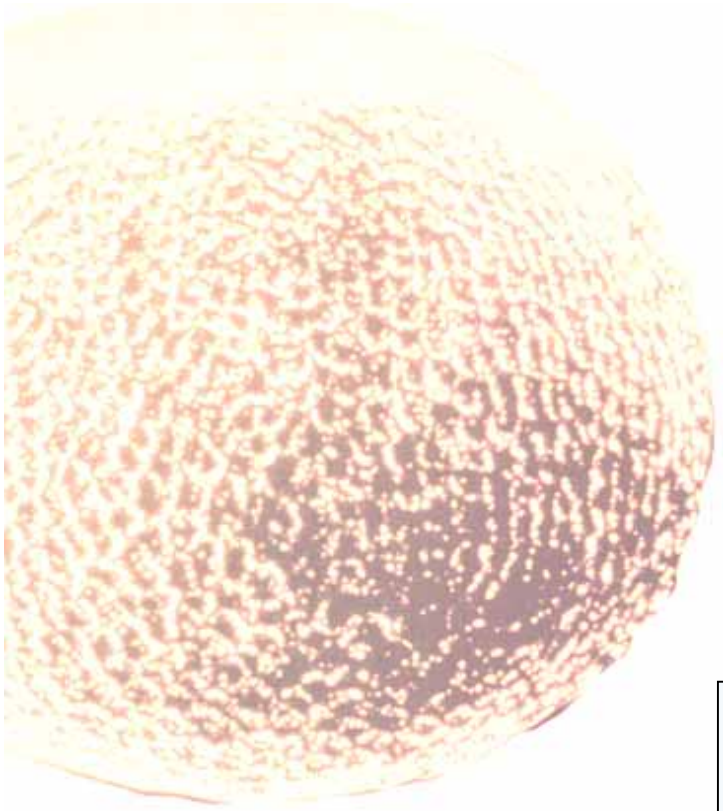


# *Canola Quality*

Calgary
July 17
2006

# *The Power of Canola*

# *Quality*

- As a platform for manufacturing bioproducts
- As an oil for making biodiesel
- As a source of protein

# *Crop Characteristics*

- Small seeded mass (or large increase)
- Extremely high yield (of carbon and useful energy)
- Pesticide resistant traits (for conservation of energy)

# *Small seed mass*

- Four to six kilograms planting seed required per hectare (<0.5% of yield)
- Wheat requires 80 kg/ha (~4% of yield)
- Flax requires 44 kg/ha (~3% of yield)

# *Low seeding rate*

- Opens the door to efficient hybrid production
- Mitigates energy consumption in seed production
- Can lower costs associated with planting
- Allows for a lucrative and competitive seed industry

# *High yield*

- When it comes to biofuel production, energy conservation and greenhouse gas mitigation canola is Canada's highest yielding crop

# *The wrong way to measure yield*

- kg/ha

# The right way to measure yield

- km/ha

# *Wheat to ethanol vs Canola to biodiesel*

- The wheat crop has a higher yield than the canola crop

# *Wheat to ethanol vs Canola to biodiesel*

- The wheat crop has a higher yield than the canola crop (so what?)

# *Wheat to ethanol vs Canola to biodiesel*

- If you dry the wheat crop it has more water (about 4 %)

# *Wheat to ethanol vs Canola to biodiesel*

- Wheat stores its energy in the form of starch while canola stores oil

# *Wheat to ethanol vs Canola to biodiesel*

- Starch has more than 50 percent chemically bound water

# *Wheat to ethanol vs Canola to biodiesel*

- It takes a lot more energy to make and recover ethanol from wheat than it takes to make and recover biodiesel from canola

