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## Temperature modulates fatty acids profiles in freshwater diatoms and the impact of herbicides

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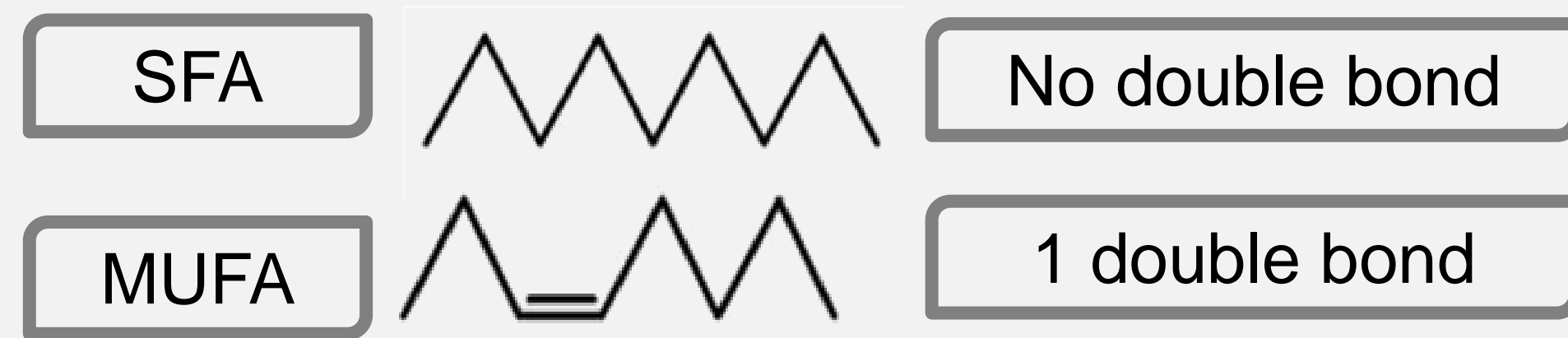
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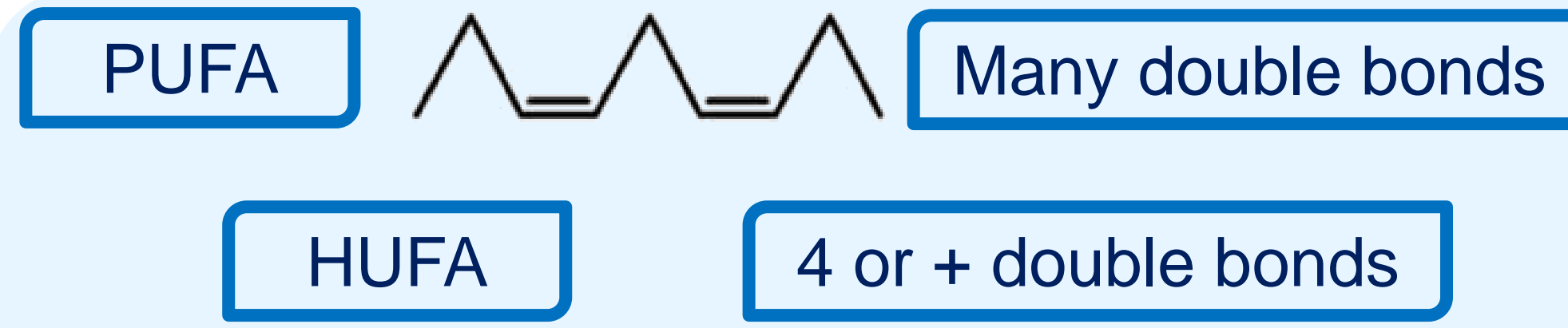
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## Introduction

### 1. What are fatty acids?



→ Reserve, metabolic energy



→ Structure of biological membranes

### 2. What are their functions?

1) Analysis of fatty acids often used to study trophic interactions

2) Microalgae with high proportion of HUFA: good source of food for animals: **high nutritional quality** (eicosapentaenoic acid **EPA**, Docosahexaenoic acid **DHA**)

