

ΦΟΥΝΤΟΥΚΙΑ

- Καταγωγή: Β. Ημισφαίριο
- Βοτανική ταξινόμηση:
 - Οικ.: Betulaceae
 - *Corylus avellana*

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

● Βοτανικοί Χαρακτήρες

- Φυλλοβόλο
- Θάμνος
- Μόνοικο, δίκλινο

➤ Φύλλα

- Απλά, κατ'εναλλαγή, οδοντωτά

➤ Οφθαλμοί

- Μικτοί, ξυλοφόροι, απλοί ανθοφόροι (ιουλοφόροι)
- Πράσινο χρώμα

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

➤ Καρπός

- Κάρυο με ξυλοποιημένο περικάρπιο
- Καρπός παράγεται μέσα σε φυλλώδες περίβλημα

● Τρόπος καρποφορίας

- Από μικτούς οφθαλμούς, επάκρια, σε ξύλο τρέχουσας περιόδου

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

● Επικονίαση και γονιμοποίηση

- Καρπόδεση: Επικονίαση και γονιμοποίηση
- Διχογαμία αλλά και αυτοστεριρότητα
- Χρειάζεται η σταυρεπικονίαση
- Επικονίαση γίνεται στα μέσα του χειμώνα και είναι μακράς διάρκειας
- Μία πλήρη σειρά επικονιάστριας για κάθε δέκα σειρές ποικιλίας
- Η γονιμοποίηση γίνεται περίπου 4-5 μήνες μετά την επικονίαση

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

Figure 5. Average Julian Days to the commencement of pollen shed (PS) and bloom (Blm) for four genotypes at four of the field sites, along with their duration (Dur)

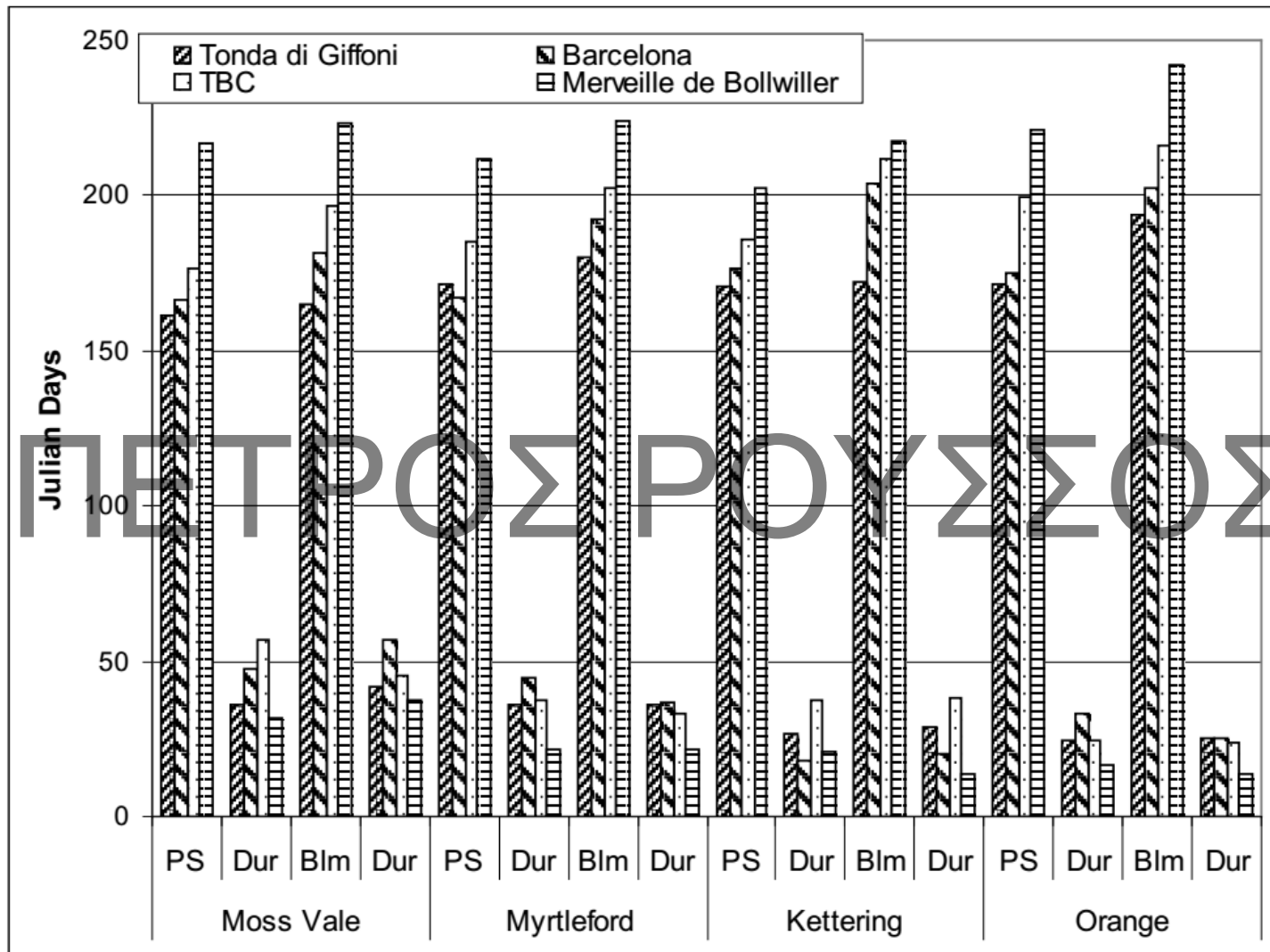


Table 9. Average Julian Days (JD) to the commencement of pollen shed and female bloom, with duration of flowering for Myrtleford and Orange, along with estimates of floral chill requirements

| Variety | JD to start of pollen shed | Av.date to start of pollen shed | Duration of pollen shed (days) | JD to start of female bloom | Av.date to start of female bloom | Duration of female bloom (days) |
|---|----------------------------|---------------------------------|--------------------------------|-----------------------------|----------------------------------|---------------------------------|
| TGDL | 152 | 1 June | 25 | 182 | 1 July | 28 |
| Atlas | 160 | 9 June | 37 | 175 | 24 June | 50 |
| Tonollo | 167 | 16 June | 34 | 199 | 18 July | 25 |
| Sicilian | 168 | 17 June | 32 | 189 | 8 July | 32 |
| Montebello | 170 | 19 June | 34 | 181 | 30 June | 37 |
| Segorbe | 170 | “ | 38 | 215 | 3 Aug | 25 |
| Tonda di Giffoni | 171 | 20 June | 30 | 188 | 7 July | 31 |
| Barcelona | 171 | “ | 39 | 196 | 15 July | 32 |
| Royal | 178 | 27 June | 33 | 217 | 5 Aug | 28 |
| Riccio de Tallanica ¹ | 179 | 28 June | 19 | 210 | 29 July | 12 |
| Ennis | 180 | 29 June | 38 | 226 | 14 Aug | 27 |
| Victoria | 183 | 2 July | 36 | 217 | 5 Aug | 25 |
| Willamette | 183 | “ | 29 | 201 | 20 July | 33 |
| Butler | 186 | 5 July | 28 | 226 | 14 Aug | 30 |
| Negret | 190 | 9 July | 23 | 195 | 14 July | 36 |
| Wanliss Pride | 191 | 10 July | 24 | 193 | 12 July | 35 |
| Lewis | 192 | 11 July | 28 | 205 | 24 July | 32 |
| TBC | 192 | “ | 31 | 210 | 29 July | 28 |
| Turkish Cosford ² | 193 | 12 July | 21 | 228 | 16 Aug | 7 |
| Tonda Romana (Ferrero) ¹ | 193 | “ | 19 | 219 | 7 Aug | 19 |
| Casina | 195 | 14 July | 25 | 228 | 16 Aug | 22 |
| Hammond 17 | 196 | 15 July | 29 | 229 | 17 Aug | 29 |
| Square Shield | 200 | 19 July | 27 | 223 | 11 Aug | 30 |
| Daviana | 200 | “ | 21 | 227 | 15 Aug | 24 |
| Du Provence ² | 200 | “ | 21 | 228 | 16 Aug | 28 |
| Eclipse | 205 | 24 July | 23 | 227 | 15 Aug | 22 |
| Wandiligong (NE Barcelona) ² | 210 | 29 July | 16 | 233 | 21 Aug | 23 |

