

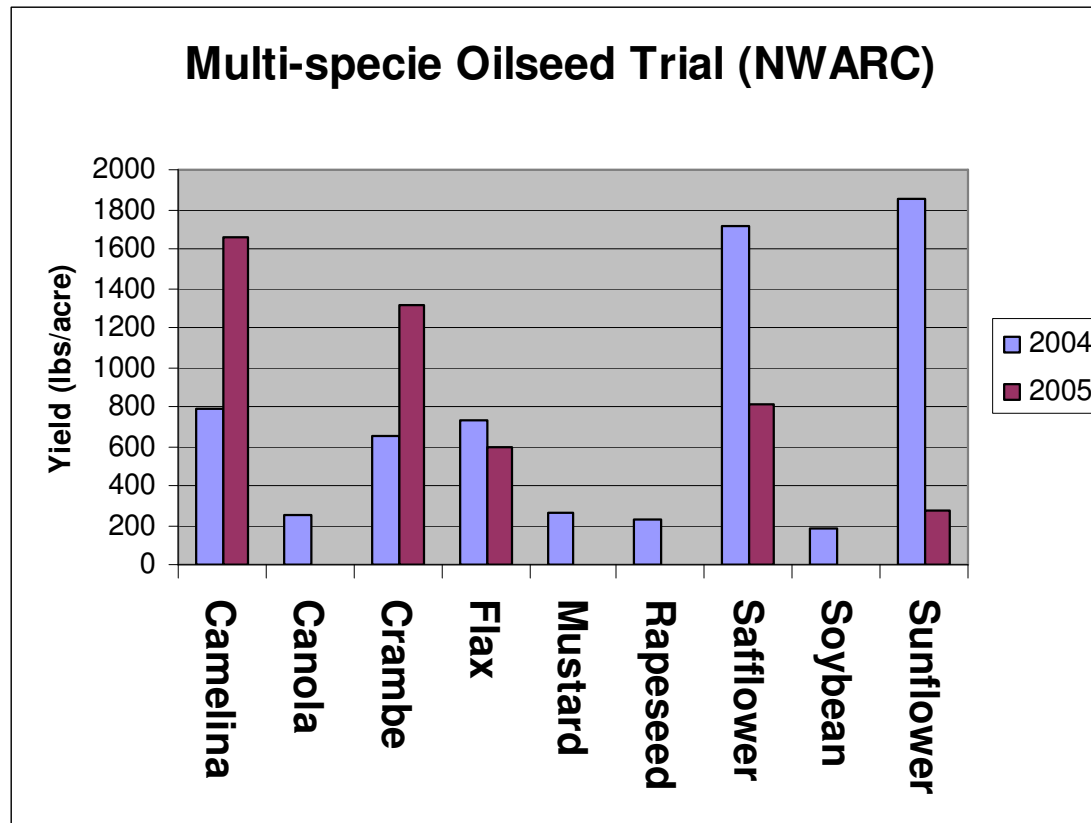
# Camelina for Biodiesel

## EPAC 2009



**Alice Pilgeram**  
Montana State University  
pilgeram@montana.edu

# Multi-specie Oilseed Trial



Peggy Lamb, Dave Wichman, Ken Kephart, Kent McVeigh,  
Grant Jackson, Chengci Chen, Louise Strang, Gregg Carlson  
and Duane Johnson  
Montana Ag Research Centers

# Camelina is adapted to Montana



Camelina emerging through snow in December



Camelina emerging through rock in Montana

Images: Duane Johnson, Great Plains Oil and Exploration 2007

## Camelina sativa or “Gold of Pleasure” or Leindotter



- Low input/Dryland Production
- Seeding rate: 2.5-5.0 lbs seed/acre
- Yield: 0-2500 lbs/acre
- Oil Content: 30-40% oil
- Protein Content: ~ 40% protein

# Camelina has been cultivated and consumed in Europe for over 2000 years



## Common Names

- Gold of Pleasure
- Leindotter
- False Flax
- Camelina

Tollund man was discovered in a Denmark bog in 1950. He was believed to have been placed in the bog ~2000 years ago. His last meal contained a mixture of grains including camelina.

