2016

# PGRO VINING PEA GROWERS GUIDE

Advice on agronomy and varieties of Vining Pea including PGRO Descriptive Lists

# CONTENTS

# 1 VINING PEA AREA AND PRODUCTION

**Vining pea production is located on the eastern side of the UK, ranging from East Anglia to north of Montrose in Scotland. The number of hectares has remained relatively stable over the last five years, but has fallen from that at the turn of the century.**

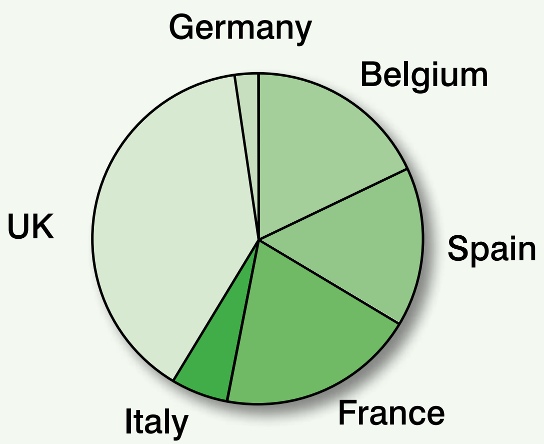
The tables below give estimates of vining pea production over the last five years and the leading frozen pea producing countries.

## UK Vining Pea Production 2011 - 2015

| | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Hectares drilled | 32987 | 32588 | 31720 | 32844 | 34584 |
| Hectares vined | 31065 | 29226 | 26794 | 32820 | 31707 |
| Yield t/ha vined | 4.88 | 3.61 | 5.01 | 4.35 | 4.69 |

Source: The British Growers Association Ltd.

## Leading Frozen Pea Producers




*"The UK is the largest producer of peas for freezing in Europe. We have a unique East facing seaboard which is ideally suited to pea production."*

*Source: www.peas.org/facts/*

Source: UNILET

# 2 DESCRIPTIVE LISTS OF PEAS AND THEIR CHARACTERS

**The introduction of new pea varieties calls for close liaison between growers, processors and plant breeders. PGRO through independent trialling is the prime link between the three parties.**

## Table characters

Varieties are tested in the Preliminary Trial when they are entered for National Listing in an EU member country. Promising varieties are tested for a further two years in the Main Trial. Trials to specifically evaluate petits pois on land best suited to their production have been introduced. Periodically, additional trials funded by the AHDB Horticulture are undertaken where varieties are grouped and sown according to maturity. This allows additional information to be obtained when the varieties are sown at times appropriate for their maturity. Peas were harvested at @TR100 and @ TR120.

Results from current trials are issued in November, together with three-year summaries and disease resistance tests in the Variety Trials Results Manual. Varietal reaction to herbicides is also evaluated and an information leaflet is available.

The tables in this guide describe briefly the characteristics of varieties evaluated over recent years. Details of other varieties are available on request. A summary of field data is given in the tables.

## Resistance to downy mildew

Downy mildew *(Peronospora viciae)* is a soil-borne disease, favoured by cool, moist conditions. It can kill young plants and reduce pod-fill in older plants. Resistance is expressed as susceptible through to good field resistance. It is a variable fungus, with many different races. Occasionally some races may become more dominant in certain growing areas and some varieties may be more susceptible to these. Therefore the ratings may change from year to year.

## Resistance to powdery mildew

Resistance to this disease *(Erysiphe pisi)* is controlled by a single recessive gene and this resistance is therefore fairly robust.

## Data from HDC funded trials

These have been used in compilation of the tables and include:

Evaluation of varieties sown at appropriate commercial timings; FV 154, FV 154a, FV 154b and FV 154c (current); Extension of variety evaluations (silt soil); FV 340, FV 340a and FV340b (current).

## Key to breeder and source of varieties

| | | |
|---|---|---|
| AGIS | = | Karl-H. Schäfer GmbH P.O.Box 1162, D37001 Göttingen Germany |
| CS | = | Crites Seed Inc, Moscow, Idaho, USA |
| DT | = | David Trethewey Seeds, The Seed Store, High Street, Pointon, Sleaford,Lincs, NG34 0LY |
| El | = | Elsoms Seeds Ltd, Pinchbeck Road, Spalding, Lincs., PE11 1QG |
| GA | = | General Availability |
| LUK | = | Limagrain UK Ltd, Rothwell, Market Rasen, Lincs, LN7 6DT |
| Nun | = | Nunhems Netherlands BV, PO Box 4005, 6080 AA Haelen, Holland |
| PFR | = | The New Zealand Institute for Plant & Food Research Ltd, Private Bag 4704 Christchurch |
| PLS | = | Pure Line Seeds Inc, N2651, County Road V, Lodi, WI, 53555-9423 |
| Syn | = | Syngenta CPC4, Capital Park, Fulbourn. CB21 5XE |
| SVS | = | Monsanto Vegetables Ltd, Cambourne Business Park, Building 2030, Cambourne, CB23 6DW. |
| Vil | = | Vilmorin SA, RTE du Manoir, 49250 La Menitre, France |
| vW | = | van Waveren Saaten GmbH, Rodeweg 20, D-37081, Göttingen, Germany |
| WAC | = | W.A.Church (Bures) Ltd, Bures, Suffolk, C08 5JQ |

# DESCRIPTIVE LIST OF STANDARD SIZE VINING PEAS, THORNHAUGH/NOCTON – DATA SUMMARY

Data is derived from at least 3 years trials, but not necessarily the same years. Yields are expressed as a percentage of the yield standard Oasis @TR100 and @TR120 and are only indications of comparative yield. Small yield differences should be treated with caution.

