Magnesium hydride acts as a convenient hydrogen supply to prolong the vase life of cut roses by modulating nitric oxide synthesis

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Abstract

Hydrogen-rich water (HRW), normally produced by water electrolysis, is a major method for hydrogen gas (H_2) delivery, and had beneficial outcomes in postharvest preservation of cut roses. Since the preparation of HRW is complicated and required a H_2 generator, the development of a convenient hydrogen supply in horticulture is required. In this report, magnesium hydride (MgH_2), a H_2-releasing material used in hydrogen industry and medical research, was tested. Compared to HRW produced by electrolysis, release of H_2 by MgH_2 hydrolysis was more convenient and flexible. Similar to conventional HRW, MgH_2 could contribute H_2 and prolong the vase life of cut roses. This beneficial role of MgH_2 was verified by the observed increase in water content, decreased lipid peroxidation, and increased antioxidant levels. Pharmacologic experiments showed that MgH_2 mimicked the cut flower response of nitric oxide (NO)-releasing compound by triggering an increase in endogenous NO production. In contrast, the positive effects of MgH_2 on cut flower vase life and lipid peroxidation were impaired by a NO scavenger and its synthetic inhibitor. This indicated a requirement for NO in the MgH_2-mediated pathway for prolonged vase life of cut rose flowers. Therefore, this study identifies a new opportunity for the application of H_2-releasing materials as an alternative approach for more convenient and flexible hydrogen supply in horticulture.