3) Source of energy for metabolism at each trophic level

4) Transferred via herbivorous invertebrates to fish and man

5) Proportions of fatty acids vary with biotic and abiotic factors

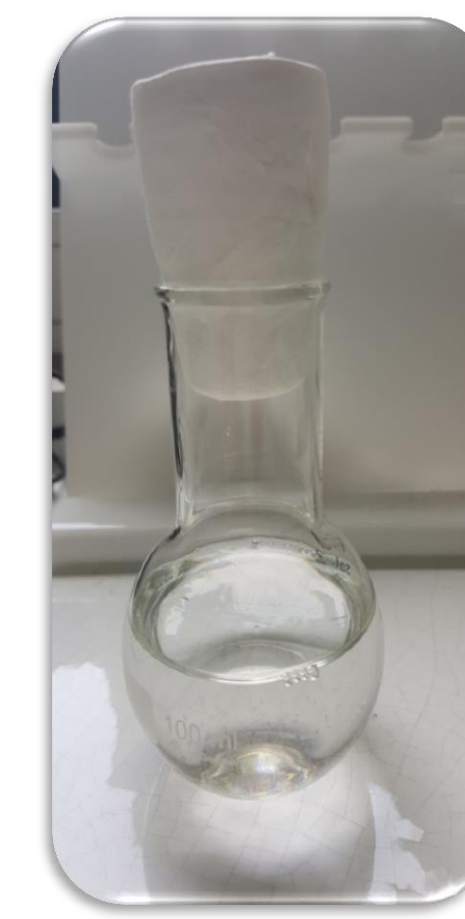
6) Including temperature and pesticide exposure

### Hypothesis

❖ The temperature could modulate the response of **fatty acid profiles** to an exposure to **pesticides**

## Materials and methods

### 1. Conditions of exposure



*Dauta medium and diatom culture*

*Gomphonema gracile* (GGRA)  
*Nitzschia palea* (NPAL)  
Exponential growth - 7 days

