

PRAC project report (final):

**Genetics and breeding of lupin for
cultivation in the Winter-rainfall Region.**

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Tables: 9

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**Appendices: A (Article: The effect of low frequency random
crossing on heterozygosity and fixation of
recombinant homozygotes in lines developed
by single seed descent.)**

**B (Article: The design of experiments for
one-step selection with an application to
the breeding of lupin.)**

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Summary.

This report reviews the cultivation of the narrow-leaf lupin, *Lupinus angustifolius*, as rotation crop in the wheat growing areas of the Western Cape Province and summarizes the results of an extensive breeding programme designed to develop new recombinant inbred lines predominantly by the method of single seed descent (SSD) following crosses between selected germplasm strains, for possible release as experimental lines. Final selections concentrated on sweet (low alkaloid) lines scored to be at least partially resistant to powdery mildew and pod-shattering but it is stressed that further testing on a broad regional basis is necessary before registration and commercial release. The inheritance of polymorphism in alkaloid level and flower colour in the original germplasm was worked out during the experiments where the latter was found to depend on two independent genes expressing recessive epistasis. Observations during these experiments led to analytical inquiries of a more general nature in plant breeding using SSD, viz., the effect of low frequency crossing on heterozygosity and fixation frequency of recombinant homozygotes and the specification of optimum designs when facilities for line testing are restricted.