Genetic Dissection of Histidine Biosynthesis in *Arabidopsis*

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The biosynthesis of histidine in microorganisms, long studied through the isolation and characterization of auxotrophic mutants, has emerged as a paradigm for the regulation of metabolism and gene expression. Much less is known about histidine biosynthesis in flowering plants. One limiting factor has been the absence of large collections of informative auxotrophs. We describe here the results of a systematic screen for histidine auxotrophs of *Arabidopsis thaliana*. Nine insertion mutants disrupted in four different biosynthetic genes (*HISN2*, *HISN3*, *HISN4*, *HISN6A*) were identified through a combination of forward and reverse genetics and were shown to exhibit an embryo-defective (*emb*) phenotype that could be rescued by watering heterozygous plants with histidine. Male transmission of the mutant allele was in several cases reduced. Another mutant blocked in the final step of the pathway (*hisn8*) and a double mutant altered in the redundant first step (*hisn1a, hisn1b*) exhibited an ovule abortion (*ova*) phenotype in heterozygotes. Homozygous mutant plants and callus tissue produced from rescued seeds appeared normal when grown in the presence of histidine but typically senesced after continued growth in the absence of histidine. These mutants document the importance of histidine biosynthesis for plant growth and development, provide valuable insights into amino acid transport and source-sink relationships during seed development, and represent a significant addition to the limited collection of well-characterized auxotrophs in flowering plants.

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