

Project title: Vining Peas: Extension of variety evaluation trials

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Report: Annual report, February 2012

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Location of project: Commercial crops of vining peas near Holbeach, S. Lincs
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Date project commenced: March 2011

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AUTHENTICATION

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

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GROWER SUMMARY

Headline

This project will provide vining pea growers with independent, relevant and accurate trials evaluations on vining pea varieties, so that a considered and informed variety choice can be made.

Background

Currently vining varieties are evaluated at just one site at PGRO, Thornhaugh with petits pois varieties being evaluated on a silt soil type in South Lincolnshire (trials funded by seedsmen). The soil type at Thornhaugh is representative of only a proportion of the national pea growing production area and varieties can often perform differently in other soil types and areas. These trials on a fertile silt soil type in South Lincolnshire will give additional data to enable growers to make an appropriate variety choice.

Results

For full and comprehensive results please refer to the full trials report.

Varieties, leaf type, source and approximate maturity - 2011

Variety Name	Leaf Type	Source	Maturity
M 89325	Semi-leafless	Maribo Seeds, Denmark	0
Avola	Conventional	Seminis Vegetable Seeds, France	0
Vivaldi (DS 89326)	Conventional	Maribo Seeds, Denmark	+ 2
Yeti (DS 89289)	Conventional	Maribo Seeds, Denmark	+ 3
M 89282	Semi-leafless	Maribo Seeds, Denmark	+ 3
DaVinci (DS 89324)	Conventional	Maribo Seeds, Denmark	+ 4
CS 421 AF	Semi-leafless	Crites Seeds, USA	+ 5
Sienna	Conventional	Limagrain, UK	+ 6
CS 424 F	Conventional	Crites Seeds, USA	+ 7
Reliance(08240793)	Semi-leafless	Seminis Vegetable Seeds	+ 8
Minotaur (08240773)	Semi-leafless	Seminis Vegetable Seeds	+ 9
PLS 560	Semi-leafless	Pure Line Seeds, USA	+ 9
Bikini	Semi-leafless/ semi-fasciated	Syngenta Seeds, France	+ 9
PLS 566	Semi-leafless	Pure Line Seeds, USA	+10
Compana (Nun 6240)	Semi-leafless	Nunhems Seeds, Netherlands	+10
Ruler (D 165182)	Semi-leafless	Syngenta Seeds	+10
Ruthless (D 165188)	Semi-leafless	Syngenta Seeds	+11
01S51911	Conventional	Limagrain	+11
00S68320	Conventional	Limagrain	+12
Genesis	Conventional	Plant & Food Research, New Zealand	+12
Fantasy	Semi-leafless	Van Waveren, Germany	+12
CMG 419 AF	Semi-leafless	Crites Seeds, USA	+13
08250833 (Hyperion)	Semi-leafless	Seminis Vegetable Seeds, France	+13
Cawood	Conventional	Plant & Food Research, New Zealand	+15
Oasis	Conventional	Limagrain	+15
Ambassador	Conventional	Van Waveren, Germany	+17
Columbus	Conventional	Plant & Food Research, New Zealand	+18
02S51209	Conventional	Limagrain	+19
02S52836	Conventional	Limagrain	+19

Trial site details

Variety Trial Site: Fertile light silt soil in a commercial crop of Vining Peas, near Holbeach Hurn, South Lincolnshire. OS Ref: TF377292. Holbeach Marsh Co-op, Manor Farm, Holbeach Hurn, Spalding, PE12 8LR.

Powdery Mildew Trial: Sandy Loam Soil. OS Ref: TF070017. PGRO, Thornhaugh, Peterborough, PE8 6HJ

Downy Mildew Trials: 2011 Silt loam soil. OS Ref TF414515 . Fold Hill, Old Leake, Lincs & silt loam soil. OS Ref TF212487 Chestnut House Farm, Amber Hill, Lincs

% yield, % size grade, haulm length and standing ability - 2011

Variety	@TR100				@TR120		Haulm length cm	Standing Ability 9=erect 1=lodged
	Yield % of Bikini	% in size grades				Yield % of Bikini		
		L	M	S	VS			
M 89325	93	28	65	7	0	82	62	6
Avola	79	59	34	6	1	80	64	4
Vivaldi (DS 89326)	79	38	54	7	1	93	78	4
Yeti (DS 89289)	110	14	49	29	8	104	66	4
M 89282	92	20	64	15	1	101	70	6
DaVinci (DS 89324)	96	13	54	29	4	105	63	4
CS 421 AF	106	28	57	13	2	100	80	7
Sienna	126 ⁺	50	46	3	1	117	64	2
CS 424 F	121	52	43	4	1	118	56	4
Reliance(08240793)	101	23	63	12	2	116	60	8
Minotaur (08240773)	105	24	56	17	3	120	62	8
PLS 560	95	21	66	12	1	91	69	6
Bikini	100	43	47	9	1	100	66	7
	(11.14t/ha)					(12.11t/ha)		
PLS 566	127 ⁺	49	45	5	1	119	66	5
Compana (Nun 6240)	117	30	54	14	2	119	75	6
Ruler (D 165182)	103	49	41	9	1	98	70	8
M 89325	93	28	65	7	0	82	62	6
Ruthless (D 165188)	99	40	49	10	1	113	76	8
01S51911	114	38	54	7	1	108	70	4
00S68320	76	40	41	16	3	79	67	4
Genesis	109	34	56	9	1	110	67	2
Fantasy	105	56	37	6	1	99	68	7
CMG 419 AF	101	14	55	28	3	100	93	8
08250833 (Hyperion)	119	25	58	15	2	117	77	9
Cawood	104	42	47	10	1	105	68	2
Oasis	117	40	49	10	1	121	70	3
Ambassador	103	47	44	8	1	105	78	4
Columbus	115	59	35	5	1	113	64	4
02S51209	114	52	41	6	1	121	78	5
02S52836	110	52	42	6	0	110	74	5

Full information on all varieties can be found in the Full Trial Report.

None of the varieties were found to be unsuitable for UK production

Growth was more vigorous than the Thornhaugh site. Pea colour was not as even as at the Thornhaugh site and there were blond peas in some of the frozen samples. The yield standard, Bikini yielded very well, giving over 12.11t/ha at TR120.

