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End Use Oil Characteristics:
Genetics and Environment Matter

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Effects of Environment on Oil Quality

- Environmental effects on oil derived from plants is well documented:
  - Increasing air temperature during flowering and seed set increases saturated fatty acids
  - Drought increases protein concentration and decreases oil concentration (but not composition)
- No information on the quality of various camelina varieties grown in the PNW

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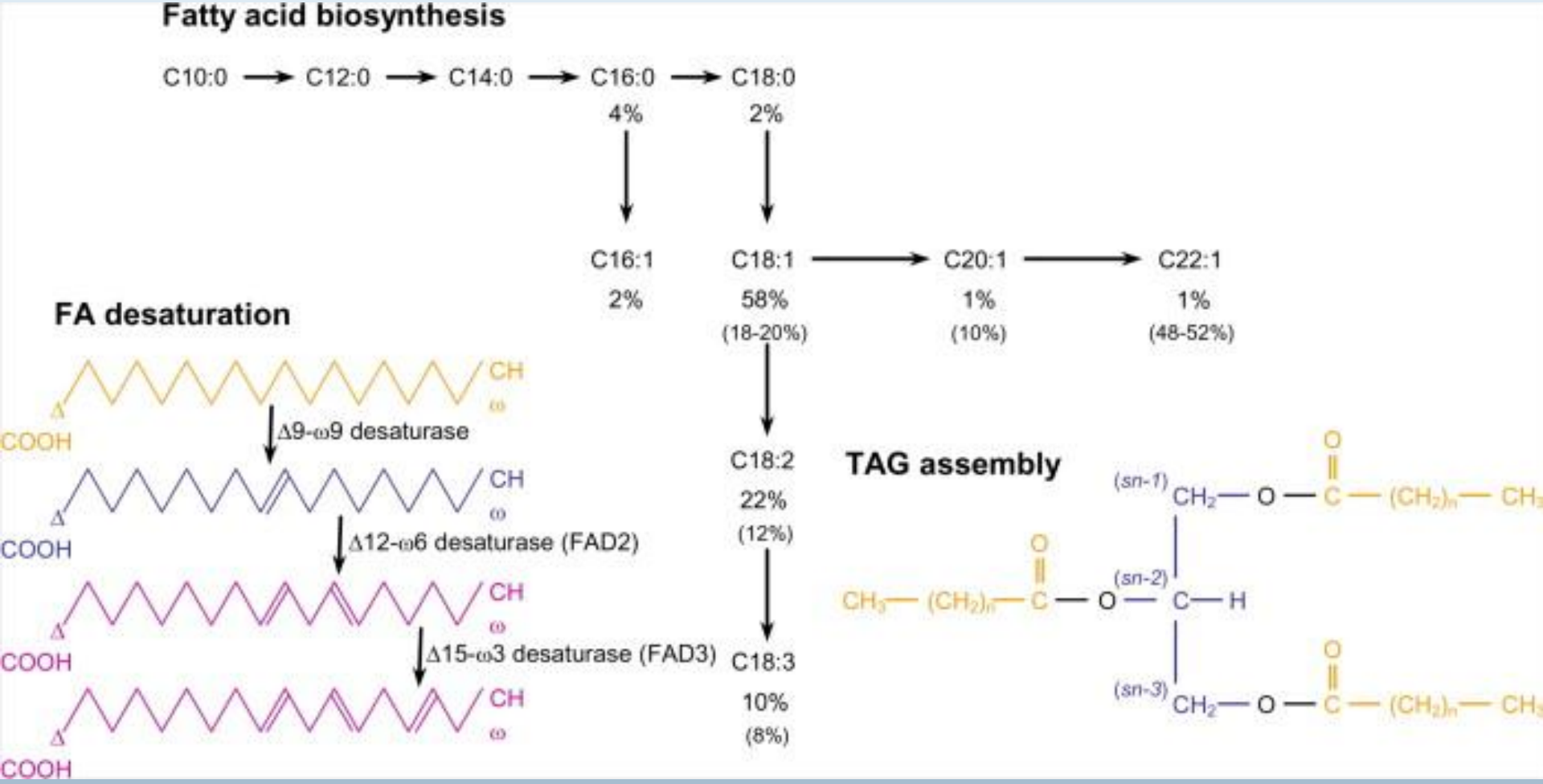
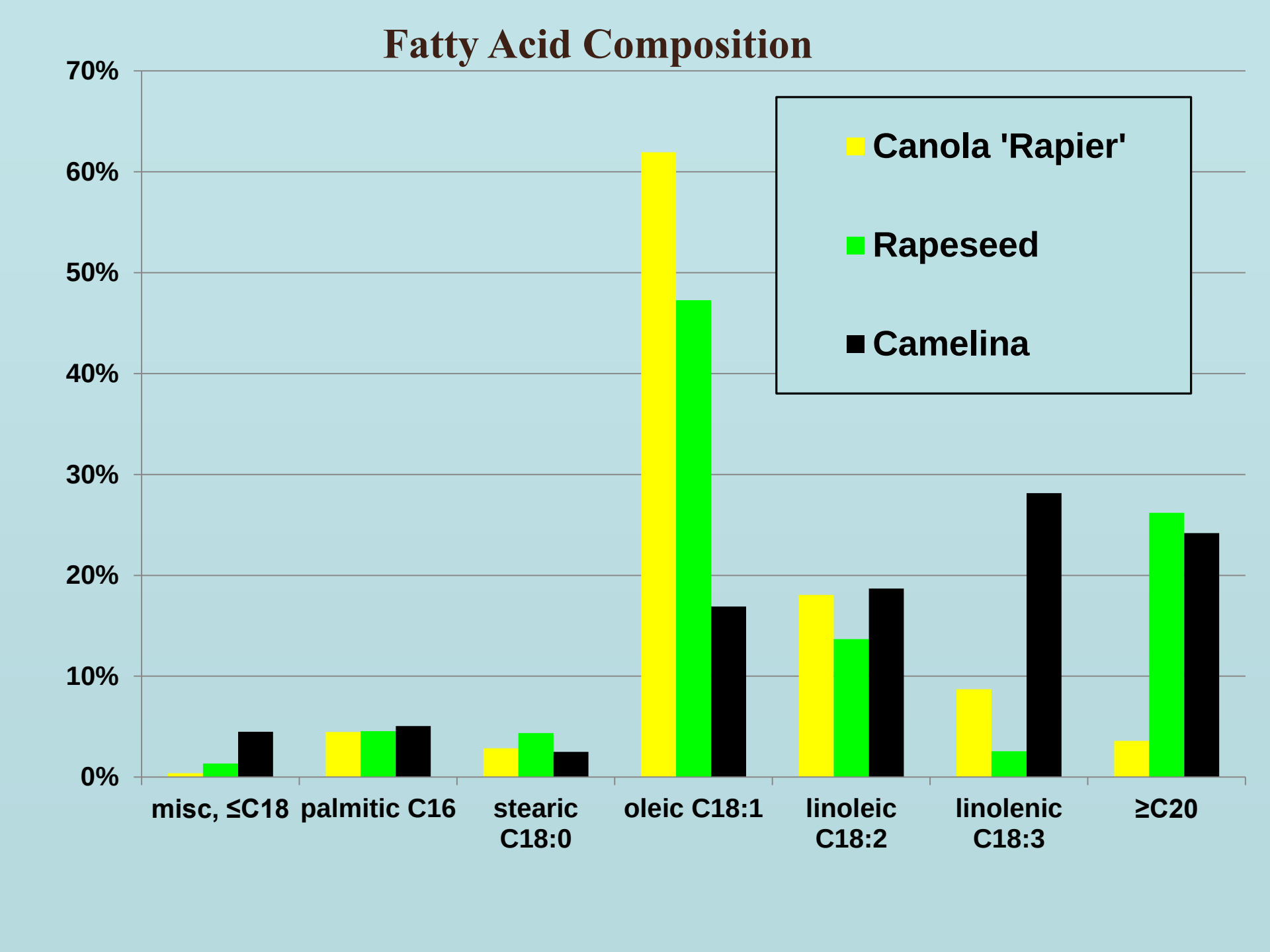
Canola Oil Composition




