Government of South Australia
Department of Primary Industries and Regions

SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

ACE FACT SHEET

SARDI Rootstock & Cultivar Compatibility Screens

Background

Australian almond growers have access to a wide range of new rootstock genotypes and scion cultivars. Locally produced performance metrics are scarce, so most planting decisions are based on overseas information and potted trials. To help investors negotiate the complexity of selecting appropriate rootstock and cultivar combinations, SARDI have established two compatibility screens testing the production characteristics of more than 140 grafted combinations. These screens, based at the Almond Board of Australia's Almond Centre of Excellence (ACE), allow growers to view graft combinations side-by-side and observe production traits relevant to their own orchard developments.

Aim

To test the compatibility and production traits of Nonpareil and new (self-fertile) cultivars grafted to a range of rootstock genotypes.

+140 graft combinations are demonstrated across the two compatibility screens.

Trial design

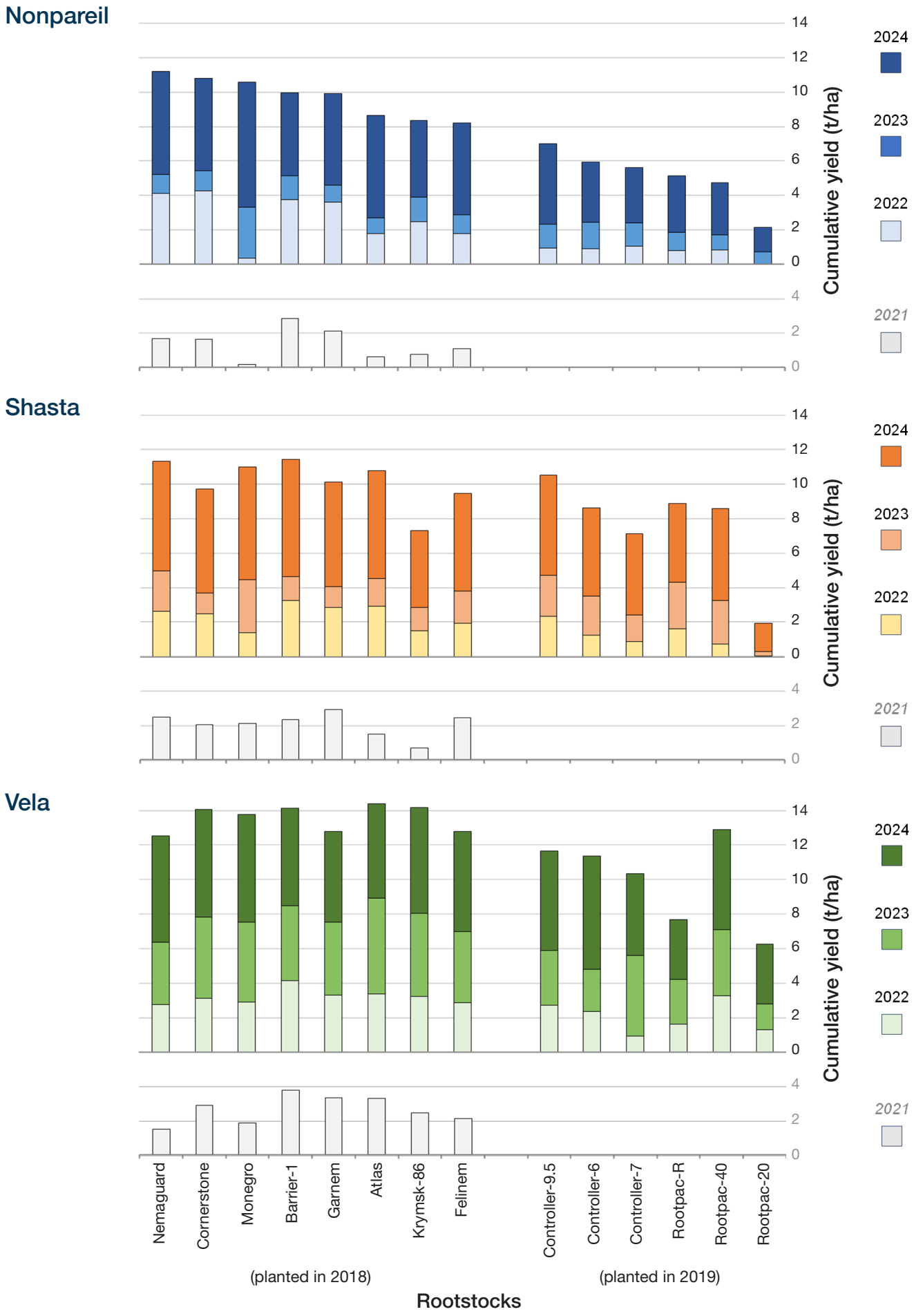
Two compatibility screens – 1,423 trees / 2.2 ha