3 T° successively =  
**17.5°C – 20.5°C – 23.5°C**  
Light = 67 μmol.m<sup>-2</sup>.s<sup>-1</sup>

S-metolachlor / Diuron  
C = 10 μg/l

### 2. Analysis of fatty acids



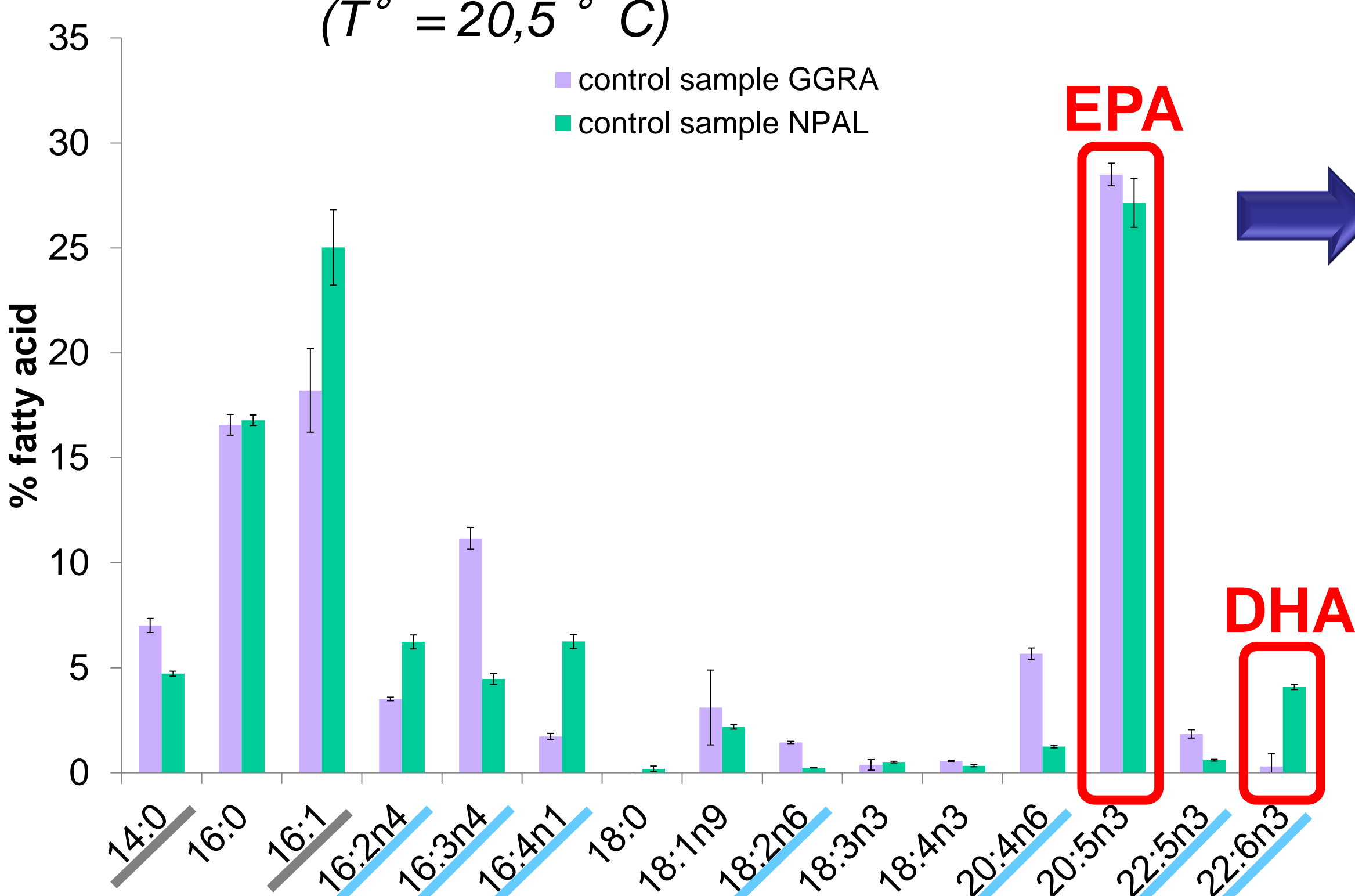
Gas chromatography

- T<sub>final</sub>
- Transesterification
- Fatty Acid Methyl Ester
- Hexane extraction
- Gas chromatography (GC-FID)
- Percentage of total fatty acids

