

Emerging Voices Shaping Regional Integration for a Food Secure World

10-11 August 2026

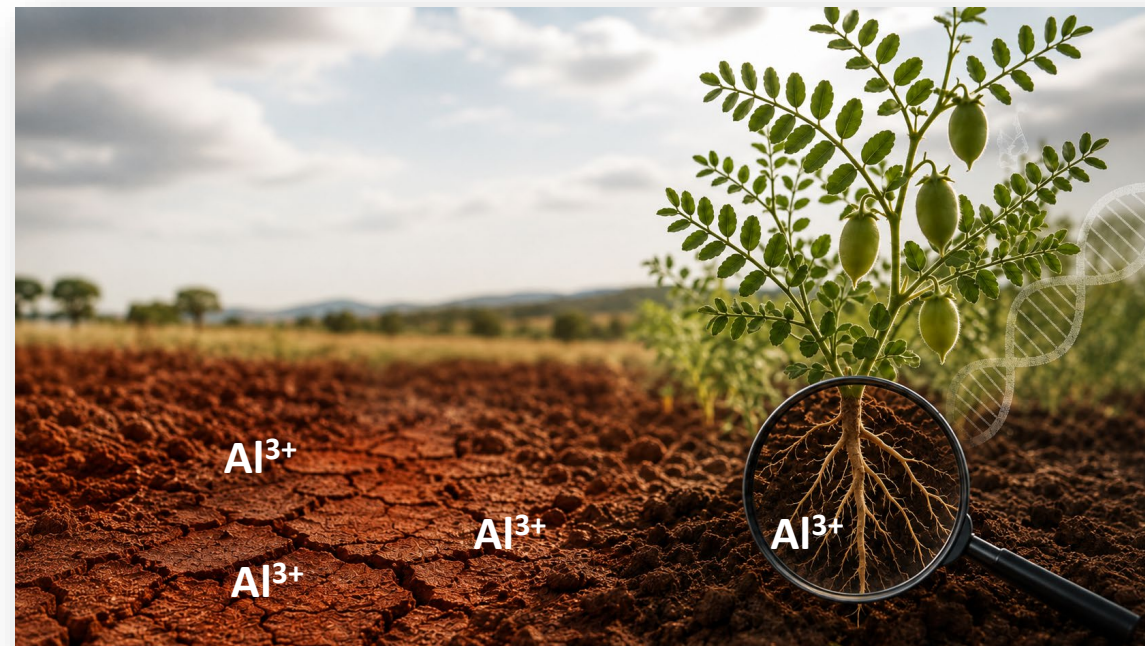
Parliament House, Canberra,
Australia, and online

Gene Hunting: Finding Resilient Chickpeas for Australia's Toxic Acidic Soils

Gayathri Rathnayake

Western Crop Genetic Alliance, School of Agricultural Science,
Murdoch University

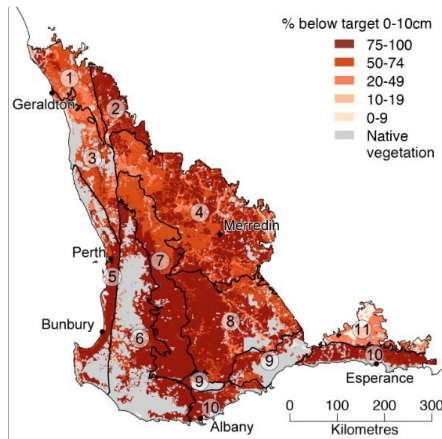
August 10-12th 2026



Why does acid soil tolerance matter in Chickpea?

