

Speedy and smart screening technique of algal biomass, carbon contents and dry weight using TOC analyzer and Thermal analyzer

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1. Abstract

The purpose is to introduce a new, much simpler, and quicker analysis method using a Total Organic Carbon analyzer / Solid Sample Module(TOC+SSM) and Thermogravimetric analyzer(TG/DTA) for measuring organic contents and dry weight of algae.

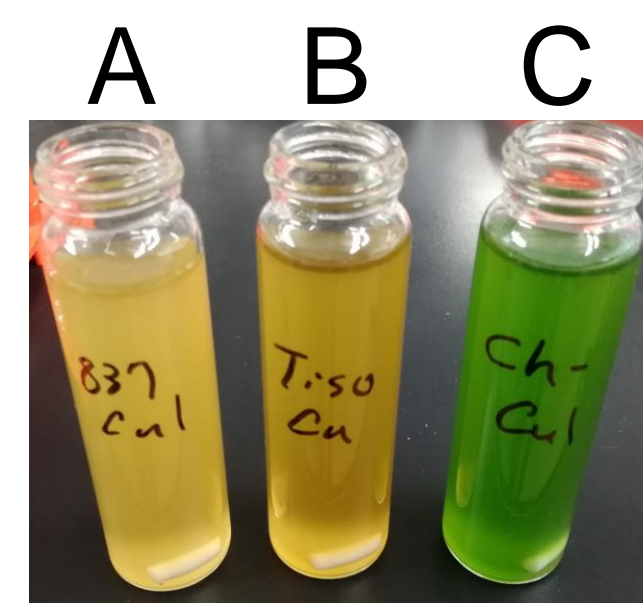
Result

- TOC+SSM system shows good linearity between the carbon content and algal cell weight.
- TG/DTA system shows the water content in algal pellets and the differences between several different algae.
- Using data obtained from 2 systems, it is possible to get actual carbon content in dry algal cells without any dry treatment.

2. Sample preparation

Sea water medium
 Alga A: *Emiliana huxleyi* NIES-837
 Alga B: *Tisochrysis lutea* (T-iso)
 Fresh water medium
 Alga C: *Chlorella vulgaris* 211-11h

10 days : culture



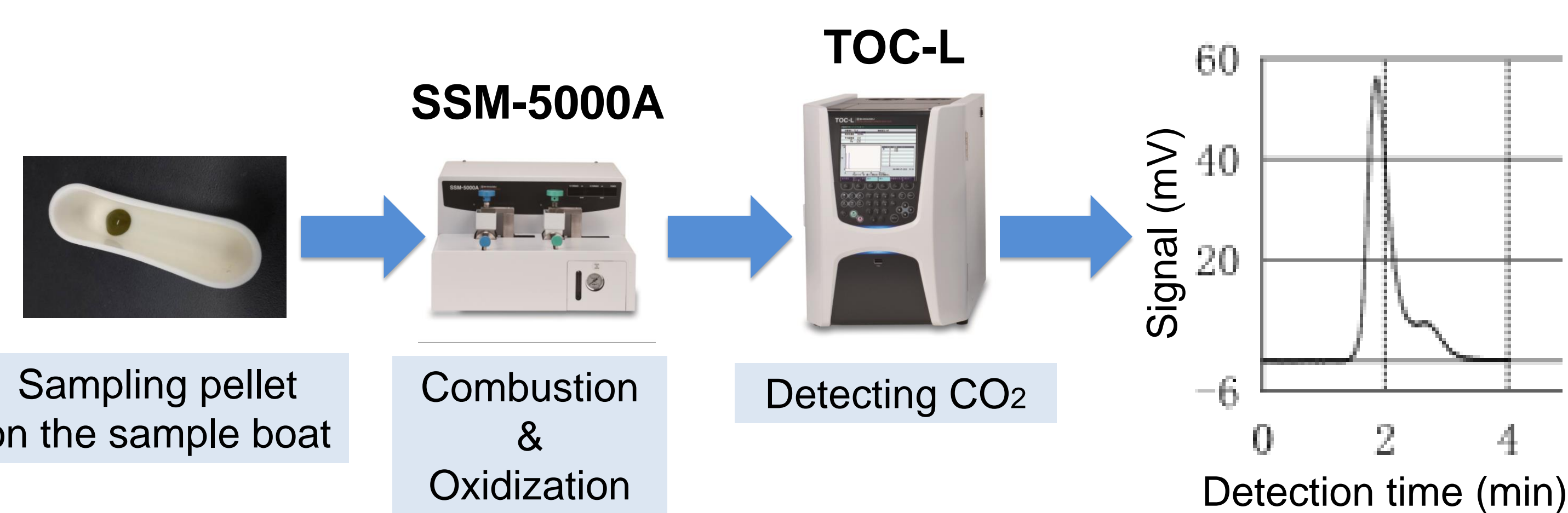
Washed with culture medium by centrifugation (3 times)