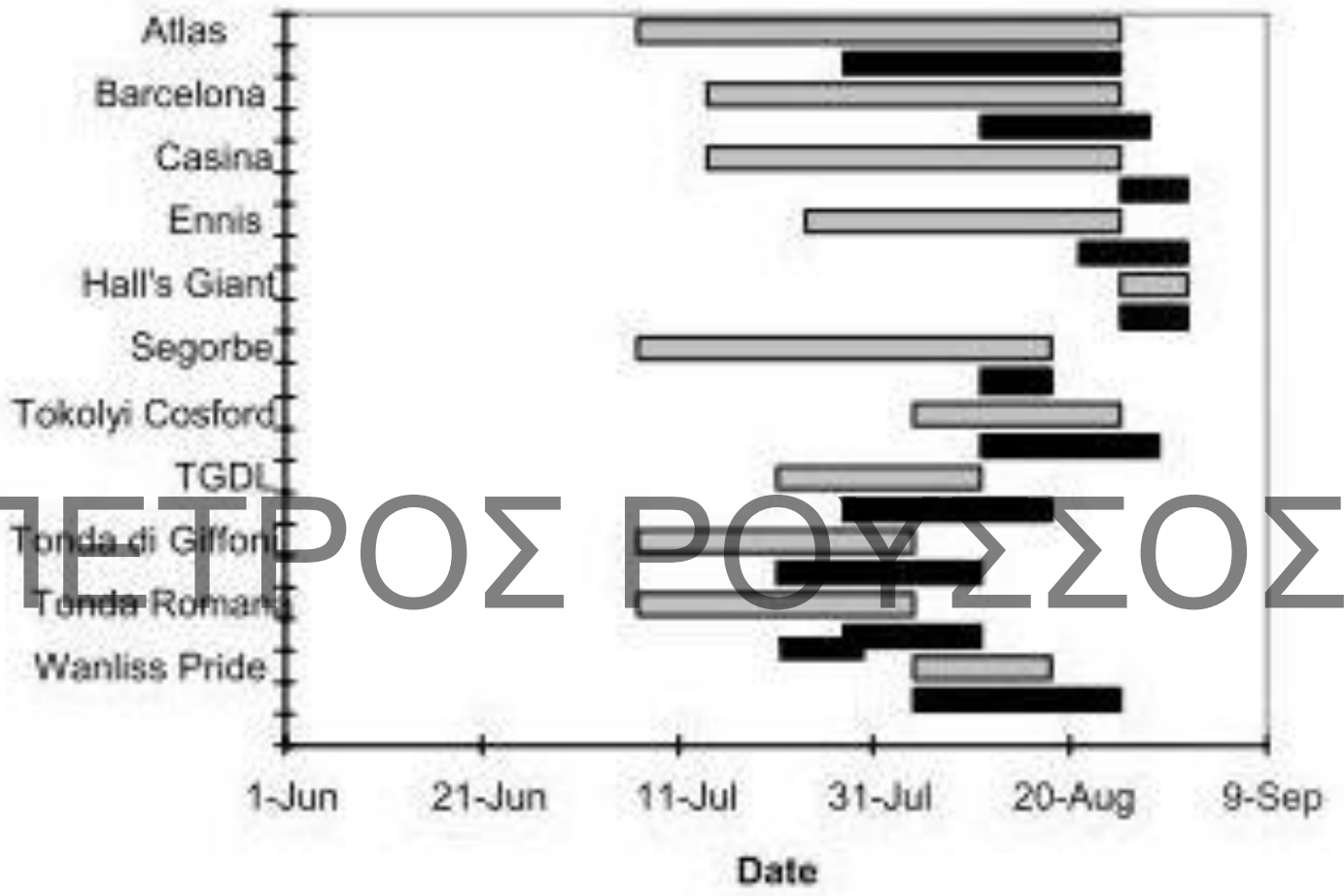
Table 10. Relative number of catkins (1=few - 5=many) produced on average at each site for the 5-6 year period

| Varieties | Mean | Orange | Myrtleford | Moss Vale | Kettering | Toolangi |
|----------------------------------|------|--------|------------|-----------|-----------|----------|
| Kentish Cob | 5.0 | | | | 5.0 | |
| TBC | 4.6 | 4.0 | 4.0 | 4.8 | 4.8 | 4.8 |
| Hall's Giant ¹ | 4.2 | 3.7 | 4.0 | 4.1 | 4.7 | 4.5 |
| Woodnut | 4.2 | | 3.1 | | 5.0 | |
| Victoria | 4.0 | 4.3 | 4.3 | 3.3 | 4.8 | 4.5 |
| Square Shield | 3.6 | 4.1 | 3.9 | 2.5 | 4.7 | 4.8 |
| Jemtegaard # 5 | 3.6 | | 3.7 | | | |
| "Sicilian" | 3.4 | 2.5 | 3.6 | 4.0 | 4.5 | 4.3 |
| Eclipse | 3.2 | 3.4 | 3.8 | 1.5 | 4.5 | 3.8 |
| Lewis | 3.2 | 3.0 | 3.7 | 2.7 | 3.2 | |
| Willamette | 3.2 | 3.3 | 3.2 | 4.3 | 2.8 | |
| Ennis | 3.1 | 2.8 | 4.1 | 4.0 | 3.3 | 1.5 |
| Segorbe | 3.1 | 3.8 | 3.8 | 3.5 | 1.5 | 1.8 |
| Tonda di Giffoni | 3.1 | 2.5 | 3.3 | 3.0 | 2.7 | 3.5 |
| Casina | 3.0 | 3.1 | 3.4 | 4.3 | | 2.0 |
| Montebello | 3.0 | 2.6 | 0.0 | 0.0 | 4.2 | |
| Tonda Romana(Ferrero) | 3.0 | | 3.0 | | | |
| Hammond 17 | 2.9 | 1.5 | 2.5 | | 4.3 | |
| Royal | 2.9 | 3.0 | 3.7 | | 4.2 | |
| Daviana | 2.7 | 1.0 | 4.0 | | | |
| Riccio di Tallancio (Ferrero) | 2.7 | | 2.7 | | | |
| Barcelona | 2.6 | 2.1 | 3.0 | 3.8 | 2.2 | 1.8 |

Table 11. Average bud burst dates for the varieties being evaluated in the field experiments, compared with the dates on which bud burst was observed in Oregon, USA

| Varieties | Average Julian Days to bud burst | Average date of bud burst | Estimated chill requirements⁽¹⁾ | Oregon dates⁽¹⁾ |
|------------------|---|----------------------------------|---|-----------------------------------|
| Tonda di Giffoni | 232 | 20 August | 600-680 | 26 February |
| TGDL | 233 | 21 August | 760-860 | “ |
| Atlas | 238 | 26 August “ | | |
| Royal | 238 | | | |
| Lewis | 242 | 30 August | | |
| Wanliss Pride | 242 | “ | | |
| Montebello | 243 | 31 August | 990-1040 | 26 February |
| “Sicilian” | 243 | “ | | |
| Barcelona | 247 | 4 September | 990-1040 | “ |
| Willamette | 247 | “ | 860-990 | 5 March |
| Tonollo | 253 | 10 September | | |
| Whiteheart | 253 | “ | | |
| Negret | 256 | 13 September | 760-860 | 5 March |
| Victoria | 260 | 17 September | | |
| Segorbe | 261 | 18 September | 1170-1255 | 12 March |
| TBC | 261 | “ | | |
| Casina | 264 | 21 September | 1395-1550 | 12 March |
| Ennis | 265 | 22 September | 1040-1170 | 5 March |
| Butler | 266 | 23 September | 1040-1170 | 5 March |

