



Significant reductions in oil quality and lipid content of oilseed rape (*Brassica napus* L.) under climate change

Namazkar, Shahla; Egsgaard, Helge; Frenck, Georg ; Terkelsen, Thilde ; Ingvordsen, Cathrine Heinz; Bagger Jørgensen, Rikke

Publication date:
2015

[Link back to DTU Orbit](#)

Citation (APA):

Namazkar, S., Egsgaard, H., Frenck, G., Terkelsen, T., Ingvordsen, C. H., & Bagger Jørgensen, R. (2015). Significant reductions in oil quality and lipid content of oilseed rape (*Brassica napus* L.) under climate change. Poster session presented at Agriculture and Climate Change: Adapting Crops to Increased Uncertainty, Amsterdam, Netherlands.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



Significant reductions in oil quality and lipid content of oilseed rape (*Brassica napus* L.) under climate change

Shahla Namazkar¹, Helge Egsgaard¹, Georg Frenck², Thilde Terkelsen³, Cathrine Heinz Ingvordsen¹ and Rikke Bagger Jørgensen^{1*}

¹ Department of Chemical and Biochemical Engineering, Technical University of Denmark, Risø Campus, Frederiksborgvej 399, DK-4000, Roskilde, Denmark;

² University of Innsbruck, Institute of Ecology, Sternwartestraße 15, 6020 Innsbruck, Austria

³ University of Copenhagen, Copenhagen Biocenter, Ole Maaløes Vej 5, 2200 København N, Denmark

*Corresponding author rijq@kt.dtu.dk

Despite of the potential importance to food and bioenergy purposes effects from climate change on plant oil quality have hardly been characterized. Worldwide *Brassica napus*, rapeseed or oilseed rape, is the second largest source of vegetable oil and the predominant oil crop in Europe. We found significant changes in oil quality and quantity of cultivars of oilseed rape grown in five future climate scenarios with elevated [CO₂], [O₃], temperature and combinations hereof (~RCP8.5, IPCC 2013).

Populations of 4 oilseed rape cultivars were grown under ambient and 5 future climate change conditions in a climate-phytotron:

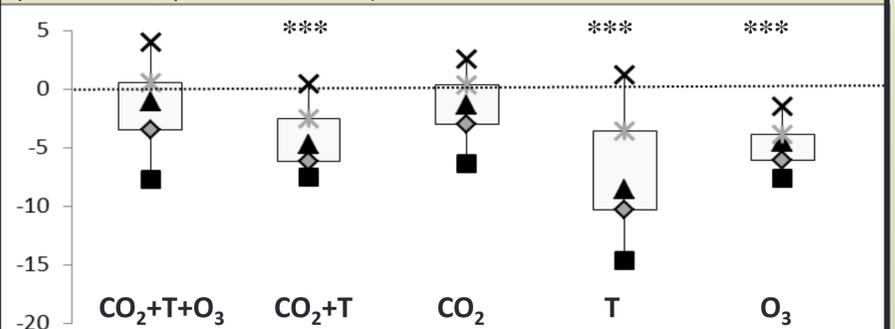


Treatment	CO ₂	O ₃	Temp.	Water
Multi	650 ppm	60/20 ppb	24/17 C	as ambient
Multi	650 ppm	20/20 ppb	24/17 C	as ambient
Single	650 ppm	20/20 ppb	19/12 C	as ambient
Single	385 ppm	20/20 ppb	24/17 C	as ambient
Single	385 ppm	60/20 ppb	19/12 C	as ambient
Ambient	385 ppm	20/20 ppb	19/12 C	ambient

The future climate decreased the content of lipid

The future climate scenarios decreased the content of total lipid in three of the treatments: When elevated [CO₂] and temperature were combined (10% decrease), and when elevated temperature (17% decrease) and ozone (11% decrease) were applied as single factors.

