ALMOND BOARD OF AUSTRALIA

APPENDIX 1: SUMMARY OF INTELLECTUAL PROPERTY AND PROPAGATION METHODS FOR KEY ROOTSTOCKS IN AUSTRALIA

Rootstock	Origin	Breeder	Source/ Australian Agent	Major Propagator	Intellectual Property			Method of Propagation (Bold = most common in Australia Italic = most common Internationally)			Commercially available in Australia as a grafted tree
					Status	Date of Grant	Right Expires	Seedling	Cuttings	Micropropagation	
Nemaguard	Georgia, USA	USDA	Ausbuds	Ausbuds	Public			***Yes***	No	No	Yes
Barrier 1 (Empyrean 1)	Firenze, Italy	National Research Council of Italy Trees and Timber Institute	ANFIC	Olea & Little Tree Company				No	**Yes**		Yes
Cadaman (Avimag)	Bordeaux, France	INRA	GF	GF, Olea & Little Tree Company	Granted	28 Mar 2002	28 Mar 2027	No	**Yes**	*Yes*	No
Adafuel	Zaragoza, Spain	CSIC	ABA	Ausbuds	Public			No	**Yes**	*Yes*	
Bright's Hybrid	California, USA	Brights Nursery	Ausbuds	Ausbuds	Public			No	**Yes**	*Yes*	Yes
Cornerstone	California, USA	Burchell Nursery	Mossmont Nurseries	Ausbuds	Granted	26 Feb 2014	26 Feb 2039	No	***Yes***	*Yes*	Yes
Felinem	Zaragoza, Spain	CITA	ABA	Ausbuds	Granted	13 Feb 2014	13 Feb 2039	No	**Yes**	*Yes*	No
Garnem	Zaragoza, Spain	CITA	ABA	Ausbuds	Granted	13 Feb 2014	13 Feb 2039	No	**Yes**	*Yes*	Yes
Monegro	Zaragoza, Spain	CITA	ABA	Ausbuds	Granted	13 Feb 2014	13 Feb 2039	No	**Yes**	*Yes*	No
GF557	Bordeaux, France	INRA	ABA	Ausbuds	Public			No	**Yes**	***Yes***	
GF677 (Paramount)	Bordeaux, France	INRA	ABA	Ausbuds & Boulevarde	Public			No	**Yes**	***Yes***	Yes
GF749	Bordeaux, France	INRA	ABA		Public						
Hansen 536	California, USA	UC Davis	Ausbuds	Ausbuds	Public			No	**Yes**	*Yes*	
Krymsk (Kuban) 86	Krasnodar, Russia	Krymsk Breeding & Research Station	ANFIC	Olea & Little Tree Company	Granted	17 Nov 2010	17 Nov 2035	No	**Yes**	*Yes*	Yes
Nickels	California, USA	UC Davis	Mossmont Nurseries	Ausbuds	Withdrawn			No	**Yes**	*Yes*	No
Atlas	California, USA	Zaiger Genetics	GF	GF	Granted	14 June 2000	14 June 2025	No	**Yes**	Yes	Yes
Viking	California, USA	Zaiger Genetics	GF	GF	Granted	3 June 2003	3 June 2028	No	**Yes**	Yes	Yes

Legend
ABA – Almond Board of Australia Inc
ANFIC – Australian Nurseryman's Fruit Improvement Company Ltd
CITA – Centro de Investigacion y Tecnologia Agroalimentaria de Aragon
CSIC - Consejo Superior de Investigaciones Científicas
USDA – United States Department of Agriculture
UC Davis – University of California, Davis Campus
*date of Grant unknown

