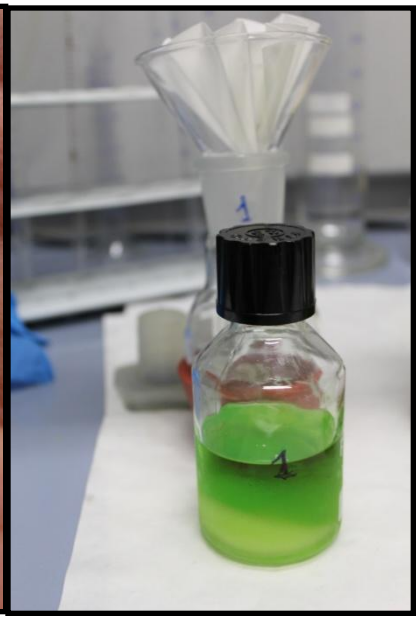
Impact Of The Growing Conditions On The Oil Content And Fatty Acid Metabolism In Developing Camelina Seeds





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ADDING VALUE TO CAMELINA AND CRAMBE OIL

Introduction

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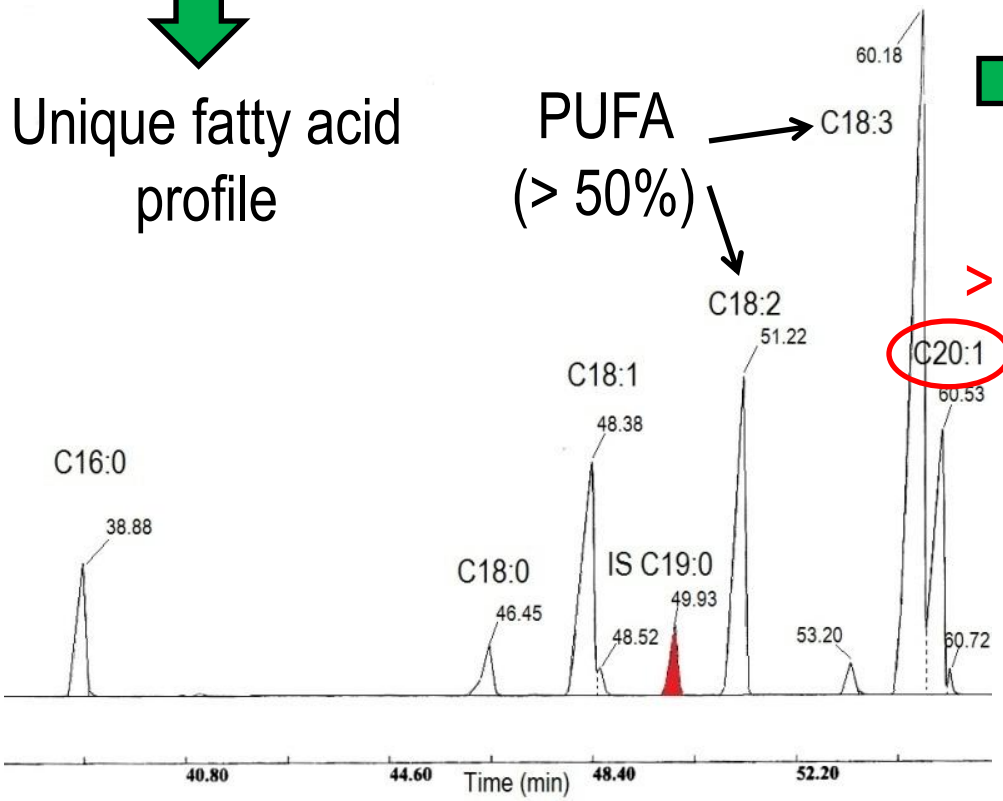
Camelina sativa: Brassicaceae family, native to Mediterranean basin