## Results

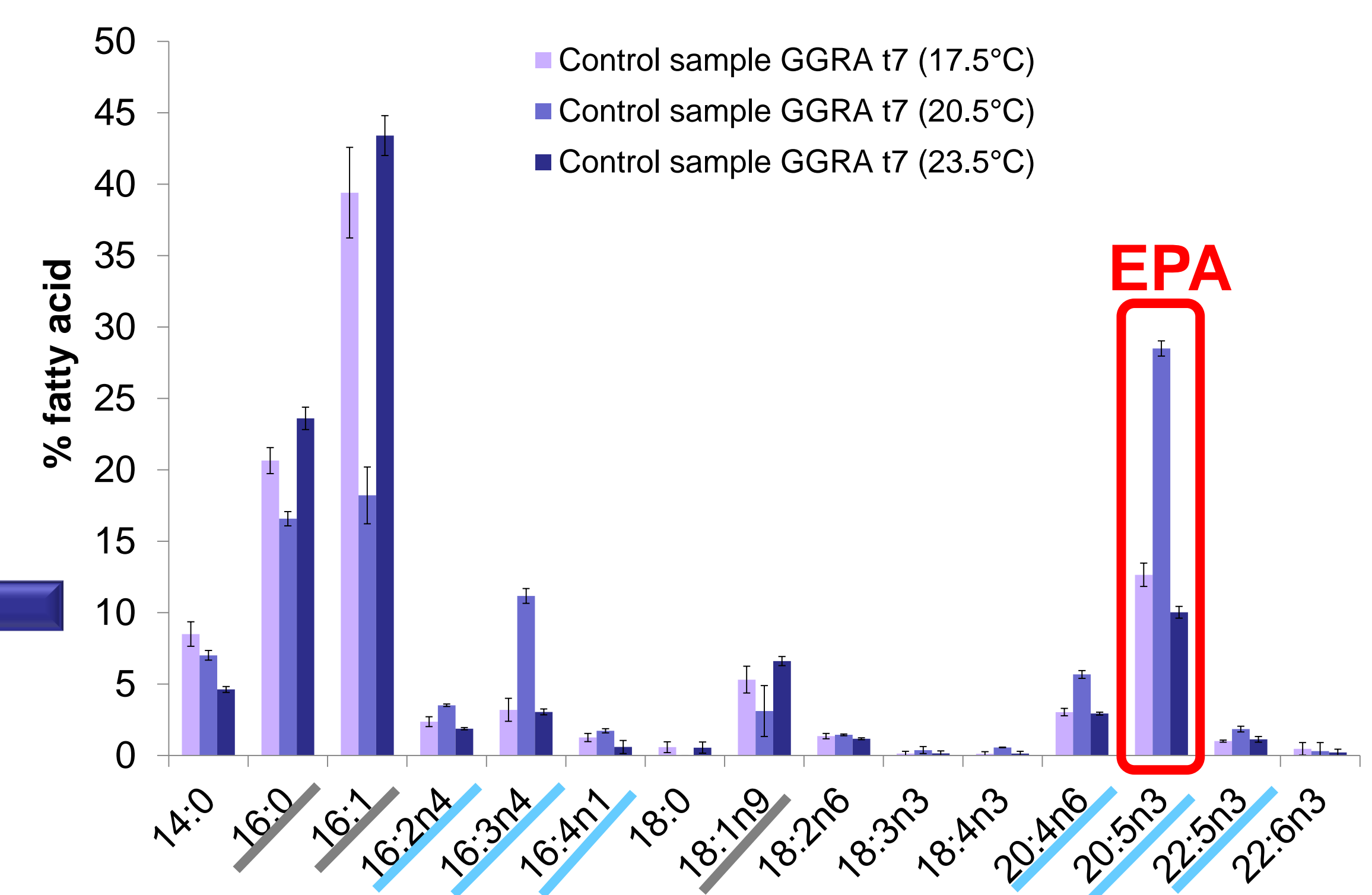
### 1. Fatty acid profile of GGRA and NPAL

(T° = 20,5 °C)