Screen 1 – Rootstock focussed	
Five cultivars	Nonpareil, Shasta, Vela, Almond-12 & Almond-21
14 rootstocks	Nemaguard, Cornerstone, Garnem, Controller-6, C-7, C-9.5, Rootpac-R, R-20, R-40, Felinem, Monegro, Atlas, Barrier-1 & Krymsk-86
Two densities	513 & 1,111 trees/ha
Planted	2018 & 2019

Screen 2 – Cultivar focussed	
21 cultivars	Nonpareil, Carina, Maxima, Vela, Mira & 16 unnamed lines from the University of Adelaide breeding program
Four rootstocks	Nemaguard, Garnem, Controller-7 & Rootpac-40
One density	513 trees/ha
Planted	2018 & 2019

Rootstock observations at ACE (2024 – 5th/6th leaf)

Low Vigour	Rootpac-20	Plum hybrid rootstock. Susceptible to suckering. Yielding best with highly branching cultivars (like Vela). Lower yields with upright or sparsely branched cultivars (like Nonpareil and Shasta).
	Controller-6	Peach rootstock. Yielding well with cultivars tested. Producing neat, evenly branched and spreading canopy. No notable issues to date.
	Controller-7	Peach rootstock. Highly susceptible to mildly alkaline soils (weak chlorotic growth). Variable yield performance due to delays in canopy development. Not a commercially relevant rootstock for ACE soils.
	Rootpac-40	Peach almond hybrid. Yielding well with cultivars tested. Producing less dense, irregularly branched canopy that fills space quickly. No notable issues to date.
Moderate Vigour	Rootpac-R	Plum hybrid rootstock. Moderately upright and spreading canopy with heavy spurring. ACE yields too variable to be recommended for commercial use.
	Controller-9.5	Peach rootstock. Upright to moderately spreading canopy that has presented some blind wood on leaders and secondary branches. ACE yields too variable to be recommended for commercial use.
	Atlas	Multi-species hybrid. Yielding well with cultivars tested. Moderately spreading with lighter calliper, densely spurred branches from strong scaffolds. Relatively open inner canopy. No notable issues to date.
High/Moderate	Nemaguard	Peach rootstock. Moderately upright canopy with good scaffolds and secondary branching. Presents more overgrowth than most stocks at the graft union. Good performance with all cultivars tested.
	Krymsk-86	Plum hybrid rootstock. Strong anchorage. Smaller tree than those grafted to Nemaguard. Yields well with cultivars tested. Reduced scaffold density with irregular branching, which suits highly branched cultivars (Vela) more than sparsely branched cultivars (Nonpareil and Shasta). No notable issues to date.
High Vigour	Barrier-1	Peach hybrid rootstock. A large, dense canopy with strong orderly branching. Good anchorage and salt tolerant. Strong performance at ACE and one of the more precocious yielders across all cultivars.
	Cornerstone	Peach almond hybrid rootstocks. Slightly shorter than Nemaguard and more spreading. Good anchorage. Lime and salt tolerant. Balanced canopy with good secondary branching and spurring. ACE yields have been strong with all cultivars tested.
	Garnem	
	Felinem	
	Monegro	