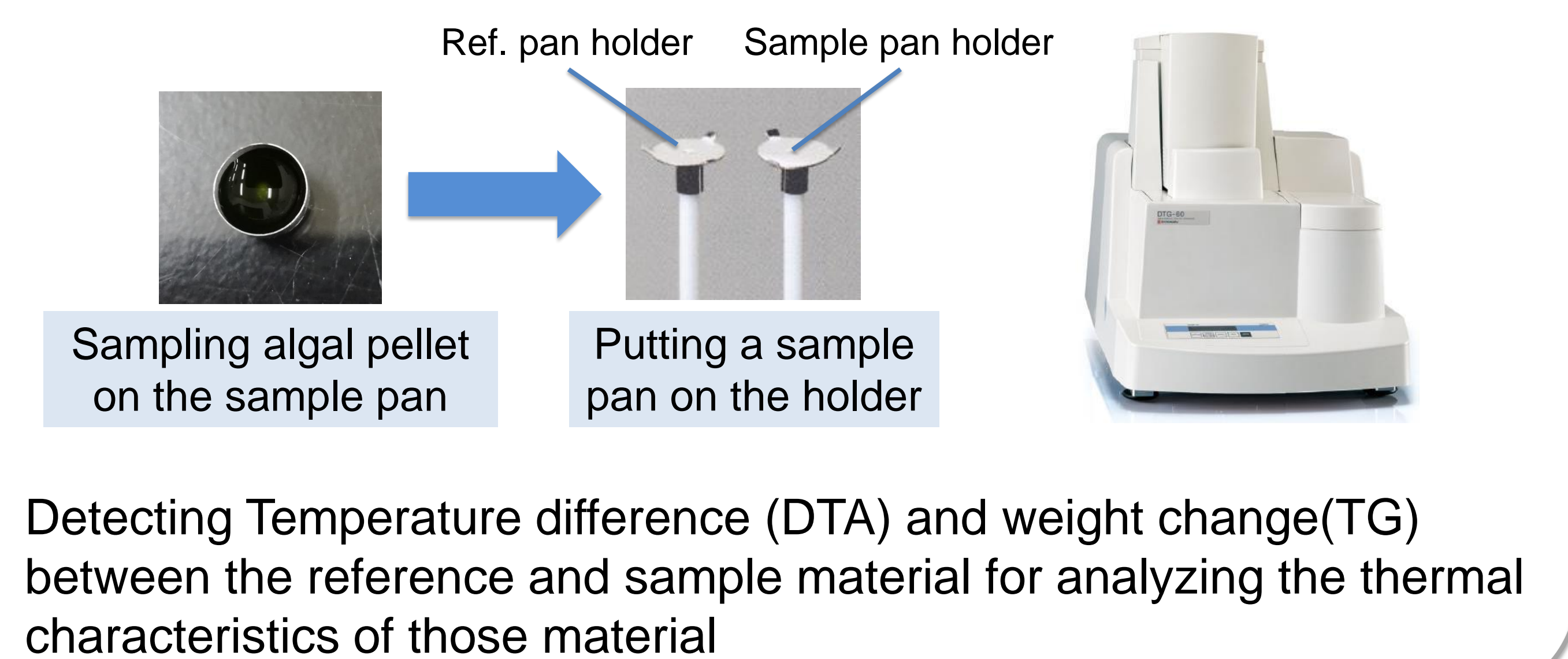
3. Instruments

Algal wet pellets were applied directly to TOC and TG/DTA.

