Chickpea phenology and architecture: responses to temperature

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ABSTRACT

Temperature plays a critical role in phenology and plant architecture. It significantly alters the timing of key phenological stages and shapes important architectural traits.

Genotypes that reached floral transition and podding consistently across tested temperatures, may be valuable for breeding programs targeting stable phenology under varying temperature environments.

A better understanding of the genetic basis of chickpea architecture could improve harvesting efficiency and guide the optimisation of existing agricultural machinery, and support the development of innovative plant spacing arrangements through better characterisation of genotype × environment × management interactions.

Introduction

- Phenology and plant architecture are key traits for yield potential and crop adaptation, shaped by genetics, environments and their interactions.
- In chickpea, the genetic basis of these traits and their responses to temperature remain poorly understood. Moreover, cardinal temperature thresholds for key processes, including the progression of phenological stages, are also largely undocumented.
- Understanding these responses and the genetic diversity available is essential for selecting the right cultivars suited to diverse thermal environments.



Fig.1: Architecture diversity among chickpea cultivars

Methods

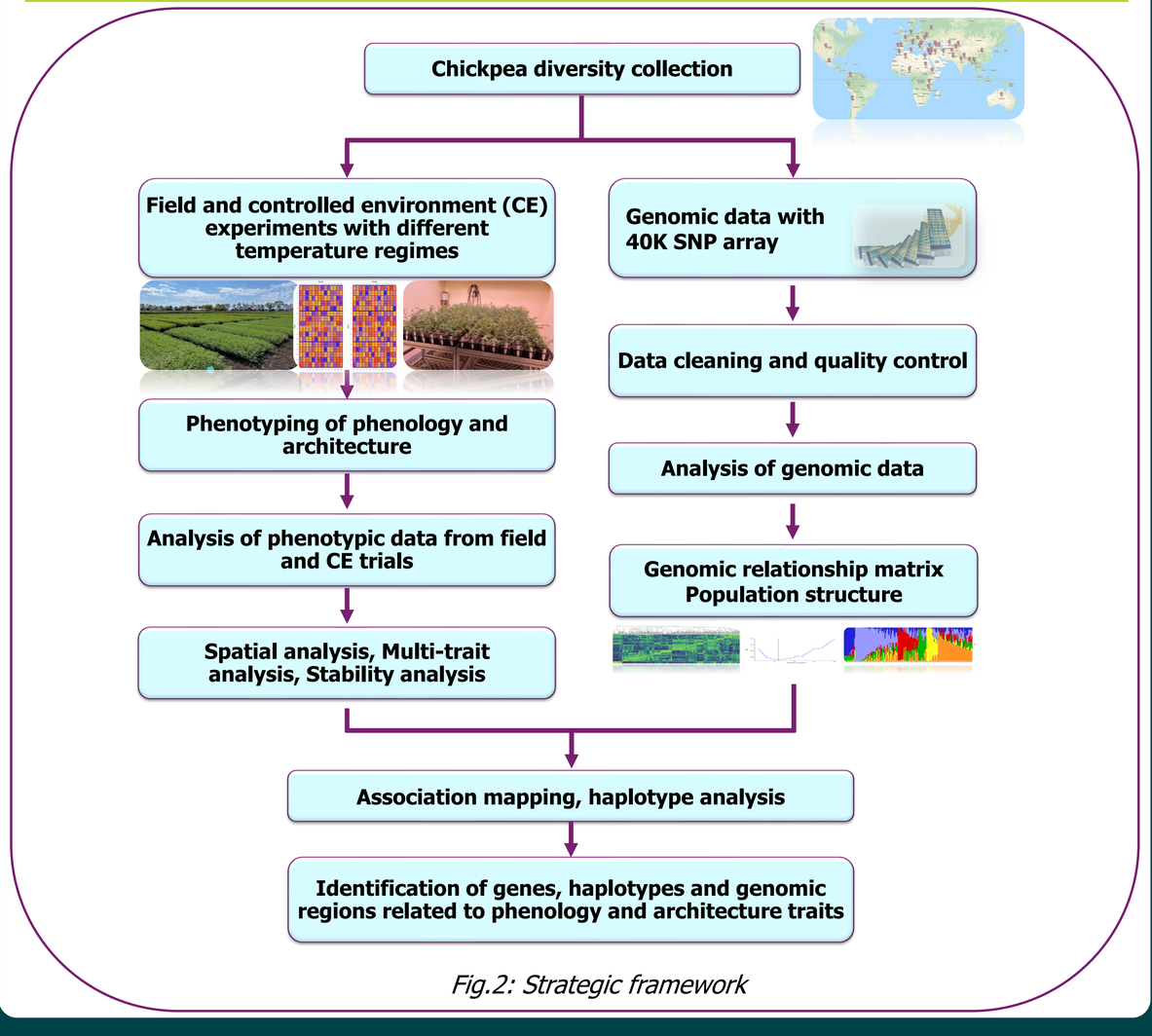


Fig.2: Strategic framework

Results

- **Vegetative development**

Temperature influences vegetative development in chickpea. Within the tested temperature range, leaf and node appearance rates increased as temperature increased.