Unique fatty acid profile

PUFA (> 50%) → C18:3

Oleochemical applications



> 15 %

C20:1 → Source of medium chain FA

Reduction of the European dependence from Palm and Kernel oil

Introduction

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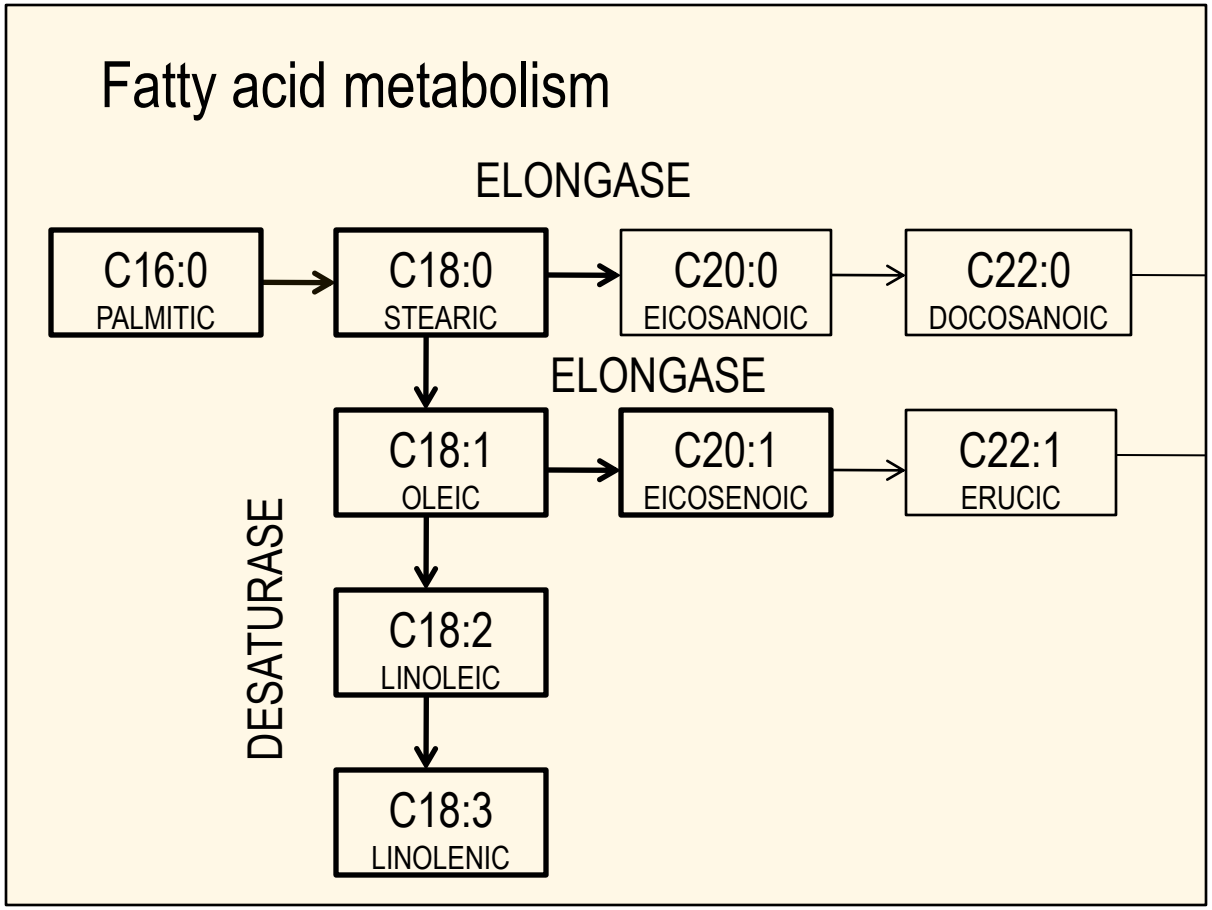
Developing of a value chain based on **NO GMO** oilseed crops that can be cultivated in many different European areas

Camelina sativa

Crambe abyssinica

Introduction



Seed oil quality in high polyunsaturated oil plants

High temperature during seed filling period

Interference with enzymatic activity

< production of polyunsaturated fatty acid

Objectives

✓ **General objective**: determination of the temperature effect on FA metabolism in developing camelina seeds

