 69 and 62 days, respectively. Harvest data were collected for the first time at Site 4.

All clones have been sexed and clones represented by the following codes are females: 1, 7, 14, 22, 33, 48 and 49.

Yield and quality data are summarised in Tables 2-9.

Table 2: Harvest dates for the four sites (Halcombe, Waikato, Hastings and Lincoln)

Site	Trial	Start date
1	Halcombe	10 October
2	Waikato	23 September
3	Hastings	30 September
4	Lincoln	7 October

Table 3: Summary of export yield (t/ha) ranked within each site (1 = Halcombe, 2 = Waikato, 3 = Hastings and 4 = Lincoln).

Site 1		Site 2		Site 3		Site 4	
47	(2.91)[1]	12	(13.71)	45	(4.09)	7	(2.48)
3	(2.35)	16	(11.58)	27	(3.86)	27	(2.37)
35	(2.29)	3	(9.77)	7	(2.92)	25	(2.34)
7	(1.61)	15	(9.46)	44	(2.84)	1	(2.32)
21	(1.47)	7	(9.30)	3	(2.60)	JG	(1.85)
27	(1.47)	27	(8.66)	15	(2.59)	31	(1.53)
40	(1.46)	4	(8.17)	1	(2.14)	23	(1.41)
36	(1.46)	40	(7.73)	33	(2.05)	15	(1.38)
2	(1.37)	46	(7.59)	28	(1.98)	45	(1.31)
43	(1.35)	36	(7.26)	UC157	(1.92)	33	(1.22)
JG	(1.30)	JG	(6.50)	36	(1.85)	4	(1.18)
8	(1.24)	29	(6.46)	16	(1.79)	40	(1.16)
UC157	(1.21)	18	(6.26)	17	(1.76)	46	(1.16)
38	(1.19)	34	(5.47)	JG	(1.74)	26	(1.06)
24	(1.17)	45	(5.43)	23	(1.40)	3	(0.80)
46	(1.08)	28	(5.09)	24	(0.93)	11	(0.78)
23	(1.04)	32	(4.75)			8	(0.78)
16	(0.99)	24	(4.46)			36	(0.77)
1	(0.96)	1	(4.41)			50	(0.75)

Site 1		Site 2		Site 3	Site 4	
20	(0.96)	2	(4.41)		UC157	(0.73)
22	(0.89)	UC157	(4.29)		16	(0.71)
15	(0.85)	13	(4.07)		5	(0.55)
44	(0.84)	42	(4.02)		2	(0.52)
48	(0.77)	44	(3.54)		14	(0.48)
32	(0.77)	26	(3.09)		34	(0.48)
28	(0.68)				13	(0.16)
42	(0.67)				17	(0.15)
39	(0.60)				10	(0.13)
34	(0.59)				32	(0.00)
33	(0.59)					
26	(0.56)					
41	(0.54)					
4	(0.51)					
37	(0.47)					
45	(0.43)					
6	(0.42)					
29	(0.41)					
31	(0.33)					
9	(0.30)					
LSD (0.05)[2]	0.70		2.87	1.36		0.64

[1] Numbers inside brackets are export yield.

[2] Significant differences between clones occur where the difference between two scores is greater than LSD (0.05).

Table 4: Summary of ranked export mean (t/ha) and purple mean (of the 1-4 range) over three sites (1 = Halcombe, 2 = Waikato, 3 = Hastings).