Fatty Acid Composition
70%
60%
50%
40%
30%
20%
10%
0%
Canola 'Rapier'
Rapeseed
Camelina
misc, ≤C18
palmitic C16
stearic C18:0
oleic C18:1
linoleic C18:2
linolenic C18:3
≥C20

Sun Grant Opportunity

- Funded to address camelina variety performance and fertility requirements (Schillinger).
- Represented a significant dataset, but there were no plans to examine composition.

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Oil analysis Procedures:

~ 800 g seed sample → 10 g moisture test

↓

Crush 250 g, Catch 2 min sample → ~ 30 g oil → Centrifuge and freeze aliquot

↓

Derivatize 10 µL oil with Na-methoxide

↓

fatty acid methyl esters (FAMEs)

↓

GC - FID
GC - MS

↓

~ 50 g seed meal

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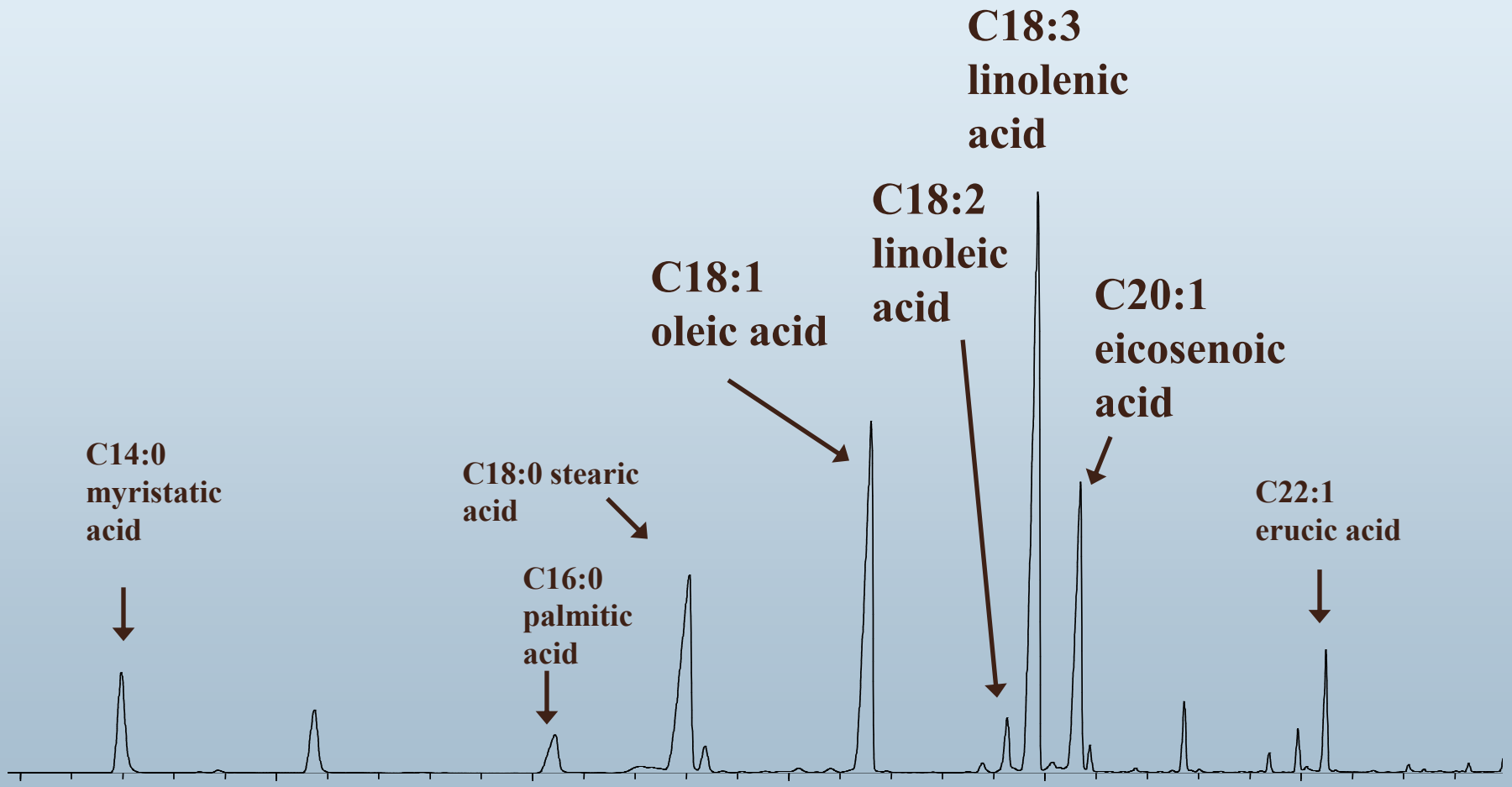
GC – FID