✓ **Specific:** *Camelina sativa* var. Midas

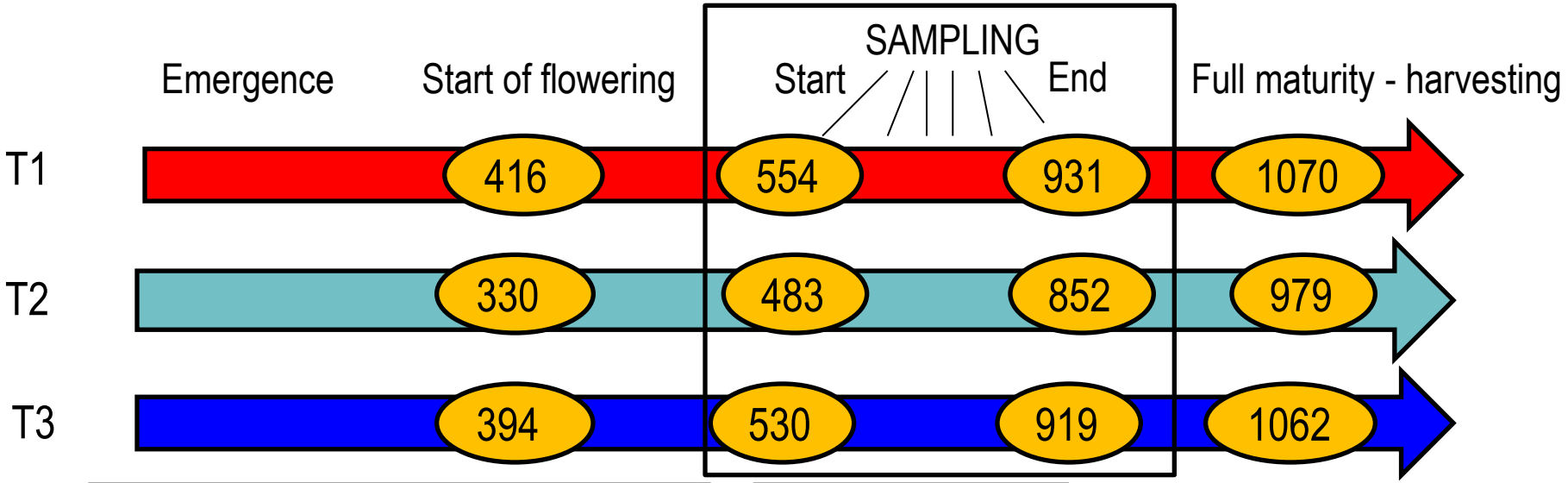
Open field (OF) ⇔ Controlled Environment (CE)

T1. Sowing: 1/04/2015 → Start flowering: 14/05/15 — **T1**. 24-14 ° C day-night

T2. Sowing: 26/10/2015 → Start flowering: 24/03/16 — **T2**. 20-9 ° C day-night

T3. Sowing: 9/10/2015 → Start flowering: 14/03/16 — **T3**. 14-4 ° C day-night

Sampling: 3 open field trials



GDD = Growing Degree Day

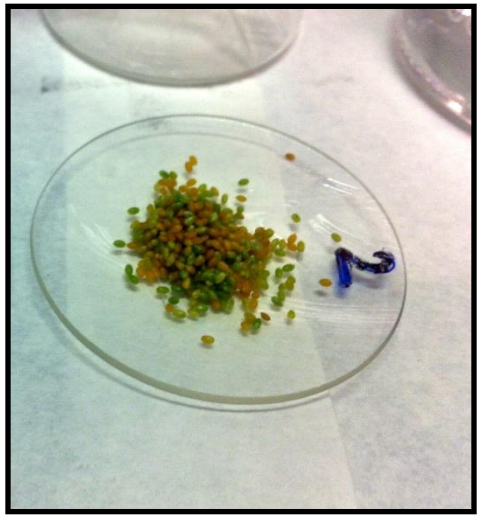
T_{base} = 5 ° C (*Gesch, 2014*)

Sampling: 3 controlled environment experiments

- ✓ 3 experiments with different temperature's ranges in order to mimic the mean temperature occurred in OF:
  - **T1**: 24-14 ° C day-night
  - **T2**: 20-9 ° C day-night
  - **T3**: 14-4 ° C day-night
- ✓ All other parameters are maintained constant
- ✓ Seed sampling at different GDD during seed filling stage