Code	Site 1	Site 2	Site 3	Export mean	Purple mean
12		13.71		13.71	1.95
18		6.26		6.26	1.80
3	2.35	9.77	2.60	4.91	1.65
16	0.99	11.58	1.79	4.79	1.72
27	1.47	8.66	3.86	4.66	1.65
7	1.61	9.30	2.92	4.61	2.16
40	1.46	7.73		4.59	1.65
4	0.51	8.17		4.34	1.96
46	1.08	7.59		4.34	1.64
15	0.85	9.46	2.59	4.30	1.88
13		4.07		4.07	1.79
36	1.46	7.26	1.85	3.53	2.07
29	0.41	6.46		3.44	1.81
45	0.43	5.43	4.09	3.32	1.83
JG	1.30	6.50	1.74	3.18	1.34
34	0.59	5.47		3.03	1.80
47	2.91			2.91	1.53
2	1.37	4.41		2.89	1.72
32	0.77	4.75		2.76	1.27
28	0.68	5.09	1.98	2.58	1.59
1	0.96	4.41	2.14	2.50	1.06
UC157	1.21	4.29	1.92	2.47	1.18
44	0.84	3.54	2.84	2.41	1.54
42	0.67	4.02		2.35	1.44
35	2.29			2.29	1.45
24	1.17	4.46	0.93	2.19	1.18
26	0.56	3.09		1.83	1.48

Code	Site 1	Site 2	Site 3	Export mean	Purple mean
17			1.76	1.76	1.52
21	1.47			1.47	1.43
43	1.35			1.35	1.57
33	0.59		2.05	1.32	1.22
8	1.24			1.24	1.83
23	1.04		1.40	1.22	1.77
38	1.19			1.19	1.53
20	0.96			0.96	1.38
22	0.89			0.89	1.22
48	0.77			0.77	1.23
39	0.60			0.60	1.41
41	0.54			0.54	1.36
37	0.47			0.47	1.65
6	0.42			0.42	1.40
31	0.33			0.33	1.67
9	0.30			0.30	1.41
LSD (0.05)[1]	0.70	2.87	1.36	0.64	

[1] Significant differences between clones occur where the difference between two scores is greater than LSD (0.05).

Table 5: Summary of purple grade (of the 1-4 range) in the four sites (1 = Halcombe, 2 = Waikato, 3 = Hastings and 4 = Lincoln).

Code	Site 1	Site 2	Site 3	Site 4	Mean
7	2.05	2.50	1.95	2.48	2.24
36	1.88	2.22	2.12	2.41	2.16
11				2.02	2.02
34	1.73	1.87		2.37	1.99
12		1.95			1.95
27	1.69	1.67	1.60	2.77	1.93
4	1.78	2.14		1.79	1.90
8	1.83			1.88	1.85
45	1.59	2.01	1.87	1.93	1.85
16	1.47	1.94	1.75	2.25	1.85
15	1.92	2.01	1.71	1.68	1.83
23	1.83		1.71	1.95	1.83
40	1.41	1.90		2.14	1.81
29	1.70	1.92			1.81
18		1.80			1.80
2	1.61	1.83		1.77	1.74
31	1.67			1.77	1.72
46	1.54	1.75		1.76	1.68
37	1.65				1.65
17			1.52	1.76	1.64
3	1.59	1.98	1.39	1.56	1.63
14				1.61	1.61
28	1.44	1.77	1.56		1.59
43	1.57				1.57
26	1.25	1.70		1.73	1.56
50				1.55	1.55
44	1.71	1.38	1.53		1.54

Code	Site 1	Site 2	Site 3	Site 4	Mean
47	1.53				1.53
38	1.53				1.53
25				1.52	1.52
35	1.45				1.45
13		1.79		1.09	1.44
42	1.16	1.72			1.44
21	1.43				1.43
JG	1.41	1.31	1.30	1.69	1.43
9	1.41				1.41
39	1.41				1.41
6	1.40				1.40
10				1.38	1.38
20	1.38				1.38
41	1.36				1.36
33	1.26		1.18	1.37	1.27
48	1.23				1.23
32	1.14	1.40		1.13	1.23
22	1.22				1.22
UC157	1.10	1.22	1.20	1.33	1.22
24	0.99	1.15	1.41		1.18
1	1.03	1.03	1.12	1.03	1.05
LSD (0.05)[1]	0.21	0.19	0.23	0.42	

[1] Significant differences between clones occur where the difference between two scores is greater than LSD (0.05).

