

# Mixotrophic cultivation of *Chlorella vulgaris* using *Brassica carinata* hydrolysate as carbon source for biomass and lutein production



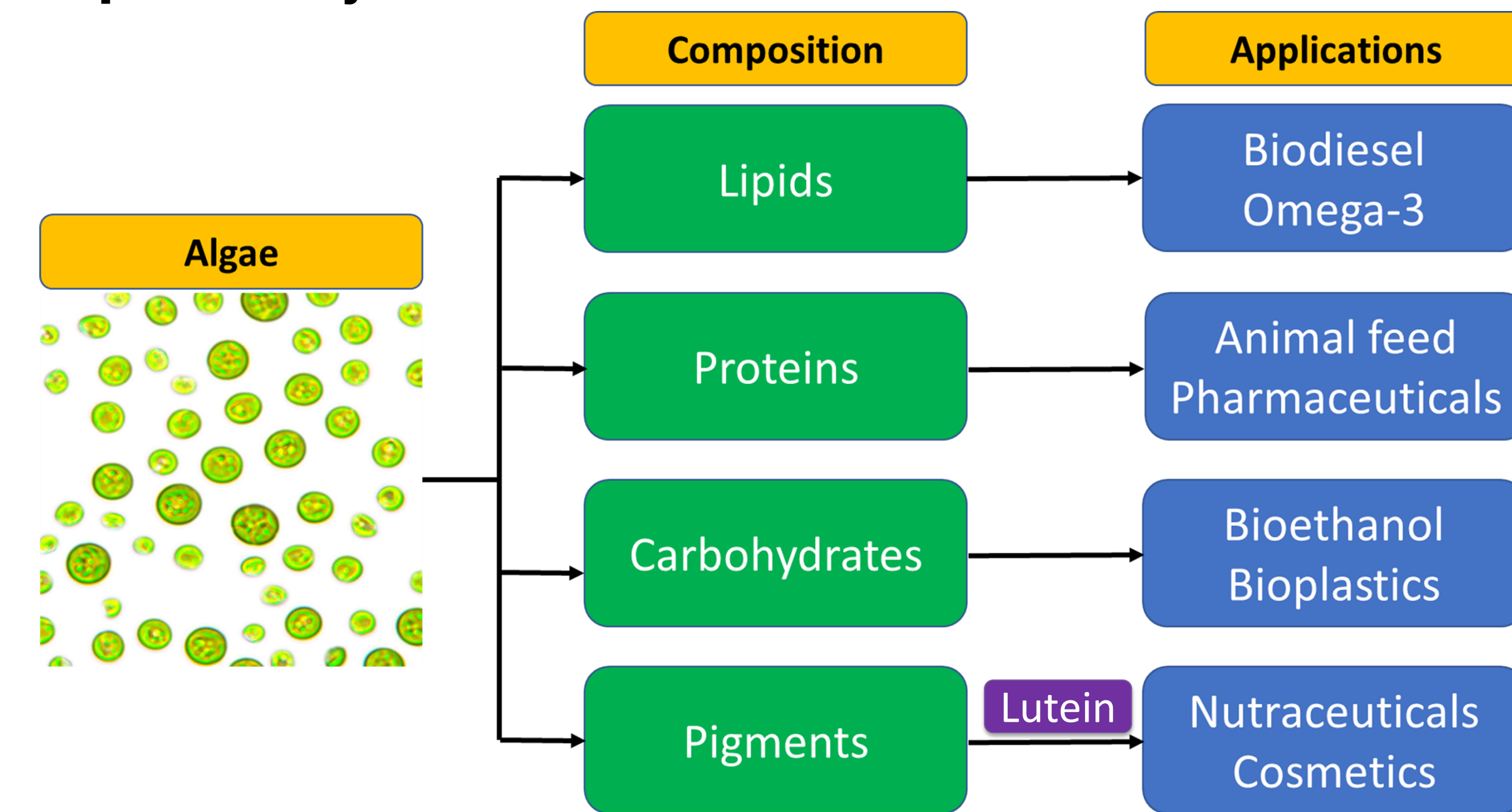
Jessica Martin<sup>1</sup>, Dr. Neha Arora<sup>2</sup>, Dr. George Philippidis<sup>2</sup>

<sup>1</sup>Department of Chemistry, <sup>2</sup>Patel College of Global Sustainability, University of South Florida, Tampa, FL