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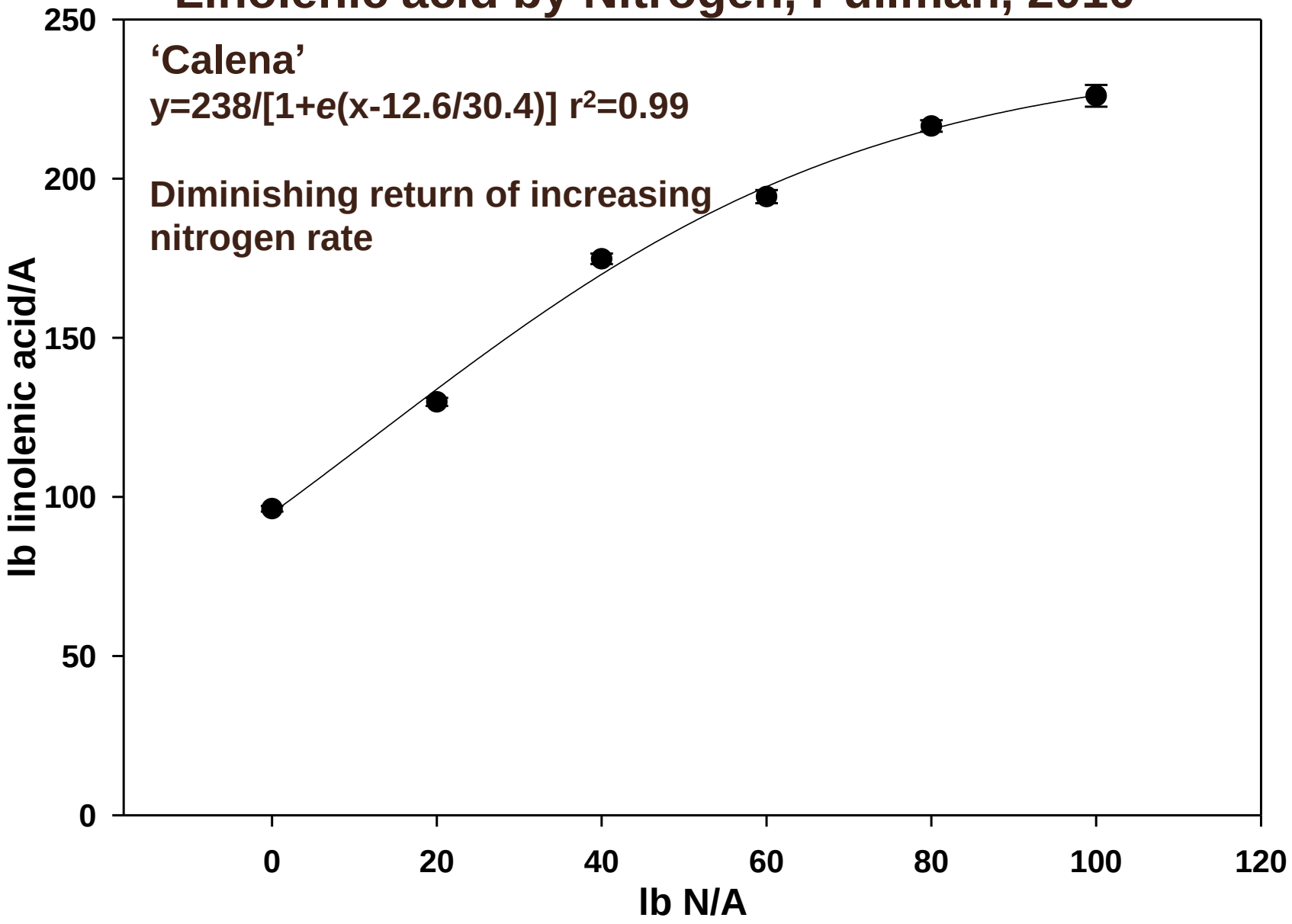
Linolenic acid by Nitrogen, Pullman, 2010



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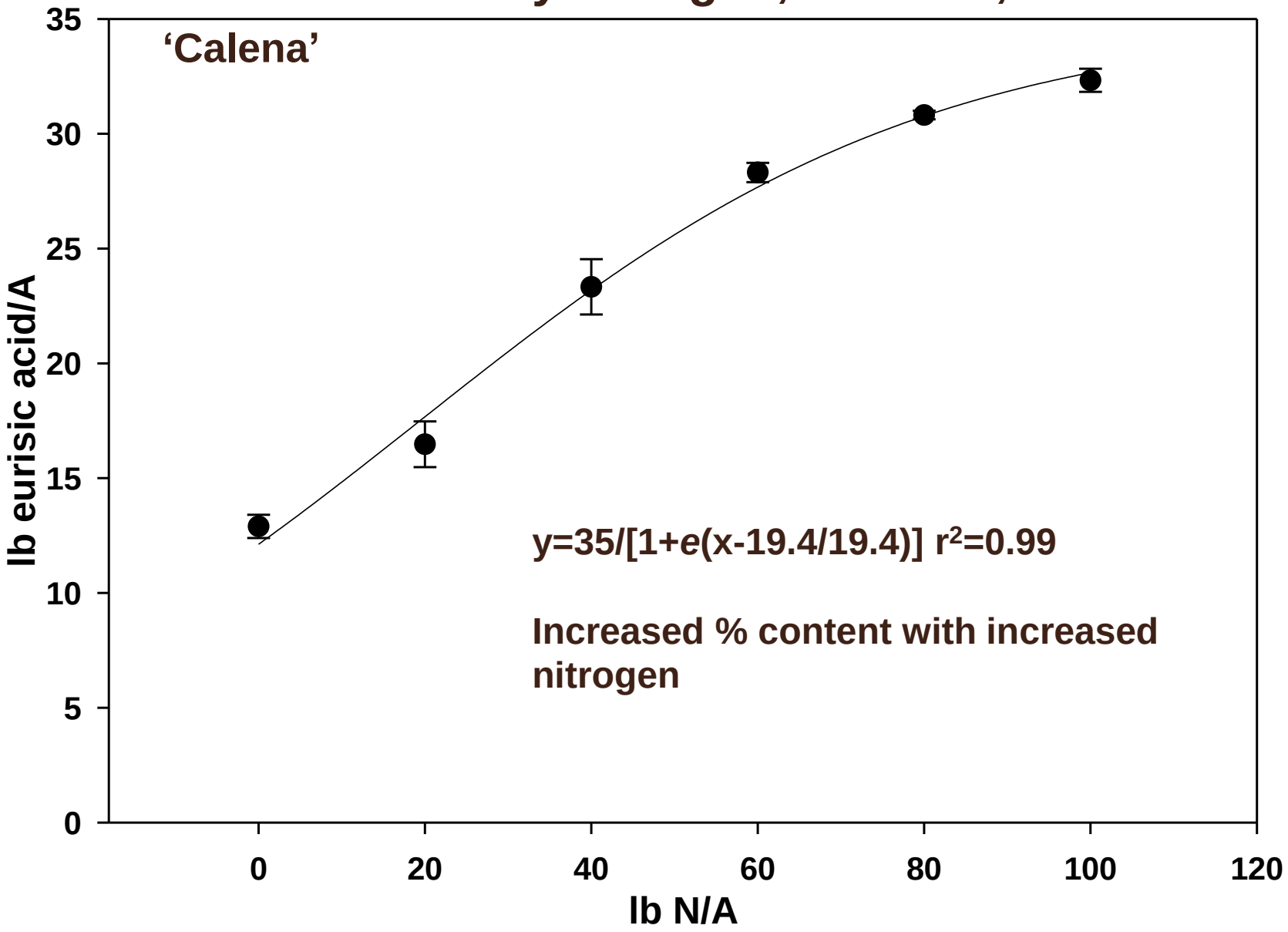
Eurisic acid by Nitrogen, Pullman, 2010