# Camelina Production is Being Driven by the Biodiesel Industry

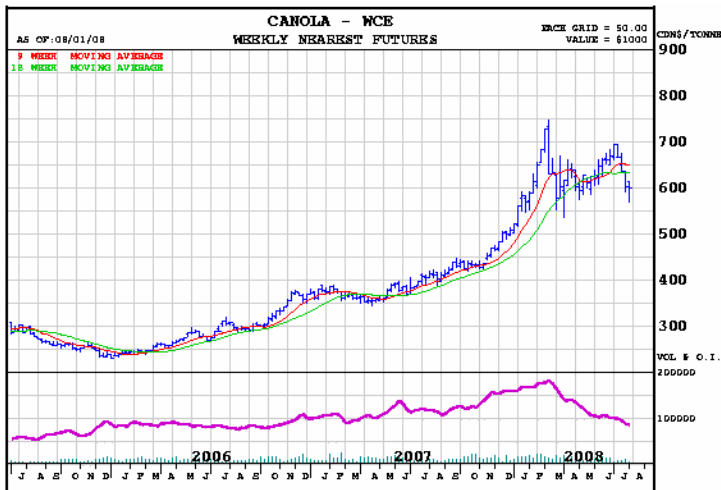


Year	MT Acres
2005	450
2006	8,000
2007	32,000
2008	20,000
2009	~35,000

# Camelina Biodiesel Companies

Company	Location	
Great Plains Oil and Exploration	Big Fork, MT	<a href="http://camelinacompany.com">camelinacompany.com</a>
Sustainable Oils	Portland, OR Bozeman, MT	<a href="http://susoiils.com">susoiils.com</a>
Earl Fisher Biofuels	Chester, MT	<a href="http://earlfisherbiofuels.com">earlfisherbiofuels.com</a>
Flathead Biodiesel	Kalispell, MT	<a href="http://flatheadbiodiesel.com">flatheadbiodiesel.com</a>
Blue Sun Biodiesel	Denver, CO	<a href="http://gobluesun.com">gobluesun.com</a>
Willamette Biomass	Rickreall, OR	<a href="http://willamettebiomass.com">willamettebiomass.com</a>
Lake Erie Biofuels	Erie, PA	<a href="http://lakeeriebiofuels.com">lakeeriebiofuels.com</a>

# The biodiesel industry cannot produce competitive biodiesel without cheap oil.



<b>Contract Price</b>	<b>Oil Cost</b>	<b>Biodiesel Cost</b>
<b>\$/lb seed</b>	<b>\$/gallon</b>	<b>\$/gallon</b>
<b>\$0.09</b>	<b>\$3.25</b>	<b>\$4.05</b>
<b>\$0.16</b>	<b>\$5.00</b>	<b>\$5.80</b>
<b>\$0.19</b>	<b>\$5.75</b>	<b>\$6.55</b>

Assumptions: \$80/ton oil extraction  
 \$0.80/gallon biodiesel manufacture

# However, Farm Profit



Crop	Yield/acre	Contract	Gross/acre	Net /acre
<b>Camelina</b>	<b>1000 lb</b>	<b>\$0.09/lb</b>	<b>\$90</b>	<b>\$15</b>
	<b>1000 lb</b>	<b>0.13/lb</b>	<b>130</b>	<b>55</b>
	<b>1000 lb</b>	<b>0.19/lb</b>	<b>190</b>	<b>115</b>
	<b>1500 lb</b>		<b>285</b>	<b>210</b>
	<b>2000 lb</b>		<b>380</b>	<b>305</b>
<b>Winter Wheat</b>	<b>30 bushels</b>	<b>7.00/bu</b>	<b>210</b>	<b>116</b>
<b>Assumptions:</b>	<b>Camelina Input Cost = \$75/acre; Wheat input Cost = \$150/acre</b>			
	<b>30% Oil Extraction (80 gallons/ton); \$80/ton toll-press</b>			

Our challenge is produce inexpensive oil while  
generating fair farm profit.



