

Table 1. Some striking morphological aberrations seen in *Arabidopsis* mutants defective in microtubule functions. Individual alleles may combine several of the indicated phenotypes. Some of the phenotypes can be found in other classes of mutants (e.g. cell swelling in cell wall mutants).

Phenotype	Wild-type phenotype and mutant example.	Reference (e.g.)
Cell swelling.	Diffusely growing wild-type cells often adopt highly elongated shapes. In mutants this anisotropic growth behaviour is impaired and the cells appear swollen (e.g. <i>fra2</i>).	(Burk and Ye, 2002)
Organ swelling.	Organ swelling may be the result of interfering with diffuse growth (see above). However, cytokinetic mutants frequently show organ swelling (<i>fass</i> , <i>pleiade</i> , <i>pok1/2</i>).	(Traas et al., 1995; Müller et al., 2004; Müller et al., 2006)
Twisted growth of aerial organs.	Under lab conditions wild-type plants form straight hypocotyls, petioles and stems etc. Mutant organs may twist in a right-handed or left-handed manner (e.g. <i>spr1</i> , <i>tor1</i>).	(Furutani et al., 2000; Buschmann et al., 2004)
Skewed root growth.	Root skewing on slanted agar surfaces is often seen in mutants with twisted aerial organs. However, the agar assay appears to be somewhat more sensitive (e.g. <i>wvd2</i>).	(Rutherford and Masson, 1996; Yuen et al., 2003)
Aberrant trichome shape.	Wild-type trichomes show about two branch points on average. Mutant trichomes have less (<i>mor1</i>) and sometimes more branch points (<i>kinesin13a</i>). Additionally, branch elongation may be inhibited (<i>zwichel</i>) and overall trichome size may be reduced (<i>fass</i>).	(Torres-Ruiz and Jurgens, 1994; Oppenheimer et al., 1997; Whittington et al., 2001; Lu et al., 2005)
Aberrant root hair shape.	Wild-type root hair elongation is based on a single tip advancing into space. Mutant root hairs may split and form several tips (<i>ple-1</i> and <i>mrh2</i>). Mutant root hairs may form ectopically in non-trichoblast cells (<i>fra2</i>).	(Webb et al., 2002; Müller et al., 2004; Sakai et al., 2008)
Defective hypocotyl elongation in darkness.	In the dark, wild-type hypocotyls elongate quickly, however, root growth is inhibited. Growth in darkness elicits dramatic cell swelling in the hypocotyls of some mutants (<i>kiesel</i>).	(Kirik et al., 2002)

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