Blue light effects on rose photosynthesis and photomorphogenesis

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Through its impact on photosynthesis and morphogenesis, light is the environmental factor that most affects plant architecture. Using light rather than chemicals to manage plant architecture could reduce the impact on the environment. However, the understanding of how light modulates plant architecture is still poor and further research is needed. To address this question, we examined the development of two rose cultivars, Rosa hybrida‘Radrazz’ and Rosa chinensis‘Old Blush’, cultivated under two light qualities. Plants were grown from one-node cuttings for 6 weeks under white or blue light at equal photosynthetic efficiencies. While plant development was totally inhibited in darkness, blue light could sustain full development from bud burst until flowering. Blue light reduced the net CO2 assimilation rate of fully expanded leaves in both cultivars, despite increasing stomatal conductance and intercellular CO2 concentrations. In ‘Radrazz’, the reduction in CO2 assimilation under blue light was related to a decrease in photosynthetic pigment content, while in both cultivars, the chl a/b ratio increased. Surprisingly, blue light could induce the same organogenetic activity of the shoot apical meristem, growth of the metamers and flower development as white light. The normal development of rose plants under blue light reveals the strong adaptive properties of rose plants to their light environment. It also indicates that photomorphogenetic processes can all be triggered by blue wavelengths and that despite a lower assimilation rate, blue light can provide sufficient energy via photosynthesis to sustain normal growth and development in roses.

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