CBeet: Developing a Biotechnological Seed Coating With Beet Byproducts

Monteiro Lima de Souza, Ana Rebeka (School: EEMTI Marconi Coelho Reis)

The improper use of synthetic inputs in agriculture may impact the environment and human health. This research developed a biotechnological polymer seed coating rich in bioactive compounds to enhance physiological and biochemical aspects in Coriandrum sativum. The polymer synthesis used a symbiotic culture of bacteria and yeast and extract made from beet peels (Beta vulgaris L.). The influence of sucrose concentration and beet biomass on its physicochemical and mechanical properties was evaluated with a 2^2 factorial design. The results were compared with analysis of variance (ANOVA) at 95% reliability and Principal Component Analysis (PCA). Those statistical analyzes show the best polymer presented Thickness of 0.27 mm (±0.0), Tensile Strength of 5.53 MPa (±2.02), Porosity of 88.08% (±0.29), Water Vapor Permeability of 5.08 g.mm/k.Pa.h.m² (±0.02), Biodegradability of 90.67% (±0.09), Water uptake of 642.6% (±3.29), and Solubility of 87.43% (±0.07). These results follow the American Society for Testing and Materials norms. The polymer was crushed and incorporated into the beet biomass, creating a coating that was applied to the pelleting of coriander seeds. Physiological and biochemical analyses were carried out after 30 days of planting. The results showed that the biotechnological coating promoted a 39.20-fold in flavonoid content compared to the conventional synthetic coating, while also enhancing physiological descriptors. Bioactive compounds regulate plant growth and stimulate the absorption of nutrients by the plant's root system. These substances are of great importance for increasing agricultural production in a sustainable way. This research demonstrates beet byproducts can be used in biotechnological processes to produce alternatives to synthetic coatings.