## INTRODUCTION

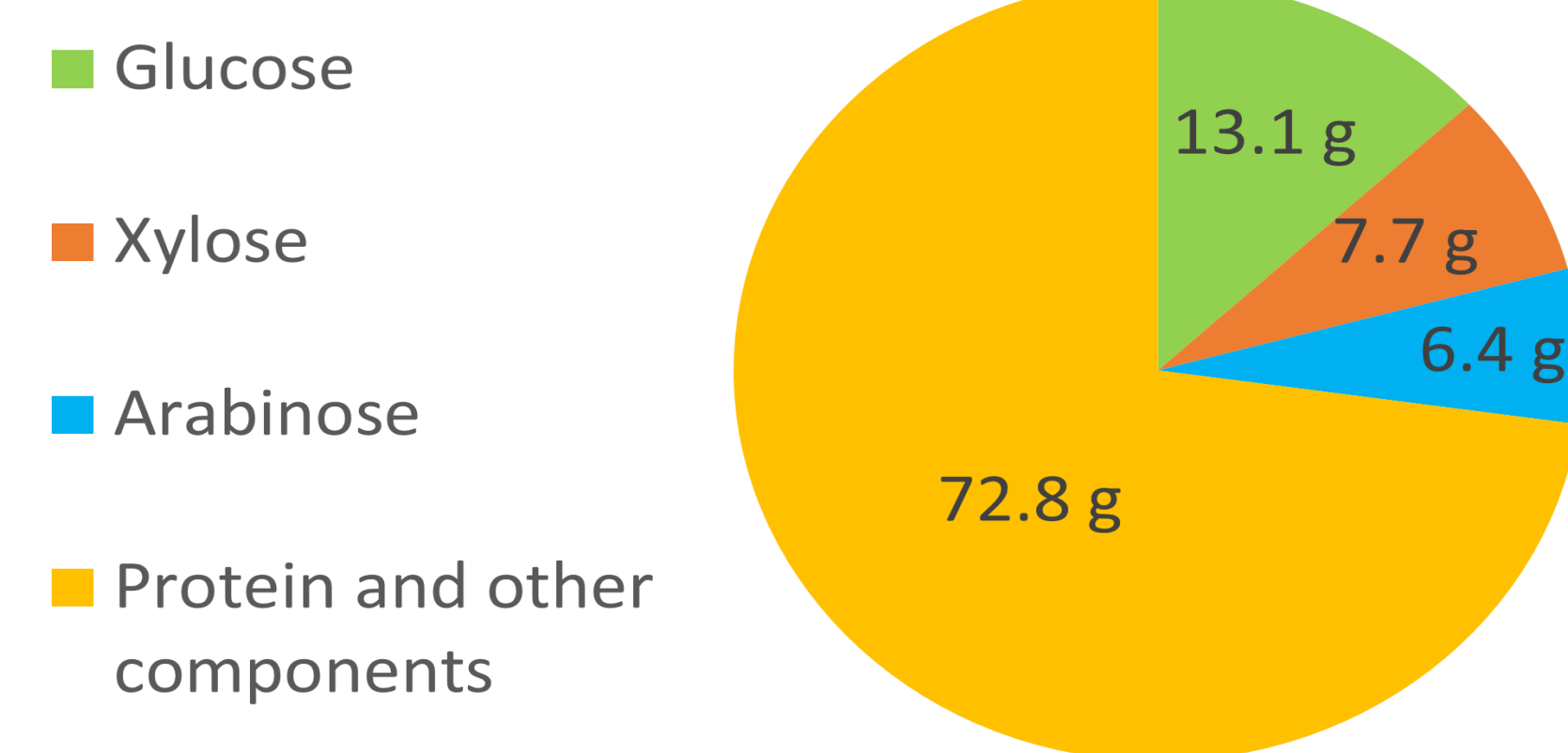
### *Chlorella vulgaris*

- A microalga that can grow on sunlight (autotrophy) and organic carbon (mixotrophy)
- Lutein is a valuable carotenoid pigment used to prevent eye diseases and cataracts in humans