# The Key to this Challenge is the Camelina Meal.



**Camelina seed**



**Camelina oil (30%) and meal (70%)**

## **Increasing the value of camelina meal decreases the cost of camelina oil.**

<b>Contract Price</b>	<b>Meal Value</b>	<b>Application</b>	<b>Oil Cost</b>	<b>Biodiesel Manufacture Cost</b>
<b>\$/lb seed</b>	<b>\$/ton</b>		<b>\$/gallon</b>	<b>\$/gallon</b>
<b>0.19</b>	<b>0</b>		<b>5.75</b>	<b>6.55</b>
	<b>150</b>	<b>Solid Fuel</b>	<b>3.88</b>	<b>4.48</b>
	<b>300</b>	<b>Feed</b>	<b>2.00</b>	<b>2.80</b>



Camelina oil and, therefore meal, are rich sources of Omega-3 Fatty acids (C18:3).



Alpha-Linolenic Acid (omega-3)

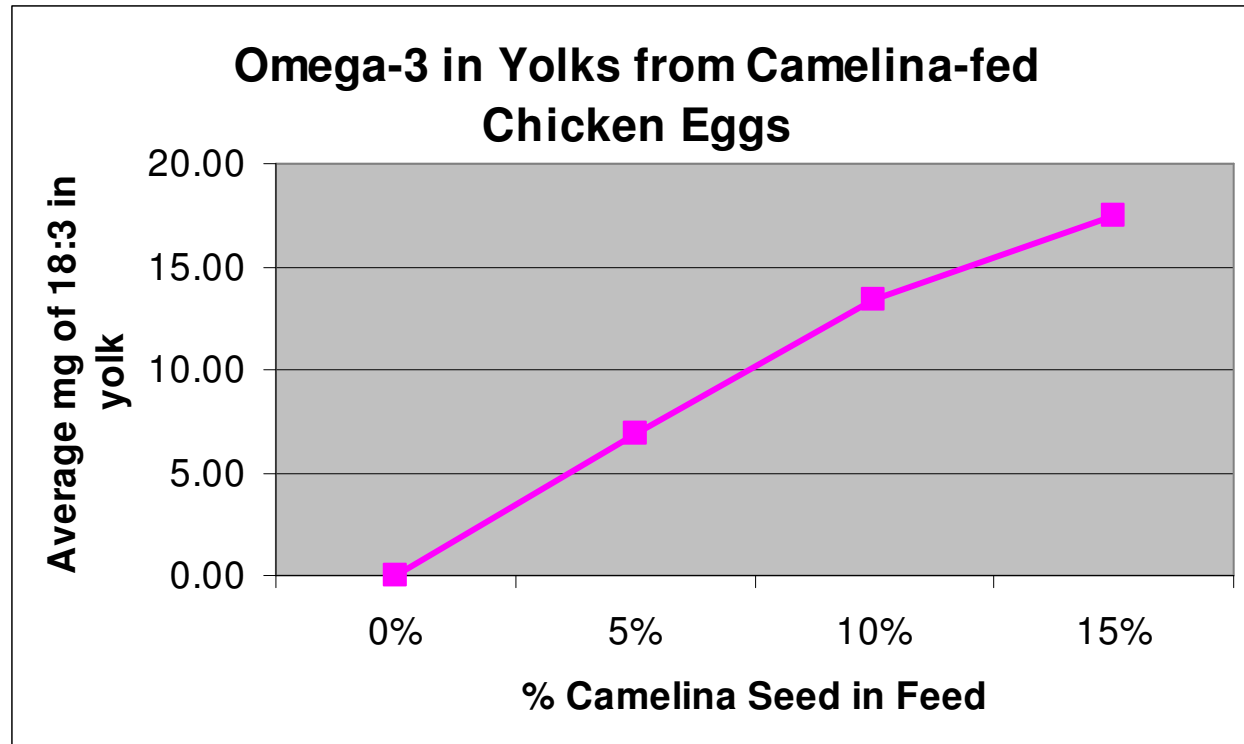
The ratio of omega-6 fatty acids to omega-3 fatty acids in the Inuit diet is...

