

**GUADALUPE HYBRIDS TIMBERBELT
DEMONSTRATION/RESEARCH TRIAL —
AGE 3 & 4 YR ASSESSMENT RESULTS**

J.D. Tombleson & J.T.D. Penman

Report No. 21

November 1995

FOREST & FARM PLANTATION MANAGEMENT COOPERATIVE

EXECUTIVE SUMMARY

GUADALUPE HYBRIDS TIMBERBELT DEMONSTRATION/RESEARCH TRIAL — AGE 3 & 4 YEAR ASSESSMENT RESULTS

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A trial to compare tree growth and in quality of radiata pine Guadalupe hybrids (grown as seedlings), GF 25 juvenile cuttings and LI 25 seedlings grown as a timberbelt, was measured at ages three and four years. Results show the Guadalupe hybrids to have larger stem diameters, by 3 cm, and are taller by 0.4 m, than either the GF 25 juvenile cuttings or LI 25 seedlings. The incidence of windthrow as a result of a wind storm prior to the age three assessment was 3% for the Guadalupe hybrids, compared to nil for the GF 25 juvenile cuttings and 7% for the LI 25 seedlings. The incidence of lean was 19% for both the Guadalupe hybrids and GF 25 cuttings, and 32% for the LI 25 seedlings. The trial will continue to be measured on an annual basis until three years after the pruning is completed, after which time it will be measured on a two-yearly basis.

GUADALUPE HYBRIDS TIMBERBELT DEMONSTRATION/RESEARCH TRIAL — THREE & FOUR YEAR ASSESSMENT RESULTS

J. D. TOMBLESON & J. T. D. PENMAN

BACKGROUND

Previous plantation-based trials involving the hybrid combination between New Zealand and Guadalupe provenance parents have resulted in F1 progeny with improved stem form, higher wood density, an increased pith-to-bark wood density gradient, and an increased inside bark volume. Early research by R.D. Burdon (1969) showed that Guadalupe seedlings had a longer and more extensive rooting system, which may confer greater wind stability. Guadalupe Island is extremely exposed and therefore wind stability could be an adaptive trait.

In July 1990 a trial was established to evaluate the growth, form, wood density and stability to wind of Guadalupe hybrids when established as a timberbelt on a fertile farm site. The results from this trial will also complement a more extensive series of plantation-based trials located on a range of forest sites throughout New Zealand.

PLANT MATERIAL

Eighteen high ranking NZ x Guadalupe inter provenance hybrid families were created in 1986 under NZ FRI work plan No.1522. The families comprise 17 NZ '268' clones and 1 NZ '850' clone as female parents combined with a pollen mix of 10 phenotypically selected Guadalupe pollen parents from the Kaingaroa Cpt 1333/918 genetic survey trials. The inter-species *Pinus attenuata* x Guadalupe hybrid is also compared with the above hybrids. The individual tree identity for each of the Guadalupe hybrid plots is shown in Appendix 1. A list of the control pollinated families is contained in Appendix 2. The total number of trees represented for each family, which ranges from 1 to 13, is shown in Appendix 3.

For comparative purposes the trial incorporates 2-yr-aged cuttings from the 'Growth and Form' breed (GF25) and seedlings of the Long Internode breed (LI25). This represented the best available 'routine' stock, at the time of trial establishment.

The timberbelt trial was established on the Wharenui dairy farm, located at Owkata on the eastern side of Rotorua city. Planted either side of a dry creek, the surrounding paddocks are flat and devoid of any trees. The orientation of the timberbelt is approximately NW/SE and exposed to all wind directions.

TRIAL LAYOUT

The trial design comprises 18 plots, each established as a 15 tree, single-row timberbelt, with a between tree spacing of 2.5m (see Appendix 4 for plot lay-out). The 18 plots are comprised of 8 x Guadalupe hybrids, 6 x GF25 2-yr-old cuttings and 4 x LI25 seedling plots.