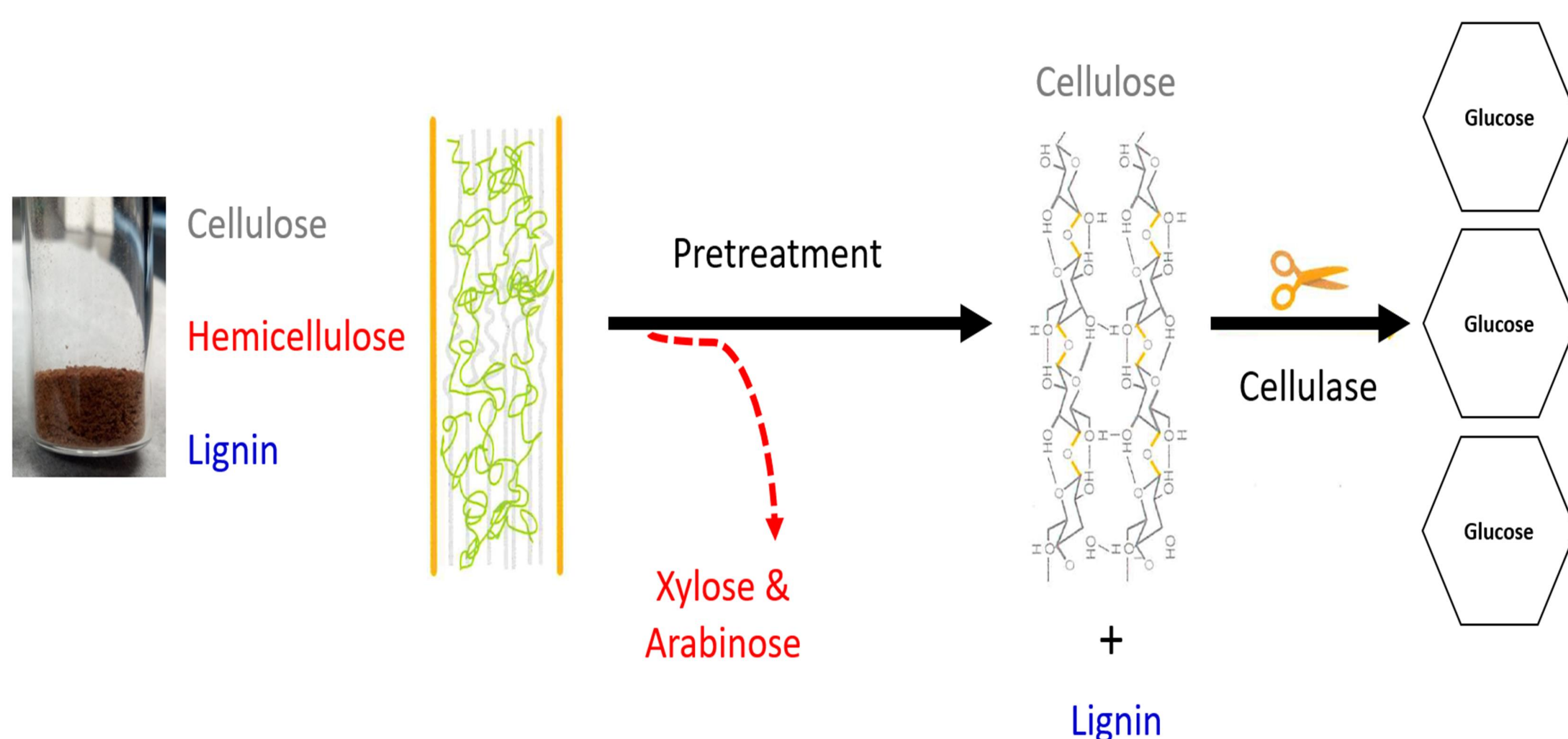


### *Brassica carinata*

- Inedible oilseed crop, whose oil can be converted to sustainable aviation fuel (SAF)
- Residual biomass (carinata meal) is rich in protein and carbohydrates

