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Red to Far-Red Light Ratio Modulates Hormonal and Genetic Control of Axillary bud Outgrowth in Chrysanthemum (*Dendranthema grandiflorum* 'Jinba')

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Abstract: Single-flower cut Chrysanthemum (*Dendranthema grandiflorum* 'Jinba') holds a unique status in global floriculture industry. However, the extensive axillary bud outgrowth presents a major drawback. Shade is an environment cue that inhibits shoot branching. Present study was aimed at investigating the effect of ratio of red to far-red light (R:FR) in regulating the lateral bud outgrowth of Chrysanthemum and the detailed mechanism. Results showed that the fate of axillary buds at specific positions in stem exhibited difference in response to R:FR. Decreasing R:FR resulted in elevation of abscisic acid (ABA) accumulation in axillary buds. Expression of ABA, indole-3-acetic acid (IAA) and strigolactones (SL) -related metabolism and signal transduction genes was significantly changed in response to low R:FR. In addition, low R:FR caused the re-distribution of sucrose across the whole plant, driving more sucrose towards bottom buds. Our results indicate that low R:FR not always inhibits bud outgrowth, rather its influence depends on the bud position in the stem. ABA, SL and auxin pathways were involved in the process. Interestingly, sucrose also appears to be involved in the process which is necessary to pay attention in the further studies. The present study also lays the foundation for developing methods to regulate axillary bud outgrowth in Chrysanthemum.

Keywords: chrysanthemum; R:FR; bud outgrowth; hormone; sucrose

1. Introduction

Escalation and development of lateral branches are the major determinants of diverse shoot architectures, and this plastic trait is controlled by genetic and environmental regulators, and the interactive effect of both. Leaf axils nurture axillary meristems to produce axillary buds, which can then either remain arrested or transform into branches, creating plentiful architectural patterns [1]. In floriculture crops, axillary bud outgrowth impacts flower productivity and market value, and therefore has been considered a precious attribute in domestication and is one of the most targeted aspects by flower breeders when creating novelty. However, single-flower cut Chrysanthemum (*Dendranthema grandiflorum* 'Jinba') needs axillary buds remain arrested, letting only single stalk to grow vigorously with one flower at top. But it was backfire, most of the cultivated varieties produce number