METHODS

In June 1993 and July 1994, at tree ages three and four years respectively, the Wharenui timberbelt trial was assessed for: tree height, stem diameter, and any incidence of tree toppling or lean.

Diameters at breast height were measured to the nearest 0.1 centimetre, using a diameter tape. Tree heights and pruned heights were measured to the nearest decimetre, using a telescopic height pole. All data was entered into and summarised using the NZ FRI Permanent Sample Plot System.

The incidence of wind blow and tree lean was also assessed at the time of annual tree measurement. Trees were subjectively categorised as being wind blown/toppled (which usually meant they were lying on the ground), leaning, or as being unaffected by the wind. In the growing season prior to the 1994 assessment, a wind storm was recorded which damaged many of the trees. The leaning trees were stabilised by being tied with string back to one or more stakes inserted into the ground.

RESULTS

Diameter growth, expressed as treatment means for each of the three plant types, assessed at age four years, ranged from 10.2cm for the GF25 juvenile cuttings, 10.9cm for the LI25 seedlings, to 11.7cm for the Guadalupe hybrids. See Table 1 and Figures 2 & 3 for details.

Height growth, expressed as treatment means for each of the three plant types, assessed at age four years, ranged from 4.9m for the LI25 seedlings, 5.2m for the GF25 juvenile cuttings to 5.6m for the Guadalupe hybrids. See Table 1 and Figures 2 & 3 for details.

Diameter and height measurements were calculated at age four years for each of the 21 individual Guadalupe hybrid crosses, which are presented graphically in Figure 1. Hybrid 268.41 x Guadalupe pollen mix (comprising 4 trees) had the largest mean height of 6.9m, followed by 850.55 x Guadalupe pollen mix (comprising 7 trees) which had a mean diameter of 13.8cm, and a mean height of 6.5m. It should be emphasised that the sample size for each hybrid cross varies between only 1 and 13 trees, with five trees on average.

The incidence of wind throw as a result of a wind storm prior to the 1993 measurement was nil for the GF25 juvenile cuttings, 3% for the Guadalupe hybrids and 7% for the LI25 seedlings. The incidence of resulting lean was 19% for both the Guadalupe hybrids and GF25 juvenile cuttings, and 32% for the LI25 seedlings (see Table 1 for details). An assessment of tree stability carried out in 1994, showed most of the leaning trees which had been corrected approximately 18 months previously, remained upright. By 1994 none of the GF 25 juvenile cuttings were recorded as leaning, only 4% of the Guadalupe hybrids and 5 % of the LI 25 seedlings were recorded as leaning (see Table 1 for details).

FUTURE MEASUREMENTS

The trial will continue to be measured on an annual basis until three years after the pruning is completed, after which time the trial will be measured on a two yearly basis.

REFERENCE

Burdon, R. D. 1969: A quantitative study of differences in root systems between four populations of *Pinus radiata*. GTI Branch Report No. 45