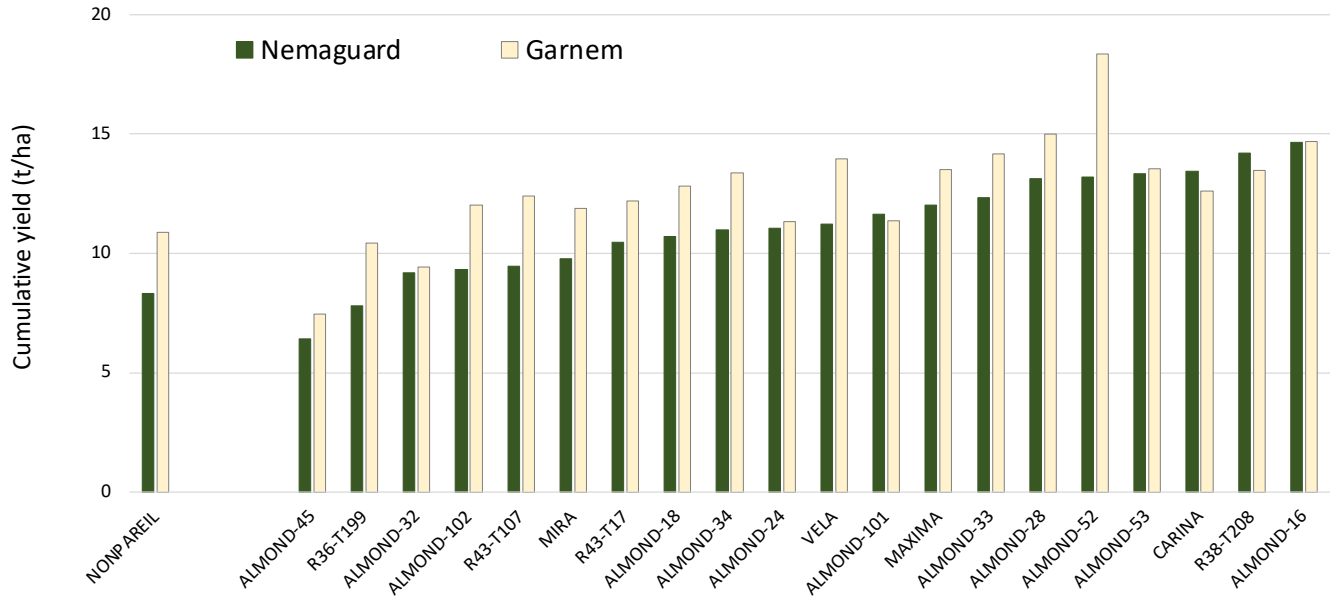
Cumulative yield (2022 to 2024) of Nonpareil (A), Shasta (B) and Vela (C) on 14 rootstocks planted in 2018 and 2019, with additional 2021 yield for 2019 plantings.

Order of rootstocks is from highest to lowest yields of the rootstocks when grafted to Nonpareil.

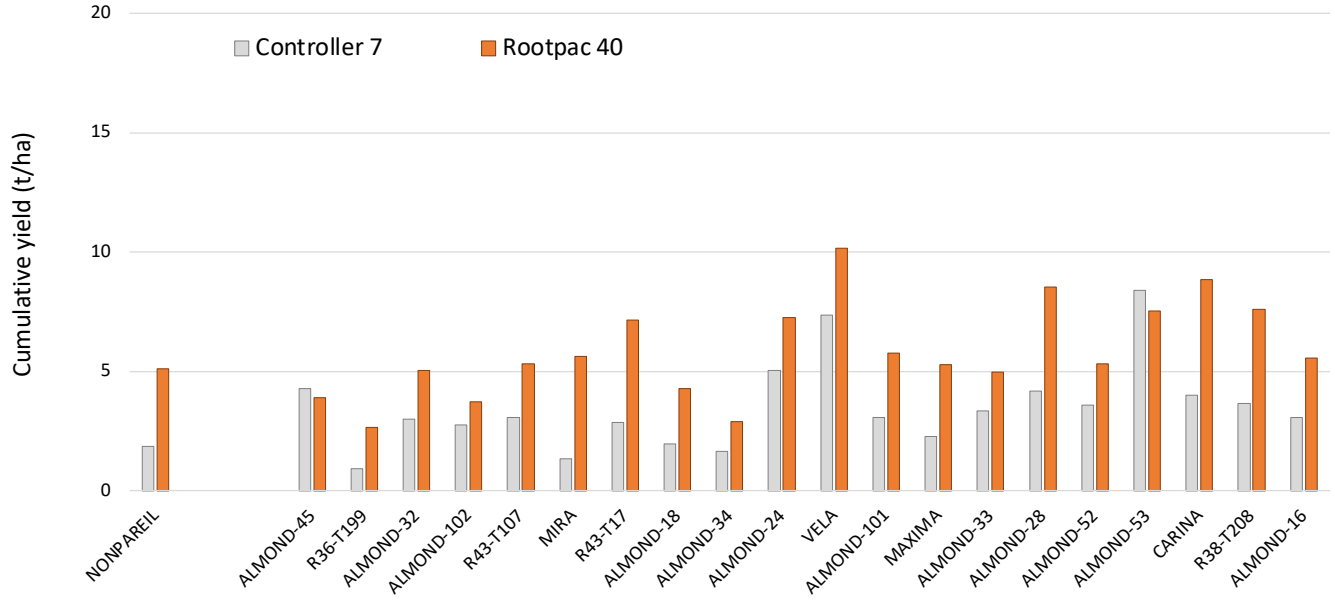
Cultivar observations at ACE (2024 – 5th/6th Leaf)