Laboratory analysis: lipid extraction

- ✓ Total lipids are extracted using the method described by *Hara and Radin (1978) – hexane-propanol 3:2*
- ✓ Residual moisture content was determined as the weight difference between about 30 seeds before and after desiccation at 80 °C for 48 h (*Rodríguez-Rodríguez et al., 2013*)

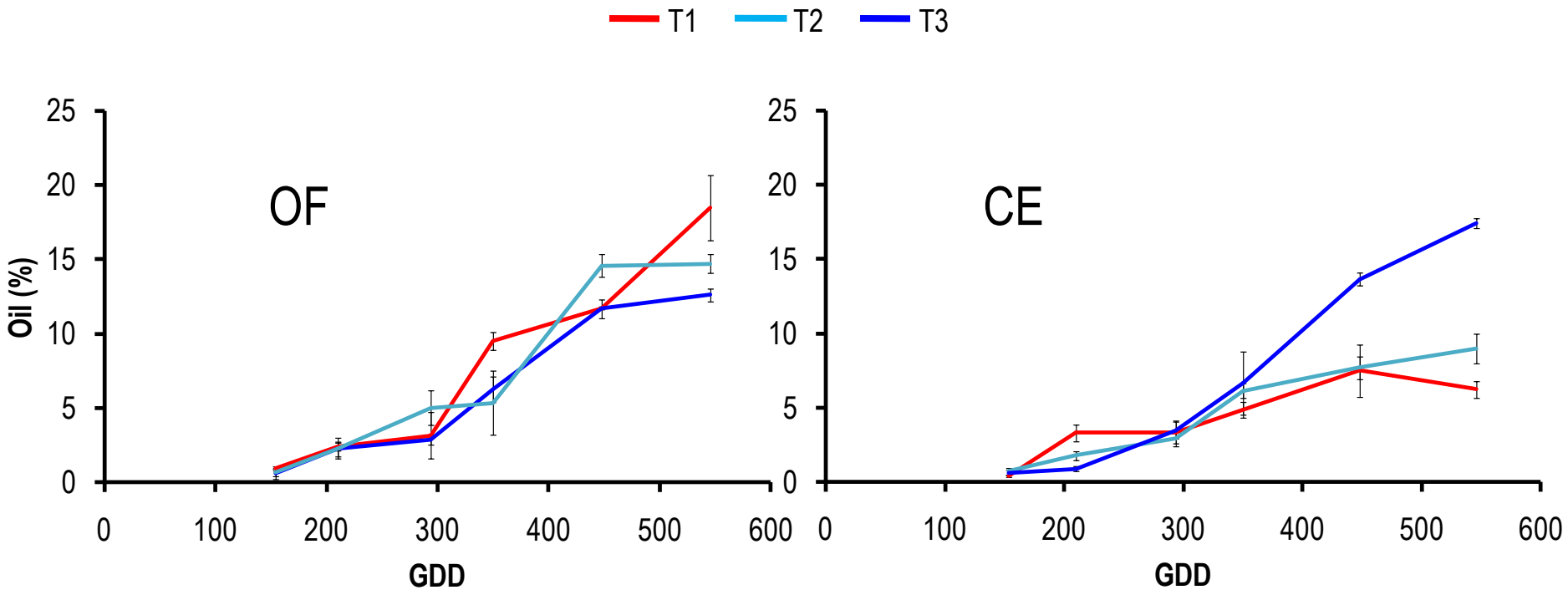


Laboratory analysis: total fatty acid determination

- ✓ Transesterification of the triacylglicerols into the corresponding fatty acid methyl esters (*Reg.CE 796/2002*)

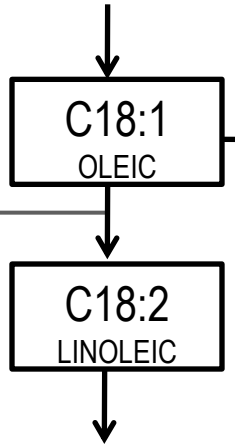
- ✓ Fatty acid characterization by capillary column gas-chromatography (HRGC-FID, ThermoQuest, Italy)