| Variety SL=Semi-leafless | [ ]=No. of trials | Breeder (UK source) | TSW g | @TR 100 Maturity to Avola ±days | @TR 100 Yield % of Oasis | @TR 100 % in size grade L | M | S | VS | @TR 120 Yield % of Oasis | Haulm length cm | Disease Downy mildew | Disease Powdery mildew |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pizarro$^{SL}$ | [6] | SVS | 223 | -1 | 53- | 31 | 45 | 20 | 4 | 54- | 54 | SS | S |
| Salinero | [5] | SVS | 199 | 0 | 53- | 34 | 43 | 18 | 5 | 53- | 50 | SS | S |
| Avola | [40] | SVS (GA) | 223 | 0 | 58- | 44 | 42 | 12 | 2 | 60- | 57 | MS | [S] |
| Tomahawk$^{SL}$ | [3] | CS (EI) | 213 | 0 | 66- | 21 | 57 | 19 | 3 | 74- | 46 | MS | [R] |
| Aloha | [3] | vW (DT) | 219 | 0 | 70- | 33 | 50 | 14 | 3 | 71- | 49 | SS | [S] |
| Twinkle | [6] | LUK | 228 | 0 | 78- | 34 | 50 | 13 | 3 | 81- | 45 | S | [S] |
| Sherwood | [6] | SVS | 195 | +1 | 54- | 22 | 49 | 24 | 5 | 62- | 54 | SS | S |
| Kiss | [3] | vW (DT) | 195 | +1 | 65- | 30 | 52 | 15 | 3 | 72- | 62 | (SS) | [S] |
| Anubis | [6] | LUK | 224 | +1 | 71- | 28 | 46 | 21 | 5 | 74- | 51 | MS | R |
| Span | [3] | CS (EI) | 195 | +1 | 73- | 29 | 49 | 19 | 3 | 74- | 39 | S | [S] |
| Hesbana$^{SL}$ | [6] | Nun | 187 | +2 | 47- | 11 | 50 | 33 | 6 | 49- | 56 | - | R |
| Romance$^{SL}$ | [6] | SVS | 175 | +4 | 72- | 24 | 50 | 22 | 4 | 73- | 51 | GFR | S |
| Savannah$^{SL}$ | [3] | CS (EI) | 214 | +5 | 85 | 58 | 35 | 6 | 1 | 92 | 59 | MS | - |
| Jaguar | [7] | LUK | 189 | +5 | 67- | 30 | 49 | 18 | 3 | 74- | 53 | S | R |
| Sienna | [3] | vW (DT) | 240 | +6 | 95 | 43 | 46 | 9 | 2 | 94 | 42 | SS | S |
| Jubilee | [3] | LUK | 192 | +6 | 76- | 29 | 50 | 18 | 3 | 79- | 55 | S | R |
| Chinook$^{SL}$ | [6] | LUK | 198 | +6 | 82- | 19 | 58 | 21 | 2 | 87- | 44 | MS | S |
| Gusty$^{SL}$ | [3] | vW (DT) | 187 | +7 | 88 | 31 | 55 | 12 | 2 | 83- | 50 | SS | S |
| Payton$^{SL}$ | [3] | PLS (WAC) | 143 | +7 | 63- | 16 | 59 | 22 | 3 | 60- | 50 | MFR | [R] |
| Reliance$^{SL}$ | [3] | SVS | 167 | +7 | 69- | 15 | 57 | 26 | 2 | 68- | 47 | GFR | R |
| Minotaur$^{SL}$ | [3] | SVS | 171 | +7 | 72- | 18 | 57 | 23 | 2 | 75- | 37 | GFR | R |
| Bingo$^{SL}$ | [5] | Syn | 214 | +7 | 78- | 34 | 51 | 13 | 2 | 84- | 49 | SS | R |
| Amalfi | [3] | Syn (EI) | 138 | +7 | 84- | 5 | 39 | 50 | 6 | 85 | 49 | MS | S |
| Novella$^{SL}$ | [3] | Syn | 200 | +8 | 76- | 30 | 53 | 15 | 2 | 76- | 43 | MS | R |
| Bikini$^{SL}$ | [55] | Syn (GA) | 196 | +8 | 78- | 32 | 51 | 15 | 2 | 79- | 44 | MS | S |
| Preference$^{SL}$ | [3] | PLS (WAC) | 208 | +8 | 82- | 36 | 47 | 15 | 2 | 82- | 49 | SS | R |
| Biktop$^{SL}$ | [6] | Syn | 196 | +9 | 89 | 29 | 57 | 13 | 1 | 91 | 43 | GFR | S |
| Ruthless$^{SL}$ | [3] | Syn | 177 | +9 | 74- | 26 | 52 | 20 | 2 | 74- | 57 | SS[HR] | R |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CS-426AF[SL] | [3] | CS (EI) | 192 | +9 | 75- | 20 | 53 | 24 | 3 | 81- | 56 | (SS) | [R] |
| Spandimo[SL] | [6] | SVS | 184 | +9 | 78- | 31 | 56 | 12 | 1 | 76- | 47 | MS | S |
| Boogie[SL] | [6] | vW (DT) | 210 | +9 | 79- | 53 | 43 | 4 | 0 | 79- | 49 | SS | R |
| D85178 | [3] | Syn | 183 | +9 | 80- | 18 | 60 | 20 | 2 | 81- | 67 | MS | [R] |
| Ruler[SL] | [3] | Syn | 211 | +9 | 81- | 32 | 53 | 14 | 1 | 83- | 53 | SS[HR] | R |
| Compana[SL] | [3] | Nun | 179 | +9 | 83- | 15 | 46 | 33 | 6 | 93 | 57 | SS | R |
| Ashton | [6] | SVS | 183 | +9 | 83- | 27 | 58 | 13 | 2 | 84- | 53 | GFR | R |
| Geneva | [7] | Nun | 167 | +9 | 84- | 16 | 51 | 29 | 4 | 89 | 60 | SS | - |
| Tommy[SL] | [6] | LUK | 161 | +9 | 84- | 18 | 59 | 20 | 3 | 85- | 60 | SS | S |
| Charlie[SL] | [3] | LUK | 188 | +10 | 91 | 32 | 57 | 10 | 1 | 89 | 63 | GFR | R |
| Vivado | [3] | Syn | 167 | +10 | 93 | 25 | 58 | 16 | 1 | 94 | 60 | GFR | [R] |
| Urbana[SL] | [6] | Nun | 142 | +10 | 68- | 12 | 49 | 31 | 8 | 71- | 70 | MS | - |
| Quota[SL] | [3] | PLS (WAC) | 162 | +10 | 70- | 14 | 57 | 26 | 3 | 72- | 48 | S | S |
| D165250[SL] | [3] | Syn | 205 | +10 | 78- | 40 | 41 | 16 | 3 | 87 | 53 | MS | [R] |
| Starlight | [6] | LUK | 192 | +10 | 80- | 37 | 43 | 16 | 4 | 79- | 58 | S | S |
| Oasis | [21] | LUK | 195 | +11 | 100 | 34 | 52 | 12 | 2 | 100 | 57 | MS | S |
| Standana[SL] | [3] | Nun | 156 | +11 | 68- | 18 | 64 | 17 | 1 | 71- | 66 | - | [R] |
| Akura[SL] | [6] | SVS | 172 | +11 | 69- | 17 | 46 | 29 | 8 | 67- | 57 | S | R |
| Butana[SL] | [6] | Nun | 180 | +11 | 81- | 18 | 58 | 22 | 2 | 78- | 62 | SS | R |
| Ibis[SL] | [6] | Syn (EI) | 173 | +11 | 87- | 21 | 46 | 26 | 7 | 93 | 59 | GFR | R |
| Acclaim | [3] | PFR(AGIS) | 210 | +12 | 95 | 19 | 57 | 21 | 3 | 102 | 53 | SS | R |
| Geisha[SL] | [6] | LUK | 177 | +12 | 71- | 26 | 51 | 19 | 4 | 72- | 57 | S | S |
| Maurice[SL] | [3] | SVS | 132 | +12 | 76- | 23 | 48 | 23 | 6 | 79- | 62 | (GFR) | - |
| Fantasy[SL] | [3] | vW (DT) | 194 | +12 | 78- | 34 | 51 | 13 | 2 | 75- | 55 | SS | R |
| Serge[SL] | [6] | PLS (WAC) | 173 | +12 | 79- | 40 | 45 | 13 | 2 | 79- | 56 | MS | R |
| Ambassador | [33] | vW (DT) | 205 | +12 | 83- | 41 | 46 | 11 | 2 | 83- | 68 | MS | R |
| Kiros | [6] | vW (DT) | 181 | +12 | 87- | 20 | 52 | 23 | 5 | 83- | 54 | MS | S |
| Hyperion[SL] | [3] | SVS | 159 | +13 | 94 | 14 | 52 | 28 | 6 | 95 | 60 | GFR | R |
| Cawood | [3] | PFR(AGIS) | 216 | +13 | 99 | 31 | 55 | 12 | 2 | 100 | 52 | SS | R |
| Kenobi[SL] | [6] | Syn | 198 | +13 | 85- | 30 | 56 | 13 | 1 | 83- | 58 | MS | R |
| Naches[SL] | [6] | CS (EI) | 198 | +13 | 86- | 37 | 52 | 10 | 1 | 82- | 50 | S | R |
| Terrain | [3] | LUK | 219 | +15 | 85- | 34 | 50 | 14 | 2 | 83- | 71 | GFR | R |
| Columbus | [3] | PFR(AGIS) | 226 | +16 | 78- | 21 | 50 | 24 | 5 | 78- | 58 | SS | R |