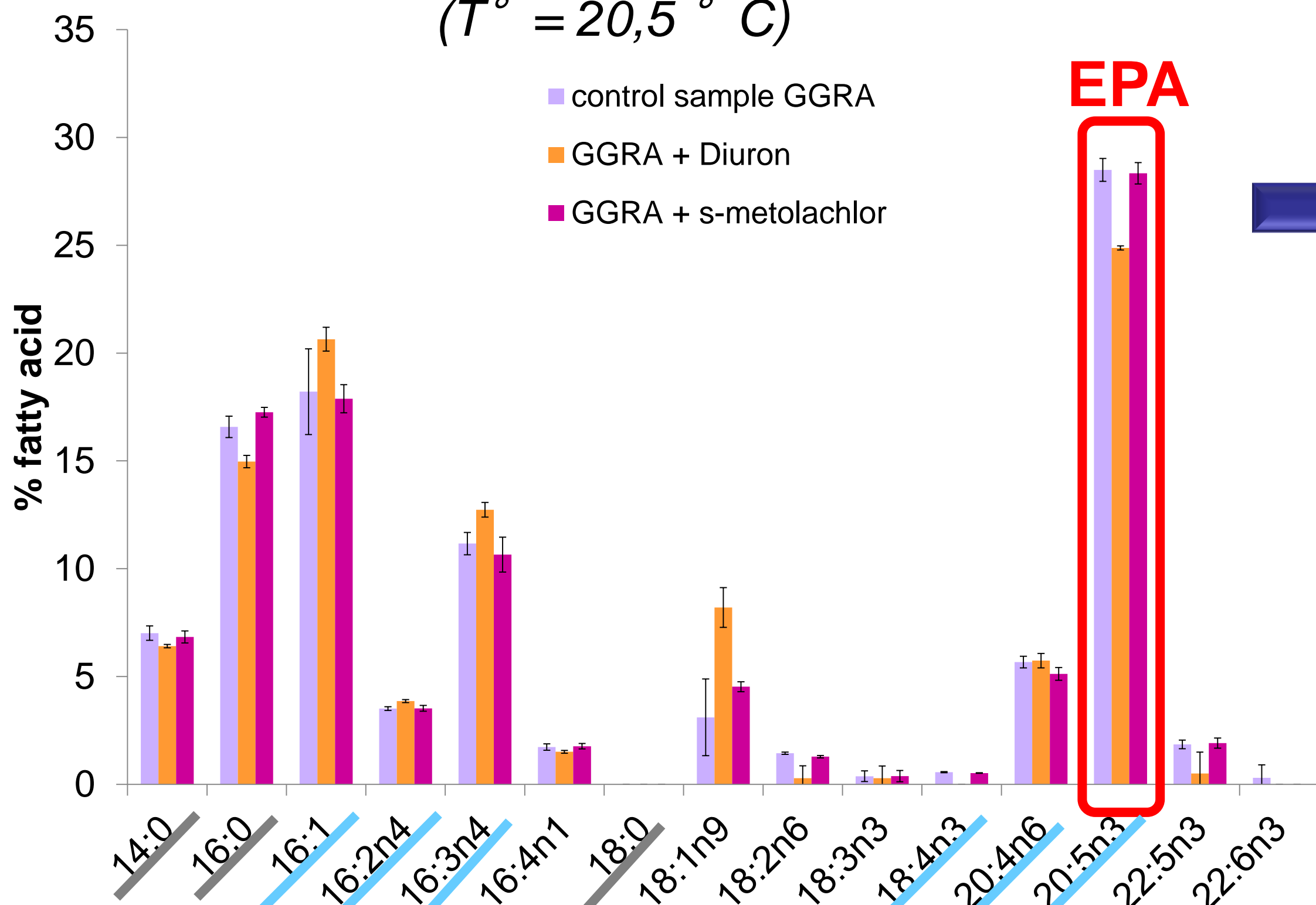
- ✓ Slight difference in **fatty acid of reserve**
- ✓ Slight difference in **fatty acid of membrane structure** (ex: **22:6n3**)
- ✓ Different **nutritional quality** of GGRA and NPAL
- ✓ No difference in **20:5n3**
- ✓ Difference of fatty acid profile **with temperature**
- ✓ 17,5 and 23,5 °C: more **fatty acid of reserve**
- ✓ 20,5 °C: more **fatty acid of membrane structure**
- ✓ **EPA** increase with T°=20,5°C