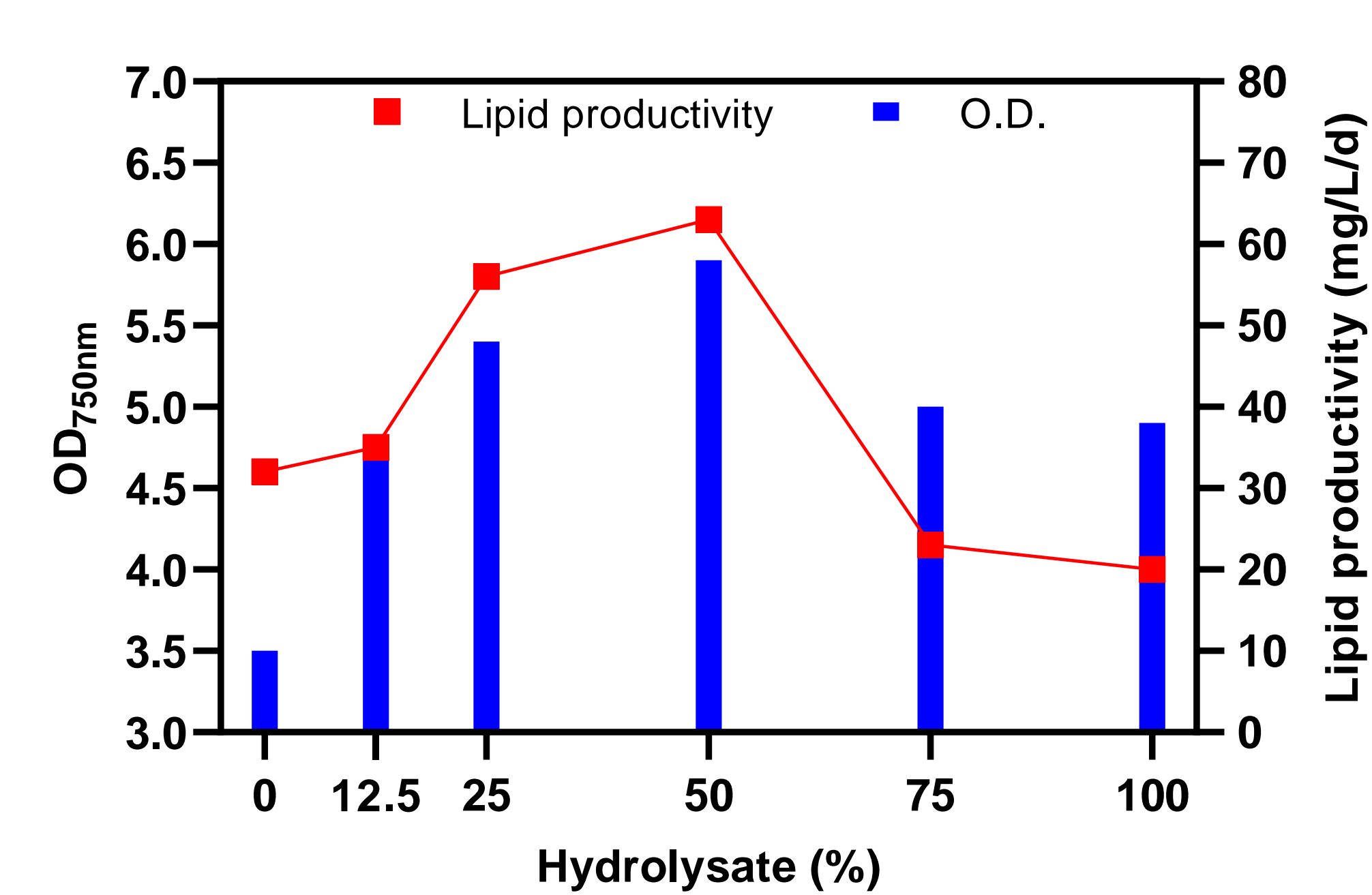


### Biochemical extraction of glucose from carinata meal



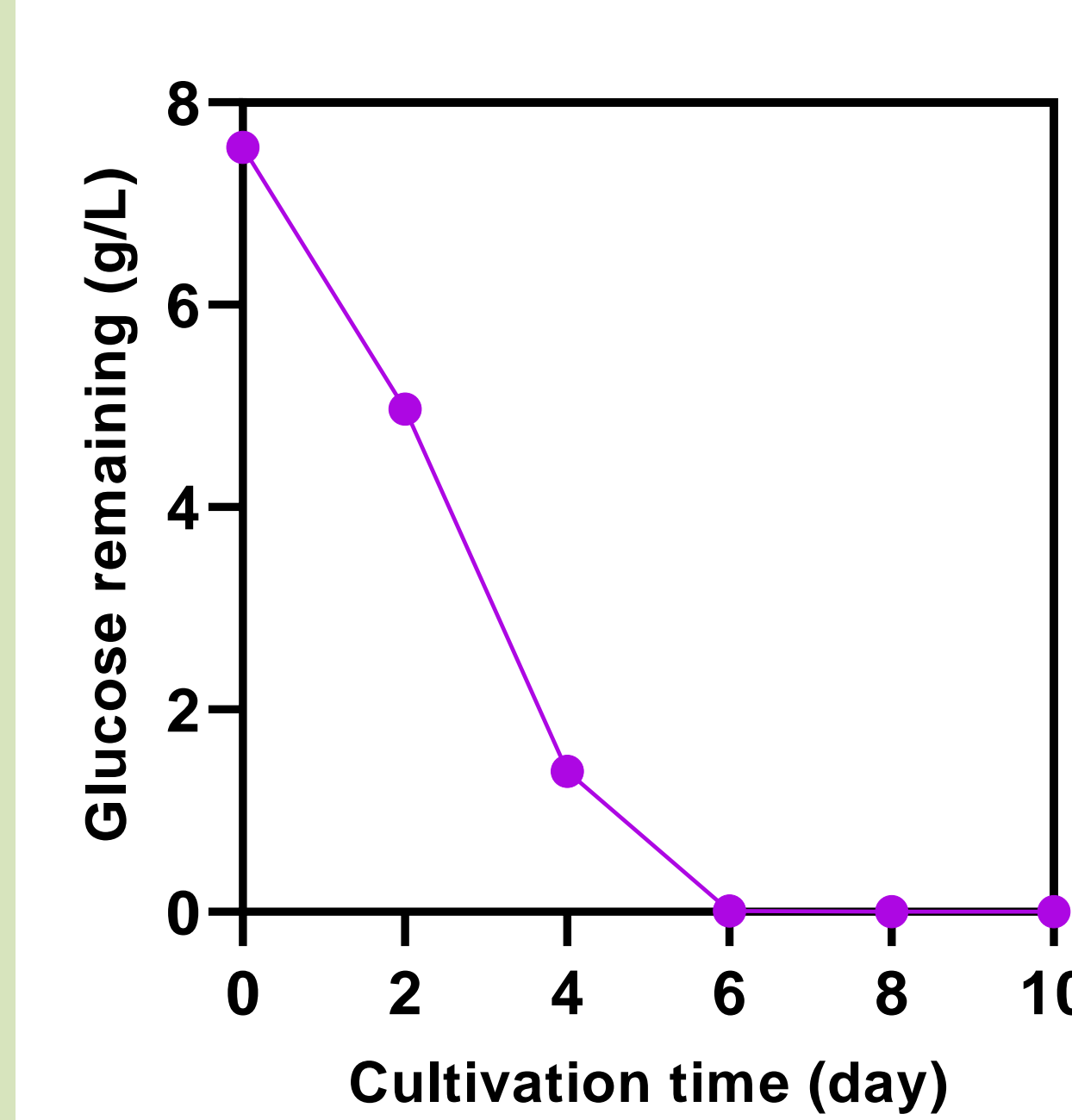
## RESULTS

### CM hydrolysate tolerance



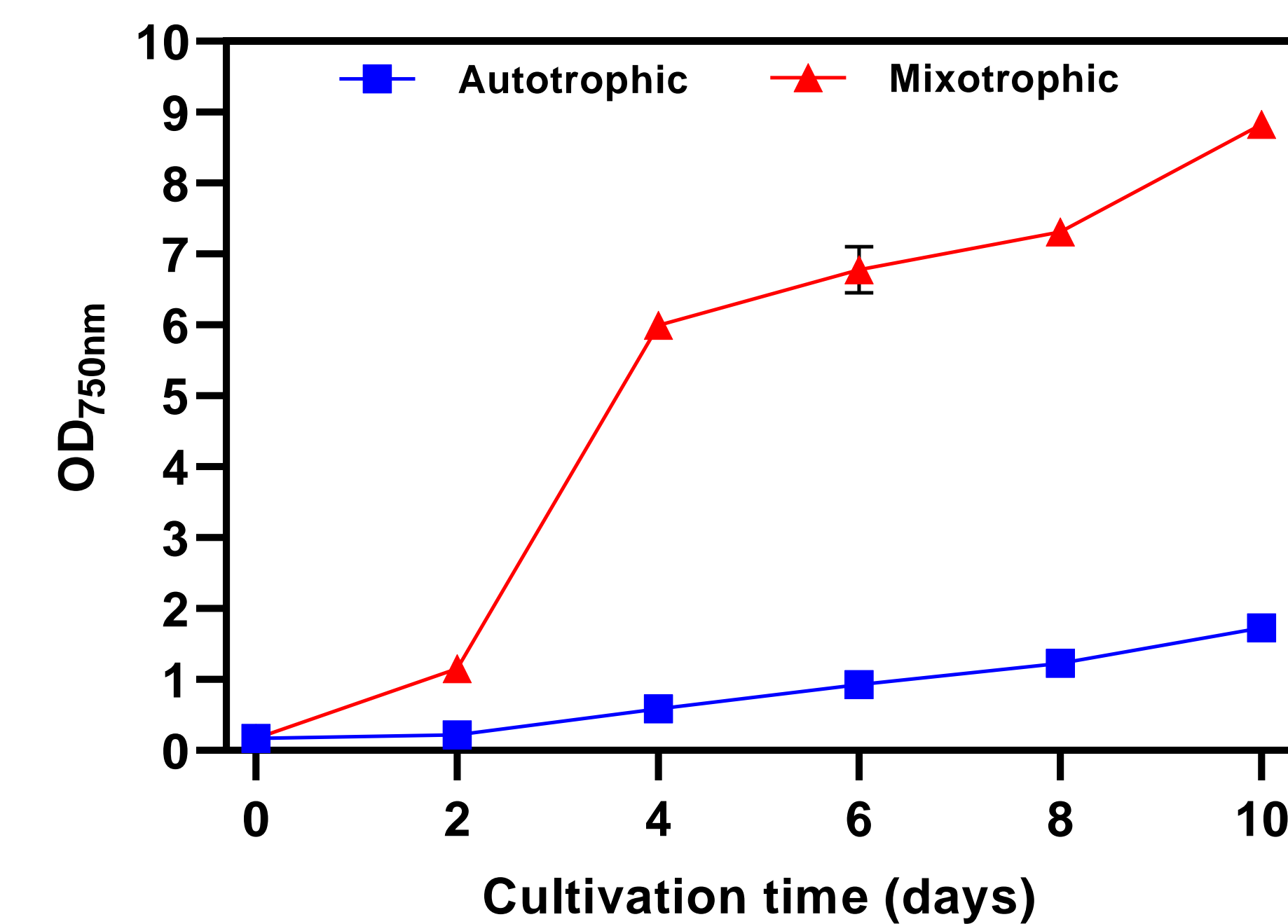
Cultures harvested on day 10

### Glucose consumption

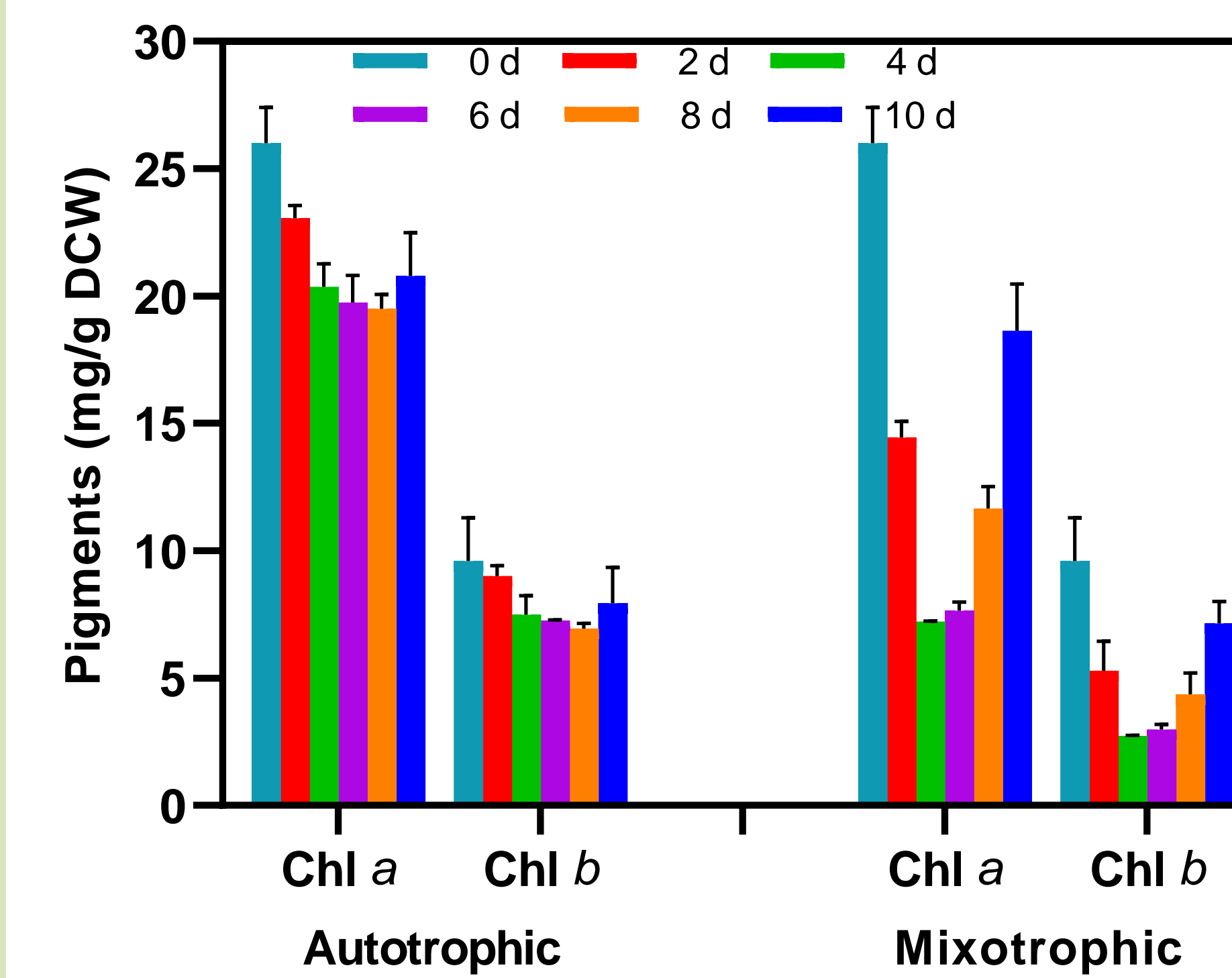


Mixotrophic cultures grown in 50% CM hydrolysate

