

Table 1 Overview of seed priming benefits under various abiotic stresses in horticultural crops

Abiotic stress type	Horticultural crop	Priming agent(s)	Observed benefits	References
Drought	Tomato ( <i>Solanum lycopersicum</i> L.)	Silicon, salicylic acid (SA), biopriming	Improved germination rate (15-22%), vegetative growth improvement and fruit yield enhancement (33%)	Chakma et al., 2021; Kurniawan et al., 2025; Papadopoulou et al., 2022; Pehlivan et al., 2018
	Pepper ( <i>Capsicum annuum</i> L.)	Polyethylene glycol (PEG), gibberellic acid (GA <sub>3</sub> )	Improved germination rate, vegetative growth improvement and fruit yield enhancement	Gammoudi et al., 2020; Haris et al., 2023; Tombegavani et al., 2020
	Cucumber ( <i>Cucumis sativus</i> L.)	SA, Bioprimerin	Improved germination rate, vegetative growth improvement and fruit yield enhancement. Increased antioxidant activity	Alam et al., 2023; Mombeini et al., 2021; Piri et al., 2019
	Onion ( <i>Allium cepa</i> L.)	PEG, SA	Improved germination rate and growth	Jagosz, 2015; Silva et al., 2019
Salinity	Tomato ( <i>Solanum lycopersicum</i> L.)	PEG, KNO <sub>3</sub> , NaCl	Earlier seed emergence, increased root growth	Cayuela et al., 1996; Habibi et al., 2025
	Pepper ( <i>Capsicum annuum</i> L.)	Hydropriming, NaCl, KCl, proline, SA, acetylsalicylic acid	Total germination and emergence percentage, root and shoot length increase. Increased osmolyte accumulation	Aloui et al., 2017; Karalija et al., 2024; Khan et al., 2009
	Lettuce ( <i>Lactuca sativa</i> L.)	KNO <sub>3</sub> , GA <sub>3</sub>	Improved growth. Increased antioxidant activity	Adhikari et al., 2024; Mahmoudi et al., 2012
	Cucumber ( <i>Cucumis sativus</i> L.)	NaCl, KCl, KNO <sub>3</sub> , nanofertilizers	Improved emergence rate and early growth	da Silva Oliveira and Steiner, 2017; Esmailpour et al., 2006; Moustafa et al., 2022
	Melon ( <i>Cucumis melo</i> L.)	NaCl, CaCl <sub>2</sub> , SA	Improved germination rate, seedling emergence, and early growth. Increased antioxidant activity and osmolyte accumulation	Basra et al., 2007; Castañares and Bouzo, 2020; Sivritepe et al., 2005
	Spinach ( <i>Spinacia oleracea</i> L.)	PEG	Improved germination rate	Chen et al., 2010
Heat	Lettuce ( <i>Lactuca sativa</i> L.)	CaCl <sub>2</sub>	Improved germination rate	Castañares, 2019
	Carrot ( <i>Daucus carota</i> L.)	PEG, KNO <sub>3</sub>	Improved germination rate and ethylene production	Mahmood ur Rehman et al., 2024; Nascimento et al., 2013
	Pansy ( <i>Viola x wittrockiana</i> )	PEG, CaCl <sub>2</sub> , KNO <sub>3</sub> , KH <sub>2</sub> PO <sub>4</sub>	Improved germination rate	Yoon et al., 1997
	Celery ( <i>Apium graveolens</i> L.)	Matrix priming, NaOCl	Improved germination rate	Parera et al., 1993
Cold	Spinach ( <i>Spinacia oleracea</i> L.)	PEG	Improved germination rate	Chen et al., 2010
	Tomato ( <i>Solanum lycopersicum</i> L.)	Hydropriming, Biopriming, Melatonin	Improved emergence rate and growth. Increased antioxidant activity	Park et al., 2025; Ya-bo et al., 2024
	Eggplant ( <i>Solanum melongena</i> L.)	Ca(NO <sub>3</sub> ) <sub>2</sub> , KNO <sub>3</sub> , SA	Improved emergence rate and growth	Salles et al., 2019; Zhang et al., 2011
	Melon ( <i>Cucumis melo</i> L.)	KNO <sub>3</sub> , CaCl <sub>2</sub> methyl jasmonate, spermine	Improved germination rate	Castañares and Bouzo, 2018; Korkmaz et al., 2017