The Effect of Induced Hypoxia upon the Phototoxicity of Plants

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Photodynamic Therapy (PDT) is a form of a cancer treatment that exposes a photosensitizing drug to a highly specific wavelength of light from a laser. This reaction produces a form of singlet oxygen that kills cancerous cells, and is on the way to becoming the most effective, non-invasive cure for cancer. One of the major drawbacks of this treatment is that if a tumor has become too large, there will not be enough singlet oxygens produced to destroy the entirety of the cancer cells. This project plans to replicate— on a smaller, non-human scale— the act of performing a technique similar to hyperbaric oxygen therapy on a patient before PDT in order to tackle this problem. Using phototoxic plants (Anethum graveolens) and the Candida albicans test, this experiment aims to investigate the hypothesis that when oxygen concentrations are increased, the cleared area of yeast also increases, and therefore phototoxicity of the plant as well. The results proved this hypothesis to be correct, with the control group of 21% oxygen concentration averaging at 0.825mm, the 18% group at 0.45mm, and the 15% group at 0.05mm. By first determining the source of and developing a possible solution for one major drawback of PDT, this allows for further development on the human scale to achieve increased production of singlet oxygens. Also, isolating one specific variable in testing enhances the accuracy of the conclusions drawn and provides better insight for improvement of the PDT methodology.

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