

A review of genetic parameters in *Eucalyptus nitens*

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Eucalyptus nitens

Rapid growth, cold tolerance and good pulping properties

Large (140,000+ ha) plantation estates in Australia and Chile

Most plantations managed for pulpwood BUT increasing interest in solidwood



Photo: Simon Whittock



Methods

Collated data from over 100 progeny trials including:

- trait means
- additive and phenotypic variances
- within-population narrow-sense heritabilities
- inter-age, inter-site and inter-trait genetic correlations



Methods continued

Modified trait names and inverted correlations as necessary

Repeated estimates deleted

Standard (average) genetic parameters calculated

Open-pollinated (OP) progeny trials

Heritability estimates from single-site analyses

Coefficient of relationship of 0.4 assumed

Heritability and CV_a

(OP trials, single site, coefficient of relationship = 0.4)

Trait category	Heritability	CV_a
Growth	0.30	12.4%
Wood property	0.45	4.7%
Tree architecture	0.17	9.5%
Fitness	0.42	12.8%

More on heritability

(OP trials, single site, coefficient of relationship = 0.4)

Trait	Trials	Mean	Min	Max
Diameter	79	0.26	0.00	0.78
Basic density	16	0.51	0.11	0.96
Pilodyn penetration	13	0.35	0.00	1.00
Pulp yield	8	0.50	0.03	0.79
Cellulose	5	0.67	0.37	1.05
Branch size	6	0.12	0.04	0.25
Stem straightness	5	0.28	0.20	0.44

Heritability estimates similar to *E. globulus*

Trait	<i>E. nitens</i>	<i>E. globulus</i>
Diameter	0.26	0.23
Basic density	0.51	0.60
Pilodyn penetration	0.35	0.26
Pulp yield	0.50	0.48

E. globulus data from WHITTOCK, S.P.; COSTA E SILVA, J.; HAMILTON, M.; POTTS, B. 2006: "A review of genetic parameters in *Eucalyptus globulus*". Report to the partners in the Australian Research Council (ARC) linkage grant LP0453704. 72 p.

High age-to-age correlations for diameter

Age 1 (years)	Age 2 (years)	Trials	Mean
3	5	1	0.88
3	6	1	0.88
4	6	3	0.96
4	7	1	0.68
5	7	1	0.83
6	12	3	0.92
		10	0.89

Inter-site genetic correlations

Trait	Estimates	Mean	Min	Max
Diameter	106	0.70	-0.15	1.14
Basic density	5	0.77	0.67	0.92
Pilodyn penetration	4	0.91	0.79	0.99
Cellulose content	4	0.85	0.77	0.91
Branch size	2	0.72	0.63	0.80
Stem straightness	3	0.78	0.62	0.93

Inter-trait genetic correlations

Trait 1	Trait 2	N	Mean	Min	Max
Basic density	Pilodyn penetration	4	-0.90	-1.11	-0.71



Pulpwood inter-trait genetic correlations

Trait 1	Trait 2	N	Mean	Min	Max
Diameter	Basic density	10	-0.27	-0.79	0.08
	Pilodyn	6	0.49	0.20	0.82
Diameter	Cellulose	5	0.56	0.25	0.86
Basal area	Pulp yield	1	0.63		
Basic density	Cellulose	5	-0.07	-0.53	0.37
	Pulp yield	1	0.42		

Outstanding issues

Assumptions relating to inbreeding

Genetic correlations between pulpwood traits are not well understood BUT near infrared spectroscopy (NIR) may change this

Limited information for solidwood traits

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