

Manjula Bandara Art Kruger, Kathie Davidson, Don Elmer, Alyssa Simpson, and Alison MacLachlan

The Pulse and Special Crops Program is primarily responsible for evaluation, introduction and development of new/under-utilized crops and production technologies to enhance crop productivity and profitability, and improve the crop diversity in Alberta.

In addition, the program lead involves in training of post-graduate level students at the University of Saskatchewan and the University of Lethbridge, by co-supervising or serving as a graduate committee member, and also guiding/instructing students for graduate level independent courses.

Research projects

1. *Cultivar development/selections*

Red lentil (herbicide tolerance), Kabuli chickpea (super-size-seeded), mung bean (early maturing with resistant to bacterial blight), black gram (early maturing and resistant to bacterial blight) and coriander (high yielding with higher fruit oil content)

2. *Agronomic/physiological studies*

Develop cost-effective production package for soybean, considering genotype, seeding density, row spacing, inoculation and irrigation requirement.

Develop cost-effective essential oil extraction protocol for coriander.

Develop production package for rain-fed grown grain corn in southern Alberta

3. *Production system studies*

Optimizing frequency and sequence of annual deep- and shallow-rooted pulses (chickpeas, lentils, field peas) in cereal/oilseed based crop rotation system in southern Alberta.

Project Collaborators/Funders

AF researchers and specialists; pulse and special crop/seed production and processing industries (Alberta Pulse Growers, Alberta Corn Committee, Monsanto DuPont-Pioneer, SeCan, NorthStar Genetics, Query Seeds Ltd., La Coop Fédérée, Country Commodities Ltd., Fabian Seed Farms Inc. and Quattro Ventures), Agriculture Funding Consortium; and Federal/Provincial Departments of agriculture (Agriculture and Agri-Food Canada; Manitoba Agriculture, Food and Rural Initiatives) and international research institutes [International Crops Research Institute for the Semi-Arid Tropics (ICRISAT); International Centre for Agricultural Research in the Dry Areas (ICARDA); AVRDC- The World Vegetable Centre] and Universities (Lethbridge, Saskatoon and Guelph).

Results and Progress

- Chickpea and lentil cultivars developed in collaboration with U. of S. are available for AB growers (conventional red lentils cultivars, CDC Redcliff, CDC Redbow, CDC Rosebud, CDC KRI, CDC Scarlet, CDC Marble, CDC Asterix, CDC Rosie and CDC Redmoon; CLEARFIELD type lentil cultivars, CDC Maxim, CDC Dazil, CDC KR-2 and CDC Proclaim; and Kabuli chickpea cultivar CDC Orion).
- Three lines of superlarge-seeded chickpeas and two early maturing lentil lines have been selected and multiplied.
- Herbicide resistance has been identified as an important trait for chickpea and lentil cultivar development.
- New mung bean and black gram lines have been developed through conventional and mutation breeding. Three promising mung bean lines and two black gram are being evaluated at forma level for productivity in Southern Alberta.

- Several roundup-ready soybean cultivars have been identified for the Southern AB under supplementary irrigation conditions.

Long-term studies carrying out in 2016

Soybean project:

Identifying promising genotypes, and optimizing seeding density, nitrogen fixation and irrigation for cost-effective soybean production in Alberta (2014-2018).

Objectives:

The main goal of this project is to increase the soybean production area in Alberta (AB), to support the local soybean production and processing industry.

1. To identify high yielding, early maturing 'Roundup Ready' and 'Conventional' type soybean genotypes with desirable plant traits for commercial production in southern AB under supplementary irrigation.
2. To compare soybeans with dry beans for productivity, cost-effectiveness and rotational benefits in southern AB.
3. To develop a production package, considering seeding density, row spacing, root nodulation/ N₂-fixing ability based on soil N level, and irrigation requirements for competitive soybean production in southern AB.
4. To assess the most promising agronomic treatments selected from small plot tests, under large-scale production systems for adaptability.

Study 1. Genotype evaluation:

The objective of this study is to select the most promising soybean genotypes for southern AB with high productivity, and other desirable crop growth traits, i.e. standability and high pod clearance. Eighteen 'Roundup Ready= RR' and seven 'conventional' early maturing and low heat amount requiring soybean genotypes, provided by several soybean breeding companies are being evaluated at Brooks, Bow Island, Lethbridge and Medicine Hat.

Study 2. Soybean vs. dry bean (productivity, cost effectiveness and rotational benefits):

The objective of this study is to compare soybean with dry bean for productivity, cost-effectiveness and rotational benefits under supplementary irrigation in southern AB. This study was established at Bow Island and Lethbridge using two RR type soybean cultivars, three seeding densities (30, 50 and 80 seeds m⁻²) and two row spacing (17.5 cm and 35 cm). One pinto dry bean cultivar in wide row (52.5 cm apart at 25 seeds/m²) and solid-seeded (35 cm apart at 40 seeds m⁻²) systems, and spring wheat crop were also seeded adjacent to soybean plots.

Study 3. Irrigation study:

The objective of this study is to develop cost effective irrigation schedule for soybean in southern Alberta, based on crop phenology and evapo-transpiration rate. This study is being conducted at Brooks using one RR soybean cultivar.

Study 4. Impact of soil nitrogen content on root nodulation:

The objective of this study is to determine the threshold soil N content for optimum root nodulation of short-season soybean grown under contrasting growing environments in southern AB. This study is being conducted at Bow Island and Lethbridge using two soybean genotypes. Treatments included were pre-seed applied 0, 40, 80 and 120 kg (N)/ ha⁻¹, using urea (46:0:0) as N source. The crop was seeded with or without seed applied peat-based inoculant.

Project funders

- Agricultural Funding consortium (Alberta Innovates Bio-solutions, ACIDF and Alberta Pulse Growers)
- Soybean variety breeding and processing companies.
- Growing Forward 2 (Pulse cluster).

Red lentil cultivar development for Alberta

Developing red lentil cultivars for Alberta and analyzing the newest red lentil cultivars for the starch profile to attract new lentil markets (2012-2017).

Objectives:

1. To develop red lentil cultivars with desirable traits, such as early maturity, improved resistance to Ascochyta blight and anthracnose, determinant and upright plant status with lodging resistance, resistant to herbicide (imidazolinone) and improved drought tolerance.
2. To understand the starch composition (total, resistant and digestible starch contents, and amylose and amylopectin contents) of newly released red lentils.
3. To identify the most promising red lentil cultivars with productivity and production stability of seed yield and functional food starch components such as amylose and amylopectin.
4. To understand the genotype by environment interaction (G x E) and relative contribution of G x E to the total variability of starch components of those newly released red lentil cultivars.

Project funders:

- Agricultural Funding consortium (Alberta Innovates Bio-solutions, ACIDF and Alberta Pulse Growers)

Crop rotation project

Optimizing the frequency and sequence of annual pulses in cropping systems and their impacts on crop performance, biotic and abiotic stresses, and soil quality attributes (2010-2017).

Objectives:

To determine

1. the optimum frequency and sequence of various pulse crops (field peas, lentil and chickpea) in rotation systems
2. the impact of crop frequency and sequence on the seed yield and quality of pulse crops and the crops following them in cropping systems, potential changes of disease and weed spectrum and infestations, carbon contribution to the soil, and soil quality attribute such as soil microbial community composition and biodiversity, and functional gene profile.

Project funder

AAFC/Growing Forward 1 and 2 (Pulse cluster).

Contact Manjula Bandara 403-362-1355 or manjula.bandara@gov.ab.ca for more information.