10.012 Introduction to Biology 2D Report 2 F06 Team 06

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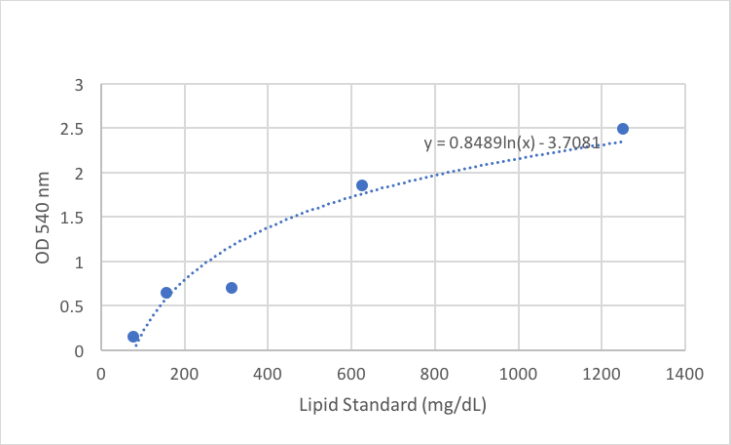
I. Objectives

To use the sulpho-phospho-vanillin method to determine and compare the lipid content in different algae samples. The sulpho-phospho-vanillin assay reacts with lipids to produce colorimetric products of different colour intensity. The products are analysed using a spectrophotometer and the results obtained will be matched against the graph below to determine the lipid content present in a particular sample.

II. Experimental Result



The sulpho-phospho-vanillin method will be administered on the positive controls (known lipid concentrations) to produce colorimetric products with different spectrophotometer readings. The numbers are then used with their respective concentrations to plot a logarithmic graph as shown above.

Reading 1 and 2:

Group	A1	A2	B1	B2	C1	C2	D1	D2	A1-D1	A2-D2
2	0.045	0.164	0.125	0.392	0.17	0.369	0.105	0.073	-0.06	0.091
4	0.064	0.739	0.121	0.45	0.127	0.384	0.047	0.077	0.017	0.662
6	0.045	0.77	0.215	0.285	0.432	0.247	0.047	0.073	-0.002	0.697
8	0.055	1.206	0.242	0.458	0.646	0.578	0.789	0.083	-0.734	1.123
10	0.049	2.577	0.157	0.329	0.127	0.275	0.051	0.089	-0.002	2.488

Fig. 1: A: Positive control, B: Sample 1, C: Sample 2, D: Negative control

Calculating OD values:

	(A1-D1) - (A2-D2)	Concentration
Group		
2	0.151	78
4	0.645	156
6	0.699	313
8	1.857	625
10	2.49	1250

$$Ratio\ of\ B\ to\ C = \frac{(B2-D2)-(B1-D1)}{(C2-D2)-(C1-D1)}$$

$$B : C = -1 : 149$$

III. Analysis of Result

Our calculated ratio is a negative number and upon analysis, it is highly possible that an experimental error had occurred. It is thus impossible to do an in-depth analysis using our group's results. We will be analysing Group 2 results instead.

OD value of sample 1:

$$(B2 - D2) - (B1 - D1) = 0.299$$

From the graph obtained, OD value of 0.299 corresponds to a lipid standard of 112 mg/dL.

OD value of sample 2:

$$(C2 - D2) - (C1 - D1) = 0.231$$

From the graph obtained, OD value of 0.231 corresponds to a lipid standard of 103 mg/dL.

Sample 1 has a higher lipid content compared to Sample 2. Sample 1 and Sample 2 are obtained from different strains of algae and this fact can be used to account for the difference.

Exposing algal cells to light increases their rate of reproduction and photosynthesis. This results in higher conversion rate of carbon dioxide into sugar, which is metabolised by algal cells to form lipids.

Different strains of algae require different conditions (e.g. light intensity, carbon dioxide concentration, temperature, etc.) to achieve the optimal growth and photosynthesis rate. It is possible that both algae strains in Sample 1 and Sample 2 are subjected to the same environment which, in this case, appears to favour the growth of the strain of algae in Sample 1. This implies that algal cells in Sample 1 have a higher rate of photosynthesis and growth, thus explaining the higher lipid content in Sample 1 compared to Sample 2.

Another possibility could be that one of the samples (in this case, Sample 1), has been biologically modified, to divert the biosynthetic metabolism of the cells to mainly lipid synthesis. One possible reason for this is commercial, which utilises high lipid content for biofuels. This accounts for the higher lipid content in Sample 1.

IV. References

1) McMahon, A., Lu, H., & Butovich, I.A. (2013, May). The Spectrophotometric Sulfo-Phospho-Vanillin Assessment of Total Lipids in Human Meibomian Gland Secretions.
2) Hannon, M., Gimpel, J., Tran, M., Rasala, B., & Mayfield, S. (2010, September). Biofuels from algae: challenges and potential.