## KEY

Size grade classifications: L = large, >10.2mm; M = medium, >8.75-10.2mm; S = small, >7.5-8.7mm; VS = very small, <7.5mm
Yield: + significantly higher than Oasis @p=0.05; - significantly lower than Oasis @p=0.05

**Diseases: Downy mildew:** GFR = Good field resistance; MFR = Moderate field resistance; SS = slightly susceptible; MS = Moderately susceptible; S = Susceptible; HR High resistance; [ ] Breeders information. ( ) 1 or 2 year data; - = no data.

**Powdery mildew:** R = resistant / tolerant; S = susceptible; [ ] breeders information; - = no information

# DESCRIPTIVE LIST OF STANDARD SIZE VINING PEAS, HOLBEACH – DATA SUMMARY

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| Variety SL=Semi-leafless | [ ]=No. of trials | Breeder (UK source) | TSW g | @TR 100 Maturity to Avola ±days | @TR 100 Yield % of Oasis | @TR 100 % in size grade L | M | S | VS | @TR 120 Yield % of Oasis | Haulm length cm | Disease Downy mildew | Disease Powdery mildew |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avola | [7] | SVS(GA) | 217 | 0 | 64- | 52 | 37 | 9 | 2 | 75- | 72 | MS | [S] |
| Aloha | [2] | vW (DT) | 216 | 0 | 64- | 41 | 42 | 13 | 4 | 78- | 65 | SS | [S] |
| Tomahawk[SL] | [2] | CS (EI) | 212 | 0 | 76 | 27 | 52 | 19 | 2 | 98 | 63 | MS | [R] |
| Span | [2] | CS (EI) | 185 | 0 | 81- | 38 | 43 | 17 | 2 | 88 | 54 | S | [S] |
| Salinero | [2] | SVS | 208 | +1 | 91 | 34 | 45 | 18 | 3 | 85 | 68 | SS | S |
| Kiss | [2] | vW (DT) | 183 | +2 | 86 | 30 | 48 | 19 | 3 | 80- | 70 | (SS) | [S] |
| Jubilee | [2] | LUK | 180 | +5 | 83 | 28 | 47 | 22 | 3 | 79- | 70 | S | R |
| Savannah[SL] | [2] | CS (EI) | 210 | +5 | 94 | 52 | 34 | 12 | 2 | 93 | 70 | MS | - |
| Sienna | [2] | vW (DT) | 248 | +6 | 114 | 48 | 47 | 4 | 1 | 107 | 66 | SS | S |
| Jaguar | [2] | LUK | 186 | +6 | 77- | 36 | 45 | 15 | 4 | 92 | 65 | S | R |
| Reliance[SL] | [2] | SVS | 174 | +6 | 88 | 26 | 58 | 13 | 3 | 102 | 70 | GFR | R |
| Gusty[SL] | [2] | vW (DT) | 174 | +6 | 96 | 44 | 47 | 8 | 1 | 84- | 71 | SS | S |
| Amalfi | [2] | Syn (EI) | 133 | +7 | 108 | 8 | 33 | 45 | 14 | 102 | 71 | MS | S |
| Bikini[SL] | [6] | Syn | 198 | +7 | 86- | 38 | 46 | 13 | 3 | 89- | 57 | MS | S |
| Minotaur[SL] | [2] | SVS | 171 | +7 | 87 | 25 | 51 | 20 | 4 | 99 | 69 | GFR | R |
| Charlie[SL] | [2] | LUK | 203 | +8 | 102 | 37 | 53 | 9 | 1 | 98 | 81 | GFR | R |
| Compana[SL] | [2] | Nun | 180 | +8 | 102 | 28 | 53 | 16 | 3 | 98 | 81 | SS | R |
| Biktop[SL] | [2] | Syn | 204 | +8 | 108 | 33 | 51 | 14 | 2 | 111 | 55 | GFR | S |
| Payton[SL] | [2] | PLS(WAC) | 139 | +8 | 83 | 19 | 54 | 23 | 4 | 75- | 68 | MFR | [R] |
| Quota[SL] | [2] | PLS(WAC) | 163 | +8 | 83 | 20 | 65 | 13 | 2 | 77- | 70 | S | S |
| Ruler[SL] | [2] | Syn | 215 | +8 | 87 | 41 | 41 | 14 | 4 | 86 | 75 | GFR | R |
| Preference[SL] | [2] | PLS(WAC) | 213 | +8 | 98 | 51 | 43 | 5 | 1 | 90 | 65 | SS | R |
| Boogie[SL] | [2] | vW (DT) | 206 | +9 | 103 | 50 | 42 | 7 | 1 | 104 | 61 | SS | R |
| D85178 | [2] | Syn | 185 | +9 | 79- | 20 | 61 | 17 | 2 | 75- | 91 | MS | [R] |
| Terrain | [2] | LUK | 204 | +9 | 88 | 42 | 44 | 11 | 3 | 86 | 91 | GFR | R |
| Ruthless[SL] | [2] | Syn | 168 | +9 | 90 | 39 | 45 | 13 | 3 | 97 | 80 | SS | R |
| Geneva | [2] | Nun | 174 | +9 | 94 | 27 | 52 | 18 | 4 | 97 | 64 | SS | - |
| CS-426AF[SL] | [2] | CS (EI) | 194 | +9 | 95 | 29 | 51 | 17 | 3 | 93 | 76 | (SS) | [R] |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fantasy[SL] | [2] | vW (DT) | 202 | +10 | 87 | 45 | 43 | 10 | 2 | 80- | 71 | SS | R |
| D165250[SL] | [2] | Syn | 204 | +10 | 92 | 39 | 47 | 12 | 2 | 87 | 62 | MS | [R] |
| Hyperion[SL] | [2] | SVS | 171 | +11 | 114 | 25 | 59 | 14 | 2 | 107 | 81 | GFR | R |
| Standana[SL] | [2] | Nun | 163 | +11 | 89 | 19 | 57 | 22 | 2 | 91 | 89 | - | [R] |
| Vivado | [2] | Syn | 155 | +11 | 90 | 30 | 51 | 17 | 2 | 86 | 79 | GFR | [R] |
| Oasis | [7] | LUK | 199 | +12 | 100 | 35 | 48 | 14 | 3 | 100 | 77 | MS | S |
| Cawood | [2] | PFR(AGIS) | 217 | +12 | 92 | 37 | 50 | 11 | 2 | 89 | 71 | SS | R |
| Maurice[SL] | [2] | SVS | 128 | +13 | 110 | 28 | 47 | 20 | 5 | 95 | 80 | (GFR) | - |
| Acclaim | [2] | PFR(AGIS) | 197 | +13 | 82- | 20 | 46 | 29 | 5 | 82- | 73 | SS | R |
| Ambassador | [7] | vW (DT) | 216 | +13 | 87- | 36 | 46 | 15 | 3 | 82- | 90 | MS | R |
| Columbus | [2] | PFR(AGIS) | 227 | +14 | 91 | 47 | 40 | 10 | 3 | 94 | 77 | SS | R |

