Influence of salinity on glycerol production in microalga (*Dunaliella tertiolecta*) culture: Application to biodiesel fuel production

Microalgae have strong potential as sustainable biodiesel organisms. *Dunaliella tertiolecta*, a green mircroalga, continuously excretes glycerol, allowing extracellular glycerol collection for use as a biodiesel additive. The commercial process of glycerol isolation and glycerol collection from this microalga are understudied yet valuable to sustainable energy. This alga uses glycerol as a survival tactic in abnormal environments such as outside the natural salinity range (25-35 PSU); the salinity may cause the microalga to release glycerol as a buffer from the external osmotic pressure. Environmental stressors such as salinity, temperature, and nutrient levels may induce higher extracellular glycerol production from this alga. In this study, four salinity regimes (10, 20, 30, 40 PSU) were evaluated for glycerol production by culturing, monitoring, and sampling in a closed photobioreactor-illuminated system. Culturing results demonstrated that higher salinity significantly (One-way ANOVA, $p<0.001$, $F=12.718$, $n_{10}=7$, $n_{20}=8$, $n_{30}=8$, $n_{40}=7$) increased average extracellular glycerol concentration in culture, however these differences were small enough to be negligible (~0.3%). Additionally, the day glycerol collection is taken is significant (Two-way ANOVA, $p<0.002$, $F=3.865$, $df=7$) but there was a minute difference between days that it was negligible as well (~0.2%). Findings from this work suggest that salinity does have a significant impact on glycerol concentration on a small scale, but not substantial enough to impact glycerol production on an industrial scale.

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