THE EFFECTS OF LED LIGHT SPECTRA ON GROWTH AND DEVELOPMENT OF *IN VITRO LABISIA PUMILA* VAR. *ALATA*

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INTRODUCTION

Light quality is an important environmental factor affecting the growth, development, and morphogenesis of *in vitro* plants. Light-emitting diodes (LEDs) had been used in plant tissue culture and proof to be a better alternatives light source with low energy consumption and high photoelectric conversion efficiency that can satisfy the energy-saving needs of feasible plant production systems. However, the effects of LED light sources on *L. pumila* var. *alata* tissue culture are poorly understood.

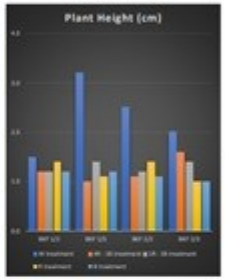
Objective

To evaluate the effect of LEDs on plant growth and development (height, leaf number, leaf length and width, root length) in *L. pumila* var. *alata* clones (BKF 1/2, BKF 1/3, BKF 2/2, BKF 2/3).

Materials and Methods

- ✓ Four *L. pumila* var. *alata* clones (namely BKF 1/2, BKF 1/3, BKF 2/2, and BKF 2/3) are selected and single nodal segments were excised at 1 cm in length and used as explants.
- ✓ Explants were cultured onto a full-strength MS medium supplemented with 1mg/L NAA (1-Naphthaleneacetic acid). The cultures were incubated under controlled conditions at 21 ± 2°C, light and dark cycle of 12-h photoperiod (alternate every 4 hours) under different LEDs treatments. Four explants were subjected to each treatment with 3 replicates.
- ✓ The LEDs light treatments were imposed of white (W), red (R), blue (B), and a combination of red and blue LEDs (1R:1B and 4R:1B). Red and blue LEDs lights supplied 32 W (4ft); 22 W (2ft) whereby white LEDs supplied 18 W (4ft); 9 W (2ft).
- ✓ The performance such as plant height, leaf number, leaf length and width, root length were measured after 4 months.

Results



W treatment

4R : 1B treatment

Note:
Left to right: BKF 1/3, BKF 2/3, BKF 2/2, BKF 1/2

After 4 months of culture, significant differences were observed between the different LED wavelengths towards different clones of *L. pumila* var. *alata*. The highest plant height was obtained under treatment W BKF 2/2 (3.2 cm) followed by BKF 1/3 (2.5 cm) whereas treatment with 4R:1B, R and B produced shortest plant height in BKF 2/2, BKF 2/3 and BKF 2/3, respectively. The treatment 4R:1B in BKF 2/3 produced the highest number of shoots (n=2) and leaves (n=5), evidencing that 4R:1B LEDs exert a positive effect on the variables evaluated during the *in vitro* formation of shoots in *L. pumila* var. *alata*.

Two out of 4 clones (BKF 2/2 and BKF1/3) gave the best results in terms of leaf size under control treatment W with BKF 2/2 produced larger leaves compared to BKF 1/3. Hence, no leaf produced in treatment R for BKF 2/3 and treatment B for BKF 1/2 and BKF 2/3. Significant differences were observed in rooting responses under different LED treatments. Clone BKF 2/2 under control treatment W produced highest number of roots per explant (n=81) and root length of 3.6 cm followed by BKF 1/3 producing 48 roots per explant and 3.0 cm in root length. Eventhough treatment R produced the longest root length in BKF 2/3 which is 3.7 cm and 22 number of roots per explant, no new shoots and leaves produced. Further observation revealed no roots developed from explant treated under 4R: 1B (BKF 1/3), 1R: 1B (BKF 1/2, BKF 1/3 and BKF 2/3), R (BKF 1/2) and similarly in treatment B for all clones.

Conclusion

- ✓ Treatment W is the most suitable for *L. pumila* var. *alata* as it promotes fastest plant growth *in vitro*. Results show treatment W is the best as it displays rapid responses towards initiation, differentiation, and regeneration compared to other treatments in *L. pumila* var. *alata*.
- ✓ The *L. pumila* var. *alata* clones responded differently under different LED treatments as each clone came from different mother tree.

References

Gupta, S.D., & Jatothu, B. (2013). Fundamentals and applications of light emitting diodes (LEDs) in *in vitro* plant growth and morphogenesis. Plant Biotechnol Rep 7:211–220.

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