2:1 or 1:1



# Production of high omega-3, high tocopherol eggs

David C. Sands, Alice L. Pilgeram, Duane L. Johnson, Nick Dale and Matthew M. Kirkpatrick



Research was funded by the US Egg and Poultry Association.

Produced & Distributed by:

# OMEGAMONTANA™

# MONTANA EGGS

200 mg of Omega 3  
40 mg of Vitamin

80 mg of DHA  
25% less saturated fat

Certified by



One Dozen  
Grade AA Eggs

Montana grown Camelina sativa, OmegaMeal™, fed in a special ration provides a healthier, better tasting Montana egg for you and your family.

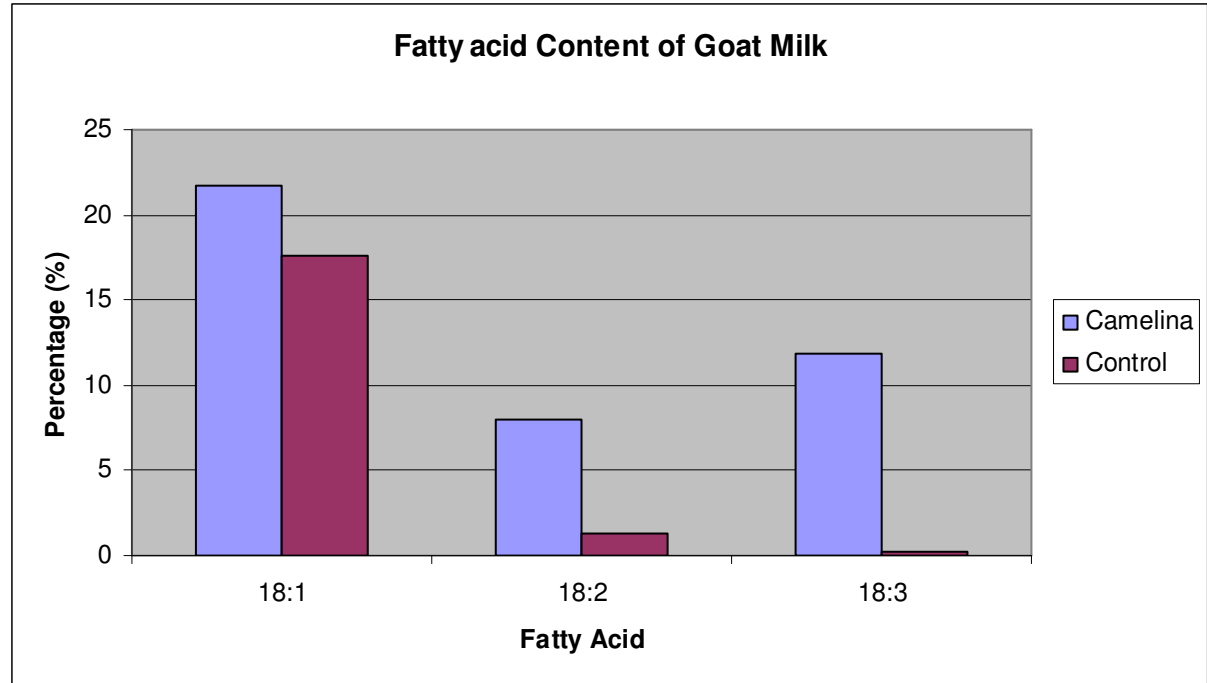
Extra Large

united egg producers  
seal

Product	Wholesale
Traditional	\$1.00/dozen
OmegaMontana Eggs	\$1.50/dozen

# Production of high omega-3 milk

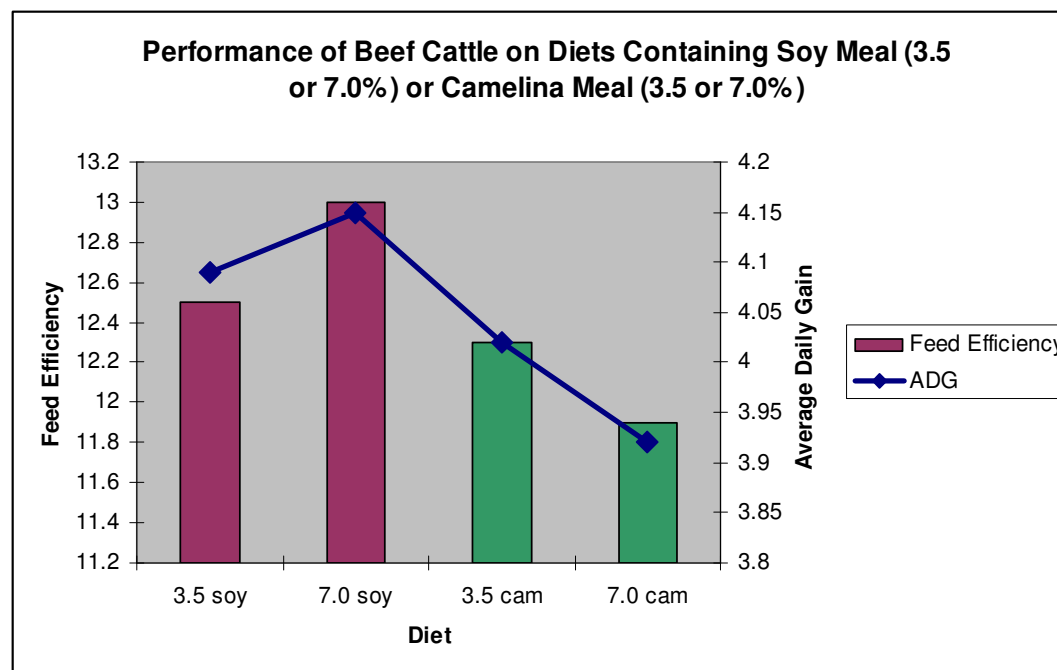
David C. Sands, Alice L. Pilgeram, Duane L. Johnson, Nick Dale and Matthew M. Kirkpatrick



Research was funded by the MSU Biobased Institute (USDA CSREES Special Grant). Special thanks to the Amaltheia Goat Dairy.