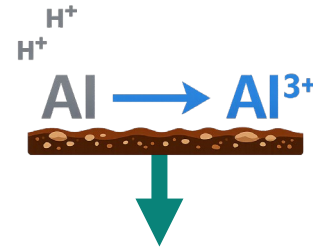
1 Acidic soil

50% of Australia's agricultural land has surface soil pH of 5.5 or lower

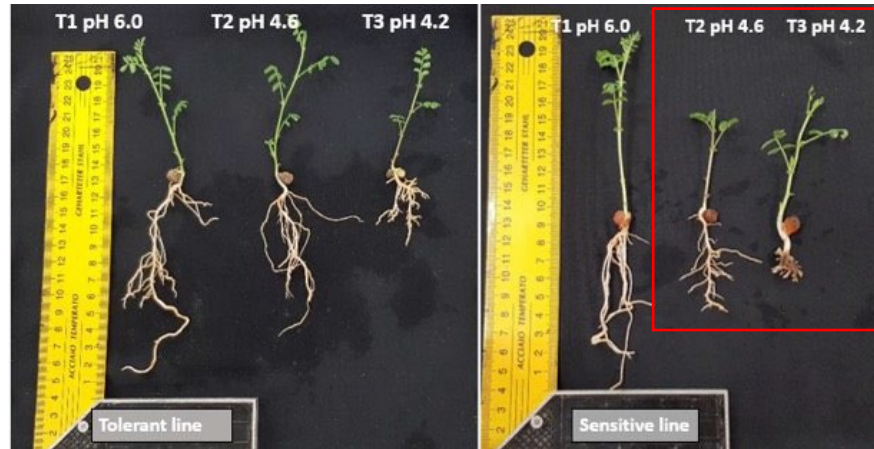


% Land area of WA (wheatbelt) soil below pH 4.8

2 Al^{3+} toxicity

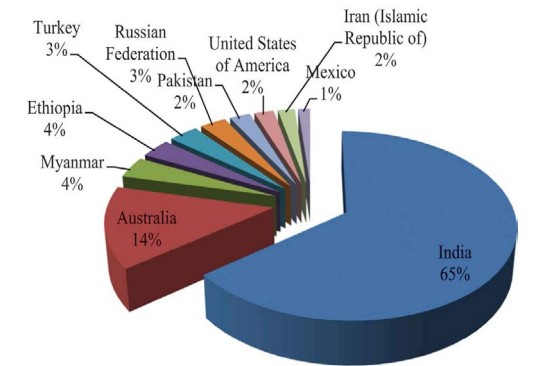


Inhibit roots elongation



3 Yield risk

Shorter roots reduce nutrient and water uptake limiting productivity



Chickpea production Worldwide (2022)





Our Objectives

Identify Al toxicity tolerance genes

Understand Molecular Mechanism

Develop molecular markers for marker-assisted breeding of **Al-tolerant chickpea cultivars**