# *Wheat to ethanol vs Canola to biodiesel*

- Biodiesel has more energy per liter than ethanol

# *Wheat to ethanol vs Canola to biodiesel*

- Diesel engines are 50 % more efficient than gasoline engines

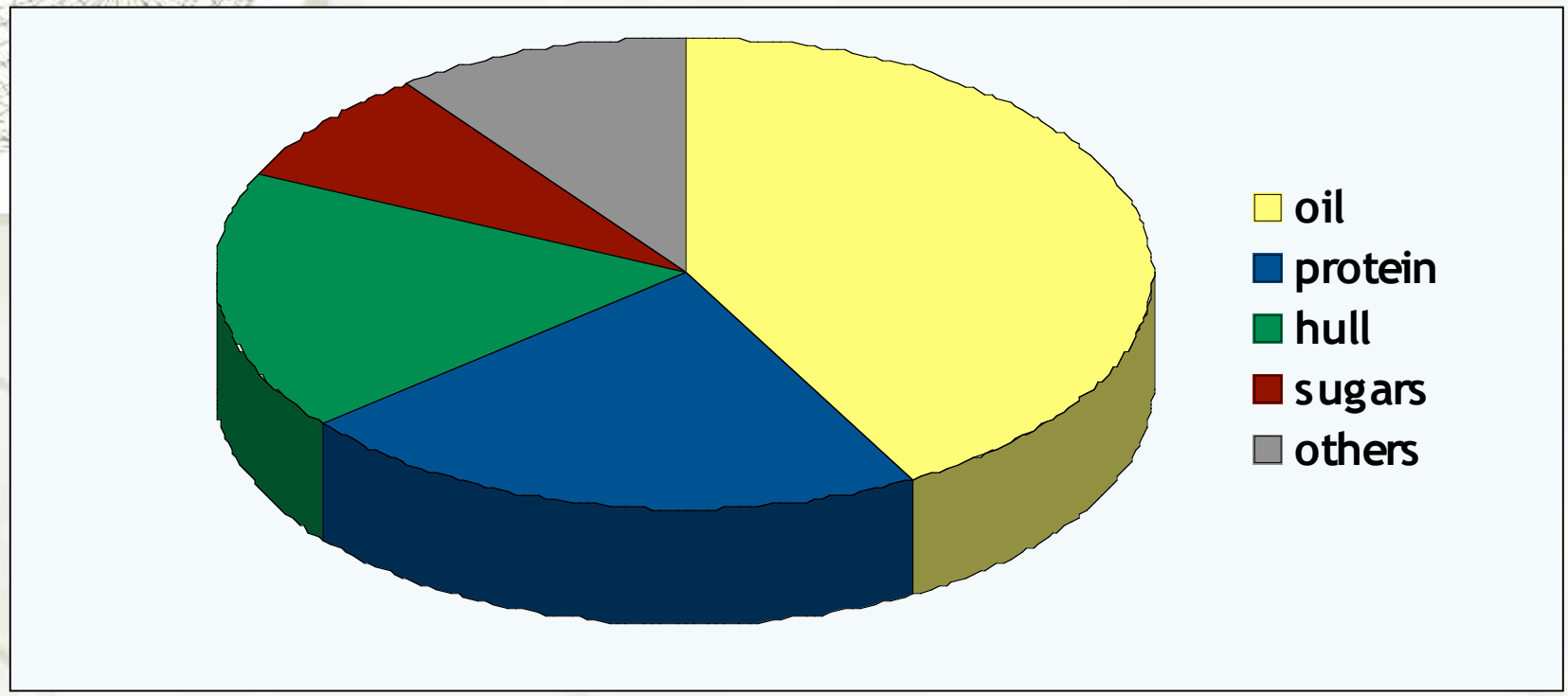
# *Wheat to ethanol vs Canola to biodiesel*

- Canola yields over 2 times the km/ha when compared with wheat

# *Ethanol may make a better business case*

- Fuel is purchased by the liter and not the by energy content or efficiency
- The best market for biodiesel is in Europe

# *Canola seed composition*



# *Biodiesel from canola*

- Has good fuel properties
  - Good stability
  - High cetane
  - Good lubricity
  - Burns cleanly

# *As an oil*

- Both EN and ASTM Standards can be met using canola
- Canola biodiesel can be used to blend with Canadian winter fuels

# *A bit about standards*

- The standards in North America are designed for blended fuels
- The standards are continually being changed
- Canada has not adopted a standard