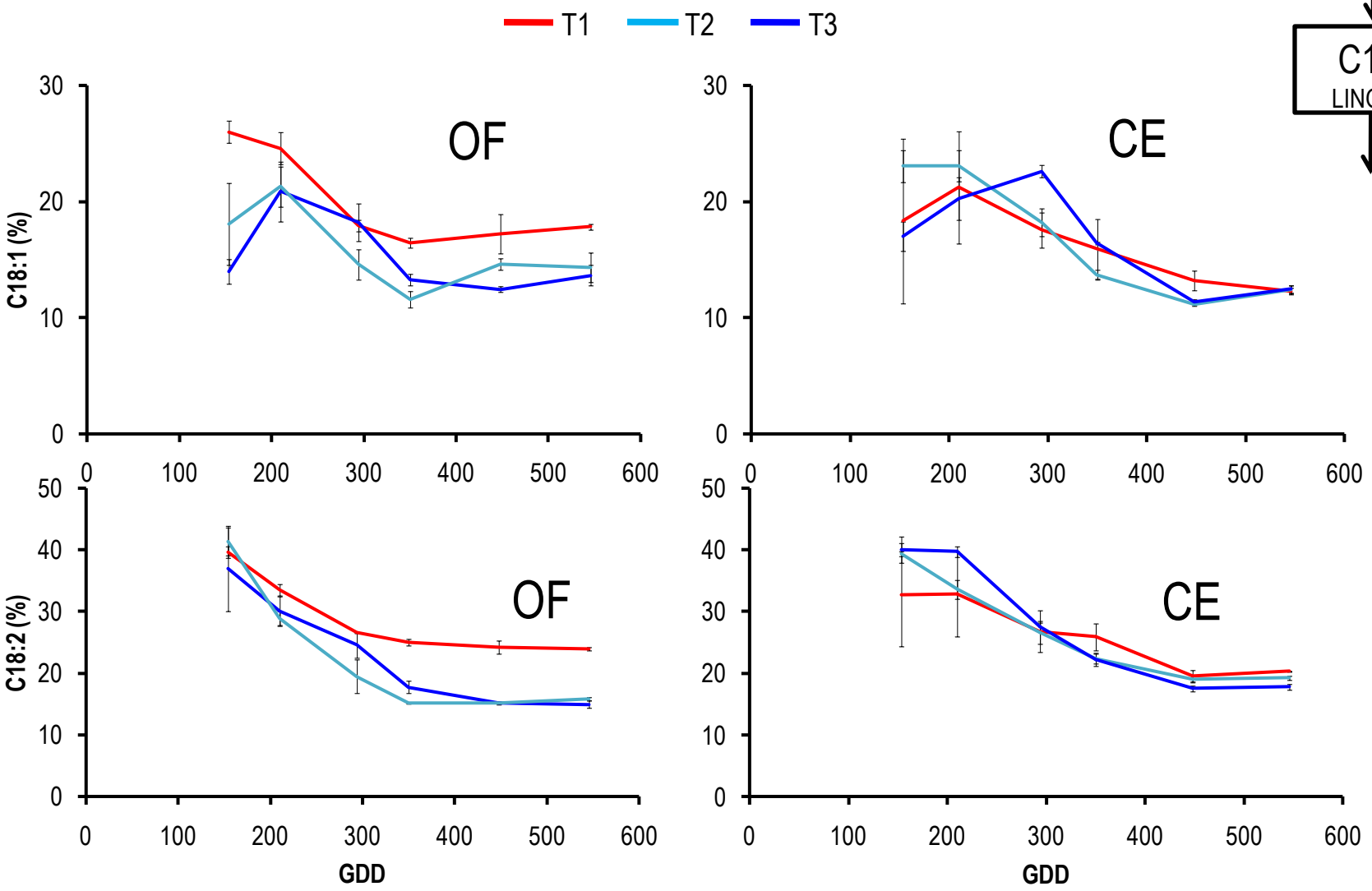
Results: oil content



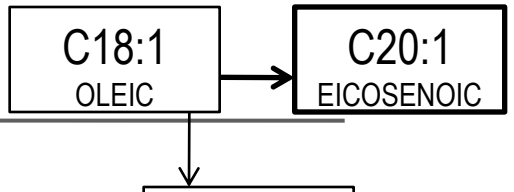
High difference in the oil content probably due to the negative effect of the temperature and artificial illumination in CE