## DESCRIPTIVE LIST OF PETITS POIS VINING PEAS, HOLBEACH – DATA SUMMARY

PGRO

Data is derived from at least 3 years trials, but not necessarily the same years. Yields are expressed as a percentage of the yield standard Waverex @TR100 and @TR120 and are only indications of comparative yield. Small yield differences should be treated with caution.

AHDB HORTICULTURE

| Variety SL=Semi-leafless [ ]=No. of trials | | Breeder (UK source) | TSW g | @TR 100 Maturity to Waverex ±days | @TR 100 Yield % of Waverex | @TR 100 % in size grade L | M | S | VS | @TR 120 Yield % of Waverex | Haulm length cm | Disease: Downy mildew | Disease: Powdery mildew |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Baghera | [5] | Vil (LUK) | 96 | -6 | 83 | 1 | 14 | 45 | 40 | 92 | 66 | S | S |
| Noroit | [3] | Syn | 96 | -2 | 99 | 1 | 17 | 51 | 31 | 104 | 56 | S | R |
| Legato | [3] | Syn (El) | 108 | -2 | 102 | 3 | 23 | 55 | 19 | 101 | 71 | GFR | S |
| Trophee | [3] | Syn | 118 | -2 | 126+ | 1 | 18 | 59 | 22 | 130+ | 70 | MS | S |
| Tendrilla[SL] | [3] | Vil (LUK) | 113 | 0 | 98 | 2 | 23 | 56 | 19 | 106 | 79 | S | S |
| Waverex | [14] | vW (DT) | 117 | 0 | 100 | 3 | 22 | 44 | 31 | 100 | 60 | SS | [S] |
| Louise | [3] | vW (DT) | 87 | 0 | 100 | 0 | 6 | 53 | 41 | 111 | 65 | (MFR) | S |
| Corus | [5] | Syn | 88 | 0 | 79- | 1 | 16 | 53 | 30 | 87 | 61 | GFR | S |
| Katie[SL] | [3] | vW (DT) | 88 | +1 | 88 | 1 | 9 | 49 | 41 | 94 | 67 | (SS) | S |
| Firenza | [3] | Vil (LUK) | 90 | +1 | 92 | 0 | 10 | 50 | 40 | 103 | 62 | GFR | S |
| Oracle | [3] | vW (DT) | 96 | +1 | 98 | 1 | 12 | 47 | 40 | 97 | 66 | - | [R] |
| Rhianna | [3] | vW (DT) | 83 | +1 | 113 | 1 | 12 | 49 | 38 | 112 | 69 | (MFR) | S |
| Ambience[SL] | [3] | SVS | 107 | +1 | 117 | 2 | 21 | 52 | 25 | 120+ | 59 | GFR | S |
| Tiffany | [3] | vW (DT) | 101 | +1 | 78- | 1 | 18 | 53 | 28 | 85 | 60 | - | S |
| Contravert | [3] | Syn | 109 | +3 | 98 | 2 | 28 | 53 | 17 | 89 | 80 | MFR | R |
| Arnesa[SL] | [6] | Nun | 89 | +4 | 90 | 1 | 10 | 45 | 44 | 95 | 61 | SS | S |

### KEY

**Size grade classifications:** L = large, >10.2mm; M = medium, >8.75-10.2mm; S = small, >7.5-8.7mm; VS = very small, <7.5mm
Yield: + significantly higher than Waverex @p=0.05; - significantly lower than Waverex @p=0.05.

**Diseases: Downy mildew:** GFR = Good field resistance; MFR = Moderate field resistance; SS = slightly susceptible; MS = Moderately susceptible; S = Susceptible; HR High resistance; [ ] Breeders information. ( ) 1 or 2 year data; - = no data.

**Powdery mildew:** R = resistant / tolerant; S = susceptible; [ ] breeders information; - = no information

# 4 CHOICE AND USE OF SEED

**A high proportion of seed is imported from USA or Europe, although a significant tonnage is produced in the UK. Seed is relatively fragile, and care should be taken in handling seed as mechanical injury to the seed coat can result in a loss of seed vigour. Seed should be of high germination and free from seed-borne diseases such as Ascochyta leaf spot and pea seed-borne mosaic virus. Vining peas are prone to emergence failure when sown early or in adverse soil and weather conditions.**

## Seed vigour

The ability of seed to survive and emerge in field conditions is known as 'seed vigour'. Vigour can be tested using an electrical conductivity test and results are categorised into levels of vigour. High vigour seeds are suitable for early sowing, but some seedbed losses may occur in adverse conditions if medium vigour seed is used. However, it can be used for later drillings without a problem. Low vigour seed is not suitable for early sowing and very low vigour seed should not be used at all. If by-passed seed is used, it should be tested for germination, seed health and seed vigour. Tests are available from PGRO.

## Seed treatment

Generally, all vining pea seed is treated with a fungicidal seed protectant. Although some varieties have good field resistance to downy mildew, most seed in the UK is treated with a multi purpose product which controls seed-borne Ascochyta leaf spot and protects against soil-borne damping off diseases and downy mildew (Wakil XL).

## Seed size

Seed size is very dependent on growing conditions, variety and can also be influenced by the cleaning process. The 1000 seed weight data (TSW) shown in the Descriptive Lists should be taken only as a guide to the relative seed size of varieties.

## Seed rate and plant populations

The optimum population depends on seed cost and return of produce per hectare. Adjustments should be made accordingly. However, for most situations, a target population of around 100 plants per $m^2$ has been found to be the optimum for most varieties.

