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Effects of low light on photosynthetic properties, antioxidant enzyme activity and anthocyanin accumulation in purple Pakchoi

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Anthocyanins are secondary metabolites that contribute to red, blue, and purple colors in plants and are affected by light, but the effects of low light on the physiological responses of purple Pakchoi plant leaves are still unclear. In this study, purple Pakchoi seedlings were exposed to low light by shading with white gauze and black shading in a phytotron. The responses in terms of photosynthetic properties, carbohydrate metabolism, antioxidant enzyme activity, anthocyanin biosynthetic enzyme activity, and the relative chlorophyll and anthocyanin content of leaves were measured. The results showed that chlorophyll b, intracellular CO_2 content, stomatal conductance and antioxidant activities of guaiacol peroxidase, catalase and superoxide dismutase transiently increased in the shade treatments at 5 d. The malondialdehyde content also increased under low light stress, which damages plant cells. With the extension of shading time (at 15 d), the relative chlorophyll a, anthocyanin and soluble protein contents, net photosynthetic rate, transpiration rate, stomata conductance, antioxidant enzyme activities, and activities of four anthocyanin biosynthetic enzymes decreased significantly. Thus, at the early stage of low light treatment, the chlorophyll b content increased to improve photosynthesis. When the low light treatment was extended, antioxidant enzyme activity and the activity of anthocyanin biosynthesis enzymes were inhibited, causing the purple Pakchoi seedlings to fade from purple to green. This study provides valuable information for further deciphering genetic mechanisms and improving agronomic traits in purple Pakchoi under optimal light requirements.

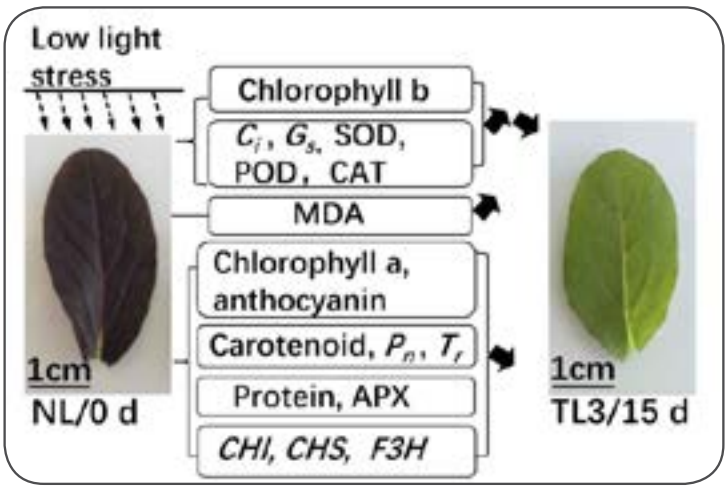

Figure 1: A model of purple Pakchoi grown under low light stress. The 45 degree upward sloping black arrow indicates a rise, and the 45 degree downward sloping black arrow indicates a descent.

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3. Wang L et al. (2012) Effects of shading on starch pasting characteristics of indica hybrid rice (*Oryza sativa* L.). PLoS One. 8(7):e68220.
4. Guo N et al. (2014) Anthocyanin biosynthetic genes in *Brassica rapa*. BMC Genomics. 15:426.
5. Miki S, Wada K C and Takeno K (2015) A possible role of an anthocyanin filter in low-intensity light stress-induced flowering in *Perilla frutescens* var. crispa. Journal of Plant Physiology. 175:157-162.

Biography

Hongfang Zhu has working on Shanghai Academy of Agricultural Sciences since 2009. She has mainly engaged in the collection, arrangement and evaluation of pakchoi and Chinese cabbage germplasm resources, the selection of new varieties, the breeding of good species, the study of cultivation techniques, and the demonstration and promotion of the germplasm.

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