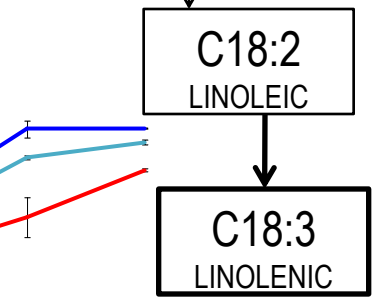
Results: C18:1 & C18:2

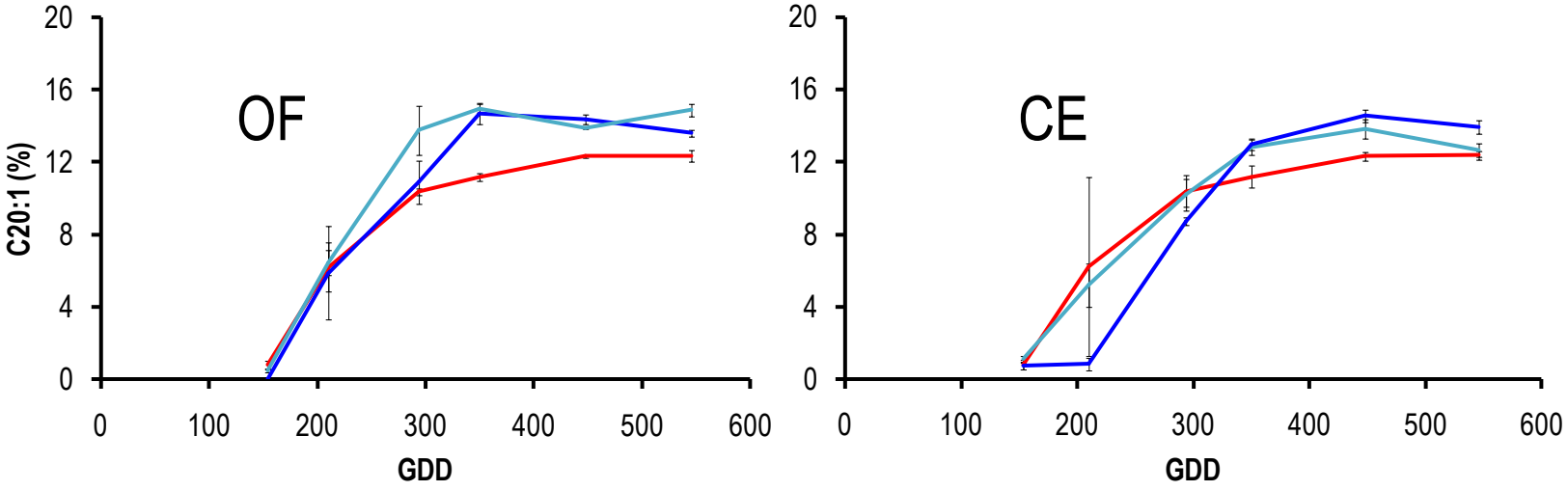




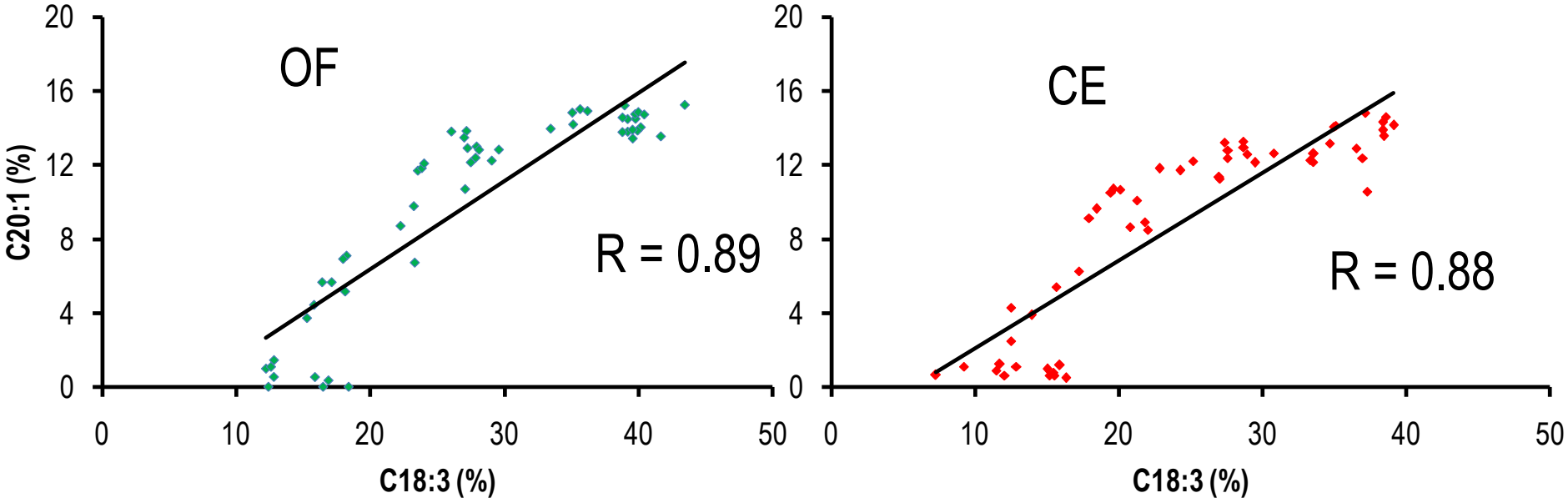
Results: C18:3 & C20:1





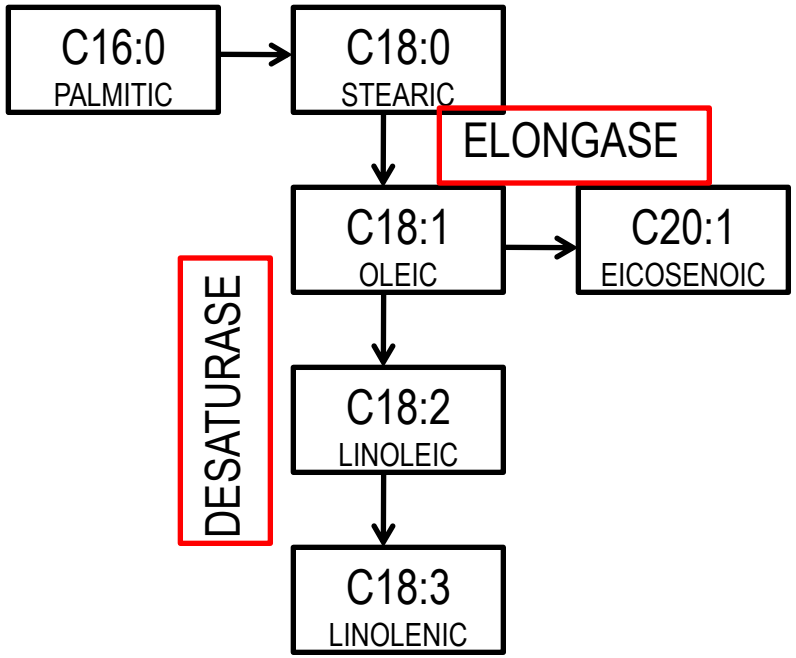


Results: Positive correlation between C18:3 & C20:1



Conclusion: temperature effect

- ✓ **Sowing dates influence fatty acid profile** in developing camelina seeds: autumn sowing are better to achieve an high amount of PUFA and C20:1



Conclusion: OF and CE trials

OIL CONTENT :

- ✓ CE: artificial illumination, elevate humidity, absence of pollinators (**T1**, **T2**)
- ✓ OF: variability of environmental factors

FATTY ACID COMPOSITION :

- ✓ CE: less evident effect
- ✓ OF: minimum night temperatures

Future prospettive

- ✓ Setting of **further trials** in order to deeply understanding the effects of temperature on camelina fatty acid metabolism
- ✓ Establishing of a customized **model for fatty acid biosynthesis** in order to predict oil composition as a function of the temperatures occurring during filling stage

Thank you to everybody!!

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“Camelina & crambe Oil crops as Sources for Medium-chain Oils for Specialty oleochemicals”

The COSMOS project has received funding from the European Union’s Horizon 2020 research and innovation program.

Grant agreement No. 635405

http://cosmos-h2020.eu/

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