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ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

Key: Pollen Shed [grey bar] Stigma receptivity [black bar]

ΥΠΟΚΕΙΜΕΝΑ ΚΑΙ ΠΟΛΛΑΠΛΑΣΙΑΣΜΟΣ

- Τρόποι πολλαπλασιασμού
 - Συνήθως με καταβολάδες (καταβολάδα κατά συστάδα) και λιγότερο με μοσχεύματα ή ξυλοποιημένα χειμερινά μοσχεύματα ή εμβολιασμό



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

- **Υποκείμενα**

- Επιθυμητό είναι το υποκείμενο εκείνο που δε σχηματίζει πολλές παραφυάδες
 - *C. colurna* (πολλά όμως μειονεκτήματα)

ΠΕΤΡΟΣ ΦΟΥΣΣΟΣ

- Βλαστικότητα σπόρων ακατάστατη
- Αργή είσοδο σε καρποφορία
- Μεγάλες πασσαλώδεις ρίζες, δύσκολη μεταφύτευση
- Περιορισμένη ανάπτυξη



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

ΠΟΙΚΙΛΙΕΣ

- Τουρκικής προέλευσης κυρίως
 - Έξτρα Γιαγλί
 - Σιβρί Γιαγλί
 - Μαύρη Αγίου Όρους
 - Barcelona
 - Cuban
 - President
 - Sotsi
 - Tonda Giffoni
 - Tonda Gentile
 - Tonda Romana

ΠΙΕΤΡΟΣ ΡΟΥΣΣΟΣ

photo 1: Definition of Produce – Round type hazelnuts



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



photo 2: Definition of Produce – Oblong type hazelnuts

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



photo 3: Definition of Produce – Pointed type hazelnut

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ





Barcelona



TBC

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



Ennis



Lewis

photo 6: Definition of Produce – Variety “Tonda Giffoni”



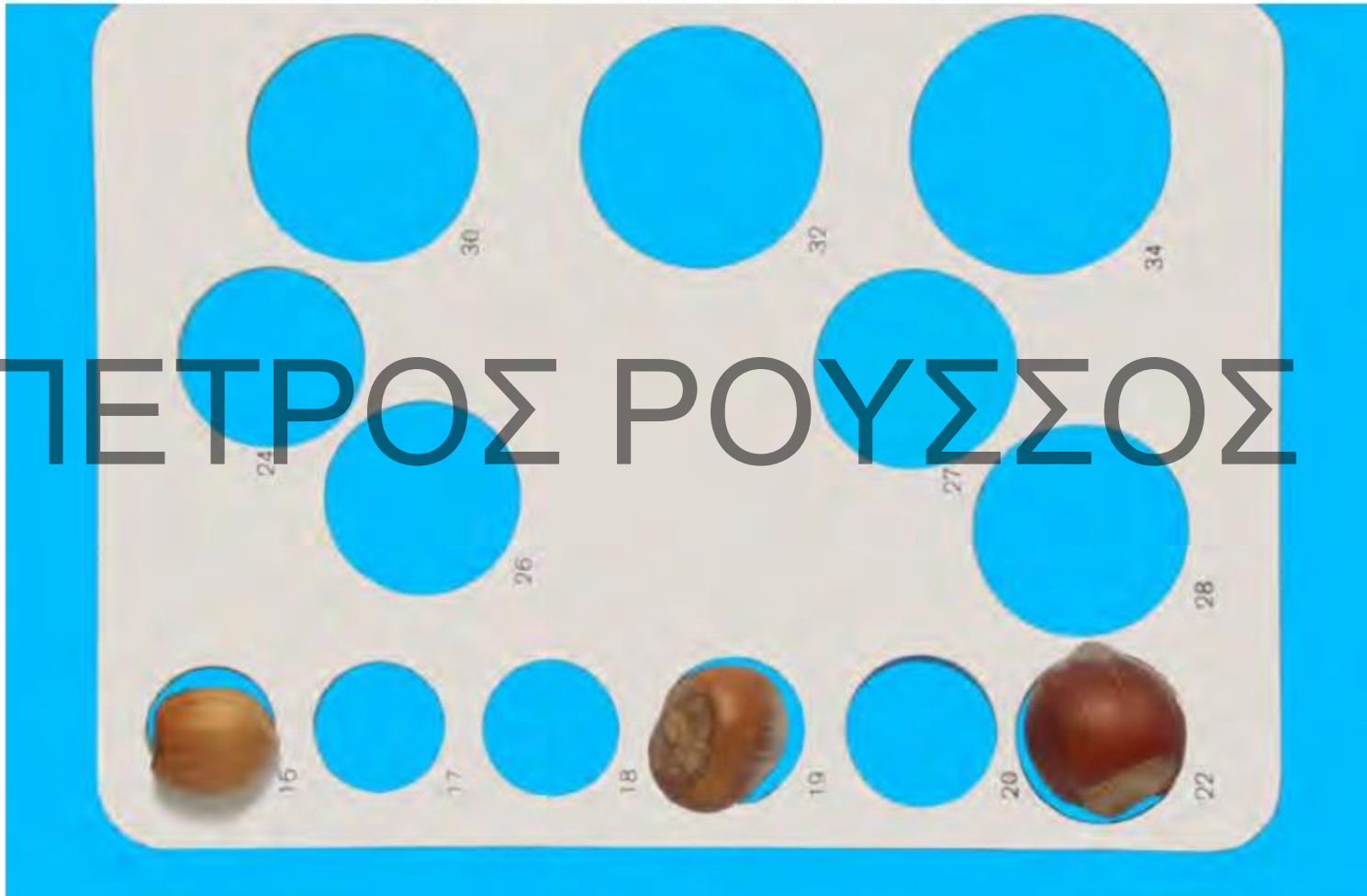
ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



photo 19: Minimum requirement “kernel sufficiently developed” – a): kernel fully developed; b): kernel sufficiently developed – Limit allowed; c): kernel not sufficiently developed – Not allowed



photo 32: Sizing – The diameter is checked by means of sizing rings



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

Αυστραλία

| Varieties | Potential use |
|-----------------------------|-------------------------|
| Atlas | Kernel/ In-shell |
| Barcelona | Kernel/ In-shell |
| Butler | Polliniser /In-shell |
| Casina | Kernel |
| Daviana | Polliniser |
| Eclipse | Kernel |
| Ennis | In-shell |
| Hall's Giant | Late polliniser |
| Hammond 17 | Kernel/ In-shell |
| Lewis | Kernel |
| Merveille de Bollwilller | Late Polliniser |
| Montebello | Kernel |
| Negret | Kernel |
| Royal | In-shell |
| Segorbe | Kernel |
| Square Shield | Kernel |

| | |
|---|---------------------|
| Tonda Gentile delle Langhe (TGDL) | Kernel |
| Tokolyi/Brownfield Cosford (TBC) | Kernel |
| Tonda di Giffoni Sicilian type "Tonda Romana" | Kernel |
| Tonollo | Kernel/ In-shell |
| Victoria | In-shell |
| Wanliss Pride | Kernel/ In-shell |
| Whiteheart | Kernel |
| Willamette | Kernel |