TABLE 1

WHARENUI SHELTERBELT

MEASUREMENT SUMMARY

Plot ID	Mean DBH (cm)		Mean Height(m)		Pruned Height (m)	stems/km	wind blown stems/plot		leaning stems/plot	
	1993	1994	1993	1994			1994	1993	1994	1993
Guadalupe Hybrid										
41/1/1	7.6	9.9	4.0	5.0	1.5	297	1	0	1	1
41/2/1	8.8	11.9	4.6	5.8	1.9	405	0	0	4	0
41/3/1	7.9	10.9	4.0	5.4	1.5	405	0	0	3	1
41/4/1	9.8	12.0	5.2	5.9	1.9	405	0	0	6	0
41/5/1	8.6	12.0	4.6	5.7	2.0	405	0	0	1	1
41/6/1	8.7	12.9	4.2	5.9	1.7	405	0	0	0	0
41/7/1	8.7	11.2	4.4	5.2	1.6	405	0	0	3	1
41/8/1	8.9	12.4	4.7	5.9	1.7	324	2	2	4	1
Mean	8.6	11.7	4.5	5.6	1.7	381	0.4	0.3	2.8	0.6
Percentage							3	3	19	4
GF 25 (juv cuttings)										
42/1/1	6.2	8.5	3.7	4.7	1.4	405	0	0	6	0
42/2/1	8.2	10.0	4.3	5.3	1.5	378	0	0	1	0
42/3/1	7.8	10.8	4.2	5.6	1.5	405	0	0	1	0
42/4/1	7.5	11.0	3.9	5.5	1.6	378	0	0	2	0
42/5/1	8.6	11.1	4.2	5.4	1.3	324	0	0	0	0
42/6/1	8.8	9.6	4.0	5.0	1.1	405	0	0	7	0
Mean	7.9	10.2	4.1	5.3	1.4	383	0	0	2.8	0
Percentage							0	0	19	0
LI 25 seedlings										
43/1/1	7.2	10.6	3.9	4.9	1.6	378	1	0	7	1
43/2/1	8.4	10.9	3.8	5.1	1.6	297	0	2	6	1
43/3/1	8.0	11.7	4.2	4.8	1.1	378	1	0	1	1
43/4/1	7.5	10.0	3.8	4.8	1.0	270	0	0	5	0
Mean	7.8	10.8	3.9	4.9	1.3	331	0.5	0.5	4.8	0.8
Percentage							7	3	32	5