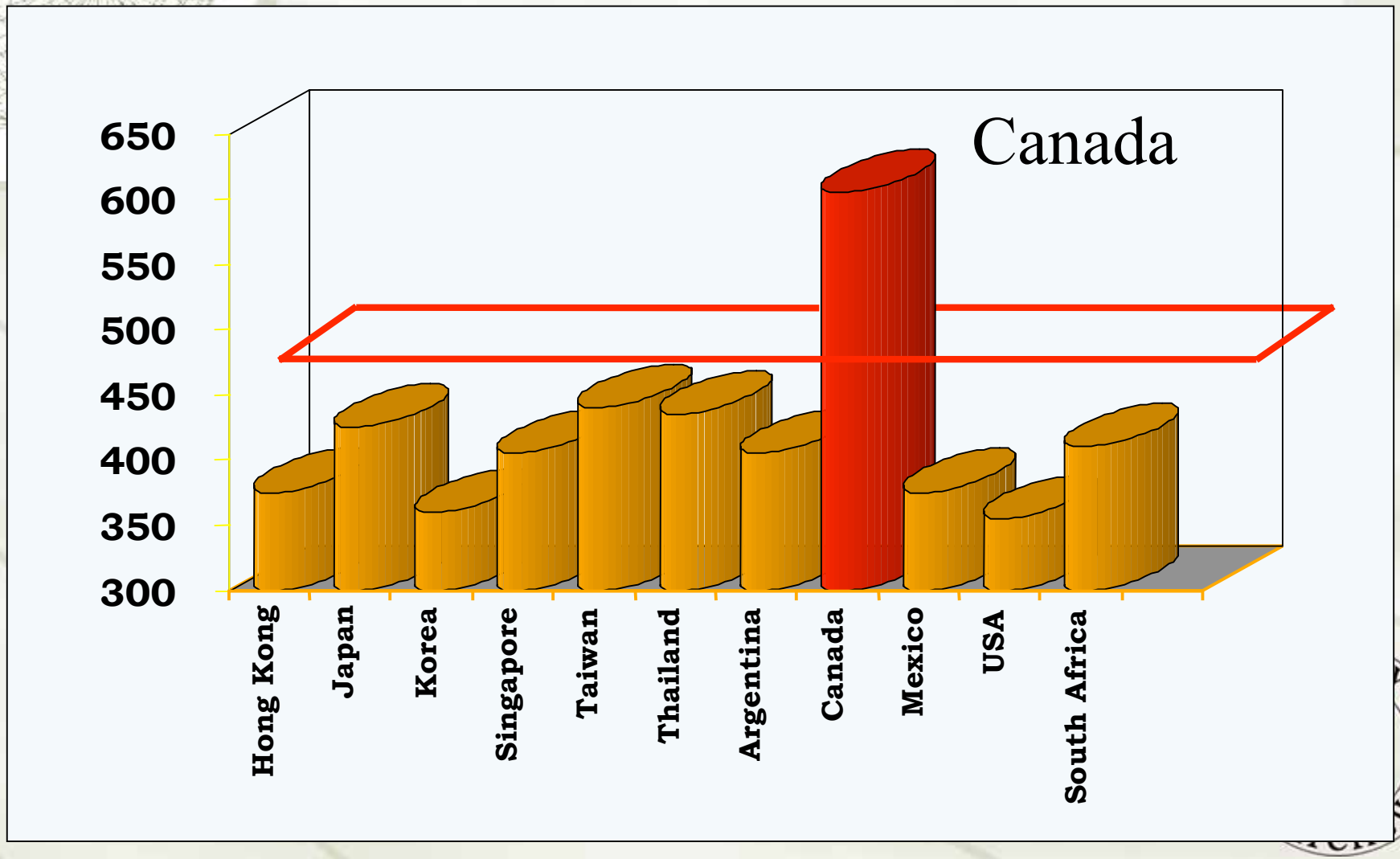
# *Wear costs*

- In the Saskatoon biobus study it was determined that the cost of engine wear was $0.10/L
- A fuel additive that lowered engine wear by 10% would save $0.01 per L of fuel


Diesel Wear Scar


Biodiesel Wear Scar

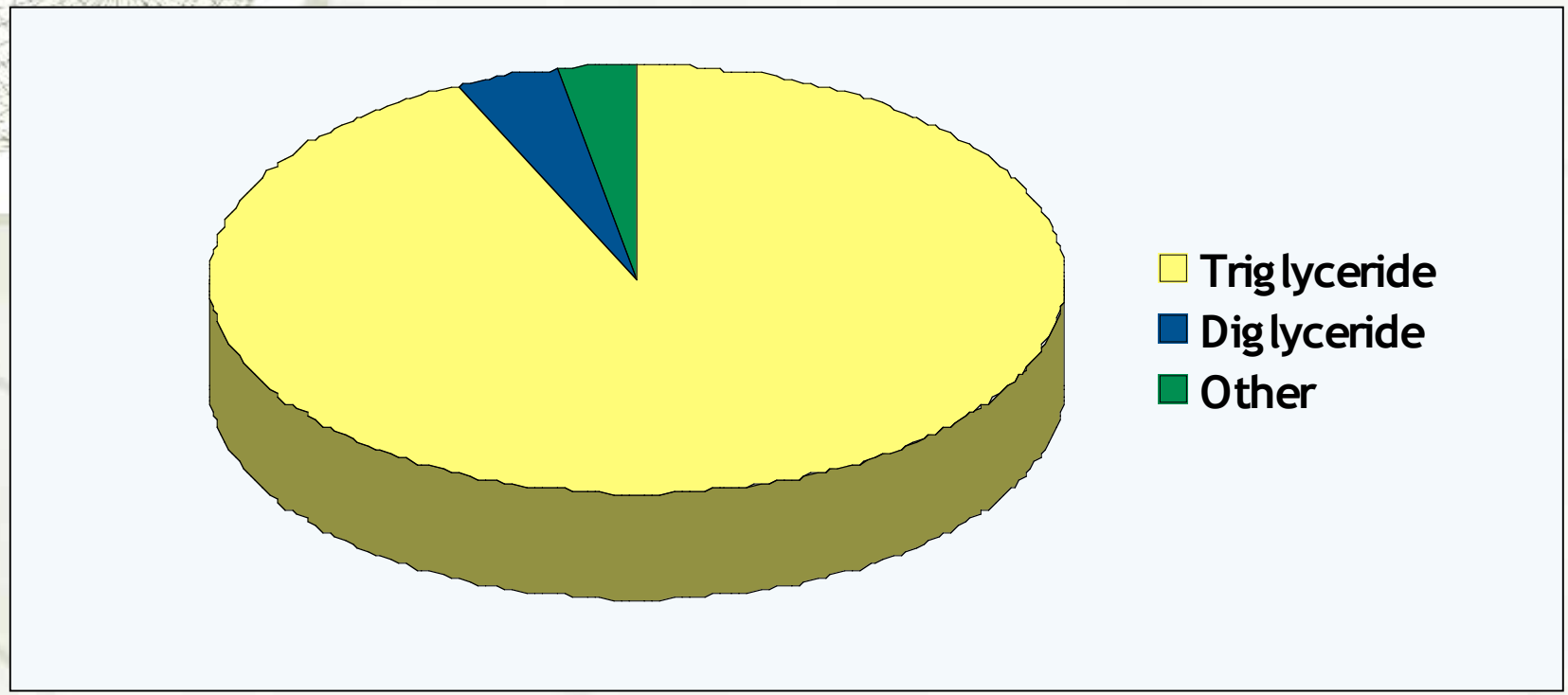
# Infineum Worldwide Fuel Quality Survey