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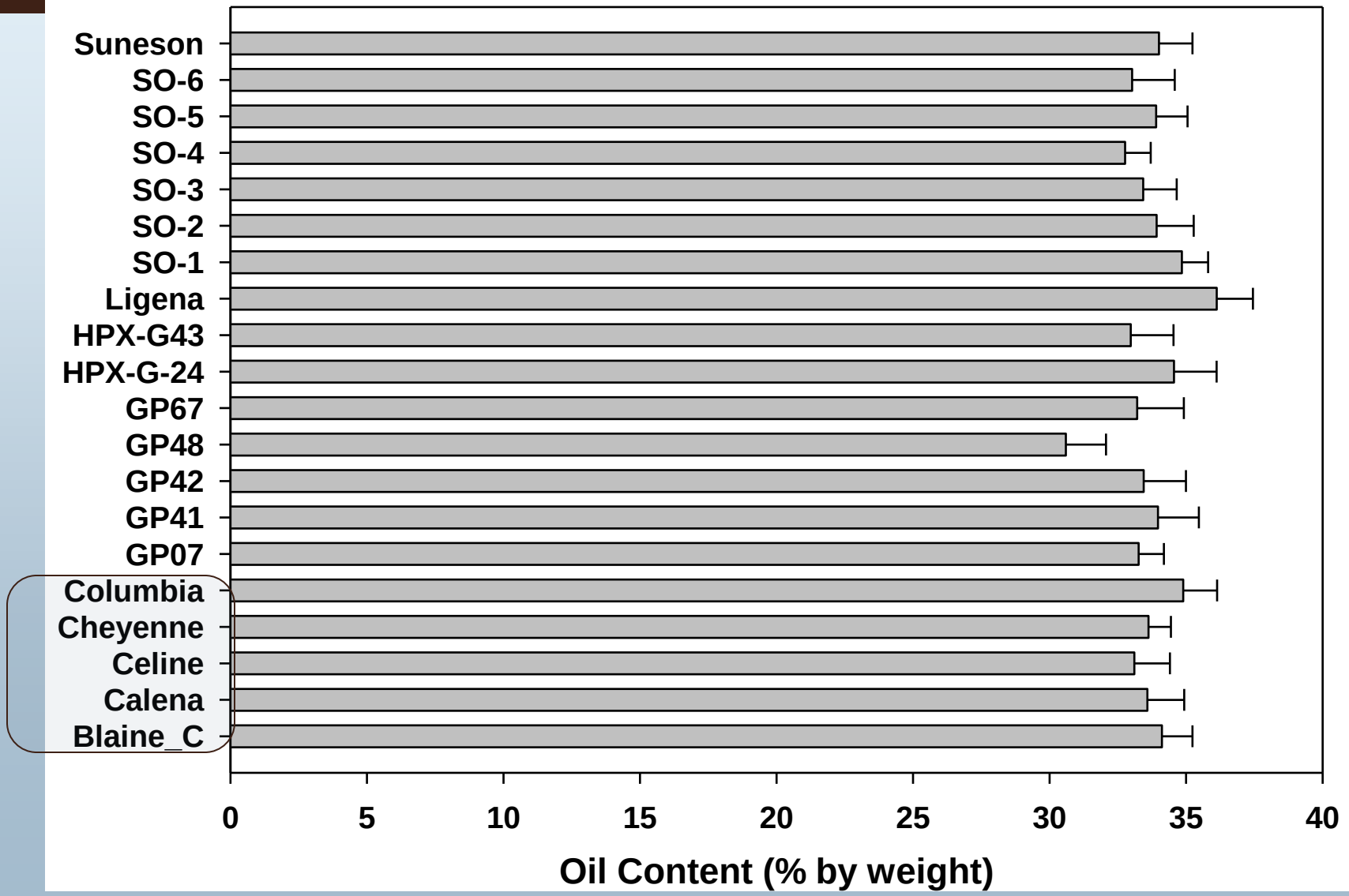
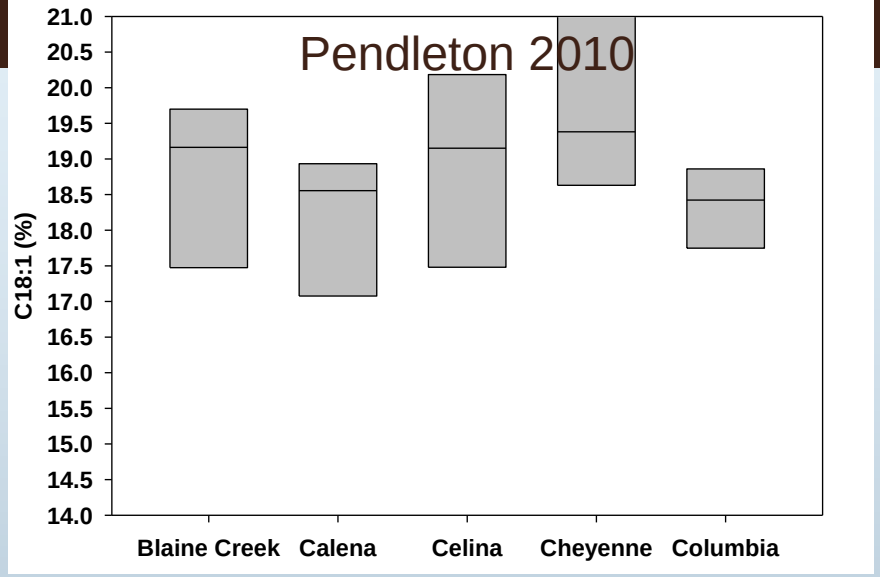
