Evaluation of **Amaranth** *(Amaranthus Tricolor L.)* growth and development under Blue and Red **LED light** in controlled environment

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Abstract

This experiment was conducted to investigate the effective BR light composition for Amaranth growth and development in controlled environment under three different mixture of blue (450nm) and red (660nm) LED light, viz.; B: R= 1:1; 1:3 and 1:5. Plants were reared in an indoor room where photosynthetic photon flux density (PPFD) was 90 ± 5 µmol m-2s-1, photoperiod 16 h, RH 65-70%, temperature 25±1 0C day/night. After 30 days treatments (40 days after sowing), ten plants from each treatments were subjected to measure the growth rate. It was found that B: R= 1:3 treatment significantly increased the plant height and fresh weight compared to BR=1:1 and BR=1:5 treatments. Leaf and node number, leaf length and width were significantly increased by BR=1:3 and BR=1:5 treatments. However, there was no significant difference found in dry weight.

Background

Plant production in controlled environment has been rapidly developing because of its versatile facilities such as; safe, fresh and quality plant food, no pesticide, less water use, no transportation cost, no spoilage from field to market and so on. In a controlled environment, light is crucial because artificial light entirely determine the light condition where sun light is completely restricted. Light regulates the plant growth and development and it's directly influence the plant photosynthesis resulting in increased carbohydrate and total biomass (Folta et al., 2005).

BR: 1:1 BR: 1:3 BR: 1:5

Fig.1. Growth of Amaranth plant under different BR light composition

Results and Discussion

Plant height and fresh weight were significantly increased by BR=1:3 light compared to BR=1:1 and 1:5 treatments. Among the light ratio BR=1:3 and 1:5 treatments significantly increased the leaf and node number, and leaf length and width. However, there was no significant variation found in dry weight (Table 1). Red light is received by phytochrom and blue light by cryptochrom photoreceptors; these two photoreceptors play a vital role for plant growth and development. Red light improves the photosynthetic ability inducing CO2 absorption into the mesophyll cell which leads promotes the growth of plants (Kim et al., 2005). Blue light is important for chlorophyll formation, chloroplast development and signal transmission and these responses highly depend on blue light doses (Hogewoning et al., 2010).

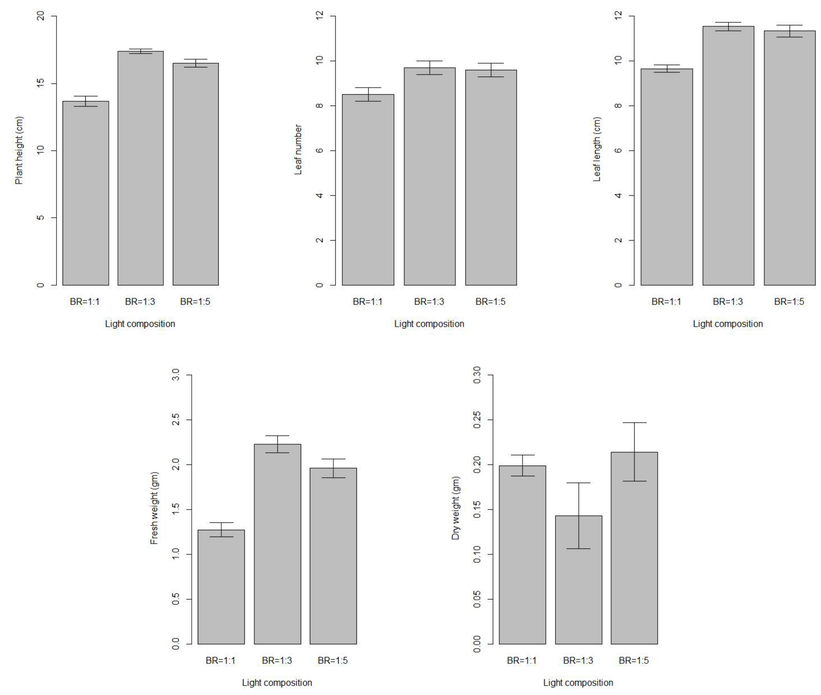

Fig. 2. Plant height, leaf number, leaf length, fresh weight and dry weight of Amaranth in different BR light treatments

Conclusions

Results demonstrate that B: R= 1:3 light ratio is the most effective treatment therefore; this BR light combination could be strategically used to enhance the growth of Amaranth plants in a controlled environment.

References

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