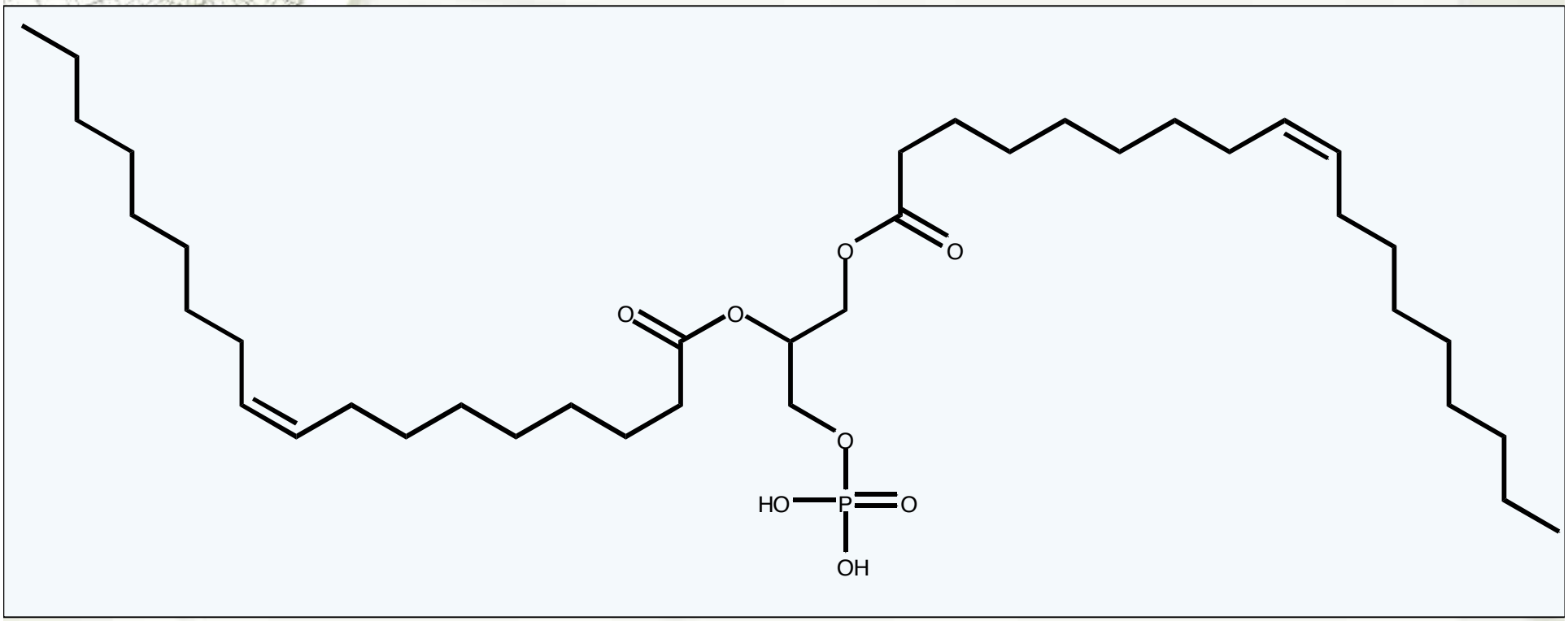
# *Non-biodiesel use of oil*

- Other compounds in canola oil may be very valuable

# *Oil composition*



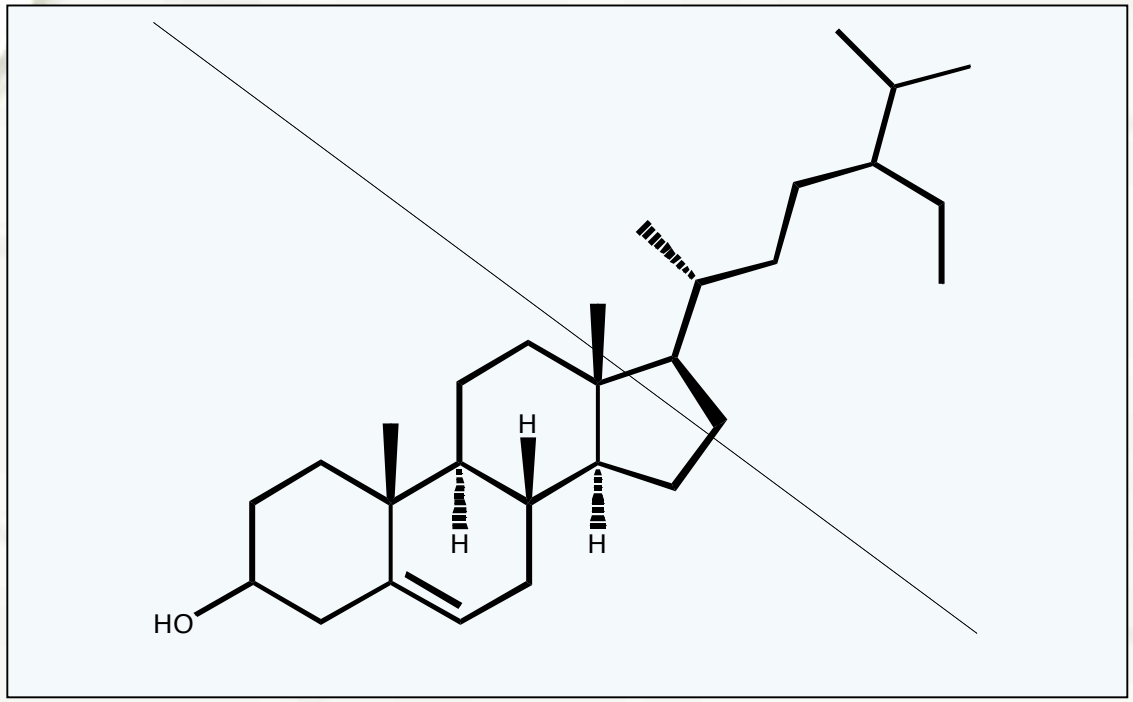
# Lecithin



# *Lecithin*

- Used as an emulsifier
