

Ascorbate and glutathione are indispensable cellular redox buffers and allow plants to acclimate stressful conditions. *Arabidopsis* contains three functional dehydroascorbate reductases (DHAR1-3), which catalyzes the conversion of dehydroascorbate into its reduced form using glutathione as a reductant. We herein attempted to elucidate the physiological role in DHAR1 and DHAR2 in stress responses. The total DHAR activities in DHAR knockout *Arabidopsis* plants, *dhar1* and *dhar2*, were 22 and 92%, respectively, that in wild-type leaves. Under high light (HL), the levels of total ascorbate and dehydroascorbate were only reduced and increased, respectively, in *dhar1*. The oxidation of glutathione under HL was significantly inhibited in both *dhar1* and *dhar2*, while glutathione contents were only enhanced in *dhar1*. The *dhar1* showed stronger visible symptoms than the *dhar2* under photooxidative stress conditions. Our results demonstrated a pivotal role of DHAR1 in the modulation of cellular redox states under photooxidative stress.