FIGURE 1

Figure 1: Guadalupe hybrids shelterbelt: Wharenui

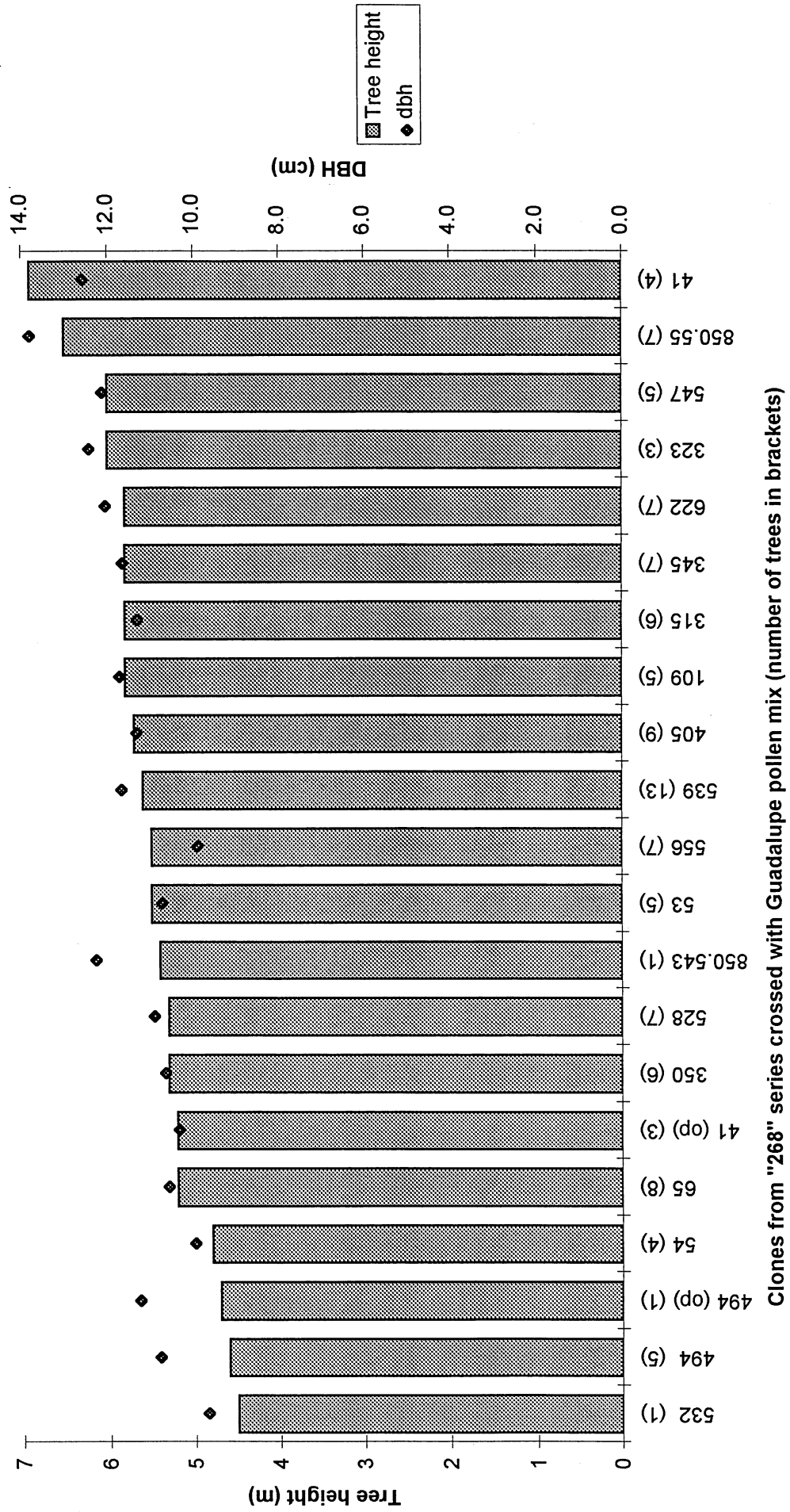


FIGURE 2

