Reassessing Inefficient Taxane Extraction Methods: A Novel Approach to Optimize Paclitaxel Production

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Paclitaxel, a critical plant-derived chemical harvested from yew trees, is implemented in numerous applications including various chemotherapy treatments. The conventional method of paclitaxel production is semi-synthesis, which extracts taxane compounds from yew tree needles, then conducts chemical alterations to produce the desired paclitaxel. However, current extraction methods are cost-prohibitive and hazardous, establishing the need for alternative methods. In this project, a cost effective and environmentally safer dimethyl sulfoxide (DMSO) and propylene carbonate (PC) solvent was explored as a potential enhancement. In the first objective, a series of DMSO and PC ratios were utilized in a maceration extraction, then chromatography tests were conducted. The mean Rf value of the 1:1 ratio presented an average of 0.752, receiving the closest average to the commercial average of 0.74. In the second objective, the bioactivity characteristics of the taxane compounds extracted were analyzed by being utilized as a treatment in a yeast stock solution then, measuring the light absorbed. The difference between the light absorbed before and after treatment showed a p-value of <.01, establishing statistical significance for decrease of cell growth. Thus, supporting this is a promising chemical alternative to current extractions. The implementation of this extraction method allows for increased paclitaxel production. Therefore, allowing for pharmaceutical companies to increase pharmaceutical production, leading to increased accessibility of paclitaxel-based pharmaceuticals and contributing to the pharmaceutical economy. Future developments of this project could chemically alter the solvent to allow for incubation during maceration to increase effectiveness and efficiency.

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