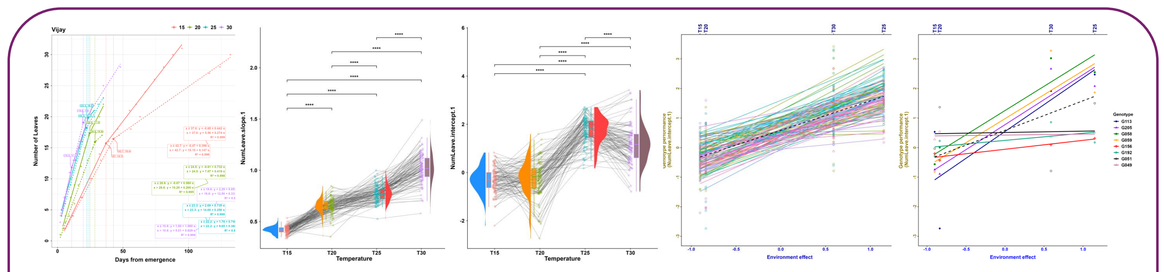


Fig.3: Rates of vegetative development across temperature regimes

- **Reproductive development**

Chickpea genotypes vary in their responses to temperature, with substantial variation among phenological stages observed at 30°C.

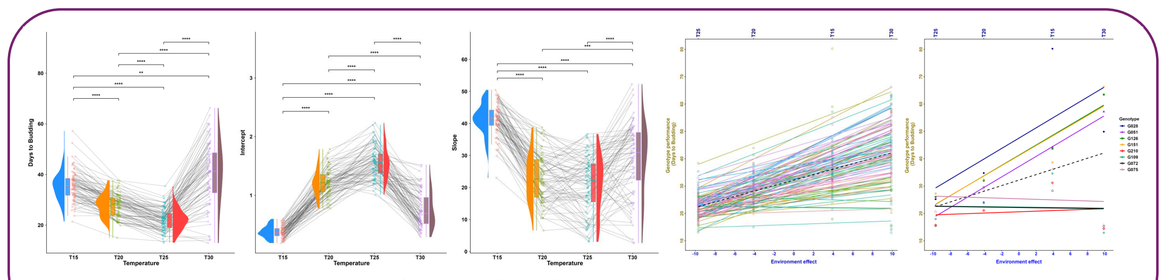


Fig.4: Reproductive phenology across temperature regimes

- **Architecture responses to temperature**

Temperature affects chickpea architecture, with responses varying among traits. Considerable genetic variation in temperature response was observed among chickpea genotypes, as evidenced by the wide range of phenotypic responses across temperature treatments.

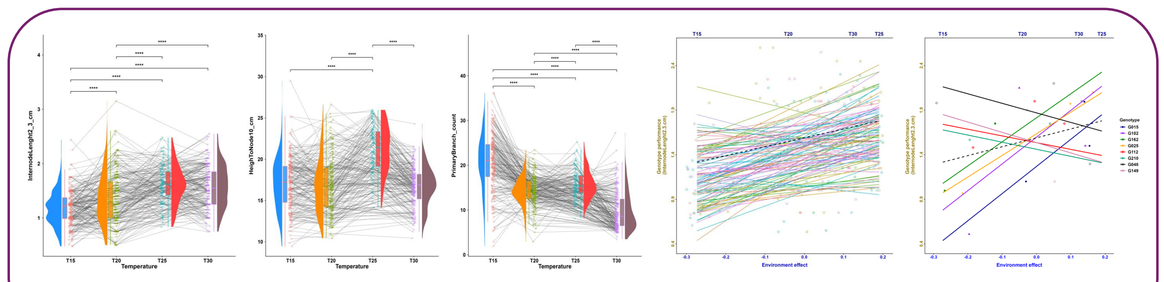


Fig.5: Architecture traits across temperature regimes

Future work

- Genome-wide association studies and haplotype analyses for the phenology- and architecture-related traits, are currently under investigation.

References

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