Table 21. Proportion of nuts in each size grade from 16mm to above 21mm for a range of varieties

| Variety | Size grade (mm) | | | | | | |
|------------------|-----------------|----|-----|-----|-----|-----|-----|
| | 16 | 17 | 18 | 19 | 20 | 21 | 22+ |
| Barcelona | | | | 2% | 7% | 27% | 64% |
| Butler | | | 2% | 7% | 18% | 27% | 45% |
| Ennis | | | | | | 6% | 93% |
| Lewis | | | 4% | 28% | 41% | 21% | 5% |
| Hall's Giant | | | | 1% | 5% | 18% | 75% |
| Montebello | | | 3% | 15% | 38% | 32% | 12% |
| Royal | | | | | 1% | 3% | 97% |
| Segorbe | | 1% | 7% | 23% | 32% | 24% | 13% |
| TBC | | | | 2% | 14% | 39% | 44% |
| Tonda di Giffoni | | | 2% | 14% | 36% | 34% | 14% |
| TGDL | 1% | 6% | 23% | 43% | 22% | 4% | 2% |
| Victoria | | | 1% | 3% | 11% | 29% | 56% |
| Willamette | | 2% | 8% | 25% | 38% | 21% | 5% |
| Wanliss Pride | | | | 2% | 4% | 11% | 83% |

Table 22. Mean size of kernels from the Myrtleford site in 2002

| Variety | Mean kernel size (mm) | Co-efficient of variation % |
|-------------------------|-------------------------|--------------------------------|
| | Kernels 13-15mm | |
| Negret | 13.4 | 5.78 |
| <i>Casina</i> | 13.5 | 5.70 |
| Segorbe | 13.7 | 5.47 |
| Montebello | 14.2 | 4.99 |
| “Sicilian” | 14.4 | 5.75 |
| TGDL | 14.4 | 6.79 |
| <i>Tonda di Giffoni</i> | 14.6 | 4.34 |
| | Kernels 15-17 mm | |
| Willamette | 15.1 | 4.37 |
| Atlas | 15.3 | 5.58 |
| TBC | 15.8 | 5.31 |
| Barcelona | 15.7 | 5.96 |
| Tonollo | 16.3 | 5.20 |
| <i>Wanliss Pride</i> | 17.0 | 6.99 |

Note: A high value for the coefficient of variation indicates high variability in kernel size.

Table 23. Oil content (%) of hazelnut varieties from Australian research sites compared with Oregon (Ebrahim et al, 1994)

| | 2002 | 2005 | | 2006 | | 2008 | Oregon | |
|------------------|------------|------------|-----------|------------|-----------|-----------|---------|------------|
| | Myrtleford | Myrtleford | Moss Vale | Myrtleford | Kettering | Kettering | Ebrahim | Richardson |
| Barcelona | 62.0 | 59.1 | 57.4 | 63.5 | 64.2 | 62.7 | 62.8 | 61.8 |
| Butler | | 56.3 | | | | | | |
| Ennis | | 54.2 | 52.6 | 59.4 | | 58.7 | | |
| Lewis | | 61.0 | | 64.7 | 62.4 | 64.8 | | |
| Segorbe | | 56.6 | | | | | | |
| “Sicilian” | 61.1 | 59.3 | 58.2 | | | | | |
| TBC | 60.1 | 60.2 | 56.4 | 64.4 | 64.0 | 64.0 | | |
| Tonda di Giffoni | 63.6 | 63.0 | 57.3 | 62.5 | 61.9 | 64.9 | 62.9 | 63.1 |
| Tonollo | 60.2 | 56.1 | | | | | | |
| Wanliss Pride | 57.5 | 55.5 | | | | 62.2 | | |
| Whiteheartt | | | | | | 64.2 | | |

Source of Oregon data: Ebrahim et al, 1994. Richardson and Ebrahim, 1996

Figure 35. Seasonal and site variations in the oil content of four hazelnut varieties

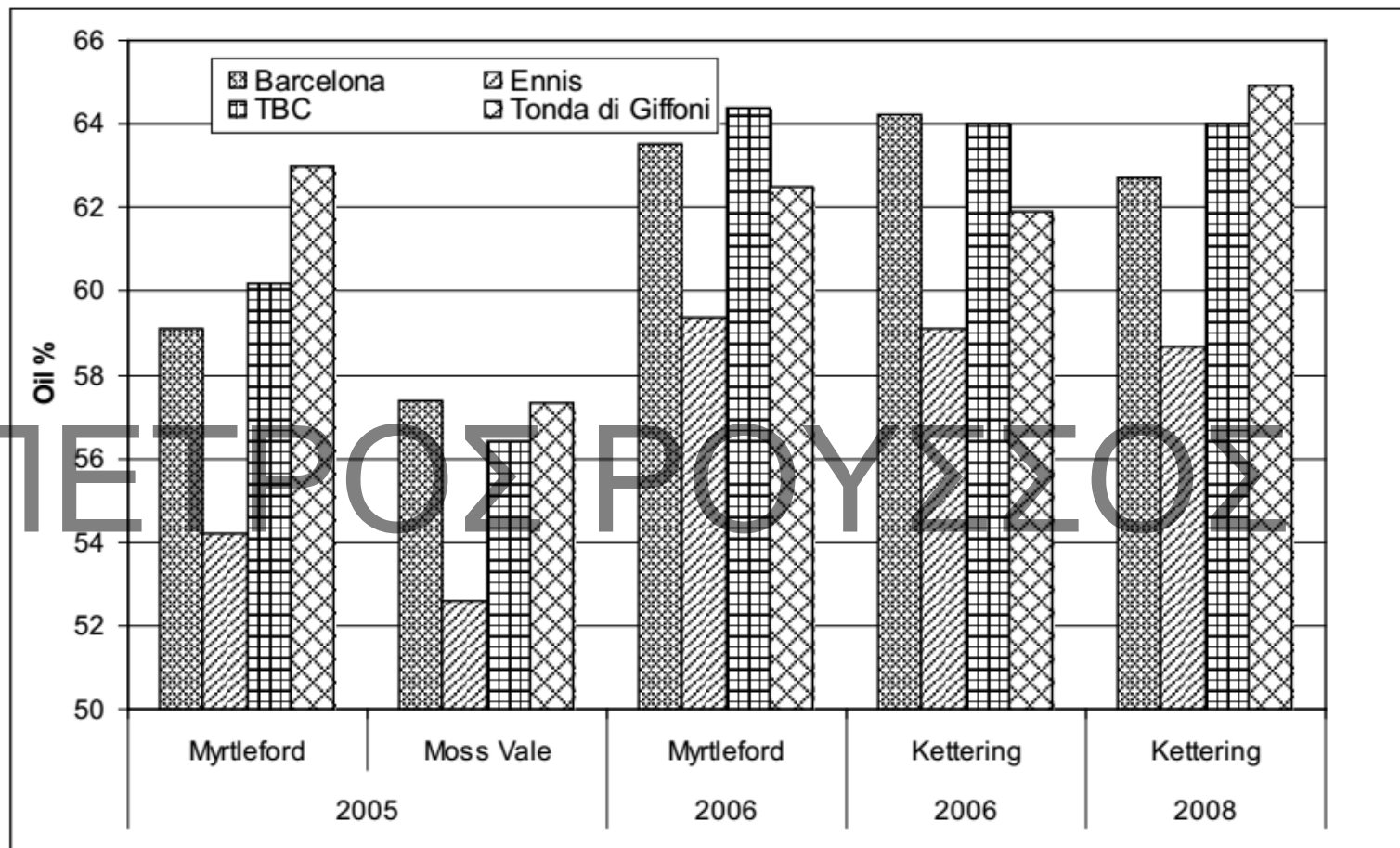


Table 24. Oil content (%), Vitamin E ($\mu\text{g/g}$) and proportion of mono-unsaturated fatty acids (MUFA) for five hazelnut varieties in two seasons and at two sites