### 2. Effect of temperature on GGRA's fatty acid profile



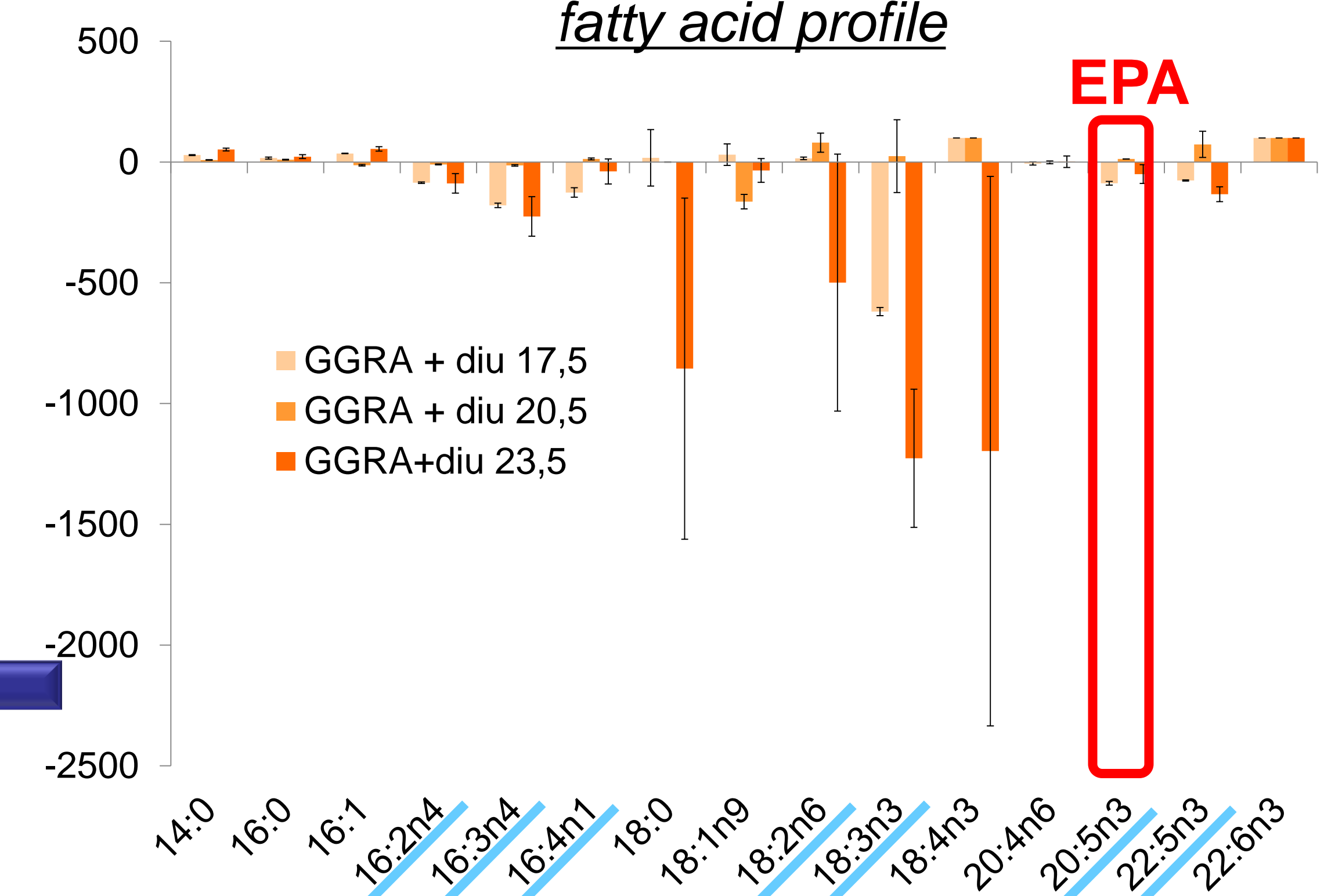
### 3. Effect of pesticide on GGRA's fatty acid profile

(T° = 20,5 °C)



- ✓ Slight impact of **s-metolachlor** on GGRA: decrease of 20:4n6
- ✓ No impact of **s-met** on **EPA**
- ✓ Impact of **diuron** on GGRA
- ✓ Impact on **fatty acid of reserve**
- ✓ Impact on **fatty acid of membrane structure**
- ✓ Decrease of **EPA** with diuron
- ✓ Difference of diuron impact **with temperature**
- ✓ T°= 17,5°C and 23,5°C: **less inhibition of fatty acid of membrane structure**
- ✓ **EPA** increase with T°=17,5°C and 23,5°C

### 3. Effect of temperature on diuron impact on GGRA's fatty acid profile



## Conclusions

Interspecific variability demonstrated in literature (Aussant et al., 2018)

Variability of fatty acid profile with temperature demonstrated in literature  
T° decrease → increase of PUFA (ex: EPA)  
T° increase → decrease of PUFA (Li et al., 2014)

T°=20,5°C increase EPA and modify **nutritional quality** of GGRA

T°=20,5°C  
S-metolachlor inhibits elongase enzymes (Robert et al. 2007)  
Diuron inhibits EPA and modify **nutritional quality** of GGRA

-3°C and +3°C decrease impact of diuron?  
Larras et al., 2013 demonstrated that higher temperature decreased pesticide impact on biofilm