Some varieties are sold in units which are pre-calculated weights for a given area. However, for other seed, the seed rate can be calculated from the following formula:

$$\text{Seed rate kg/ha} = \frac{\text{thousand seed weight x target population plants/m}^2}{\text{\% germination}} \times \frac{100}{(100\text{-field loss})}$$

Use of the seed rate formula, and adjustment for expected field losses, is necessary to achieve the most profitable population.

Expected field losses are given in the table below:

| Expected field losses (%) | |
|---|---|
| Sowing time | Vining peas |
| Very early (February) | 15 |
| Early (March) | 10 |
| Mid-season (April) | 5 |

# 5 CROP HUSBANDRY

## Rotation

It is recommended that the rotation carries no more than a single crop of the following group every five years: peas, field or broad beans, green beans, vetches, and lupins. This four-year break is the minimum recommended without increasing the risk of building up persistent soil-borne pests and diseases.

A predictive test for the presence of soil-borne root-infecting diseases is available from PGRO and details are available on request.

## Cultivations

Often land is ploughed in the autumn. This allows natural weathering to aid the production of adequate tilth in the spring with minimal cultivations. Peas are sensitive to an excessive number of wheelings.

On lighter soils, spring ploughing is an option where over-wintered stubbles are required. Here, drilling with a cultivator drill on spring ploughed land is becoming more popular.

## Fertiliser

The requirements of peas are small, but where fertiliser is necessary, it is essential that it is put deep enough into the seedbed to allow full utilisation by the crop. Broadcast fertiliser should be ploughed shallow or applied over the furrows. It can then be worked in by subsequent cultivations, but the production of too fine a tilth and compaction must be avoided. Peas may suffer from sulphur deficiency on poor, light textured soils away from industrial emissions. Where soil deficiency is suspected, apply 25 - 35 kg/ha $SO_3$, as a pre-drilling treatment. This can be in the form of magnesium sulphate, calcium sulphate, potassium sulphate or elemental sulphur.

### The fertiliser requirements of peas (kg/ha)

| Soil index# N,P or K | N | $P_2O_5$ | $K_2O$* | MgO |
|---|---|---|---|---|
| 0 | 0 | 100 | 100 | 100 |
| 1 | 0 | 70 | 70 | 50 |
| 2 | 0 | 40 | 40 (2-) | |
| | | | 20 (2+) | 0 |
| >2 | 0 | 0 | 0 | 0 |

**KEY**

#According to soil analysis on the ADAS classification: 0 = very low, 1 = low, 2 = medium, >2 = high

*Not more than 50 kg/ha $K_2O$ should be combine-drilled, otherwise germination may be affected. The rest should be broadcast.

## Determining sowing dates

The aim is to ensure that sowings reach the desired maturity in succession, providing a smooth progression in harvesting and processing, with a product of consistently good quality. It is therefore necessary to equate the growth between sowings with that expected during harvesting. The intervals between sowings are based upon temperature being the major factor that affects growth, although over-riding corrections may need to be made for other factors, such as soil type.

## The accumulated heat unit system

Accumulated heat units (AHU) may be defined as the difference between the base temperature for crop growth and the mean of the daily maximum and minimum air temperature. The base temperature is that below which no growth occurs and it varies between different crop species: in the case of peas it is 4.4°C. So, if the daily mean is 12.5°C and after subtracting the base temperature (4.4°C), 8.1 AHU are recorded. A negative AHU value is NOT subtracted from the running total.

To plan sowings it is first necessary to consider the conditions which are to be expected during the vining season. Mean temperatures of 16°C, giving 11.6 AHU, are typical of Eastern England. 11.6 AHUs need to accumulate between drillings. Drillings are likely to be relatively infrequent in February and March, but could well be made every second or third day in early May.

Often a credit is given to temperatures below 4.4°C with some growth value, such as 0.5 heat unit values being given to mean temperatures between 2.2°C and 4.4°C. Meteorological Office leaflet No. 10 describes a method of heat unit accumulation based on maximum and minimum temperatures and a base temperature (and or upper limit). The only situation where no heat units are collected is when the maximum temperature falls below the base temperature.

## Observations on growth

Observations on the development of seedlings, in terms of radicle length and emergence, can be used as a means of checking the influence of weather conditions in relation to growth.

## Integration of varieties

By using several varieties and exploiting their maturity differences, more effective use can be made of a limited sowing season. To integrate varieties into a sowing program their maturity must be accurately defined.

For example, Bikini is 8 days later to mature than Avola. To ensure that Bikini is ready for harvesting on the day following Avola, sowing of the two must overlap by the equivalent of 8 days worth of AHU (i.e. 8 x 11.6 = 92.8 AHU).

## Row width and plant population

Peas should not be sown in rows wider apart than 20cm. Narrower rows result in higher yields and tend to give more even crops, better weed competition and easier vining. Peas sown with a precision drill emerge evenly and are well spaced to allow rapid growth in the early stages. They also tend to reach a more even maturity around 2 days before non-precision drilled crops. An adequate plant population is essential since low populations are more difficult to harvest, later maturing and more prone to bird damage.

## Drilling and rolling

Most cereal drills are suitable for peas. The drill should be accurately calibrated for each seed lot before sowing. Seeds should be sown so that they are covered by at least 3cm of settled soil after rolling. On most soil types it is necessary to roll the field to depress stones in order to avoid damage to the viner, and for effective pre-emergence weed control. Rolling should be done soon after sowing but prior to the application of pre-emergence herbicide and well before emergence.

## Irrigation

Vining peas are very responsive to irrigation. However, irrigation rarely increases yield if applied before the start of flowering, unless the seedbed is very dry and adequate germination would not otherwise occur, or if the crop is severely wilted. Peas are most responsive when the first flowers are opening. Irrigation at late flowering or petal fall does not result in a yield increase and may encourage *Botrytis* infection if the weather becomes wet. Irrigation is also beneficial if drought is affecting crops during pod filling, but irrigation occurring when the average TR is around 80 delays the maturity by around 2 days. Typical irrigation amounts are 25mm at the start of flowering and 30mm during pod filling.

# 6 WEED CONTROL

It is important to control weeds in vining peas to avoid harvest problems and crop rejection from contamination

**Since the pea crop is not very competitive and easily dominated by weeds during early development, a suitable pre-emergence herbicide application is advisable. Weeds not only reduce yields, they can seriously affect the handling of the crop and the quality of the produce. Viner throughput and the efficiency of produce recovery will be seriously reduced by the bulk of weed debris passing through the drum. Contamination of the produce with weed debris such as thistle, poppy, mayweed seed heads and berries from black-nightshade and volunteer potatoes can result in crop rejection. A number of pre- and post-emergence herbicides are available and a list of currently approved herbicides can be found in PGRO Technical Updates TU18 & TU22. Pre-emergence herbicides are best applied to a rolled, clod-free, moist seedbed.**

## Broad-leaved weeds

General control of annual broad-leaved weeds can be achieved pre-emergence with a soil-applied residual herbicide or, when weeds and crop have both emerged, with a foliar-applied post-emergence product.