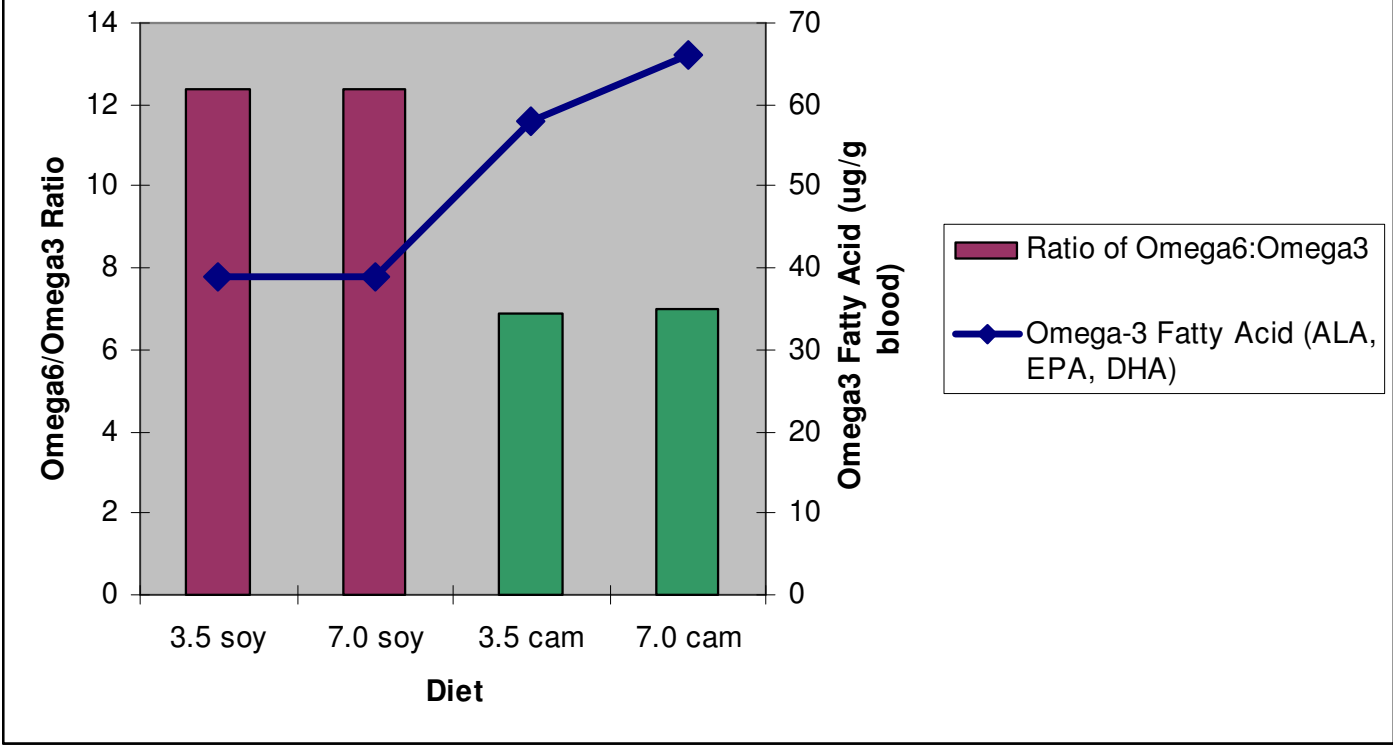
# Production of high omega-3 beef

Darrin Boss (Northern Ag Research Center)



Research was funded by the MSU Biobased Institute (USDA CSREES Special Grant).

### Impact of Camelina on Fatty Acid Profile of Beef Blood



# However,

- Camelina meal has FDA approval as a feed ingredient for;
  - Broilers (10%)
  - Beef (2%) and Swine (2%)



