INTRODUCTION

Southern Pulse Agronomy (SPA) is a collaborative research program across South Australia and Victoria lead by DJPRVic and funded through GRDC, DJPRVic, and SARDI. The current project, from which research results presented here have been generated, is entitled 'Understanding the implications of new traits on adaptation, crop physiology and management of pulses in the southern region' (DAV00150).

The program aims to deliver information on the agronomic implications of new traits in breeding lines and new varieties of pulses (lentil, chickpea, faba bean, field pea and lupin) within modern farming systems.

About the Program

Pulses are an important part of many productive, profitable and sustainable farming systems in southern Australia. In recent seasons, there has been rapid and successful uptake of new varieties with improved adaptability and novel management traits (e.g. PBA Hurricane XT lentil). In addition, pulses have expanded into the low (LRZ) and high rainfall zones (HRZ) where they are less adapted, specifically, lentils and field peas in the LRZ and faba beans in the HRZ.

Breeding programs continually identify and develop new traits to improve crop adaptation to a range of environments, while farming systems and crop management options continue to change in the face of new challenges. For example, following the success of the herbicide tolerance trait in PBA Hurricane XT, several other herbicide tolerance traits are currently being developed in faba bean, chickpea and lentil. Ongoing collaborative research between germplasm enhancement (GE), breeding and SPA ensures a successful pipeline exists for the rapid and effective delivery of these traits to market. Several other key traits including disease resistance (responding to recent resistance breakdowns), canopy development, early maturity and tolerance to soil constraints have been identified for future research. Building on previous projects through targeted research and development activities, this project will continue to contribute to the understanding of pulse growth and performance under changing environmental and management conditions. This will lead to improved yield and yield stability of pulses, ultimately leading to increased profitability and adoption of new varieties by growers.

This project delivers research and development activities to address 2 outputs, whilst maintaining flexibility to address rapidly emerging industry needs (e.g. changes in disease resistance status):
1. New traits for modern farming systems - Strategic genotype x management research will be conducted that provides information on understanding and maximising the benefits of new traits/genes recognised in the breeding program through improved crop management:
a. Herbicide tolerance and weed ecology - Understanding the agronomic importance and viability of traits linked with weed management and herbicide tolerance in lentil and faba bean (metribuzin and Gp B tolerance) and chickpea (potentially Gp B and Gp I). Implications for weed management and ecology will also be considered, including early maturing varieties for crop topping.
b. Disease management – In field pea, blackspot continues to be a major limitation to production. Recent work in SA by the SPA and in France by INRA suggest there are opportunities to minimise the risk of blackspot by combining novel fungicide applications, with improvements in genetic resistance enhanced by plant morphological and architectural differences. In faba bean and chickpea, resistance to ascochyta blight has recently broken down and implications for management packages need to be elucidated.
c. Canopy management (biomass and architecture) – In lentils and faba beans improvements in vigour, architecture and biomass development combined with improved disease resistance, may require reduction in seeding rates, particularly when combined with early sowing dates to secure

yields in dry years. There are also opportunities to better manage bulky canopies and maximise pod set through a combination of crop management and genetic practices including the use of PGR's.
d. Harvest quality – Little is understood about the impact of adverse weather events on mature crops, yet major quality and industry issues have arisen when they have occurred in the past. Genetic and agronomic differences have been reported as being important in reducing quality losses. Opportunistic research through trials assessing delayed harvest and weather events on a range of genotypes under the same conditions will add to this knowledge both for producers and breeders.

2. Variety specific agronomy packages (VSAP) - Targeted agronomic research will produce data for new pulse varieties which will be synthesised into management packages for the southern Australian cropping regions in collaboration with PBA or other pulse breeding organisations. This will deliver maximum benefits of new varieties to growers immediately after they are released. The pulse industry views the delivery of VSAP's and the matching of genotypes to optimum farming systems as an essential link in the development of new varieties by PBA.

The research will address major and expanding production zones in alignment with GRDC's agroecological zones: SA Mid-North/YP/Lower EP; SA/VIC Bordertown/Wimmera; SA/VIC Mallee including UEP; VIC High Rainfall.

This project will draw on the extensive experience of project partners in pulse production and linkages with PBA, grower groups, commercialising companies, advisors and other research projects. Field research will be conducted on small-scale trial plots due to limited seed supply of advanced breeding lines, combined with strategic glasshouse studies where relevant to provide further detailed physiological understanding. Field research sites, where possible, will be located with other pulse research sites. In addition, field trials will have additional value being utilised by other research groups. For example, the national rhizobia programs could use trials to test new inoculants and interaction with varieties and regional research agronomy specialists could assess the potential of remote sensing tools to assess disease incursion and progression in pulses. These technologies will be incorporated where beneficial to increasing the outputs of this program.

The project maintains close industry links through active participation at field days, with technical publications and grower groups (e.g. VNTFA, BCG, SFS, MSFS, EP, YPASG, Hart, LEDA, Mackillop, MNHR, SA/Vic private consultants) and presentations at key industry conferences (i.e. GRDC updates).

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Ian Ludwig	Technical Officer, SARDI Naracoorte, South Australia
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Andrew Ware	formerly Senior Research Scientist, SARDI Port Lincoln, South Australia
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Ashley Flint	Technical Officer, SARDI Port Lincoln, South Australia
Brenton Spriggs	Technical Officer, SARDI Minnipa, South Australia
Sue Buderick	Casual Technical Staff Member, SARDI Minnipa, South Australia
Mick Brady	R&D Agronomist, Frontier Farming Systems Mildura, Victoria
Todd McDonald	Technical Support, Frontier Farming Systems Mildura, Victoria
Chris Davies	Technical Support, Frontier Farming Systems Mildura, Victoria
Charlton Jiesman	Technical Support, Frontier Farming Systems Mildura, Victoria
Ronald Buitendijk	Technical Officer, SFS Inverleigh, Victoria

Industry Collaborators

Garry Rosewarne, Arun Shunmugam, Laura James and Babu Pandey, Pulse Breeding Australia, DJPR – Horsham, Victoria.

Kristy Hobson, Pulse Breeding Australia, DPI – Tamworth, New South Wales

Jeff Paull, Pulse Breeding Australia, University of Adelaide – Adelaide, South Australia.

Jenny Davidson, Rohan Kimber, Sara Blake, Ross Ballard and Liz Farquharson, SARDI – Waite, Adelaide, South Australia.

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