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IMPROVED MORPHOLOGY AND BIOCHEMICAL PROPERTIES OF CARROT'S ROOTS AFTER SIMULATED MICROGRAVITY IMPACT

Abstract

Gravity is always present on earth; while it is at a micro level at the space region. However, the influence of gravity can be modified or compensated for. Real microgravity conditions which are short term and fast responding can be provided in drop towers, balloons, parabolic flights of aircraft or sounding rockets. To study long term effects of microgravity, human tended space laboratories have been used such as the International Space Station; but scientists have developed various kinds of ground-based facilities and equipment to achieve the condition of functional weightlessness for long term experimental windows, needed for samples such as plants. A clinostat is one of those experimental devices which create simulated microgravity conditions in an earth laboratory. Simulated microgravity causes significant changes on biological organisms. These changes have led to discoveries that are of social-economic benefits. Roots are structures specialized for anchorage, storage, absorption and conduction. Root determines fruits. Without root no fruits; without fruits no food: no life; no existence; no future. This paper focuses on carrot (Daucus carota subsp. sativus) plant research with respect to gravity in comparison to its simulated microgravity counterpart. This is because carrot is an essential economic crop. The differences in the germination and early growth (morphology) of carrot under gravity and simulated microgravity were analyzed by determining the root curvature and the root growth rate using ImageJ software. Furthermore, some other biochemical analyzes such as the determination of the nutritional crude analysis (proximate), phytochemicals and antioxidant potentials were carried out on the roots of the germinated seeds. The plant chemicals analyzed include tannins, saponins, zeaxathin, phytate, oxalate, carotenoids, vitamin A and vitamin C. Overall, the obtained results showed that the clinostat rotated (clinorotated) roots had significant higher and improved nutritional qualities, and quantities of essential phytochemicals than the gravity samples. More so, the commonly used rotation on the clinostat on related research is clockwise, this project put it into consideration to know if there is a significant difference in the clockwise rotation in comparison to the anticlockwise. This paper therefore, contributes a new world of beneficial discoveries on clinostat rotated germinated carrot seeds that could be translated to the fruits in a future research.