Light quality regulates plant architecture in different genotypes of *Chrysanthemum morifolium* Ramat

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**Introduction**

Specific light spectra play an important role in plant photomorphogenic responses. Plants are sensitive to light ranging from UV (280-400 nm) to far-red light (700-800 nm). The shoot architecture or plant shape is an important quality trait in ornamental plants and can be altered under specific light spectra. The shade avoidance syndrome is a well-documented response of plants to canopy shading and low R:FR conditions, characterized by shoot elongation and inhibited branching.

**Experiment 1**

In the first experiment, 25 rooted cuttings of cut flower chrysanthemum genotype C17 were tested per light treatment. Ten of these cuttings were decapitated at the start of the experiment and 15 were left intact. The used light qualities and fluence rates are in Table 1. Cuttings were grown for 6 weeks in the growth chamber. For the intact plants, the percentage of bud outgrowth was low throughout all light treatments with only a noticeable difference in the 90R treatment (Fig. 1A). The decapitated plants showed a higher percentage of bud outgrowth, ranging from 20 to 50% (Fig. 1B).

In the treatments with a fluence rate of 60 µmol.m⁻².s⁻¹ the plants under 60R and 30R30B, showed a significantly higher percentage of outgrown buds than the 60FR treatment. The 60B and the 60FL treatments showed similar percentages of bud outgrowth that were somewhat smaller than the other treatments. In the 30 µmol.m⁻².s⁻¹ fluence rate treatments, the 30R showed a higher percentage of bud outgrowth than 30BFR, like in the 60 µmol.m⁻².s⁻¹ treatments, but in the 30 µmol.m⁻².s⁻¹ treatments this was not the case and the bud outgrowth percentage was similar in 90R and 90BFR. The bud length of intact plants was low (Fig. 1C), treatments with BFR and B light showed significantly lower bud lengths compared to the other treatments for all 3 intensities that were tested. The decapitated plants showed the highest axillary bud length in the R treatments and the lowest in the BFR treatments for all fluence rates (Fig. 1D).

**Table 2: Light conditions used in experiment 2.**

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**Experiment 2**

In this experiment, rooted cuttings of a pot (C9), disbud type (C13) and cut (C17) chrysanthemum were grown under different light conditions listed in Table 2. Treatments were given for either 6 weeks in the growth chamber (w6) or for 3 weeks in the growth chamber, followed by 3 weeks in the greenhouse (3w). Per treatment 10 decapitated cuttings were measured.

The percentage of bud outgrowth was generally lower in the BFR treatments in all genotypes and both in cuttings that were in the growth chamber for 6 weeks and those that were transferred to greenhouse conditions after 3 weeks (Fig. 3A). There was little difference in bud outgrowth between the 60FL, 60R and 57R3B conditions for all genotypes except for C17. The cuttings of C17 that spent 6 weeks in the growth chamber had a higher percentage of bud outgrowth in the 57R3B condition compared to the 60FL treatment.

Bud length was lower in BFR conditions than in the R treatment for the C13 genotype with w6 and w3, and for C17 with w6. The bud length of the R treatment was higher than the FL and 57R3B conditions for w6 and w3 (Fig. 3B). Genotype C9 showed similar bud lengths for all light conditions in the cuttings that were transferred to greenhouse conditions after 3 weeks. The cuttings that spent 6 weeks in the growth chamber showed a lower bud length under fluorescent light compared to the other treatments. At the end of the experiment, the plant phenotypes (Fig. 4) visually showed minimal differences between the cuttings that had spent 6 weeks in the growth chamber versus the cuttings that were in the growth chamber for 3 weeks and under greenhouse conditions for 3 weeks.

**Fig. 2** A) % of bud outgrowth B) % of bud length.

**Fig. 3** Plant phenotypes of decapitated cuttings after 6 weeks (w6) of growth under different light treatments (60FL; 60R; 57R3B; and 60B60FR) in the growth chamber or after 3 weeks in the growth chamber and a consecutive 3 weeks in the greenhouse (3w).

Full paper:
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