M 89325 matured at the same time as Avola, was semi-leafless and had similar length haulm to Avola. Yields of medium size grade peas were higher than Avola and a little lower than Bikini at TR100.

Avola gave lower, but not significantly lower yields than Bikini. Produce was very large size grade.

Vivaldi matured 2 days later than Avola. Haulm was longer than Avola and standing ability similar. Yields were better at TR120, a little lower than Bikini. Produce was uneven in colour and contained several blond peas.

Yeti and M89282 matured 3 days later than Avola.

Yeti had shorter haulm than Avola and similar standing ability. Yields of medium-small size grade peas were higher, but not significantly higher than Bikini. Produce was uneven in colour and contained some blond peas.

M 89282 was semi-leafless, had longer haulm than Avola and better than average standing ability. Yields of medium size grade peas were similar to Bikini at TR120.

DaVinci matured 4 days later than Avola. Haulm length and standing ability were similar to Avola. Yields of medium size grade peas were higher than Avola and similar to Bikini at TR120.

CS 421 AF was semi-leafless and matured 5 days later than Avola. Haulm was long and the variety stood well at harvest. Yields of medium-large size grade peas were similar to Bikini at TR100.

Sienna matured 6 days later than Avola. Haulm was similar in length to Avola and the variety was lodged at harvest. Yields of large size grade peas were significantly higher than Bikini at TR100.

CS 424 F matured 7 days later than Avola. Haulm was shorter than Bikini and standing ability similar to Avola. Yields of large size grade peas were good, higher than Bikini, but significantly so.

Reliance was semi-leafless and matured 8 days later than Avola. Haulm was shorter than Bikini and the variety stood well at harvest. Yields of medium size grade peas were higher than Bikini at TR120, but significantly so.

Minotaur and PLS560 were semi-leafless and matured at the same time as Bikini, 9 days later than Avola.

Minotaur had similar length haulm to Bikini and stood very well at harvest. Yields of medium-large size grade peas were higher, but not significantly higher than Bikini at TR120.

PLS 560 had similar length haulm to Bikini and better than average standing ability. Yields of medium size grade peas were similar to Bikini at TR100.

Bikini gave high yields of large size grade peas.

PLS 566, Compana and Ruler were all semi-leafless and matured one day later than Bikini.

PLS 566 had similar length haulm to Bikini and had average standing ability. Yields were very high, significantly higher than Bikini at TR100. Produce was large size grade.

Compana had longer haulm than Bikini and had average standing ability. Yields of medium-large size grade peas were higher, but not significantly higher than Bikini.

Ruler had longer haulm than Bikini and stood very well at harvest. Yields of large size grade peas were similar to Bikini.

Ruthless and 01S51911 matured 2days later than Bikini.

Ruthless was semi-leafless, had long haulm and stood very well at harvest. Yields of large size grade peas were higher than Bikini at TR120, but not significantly so.

01S51911 lodged at harvest and stood similar to Ambassador. Yields of large size grade peas were higher than Bikini at TR120, but not significantly so.

00S68320, Genesis and Fantasy matured 3 days later than Bikini.

00S68320 lodged similar to Ambassador. Yields of large size grade peas were lower, but not significantly lower than Bikini. Produce was uneven in colour and contained some blond peas.

Genesis was lodged at harvest. Yields of large size grade peas were higher than Bikini, but not significantly so. Produce was uneven in colour and contained some blond peas.

Fantasy had long haulm and stood well at harvest. Yields of large size grade peas were similar to Bikini.

CMG 419 AF and 08250833 were semi-leafless and matured 4 days later than Bikini.

CMG 419 AF had very long haulm and stood very well at harvest. Yields of medium-small size grade peas were similar to Bikini.

08250833 had long haulm and excellent standing ability. Yields of medium size grade peas were higher, but not significantly higher than Bikini.

Cawood matured at the same time as Oasis, 6 days later than Bikini. Haulm was not as long as Ambassador and the variety was lodged at harvest. Yields of large size grade peas were similar to Bikini. Produce was uneven in colour and contained some blond peas.

Oasis was also lodged at harvest. Yields of large size grade peas were good, higher than Bikini, but not significantly higher.

Ambassador matured 7 days later than Bikini and was lodged at harvest. Yields of large size grade peas were similar to Bikini.

Columbus matured one day later than Ambassador and lodged the same as Ambassador. Yields of very large size grade peas were good, higher than Bikini, but not significantly higher. Produce was uneven in colour and contained some blond peas.

02S51209 and **02S52836** matured 2 days later than Ambassador. Both varieties had

average standing ability.

02S51209 was the higher yielding of the two and both gave higher, but not significantly higher yields than Bikini. Both varieties gave peas of very large size grade. Produce from both varieties was uneven in colour and contained some blond peas.

Main conclusions

Conclusions are drawn from a 2 year summary of varieties evaluated in either 2010/2011.

Vining peas are a unique crop in terms of timely harvesting. Varietal selection is an important and key element of vining pea crop production to ensure a programmed harvest period and to maintain high quality.

Avola gave statistically significantly lower yields than Bikini.

Early and second early varieties Yeti, Vivaldi and DaVinci gave lower yields than Bikini, but yields were higher than the standard early Avola. These varieties yielded better at TR 120 than TR100.

Reliance and Minotaur were a little lower yielding than Bikini at TR100, but a little higher yielding at TR120. Produce size was smaller than Bikini, with fewer peas in the large size grade.

Ruler and Ruthless were a little lower yielding at TR100. Ruthless was a little higher yielding than Bikini at TR120. Both had longer haulm than Bikini and gave similar size grade peas to Bikini.

Several varieties including DaVinci, Reliance, Minotaur, Ruthless and Ruler Showed resistance to powdery mildew, a trait that can be beneficial for late sown and late maturing crops.

Ruthless, Vivaldi, Reliance and Minotaur showed good tolerance to downy mildew.

FULL TRIAL REPORT

Introduction

Vining peas are a major vegetable crop grown for processing and for the fresh market and peas for freezing and canning occupy 29-36,000 ha per annum, with a value of £ 50M.

