

## Lupin Seed Storage Proteins and their Potential for Human Health

Rhonda Foley<sup>1</sup>

Lars Kamphuis<sup>1,2</sup> and Karam Singh<sup>1,2</sup>

<sup>1</sup> CSIRO Agriculture and Food

<sup>2</sup> CCDM Curtin University

Narrow-leafed lupin (NLL; *Lupinus angustifolius* L.) is a major grain legume crop that is important for sustainable farming systems, particularly in Western Australia. It has been used traditionally as an animal feed, and is important for sustainable agriculture by acting as a disease break for cereals and replenishing soils with nitrogen and phosphorous. Recently, the grain has gained attention as a human health food for its high protein and fibre content and being gluten-free. It also has various nutraceutical benefits through influencing satiety and lowering blood pressure and cholesterol, benefiting those that suffer from lifestyle diseases such as obesity, diabetes and cardiovascular disease.

Our group has led the identification and characterisation of the major proteins in lupin seeds. These are called conglutins, and they have primary roles in supplying carbon, sulphur, nitrogen and energy for the germinating seedling. They fall into four families:  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ ; and interest in these conglutins is growing as family members have been shown to have beneficial nutritional and pharmaceutical properties. We analysed the conglutins in a range of lupin species in terms of their gene structure, phylogenetic relationships as well as their expression during seed development. The majority of the heterogeneity of conglutin polypeptides is likely to arise from post-translational modification from a limited number of precursor polypeptides rather than a large number of different genes. Overall, the results demonstrate a high degree of plasticity for conglutin expression during seed development, allowing the way to modification of the expression of conglutins through reverse genetics strategies. This could be achieved through a TILLING population currently under development or gene editing, with the ultimate aim of reducing allergenicity and improving nutritional and pharmaceutical properties.