Mung bean (Vigna radiata L.) source leaf adaptation to shading stress affects not only photosynthetic physiology metabolism but also control of key gene expression

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Abstract:【Objective】 Shading stress strongly limits the effective growth of plants. Understanding how plant morphogenesis and physiological adaptation are generated in response to reduced low light conditions is important for food crop development. **【Method】** Two mung bean (Vigna radiata L.) cultivars, namely, Xilv 1 and Yulv 1, were grown in the field to explore the effects of shading stress on their growth. **【Result】** Shading stress significantly weakened the leaf photosynthetic capacity as measured by the decreased net photosynthetic rate, stomatal conductance, and transpiration rate and increased intercellular CO_2 concentration. These responses resulted in plant morphological characteristics that increased light energy absorption in low light conditions. Such variations occurred due to the leaf anatomical structure with destroyed palisade tissues and spongy tissues. Under shading stress, Yulv 1 showed higher physiological metabolic intensity than Xilv 1, which was related to changes in chlorophyll (Chl), including Chl *a* and *b*, and Chl a/b ratio. Compared with normal light conditions, the Chl fluorescence values, photosynthetic assimilation substances, and enzyme activities in mung bean plants under shading stress were reduced to different extent. In addition, the relative expression levels of *VrGA2ox*, *VrGA20ox1*, *VrGA3ox1*, *VrROT3*, and *VrBZR1*, which are related to endogenous hormone in mung bean leaves, were upregulated by shading stress, further leading to the improvements in the concentrations of auxin, gibberellins, and brassinolide. **【Conclusion】** Combined with the morphological, physiological, and molecular responses, Yulv 1 has stronger tolerance and ecological adaptability to shading stress than Xilv 1. Our study provides insights into the agronomic traits and gene expressions of mung bean cultivars to enhance their adaptability to shading stress.

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