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The arogenate dehydratase ADT2 is essential for seed development in *Arabidopsis*

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Phenylalanine (Phe) biosynthesis in plants is a key process, as Phe serves as precursor of proteins and phenylpropanoids. The prephenate pathway connects chorismate, final product of the shikimate pathway, with the biosynthesis of Phe and Tyr. Two alternative routes of Phe biosynthesis have been reported: one depending of arogenate, and the other of phenylpyruvate. Whereas the arogenate pathway is considered the main route, the role of the phenylpyruvate pathway remains unclear. Here, we report that the deficiency in ADT2, a bifunctional arogenate dehydratase (ADT)/ prephenate dehydratase (PDT) enzyme, causes embryo arrest and seed abortion. This result makes a clear distinction between the essential role of *ADT2* and the five remaining *ADTs* from *Arabidopsis*, which display mostly overlapping functions. We have found that PHA2, a monofunctional PDT from yeast, restores the *adt2* phenotype when is targeted within the plastids, but not when is expressed in the cytosol. Similar results can be obtained by expressing ADT3, a monofunctional ADT. These results suggest that Phe can be synthesized from phenylpyruvate or arogenate when the bifunctional ADT2 is replaced by other ADT or PDT enzymes during seed formation, highlighting the importance of Phe for embryo development, and providing further insights into the plasticity of Phe biosynthesis.