

Size does not always matter for root systems

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A wheat crop efficiently taking up nitrogen is critical to its growth, grain yield, grain protein and ultimately, its profitability for the wheat grower, Dr Palta says. Credit: Sleepy Claus

Scientists will dramatically change the direction of their breeding efforts to improve nitrogen uptake by wheat, after the release of findings suggesting wheat genotypes with smaller root systems might be better suited to WA's water and nitrogen leaching soils.

For some years, it was believed [wheat](#) genotypes with large and early prolific root systems were the most effective in capturing nitrogen in deep [sandy soils](#).

However, research now suggests this is not always the case.

During the winter months WA's deep sandy soils are known for leaching large amounts of the nitrogen available in the soil profile, which is not only a profitability issue for grain farmers but also an environmental concern.

CSIRO research has shown the commercial cultivars Janz and Kulin, while having smaller root systems, are able to uptake similar nitrogen than those genotypes with large root systems.

The findings mean scientists can now explore other ways to breed wheat cultivars specifically suited to WA's sandy soils, CSIRO principal scientist Jairo Palta says.

"We had previously thought we needed to select only genotypes with large root systems which branch earlier and faster so they can intercept the soil nitrogen before it goes below the root system zone," he says.

The research identified that Janz and Kulin cultivars, while having a similar nitrogen uptake, had large differences in root biomass, root growth and proliferation to those genotypes with larger root systems, Dr Palta says.

"This is suggesting that nitrogen uptake is not always directly related to [root growth](#), proliferation and root tip numbers," he says.

"Janz and Kulin appear to have a high affinity for nitrate, meaning they have a great attraction and fast absorption once the roots came into

contact with the nitrate."

A wheat crop efficiently taking up [nitrogen](#) is critical to its growth, grain yield, grain protein and ultimately, its profitability for the wheat grower, Dr Palta says.

"The next step is to seek genetic variation for high nitrate affinity in wheat germplasms and to answer the question in regard to to which root systems are more suitable to different soil types in WA, such as heavy clay soils, duplex soils and sandy soils" he says.

The research used pit holes in field trials across the Wheatbelt, plus one metre deep Rhizo-boxes and detailed hydroponic studies in glasshouses.

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