

Supplementary Table S1. Growth, development and stress responses of *Arabidopsis thaliana* ascorbate deficient (*vtc*) mutants.

A reasonably comprehensive list reports on the characteristics of *vtc* mutants are listed below. Readers are advised to check individual references for details of mutants used in each study, specific phenotypes and experimental conditions.

Condition	Mutants/alleles	Effect	References
Photosynthesis and high light response.	All	Generally, more sensitive to high light. Decreased NPQ and zeaxanthin formation in high light. Slower anthocyanin accumulation in high light.	(Giacomelli <i>et al.</i> , 2006; Havaux <i>et al.</i> , 2006; Kanwischer <i>et al.</i> , 2005; Muller-Moulé <i>et al.</i> , 2002; Muller-Moulé <i>et al.</i> , 2004; Muller-Moulé <i>et al.</i> , 2003; Page <i>et al.</i> , 2012; Plumb <i>et al.</i> , 2018; Podmaniczki <i>et al.</i> , 2021; Smirnov, 2000; Toth <i>et al.</i> , 2011; Toth <i>et al.</i> , 2009; Wormuth <i>et al.</i> , 2006; Zeng <i>et al.</i> , 2018)
UV-C	<i>vtc1</i>	Increased double strand DNA breaks	(Filkowski <i>et al.</i> , 2004)
UV-B	<i>vtc1-1</i> , <i>vtc2</i>	Increased sensitivity	(Gao and Zhang, 2008; Yao <i>et al.</i> , 2015)
Ozone/SO ₂	<i>vtc1-1</i> , <i>vtc2-1/2-2/2-3</i> , <i>vtc2-1</i> , <i>vtc4-1</i>	Increased ozone sensitivity (except <i>vtc2-2</i>). <i>vtc1</i> is SO ₂ sensitive (others not reported)	(Conklin <i>et al.</i> , 2000; Conklin <i>et al.</i> , 1996)
Temperature extremes	<i>vtc1-1</i> , <i>vtc2-1</i>	Decreased basal thermotolerance. Protection against PSII inactivation. Increased chilling sensitivity.	(Larkindale <i>et al.</i> , 2005; Toth <i>et al.</i> , 2011; Wang <i>et al.</i> , 2012)
High salinity (NaCl)	<i>vtc2-4</i> , <i>vtc2-5</i> , <i>vtc1-1</i> , <i>vtc2-1</i> , <i>vtc3-1</i> , <i>vtc4-1</i>	More sensitive	(Hoang <i>et al.</i> , 2021; Huang <i>et al.</i> , 2005; Koffler <i>et al.</i> , 2014a; Smirnov, 2000)
Drought and osmotic stress	<i>vtc2-4</i> , <i>vtc2-5</i> , <i>vtc1-1</i> , <i>vtc2-1</i> , <i>vtc3-1</i> , <i>vtc4-1</i> and GalLDH knockdown	More sensitive; reduced stomatal aperture. More ABA; increased lipid oxidation, decreased tocopherol/β-carotene	(Brossa <i>et al.</i> , 2011; Hoang <i>et al.</i> , 2021; Koffler <i>et al.</i> , 2014a; Li <i>et al.</i> , 2014; Lopez-Carbonell <i>et al.</i> , 2006; Munne-Bosch and Alegre, 2002)
Cu or Cd toxicity	<i>vtc2</i> -*	Tolerance unaffected or affected <i>via</i> altered GSH	(Hoang <i>et al.</i> , 2021; Jozefczak <i>et al.</i> , 2015; Koffler <i>et al.</i> , 2014b; Peto <i>et al.</i> , 2013)
Pathogen resistance (biotrophs)	<i>vtc1-1</i> , <i>vtc2-1</i> , <i>vtc2-2</i> ; <i>vtc3-1</i> , <i>vtc4-1</i>	Increased NPR1-mediated basal resistance to <i>Pseudomonas syringae</i> and <i>Hyaloperonospora</i> <i>via</i> H ₂ O ₂ -induced salicylic acid accumulation. Greater expression of PR proteins. Increased hypersensitive-like lesions	(Barth <i>et al.</i> , 2004; Brosché and Kangasjärvi, 2012; Colville and Smirnov, 2008; Mukherjee <i>et al.</i> , 2010; Pastor <i>et al.</i> , 2013; Pastori <i>et al.</i> , 2003; Pavet <i>et al.</i> , 2005)
Pathogen resistance (necrotrophs)	<i>vtc1-1</i> , <i>vtc2-1</i>	More susceptible to <i>Alternaria</i>	(Botanga <i>et al.</i> , 2012)
Ammonium hypersensitivity	<i>vtc1</i>	Root growth more inhibited by ammonium in a VTC1 specific manner.	(Barth <i>et al.</i> , 2010; Qin <i>et al.</i> , 2008; Zhang <i>et al.</i> , 2021)
Growth and development	<i>vtc1-1</i> ; <i>vtc 2-1</i> , <i>2-2</i> , <i>2,4</i> , <i>2-5</i>	Growth (rosette size) slightly less or unaffected. Early senescence of older leaves. Altered hormone responses. Flowering time accelerated.	(Barth <i>et al.</i> , 2004; Caviglia <i>et al.</i> , 2018; Dowdle <i>et al.</i> , 2007; Kerchev <i>et al.</i> , 2011; Kka <i>et al.</i> , 2018; Kotchoni <i>et al.</i> , 2009; Li <i>et al.</i> , 2016; Lim <i>et</i>

		Total ascorbate deficiency in <i>vtc2/vtc5</i> double mutants arrests growth after germination. Very small size of <i>vtc2-1</i> caused by a second site mutation. <i>vtc1</i> growth defects could be related to impaired GDP-mannose production. Altered cell wall glycoproteome.	<i>al.</i> , 2016; Olmos <i>et al.</i> , 2006; Plumb <i>et al.</i> , 2018; Sultana <i>et al.</i> , 2015; Veljovic-Jovanovic <i>et al.</i> , 2001)
Iron nutrition	<i>vtc2-4</i> , <i>vtc5-1</i> , <i>vtc5-2</i> , <i>vtc4-1</i>	Decreased iron in seeds. Iron deficiency chlorosis in <i>vtc4</i> during P deficiency	(Grillet <i>et al.</i> , 2014; Nam <i>et al.</i> , 2021)
Hydrogen peroxide concentration	<i>vtc1-1</i> , <i>vtc2-1</i> , <i>vtc3-1</i> , <i>vtc4-1</i>	Increased	(Heyneke <i>et al.</i> , 2013; Mukherjee <i>et al.</i> , 2010; Naydov <i>et al.</i> , 2010)

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