➤ Total Organic Carbon (TOC) analyzer [TOC-L]

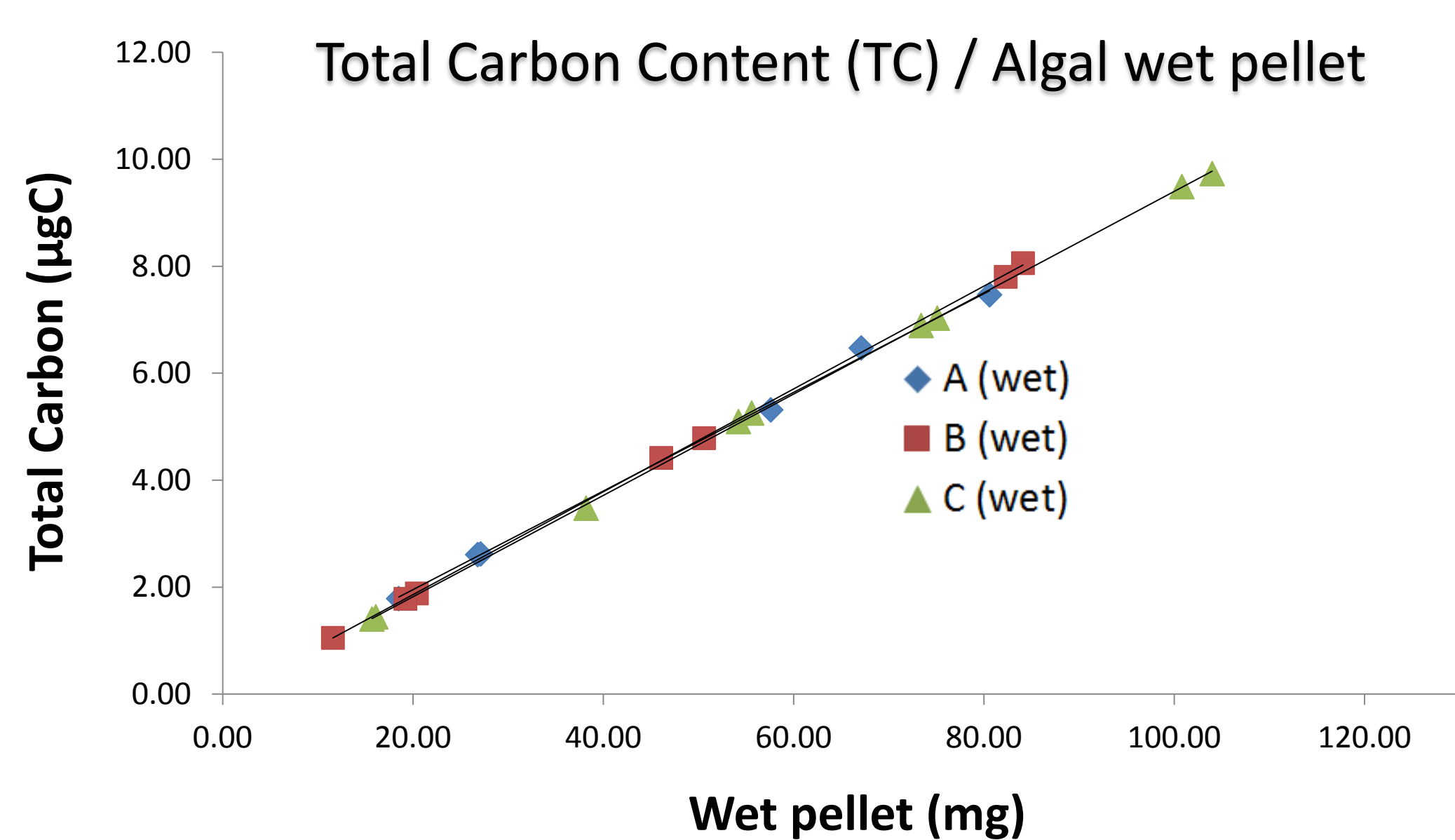


➤ Simultaneous TG/DTA [DTG-60]