Table 6: Summary of open head expressed as a percentage of the percentage of rejected spears in four sites (Halcombe, Waikato, Hastings and Lincoln).

	Site 1		Site 2		Site 3		Site 4	
Code	Open	% Reject	Open	% Reject	Open	% Reject	Open	% Reject
JG	11	49	57	8	57	43	98	57
UC157	11	49	75	10	48	40	96	59
1	4	53	44	10	44	41	91	26
2	66	64	78	27			99	86
3	41	43	63	20	92	69	98	89
4	29	59	45	8			98	68
5							100	86
6	24	72						
7	3	59	45	10	54	49	99	56
8	52	50					100	67
9	72	82						
10							100	80
11							100	80
12			50	15				
13			91	29			96	93
14							99	91
15	26	54	40	6	94	56	98	71
16	74	53	80	28	97	80	100	88
17					89	75	100	82
18			76	16				
20	29	58						
21	16	35						
22	5	52						
23	42	67			90	64	99	76
24	63	63	78	20	83	81		
25							96	59

	Site 1		Site 2		Site 3		Site 4	
Code	Open	% Reject	Open	% Reject	Open	% Reject	Open	% Reject
26	72	75	89	42			99	72
27	25	54	46	10	94	54	99	77
28	82	69	74	24	98	73	100	100
29	47	72	88	13				
31	14	65					95	54
32	59	62	93	34			99	89
33	7	60			84	47	96	65
34	91	75	89	36			99	87
35	55	54						
36	59	60	87	25	86	76	100	86
37	27	63						
38	34	48						
39	44	56						
40	15	53	61	11			98	77
41	61	65						
42	26	63	78	5				
43	47	46						
44	65	61	0	0	94	61		
45	20	48	44	6	71	24	96	38
46	73	66	72	24			100	89
47	16	47					98	100
48	44	56						
49							98	100
50							98	82

Table 7: Summary of deformed spears expressed as a percentage of the percentage of rejected spears in four sites (1 = Halcombe, 2 = Waikato, 3 = Hastings and 4 = Lincoln).

	Site 1		Site 2		Site 3		Site 4	
Code	Deform	% Reject	Deform	% Reject	Deform	% Reject	Deform	% Reject
JG	82	49	36	8	43	43	2	57
UC157	88	49	16	10	51	40	4	59
1	90	53	54	10	56	41	9	26
2	30	64	11	27			1	86
3	57	43	30	20	8	69	2	89
4	56	59	50	8			2	68
5							0	86
6	68	72						
7	74	59	43	10	41	49	1	56
8	45	50					0	67
9	27	82						
10							0	80
11							0	80
12			46	15				
13			6	29			0	93
14							1	91
15	68	54	44	6	6	56	2	71
16	25	53	12	28	3	80	0	88
17					11	75	0	82
18			20	16				
20	67	58						
21	78	35						
22	86	52						
23	51	67			10	64	1	76
24	33	63	9	20	17	81		
				13				

	Site 1		Site 2		Site 3		Site 4	
Code	Deform	% Reject	Deform	% Reject	Deform	% Reject	Deform	% Reject
25							3	59
26	23	75	3	42			1	72
27	64	54	40	10	6	54	1	77
28	16	69	24	24	2	73	0	100
29	47	72	7	13				
31	86	65					5	54
32	40	62	5	34			0	89
33	87	60			16	47	4	65
34	9	75	6	36			1	87
35	34	54						
36	37	60	5	25	14	76	0	86
37	65	63						
38	59	48						
39	50	56						
40	79	53	27	11			2	77
41	36	65						
42	63	63	11	5				
43	49	46						
44	33	61	0	0	6	61		
45	77	48	44	6	29	24	4	38
46	21	66	16	24			0	89
47	76	47					2	100
48	54	56						
49							2	100
50							2	82

Table 8: Summary of incidence of Phytophthora expressed as a percentage of the percentage of rejected spears in three sites (1 = Halcombe, 2 = Waikato and 3 = Hastings).

