

GENETIC BASIS OF GRASS PEA AGRONOMIC TRAITS FOR PRECISION BREEDING TOWARD CLIMATE CHANGE MORE ADAPTED VARIETIES

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Grass pea (*Lathyrus sativus* L.) is an annual cool-season grain legume recognized as a stress-resilient crop. In the Mediterranean region, climate change has increased environmental instability, creating a fundamental need for more adaptable plant varieties. To assist the development of such varieties, we studied the genetic basis of 13 agronomic traits in a worldwide collection of 182 grass pea accessions, making use of the genotypic screening of the same accessions with genotyping-by-sequence SNP-markers. For the agronomic evaluation, the grass pea accessions were field trailed, over 4 growing seasons, in a Mediterranean region, and the agronomic traits (3 plant growth-, 2 inflorescence-, 4 seed-, and 4 yield-related) were scored according to the “Descriptors for *Lathyrus* spp.” (IPGRI, 2000). The genetic basis of these important agronomic traits was studied through a genome-wide association. A panel of 5,651 high-quality SNP markers was used to test for SNP-trait associations, based on linear mixed models, accounting for population structure. Using a $-\log_{10}P\text{-value} \geq 4$, and a grass pea reference genome (Rajarammohan et al. 2023), we detected a total of 33 SNP markers significantly associated with the traits. Fourteen SNP markers were associated with plant growth-, 6 with yield-, 6 with seed-, and 7 with inflorescence-related traits, explaining from 2.75 to 62.96 % of the observed variability. Two SNP markers, S3424 and S3097, were common to one plant growth- and one yield-related traits, the S3803 was common to one yield- and one seed-related traits, the S3891 was common to two growth-related traits, and the S1194 was common to two seed-related traits. The candidate genes and metabolic pathways underlying the associations are currently being explored. The detected associated SNP markers constitute promising genomic targets for the development of molecular tools to assist stress-resilience precision breeding.

IPGRI, 2000. Descriptors for *Lathyrus* spp. International Plant Genetic Resources Institute, Rome, Italy.

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