Carina	Self-fertile. Spreading dense canopy. Semi-hard shell. Small kernel ~1.1g (short, wide, and flat). Crack-out ~22.5%. Heavy regular cropper but no yield response to higher density plantings in SARDI density trials.
Maxima	Not self-fertile. Balanced moderately upright and spreading canopy. Semi-hard shell. Large cordate kernel ~1.6g (wide, flat and light colour). Crack-out ~24%.
Mira	Self-fertile. Very upright, tall narrow canopy. Semi-hard shell. Smaller kernel ~1.3g (good flavour). Crack-out ~27%.
Nonpareil	Not self-fertile. Upright canopy. Paper shell. Medium sized kernel ~1.4g (plump and light colour). Crack-out ~26.5%. Yield responds to increased planting densities in SARDI density trials.
Shasta	Self-fertile. Upright canopy that opens with weight of crop (due to tip bearing). Paper shell. Medium kernel ~1.4g (long, thin and rounded). Crack-out ~28%. Prone to kernel shrivel in SARDI plantings, minor pepper spotting. Out yields Nonpareil, irregular.
Vela	Self-fertile. Spreading canopy (excellent shoot renewal if not overly shaded). Paper shell. Large kernel ~1.6g (wide thick and light coloured). Crack-out ~ 34%. Prone to pepper spotting in SARDI plantings. Heavy regular cropper but no yield response to higher density plantings in SARDI density trials.
Almond-12	Self-fertile. Moderately upright and spreading, like Carina. Semi-hard shell. Medium kernel ~1.4g (long, wide and moderately flat). Crack-out ~27%. Prone to a high proportion of flakes (unfilled nuts) and many stick tights. Out yielded by Vela.
Almond-16	Not self-fertile. Balanced open canopy. Paper shell. Large kernel ~1.6g (long, flat and light colour). Crack-out ~31%. Overgrows Nemaguard at bud union. Possible risk of bacterial spot (from poor seal) but not yet observed at ACE. Large similar yields on Nemaguard and Garnem.
Almond-18	Not self-fertile. Nice well-balanced canopy. Paper shell. Very large kernel ~1.8g (long, wide and slightly dark coloured). Crack-out ~29%. Acceptable yields, biggest kernel tested but prone to pepper spot. Can be sticky.
Almond-21	Self-fertile. Moderately upright but opens to be spreading like Carina. Soft shell. Smallish kernel ~1.3g (ovate, medium length, wide and slightly flat, light colour). Crack-out ~26%. Out yielded by Vela.
Almond-24	Self-fertile. Messy, moderately upright, spreading and weepy, terminally busy tree. Hard shell. Smaller kernel ~1.3g (short, medium to wide, flat, darkish). Crack-out ~28%.
Almond-28	Not self-fertile. Balanced canopy with good shoot renewal. Hard shell. Large kernel ~1.5g (long, wide, flat and slightly brown). Crack-out ~24%.
Almond-32	Not self-fertile. Canopy is upright, tall, narrow and quite dense. Soft shell. Small kernel ~1.4g (plump and light coloured). Crack-out ~25%. Poor yielding.
Almond-33	Not self-fertile. Canopy large and upright but open with some blindness on scaffolds. Soft shell. Large kernel ~1.5g (long, flat and medium brown). Crack-out ~31%. Has shown “verticillium like” symptoms which affected yields less on vigorous rootstocks.
Almond-34	Not self-fertile. Canopy is upright and slightly spreading. Paper shell. Smaller kernel ~1.4g (short, narrow, plump, Nonpareil like). Crack-out ~29%. Has shown “verticillium like” symptoms which affected yields less on vigorous rootstocks.
