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Control of seed quality traits in legumes: from model to crop species

Karine Gallardo, Christine Le Signor, Judith Burstin, Richard Thompson

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The seeds of legumes such as peas, faba bean and lupines substantially contribute to the European autonomy in plant proteins due to their high protein content (23-36% depending on species). Rich in lysine, they are mainly used in animal feed and can be used as supplements in diets based on cereal grains. By using the model legume *Medicago truncatula* and implementing omics approaches, we made significant progress in the knowledge of the genes involved in seed development in this species. We also tested the potential to transfer such information to legume crops, particularly peas, which are mostly grown in Europe. I will present these omics resources and the strategy we have used to identify genes controlling the size or protein composition of legume seeds. I will also refer to the TILLING (Targeting Induced Local Lesions in Genomes) population developed in pea and its use to modulating the function of genes controlling seed quality. Among them are genes involved in the transport and metabolism of sulfate that enable the accumulation of proteins rich in sulfur-containing amino acids, including methionine, an essential amino acid that animals and humans are unable to synthesize and must therefore find in their diets. These results, and well-established observations of the impoverishment in sulfur of European soils due to better control of industrial pollution, led us to better characterize the role of sulfur nutrition in the quality and value of seed legume seeds. I will present the progress made in this area, particularly with regard to coping with a lack of sulfur during the reproductive phase.

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