Australian National University

TECHNICAL SUMMARY

Root Architecture Regulator (RAR) – Key to Modulating Root Architecture for Thriving Plants

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The success of the Green Revolution can be attributed to customized crop varieties with modified growth parameters, addressing diverse agro-ecological challenges. Optimised plant root architecture is essential for sturdier stems, improved water and nitrogen use efficiency, enhanced fertilizer response, and stress tolerance.

Ongoing research is delving into molecular-genetic regulation, stem cell manipulation in plants, and optimization of root architecture to better align with prevailing growing conditions. These aspects are pivotal in shaping plant forms, but require genetic manipulation and extensive breeding.

Researchers from the Australian National University (ANU) have demonstrated that a family of genes encoding regulatory peptides (RAR; Root Architecture Regulator) play a key role in determining root architecture in response to various abiotic stresses and biotic interactions.

Technology (TT2011-027 & TT2013-035)

ANU researchers have discovered a unique root architecture modulating technology platform, which includes C-Terminally Encoded Peptides (CEP), mobile peptide hormones capable of detecting low nitrogen (N) levels and enhancing the activity of nitrate transporters. Genes from the CEP family produce such peptides that communicate with CEP receptors to regulate plant growth, especially under stress, and affect other important developmental processes.

Studies conducted by scientists at ANU identified peptide/CEP receptor interactions that govern various aspects of root architecture and function between shoots and roots, resulting in the development of deeper roots, offering a potential avenue for enhancing drought tolerance.

Additionally, this technology has the potential for improving the agronomic performance of crop and pasture plants utilized in the global production of food, feed, fibre and fuel.

Potential benefits

> Increased nutrient uptake, root nodule formation and nitrogen fixation
> Stimulating lateral root growth and development in response to abiotic stress and root knot nematodes across a range of crops
> Increased nodulation in legumes and thereby increase N fixation
> Improved acquisition of N and possibly P and S from the soil
> Reduced fertiliser field application and reduced fertiliser run off
> Improved adaptation to nutrient limitation.

Opportunity

ANU is seeking engagement with industry partners to test the peptides, work collaboratively to further develop, optimise, and advance the technology.

ANU will also consider assignment of the patents to bolster a companies existing patent position in the field.

IP status

Australian National University hold two granted patents in multiple countries (WO 2013104026 A1, WO 2015054728 A1).

Key research team

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Publications

> doi:10.1093/jxb/ert369
> doi:10.1111/nph.15019
> doi:10.1111/nph.16483
> doi:10.1093/jxb/ert332

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