| | | Barcelona | Ennis | Lewis | TBC | Tonda di Giffoni |
|--------------------|-----------|------------------|--------------|--------------|------------|-------------------------|
| Myrtleford 2005 | Oil | 59.1 | 54.2 | 61 | 60.2 | 59.3 |
| | Vitamin E | 388 | 293 | 387 | 419 | 396 |
| | MUFA | 80 | 80 | 81 | 81 | 82 |
| Myrtleford 2006 | Oil | 63.5 | 59.4 | 64.7 | 64.4 | 62.5 |
| | Vitamin E | 295 | 224 | 262 | 274 | 351 |
| | MUFA | 83 | 82 | 84 | 83 | 82 |
| Kettering 2006 | Oil | 64.2 | 59.1 | 62.4 | 64 | 61.9 |
| | Vitamin E | 400 | 364 | 378 | 475 | 383 |
| | MUFA | 76 | 76 | 79 | 79 | 80 |
| Kettering 2008 | Oil | 62.7 | 58.7 | 64.8 | 64 | 64.9 |
| | Vitamin E | 526 | 428 | 430 | 525 | 474 |
| | MUFA | 77 | 74 | 79 | 79 | 80 |
| Mean values | Oil | 62.4 | 57.9 | 63.2 | 63.2 | 62.2 |
| | Vitamin E | 402 | 327 | 364 | 423 | 401 |
| | MUFA | 79 | 78 | 81 | 81 | 81 |

Figure 36. Concentration levels of some key elements in hazelnut kernels from Kettering 2008

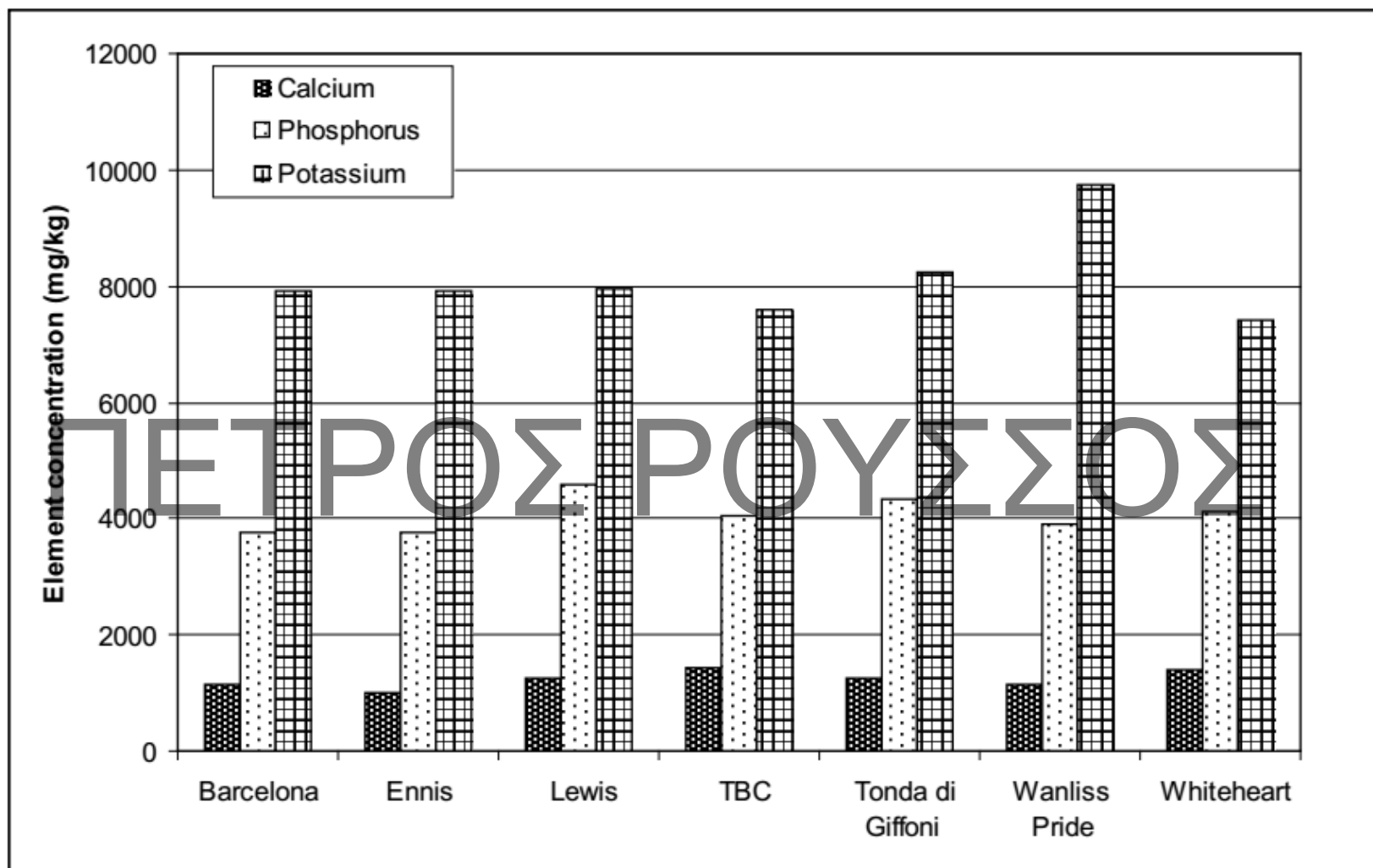


Figure 16. Cumulative nut yields (kg/tree) for five key varieties during their first eight years of growth at the five sites