### Growth performance

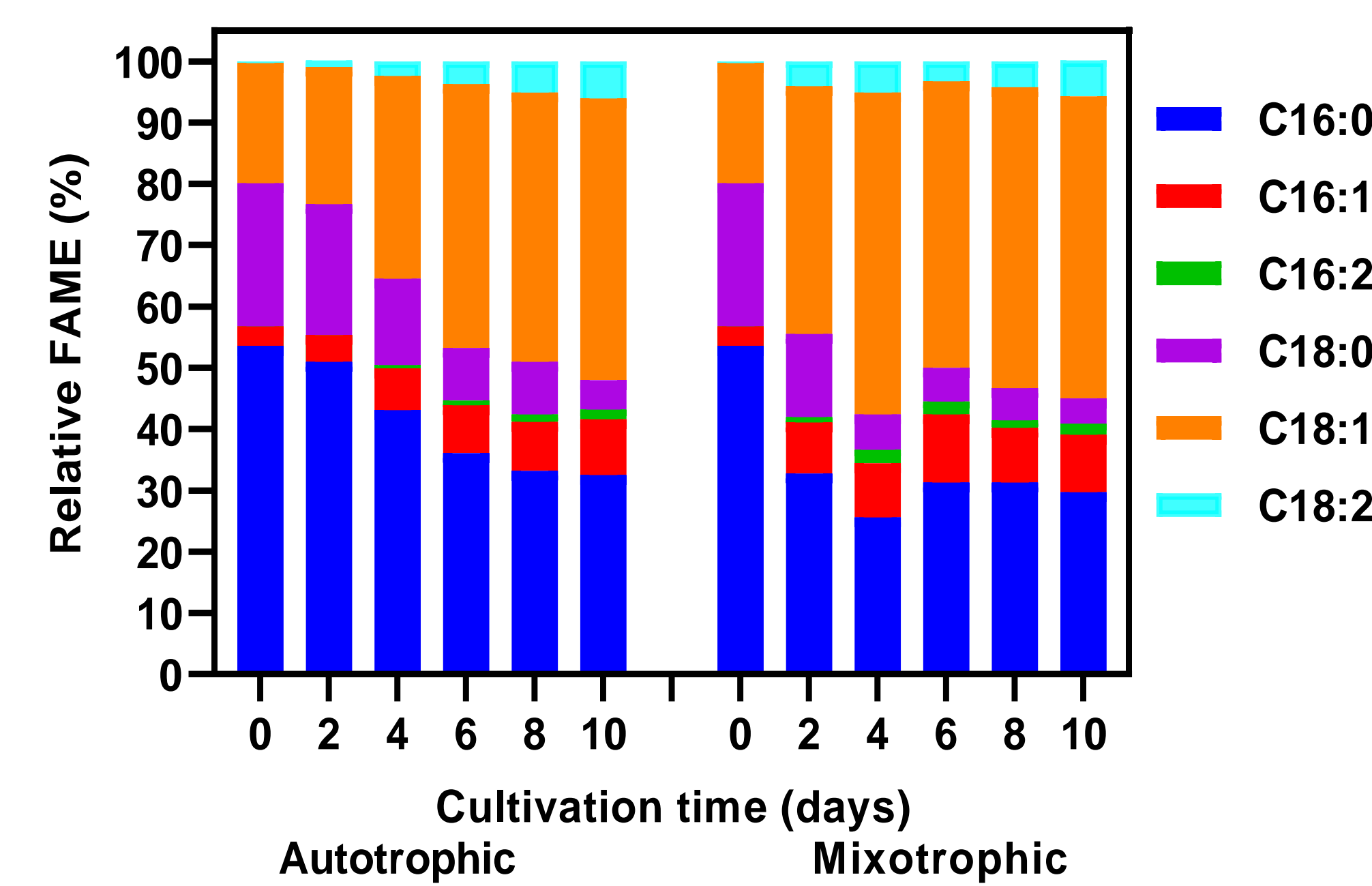


### Chlorophyll content

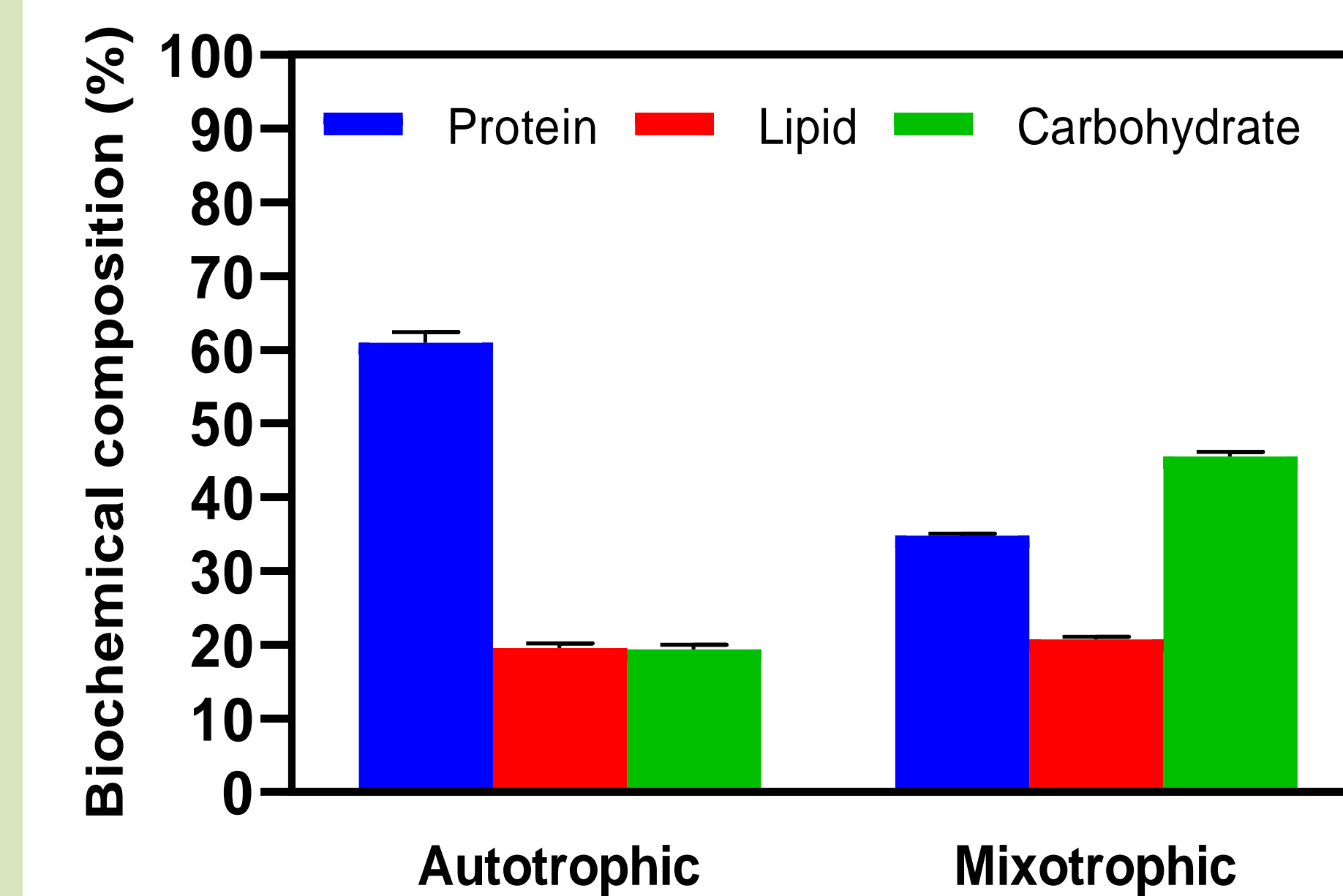


Autotrophic and mixotrophic cultures harvested on day 10

### FAME profile



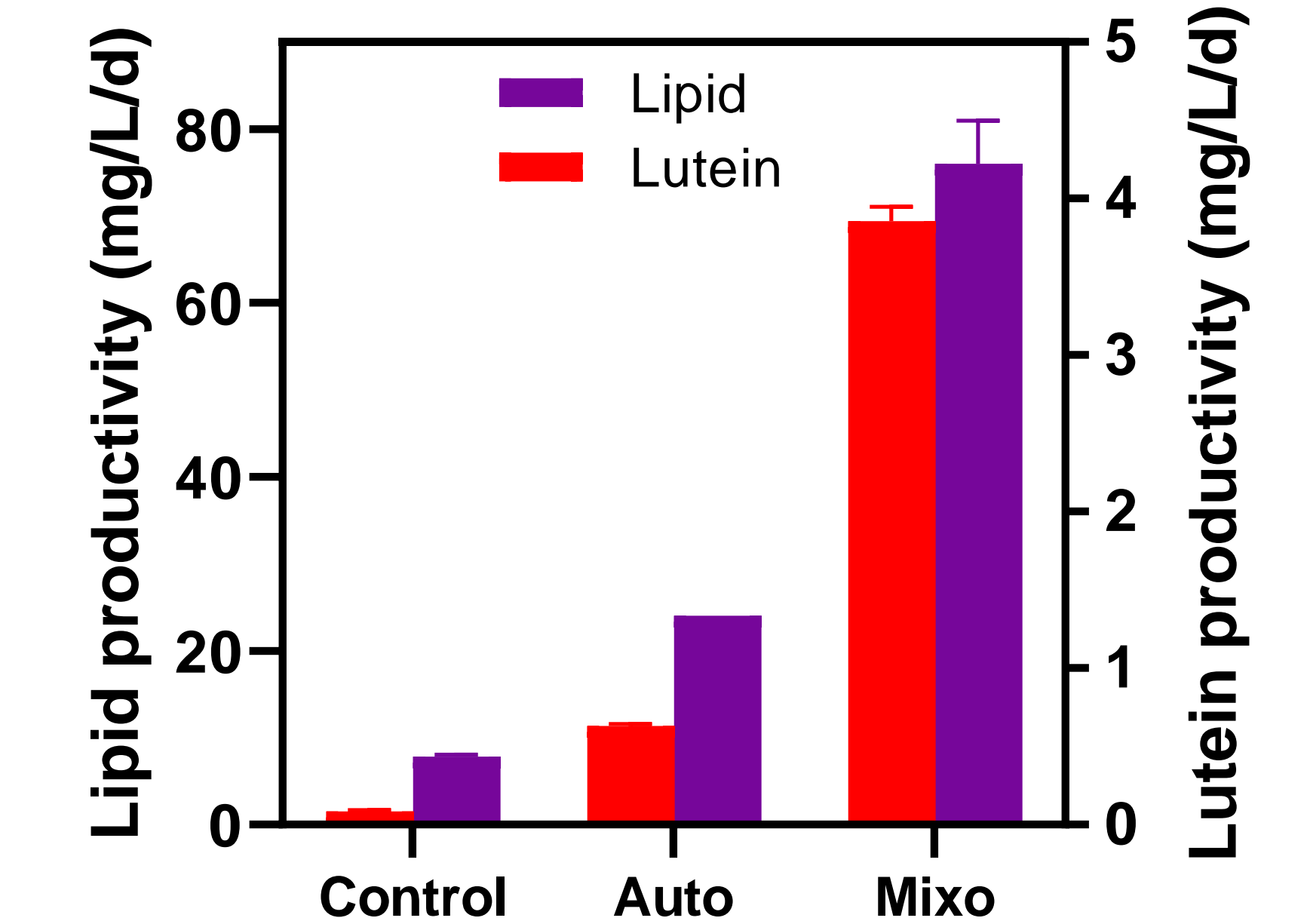
### Biochemical composition



Autotrophic and mixotrophic cultures harvested on day 10

## CONCLUSION

### Lipid and lutein content



Control = starter culture; Auto = autotrophic; Mixo = mixotrophic; Auto and Mixo harvested on day 10

- C. vulgaris* displayed highest lipid productivity cultivated in 50% carinata meal (CM) hydrolysate.
- Mixotrophic growth in CM hydrolysate was superior to autotrophic for cell growth with the entire glucose being consumed by day 6.
- Chlorophyll content indicated that upon glucose exhaustion (day 6) cells switched from mixotrophic to autotrophic growth.
- FAME profile contained higher saturated fatty acids in autotrophy and higher monounsaturated fatty acids in mixotrophy with little polyunsaturated fatty acids.
- Biochemical composition analysis revealed mixotrophic cultivation in CM hydrolysate leads to higher lipid and carbohydrate content with a decrease in protein.
- Lipid productivity was enhanced by the CM hydrolysate by 3-fold from 24 mg/L/d to 75 mg/L/d.
- Lutein content increased in mixotrophic cultivation.

### Acknowledgements

We thank the Southeast Partnership for Advanced Renewables from Carinata (SPARC) for financial support and the members of the Philippidis group for assistance.