The PGRO Processed Legume Panel have identified Varietal selection is an important and key element of crop production to ensure a programmed harvest period and to maintain high quality produce and require as accurate a guide to the performance of varieties in areas typical of pea production areas as possible

Varietal selection is an important and key element of vining pea crop production to ensure a programmed harvest period and to maintain high quality produce. To this end PGRO evaluates around 15 varieties annually at National List stage funded by Seedsmen and PGRO Levy and the most promising are evaluated in trials for a further two years in the Main Trial. There are no other independent facilities for vining pea evaluation in the UK.

Currently varieties are evaluated at just one site at Thornhaugh with petits pois varieties being evaluated on a silt soil type in South Lincolnshire. The soil type at Thornhaugh is representative of only a proportion of the national pea growing production area and varieties can often perform differently in other soil types and areas. An extension of the PGRO trials system to include an evaluation of the candidate commercial varieties at both Thornhaugh and in South Lincolnshire sites will add to refine the evaluation process, with additional information to supplement data from established trials. The variety treatment is replicated three times and each plot has to be harvested at different stages of maturity to enable yield and size grade data to be presented for the freezing stage Tenderometer Reading (TR) 100 and TR 120.

Several promising new vining pea varieties with improved yield and with more uniform size-grade and colour have been evaluated in PGRO Main and Preliminary Trials. A further factor of vining pea variety evaluation is the use of specialised equipment needed during harvesting and processing. The independent systematic evaluation of varieties is restricted to the PGRO, Thornhaugh site and one site for petits pois varieties in a commercial crop. This forms the basis for the selection and development of varieties for the 36,000 ha of commercial crops. In practice, commercial programmes are based on the use of a minimum of 4 varieties and it is more likely that 6 or 7 will be used to give a spread of

maturity and to allow production for special markets. On the latter point, these can either be premium 'petits pois' or '150 minute' peas or, so called, economy/value packs.

Varietal characteristics affect:

- yield
- quality (colour, flavour, size and texture)
- ease of harvesting
- disease susceptibility
- timeliness
- ease of integration in the harvest programme

New ones are being actively sought by growers so that they can meet processors specifications for quality with the most productive, reliable and cost effective varieties.

Several promising varieties have been tested in recent years and more information on their performance and relative maturity of varieties on a different soil type is needed. Work is needed over at least three years to gain experience in contrasting seasonal weather conditions

Varieties and numbered selections included

Variety Name	Leaf Type	Source	Maturity
M 89325	Semi-leafless	Maribo Seeds, Denmark	0
<u>Avola</u>	Conventional	Seminis Vegetable Seeds, France	<u>0</u>
Vivaldi (DS 89326)	Conventional	Maribo Seeds, Denmark	+ 2
Yeti (DS 89289)	Conventional	Maribo Seeds, Denmark	+ 3
M 89282	Semi-leafless	Maribo Seeds, Denmark	+ 3
DaVinci (DS 89324)	Conventional	Maribo Seeds, Denmark	+ 4
CS 421 AF	Semi-leafless	Crites Seeds, USA	+ 5
Sienna	Conventional	Limagrain, UK	+ 6
CS 424 F	Conventional	Crites Seeds, USA	+ 7
Reliance(08240793)	Semi-leafless	Seminis Vegetable Seeds	+ 8
Minotaur (08240773)	Semi-leafless	Seminis Vegetable Seeds	+ 9
PLS 560	Semi-leafless	Pure Line Seeds, USA	+ 9
<u>Bikini</u>	Semi-leafless/ semi-fasciated	Syngenta Seeds, France	<u>+ 9</u>
PLS 566	Semi-leafless	Pure Line Seeds, USA	+10
Compana (Nun 6240)	Semi-leafless	Nunhems Seeds, Netherlands	+10
Ruler (D 165182)	Semi-leafless	Syngenta Seeds	+10
Ruthless (D 165188)	Semi-leafless	Syngenta Seeds	+11
01S51911	Conventional	Limagrain	+11
00S68320	Conventional	Limagrain	+12
Genesis	Conventional	Plant & Food Research, New Zealand	+12
Fantasy	Semi-leafless	Van Waveren, Germany	+12
CMG 419 AF	Semi-leafless	Crites Seeds, USA	+13
08250833 (Hyperion)	Semi-leafless	Seminis Vegetable Seeds, France	+13
Cawood	Conventional	Plant & Food Research, New Zealand	+15
<u>Oasis</u>	Conventional	Limagrain	<u>+15</u>
<u>Ambassador</u>	Conventional	Van Waveren, Germany	<u>+17</u>
Columbus	Conventional	Plant & Food Research, New Zealand	+18
02S51209	Conventional	Limagrain	+19
02S52836	Conventional	Limagrain	+19

Trial site details

Variety Trial Site: Fertile light silt soil in a commercial crop of Vining Peas, near Holbeach Hurn, South Lincolnshire. OS Ref: TF377292. Holbeach Marsh Co-op, Manor Farm, Holbeach Hurn, Spalding, PE12 8LR.

Powdery Mildew Trial: Sandy Loam Soil. OS Ref: TF070017. PGRO, Thornhaugh, Peterborough, PE8 6HJ

Downy Mildew Trials: 2011 Silt loam soil. OS Ref TF414515 . Fold Hill, Old Leake, Lincs & silt loam soil. OS Ref TF212487 Chestnut House Farm, Amber Hill, Lincs

Production details

Sown: 12 April 2011 in commercial crop of vining peas and grown according best local and commercial practice.

Fungicide seed treatment: Wakil XL

Broad-leaved weeds were controlled pre-emergence and (post-emergence where required).

Aphid and pea moth (*Cydia nigricana*) were controlled (monitored by pea moth traps).

Fungicide sprays were applied to control *Botrytis* and *Mycosphaerella* (where required).

No irrigation was applied.

Haulm lengths and standing ability were measured post flowering.

Maturity was assessed from the sampling areas to achieve correct harvest dates for quick-freezing and TR120 harvest stage for vined peas using a Martin Pea Tenderometer.

Sub-plots were harvested when appropriate by hand, vined in a static plot pea viner, sieved and washed. Peas were size-graded with a Mather & Platt size-grader, weighed and total yield measured.

Samples were blanched, sorted and quick-frozen at @TR100 for quality appraisal and inspection by processors and growers.

Quality aspects of the defrosted and cooked frozen samples were assessed for colour, evenness of colour, brightness of colour and numbers of blond peas.

Measure of sweetness assessed by Brix measurement.

Trial design

Trial layout: Randomised block, 2 replications.