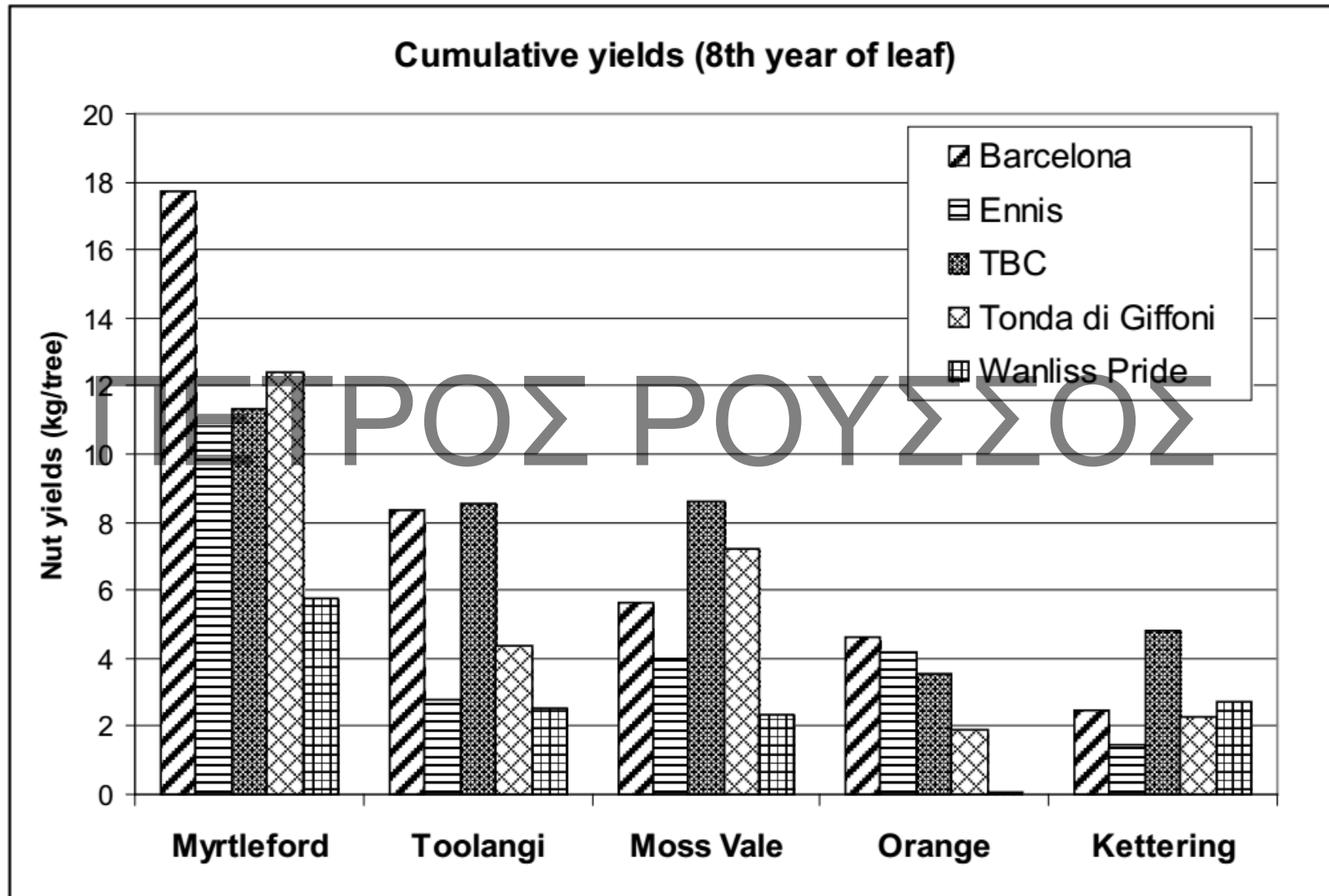


Table 15. Annual and cumulative nut yields (kg/tree) for the varieties planted in 1996 at Myrtleford. This excludes the later planted varieties of 'Casina', 'Montebello', 'Lewis' and 'Willamette'

| Variety | Year of harvest | | | | | Cumulative yield |
|-------------------|-----------------|------|------|------|------|------------------|
| | 2001 | 2002 | 2003 | 2004 | 2005 | |
| Atlas | 1.53 | 2.36 | 4.29 | 2.02 | 1.99 | 12.19 |
| Barcelona | 1.35 | 6.12 | 5.14 | 5.13 | 4.47 | 22.20 |
| Butler | 1.11 | 5.59 | 5.46 | 5.72 | 5.29 | 23.17 |
| Daviana | 0.19 | 0.75 | 0.83 | 0.86 | 0.33 | 2.96 |
| Eclipse | 0.41 | 2.50 | 2.31 | 2.78 | 1.60 | 9.60 |
| Ennis | 0.89 | 3.54 | 3.66 | 2.73 | 3.08 | 13.89 |
| Hall's Giant | 0.03 | 0.45 | 0.41 | 0.32 | 0.27 | 1.48 |
| Negret | 0.48 | 2.33 | 2.01 | 3.11 | 1.66 | 9.60 |
| Royal | 0.61 | 1.85 | 2.33 | 1.53 | 2.04 | 8.37 |
| Segorbe | 1.02 | 4.67 | 3.73 | 2.43 | 2.16 | 14.00 |
| "Sicilian" | 2.15 | 5.31 | 4.10 | 4.82 | 5.36 | 21.74 |
| Square Shield | 0.18 | 1.12 | 1.95 | 1.26 | 1.19 | 5.72 |
| TBC | 1.80 | 3.01 | 3.54 | 1.80 | 2.85 | 12.99 |
| T.G.D.L. | 0.59 | 1.60 | 2.30 | 1.55 | 0.70 | 6.74 |
| Tonda di Giffoni | 2.25 | 2.91 | 4.86 | 2.37 | 3.24 | 15.63 |
| Tonollo | 0.92 | 4.87 | 4.68 | 4.15 | 4.00 | 18.62 |
| Victoria | 0.89 | 2.59 | 2.77 | 1.21 | 1.66 | 9.11 |
| Wanliss Pride | 1.48 | 0.95 | 2.00 | 1.34 | 0.96 | 6.74 |

Table 20. Mean nut and kernel weights with nut shape and kernel characteristics of the varieties being evaluated. The varieties are ranked for kernel/nut weight, an indication of kernel yield after cracking.

| Variety | Nut wt (g) | Nut shape (length/width) | Kernel wt (g) | Kernel/nut wt (%) | Kernel fibre | Relative blanching |
|---------------|------------|--------------------------|---------------|-------------------|--------------|--------------------|
| Atlas | 3.10 | 0.92 | 1.26 | 41% | 2.5 | 4.1 |
| Barcelona | 3.25 | 0.97 | 1.29 | 40% | 3 | 3.3 |
| Butler | 3.35 | 1.1 | 1.41 | 42% | 2 | 6.3 |
| Casina | 1.91 | 1.08 | 0.98 | 51% | 1.5 | 5.7 |
| Daviana | 2.75 | 1.18 | 1.40 | 51% | 2 | 5.4 |
| Eclipse | 2.71 | 0.92 | 1.25 | 46% | 3.3 | 3.1 |
| Ennis | 3.92 | 1.12 | 1.62 | 41% | 1.5 | 6.6 |
| Halls Giant | 3.42 | 1.1 | 1.41 | 41% | 1.3 | 3.4 |
| Hammond 17 | 3.29 | 1.1 | 1.36 | 41% | 2 | 5.7 |
| Lewis | 2.40 | 0.97 | 1.15 | 48% | 1.8 | 2.6 |
| Montebello | 3.02 | 0.92 | 1.09 | 36% | 2.5 | 2.7 |
| Negret | 0.86 | 1.15 | 0.42 | 49% | 2 | 1.7 |
| Royal | 4.07 | 1.2 | 1.61 | 40% | 1.7 | 4.8 |
| Segorbe | 2.37 | 1.04 | 0.96 | 40% | 1.7 | 4.1 |
| “Sicilian” | 3.15 | 0.96 | 1.09 | 35% | 2 | 3.1 |
| Square Shield | 2.96 | 0.96 | 1.19 | 40% | 2 | 5.1 |
| TBC | 2.98 | 1 | 1.27 | 43% | 2.5 | 2.6 |
| TGDL | 2.46 | 0.97 | 1.10 | 45% | 2 | 2.8 |
| T. di Giffoni | 2.62 | 0.94 | 1.12 | 43% | 2 | 3.1 |
| Tonollo | 3.26 | 0.98 | 1.41 | 43% | 3 | 3.8 |
| Victoria | 2.94 | 1.05 | 1.18 | 40% | 1.3 | 5.5 |
| Wanliss Pride | 3.23 | 0.85 | 1.45 | 45% | 2 | 2.4 |
| Whiteheart | 2.68 | 100 | 1.25 | 47% | 1 | 1.0 |
| Willamette | 2.12 | 0.96 | 0.96 | 45% | 2.5 | 2.8 |

Notes: Kernel fibre was rated on a 1(low) - 5 (high) scale, Relative blanching was rated on a 1(little pellicle remaining or excellent blanching) to 7 (most pellicle remaining, kernels did not blanch).