- Also a digestive aid

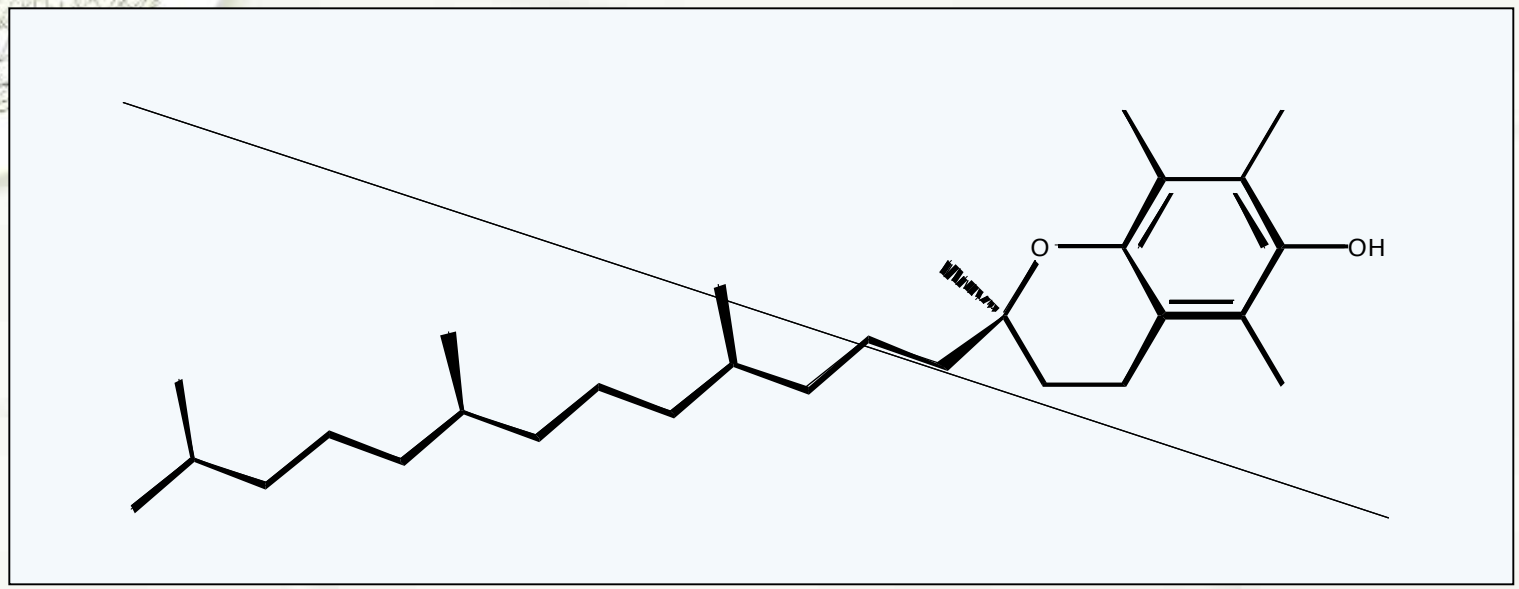
# *Phytosterol*



# *Phytosterol*

- Stabilizes oil against heat degradation
- Lowers cholesterol

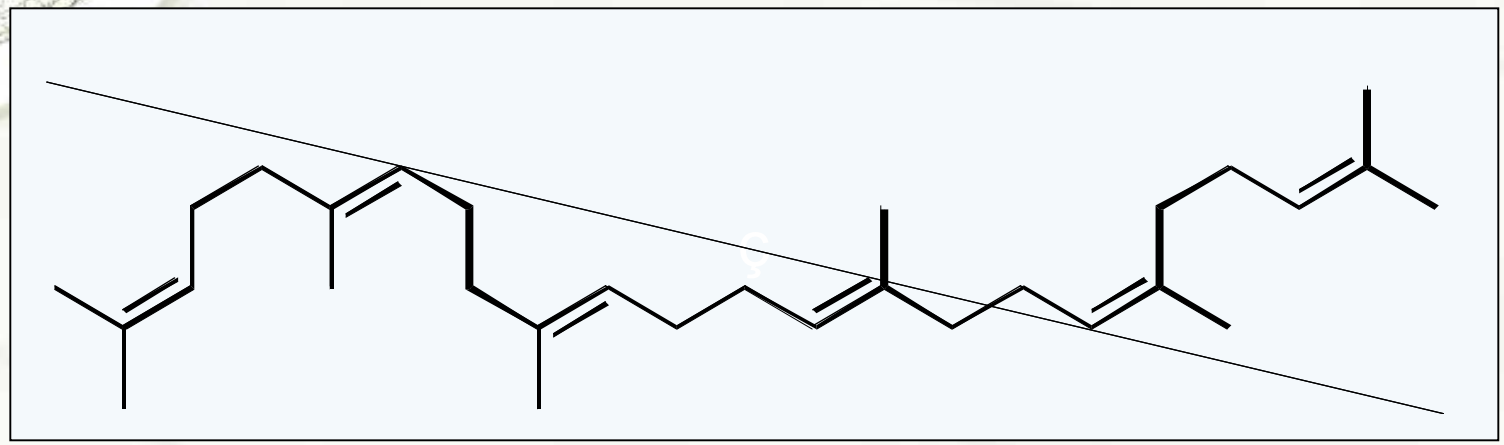