Where soil type allows, it is advisable to use a pre-emergence herbicide. It removes weed competition early and gives better control of some weeds (for example, knotgrass and annual meadow-grass). However, adequate soil moisture is needed for good efficacy of a residual herbicide. Pre-emergence Stomp Aqua (pendimethalin), via an EAMU, Nirvana (imazamox + pendimethalin) and Lingo (linuron + clomazone) are effective. Pre-emergence cleaver control is possible using Lingo or Centium 360CS (clomazone). Centium alone has a limited spectrum of activity and is typically used with a partner product. Remember to check product labels for rate of use and soil type restrictions.

Post-emergence sprays should be applied to well waxed peas (tested with crystal violet dye). Full Basagran rates can be applied from 3 nodes. It has useful activity on volunteer oilseed rape and small cleavers but less so on black-bindweed and fat-hen. MCPB controls thistles and docks and effectively stunts volunteer oilseed rape. Check product labels for any varietal restrictions. Basagran + MCPB mixes are permitted but past work has shown an increased likelihood of crop effects.

### Volunteer oilseed rape
This can be a serious problem if it is grown in the same rotation. Pre-emergence, higher rates of Nirvana can be effective. However, control of oilseed rape germinating from depth may be incomplete. If not controlled, a post-emergence treatment will be required. The least expensive herbicide is MCPB and can be effective if the oilseed rape is relatively small. Larger plants are stunted / suppressed rather then controlled by MCPB. If infestation is severe use a post–emergence application of Basagran alone.

### Wild oats
Infestations of wild-oats can cause severe yield reduction. Post-emergence graminicides such as Fusilade Max (fluazifop-p-butyl), Laser (cycloxydim) + oil, Pilot Ultra (quizalofop-p-ethyl) and Aramo (tepraloxydim) give good control. A pre-emergence treatment with Avadex Excel 15G (tri-allate) is also an option.

### Couch
Couch is best controlled pre-harvest in the previous cereal crop or in the autumn with products containing glyphosate. Although several permitted graminicides do give some couch control, the recommended rates are uneconomic.

### Other grass weeds
Generally post-emergence graminicides control black grass and volunteer cereals. Aramo has activity on both target site and enhanced metabolism resistant populations of black grass and offers effective control of annual meadow-grass. Laser is only effective on enhanced metabolism resistant black grass populations. It is advised that you do not rely solely on the graminicides mentioned to control high populations of blackgrass. In these situations, combinations of ploughing, stale seedbed practices, perhaps using Avadex 15G (tri-allate) pre-emergence with post - emergence graminicide options, will be more effective.

### Volunteer potatoes
Some potato varieties produce toxic berries which can contaminate produce and lead to crop rejection. There are EAMUs for flumioxazin products Digital, Guillotine and Sumimax which have been found to be effective. There may also be some activity on oilseed rape, mayweed, groundsel, charlock and cleavers. Applications of up to 100ml/ha are permitted and applied from 4/5 nodes of a well waxed crop. No adjuvants or tank-mixes are permitted and if foliage is wet or rainfall occurs shortly after spraying the level of crop damage can increase. There is a 42 day harvest interval with these products.

There are now EAMUs for Roundup Flex and Roundup Energy. Applications must be made by a spot spray hydraulic nozzle used in conjunction with an automated optical weed recognition system. Realistically, effective control of volunteer potatoes emerging early with the crop will only be achieved using this option.

*See PGRO TU26 for more details.*

### Mechanical weeding
Trials have shown that some control of shallow-rooted annual weeds can be gained using mechanical weeding methods at early growth stages (GS 102 - 105). Such treatment is more effective on lighter soil types and should be made when the surface is dry. Passes with an Einbock type weeder may be made along or across rows without causing significant damage to the crop. Later passes can be made along the rows but may cause damage to pea crops - especially when they have begun flowering. Severe damage will be sustained if passes are made across the rows at later growth stages.

# 7 DISEASES

**Many factors can affect growth of the pea crop, and the section below describes the main diseases which reduce yield and quality. Further information, and colour photographs of symptoms and damage may be obtained from the publication Pea and Bean Pests, Diseases and Disorders - and a list of currently approved pesticides can be found in PGRO TU12 and TU14.**

## Downy mildew *(Peronospora viciae)*

This disease produces resting spores, which persist in the soil and initiate primary infections in young pea plants. Though secondary infections can develop, particularly in cool, damp conditions, they are rarely as damaging as primary infections, which can kill plants before flowering. The most reliable means of control is to use a seed treatment (Wakil XL). This is used to give initial disease control to varieties with a good level of field resistance, and it is advisable that seed treatment is used where high levels of disease have occurred before, or where susceptible varieties are grown, since there is no effective method for control after sowing.

## Leaf and pod spot

Leaf and pod spots are caused by three fungi, *Ascochyta pisi, Mycosphaerella pinode*s and *Phoma medicaginis*, which may be spread by seed infection, soil or plant debris. The most frequent is *M. pinodes*, which can cause losses in both yield and quality in wet conditions. The use of disease-free seed will help to reduce the incidence of disease. By-passed seed should be tested. Wakil XL seed treatment is recommended for the control of disease at certain levels of infection. Fungicides such as azoxystrobin, metconazole, Signum (pyraclostrobin+boscalid) or Switch (cyprodinil+fludioxinil) can give useful control of the disease in the crop.

## Botrytis, or grey mould *(Botrytis cinerea)*

This can affect stems and pods during wet weather, and is initiated when the remains of petals adhere to plant parts after pod set. A fungicide application at first pod may be required to prevent *Botrytis* infection when wet or damp weather occurs during flowering. Suitable products include azoxystrobin, Switch or Signum.

## Sclerotinia *(Sclerotinia sclerotiorum)*

Where the disease is a regular occurrence, especially where the rotation includes vegetables, oilseed rape or potatoes, a preventative spray at first pod will reduce the risk of contamination by sclerotia. Both azoxystrobin and Switch are effective.

## Powdery mildew *(Erysiphe pisi)*

Occasionally late maturing crops may become covered with a grey-white film of powdery mildew. Several varieties are resistant to powdery mildew and the PGRO Descriptive List of Varieties gives details of this. The disease can delay maturity and taint produce. Some degree of protection is given by approved sulphur formulations (EAMU).

## Foot and root rots

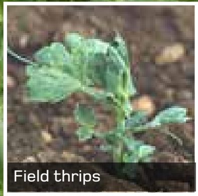
Several species of fungi cause foot and root rots. The effects of these diseases are particularly common on land with a history of frequent pea cropping. Good drainage and avoiding compaction can help to minimise losses. A soil test, which predicts the likelihood of soil-borne disease causing serious yield loss in future crops, is available. There is no means of controlling foot rots satisfactorily once they become established in a field, other than extended cropping with non-legume species. *Sclerotinia sclerotiorum* causes a stem rot rather than a foot rot, but affects peas, oilseed rape, linseed, potatoes and certain field vegetables. This should be remembered when planning rotations in areas where *Sclerotinia* has occurred.