Table 27. Potential kernel varieties

| | Highest yielding varieties | | Other potential varieties | |
|--|---|---|---|-----------------------|
| | Barcelona | TBC | Tonda di Giffoni | Lewis |
| Nut yield, based on cumulative 8-year yields, (Figures 9 and 14) | Outstanding at Myrtleford, good at Toolangi and Orange, poor at Kettering | Fairly even across all sites, highest at Moss Vale and Kettering. | Good yields at Moss Vale, less well at other sites. | Promising yields. |
| Average percentage kernel weight (Table 20) | 40% Relatively thick shells | 43% | 43% | 48% Thinner shells |
| Kernel defects (shriveled and poor fill) (Figure 23) | Commonly some poor filled and shriveled also some twin kernels. | Generally low proportion of shrivel or poorly filled. | Generally well filled. | Generally well filled |
| Blanching (1 excellent – 7 none) (Table 20) | 3.3 | 2.6 | 3.1 | 2.6 |
| Pellicle fibre 1(low) – 5 (high) | 3 | 2.6 | 2 | 1.8 |
| Nut shape (l/w) | 0.97 | 1.0 | 0.9 Distinct indents on the sides | 0.97 |
| Average kernel size | 14-16 mm | 14-16mm | 12-14mm | 12-14mm |

ΚΛΙΜΑ

- Ευδοκιμεί σε κλίμα ελαφρά υγρό και ψυχρό
- Ανάγκες σε ψύχος περί τις 600-800 αλλά και μέχρι 1200 ώρες
- Δεν θέλει θερμοκρασίες το καλοκαίρι άνω των 37°C γιατί επηρεάζουν ανάπτυξη καρπού
- Όχι θερμοκρασίες κάτω από -8 C
- Ευδοκιμεί σε περιοχές με ήπιο καλοκαίρι και δροσερό χειμώνα
- Δεν ανέχεται ξηρούς, ζεστούς ανέμους το καλοκαίρι

Table 8. Relationship between temperature and effective units of chill (Richardson et al 1974)

| Temperature range (°C) | Effective chill units |
|-------------------------------|------------------------------|
| <1.4 | 0 |
| 1.5 – 2.4 | 0.5 |
| 2.5 – 9.1 | 1.0 |
| 9.2 – 12.4 | 0.5 |
| 12.5 – 15.9 | 0 |
| >16.0 | negative effect |

ΚΛΙΜΑ

- Πολύ καλό κλίμα σε περιοχές με
 - 60% μέση υγρασία
 - 800-1000 mm
 - 8-21 C

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

ΕΔΑΦΟΣ

- Ριζικό σύστημα θυσσανώδες
- Βαθύ έδαφος, γόνιμο, pH 6.0 πολύ καλό
- Η παραγωγική ζωή της είναι μόλις 8-12 χρόνια και οφείλεται κυρίως σε εξασθένηση του εδάφους
- Απαιτεί γόνιμα εδάφη για πολύ καλή και μακροχρόνια παραγωγή
- Πρέπει να αποστραγγίζουν καλά, τουλάχιστον μέχρι βάθους 1 m

ΚΑΛΛΙΕΡΓΗΤΙΚΗ ΤΕΧΝΙΚΗ

ΕΓΚΑΤΑΣΤΑΣΗ ΟΠΩΡΩΝΑ

- Προετοιμασία εδάφους
 - Ανάλυση εδάφους
 - Βαθύ όργωμα
 - Εγκατάσταση αρδευτικού συστήματος
 - Προσθήκη οργανικού λιπάσματος είτε σε όλη την έκταση αν είναι εφικτό είτε μεμονωμένα στη θέση φύτευσης
 - Απολύμανση εδάφους
 - Φύτευση δενδρυλλίων (το χειμώνα χωρίς μπάλα χώματος) είτε 4-5 μαζί (θαμνώδης τύπος) είτε ένα μόνο του (δενδρώδης τύπος)

Table 3. Soil analysis data for each of the hazelnut variety trial sites, prior to liming and planting

| Attributes | SITES | | | | | Minimum Desirable Levels ¹ |
|---|--------|-----------|------------|----------|-----------|---------------------------------------|
| | Orange | Moss Vale | Myrtleford | Toolangi | Kettering | |
| pH _{Ca} (1:5 soil CaCl ₂) | 5.7 | 4.3 | 4.5 | 4.5 | 5.5 | pH _w 5.0 |
| Phosphorus (P) Bray test (mg/kg) | 21.0 | 9.0 | 7.0 | 3.0 | 141.0 | N/A |
| Total carbon (%) | 2.0 | 3.8 | 3.3 | 6.6 | 3.5 | N/A |
| Potassium (K) meq/100g | 0.6 | 0.3 | 0.6 | 0.5 | 1.0 | 0.2 |
| Calcium (Ca) meq/100g | 6.8 | 3.9 | 5.6 | 3.8 | 12.6 | 5.0 |
| Magnesium (Mg) meq/100g | 0.7 | 1.4 | 2.3 | 0.8 | 2.7 | 0.5 |
| Sodium (Na) meq/100g | <0.1 | 0.2 | <0.1 | 0.1 | 0.11 | <5 |
| Aluminium meq/100g | <0.1 | 0.6 | 0.2 | 1.4 | <0.1 | <5 ⁽²⁾ |
| Total exchangeable cations (mg/kg) ² | 8.1 | 6.4 | 8.8 | 6.6 | 4 | N/A |
| Ca/Mg ratio | 9.7 | 2.8 | 2.4 | 4.8 | 4.8 | 2.0 |
| Boron (B) (mg/kg) | <2 | <2 | <2 | <2 | <2 | N/A |

Source: ¹ Olsen, 1995 ² Aluminium sensitive crops. Peverill et al., 1999. N/A Not available

Table 13. Soil analysis data for each of the hazelnut trial sites (Desirable levels are in Table 3)

| Site | Orange | | | Moss Vale | | Myrtleford | | | Toolangi | | Kettering | | |
|--|--------|------|------|-----------|------|------------|------|------|----------|------|-----------|------|------|
| | 1995 | 2003 | 2006 | 1996 | 2003 | 1996 | 2003 | 2006 | 1995 | 2003 | 1999 | 2006 | 2008 |
| pH _{Ca} (1:5 soil CaCl ₂) | 5.7 | 6.7 | 7.3 | 4.3 | 5.2 | 4.5 | 5.6 | 5.2 | 4.5 | 5.2 | 5.5 | 5.8 | 5.6 |
| Phosphorus (P) Bray (mg/kg) | 21 | 61 | 76 | 9 | 18 | 7 | 10 | 12 | 3 | 4 | 141 | 120 | 110 |
| Total carbon (%) | 2 | 1.9 | 1.8 | 3.8 | 3.2 | 3.3 | 2.8 | 3.5 | 6.6 | 6.1 | 3.5 | 3.7 | 4.0 |
| Potassium (K) meq/100g | 0.6 | 0.98 | 0.78 | 0.3 | 0.35 | 0.6 | 0.57 | 0.5 | 0.5 | 1.8 | 1.03 | 1.2 | 1.3 |
| Calcium (Ca) meq/100g | 6.8 | 12 | 12 | 3.9 | 8.4 | 5.6 | 10 | 9.8 | 3.8 | 11 | 12.6 | 13 | 13 |
| Magnesium (Mg) meq/100g | 0.7 | 1 | 0.95 | 1.4 | 1 | 2.3 | 2.5 | 2.5 | 0.8 | 1.8 | 2.65 | 3.1 | 3.1 |
| Aluminium meq/100g | <0.1 | <.05 | <.01 | 0.6 | 0.12 | 0.2 | <.05 | <0.1 | 1.4 | 0.31 | <0.1 | <0.1 | <0.1 |
| Total exch cations (mg/kg) | 8.1 | 14 | 14 | 6.4 | 9.9 | 8.8 | 13 | 13 | 6.6 | 15 | 16.2 | 17.3 | 17.4 |
| Ca/Mg ratio | 9.7 | 12 | 12.2 | 2.8 | 8.4 | 2.4 | 4 | 4 | 4.8 | 6.1 | 5 | 4.2 | 4.2 |

ΚΑΛΛΙΕΡΓΕΙΑ ΕΔΑΦΟΥΣ

- Αποσκοπεί:
 - Διατήρηση περιεκτικότητας σε χούμο
 - Αποθήκευση νερού
 - Παρεμπόδιση διάβρωσης
 - Διατήρηση γονιμότητας
 - Αύξηση ποιοτική και ποσοτική της παραγωγής
- Σε πολλές περιπτώσεις έχει αντικατασταθεί από την ακαλλιεργησία, μέσω χημικής ζιζανιοκτονίας ή συνδυασμό καλλιέργειας εδάφους και ζιζανιοκτονίας

