Enhancing Efficiency in Micropropagation: The Role of Plant Growth Regulator Concentrations

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Abstract

The aim of this experiment was to test concentrations of plant growth regulators on efficient rooting and shooting for the creation of genetic clones for use in research projects.

Industrial hemp, *Cannabis sativa* L. is an ancient crop originating from Asia which has been historically used for food, textiles, and medicine. The micropropagation of *Cannabis sativa* L. allows for a fast production of a large number of genetically identical plants which can then be used for scientific and industrial applications. Explants were placed in media with varying concentrations of auxins to promote shooting. Shoots were then subcultured in media with sixteen varying concentrations of auxins. Shoots were optimized in 0.5 mg/L TDZ and roots were optimized in IBA concentration T5.

Methods and Materials

Seeds are sterilized and placed in MS media → Explants are placed in 0.5 and 1.0 mg/L TDZ (Thidiazuron) and 0.5 and 1.0 mg/L BA (Benzylaminopurine) shooting media → Shoots are subcultured and placed in varying concentrations of indole-3-acetic acid (IAA) and indole-3-butyric acid (IBA) rooting media and Copper sulfate

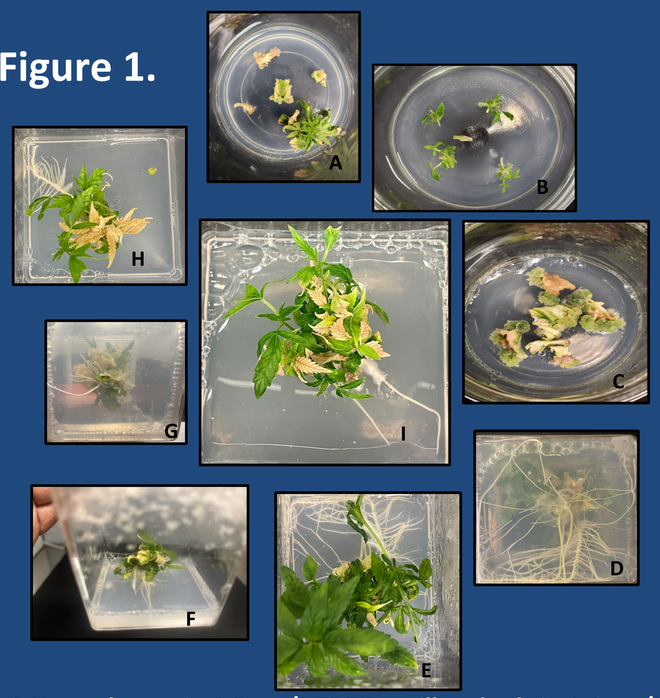
Table 1.

Shoots were subcultured in media with different concentrations of copper sulfate, indole-3-butyric acid (IBA), and indole-3-acetic acid (IAA) rooting media

	IAA (µM)	CuSO4 (mg/L)
RMA-C0	0	0
RMA-C1	2.5	0
RMA-T1	0.25	0.025
RMA-T2	0.5	0.05
RMA-T3	1	0.1
RMA-T4	1.5	0.15
RMA-T5	2	0.2
RMA-T6	2.5	0.25

	IBA (µM)	CuSO4 (mg/L)
RMB-C0	0	0
RMB-C1	2.5	0
RMB-T1	0.25	0.025
RMB-T2	0.5	0.05
RMB-T3	1	0.1
RMB-T4	1.5	0.15
RMB-T5	2	0.2
RMB-T6	2.5	0.25

Figure 1.



A.Young leaves in 0.5 mg/L TDZ B. axillary buds in 1.0 mg/L TDZ C. Cotelydons in 1.0mg/L TDZ.
Images D-I shoots subcultured in the following concentrations: D & E. RMB T2 F. RMB T3 G. RMA T2 H. RMB T5 I. RMB T5

Conclusion

- Micropropagation of shoots is optimized by utilizing TDZ 0.5 and 1.0 concentrations and could be further improved by pairing particular explants to specific concentrations of the cytokinin.
- Initial data suggests that IBA media is more efficient in prompting roots.

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Results and Discussion

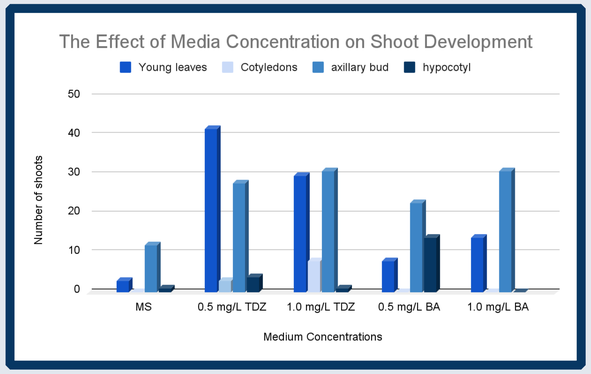

Figure 2.

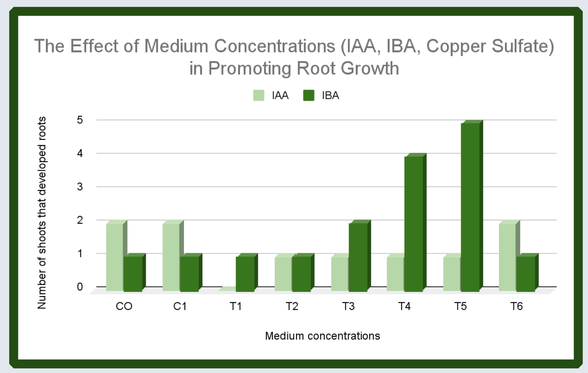

Figure 3.

The data (Figure 2) shows that the optimization of shoots is dependent on both the concentration of the plant growth regulators as well as the type of explants. Concentration 0.5 mg/L TDZ was most effective in the regeneration of young leaves as well as generating the most shoots overall. Axillary bud regeneration was optimized in 1.0 mg/L TDZ and 1.0 mg/L BA, while hypocotyls were optimized in 0.5 mg/L BA. Roots were optimized (Figure 3) in IBA concentration T4, (304.86 mg/L IBA with 150 mg/L Copper sulfate).

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