SUMMARY CHARACTERISTICS FOR KEY ROOTSTOCKS IN AUSTRALIA

Rootstock	Parentage	Pathogen Resistance								Soil Adaptation		Effects on the Variety		
		Root Knot Nematode Variation in resistance / susceptibility of species and isolates when tested in Australia[1]			Lesion Nematode	Ring Nematode/ Bacterial Canker	Crown Gall	Armillaria	Phytophthora	Salt Exclusion[1]	Chlorosis	Compatibility	Vigour	Propagation by Cuttings
		M.javanica	*M.arenaria*	*M.incognita*										
Nemaguard	Wild Peach x Peach	Tolerant[1]	Tolerant[1]	Tolerant[1]	Medium	Medium	Medium	Susceptible	Medium	Sensitive[1]	Susceptible	Good	Medium	NA
Barrier 1 (Empyrean 1)	Wild Peach x Peach	Susceptible[1]		Resistant							Tolerant	Good	High	
Cadaman (Avimag)	Wild Peach x Peach	Resistant[1,2]	Resistant[1]	Resistant[1]	Susceptible	Unknown	Susceptible	Susceptible	Unknown	Moderate[1]	Medium	Good	High	Poor
Adafuel	Peach x Almond	Tolerant[1]	Resistant[1]	Tolerant[1]							Tolerant[3]	Good	High	Medium
Bright's Hybrid	Peach x Almond	Resistant[1]	Resistant[1]	Susceptible[1]	More Tolerant than Nemaguard	Susceptible	Susceptible	Susceptible	Susceptible	Tolerant[1]/ Excluder	Tolerant	Good	High	Poor
Cornerstone	Peach x Almond	Tolerant[1]	Resistant[1]	Tolerant[1]	Susceptible	Susceptible	Susceptible	Susceptible	Susceptible	Excluder[1]	Tolerant	Good	High	Good
Felinem	Peach x Almond	Tolerant[1]	Resistant[1,3]	Resistant[1,3]	Moderate[2,3]	Unknown	Susceptible[3]				Tolerant[2]	Good[3]	High[3]	Good[3]
Garnem	Peach x Almond	Tolerant[1] Resistant[3]	Resistant[1,3]	Tolerant[1] Resistant[3]	Medium / Susceptible[2,3]	Unknown	Susceptible[3]	Unknown	Susceptible	Excluder[1]	Tolerant[3]	Good[3]	High[3]	Good[3]
Monegro	Peach x Almond	Tolerant[1] Resistant[3]	Resistant[1,3]	Susceptible[1] Resistant[3]	Susceptible[2,3]	Unknown	Susceptible[3]				Tolerant[3]	Good[3]	High[3]	Good[3]
GF557	Peach x Almond	Susceptible[1]	Resistant[1]	Susceptible[1]								Good	High[3]	Good
GF677	Peach x Almond	Susceptible[1]	Tolerant[1]	Susceptible[1]	Susceptible	Susceptible	Susceptible		Susceptible	Tolerant / Excluder[1]	Tolerant[3]	Good	High	Poor
GF749	Peach x Almond	Susceptible[1]	Tolerant[1]	Susceptible[1]								Good	High	Average

[1]Walker, A.R., Smith, M.H., McDavid, D., Goonetilleke, S., Hassan, M., 2017. Resilience traits for almond rootstocks. Final report for IRSPR2-004. CSIRO Agriculture and Food, Urbrae, pp 61.

[2]Pinochet, J., Calvet, C., Hernández-Dorrego, A., Bonet, A., Felipe, A., and Moreno, M. 1999. Resistance of Peach and Plum Rootstocks from Spain, France, and Italy to Root-knot Nematode *Meloidogyne javanica*. HORTSCIENCE 34(7):1259–1262.

[3]Felipe, A.J., 2009. Felinem', 'Garnem', and 'Monegro' Almond · Peach Hybrid Rootstocks. HORTSCIENCE 44(1):196–197.

Rootstock	Parentage	Pathogen Resistance								Soil Adaption		Effects on the Variety		
		Root knot Nematode Variation in resistance / susceptibility of species and isolates when tested in Australia[1]			Lesion Nematode	Ring Nematode/ Bacterial Canker	Crown Gall	Armillaria	Phytophthora	Salt exclusion[1]	Chlorosis	Compatibility	Vigour	Propagation by Cuttings
		M.javanica	*M.arenaria*	*M.incognita*										
Hansen 536	Peach x Almond	Resistant[1]	Resistant[1]	Resistant[1]	More Tolerant than Nemaguard	Susceptible	Susceptible	Susceptible	Susceptible	Resistant[1]/ Excluder	Tolerant	Good	High	Poor
Nickels	Peach x Almond	Susceptible[1]	Tolerant[1]	Susceptible[1]	More Tolerant than Nemaguard	Susceptible	Susceptible	Susceptible	Susceptible	Moderate[1]	Tolerant	Good	High	Poor
Krymsk (Kuban) 86	Peach x Plum	Susceptible[1]	Tolerant[1]	Tolerant[1]	Medium	Susceptible	Medium	High	Tolerant	Sensitive[1]	Medium	Good	Medium	Good
Atlas	Peach x Almond x Apricot x Plum	Susceptible[1]	Resistant[1]	Resistant[1]	Medium	Susceptible	Medium	Susceptible	Medium	Sensitive[1]	Tolerant	Good	High	Poor
Viking	Peach x Almond x Apricot x Plum	Susceptible[1]	Resistant[1]	Resistant[1]	Medium	High	Medium	Susceptible	Medium	Moderate[1]	Tolerant	Good	High	Good
Rootpac 20		High[1]								Moderately tolerant[1]				
Rootpac 40		High[1]								Moderately tolerant[1]				
Rootpac R										Sensitive[1]				

[1]Walker, A.R., Smith, M.H., McDavid, D., Goonetilleke, S., Hassan, M., 2017. Resilience traits for almond rootstocks. Final report for IRSPR2-004. CSIRO Agriculture and Food, Urbrae, pp 61.

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[3]Felipe, A.J., 2009. Felinem', 'Garnem', and 'Monegro' Almond · Peach Hybrid Rootstocks. HORTSCIENCE 44(1):196–197.

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