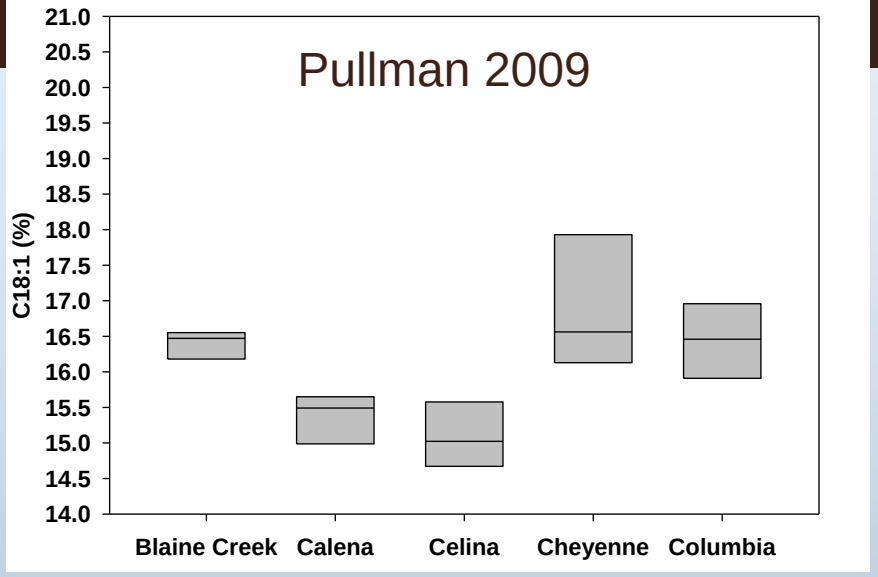
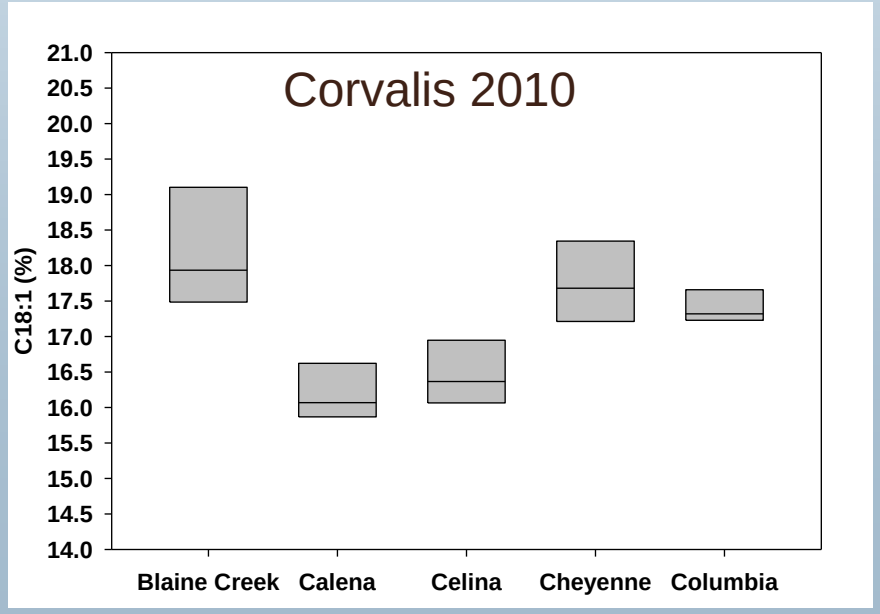
Oil Content by Variety, Pullman, 2010

