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PG-16 Nitric oxide as a key to elucidate temperature stress response in plants

Khurshida K. Hossain[1], Gaku Tokuda[2], Ryuuichi D. Itoh[1], Hideo Yamasaki[1]

[1)] Faculty of Science,
[2)] Center of Molecular Biosciences, University of the Ryukyus

Global warming is a serious problem in food productivity worldwide because plant development and growth is are inhibited at high temperature. Although plants sometimes cannot grow even by a few degree increases in temperature, the fundamentals of high temperature response of plants remain obscure. In the context of global warming, therefore, it has become urgent to understand how plants cope with temperature stress. We have suggested that nitric oxide (NO), a gaseous radical molecule, is a key to elucidate temperature stress response in plants. Here, we report effects of NO scavengers on seed germination of the plant *Arabidopsis thaliana* at high temperature. The protein hemoglobin (Hb) and isoprene (2-methyl-1,3-butadiene) were examined in this study. *A. thaliana* genome includes three types of hemoglobin gene: class-1 : symbiotic Hb, class-2 non-symbiotic Hb, and truncated Hb (trHb). The T-DNA insertion mutant △GLB3 lacks the lacks functional has the disrupted gene of the trHb. We have found that the △GLB3 seeds cannot germinate above 32℃ where the wild type shows normal germination. The germination was partially restored by adding 2-(4-carboxyphenyl)-4,4,5,5-tetramethylimidazoline- 1-oxyl-3-oxide (carboxy-PTIO), 3-(3,4-dihydroxycinnamoyl) quinic acid (CGA), or bovine serum Hb. Furthermore, the volatile organic compound isoprene was also found to restore the germination capability of the △GLB3 seeds at high temperature in △GLB3. These results suggest that trHb and isoprene can help germination at high temperature by removing excessive NO that can be produced in conditions of high temperature stress.