LEUPHANA
UNIVERSITY OF LÜNEBURG

UTILIZATION OF OLIVE MILL WASTEWATER BY MICROALGAE

ASTRID VICTORIA LINDNER, M. SC., PROF. DR. DANIEL PLEISSNER
Leuphana University of Lüneburg, Sustainable Chemistry (Resource Efficiency), Institute of Sustainable and Environmental Chemistry

INTRODUCTION

Phenolic compounds arising from olive oil production sites constitute an environmental threat due to antimicrobial properties[1,2,3].

To remove and utilize these compounds from wastewater, microalgae represent capable microorganisms due to their adaptive metabolic pathways[4,5]. Utilization may occur either as mineralization, transformation and/or metabolisation. In order to utilize phenolic compounds in olive mill wastewater (OMW) using microalgae investigations on their resistance against inhibitory effects and their abilities to use phenolic compounds as carbon source are necessary.

METHODS

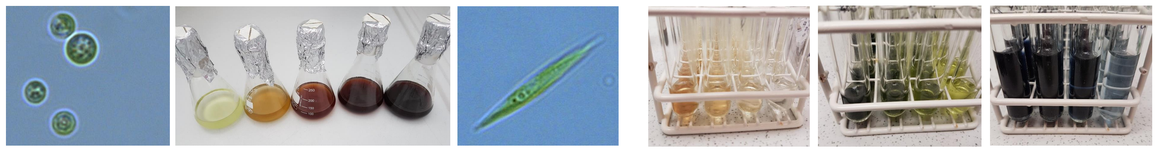
Cultivation in flasks

OMW concentrations (v/v) of 0, 1, 6, 12 and 25 %,

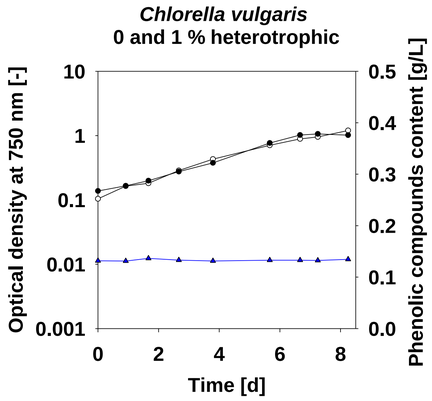
Dark vs. light (50 µmol/m²s) conditions, 30 °C, pH 6-7, 100 rpm, AF6 medium (+glucose 1 g/L in the dark),

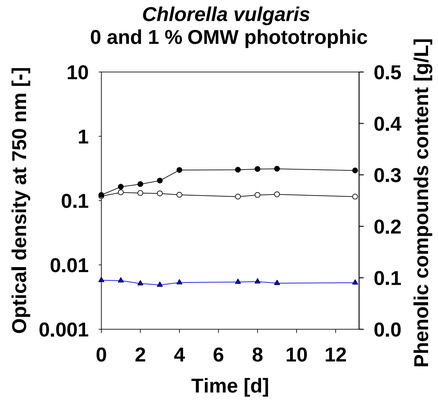
Analysis

Daily optical density (OD) measurement at 750 nm,
Correlation of OD to dry weight,
Folin-Ciocalteu reagent: determination of phenolic compounds in the supernatant; tyrosol equivalent,

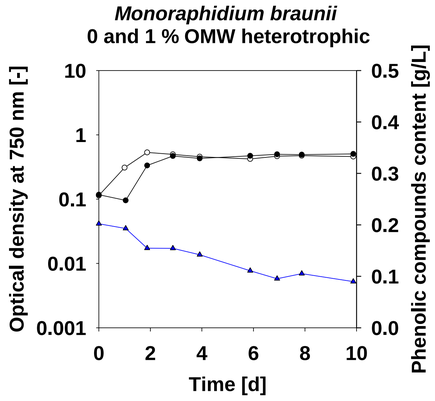


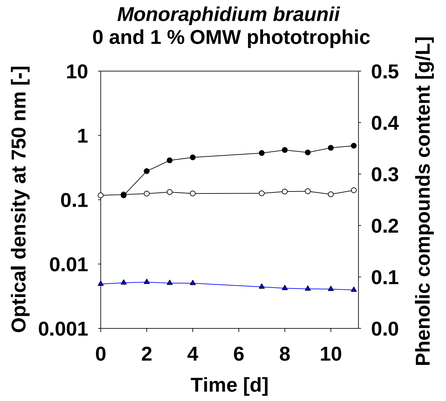
RESULTS





Heterotrophic			
C. vulgaris		*M. braunii*	
$\mu_{max\ 0\ \%}$	0.09 d^{-1}	$\mu_{max\ 0\ \%}$	0.21 d^{-1}
$\mu_{max\ 1\ \%}$	0.19 d^{-1}	$\mu_{max\ 1\ \%}$	0.11 d^{-1}
Removal	-	Removal	55.6 %
Phototrophic			
C. vulgaris		*M. braunii*	
$\mu_{max\ 0\ \%}$	-	$\mu_{max\ 0\ \%}$	-
$\mu_{max\ 1\ \%}$	0.044 d^{-1}	$\mu_{max\ 1\ \%}$	0.16 d^{-1}
Removal	5 %	Removal	13.3 %





***Chlorella vulgaris*:**
Better growth in the dark (addition of glucose), no removal of phenolic compounds.

Better growth with 1 % OMW under light; 5 % removal, possibly utilized.

***Monoraphidium braunii*:**
Growth in the dark (0 and 1 % OMW), visible lag-phase with 1 % OMW; 55 % removal of phenolic compounds.

Better growth with 1 % OMW under light; 13 % removal, possibly utilized.

CONCLUSION

Growth and phenolic compounds removal depend on microalgal strain and culture conditions.
Promising candidate for heterotrophic and phototrophic cultivation: *Monoraphidium braunii*.
Further analysis with HPLC, TOC, GC to identify mechanisms of mineralization, transformation or metabolisation.
Optimization of environmental culture conditions to improve growth and phenolic compounds removal.

REFERENCES [1] Fiorentino et al., J Agr Food Chem **51**, 1005 (2003)
[2] Capasso et al., J Appl Microbiol **79**, 393 (1995)
[3] Mekki et al., Exotox Environ Safe **69**, 488 (2008)
[4] Hariskos, Posten, Biotechnol J **9**, 739 (2014)
[5] Posten, Schaub, J Biotechnol **142**, 64 (2009)

CONTACT Astrid Lindner, M. Sc.
Leuphana University of Lüneburg
Universitätsallee 1, 21335 Lüneburg/GERMANY
Fon +49.4131.677-1968
Astrid.lindner@leuphana.de

ACKNOWLEDGEMENT This research was supported by ERA-Net Cofund on Biotechnologies and the BMBF. We thank all co-workers for help and useful discussions.