Managing grain legumes in challenging environments

Faculty of Agriculture and Environment Research Symposium
On the Pulse  12 July 2016

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Outline

› Importance of grain legumes in Australia
› Chickpea development and critical periods
› Managing chilling and high temperature impacts
› Managing drought impacts
Pulses for export

Australian chickpea exports

- 5 year average exported
- 611,000 tonnes
- Export value
- $351 million
- 91% exported
- Other destinations include Asia, North America & Europe

- Australia is the world’s largest exporter of desi chickpea

Pulse Australia
Pulses for export

Note: Indian futures are shown as an indication of prices in a destination market. Aus producers cannot hedge on this market.

Market Check
(www.marketcheck.com.au)
Pulse growing areas
Chickpea phenology

Developmental stages

Sowing → Emergence
End of basic vegetative stage → Floral initiation
1st flowering
Physiological maturity → Start pod filling

Growth stage code

VE → R1 → R8 → R12
Chickpea reproductive development

- Open flower
- Dry flower
- Pod development
- Faded flower
- Pod formation
Chickpea is sensitive to chilling temperatures at flowering.

Frost damaged chickpea

Effect of sowing date on flowering day

Chickpea is sensitive to temperatures <15°C at flowering

Source: Pulse Australia
### Preferred sowing times in different regions

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- Marginal planting time: increased costs and/or lower yields
- Preferred planting time

Chickpea is sensitive to temperatures <15°C at flowering

Source: Pulse Australia
Critical periods for stress

Flowering

Sadras & Dreccher (2015) – Crop and Pasture Science 66, 1137-1150
Chickpea is sensitive to high temperature at flowering and grain filling

Devasirvatham et al. (2013) Field Crops Research 142, 9-19
Chickpea pod set under heat stress

ICCV92944 – heat tolerant

ICC5912 – heat sensitive
Chickpea pod set under heat stress

ICCV92944 – heat tolerant

ICC5912 – heat sensitive
Pollen viability and pollination under heat stress

Photos: H. Clarke
Chickpea pollen sterility under heat stress (40/25 °C)

ICCV92944 – heat tolerant

ICC5912 – heat sensitive
Heat induced yield reduction in faba bean

Early planted

Late planted

Germinated pollen
No-till to reduce drought stress
High frequency of drought events mainly during the grain filling period

Drought frequency (water supply/demand ratio) at developmental stages

Source: APSIM modelling with 100 year historical climate data (Peter Kaloki & Qunying Luo)
Conservative genotypes that use less water early and more water during grain filling

Pulses are an important export crop for Australia.

Planting at the correct sowing window and selecting stress tolerant cultivars can help reduce abiotic stresses at flowering and grain filling.

Planting chickpea into zero-till stubble can mitigate drought stress to some extent.
Acknowledgements
Questions