# Omega-3 Oil Applications



Supplements



Cosmetics



Culinary Oils



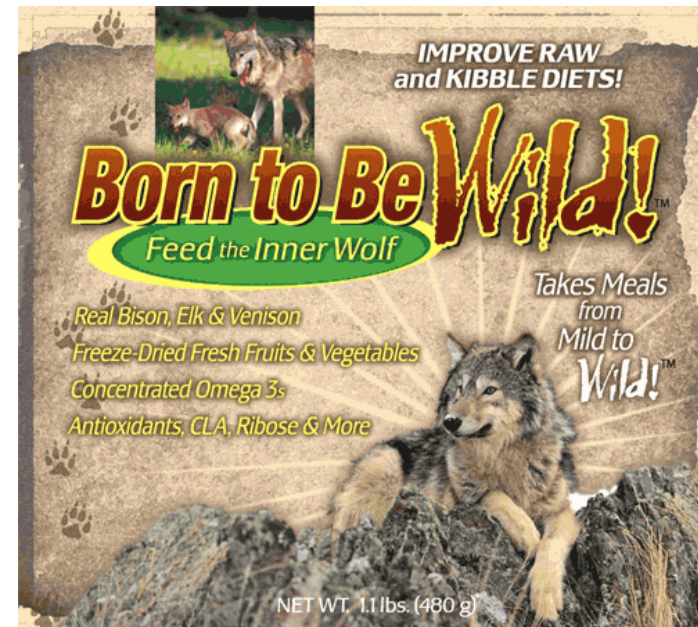
Industrial



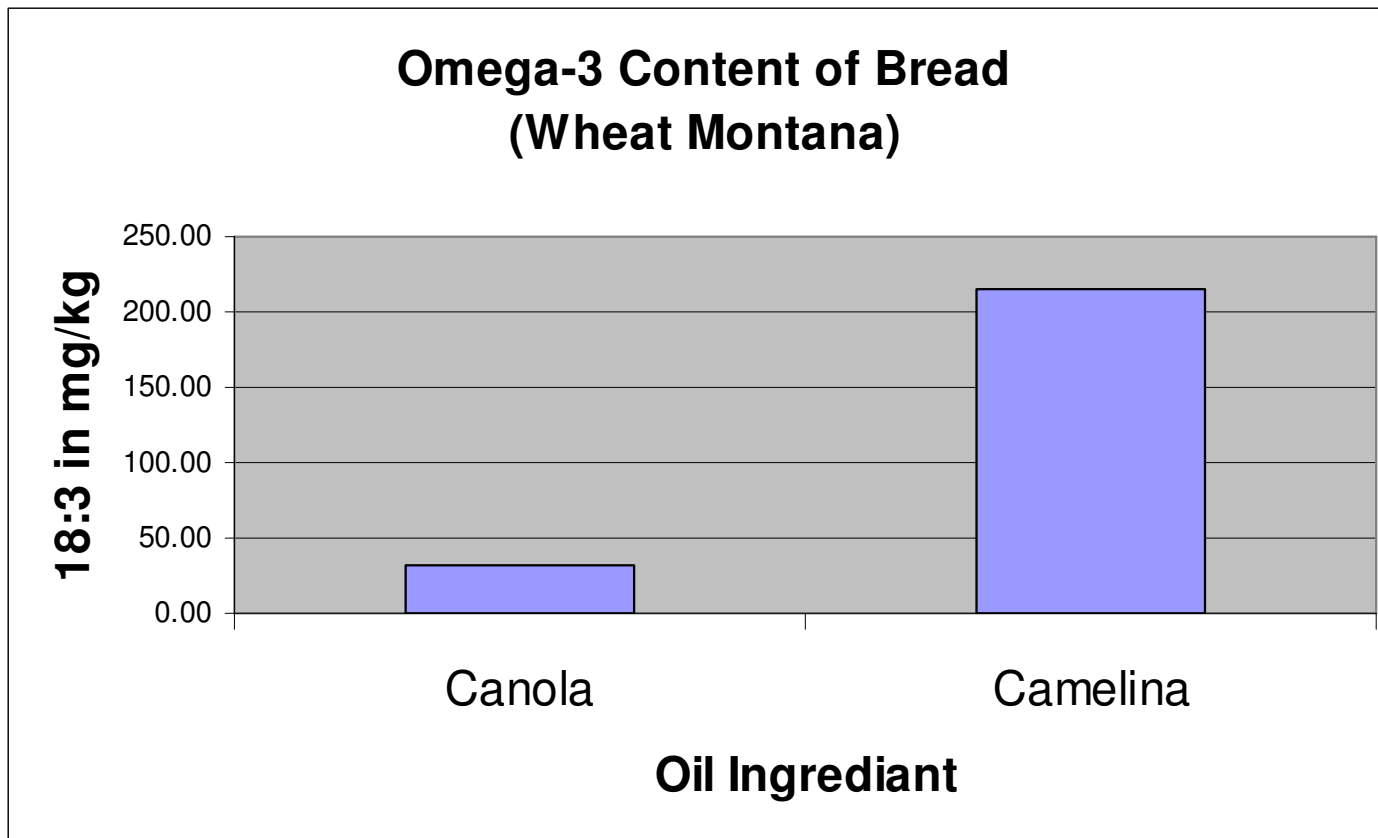
Pet Foods –

Animal Natural  
Benecia, CA

Camelina Feed Products



# Omega-3 Bread



# Camelina Fuel Pellets

## MSU Civil Engineering\*



Energy and ash content of composite fuel pellets		
Pellet	BTU/lb	Ash %
Premium Wood	8,962	0.58
100% Camelina	10,261	4.52
Straw, barley, oil	8273	8.59

\*Mike Vogal, Vic Cundy, Dan Black, Shea Herbert, Clayton Jones, Danny Taasevigen, Alex Yudell, Steve Switters

Camelina meal can be used as a barrier to prevent weed emergence and as a hydro mulch.



Carol Frohlich, USP

# Camelina meal can be used to de-odorize manure and latrines



Chemical Deodorizers - \$100/toilet  
Synthetic  
Cherry almond  
Fee for waste disposal

Camelina Deodorizer – \$0.17/toilet  
Agriculture byproduct  
Odor-less  
Safe for disposal

# Thanks

Montana Board of Research and  
Commercialization Technology

Business Resources Division  
MONTANA  
Department of Commerce

 NRCS Natural Resources  
Conservation Service



greatplains | the  
camelina  
company



  
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