Plot size: 1.83 m x 19 m

Sub-plots: 1.83 m x 4 m for up to three harvests taken at @TR 100 (range 95-105), @TR 120 Range 115-130) and a third harvest if required.

Sampling areas for TR assessment: 1.83 m x 1.5 m

Sown with an Øyjord plot drill to achieve a population of 90 plants/m²

Yields were corrected to TR100 and TR120 and statistically analysed using ANOVA.

For varieties that had completed 2 years 2010-2011, yields were corrected to TR100 and TR120 and statistically analysed using fitted constant REML analysis.

Sites will differ in their location each year and will be chosen where there has been a long history of pea cultivation and the potential for a high population of downy mildew (*Peronospora viciae*) is high. Sowing is carried out at a time which is favourable to natural infection taking place. Two replicates of 200 seeds of each variety without any fungicidal seed treatment will be drilled in a double row 5m long. The varieties will be randomised. At two occasions, disease assessments will be made, the first at about the 4 node stage when the percentage of primary infected seedlings will be estimated and the second assessment is an estimate of the percentage plants showing downy mildew infection and an estimate of the percentage leaf area infected. The scores of these assessments will be amalgamated and an overall infection level calculated. Based on the level of infection, a resistance score will be allocated using a 9-1 scale where 9 indicates good field resistance and 1 indicates very susceptible.

Varieties will also be evaluated for resistance to Powdery mildew (*Erysiphe pisi*). In each year, two 1.5m x 1.5m plots of each variety will be drilled in early June on the PGRO trial ground at Thornhaugh. Natural infection of powdery mildew is very likely to occur once the pods have formed. When natural infection has taken place, the whole plot is assigned as resistant (no infection) or susceptible.

Powdery Mildew Trial

Varieties were planted in a double row plot with two replications at Thornhaugh in late early June. Natural infection of powdery mildew was assessed after flowering and varieties were scored as susceptible or resistant.

Downy Mildew Trials

Fields differed in their location each year and were chosen where there has been a long history of pea cultivation and the potential for a high population of downy mildew (*Peronospora viciae*) was high. Sowing was carried out at a time which was favourable to natural infection taking place. Two replicates of 200 seeds of each variety without any fungicidal seed treatment, were drilled in a double row 5m long. The varieties were randomised. At two occasions, disease assessments were made, the first at about the 4

node stage when the percentage of primary infected seedlings was estimated and the second assessment was an estimate of the percentage plants showing downy mildew infection and an estimate of the percentage leaf area infected. The scores of these assessments were amalgamated and an overall infection level calculated. Based on the level of infection, a resistance score was allocated using a 1-9 scale where 1 is very susceptible and 9 indicates good field resistance

Trial records and data collected

2011, temperatures during March, April and May were above average for the time of year. April was 3.7 °C above average, making it the equal-warmest spring. Rainfall at Thornhaugh during March and April was very low, receiving only 2.0mm and 1.0 mm respectively. The first 3 weeks of May were also very dry. Temperatures during June, July and August were below average for the time of year, making it the coolest summer since 1993. Rainfall during this period was very variable across the UK. At Thornhaugh rainfall was sporadic with the months June to August receiving 48.6%, 56.2% and 68.2% of average rainfall respectively.

TABLE 1 - VINING PEA VARIETY STUDIES. Summary of agronomic data Standard Vining Pea Main Variety Trial, Holbeach - 2011
 Varieties placed in order of maturity. Standard varieties underlined. All varieties sown on 12 April
 Results are means of two replicates. Target population 90 plants per m² sown in ten 15 cm rows.

Variety	Source	1000 Seed Weight g	@ TR 100							@ TR 120							Standing Ability 9=erect 1=lodged	Pea wt. as % of total weight	Raw pea colour 1=pale 6=dark
			Maturity (± days) Avola	Yield % of Bikini	% in size grades				Maturity (± days) Avola	Yield % of Bikini	% in size grades				Haulm length cm				
					L	M	S	VS			L	M	S	VS					
M 89325	SL	Mar	192	0	93	28	65	7	0	0	82	30	64	6	0	62	6	26	5.3
<u>Avola</u>		<u>SVS</u>	<u>214</u>	<u>0(1/7)</u>	<u>79</u>	<u>59</u>	<u>34</u>	<u>6</u>	<u>1</u>	<u>0(4/7)</u>	<u>80</u>	<u>64</u>	<u>31</u>	<u>4</u>	<u>1</u>	<u>64</u>	<u>4</u>	<u>27</u>	<u>5.5</u>
Vivaldi (DS 89326)		Mar	196	+2	79	38	54	7	1	+1	93	37	58	5	0	78	4	25	4.3
Yeti (DS 89289)		Mar	176	+3	110	14	49	29	8	+2	104	21	60	16	3	66	4	22	5.5
M 89282	SL	Mar	188	+3	92	20	64	15	1	+3	101	33	59	7	1	70	6	22	5.8
DaVinci (DS 89324)		Mar	180	+4	96	13	54	29	4	+3	105	18	72	10	0	63	4	21	5.0
CS 421 AF	SL	CS	197	+5	106	28	57	13	2	+5	100	40	55	4	1	80	7	22	5.4
Sienna		vW	248	+6	126 ⁺	50	46	3	1	+6	117	56	41	2	1	64	2	29	5.1
CS 424 F		CS	202	+7	121	52	43	4	1	+6	118	58	40	2	0	56	4	29	5.0
Reliance(08240793)	SL	SVS	174	+8	101	23	63	12	2	+7	116	30	63	6	1	60	8	24	5.4
Minotaur (08240773)	SL	SVS	170	+9	105	24	56	17	3	+8	120	32	64	4	0	62	8	21	5.0
PLS 560	SL	PLS	163	+9	95	21	66	12	1	+9	91	29	63	7	1	69	6	22	5.9
<u>Bikini</u>	<u>SLSF</u>	<u>Syn</u>	<u>208</u>	<u>+9</u>	<u>100</u>	<u>43</u>	<u>47</u>	<u>9</u>	<u>1</u>	<u>+9</u>	<u>100</u>	<u>62</u>	<u>36</u>	<u>2</u>	<u>0</u>	<u>66</u>	<u>7</u>	<u>21</u>	<u>5.0</u>
					(11.14t/ha)						(12.11t/ha)								
PLS 566	SL	PLS	209	+10	127 ⁺	49	45	5	1	+9	119	65	33	2	0	66	5	24	5.4
Compana (Nun 6240)	SL	Nun	179	+10	117	30	54	14	2	+9	119	37	53	9	1	75	6	22	5.3
Ruler (D 165182)	SL	Syn	207	+10	103	49	41	9	1	+9	98	61	33	5	1	70	8	19	5.3

.....continued/

TABLE 1 (Continued) - VINING PEA VARIETY STUDIES. Summary of agronomic data Standard Vining Pea Main Variety Trial, Holbeach - 2011
 Varieties placed in order of maturity. Standard varieties underlined. All varieties sown on 12 April
 Results are means of two replicates. Target population 90 plants per m² sown in ten 15 cm rows.