Tolerant

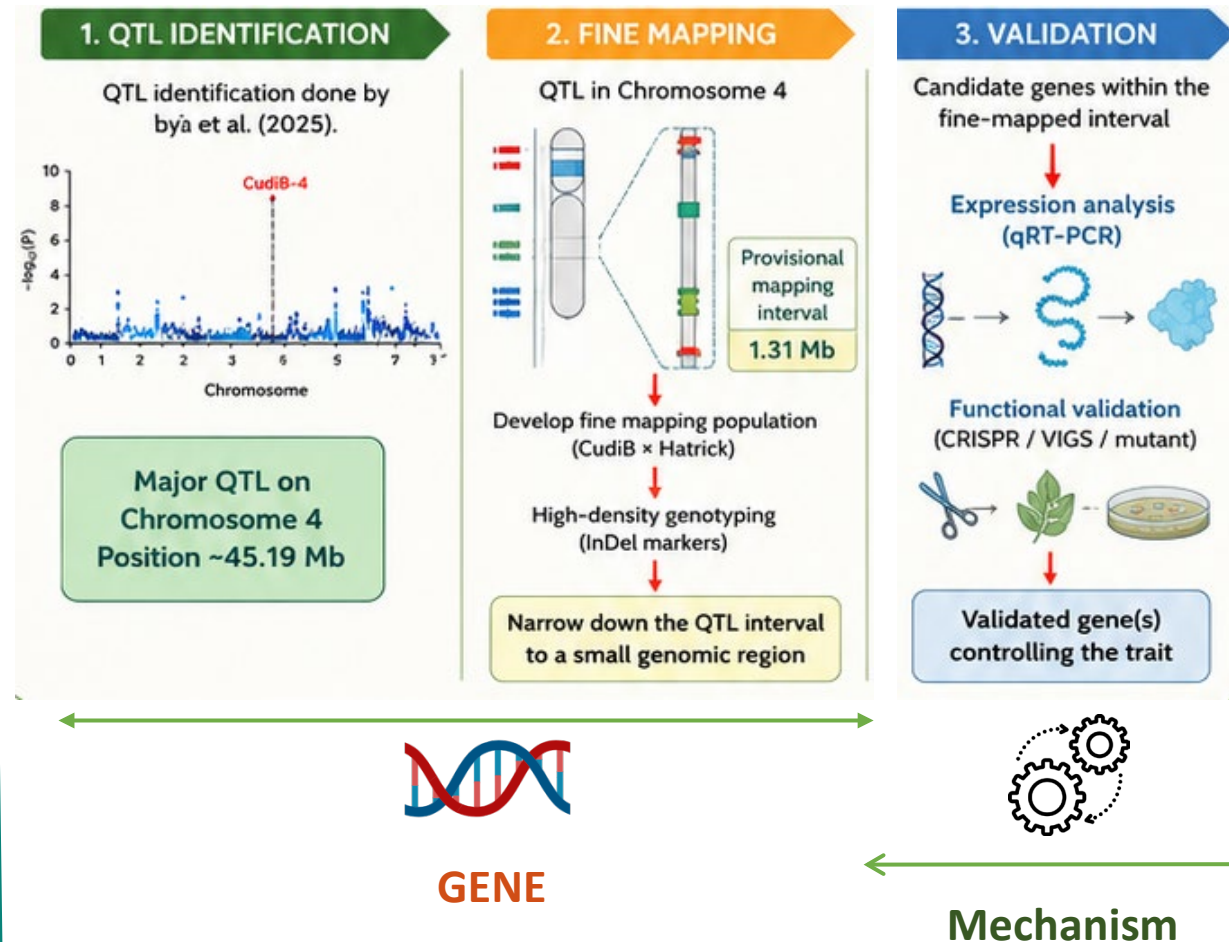


Sensitive



Chickpea acid soil trial (Merredin, WA, 2023)

Our Approach: From QTL to Gene

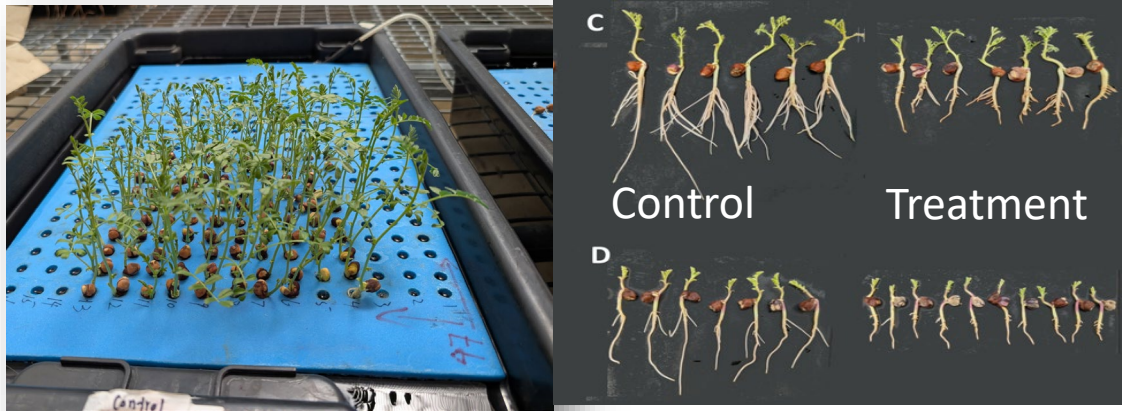


Where We Are Now ?

Bi-Parental population

Hatrick (Sensitive) * **Cudi B** (Tolerant /Wild)

1 Phenotyping

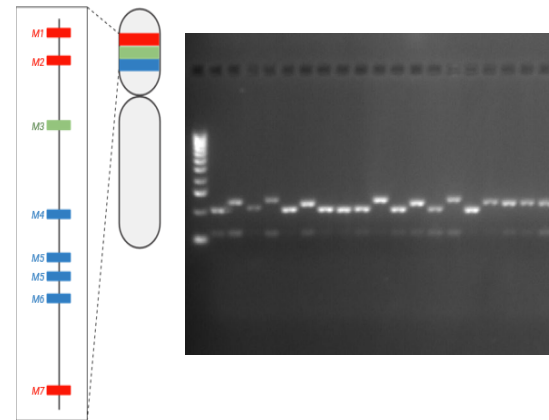


Hydroponic phenotyping to measure root length

$$\text{Root Tolerance Index} = \frac{(\text{Mean root length under AI})}{(\text{Mean root length under control})}$$

2

Genotyping



17 polymorphic Indel Markers were developed for genotyping

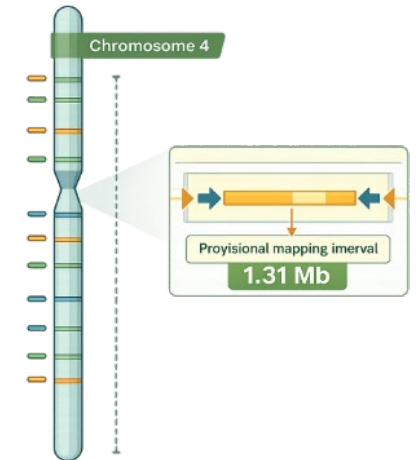
3

Recombinant identified



4

Narrow down to Genes



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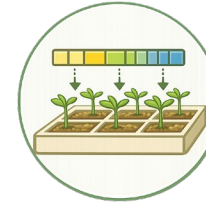
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Expected Impact



Al tolerance genes and diagnostic molecular markers



Marker-assisted selection



Al –Tolerance Chickpea Cultivars



**Improved productivity on acidic soils
and food security**



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Acknowledgement

Supervisor Panel

Prof. Chengdao Li

Dr. Yong Jia

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Prof. Rajeev Varshney

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Western Crop Genetics Alliance



Department of
Primary Industries and
Regional Development



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