DIAMETER GROWTH

Wharenui Shelterbelt

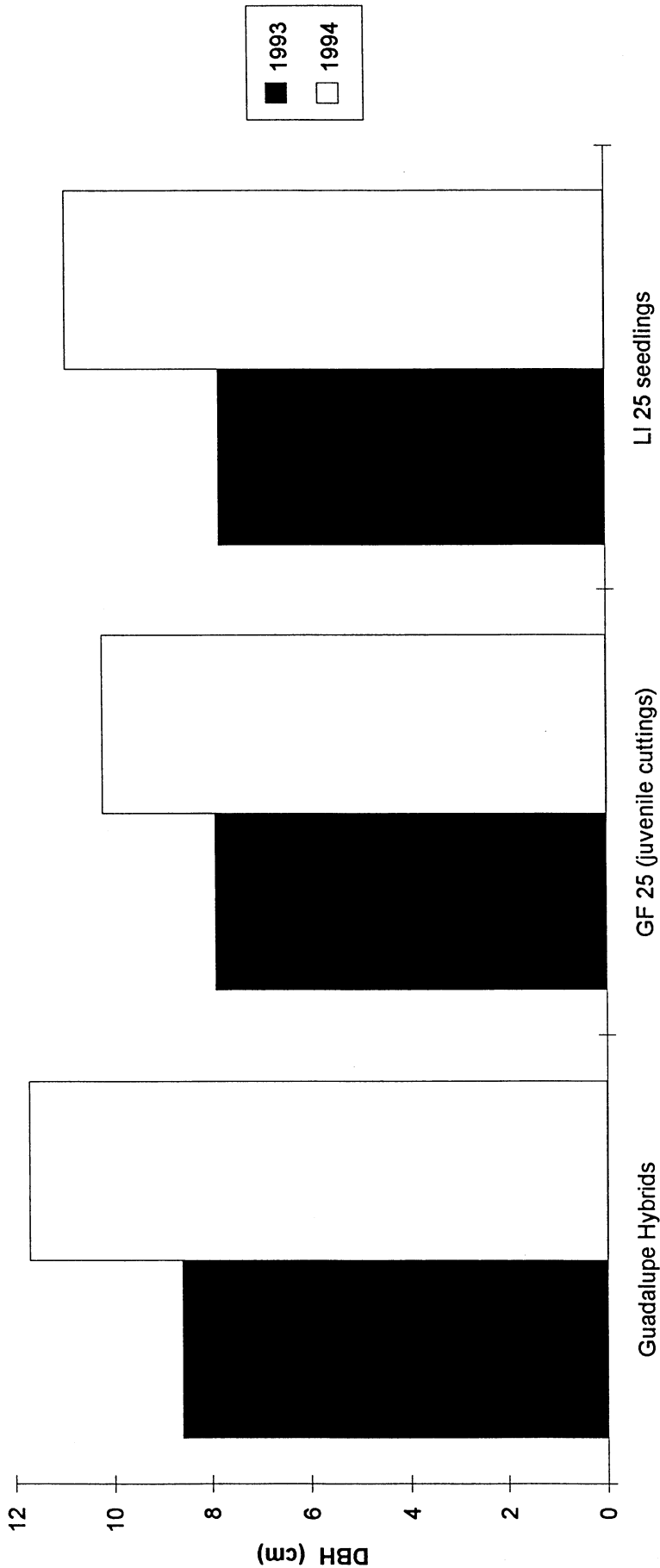
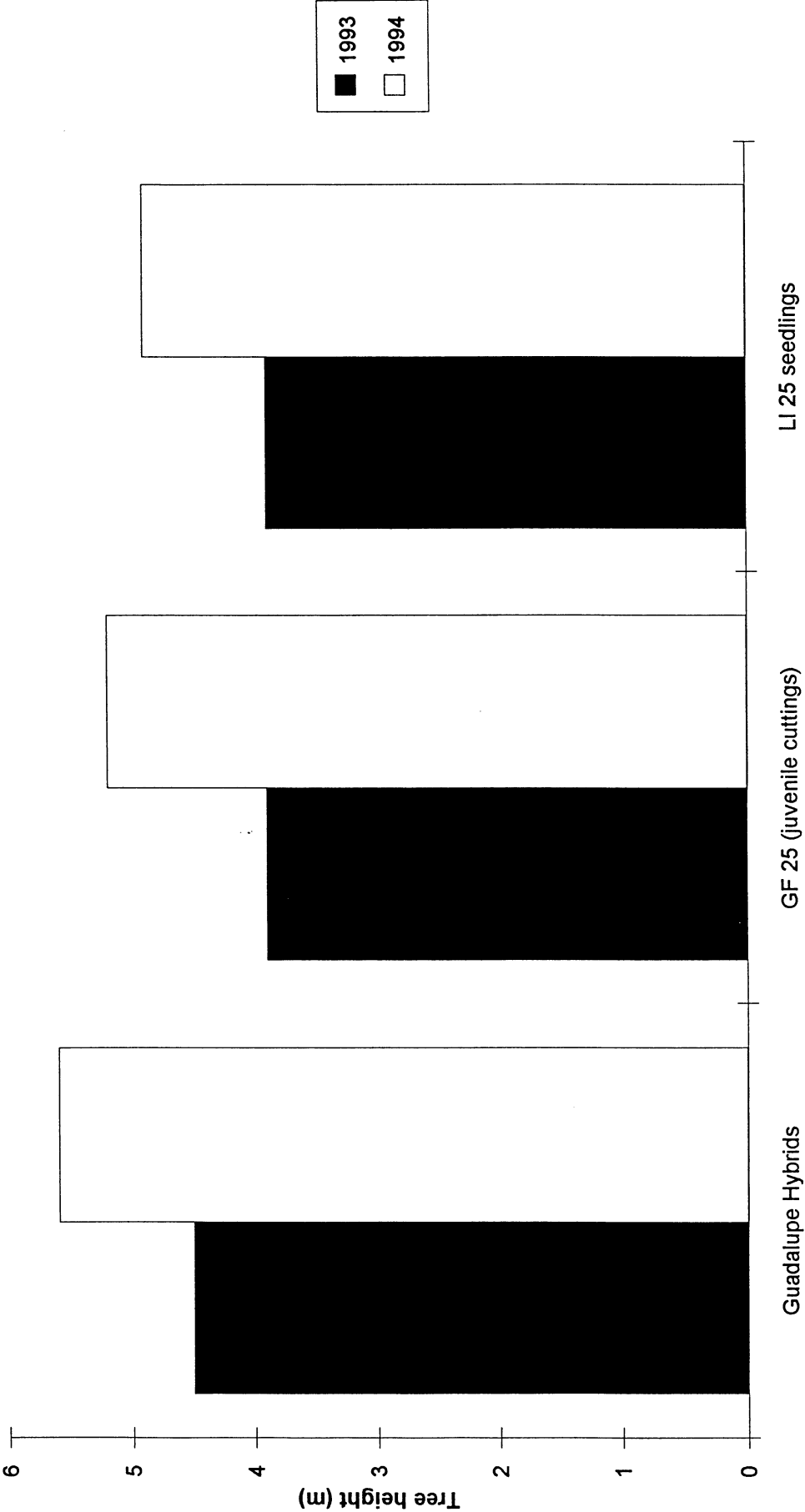