## Pea Seed-borne Mosaic Virus *(PSbMV)*

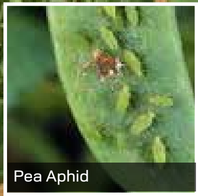
The virus is seed-borne and transmitted by aphids. Damage is characterised by blemished undersized peas, often displaying a tennis ball marking on the surface of the seed. Plant growth is dwarfed and leaves tend to be rolled. The virus is non-persistent in the aphid and transmission from infected seedlings is rapid. Aphid control is helpful in reducing spread but not wholly effective. The use of healthy seed is the only means of prevention. By-passed seed is often the source of infection.

# 8 PESTS

Pea moth



Field thrips



Pea Aphid

Pea weevil damage

**Many factors can affect growth of the pea crop, and the section below describes the main pests which reduce yield and quality. Further information, and colour photographs of symptoms and damage may be obtained from the publication Pea and Bean Pests, Diseases and Disorders, and a list of currently approved pesticides can be found in PGRO TU14.**

## Pea weevil *(Sitona lineatus)*

Weevil may cause damage if large numbers appear when plants are small and, in particular, in cloddy seedbeds and in conditions of slow growth. Leaves of attacked plants show characteristic 'U' shaped notches around the edges, but the main damage occurs as a result of the larvae feeding on the root nodules. Sprays may be applied at the first sign of leaf damage and repeated after 7-10 days.

** A monitoring system is available from Agralan Ltd (The Old Brickyard, Ashton Keynes, Swindon SN6 6QR) to predict the likely severity of attack.*

## Field thrips *(Thrips angusticeps)*

Field thrips feed on the leaf surface of emerging seedlings which results in a thickening and puckering of the tissue. Seedlings may appear pale in colour. Although further damage can be checked by spraying, in the majority of cases the peas will outgrow the effects of thrips, and yield improvement may not be achieved following treatment.

## Pea aphid *(Acyrthosiphon pisum)*

Aphids can cause severe yield loss when present in large numbers, and early infestations can result in crops becoming infected with pea enation mosaic virus. Infested crops can also be contaminated by the aphid predator, hoverfly pupae. Aphids should be controlled as soon as colonies can be found on 15% of plants, particularly where crops have commenced flowering.

## Pea moth larvae *(Cydia nigricana)*

These feed upon the developing seeds within the pod. Damage to the peas can result in crop rejection. The Oecos pheromone pea moth trapping system should be used to assess the need for treatment. Where moths are caught in the traps, the crop should be sprayed as soon as possible when the first pods are visible.

** Pea moth traps are available from Oecos at 11A High Street, Kimpton, Hertfordshire SG4 8RA*

## Pea cyst nematode *(Heterodera gottingiana)*

This is a very persistent soil-borne pest, often causing severe yield loss. Frequent cropping of peas and *Vicia faba* beans favours the build-up of infestations, and an adequate rotation is essential to minimise the risk of occurrence. Affected plants are stunted and pale, and the root systems do not develop nitrogen-fixing nodules, but become studded with white, lemon-shaped cysts. Correct diagnosis is essential as subsequent pea crops grown in infested fields risk complete failure.

## Slugs and snails

*(Deroceras reticulatum, Cernuella sp, Cepaea sp)*

Slugs can feed on emerging seedlings but most commonly, both slugs and snails can occur as contaminants in vined peas. Slugs populate and favour heavier wetter soils, whilst snails frequent chalky soils and migrate to the crop from field margins. High slug populations occur in rotations which include oilseed rape. Populations can be assessed using a board placed on the soil baited with dry layers' mash. Pelleting during early pod set is the most effective way of reducing slug numbers if they are present in wet summers. Night time harvesting of wet crops should be avoided. On chalky soils, a 2m rotovated barrier of bare soil should be maintained around the crop to discourage migration from surrounding lank vegetation.

## Silver Y moth *(Autographa gamma)*

Contamination of the peas by the caterpillar can result in crop rejection. Adult moth activity can be assessed using a pheromone monitoring system (Agralan), and where a cumulative catch of 50 moths has been recorded, crops should be sprayed 10 days later.

## Pea midge *(Contarinia pisi)*

Infestations can occur in areas of intensive pea production. Yield can be severely reduced and spoilage of produce can occur. Adults fly to peas which are at the early bud stage and lay eggs at the base of the developing flower buds. Larvae feed within the bud, making them sterile and can cause growth distortion of the growing point. Midge can be monitored using a pheromone monitoring system (Oecos) and crops should be sprayed as they reach the early bud stage where trapping indicates a high population. A second spray may be necessary where adult infestation is high.

# 9 HARVESTING


## Time of harvest and Pea Tenderometer

The Pea Tenderometer is used to measure the stage of maturity of peas to determine whether they are ready for harvesting. It measures the force required to effect a shearing action through a pea sample. Readings are expressed in tenderometer units. The tenderometer reading (TR) and yield of the cleaned produce are often used to determine grower payments.

To ensure individual tenderometers give comparable and consistent readings, they should be checked at the beginning of the season and at further periodic intervals, against a 'master' tenderometer. PGRO maintains the 'master' and offers a standardisation service.

## Harvesting

Complete pea harvesters are in operation throughout the world and combine the operations of picking, threshing and cleaning. Pods are stripped from the vine and transferred by a series of conveyers to the threshing drum, where peas are threshed from the pods. The peas fall through a set of screens that are kept clean by rotating brushes positioned along the length of the threshing drum. The peas and some waste exit the threshing drum and pass through cleaning processes to remove further waste material. Waste material is discharged onto the field, and any unthreshed pods are returned to the threshing drum. Peas are stored on-board in a hopper before being unloaded.

### Post harvest treatment

Vined peas are unloaded and transported to the processing factories usually situated within a three hour delivery radius of the fields. Currently there are 8 freezing factories and 1 canning factory processing peas in the UK. Premium quality peas are vined, delivered and frozen within 120-150 minutes

### Cooling

Some peas are cleaned and chilled in water at 4°C. Chilling slows down the rate of conversion of sugar to starch, allowing more time for delivery to the factory.

### Cleaning

On arrival at the factory, the peas are sampled to ascertain the tenderometer value and the level of extraneous matter which may include pods, stalks, stones, slugs, caterpillars, snails etc. This is used to calculate the value of the peas based on fresh, clean weight. Peas are either tipped into bulk hoppers with moveable belts or into holding pits with elevators that transport the peas over the cleaning processes.

### Pneumatic separators and shakers

Usually, the first part of cleaning involves blowing a stream of air through the flow of peas to remove lighter material such as leaf and small pieces of EVM (Extraneous Vegetable Matter).

### Pod and stick screens

The peas are fed over vibrating screens which allow the peas and smaller contaminants to fall through and any large contaminants such as stones, pods, twigs and any animals to go to waste. The peas and small contaminants drop into water. The peas are delivered by bucket elevator, belts or water flumes for further cleaning.

