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Commentary

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Effect of explants on phenotypic changes in *Cannabis* plantlets

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DESCRIPTION

Cannabis (*Cannabis sativa* L) is a dioecious herb having variable habits that is widely used for its medicinal, nutritional, industrial, and ornamental potential properties. *Cannabis* is traditionally cultivated by sexual or asexual such as cuttings methods. Both methods have their own problems. Propagating *Cannabis* plant from seed is usually difficult due to the high degree of heterozygosity property. Traditional *Cannabis* propagating methods are time consuming and associated with a variety of infectious diseases such as viruses, bacteria and fungi that affect the phytosanitary quality of the harvested plants. Vegetative propagation by cuttings theoretically produce plants which are phenotypically and genetically identical to the mother plant but *Cannabis* grower plants find that cuttings from the mother plant change over time and generally having lose vigor and found less cannabinoids. Micro propagation is an important application of plant tissue culture that represents an alternative and also promising approach for large scale *Cannabis* propagation of genetically uniform plants having high phytosanitary quality that can be produced in limited spaces. In addition to mass propagation, plant tissue culture is the cornerstone of biotechnology, allowing researchers to study developmental biology, secondary metabolite production, bioenergy production, cryopreservation, transgenics and genome editing based methods. However, culture degradation is a commonly encountered problem in tissue culture and refers to the gradual loss of vitality and viability of cultured cells and/or tissues. The reasons for cultural decline are multifactorial and may include genetic factors, epigenetic changes, physiological changes, microbial contamination, and environmental stressors. *Cannabis* has presented challenges to micro propagation, including high water content, low transmission rates, and crop decline over time. These challenges are highly genotype specific and require new approaches to develop methods that work across different genetic backgrounds. Most studies have focused on optimizing culture conditions to overcome these challenges, but the source of the starting material and whether this affects subsequent culture growth and development remains to be seen. By know about from other species that long-term explant performance can be affected by a variety of explant related factors including increase Seasonal stages of development and location within the plant.

These differences are thought to be due to differences in endogenous plant growth regulators, sugars/resources and epigenetic regulation. Thus, explant sources play a fundamental role in culture decline over time. In general, juvenile explants have some advantages in terms of growth viability and generally respond better to micro propagation techniques compared to mature explants. For example, nodes near the base of a plant are chronologically older but are usually younger than nodes in the apical portion, and explants in the basal portion generally respond better to *in vitro* rejuvenation practices. Based on the explant source *in vitro* plant rejuvenation indeed involves specific alterations in

gene expression patterns and epigenetic regulation, ultimately resulting in changes in phyllotaxis, leaf shape and size and regenerative capacity which resulting in distinct phenotypic changes such as For *cannabis*, the accumulation of somatic mutations in top derived cuttings was shown to be significantly higher than in bottom derived cuttings of the cannabis mother plant, demonstrating the importance of the explant source. The physical location and age of the explant can have a significant impact on the internal phytohormones composition and affect tissue reactivity. Furthermore, tissue size, type, and developmental stage represent explant characteristics that influence response inducing capacity and overall success. Therefore, the explant source can be considered one of the most important factors in the practice of taper to overcome culture loss over time. In addition to explant origin, the number of subcultures also plays an important role in cultural decline. The integrity of *in vitro* seedlings during development can often only be assessed after a few subcultures. Also, assessing efficacy *in vitro* often requires a broader understanding of the tissue morphogenetic response. Although the effects of explant material and culture duration on culture decline are clear, there are no studies examining the role of explant source and number of subcultures on *Cannabis* culture decline during *in vitro* propagation.

CONCLUSION

Determining the best source of explants and the number of subcultures to overcome culture decline over time characterizes *in vitro* propagated *Cannabis* seedlings for future use in commercial cultivation. Play a fundamental role on Therefore, the current study evaluates the effects of explant source and number of subcultures on the morphological parameters of *in vitro* grown *Cannabis* plantlets. Using greenhouse grown mother plants, two bud stem segments derived from *Cannabis* drug strains were selected as explants. Honey Banana is less responsive to *in vitro* culture compared to other *Cannabis* strains and is therefore considered a potential candidate to study the effects of explant sources on *in vitro* performance and rejuvenation during long term *in vitro* culture.