Variety	Source	1000 Seed Weight g	@ TR 100							@ TR 120							Standing Ability 9=erect 1=lodged	Pea wt. as % of total weight	Raw pea colour 1=pale 6=dark
			Maturity (± days) Avola	Yield % of Bikini	% in size grades				Maturity (± days) Avola	Yield % of Bikini	% in size grades				Haulm length cm				
					L	M	S	VS			L	M	S	VS					
Ruthless (D 165188)	SL	Syn	183	+11	99	40	49	10	1	+10	113	50	44	5	1	76	8	22	5.4
01S51911		LUK	183	+11	114	38	54	7	1	+10	108	43	51	5	1	70	4	26	5.1
00S68320		LUK	187	+12	76	40	41	16	3	+11	79	58	37	4	1	67	4	17	5.3
Genesis		PFR	224	+12	109	34	56	9	1	+12	110	43	49	7	1	67	2	23	5.4
Fantasy	SL	vW	200	+12	105	56	37	6	1	+12	99	70	29	0	1	68	7	20	5.3
CMG 419 AF	SL	CS	155	+13	101	14	55	28	3	+12	100	17	60	21	2	93	8	22	5.6
08250833 (Hyperion)	SL	SVS	169	+13	119	25	58	15	2	+12	117	31	59	9	1	77	9	24	5.3
Cawood		PFR	230	+15	104	42	47	10	1	+14	105	55	39	5	1	68	2	22	5.1
<u>Oasis</u>		<u>LUK</u>	<u>220</u>	<u>+15</u>	<u>117</u>	<u>40</u>	<u>49</u>	<u>10</u>	<u>1</u>	<u>+14</u>	<u>121</u>	<u>55</u>	<u>38</u>	<u>6</u>	<u>1</u>	<u>70</u>	<u>3</u>	<u>23</u>	<u>5.0</u>
<u>Ambassador</u>		<u>vW</u>	<u>190</u>	<u>+17</u>	<u>103</u>	<u>47</u>	<u>44</u>	<u>8</u>	<u>1</u>	<u>+16</u>	<u>105</u>	<u>67</u>	<u>31</u>	<u>2</u>	<u>0</u>	<u>78</u>	<u>4</u>	<u>18</u>	<u>5.0</u>
Columbus		PFR	224	+18	115	59	35	5	1	+18	113	72	25	2	1	64	4	23	5.0
02S51209		LUK	162	+19	114	52	41	6	1	+18	121	69	30	1	0	78	5	19	5.1
02S52836		LUK	224	+19	110	52	42	6	0	+20	110	45	50	5	0	74	5	17	5.3
Significance @ P=0.05					SD						NSD								
LSD @ P=0.05					23.1						23.5								
CV %					11.2						11.2								

KEY: Yield: + Significantly greater than Bikini @ P = 0.05; - Significantly less than Bikini @ P = 0.05
 Size grades: L = large > 10.2mm; M = medium 8.75 - 10.2mm; S = small 7.5 - 8.75mm; VS = very small < 7.5mm
 SL = Semi-leafless; SF = Semi-fasciated
 Source of varieties see Appendix 1

TABLE 2 - VINING PEA VARIETY STUDIES. Summary of quality data - Standard Vining Pea Main Variety Trial, Holbeach - 2011

Variety	Tenderometer Reading	Appearance			No. of blonds (1-5)	Brix %
		Colour (3-8)	Brightness (1-2)	Uniformity (1-5)		
Avola	117.5	6.17	1.00	4.00	2.0	8.8
M89325	119.0	6.17	1.00	5.00	1.0	8.8
Vivaldi (DS 89326)	111.5	5.33	1.00	3.00	3.0	8.9
Yeti (DS 89289)	100.0	5.33	1.00	3.67	2.0	8.5
M89282	106.0	5.50	1.00	5.00	1.0	9.1
DaVinci (DS 89324)	98.5	5.67	1.00	4.50	1.0	9.3
CS 421 AF	100.5	6.17	1.33	4.67	1.0	9.6
Sienna	102.0	5.67	1.33	4.50	1.0	8.1
CS 424 F	96.0	6.17	1.00	5.00	1.0	8.7
Reliance(08240793)	102.0	6.17	1.00	4.17	1.3	9.4
Minotaur (08240773)	93.5	6.00	1.00	5.00	1.0	9.1
Bikini	98.0	6.17	1.33	4.67	1.0	8.6
PLS 560	103.0	6.67	1.00	5.00	1.0	8.8
Compana (Nun 6240)	104.0	6.00	1.33	5.00	1.0	8.8
PLS 566	97.5	6.17	1.33	4.33	1.3	8.9
Ruler (D 165182)	103.5	6.00	1.00	4.33	1.0	8.6
01S51911	101.0	6.17	1.00	4.67	1.0	9.4
Ruthless (D 165188)	100.0	6.50	1.00	4.83	1.0	8.5
00S68320	106.5	6.00	1.00	3.67	2.0	9.7
Fantasy	107.5	6.33	1.00	5.00	1.0	9.5
Genesis	105.0	5.83	1.33	3.67	2.0	9.9
08250833 (Hyperion)	96.5	5.83	1.00	4.67	1.0	9.5
CMG 419 AF	98.0	7.00	1.00	5.00	1.0	10.0
Cawood	98.5	5.50	1.00	3.67	2.3	9.0
OASIS	99.5	5.67	1.00	4.00	1.3	8.2
Ambassador	100.5	5.67	1.33	4.00	1.7	8.2
Columbus	95.0	5.83	1.00	3.67	2.0	8.8
02S51209	97.0	5.83	1.00	3.00	2.7	7.6
02S52836	99.5	5.67	1.00	3.33	2.7	8.5

