



## ABRC: TRAINED Kit

### Plant Hormones

**Summary:** This kit can be used to demonstrate the concepts presented in multiple Teaching Tools in Plant Biology modules focused on plant hormones. These modules explore the function of auxin, abscisic acid, brassinosteroids, cytokinins, ethylene, gibberellins and strigolactones. The ten stocks included with this kit include seven mutants with their corresponding reference strains. By growing and observing this set of stocks students will see how mutations affecting hormone pathways and signaling can affect the phenotype of resulting plants.

**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>
- Introduction to Phytohormones module - <https://academic.oup.com/plcell/article/22/3/1/6096752>
- The Story of Auxin module - <https://academic.oup.com/plcell/article/22/4/tpc.110.tt0410/6096997>
- Abscisic Acid module - <https://academic.oup.com/plcell/article/22/12/tpc.110.tt1210/6097018>
- Brassinosteroids module - <https://academic.oup.com/plcell/article/22/9/tpc.110.tt0910/6096135>
- Cytokinins module - <https://academic.oup.com/plcell/article/22/6/tpc.110.tt0610/6095971>
- Ethylene module - <https://academic.oup.com/plcell/article/22/10/tpc.110.tt1010/6094868>
- Gibberellins module - <https://academic.oup.com/plcell/article/22/8/tpc.110.tt0810/6096225>
- Strigolactones module - <https://academic.oup.com/plcell/article/23/4/tpc.111.tt0411/6097689>

#### 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 *aba2-4*, *ein4*, *max2-1*, *tir1-1* and *wol-1* used in this module.

***aba2-4* (CS3835)** – This strain carries an ethylmethane sulfonate (EMS)-induced mutation in *ABA2*, coding for an enzyme involved in abscisic acid biosynthesis. The phenotype of this strain includes an increased rate of leaf transpiration, leading to wilting when exposed to low humidity and water stress, as well as reduced growth, plant size and vigor<sup>1</sup>.

***ein4* (CS8053)** – This strain carries a diepoxybutane-induced dominant mutation in *EIN4*, affecting the ethylene receptor that acts early in the ethylene response pathway. This mutation leads to a severe ethylene insensitivity, reflected in the absence of the triple response of dark-grown seedlings to ethylene (these seedlings do not display thickening of the hypocotyl, inhibition of hypocotyl and root elongation and the apical hook formation)<sup>2</sup>.

***max2-1* (CS9565)** – This strain carries an EMS-induced mutation in *MAX2*, affecting the strigolactone signaling pathway. The phenotype of this mutant is reflected in increased shoot branching, as well as increased hypocotyl length in seedlings grown in light conditions<sup>3</sup>.

**tir1-1 (CS3798)** – This strain carries an EMS-induced mutation in *TIR1*, affecting the auxin receptor. The phenotype of this mutant includes reduced auxin-induced lateral root formation, reduced temperature-induced hypocotyl elongation, and a slight reduction in apical dominance<sup>4</sup>.

**wol-1 (CS9817)** – This strain carries an EMS-induced mutation in *AHK4*, affecting a cytokinin receptor that acts early in the cytokinin response pathway. This mutation results in a disruption of the organization of root vascular tissue and hypocotyl development<sup>5,6</sup>.

**Enkheim (En-2, CS1138)** – This natural accession of *Arabidopsis*, which was collected in Germany, serves as the reference strain for the *bri1-6* mutant used in this module.

**bri1-6 (CS399)** – This strain carries an EMS-induced mutation affecting a brassinosteroid receptor. The resulting mutant is a dwarf plant with a small, dark green rosette, many axillary inflorescences and a short flowering stem<sup>7,8</sup>.

**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 *ga5-1* used in this module.

**ga5-1 (CS62)** – This strain carries an EMS-induced mutation, affecting GIBBERELLIN 20-OXIDASE that acts late in the gibberellic acid (GA) biosynthesis pathway, disrupting the production of multiple GA products. The resulting mutant is a dwarf plant that does not require the addition of external GA for germination<sup>9</sup>.

## Sources

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