3 - 55 Effects of NO on Amounts of Cell Wall Polysaccharides under Enhanced UV-B Radiation

Qu Ying, Li Wenjian, Yang Yuxia[1] and Liu Qingfang

Depletion of the stratospheric ozone layer caused and increased in solar ultraviolet-B (UV-B, 280～320 nm) radiation reaching the earth's surface. Enhanced UV-B radiation would have adverse effects on biological processes, owing to its high energy level. Nitric oxide (NO) was a widespread intracellular and intercellular signal molecule that was involved in many physiological processes in animals. NO had also been proved to be a signal molecule playing important roles in diverse physiological processes in plants, including growth and development, hormones nodulation and biotic/abiotic stresses. Plant cell elongation was regulated by cell wall polysaccharides deposition. The metabolism of cell wall polysaccharides might be regulated by UV-B radiation[1]. Some studies had found that NO as signal molecule regulated the activity of cell wall-degrading under enhanced UV-B radiation. However, little is known about the effects of NO on amounts of cell wall polysaccharides under enhanced UV-B radiation.

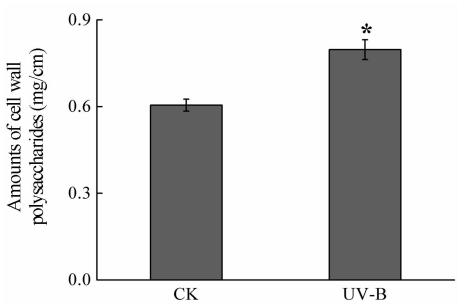

Fig. 1 Effect of UV-B on amounts of cell wall polysaccharides in stems of pea seedlings grown for 3 d. * $P<0.05$ a significant difference between UV-B radiation groups and control (CK).

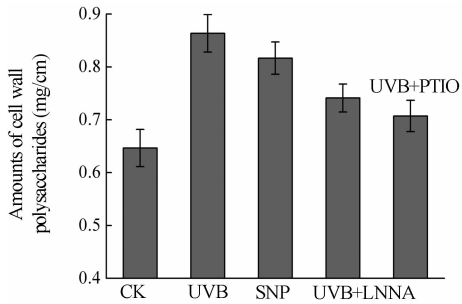

Fig. 2 Effects of NO donor (SNP), NOS inhibiter (LNNA) and NO scavenger (PTIO) on amounts of cell wall polysaccharides in stems of pea seedlings grown for 3 d.

The pea seedlings were cultivated in perlite with Hoagland solution for 3 d. Enhanced UV-B radiation was generated with filtered 30 W fluorescence sunlamps (290～320). The SNP (NO donor), LNNA (NOS inhibitor) and PTIO (NO scavenger) were applied in vivo and were absorbed through the roots. The amounts of cell wall polysaccharides fraction were determinate with the method of Dubois[2].

Amounts of cell wall polysaccharides per unit length increased under UV-B radiation compared with CK (Fig. 1). The amounts of cell wall polysaccharides per unit reflected the cross-link extent of cell wall polysaccharides fraction. The results suggested that extent of cell wall cross-link was enhanced under UV-B radiation, and these might lead to cell wall thickening. As shown in Fig. 2, the amounts of cell wall polysaccharides of pea seedling stems increased significantly under SNP and UV-B radiation compared with CK. The Effects of NO donor on the amounts of cell wall polysaccharides were similar with those of UV-B radiation. Alternatively, under UV-B radiation, the additional inhibitor of NOS and NO donor appeared to compromise the effects of UV-B radiation on amounts of cell wall polysaccharides of pea seedling stems. The results suggested that NO donor might imitate the effects of UV-B on the amounts of cell wall polysaccharides, and NOS inhibitor and NO scavenger alleviate these effects of UV-B. NO might function as a signaling molecule of UV-B thickening cell wall of pea seedlings to carry out stress-signaling transduction.

References

[1] Y. Qu, Y. B. Wang, W. J. Li, et al., J. Radiat. Res. Radiat. Process, 30(2012)303.
[2] M. Dubois, K. A. Gilles, J. K. Hamilton, et al., Anal. Chem., 28(1956)350.

1 Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, Xinjiang 830011, China.