Site 1			Site 2			Site 3		
Code	Phyto.	% Reject	Code	Phyto.	% Reject	Code	Phyto.	% Reject
41	3	65	15	13	6	7	5	49
40	2	53	26	8	42	UC157	1	40
16	2	53	16	8	28			
29	2	72	36	6	25			
36	2	60	34	5	36			
27	1	54	4	5	8			
UC157	1	49	40	5	11			
JG	1	49	12	4	15			
46	1	66	13	3	29			
			7	3	10			
			3	2	20			
			32	2	34			
			JG	1	8			
			46	1	24			
			28	1	24			
			UC157	1	10			

Table 9: Summary of Stemphyllium expressed as a percentage of the percentage of rejected spears in two sites (1= Halcombe and 2 =Waikato).

Site 1			Site 2		
Code	Stemphyllium	% Reject	Code	Stemphyllium	% Reject
7	17	59	27	14	10
4	12	59	24	13	20
42	12	63	46	11	24
35	11	54	45	11	6
37	9	63	42	11	5
6	8	72	2	11	27
22	8	52	7	10	10
47	8	47	UC157	8	10
23	7	67	40	7	11
33	7	60	3	5	20
39	6	56	JG	5	8
21	6	35	29	5	13
15	6	54	18	4	16
38	5	48	15	4	6
27	5	54	1	2	10
1	5	53	36	1	25
JG	5	49	28	1	24
26	5	75	16	1	28
46	5	66			
24	5	63			
29	5	72			
20	4	58			
2	4	64			
40	3	53			
8	3	50			
36	3	60			

Site 1			Site 2		
Code	Stemphyllium	% Reject	Code	Stemphyllium	% Reject
43	3	46			
45	2	48			
28	2	69			
3	2	43			
48	2	56			
44	2	61			
32	1	62			
9	1	82			
UC157	1	49			

3 SENSORY ANALYSIS OF ASPARAGUS CLONES - 1992 SEASON

3.1 Summary

Four asparagus clones grown in the 1992 field trials at Lincoln were assessed by a trained taste panel to characterise their sensory profiles.

Flavour and texture of clones compared well with control spears of Jersey Giant, an all-male hybrid cultivar. Not all clones yielded sufficient marketable spears at the Lincoln site for inclusion in the taste panels and therefore some reject grade spears (open, seedy tips) were substituted. This outcome accounts for the apparent increased fibrousness of two of the clones scored by the taste panel.

3.2 Method

The following clones were assessed by a trained panel:

Code number	Parent type
15	Jersey Giant
16	Limbras
27	Limbras
45	Lucullus
Control	Jersey Giant

Spears harvested on 9, 16 and 30 November were assessed.

Spears were harvested three times each week throughout November. All spears longer than 23 cm were cut, graded and brought in from the field before 10.00 am. They were washed and stored in plastic bags in a refrigerator (4-6°C) until sensory assessment was performed 2.5 days after harvest.

On occasions when there were insufficient marketable grade spears to present to the taste panel, reject grade spears (open, seedy tips) were substituted.

Spears were washed in cold water, trimmed to 15 cm in length, and cooked with the butt ends in boiling water and the tips in steam for six minutes. Panellists received an entire spear for texture assessment and a sample of puree for flavour assessment. The puree was prepared by placing cooked spears into a food processor (Ralta

Blend'n'Wizz) and processing them until a smooth puree was formed. During training of new panellists, it was found that flavour assessment was facilitated when a puree rather than a half spear (as used in previous panels was used. Because of the mixing together of 5-10 spears during pureeing, a flavour sample of greater homogeneity was produced, which was designed to reduce the spear-to-spear variation in the results.

A reference sample of pureed asparagus was also used. It was produced by cooking and pureeing (see above) 5 kg of asparagus of one variety (Jersey Giant) all from the same plot on the same day, and by freezing the puree in 250 g lots. The panel reached a consensus on the attribute rating for this puree during training, and this rating for each attribute was then marked onto the assessment form and used by the panellists at each session to give an anchor point for scoring other samples.