# Tocopherol



# *Tocopherol*

- Vitamin E
- Anti-oxidant

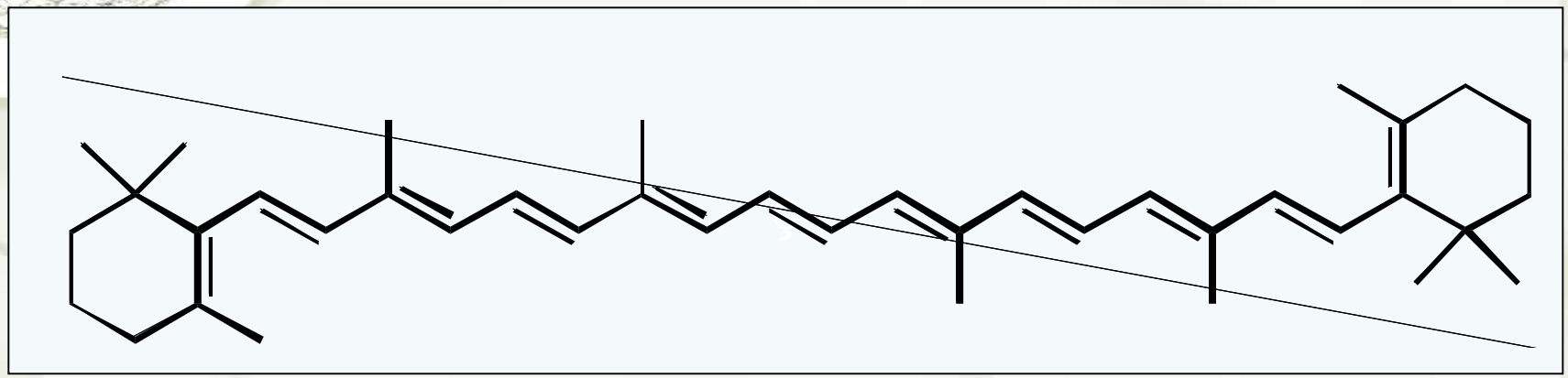
# *Squalene*



# *Squalene*

- Shark liver oil is best source
- Olive oil is 0.75%
- Canola makes squalene in early seed development