KEY: Uniformity; Uniformity; No. of blonds; Flavour; Texture: (1-5) - a high figure indicates that the variety shows the character to a high degree
 Colour: a high figure indicates a darker green; Brightness: 1 = bright, 2 = dull; Brix - measured using Atago pocket refractometer PAL-1 and gives an indication of sugar content

TABLE 5 - VINING PEA VARIETY STUDIES. Summary of Standard Vining Peas - Holbeach Tested 2010 - 2011
 Varieties placed in order of maturity. Standard varieties underlined

Variety	Source	1000 Seed Weight g	@ TR 100							@ TR 120							Standing Ability 9=erect 1=lodged	Pea wt. as % of total weight	Raw pea colour 1=pale 6=dark
			Maturity (± days) Avola	Yield % of Bikini	% in size grades				Maturity (± days) Avola	Yield % of Bikini	% in size grades				Haulm length cm				
					L	M	S	VS			L	M	S	VS					
<u>Avola</u>	<u>SVS</u>	<u>209</u>	<u>0</u>	<u>68</u>	<u>62</u>	<u>31</u>	<u>6</u>	<u>10</u>	<u>0</u>	<u>80</u>	<u>66</u>	<u>29</u>	<u>4</u>	<u>1</u>	<u>68</u>	<u>4</u>	<u>25</u>	<u>5.3</u>	
Yeti (DS 89289)	Mar	167	+2	86	19	45	28	8	+2	91	25	54	18	3	62	5	20	5.5	
Vivaldi (DS 89326)	Mar	192	+2	77	44	47	8	1	+1	85	46	47	6	1	76	4	24	4.4	
DaVinci (DS 89324)	Mar	171	+3	79	18	50	27	5	+3	93	22	65	12	1	64	5	21	5.1	
CS 421 AF	SL	CS	+4	83	35	47	14	4	+4	89	37	52	10	1	72	7	21	5.6	
Reliance (08240793)	SL	SVS	+6	93	26	58	13	3	+6	110	37	48	9	6	65	7	24	5.4	
Minotaur (08240773)	SL	SVS	+7	91	25	51	20	4	+7	107	33	55	10	2	64	7	22	5.3	
<u>Bikini</u>	<u>SLSF</u>	<u>Syn</u>	<u>+7</u>	<u>100</u>	<u>38</u>	<u>43</u>	<u>14</u>	<u>5</u>	<u>+7</u>	<u>100</u>	<u>49</u>	<u>40</u>	<u>9</u>	<u>2</u>	<u>62</u>	<u>6</u>	<u>22</u>	<u>5.3</u>	
				(11.97t/ha)						(12.45t/ha)									
Ruler (D 165182)	SL	Syn	+8	92	41	41	14	4	+8	94	55	35	8	2	70	6	19	5.3	
Ruthless (D 165188)	SL	Syn	+9	94	38	46	13	3	+9	105	47	45	7	1	75	6	21	5.5	
<u>Oasis</u>		<u>LUK</u>	<u>+13</u>	<u>104</u>	<u>36</u>	<u>47</u>	<u>14</u>	<u>3</u>	<u>+12</u>	<u>106</u>	<u>44</u>	<u>43</u>	<u>11</u>	<u>2</u>	<u>66</u>	<u>3</u>	<u>25</u>	<u>5.1</u>	
<u>Ambassador</u>		<u>vW</u>	<u>+14</u>	<u>92</u>	<u>42</u>	<u>44</u>	<u>12</u>	<u>2</u>	<u>+14</u>	<u>93</u>	<u>51</u>	<u>41</u>	<u>7</u>	<u>1</u>	<u>77</u>	<u>4</u>	<u>20</u>	<u>5.0</u>	
Significance @ P=0.05				SD						SD									
LSD @ P=0.05				21.8						14.8									
CV %				11.2						7.0									

KEY: Yield: + Significantly greater than Bikini @ P = 0.05; - Significantly less than Bikini @ P = 0.05
 Size grades: L = large > 10.2mm; M = medium 8.75 - 10.2mm; S = small 7.5 - 8.75mm; VS = very small < 7.5mm
 SL = Semi-leafless; SF = Semi-fasciated
 Source of varieties see Appendix 1

TABLE 6 - VINING PEA VARIETY STUDIES. Summary of quality data – Standard pea varieties - Holbeach 2010 - 2011

Variety	Year	Tenderometer Reading	Appearance				Brix %
			Colour (3-8)	Brightness (1-2)	Uniformity (1-5)	No. of blonds (1-5)	
Avola	10	106.5	5.33	1.33	3.33	1.67	9.20
	11	117.5	6.17	1.00	4.00	2.00	8.80
Yeti (DS 89289)	10	96.0	5.17	1.00	3.67	1.33	10.30
	11	100.0	5.33	1.00	3.67	2.00	8.50
Vivaldi (DS 89326)	10	105.0	5.33	1.33	4.33	1.33	8.70
	11	111.5	5.33	1.00	3.00	3.00	8.90
DaVinci (DS 89324)	10	99.0	5.17	1.00	4.33	1.00	9.70
	11	98.5	5.67	1.00	4.50	1.00	9.30
CS 421 AF	10	99.5	5.33	1.00	4.00	1.00	9.40
	11	100.5	6.17	1.33	4.67	1.00	9.60
Reliance (08240793)	10	99.5	6.00	1.00	4.67	1.00	9.75
	11	102.0	6.17	1.00	4.17	1.33	9.40
Minotaur (08240773)	10	96.0	5.33	1.00	4.33	1.00	9.15
	11	93.5	6.00	1.00	5.00	1.00	9.10
Bikini	10	97.5	5.67	1.00	4.33	1.33	9.00
	11	98.0	6.17	1.33	4.67	1.00	8.60
Ruthless (D 165188)	10	100.0	5.67	1.00	4.00	1.00	10.05
	11	100.0	6.50	1.00	4.83	1.00	8.50
Ruler (D 165182)	10	105.5	5.67	1.00	4.33	1.00	9.15
	11	103.5	6.00	1.00	4.33	1.00	8.60
Oasis	10	109.5	5.50	1.00	3.00	3.33	8.50
	11	99.5	5.67	1.00	4.00	1.33	8.20
Ambassador	10	105.5	5.00	1.00	3.00	3.33	8.00
	11	100.5	5.67	1.33	4.00	1.67	8.20