Almond-45	Not self-fertile. Shorter, very spreading tree but not weeping. Too early flowering (-20 days NP). Paper shell. Large kernel ~1.6g (long, wide, flat and good flavour). Crack-out ~30%. Low yielding, high incidence of doubles and prone to twig death internally.
Almond-52	Not self-fertile. Canopy is upright and slightly spreading. Hard shell. Medium kernel ~1.4g (short, thin and flat, NP like). Crack-out ~27%. Precocious yielder on more vigorous rootstocks (highest on Garnem).
Almond-53	Not self-fertile. Nice balanced moderately upright tree. Paper shell. Large kernel ~1.5g (flat and slightly dark colour). Crack-out ~27% Precocious yielder on all stocks, even C7. Badly impacted by poor bloom weather in 2023.
Almond-101	Self-fertility unknown. Interesting architecture; upright, tall but spreading and densely spurred, busy canopy. Hard shell. Very large kernel ~1.7g (elongated, wide, moderately dark). Crack-out ~21%. Lower cropping on size reducing rootstocks and fair on more vigorous.
Almond-102	Self-fertility unknown. Interesting architecture: extension breaks multiple lateral buds into new growth (feathers). Semi-hard shell. Medium size kernel ~1.4g (short, wide, dark brown and hairy). Crack-out ~27%.
R36-T199	Self-fertility unknown. Canopy balanced and open. Semi-hard shell. Large kernel ~ 1.5g (flat, wide, dark brown). Crack-out ~24%. Small flowers. Yields poorly on all rootstocks. Branch spotting disorder and sticky nuts
R38-T208	Self-fertility unknown. Upright, large trunk, scaffolds and leaves (in upward rosettes). Soft shell. Small kernel ~1.2g (round but appear marketable). Crack-out ~29%. Low flowering but good conversion to yield.
R43-T107	Self-fertility unknown. Upright tall and narrow. Moderate yields, good on Garnem. Hard shell. Smaller kernel ~1.4g (short, wide and flat, Carina like). Crack-out ~22%.
R43-T17	Self-fertility unknown (probably not self-fertile). Canopy is upright tall and narrow. Soft shell. Large kernel ~1.6g (flat, wide, and dark). Crack-out ~25%. Slow start, huge crops 2024, hanging externally in thick dense clusters. Some spur regeneration.

(A) Sixth leaf cumulative yields (at 2024)



(B) Fifth leaf cumulative yields (at 2024)



(A) Cumulative yield (2021 to 2024) of 2018 plantings for 21 varieties on Nemaguard and Garnem.

(B) Cumulative yield (2022 to 2024) of 2019 plantings for 21 varieties on Controller- 7 and Rootpac-40.

Order of varieties is from lowest to highest yields of the varieties when grafted on Nemaguard.

Ongoing investigations

- Testing the response of rootstock and cultivar to transient water stress.
- Characterising canopy architecture to inform alternate production systems.
- Ongoing compatibility and disease susceptibility surveys.
- Compiling individual rootstock/cultivar factsheets for promising genotypes.

Further information

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SARDI projects conducted at the ACE experimental orchard have been funded by Hort Innovation, using the almond research and development levies, contributions from the Australian Government and co-investment from the South Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

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