Development of low ODAP somaclones of *Lathyrus sativus.*

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Abstract

Lathyrus sativus is a grain legume high in protein (25-30%) that can be grown under limited moisture conditions. However, the Government of India has imposed a ban on its sale because of the association with human neurolathyrism in the population subsisting on it. Over the years, by mutation and conventional breeding, attempts were made to reduce the amount of oxalyl diamino propionic acid (ODAP), the chemical implicated in neurolathyrism. Although a decrease in ODAP was obtained, it was not stable. Therefore, biotechnological approaches offered the scope to develop strains that were either devoid of ODAP or contained low levels which were safe even with prolonged consumption. Intially reproducible *in vitro* regeneration protocols were not available. However, successful regeneration protocols were developed using leaf, root and internode explants of *L. sativus* cultivar P-24. About 300 *in vitro* regenerated plants were taken to the field, of which 102 survived and set seed. A wide range of variation in phenotype, as well as ODAP content and yield characteristics were observed among the regenerated plants. Phenotypic variation was observed in flower colour, seed coat colour, leaf size and morphology, pod morphology and seed weight. Analysis of seeds of about 100 R_1 generated plants for seed ODAP showed it to vary from 0.02 to 0.80%. From these plants those having low ODAP and high yielding characteristics (as compared to the parent cultivar P-24) were selected and advanced to further generations. ODAP content and yield characteristics of these low toxin lines were stable over generations.

A few of the very promising somaclones were tested in various field trials at different locations in India. Based on these trials one of the somaclones Bio L212 (Ratan) was released by the Government of India for cultivation in the North Eastern Plain and Central zones. Bio L212 or Bio L12 (Ratan) was developed from the leaf explant of P-24 and differs from its parent. It has extremely low ODAP content (0.05%) coupled with high yield potential (1800 kg/ha), large seeds (100 seed weight of 9.29g compared to P-24 of 6.94g) and high biomass (almost 150% of P-24). It also has remarkable vegetative growth, characteristic pod marking and long, broad leaves which distinguishes it from its parent in the field. The average seed yield of Bio L212 in our experimental farm is 2340 ± 170 kg/ha.

In total 18 somaclones were selected for very low ODAP content (<0.1%). These low ODAP containing somaclones have now been fully characterised at the biochemical and molecular level using isozyme analysis, RAPD, RFLP, mitochondrial specific genes and photosynthetic efficiency. All these somaclones have phenotypic distinguishing features. Two of the somaclones are white flowered with a white seed coat. A few of the somaclones are now being further tested in different locations. The phenotypic variability as observed will be a boon for plant breeders in further improving quality and yield.