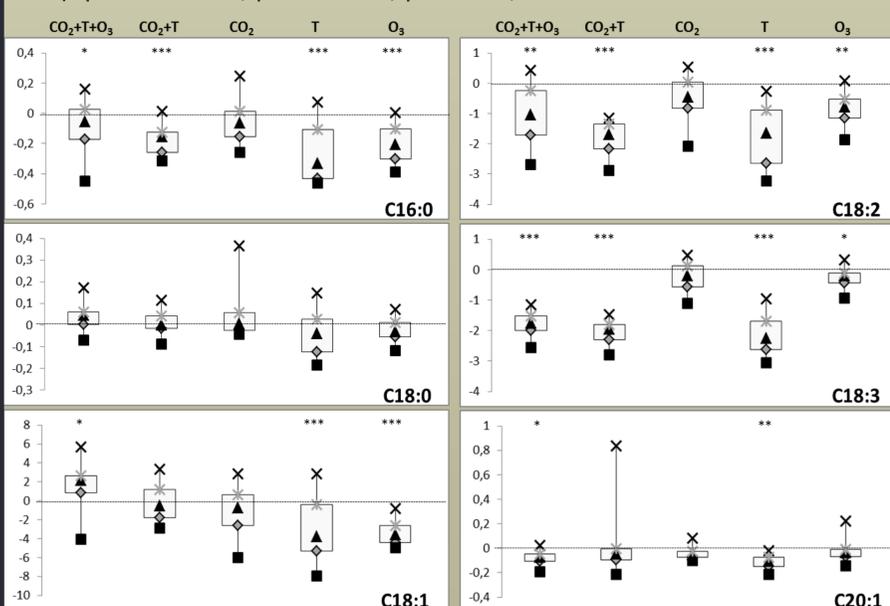
Effects of the future climate scenarios on total lipid in rapeseed (mg oil/100 mg seeds) given relative to ambient (0-line (p ≤ 0.001 ***, p ≤ 0.01=**, p ≤ 0.5=*; T-test).



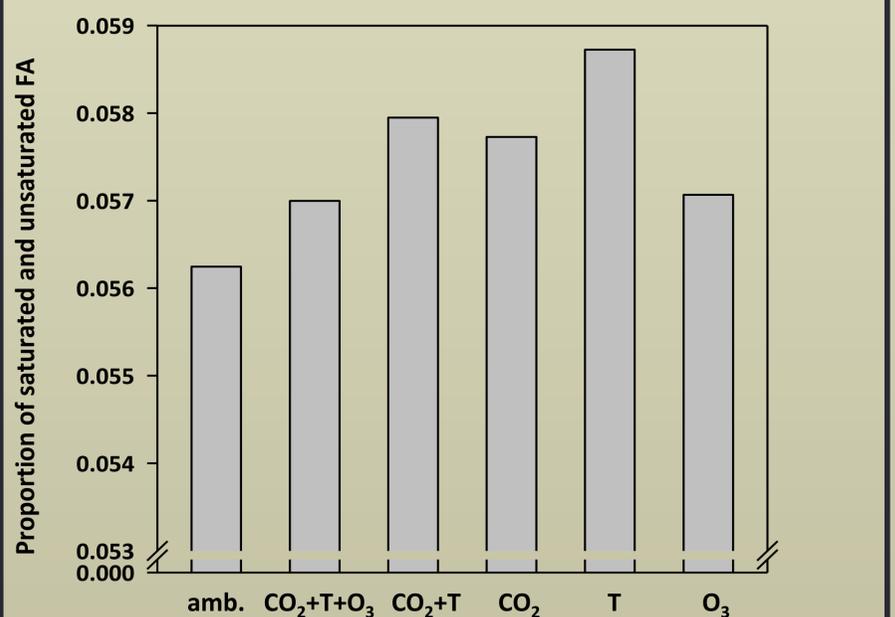
The oil quality was significantly reduced

- Oil quality were significantly reduced except in the scenario with elevated [CO₂] alone.
- Of the six analyzed fatty acids five - oleic acid (C18:1), linoleic acid (C18:2), linolenic acid (C18:3, omega-3), palmitic (C16:0), eicosenoic acid (C20:1) - showed reductions, the only exception being stearic acid, C18:0.
- We found that in the two-factor treatment, where elevated [CO₂] and temperature were combined, the essential fatty acid omega-3, C18:3, decreased by 45%.

Effects of the future climate scenarios on the fatty acid content of rapeseed oil (mg fatty acid/100 mg seeds) given relative to ambient (0-line). p ≤ 0.001 ***, p ≤ 0.01=**, p ≤ 0.5=*; T-test.



The proportion between saturated and unsaturated fatty acids was changed



Total losses in fatty acid and oil yields would be even larger considering reported reductions in seed biomass in these future scenarios (Frenck, 2011, 2013): When [CO₂] and temperature are elevated simultaneously, the oil yield per ha will drop 58% and the production of omega-3 (C18:3) will be reduced by 77% per ha. Breeding for climate tolerant cultivars seems essential for oil yield and quality.