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NSW scientists join national push to modernise chickpea nitrogen fixation after four-decade gap

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Australia is undertaking its most significant effort in more than 40 years to modernise the biological foundations of chickpea production, with New South Wales scientists playing a central role in a national research program aimed at identifying elite rhizobia strains capable of improving nitrogen fixation, expanding cultivation opportunities, and reducing reliance on synthetic fertilisers.

Led through a collaborative investment funded by the Grains Research and Development Corporation (GRDC), the initiative seeks to develop a new generation of chickpea inoculants for Australian growers, replacing rhizobia strains that have remained largely unchanged since the 1970s. The program reflects a growing recognition that biological nitrogen fixation will play an increasingly important role in maintaining productivity while improving sustainability across broadacre farming systems.

Chickpeas, like other pulse crops, depend on symbiotic soil bacteria known as rhizobia, which convert atmospheric nitrogen into forms that plants can use for growth. This natural process not only supports crop development but also leaves residual nitrogen in the soil after harvest, benefiting subsequent crops and reducing the need for additional fertiliser applications.

However, chickpea-specific rhizobia do not occur naturally in Australian soils. In regions with limited chickpea cultivation history, growers must introduce these bacteria through commercial inoculants. As chickpea production expands and environmental conditions evolve, researchers believe the time is right to identify superior strains that can deliver stronger nodulation, greater nitrogen fixation efficiency, and improved crop performance.

The project, launched in 2023, brings together expertise from the NSW Department of Primary Industries and Regional Development (DPIRD), the South Australian Research and Development Institute (SARDI), Adelaide University, Murdoch University, and the Queensland Department of Primary Industries, creating one of Australiaâ??s most comprehensive pulse microbiology research collaborations.

Given that New South Wales remains Australiaâ??s dominant chickpea-producing state, contributing significantly to national output, DPIRD scientists are playing a pivotal role in both laboratory and field evaluations. Researchers at the Elizabeth Macarthur Agricultural Institute (EMAI) are characterising candidate rhizobia strains, assessing their suitability for commercial inoculant production and conducting quality assurance work for the national program.

Simultaneously, field research teams at the Tamworth Agricultural Institute (TAI) are evaluating the strains under real-world production conditions across Tamworth, Breeza, and Narrabri, representing key environments within the northern grains region. Beyond testing biological performance, the trials are also examining agronomic factors that influence nodulation success, including sowing timing, inoculation techniques, and herbicide interactions.

The implications of the research extend well beyond improved inoculants. Scientists believe the identification of more effective rhizobia strains could potentially expand the geographic footprint of chickpea cultivation in New South Wales, opening opportunities in regions where production has historically been constrained by environmental or biological limitations.

The timing is significant for the Australian pulse sector. Chickpeas have emerged as one of the country's most valuable grain export commodities, with New South Wales recording a gross value of production of approximately AUD 1.1 billion in the last financial year. The crop accounted for around 86 per cent of the state's total pulse export value, underlining its growing economic importance within Australian agriculture.

NSW Minister for Agriculture Tara Moriarty described the initiative as a landmark step for the industry.

â??This exciting research to find elite strains of chickpea rhizobia, which has not been attempted for more than four decades, will greatly benefit chickpea growers throughout New South Wales,â?• Moriarty said.

She noted that improved rhizobia performance could strengthen both productivity and sustainability outcomes for growers while enhancing the cropâ??s contribution to nitrogen management within farming systems.

â??NSW DPIRDâ??s contribution to identify new strains will help improve the sustainability of this crop, which many of our farmers tap into for its economic value and for its ability to fix nitrogen into the soil for subsequent crops in their rotations,â?• she added.

The Minister also highlighted the potential for broader adoption of chickpeas across the state and the growing relevance of biological nitrogen fixation technologies amid global fertiliser market uncertainty.

â??This research will have another benefit in helping to reduce the need for inorganic fertilisers at a time when instability of supply is being felt globally,â?• Moriarty said.

As fertiliser costs, supply-chain disruptions, and sustainability expectations continue to reshape global agriculture, the search for more efficient biological nitrogen solutions is attracting increasing attention. The Australian chickpea rhizobia program reflects a broader industry trend toward harnessing microbiology and natural soil processes to improve productivity while reducing input dependence.

For Australia's rapidly expanding pulse industry, the initiative could mark the beginning of a new chapter in crop nutritionâ??one where the smallest organisms in the soil deliver some of the biggest gains in farm performance and sustainability.