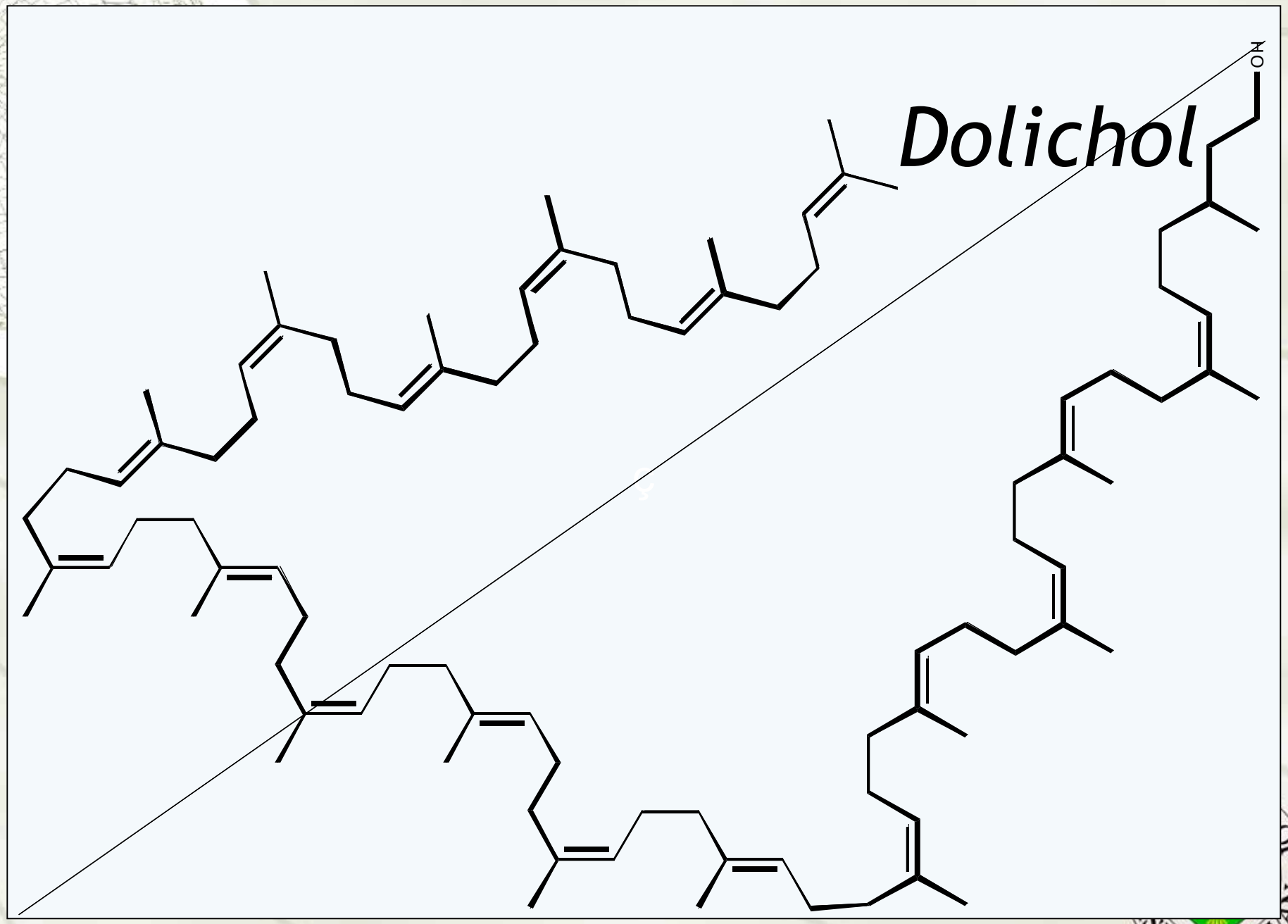
# *Carotenoids*



# *Carotenoids*

- Anti-oxidants
- Prevent macular degeneration
- Pro-vitamin A
- UV protection for the oil
- Canola oil is a good source