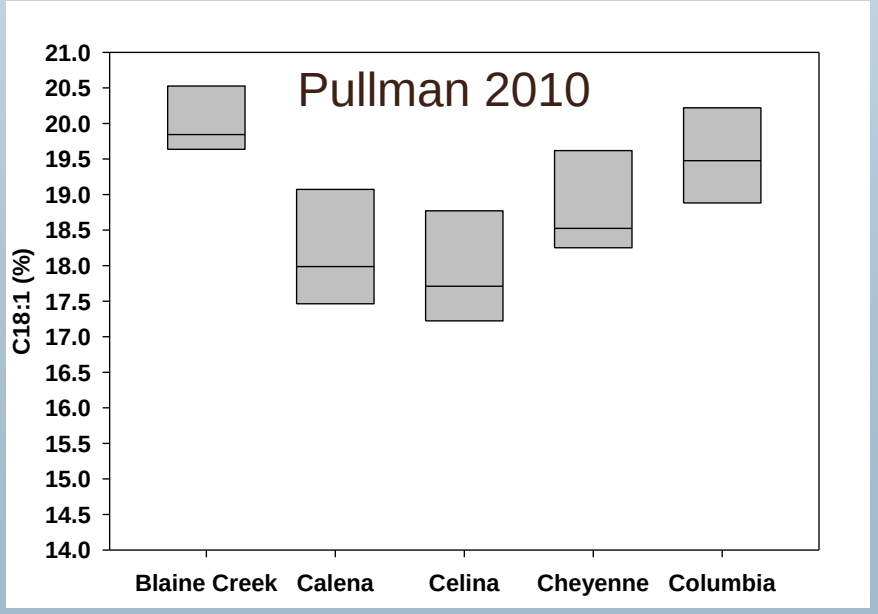


Oleic Acid

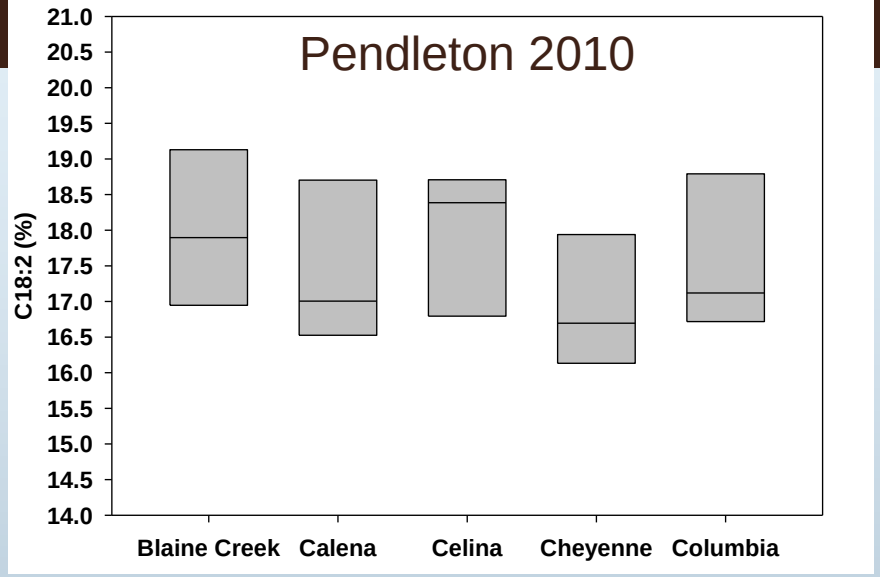

Pendleton 2010
C18:1 (%)
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
Blaine Creek
Calena
Celina
Cheyenne
Columbia

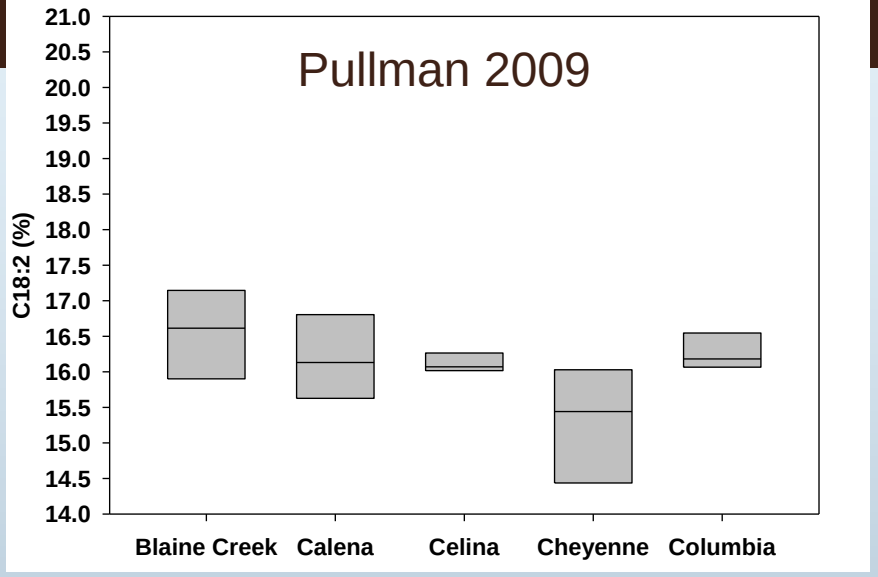

Pullman 2009
C18:1 (%)
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
Blaine Creek
Calena
Celina
Cheyenne
Columbia

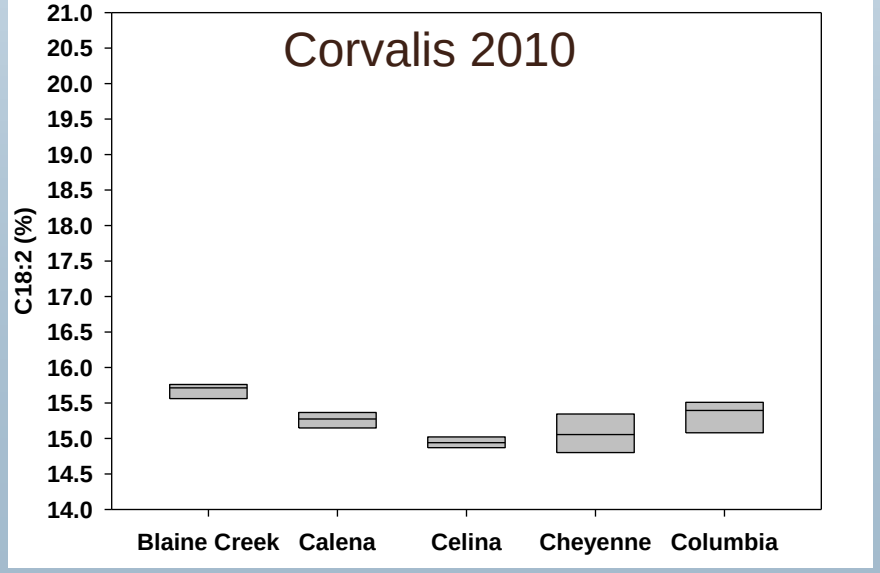

Corvalis 2010
C18:1 (%)
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
Blaine Creek
Calena
Celina
Cheyenne
Columbia

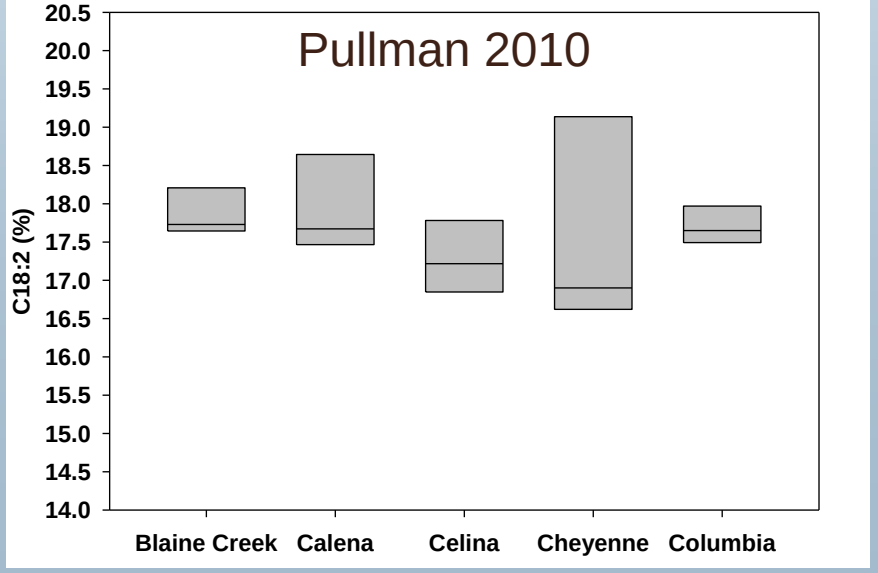

Pullman 2010
C18:1 (%)
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
Blaine Creek
Calena
Celina
Cheyenne
Columbia

