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the genetics society
John Oldacre Foundation

Comparing two DNA isolation methods on three forest species

5.5M tonnes of single-used plastic use in molecular labs worldwide per year

Urbina, M. A., Watts, A. J. R., & Reardon, E. E. (2015). Labs should cut plastic waste too. *Nature*, *528*(7583), 479–479. https://doi.org/10.1038/528479c

WE NEED TO REDUCE IT

Study species and sampling method

Thuja plicata (TP)

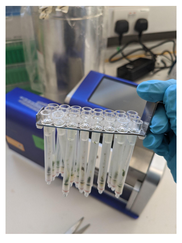
Pseudotsuga menziesii (PM)

Tsuga heterophylla (TH)

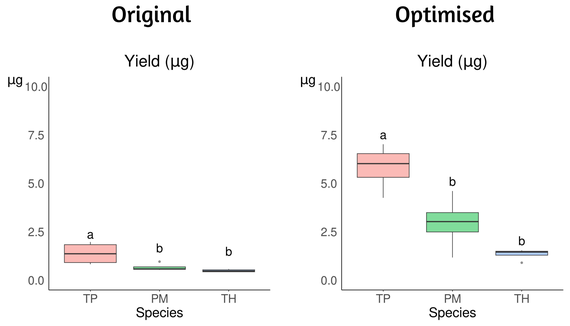
Four samples per species

Optimisation & DNA Quantification

QIAGEN - DNeasy plant mini kit
is a silica column-based method widely used to isolate DNA from conifer trees
MicroGEM - Plant DNA Extraction
is an automatized single-tube method.
uses a temperature-controlled lysis step using an enzyme cocktail.

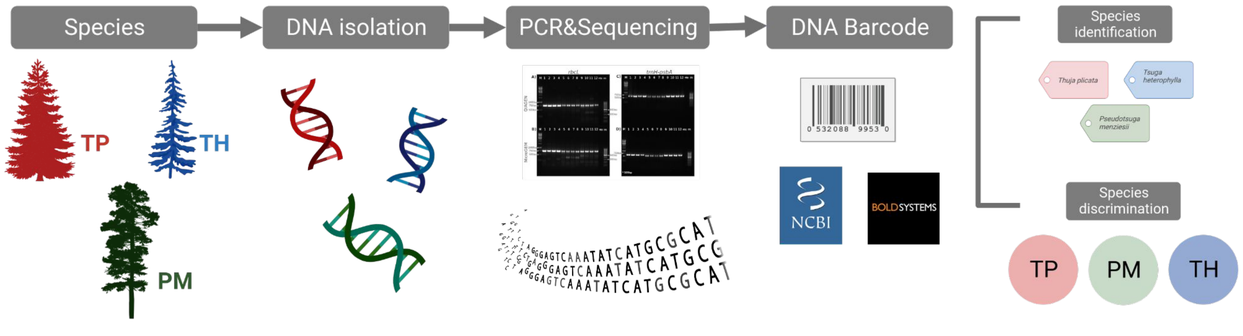


MicroGEM Yield results



Every species show yield improvement after using modified protocol

DNA Quality - DNA Barcoding



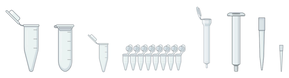
No differences between methods were found and each sequence was correctly identified and discriminated against the others

Time needed to process 1 sample

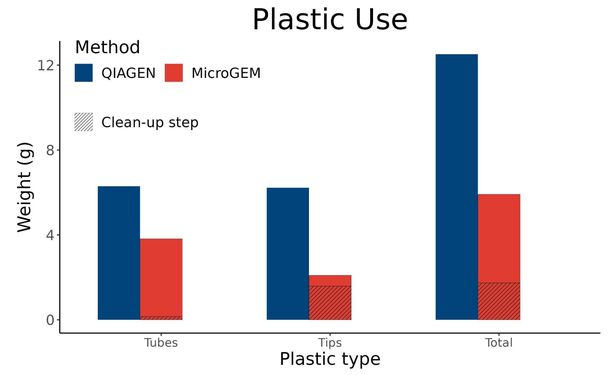
	Fixed time 1:24 samples (min)	Total (min)	hands-on (min)
QIAGEN	114	119.4	5.4
MicroGEM	54	57.5	3.5

51.8% Faster

Plastic used to process 1 sample



We measured tubes and tips used, we didn't quantified plastic on the packaging which may also have an impact.



Plastic Footprint of 1 sample

The carbon dioxide emitted to produce 1 kg of polypropylene plastic is 3.4 kg CO2.
The total energy required to produce 1 kg of plastic from the extraction of raw materials to the final manufactured product is 85.9 MJ.
(Harding K et al. J Biotechnol. 2007;130:57–66.)

	Carbon emissions (Kg CO2)	Energy used (Mj)
QIAGEN	0.04255	1.07498
MicroGEM	0.02011	0.50809

Reduces Plastic Footprint by 52.6%

Large sample size project

	Species	Number of samples	Yield mean (µg)	Yield (% CV)	Time (Days)	Plastic used (Kg)	Carbon emissions (Kg CO2)	Energy used (Mj)
QIAGEN	PM	1146	9.603	59.24	24.3	14.3	48.76	1231.93
	TP	79	7.766	40.37	1.67	0.9	3.36	84.92
MicroGEM	TP	472	3.312	66.09	5.69	2.8	9.49	239.82

If MicroGEM was used rather than QIAGEN we would have saved:
- **11.2 days**
- **8.1 kg plastic**
- **27.44 kg of CO2 emission**
- **686 Mj of energy**

Need to seek for sustainable methods and techniques to reduce the environmental footprint of molecular analyses