FINAL REPORT

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

CHC23

Development of rapid and non-destructive assays for the selection of single lupin seeds with improved protein content

PROJECT DETAILS

PROJECT CODE:	CHC23
PROJECT TITLE:	DEVELOPMENT OF RAPID AND NON-DESTRUCTIVE ASSAYS FOR THE SELECTION OF SINGLE LUPIN SEEDS WITH IMPROVED PROTEIN CONTENT
START DATE:	01.07.2001
END DATE:	30.06.2002
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Summary

Report Disclaimer

Old or Archival Reports (Projects that concluded in 2007 or earlier)

The information contained in these older reports is now several years old, and may have been wholly or partially superseded or built upon in subsequent work funded by GRDC or others. Readers should be aware that more recent research may be more useful for their needs. Findings related to agricultural chemical use are also potentially out of date and are not to be taken as a recommendation for their use.

Conclusions

A non-destructive procedure for determining the protein concentration in single *L. angustifolius* seeds has been developed using near-infrared (NIR) spectrometry. The R squared value for the calibration curve was 0.83 which, for a determination on a single seed, is excellent. More than 4,000 *L. angustifolius* single seeds were analysed using the procedure. The procedure has been used to study the inheritance of protein in the progeny from a single parent seed. The results have shown that the protein of the parent is transferred to the progeny. However, there are some instances where the agreement is not that good and in these cases, environmental factors may be a cause of the variation. The protein concentration of the single seeds from the various pods on the lateral branches is similar to the results on the main stem and there is little variation in the protein concentration of the single seeds within an individual pod. The variation is within experimental error. In determining the protein concentration of a single plant it is recommended from this initial work that the third or fourth pod on the main stem be taken and the protein concentration of the single seeds in the pod be determined and the average result for protein concentration for seed in the pod represents the seed on the whole plant. A number of seeds from some crosses were examined and the protein concentrations ranged from 29 to 49% protein. These seeds were returned to the breeder for replanting.

Recommendations

It is recommended that the non-destructive single seed protein analytical procedure be incorporated into the *L. angustifolius* breeding program. Initially the procedure will be used to determine the protein level of single seeds from new crosses. However, the system has the potential to examine larger seed populations looking for a high protein seed that may result in a new lupin variety. As other parameters are measured and determined on a single seed, then they can be added to the single seed calibration.

Other research

At present, the only calibration that is available is for *L. angustifolius* single seed. It is possible that calibrations for *L. albus* and *L. luteus* could be developed and then incorporated as an analytical tool into the appropriate breeding programs.

The effect of environment on the protein concentrations in a single seed needs to be examined. Little is understood about the effect environment has on protein content in lupins.

Intellectual property summary

The commercialisation of the procedures developed in this project will be through the *L. angustifolius* breeders using the analytical procedure to develop new higher protein *L. angustifolius* varieties. The IP would be through the release of new *L. angustifolius* varieties.

Additional information

Additional Supporting Information

Table 1: The protein concentration of a single parent seed and the average and range of protein concentration of the progeny seed.

Accession Number	Initial Protein %ar	Average protein of progeny %ar	Range of protein levels %ar

22744	37.1	39.0	35.4-41.9
22744	36.9	36.2	35.0-38.5
22744	37.3	37.3	33.2-40.7
22744	37.3	38.0	36.6-42.3
22744	37.1	36.3	34.5-39.0
22744	38.0	37.6	33.4-40.5
22744	37.1	38.4	36.1-42.7
22764	37.3	37.5	35.1-41.3
22764	30.9	36.7	33.7-39.3
22764	38.0	37.6	33.8-40.9
22764	38.7	39.3	33.8-41.9
22764	37.4	37.9	31.8-43.9
22764	37.6	38.3	34.2-40.9
22841	39.0	36.1	32.3-40.1
22841	38.3	36.8	34.2-39.0
22841	38.3	36.7	32.9-39.8

Figure 1: Calibration curve for the determination of protein concentration of single *L. angustifolius* seed.