Linoleic Acid

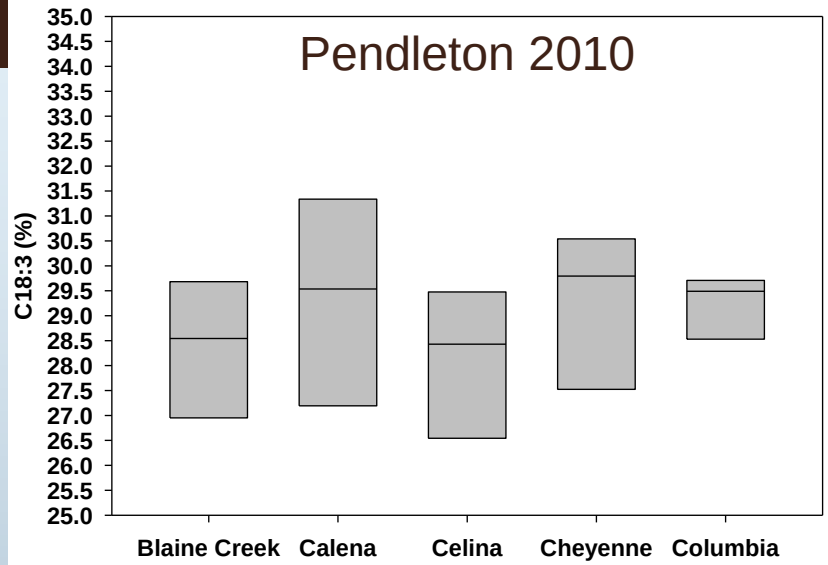


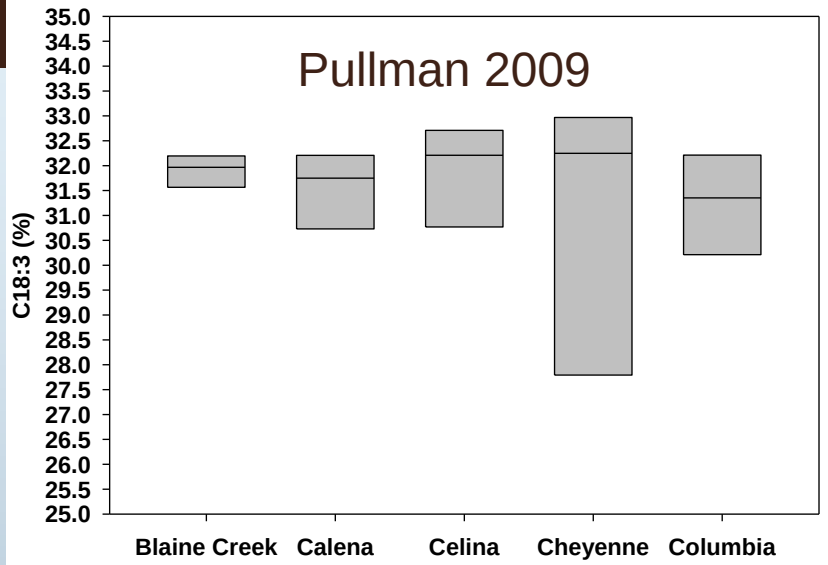


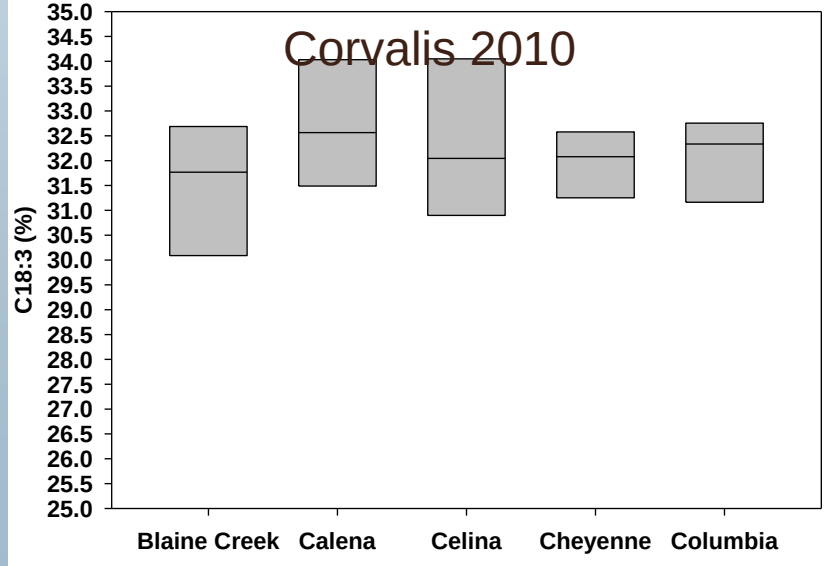


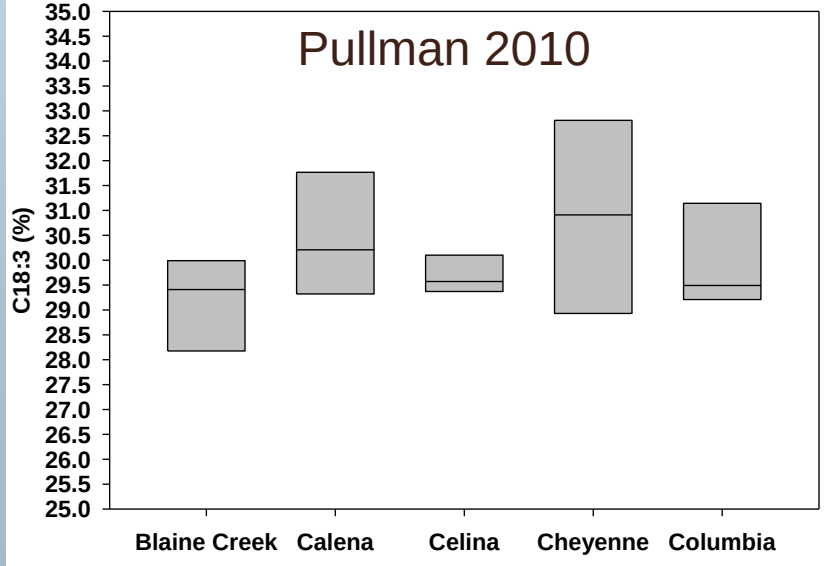


Linolenic Acid

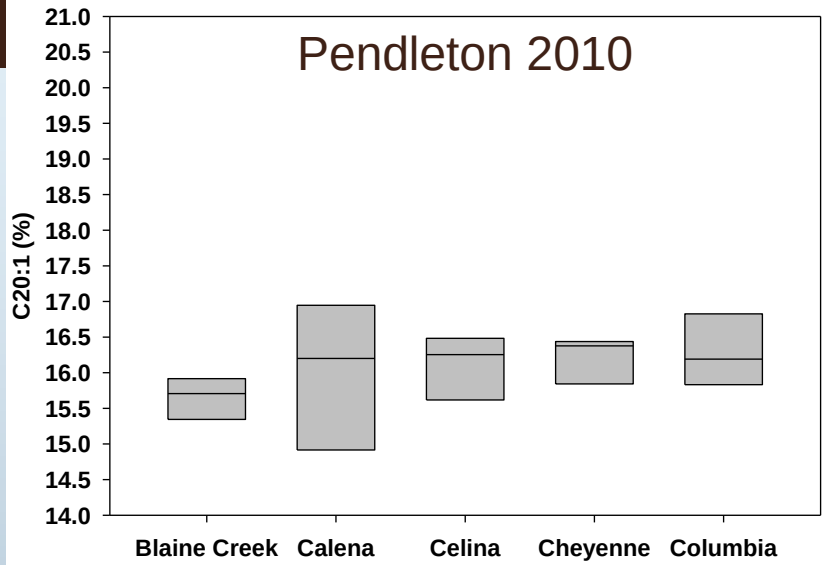


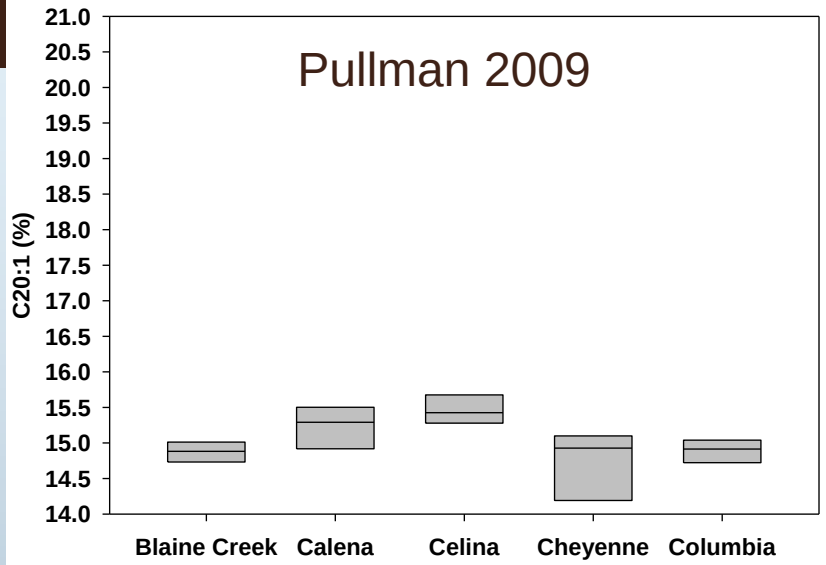


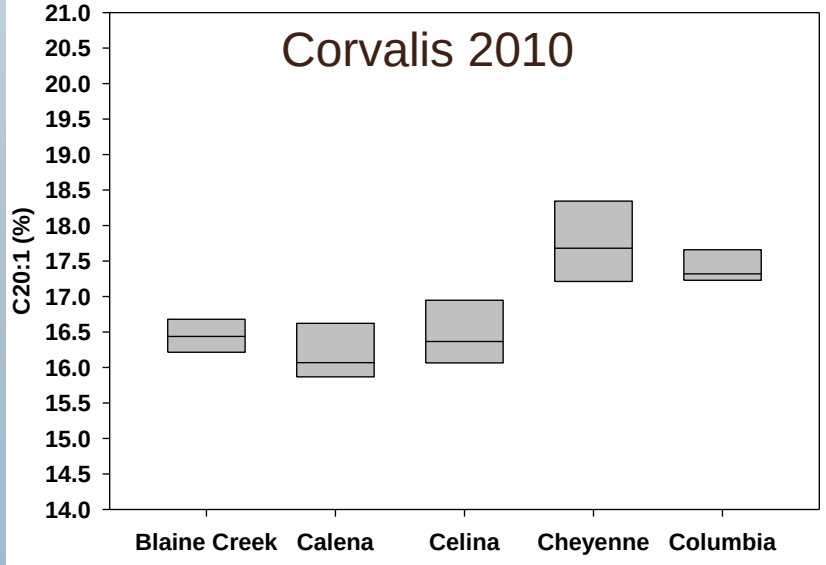


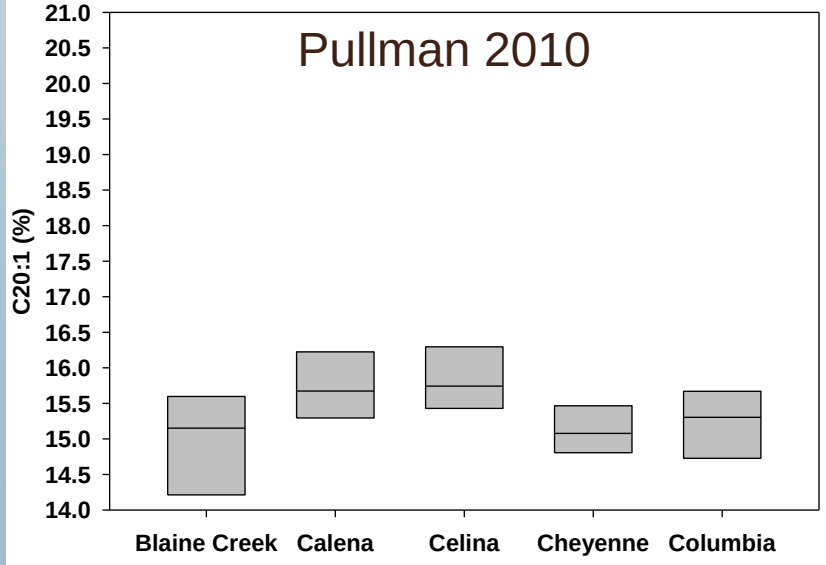


Eicosenoic Acid









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Review

- As expected, there was a genotype by environment interaction.
  - Cooler, wetter environments favored oleic and linolenic FA production.
  - Dryer climates reduced C18:3 % content and increased C18:1 content.
  - C18:3 content was most consistent.
- Camelina varieties appear to be consistently inconsistent!

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