When training panellists, samples of puree with added sucrose and added quinine sulphate were used to give reference standards for the sweetness and bitterness attributes, respectively.

In previous seasons it was found that the first cultivar tasted in a tasting session provides a focus for the following cultivars, which tend to be compared with it. To remove the effect of order, tasters were given the control, Jersey Giant, identified as such, as the first sample followed by the four clones in a carefully designed order such that each clone was tasted second, third, fourth or fifth once at each session, and the order was changed from week-to-week over the three weeks.

3.3 Results

The scores for each clone for each attribute assessed are presented in Table 10. Scores are calculated by measuring the distance from the left-hand end of the line on the taste panel assessment sheet (Appendix I) to the point where the panellist marks the line. For all attributes, the line is 1500 mm long. A score of 750 would, therefore, be in the middle. A high score means that the cultivar had a high level of a particular characteristic. The scores for off-flavour are much lower than scores for other attributes as there is normally no off-flavour at all.

Table 10: Asparagus attributes scored by taste panel.

Clone	No. tasted	Sweet-ness	Bitter-ness	Flavour	Off-flavour	Crisp-ness	Fibrous-ness
15 Jersey Giant	12	644	572	778	41	889	454
16 Limbras	12	632	617	790	134	930	447
27 Limbras	12	545	695	756	133	739	625
45 Lucullus	12	563	589	701	58	808	651
Control Jersey Giant	12	653	523	837	7	820	418
LSD (0.05)[1]		129.9	262.8	151.5	190.4	214.2	202.8

[1] Significant differences between clones occur where the difference between two scores is greater than the LSD.

There are very few significant differences between samples. The only significant difference is in the fibrousness of spears from Clone 27 Limbras, and from Clone 45 Lucullus, which were both significantly more fibrous than the control. Fibrousness may have been higher because some of the spears presented to the panel for testing were reject spears that had open, seedy heads and were more fibrous than market quality spears.

The apparent off-flavour problems (not significant) for the two Limbras clones were described by panellists as: bitter, grassy, burnt, soapy, raspberry leaves, slimy, and a "been in refrigerator too long" taste. Despite this, the scores given for off-flavour are less than "slight", so although this problem occurred in both Limbras lines, it was not observed by all panellists and is not at a level to cause any concern.

The Jersey Giant clone was very similar to the Control Jersey Giant, as would be expected.

3.4 Conclusions

No flavour or texture problems were apparent in the spears tested, apart from those mentioned above, which were not serious enough to cause concern. The season was a cold one compared with some years so any potential off-flavour problems that can occur during north-west wind conditions in Canterbury were not evident.

Apart from this possible risk, the indication is that factors other than sensory ones can be used to select the most suitable clone(s) for further development.