### Flotation washers

Stones and grit are removed by passing the peas against the flow of water over a ridged moveable belt. The peas go into flotation chambers where they sink in water and the finer material floats over a weir for waste collection. The cleaned peas are usually washed with clean water in a revolving drum before starting the cooking stage. In some cases, electronic colour sorting is used to remove stained peas or other EVM missed by the earlier processes.

### Blanching

Clean peas are delivered to the rotary blancher where they are dropped into water at 96°C for approximately 90 seconds. Blanching can also be carried out in steam, which is more energy and water efficient, but the same principle applies. The heating process stops the enzymes converting sugars into starch so keeping young peas sweet. Peas are then cooled in clean, chlorinated water.

### Freezing

Two types of freezer are used in the processing industry, a vibratory bed system and a belt system. Both use refrigerated air blown through a transporting system set within an insulated box. Vibratory bed freezers push refrigerated air through small holes in the aluminium floor of the bed. The angle of the holes allows the peas to be moved along the bed in a wave motion to the freezer outlet. Some beds also vibrate to keep the peas individually quick frozen (IQF). In the belt freezer, peas sit on a wire mesh belt through which cold air is forced as the belt is driven through the refrigerated freezer box.

### Collection

Frozen peas can be optically sorted at this stage and many are also put across vibratory slotted screens to remove any further debris. The peas are usually collected into totes, boxes, octobins or palletainers. At this stage further quality control tests are undertaken and the final grade, TR, grower details, variety, batch number and field records for each load are recorded to provide full traceability. Peas are then transferred to the cold store to await sale in bulk or to be repacked into retail and wholesale packs.

### Canning

The canning operation takes place immediately after cleaning and blanching. Cans are filled automatically with peas and a brine solution which may contain water, salt and sugar. After sealing, the cans are cooked at 121°C in a pressurised retort for several minutes. The cans are then cooled before labelling and packing.

# APPENDIX 1.

**Key pea growth stages taken from BBCH monograph: Growth stages of mono - and dicotyledonous plants 2. Edition, 2001 (Weber and Bleiholder, 1990; Feller et al., 1995b)**

| | CODE | DESCRIPTION |
|---|---|---|
| Principal growth stage 0: Germination and emergence | 00 | Dry seed |
| | 07 | Shoot breaking through seed coat |
| | 08 | Shoot growing towards soil surface; hypocotyl arch visible |
| | 09 | Emergence: shoot breaks through soil surface |
| Principal growth stage 1: Leaf development | 11 | First true leaf (with stipules) unfolded or first tendril developed |
| | 12 | 2 leaves (with stipules) unfolded or 2 tendrils developed |
| | 1.. | Stages continuous until |
| | 19 | 9 or more leaves (with stipules) unfolded or 9 or more tendrils developed |
| Principal growth stage 5: Inflorescence emergence | 51 | First flower buds visible outside leaves (enclosed bud) |
| | 55 | First separated flower buds visible outside leaves but still closed |
| Principal growth stage 6: Flowering | 61 | Beginning of flowering: 10% of flowers open |
| | 62 | 20% of flowers open |
| | 64 | 40% of flowers open |
| | 65 | 50% of flowers open (first pod) |
| | 67 | Flowering declining |
| | 68 | End of flowering |
| Principal growth stage 7: Development of fruit | 74 | 40% of pods have reached typical length; TR value 95 |
| | 79 | Pods have reached typical size (green ripe): peas fully formed |
| Principal growth stage 8: Ripening of fruit and seed | 81 | 10% of pods ripe, seed final colour, dry and hard |
| | 82 | 20% of pods ripe, seed final colour, dry and hard |
| | 8.. | Stages continuous until |
| | 89 | Fully ripe: all pods dry and brown. Seeds dry and hard (dry ripe) |
| Principal growth stage 9: Senescence | 97 | Plants dead and dry |
| | 99 | Harvested product |

*Source: Extract from the internationally recognised BBCH crop growth stage key (BBCH - Biologische Bundesanstalt, Bundessortenamt and CHemical industry).*

# APPENDIX 2. VINING PEA TECHNICAL UPDATES & OTHER USEFUL PUBLICATIONS

| NUMBER | DESCRIPTION |
|---|---|
| TU01 | Manganese Deficiency & Marsh Sport |
| TU02 | Pea Midge |
| TU03 | Pea Moth |
| TU04 | Silver Y Moth |
| TU05 | Pea Aphid |
| TU07 | Field Thrips in Beans & Beans |
| TU08 | Pea & Bean Weevil |
| TU12 | Fungicides For Peas |
| TU14 | Checklist Of Fungicides & Insecticides For Vining Peas |
| TU18 | Choice Of Herbicides For Vining Peas |
| TU22 | Checklist Of Herbicides For Vining Pea Crop |
| TU26 | Volunteer Potato Control In Vining Peas |
| TU32 | Pea & Bean Seed Quality |
| TU33 | Seed Treatment For Peas & Beans |
| TU34 | Soil-Borne Disease Test For Pea Fields |
| TU35 | Electrical Conductivity Test For Vining Pea Seed |
| TU36 | Pea Leaf Wax Assessment |
| TU37 | Tenderometer Standardisation & Maintenance |
| TU38 | Optional Extra Services |
| TU39 | Maize in the rotation |
| TU41 | Cover crops and legume based rotations |

## OTHER USEFUL PUBLICATIONS AND SOURCES OF INFORMATION

**Pea** *(Pisum sativum)* **Growth stage key** – PGRO leaflet

**Pests, diseases and disorders** – PGRO booklet

**Colour handbook of pests, diseases and disorders of peas and beans** – Manson Publishing

**Crop Walkers' Guide** - Pea and bean – Horticultural Development Company (HDC)

**Pea aphid** – HDC Factsheet

**Silver Y moth** – HDC Factsheet

**Irrigation of vining peas** – HDC Factsheet

**Yes Peas** www.peas.org

**British Society of Plant Breeders** www.bspb.co.uk

**Agriculture and Horticulture Development Board** horticulture.ahdb.org.uk

UK Vining Pea Industry Conference www.ukpeasandbeans.com

PGRO is one of the few independent, applied research organisations easily accessible to its levy payers and processor members for sound, up to the minute advice on all aspects of growing vining peas. Your voluntary levy contribution funds a substantial amount of near market research, including the PGRO Descriptive Lists of vining pea varieties, crop protection, and general agronomy trials. It also funds the knowledge transfer events which PGRO staff organise or attend. The Legumes Panel, with a wide range of members from across the industry, meets twice each year to decide on the research priorities.

An advisory service on all aspects of vining pea crop production is provided without additional charge for members of PGRO. This includes a plant clinic where samples of seed or plants affected by pests, diseases or other problems may be submitted for diagnosis and wherever necessary, members of staff will carry out investigations in the field. In addition, PGRO provides a full range of seed tests to evaluate seed health and quality, for which an additional charge is made.

For the latest PGRO crop updates, technical updates and other information visit our web site at **www.pgro.org**





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AHDB HORTICULTURE


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