KEY: Uniformity; Uniformity; No. of blonds; Flavour; Texture: (1-5) - a high figure indicates that the variety shows the character to a high degree
 Colour: a high figure indicates a darker green; Brightness: 1 = bright, 2 = dull; Brix - measured using Atago pocket refractometer PAL-1 and gives an indication of sugar content

Varietal Susceptibility of Vining Peas to Powdery Mildew (Erysiphe pisi) - 2011

Plants were scored for natural infection at the full pod growth stage. The scores reflected resistance and susceptibility and are shown below

Resistant	Vivaldi, Ruler, Ruthless, Reliance, Minotaur, CMG 419 AF, 02S51209, 02S52836, Fantasy, PLS 566, Compana, M89325
Susceptible	Yeti, DaVinci, CS 421 AF, CS 424F, 01S51911, 00S68320, Sienna, PLS 560

Varietal Susceptibility of Vining Peas to Downy Mildew (Peronospora viciae) - 2011

The trials were drilled in commercial crops in fields with a history of downy mildew. Two sites were monitored: Silt loam soil. OS Ref TF414515 . Fold Hill, Old Leake, Lincs & silt loam soil. OS Ref TF212487 Chestnut House Farm, Amber Hill, Lincs

Plants were scored for infection on two occasions during the season, to include both primary systemically infected seedlings and secondary infection on the foliage and pods. The data were combined to give an indication of the relative susceptibility to downy mildew on a 1-9 scale of increasing field resistance.

1	3	7	8	9
Susceptible	Moderately Susceptible	Slightly Susceptible	Moderate Field Resistance	Good Field Resistance
DaVinci	M89282 CS 424 F	02S52836 CMG 419 AF Fantasy	Reliance	8250833 Cawood Columbus CS 421 AF Genesis M89325 Minotaur PLS 560 Ruthless Sienna Vivaldi

Discussion

Standard Pea Main Trial, Holbeach 2011 - Tables 1 & 2

Growth was more vigorous than the Thornhaugh site. Pea colour was not as even as at the Thornhaugh site and there were blond peas in some of the frozen samples. The yield standard, Bikini yielded very well, giving over 12.11t/ha at TR120.

M 89325 matured at the same time as Avola, was semi-leafless and had similar length

haulm to Avola. Yields of medium size grade peas were higher than Avola and a little lower than Bikini at TR100.

Avola gave lower, but not significantly lower yields than Bikini. Produce was very large size grade.

Vivaldi matured 2 days later than Avola. Haulm was longer than Avola and standing ability similar. Yields were better at TR120, a little lower than Bikini. Produce was uneven in colour and contained several blond peas.

Yeti and M89282 matured 3 days later than Avola.

Yeti had shorter haulm than Avola and similar standing ability. Yields of medium-small size grade peas were higher, but not significantly higher than Bikini. Produce was uneven in colour and contained some blond peas.

M 89282 was semi-leafless, had longer haulm than Avola and better than average standing ability. Yields of medium size grade peas were similar to Bikini at TR120.

DaVinci matured 4 days later than Avola. Haulm length and standing ability were similar to Avola. Yields of medium size grade peas were higher than Avola and similar to Bikini at TR120.

CS 421 AF was semi-leafless and matured 5 days later than Avola. Haulm was long and the variety stood well at harvest. Yields of medium-large size grade peas were similar to Bikini at TR100.

Sienna matured 6 days later than Avola. Haulm was similar in length to Avola and the variety was lodged at harvest. Yields of large size grade peas were significantly higher than Bikini at TR100.

CS 424 F matured 7 days later than Avola. Haulm was shorter than Bikini and standing ability similar to Avola. Yields of large size grade peas were good, higher than Bikini, but significantly so.

Reliance was semi-leafless and matured 8 days later than Avola. Haulm was shorter than Bikini and the variety stood well at harvest. Yields of medium size grade peas were higher than Bikini at TR120, but significantly so.

Minotaur and PLS560 were semi-leafless and matured at the same time as Bikini, 9 days later than Avola.

Minotaur had similar length haulm to Bikini and stood very well at harvest. Yields of medium-large size grade peas were higher, but not significantly higher than Bikini at TR120.

PLS 560 had similar length haulm to Bikini and better than average standing ability. Yields of medium size grade peas were similar to Bikini at TR100.

Bikini gave high yields of large size grade peas.

PLS 566, Compana and Ruler were all semi-leafless and matured one day later than Bikini.

PLS 566 had similar length haulm to Bikini and had average standing ability. Yields were very high, significantly higher than Bikini at TR100. Produce was large size grade.

Compana had longer haulm than Bikini and had average standing ability. Yields of medium-large size grade peas were higher, but not significantly higher than Bikini.

Ruler had longer haulm than Bikini and stood very well at harvest. Yields of large size grade peas were similar to Bikini.

Ruthless and 01S51911 matured 2days later than Bikini.

Ruthless was semi-leafless, had long haulm and stood very well at harvest. Yields of large size grade peas were higher than Bikini at TR120, but not significantly so.

01S51911 lodged at harvest and stood similar to Ambassador. Yields of large size grade peas were higher than Bikini at TR120, but not significantly so.

00S68320, Genesis and Fantasy matured 3 days later than Bikini.

00S68320 lodged similar to Ambassador. Yields of large size grade peas were lower, but not significantly lower than Bikini. Produce was uneven in colour and contained some blond peas.

Genesis was lodged at harvest. Yields of large size grade peas were higher than Bikini, but not significantly so. Produce was uneven in colour and contained some blond peas.

Fantasy had long haulm and stood well at harvest. Yields of large size grade peas were similar to Bikini.

CMG 419 AF and 08250833 were semi-leafless and matured 4 days later than Bikini.

CMG 419 AF had very long haulm and stood very well at harvest. Yields of medium-small size grade peas were similar to Bikini.

08250833 had long haulm and excellent standing ability. Yields of medium size grade peas were higher, but not significantly higher than Bikini.