4 APPENDICES

Appendix I Taste panel assessment sheet

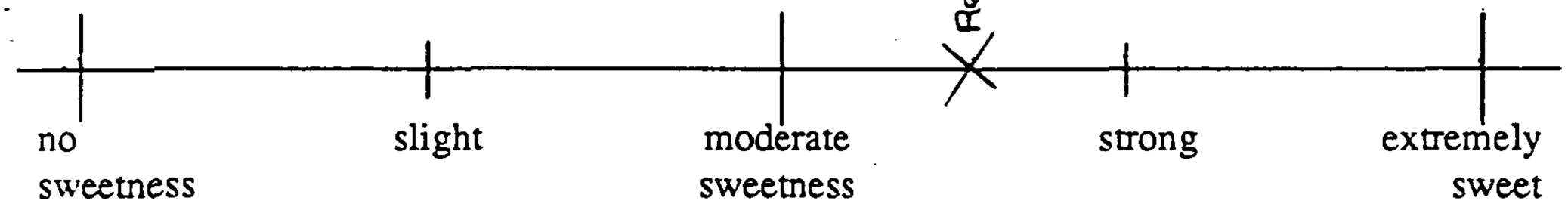
ASPARAGUS SENSORY EVALUATION - 1992

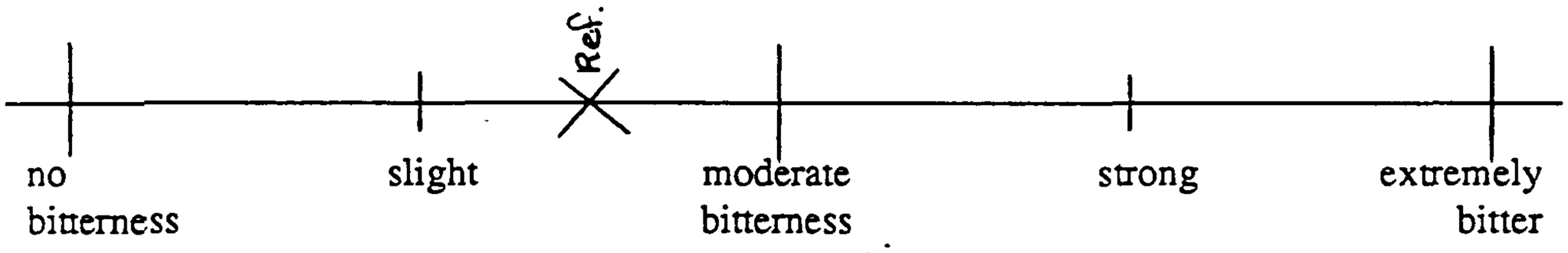
NAME : _____ **TIME :** _____

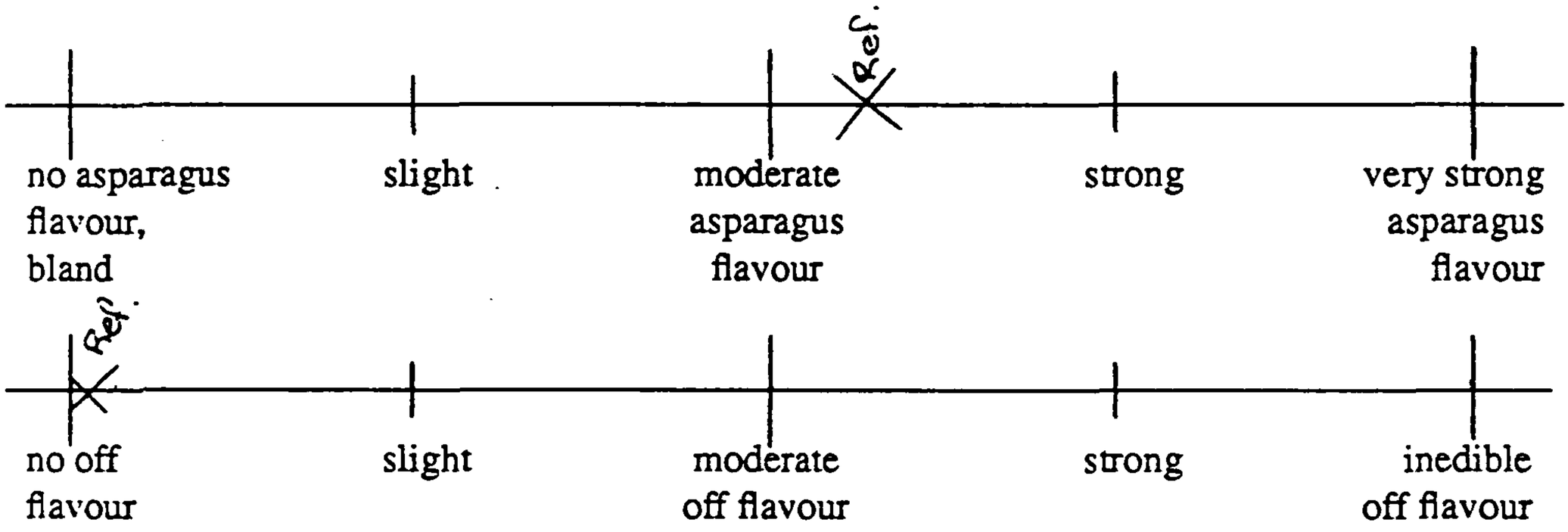
DATE : _____ **BOOTH :** _____

Please evaluate each sample by eating the entire spear. Use the half spear for flavour