FIGURE 3

HEIGHT GROWTH

Wharenui Shelterbelt



APPENDIX 1 — Individual tree identity for the Guadalupe hybrid plots

Peg No.		1	3	6	8	10	12	15	17
Tree position	1	2	15	6	11	3	14	11	6
	2	2	14	20	11	5	3	16	11
	3	2	15	17	7	4	5	16	4
	4	5	9	16	18	5	9	9	8
	5	14	15	14	12	14	17	18	12
	6	10	8	17	12	4	17	3	18
	7	8	10	11	11	14	11	13	9
	8	2	9	16	7	3	2	12	1
	9	1	29	14	18	3	18	9	8
	10	8	9	16	18	4	14	17	1
	11	1	9	20	7	7	9	6	14
	12	14	15	17	16	1	19	10	5
	13	14	15	7	12	3	17	6	5
	14	5	7	18	12	14	3	14	1
	15	8	3	20	7	10	4	10	16

The above shows the individual tree code for each of the 8 Guadalupe row plots.
See Table 2 for pedigree details.

APPENDIX 2

Control pollinated families

Code	Female	Male
1	268.41	x Guadalupe Pollen Mix
2	268.54	x Guadalupe Pollen Mix
3	268.65	x Guadalupe Pollen Mix
4	268.109	x Guadalupe Pollen Mix
5	268.315	x Guadalupe Pollen Mix
6	268.323	x Guadalupe Pollen Mix
7	268.345	x Guadalupe Pollen Mix
8	268.350	x Guadalupe Pollen Mix
9	268.405	x Guadalupe Pollen Mix
10	268.494	x Guadalupe Pollen Mix
11	268.528	x Guadalupe Pollen Mix
12	268.53	x Guadalupe Pollen Mix
13	268.532	x Guadalupe Pollen Mix
14	268.539	x Guadalupe Pollen Mix
15	268.547	x Guadalupe Pollen Mix
16	268.556	x Guadalupe Pollen Mix
17	268.622	x Guadalupe Pollen Mix
18	850.55	x Guadalupe Pollen Mix
19	850.543	(P.attenuata) x Guadalupe Pollen Mix

Open pollinated seed orchard families

20	268.41
29	268.494

APPENDIX 3

cross with Guadalupe pollen mix	number of trees
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268.41	4
268.54	4
268.65	8
268.109	5
268.315	6
268.323	3
268.345	7
268.35	6
268.405	9
268.494	5
268.528	7
268.53	5
268.532	1
268.539	13
268.547	5
268.556	7
268.622	7
850.55	7
850.543	1
268.41 (op)	3
268.494 (op)	1
Total	114

APPENDIX 4 Plot lay-out

RO 2007: Timberbelt Trial