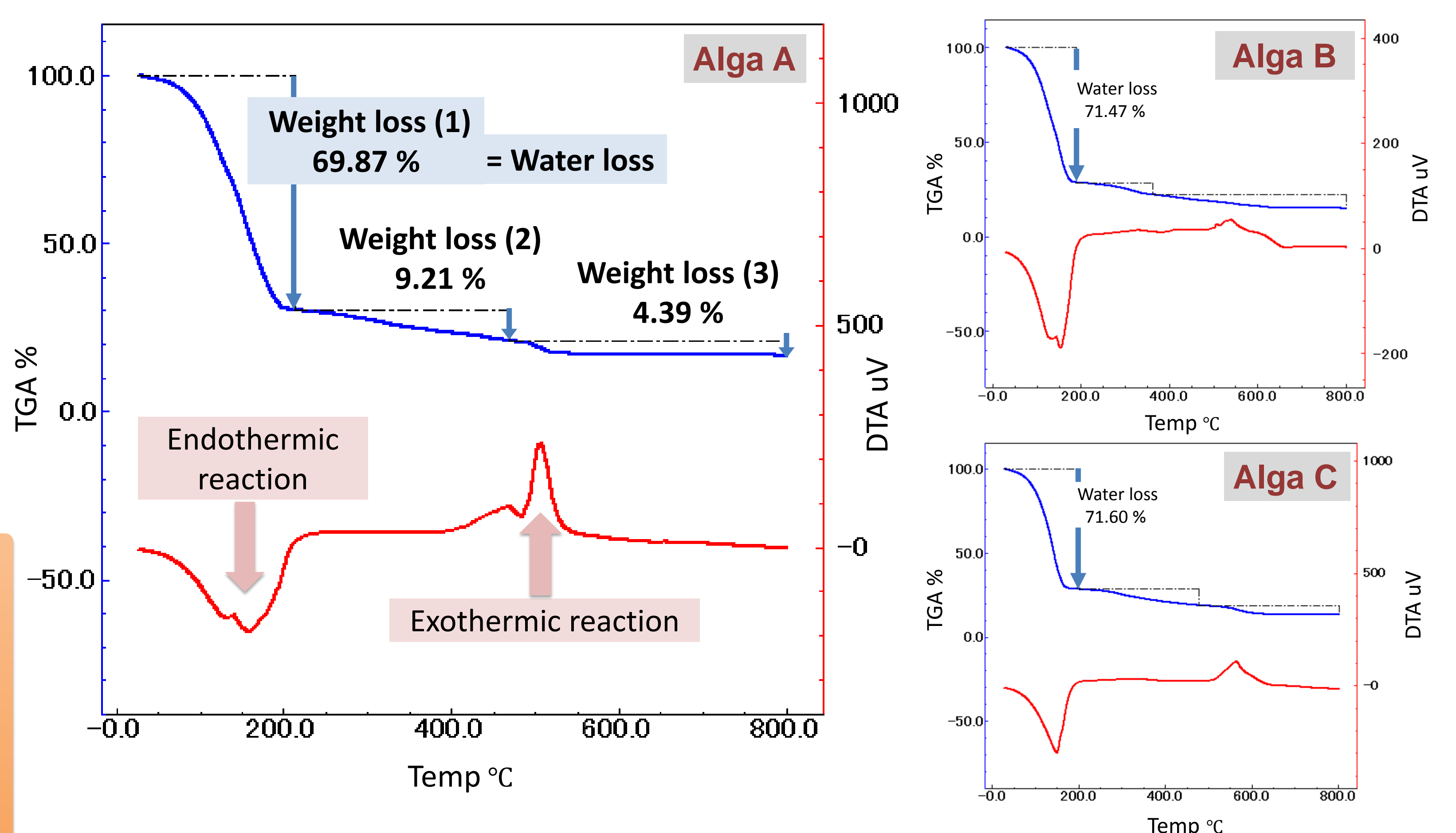
4-1. TOC analysis

The analysis results showed the carbon content increased linearly to the weight of wet pellet.