Cawood matured at the same time as Oasis, 6 days later than Bikini. Haulm was not as long as Ambassador and the variety was lodged at harvest. Yields of large size grade peas were similar to Bikini. Produce was uneven in colour and contained some blond peas.

Oasis was also lodged at harvest. Yields of large size grade peas were good, higher than Bikini, but not significantly higher.

Ambassador matured 7 days later than Bikini and was lodged at harvest. Yields of large size grade peas were similar to Bikini.

Columbus matured one day later than Ambassador and lodged the same as Ambassador. Yields of very large size grade peas were good, higher than Bikini, but not significantly higher. Produce was uneven in colour and contained some blond peas.

02S51209 and **02S52836** matured 2 days later than Ambassador. Both varieties had average standing ability.

02S51209 was the higher yielding of the two and both gave higher, but not significantly higher yields than Bikini. Both varieties gave peas of very large size grade. Produce from

both varieties was uneven in colour and contained some blond peas.

Two Year Summary – Varieties Tested 2010-2011

Standard Size Varieties, Holbeach 2008-2009 or 2010-2011 - Tables 4 & 5

Varieties were evaluated in Standard Main Trials 2010 and 2011.

Eight varieties Yeti, Vivaldi, DaVinci, CS 421 AF, Reliance, Minotaur, Ruthless and Ruler completed two years of evaluation in 2011.

The yield standard, Bikini yielded highly in both years. Yields were the highest in 2010, giving over 12t/ha at TR100, but there was little yield increase at TR120. Several varieties yielded better at TR120 when compared to Bikini. Avola gave low yields, significantly lower than Bikini. Maturity was extended for late maturing varieties in 2011 with Ambassador +17 in 2011 and +11 in 2010. Bikini showed a similar pattern.

Yeti (DS89289) (Maribo Seed) matured 2 days later than Avola. Haulm was a little shorter than Avola and standing ability was average (a little better than Avola). Yields were higher than Avola, but lower than Bikini. Produce was much smaller than Avola, medium-small size grade.

Vivaldi (DS 89326) (Maribo Seed) matured 2 days later than Avola. Haulm was a little longer than Avola and standing ability was similar. Yields were higher than Avola, but lower than Bikini, significantly so at TR100. Produce was medium-large size grade.

DaVinci (DS 89324) (Maribo Seed) matured 3 days later than Avola. Haulm was a little shorter than Avola and standing ability was average (a little better than Avola). Yields were higher than Avola and only a little lower than Bikini at TR120. Produce was smaller than Avola, medium size grade.

Semi-leafless **CS 421 AF** (Crites Seed) matured 4 days later than Avola. Haulm was a little longer than Avola and the variety stood well at harvest. Yields of medium-large size grade peas were lower, but not significantly lower than Bikini.

Maturing 6 days later than Avola, **Reliance** (08240793) (Seminis) was semi-leafless and had slightly longer haulm than Bikini and stood well at harvest. Yields of medium size grade peas were lower than Bikini at TR100, but a little higher at TR120.

Minotaur (082204773) (Seminis) matured at the same time as Bikini, 7 days later than Avola. It was semi-leafless, had slightly longer haulm than Bikini and stood well at harvest. Yields of medium size grade peas were lower than Bikini at TR100, but a little higher at TR120.

Ruler (D 165182) (Syngenta) matured 8 days later than Avola, one day later than Bikini. It was semi-leafless, had better than average standing ability, similar to Bikini. Yields of medium-large size grade peas were a little lower than Bikini, but not significantly so.

Maturing 2 days later than Bikini, **Ruthless** (D 1655188) (Syngenta) was semi-leafless, had long haulm and had similar, standing ability to Bikini. Yields of medium-large size grade peas were than Bikini at TR100, but was a little higher at TR120.

Oasis and Ambassador matured 6 and 7 days later than Bikini respectively. Oasis gave the higher yields, a little higher than Bikini.

Conclusions

Conclusions are drawn from a 2 year summary of varieties evaluated in either 2010/2011.

Vining peas are a unique crop in terms of timely harvesting. Varietal selection is an important and key element of vining pea crop production to ensure a programmed harvest period and to maintain high quality.

Avola gave statistically significantly lower yields than Bikini.

Early and second early varieties Yeti, Vivaldi and DaVinci gave lower yields than Bikini, but yields were higher than the standard early Avola. These varieties yielded better at TR 120 than TR100.

Reliance and Minotaur were a little lower yielding than Bikini at TR100, but a little higher yielding at TR120. Produce size was smaller than Bikini, with fewer peas in the large size grade.

Ruler and Ruthless were a little lower yielding at TR100. Ruthless was a little higher yielding than Bikini at TR120. Both had longer haulm than Bikini and gave similar size grade peas to Bikini.

Several varieties including DaVinci, Reliance, Minotaur, Ruthless and Ruler Showed resistance to powdery mildew, a trait that can be beneficial for late sown and late maturing crops.

Ruthless, Vivaldi, Reliance and Minotaur showed good tolerance to downy mildew.

Technology transfer

No formal trials demonstration was held in 2011 because of the earliness and intensity of the commercial harvest. However, an open invitation was sent out to view the trial at people's convenience.

A two year summary of results was presented at the PGRO Varieties Day on 15 November 2011.

The PGRO publication 'Vining Pea Growers Guide' was produced and distributed and contains 2 year summaries for varieties completing trials in 2008/9 or 2009/10 and 2010/11. Data from other PGRO trials are also presented. This Publication is available free of charge and via the PGRO website.

APPENDICES

Appendix 1

KEY TO SOURCE OF VARIETIES

CS	Crites Seed Inc., USA
LUK	Limagrain UK Ltd, UK
Mar	Maribo Seed A/S, Denmark
Nun	Nunhems Zaden BV., Holland
PFR	Plant & Food Research, New Zealand
SVS	Seminis Vegetabke Seeds, France
Syn	Syngenta Seeds SAS, France

vW

van Waveren, Germany

Appendix 2

PROCESSING DETAILS FOR FROZEN SAMPLES

All samples were sorted to remove damaged or diseased produce and extraneous matter, washed and then blanched in water of 6° hardness. After cooling in tap water and further sorting the samples were packed for freezing.

The processing details for vining peas are given below:-

Blanch:	1.5 min. @ 93°C
Blast frozen	@ -30°C
Stored	@ -18°C