



ABRC: TRAINED Kit

Genetics of Floral Development

Summary: This kit can be used to demonstrate the concepts presented in the Teaching Tools in Plant Biology module “Genetics of Floral Development”. This module explores the function of ABCDE genes as regulators of floral organ development. The ten stocks included with this kit include eight mutants with their corresponding reference strains. By growing and observing this set of seeds students will see the impacts of mutations in each gene category (ABCDE) on floral organ development.

Recommended Grade Level: College

Supporting Resources

All teaching materials related to this kit are available via *Teaching Tools in Plant Biology*, a publication of the American Society of Plant Biologists.

- Teaching Tools in Plant Biology - <https://academic.oup.com/plcell/pages/teaching-tools-plant-biology>
- Module - <https://academic.oup.com/plcell/article/29/11/tpc.117.tt1117/6100437>

Seed Strain Details

Columbia (Col-1, CS28169) – This reference strain of Arabidopsis is closely related to Col-0, which has been completely sequenced and is used as a basis of comparison with other natural variants. Col-1 is a laboratory strain used to generate many mutants, including *ap2-5*, *flo10-3/sup3* and *lfy-2* used in this module.

***ap2-5* (CS6239)** – This strain carries an ethylmethane sulfonate (EMS) induced mutation affecting the development of sepals and petals. With the mutant phenotype, some sepals have been replaced by carpels and petals transform to stamens.

***flo10-3/sup-3* (CS6227)** – This strain carries an EMS induced mutation that affects the development of stamens and carpel-stamen organs. With the mutant phenotype, the first three whorls of flowers develop normally. However, additional and variable numbers of stamens and carpel-stamen organs develop interior to the third whorl.

***lfy-2* (CS6229)** – This strain carries an EMS induced mutation that causes flowers to transform into inflorescence shoots. With the mutant phenotype, the number of petals and stamens is reduced, as is the fertility of the plant.

Landsberg erecta (Ler-0, CS20) – This reference strain, which is closely related to the original Landsberg strain collected in Germany, carries an X-ray induced mutation in the *erecta* gene causing the plants to have a more upright growth habit. Ler-0 is a laboratory strain used to generate many mutants, including *ag-1*, *ap1-1*, *ap3-1*, *rbe-3* and *eep1/mir164c* used in this module.

***ag-1* (CS25)** – This strain of Arabidopsis carries a mutation in the *AGAMOUS* gene, which encodes for a protein involved in the production of floral organs. In *ag-1* mutants, stamens and carpels have been replaced by petals and sepals to produce a “double” flower phenotype. The term *agamous* means sterile, referring to the phenotype of the mutant flowers which are unable to self-pollinate. The corresponding reference strain (Ler-0) has a single whorl of petals.

ap1-1 (CS28) – This strain carries an EMS induced mutation affecting the development of sepals and petals. With the mutant phenotype, sepals are replaced by bracts, 2° and 3° flowers form in the axil of transformed sepals, and petals are often absent or are replaced by petal-stamen-bract-like mosaics.

ap3-1 (CS3085) – This strain carries an EMS induced mutation affecting the development of petals, stamens and siliques. With the *ap3-1* mutant phenotype, petals and stamens have been replaced by sepals and carpels respectively, and siliques are often misshapen.

rbe-3 (CS6939) – This strain carries a mutation in the *RABBIT EARS* gene affecting sepal, petal and ovule development. With the mutant phenotype, more than four sepals can develop and fuse with adjacent sepals. Petals may be absent, ovules display altered growth and fertility is reduced¹. This mutant was created by treating No-0 with EMS then backcrossing with Ler-0 plants.

eep1/mir164c (CS65826) – This strain carries a spontaneous mutation caused by the transposition of one of the plant transposons within its own genome. The resulting mutant phenotype displays extra petals in early-arising flowers.

Sources

1. Krizek, B.A., Lewis, M.W. and Fletcher, J.C. (2006). RABBIT EARS is a second-whorl repressor of AGAMOUS that maintains spatial boundaries in Arabidopsis flowers. *The Plant Journal*, 45(3), 369-383.