ΖΙΖΑΝΙΟΚΤΟΝΙΑ

- Τα ζιζανιοκτόνα διακρίνονται σε προφυτρωτικά και μεταφυτρωτικά

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

ΣΥΣΤΗΜΑΤΑ ΦΥΤΕΥΣΗΣ

- Αποστάσεις φύτευσης
 - Από 5 x 5-6 (η δενδρώδης μορφή) έως και 7 x 8 (η θαμνώδης μορφή)
 - Μπορεί και 6 x 3 m και αν πυκνώσουν πολύ τότε αφαιρείται δένδρο



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ





ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

ΠΟΤΙΣΜΑ

- Δεν ανταποκρίνεται τόσο έντονα στο πότισμα
- Ανάγκες σε πότισμα κατά την καλοκαιρινή περίοδο, όταν συντελείται η ανάπτυξη του καρπού.
- Ουσιαστικά απαιτεί περισσότερα από 700 mm για πολύ καλή ανάπτυξη και παραγωγή, κατανεμημένα στη βλαστική περίοδο – κυρίως όμως Ιούνιο και Ιούλιο

Table 6. Approximate quantities of irrigation water applied as litres (L) per tree at the five sites on a per season basis

| Sites | Growing seasons | | | | | |
|------------|-----------------|---------|---------|---------|---------|---------|
| | 2000/01 | 2001/02 | 2002/03 | 2003/04 | 2004/05 | 2005/06 |
| Kettering | 100 | 100 | 250 | 870 | 790 | 1800 |
| Orange | 650 | 1120 | 1220 | 3000 | 1560 | 2450 |
| Moss Vale | 268 | 737 | 2820 | 2950 | 3150 | N/A |
| Myrtleford | 252 | 2650 | 4240 | 1170 | 900 | 2800 |
| Toolangi | 250 | nil | nil | N/A | N/A | N/A |

Note: N/A - Not applicable as site no longer being used for research

ΛΙΠΑΝΣΗ

- Απαιτητική σε κάλιο και βόριο, αλλά N, Zn επίσης
- Ανάλυση φυτικών ιστών δίνει στοιχεία της θρεπτική κατάστασης των δένδρων
- Κυρίως φυλλοδιαγνωστική

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

Table 12. Chemical composition of leaves taken from the five hazelnut variety trial sites from 1997 to the final year of study at each site

| Elements | Sites | | | | | Desirable Range ⁽¹⁾ |
|---------------|------------------------------|-----------|------------|-----------|-----------|--------------------------------|
| | Orange | Moss Vale | Myrtleford | Toolangi | Kettering | |
| | Site ranges, lowest –highest | | | | | |
| Nitrogen % | 2.4-3.17 | 2.3-2.92 | 2.5-2.9 | 2.7-3.1 | 2.2-3.49 | 2.2–2.5 |
| Phosphorus % | 0.12-0.17 | 0.12-0.19 | 0.12-0.38 | 0.13-0.29 | 0.31-0.45 | 0.14–0.45 |
| Calcium % | 1.25-1.9 | 1.04-1.60 | 0.94-2.1 | 1.15-1.8 | 1.17-2.0 | 1.0–2.5 |
| Magnesium % | 0.13-0.22 | 0.16-0.33 | 0.14-0.6 | 0.12-0.23 | 0.21-0.3 | 0.25–0.5 |
| Potassium % | 0.65-1.3 | 0.43-1.2 | 0.55-1.3 | 0.63-1.5 | 0.72-1.32 | 0.8–2.0 |
| Sodium % | 0.01-0.05 | 0.05-0.17 | 0.01-0.24 | 0.02-0.13 | 0.04-0.12 | <0.01 ⁽²⁾ |
| Manganese ppm | 490-1900 | 484-1050 | 162-530 | 230-550 | 46-327 | 26–650 |
| Sulphur % | 0.1-0.2 | 0.15-0.21 | 0.1-0.23 | 0.1-0.22 | 0.13-0.23 | 0.12 - 0.2 |
| Boron ppm | 38-67 | 25-68 | 20-57 | 44-69 | 20-53 | 30-75 |
| Copper ppm | 7.3-11 | 5-10 | 3-11 | 6.7-17 | 4.8-9.9 | 0.8–2.0 |
| Zinc ppm | 19-32 | 20-40 | 16-49 | 17-45 | 21-47 | 15 - 60 |

⁽¹⁾ Recommended range for hazelnuts (Olsen, 2001). ⁽²⁾ Weir and Cresswell, 1993.

Table 5. Typical rates of fertiliser elements applied per tree at the field sites. The actual fertiliser used varied with sites and circumstances

| Year from planting | Rate of element (g/tree) | | | |
|--------------------|--------------------------|----------------|---------------|-------------|
| | Nitrogen (N) | Phosphorus (P) | Potassium (K) | Sulphur (S) |
| 3 | 10 | | | |
| 4 | 15 | | | |
| 5 | 20 | | | |
| 6 | 25 | | | |
| 7 onwards | 30 | 5 | 8 | 9 |

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

ΚΛΑΔΕΜΑ

- Κλάδεμα μόρφωσης
 - Θαμνώδης τύπος ή δενδρώδης υπό μορφή κυπέλλου

ΚΛΑΔΕΜΑ ΚΑΡΠΟΦΟΡΙΑΣ

- Σκοπός :
 - Διατήρηση σχήματος
 - Αφαίρεση ξερών κλάδων και παραφυάδων
 - Έκθεση εσωτερικού κόμης σε φως και αέρα
 - Καλή παραγωγή και βλάστηση
 - **Αυστηρό κλάδεμα όταν μειωθεί η ευρωστία**

ΩΡΙΜΑΝΣΗ- ΣΥΝΤΗΡΗΣΗ - ΣΥΓΚΟΜΙΔΗ

- Καρποί κατάλληλοι για συγκομιδή όταν είναι εύκολη η απόσπασή τους, πάρει καστανή απόχρωση το περικάρπιο και κιτρινίσει το φυλλώδες περίβλημα
- Συγκομιδή με τα χέρια ή με ράβδισμα ή μηχανικά (Αύγουστο και αργότερα)

- Συντήρηση
 - Αποφλοιώση
 - Αποξηράνση (7-8%)
 - Λεύκανση καρπών
- Σχίζονται οι καρποί από την γρήγορη αποξηράνση

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

26 3 2005

5002 01 6

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ





ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

27 2 2005



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

27 2 2005

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ





ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

2 / 4 / 2005

A close-up photograph of a hazelnut tree. The image shows several clusters of developing hazelnut husks (involucres) hanging from the branches. The leaves are green and have serrated edges. The background is filled with more foliage, creating a dense, green environment. The lighting is bright, suggesting a sunny day.

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

3 10 2005

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



A close-up photograph of several bright green leaves with prominent veins. Small, green, fuzzy flower buds are visible at the leaf axils. The background is a soft-focus bokeh of green foliage.

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

17 5 2005



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

2005 6 23



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

2005 7 25



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

A close-up photograph of a red and yellow gall on a green leaf. The gall is a small, rounded, textured structure with a mix of red and yellow colors. It is attached to a green leaf with prominent veins. The background is a blurred green, suggesting a natural setting. Overlaid on the image is the text "ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ" in a dark, serif font.

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



ΠΕΤΡΟΣ ΡΟΥΣΟΣ

3 10 2005

A close-up photograph of a hazel branch. The leaves are bright green, ovate, and have serrated margins. Several brown, elongated catkins are visible, some in the foreground and others in the background. The lighting is bright, suggesting a sunny day.

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ

17 5 2005

A man in a light-colored shirt and dark pants is operating a red tractor with a brush cutter attachment in a wooded area. The tractor is moving from left to right, cutting through dry leaves and brush. The background is filled with green trees and foliage. The text "ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ" is overlaid in the center of the image.

ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ



ΠΕΤΡΟΣ ΡΟΥΣΣΟΣ