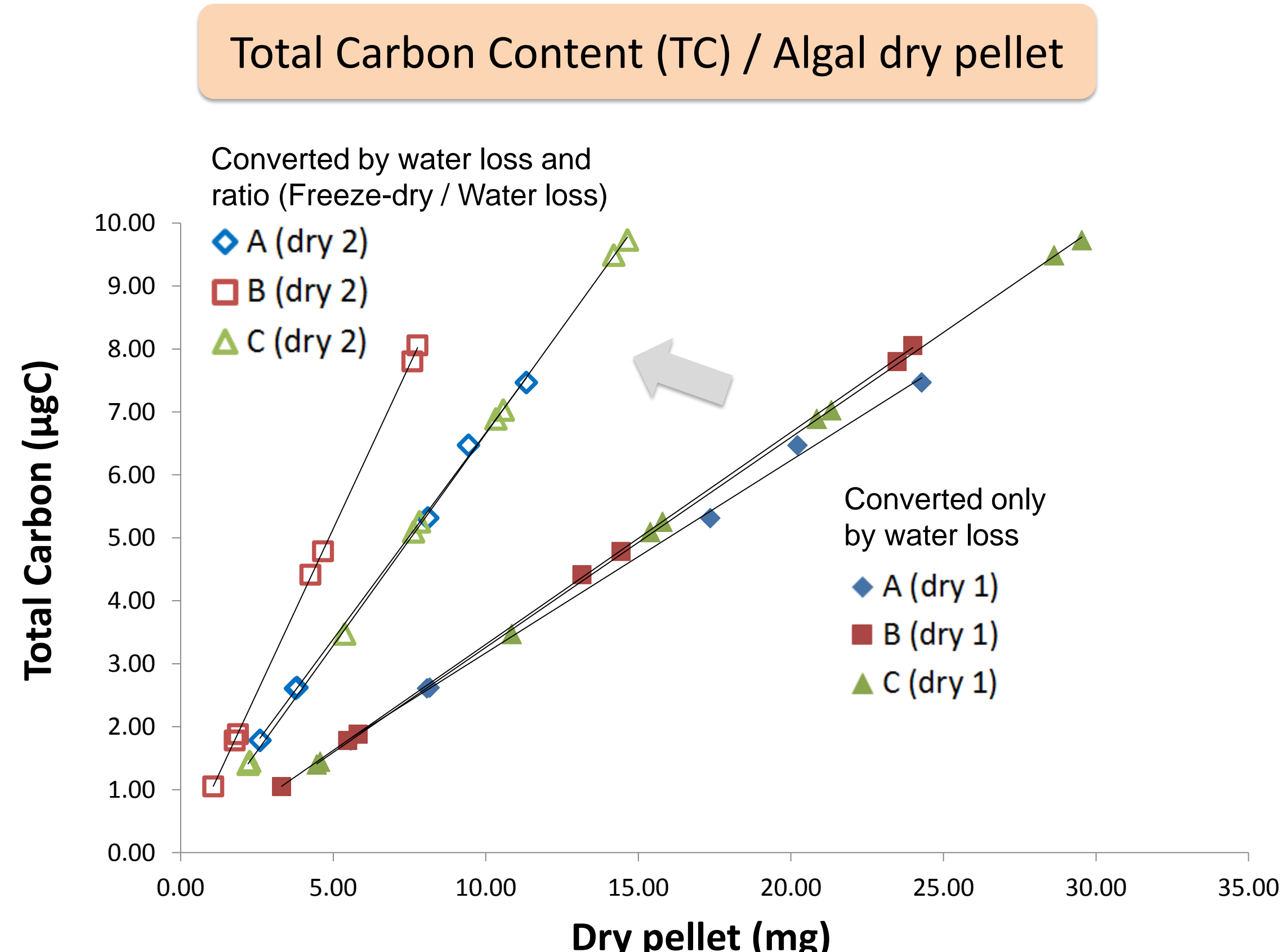


4-2. TG/DTA analysis

Several weight of loss were detected from TG/DTA analysis. First endothermic reaction means "water loss". These experiments were conducted several times in order to confirm reproducibility.



4-3. Analytical results



Alga	Weight loss (1) = Water loss		Weight loss (2)		Weight loss (3)		Freeze-dry analysis	Freeze-dry / Water loss
	Temp (°C)	%	Temp (°C)	%	Temp (°C)	%	Water content (%)	Ratio
A	RT - 213	69.87	213 - 470	9.21	470 - 800	4.39	85.91	1.23
B	RT - 190	71.47	190 - 362	6.43	362 - 800	7.20	91.01	1.27
C	RT - 196	71.60	196 - 478	9.61	478 - 800	5.53	86.00	1.20

Using values of water loss, weight of algal dry pellets can be calculated (dry 1). It is still the difference between the value obtained from the water loss and the value from Freeze-dry analysis, so the Ratio (Freeze-dry / Water loss) should be used to convert algal weight (dry 2).