evaluations and the whole spear for texture evaluations. Place a ✘ on the scale to indicate the level of each characteristic and label with the appropriate sample number.

Flavour



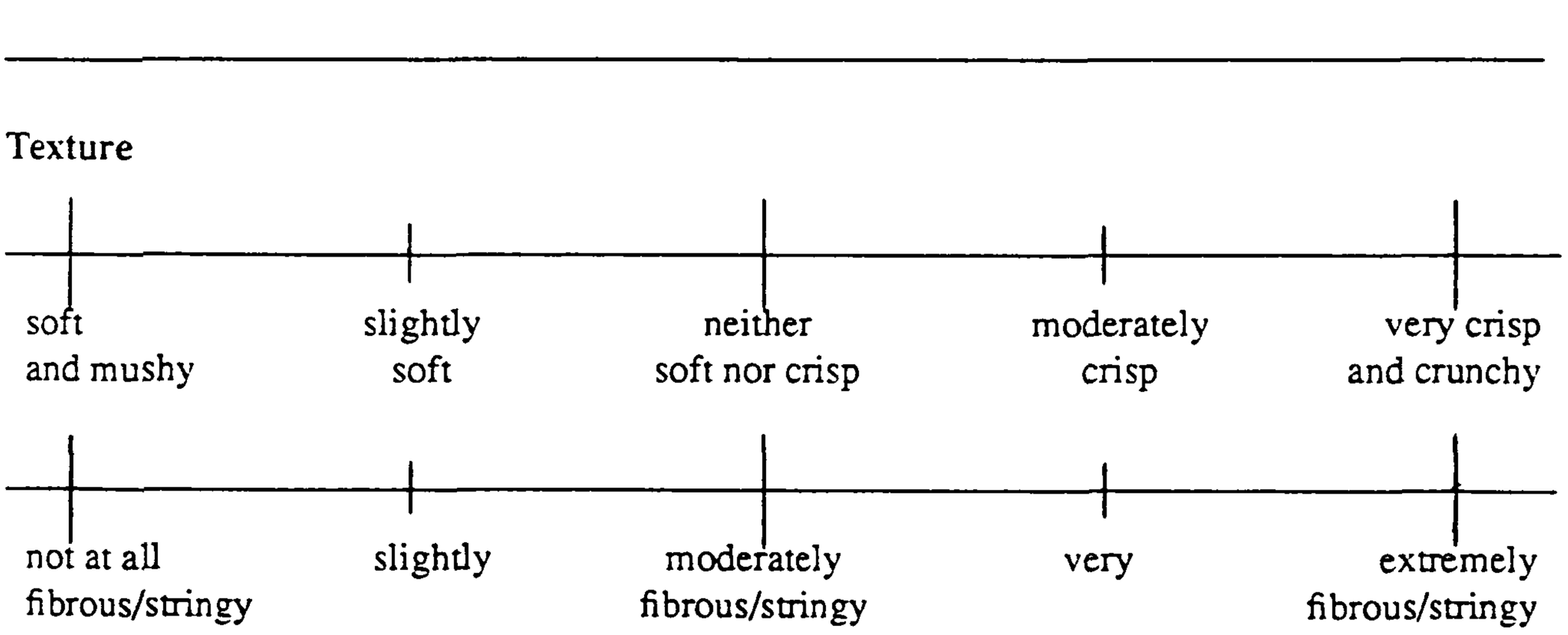




If off flavours were detected please describe: _____

_____

Texture



Comments

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