# Dolichol



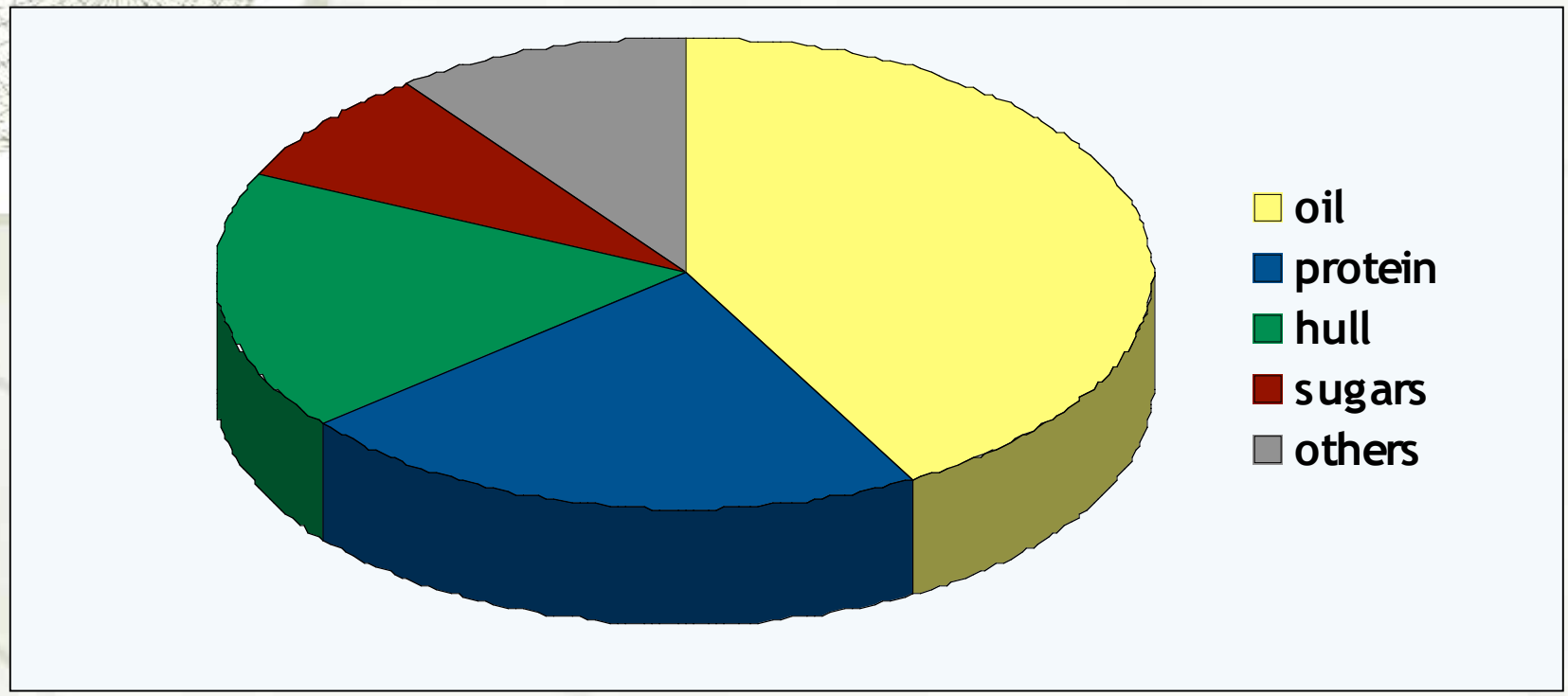
# *Dolichol*

- Lipid in all living tissue
- Associated with wound healing
- Sources are liver oils and canola oil

# *Glycerol*

- Glycerol is produced as a byproduct of biodiesel
- Glycerol used to be valuable
- It is not anymore

# *Canola seed composition*



# *As a source of protein*

- The domestic crush in Canada could double
- Typically 1.8 million tonnes of canola meal are exported annually
- Would it be necessary to export all of the new canola meal?

# *As a source of protein*

- Canola meal quality will need improvement to compete with feed coming from new US biodiesel production and domestic ethanol production

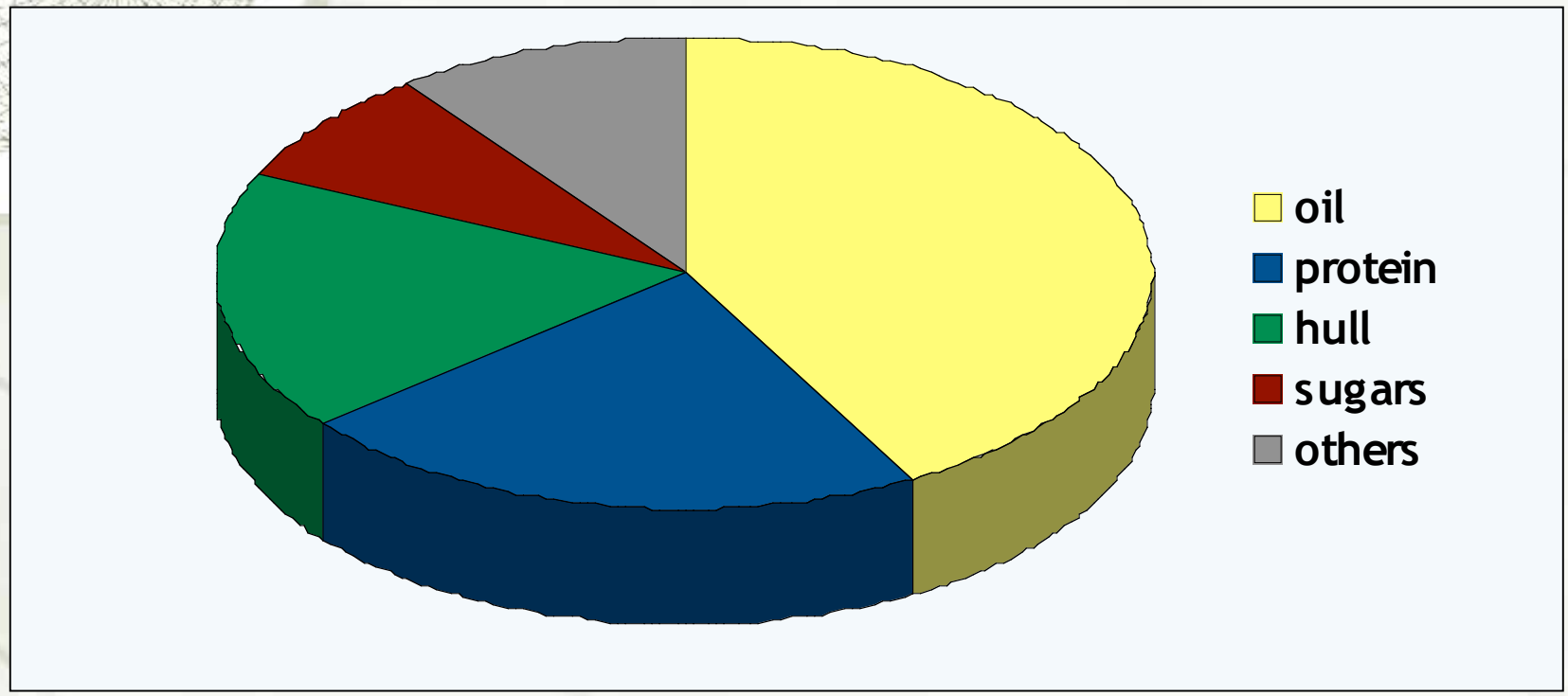
# *As a source of protein*

- In the short run improving canola by hull removal and production of protein concentrates seems like the best strategies

# *As a source of protein*

- Canola meal arising from biodiesel must displace soy protein and distiller's dried grain or it will prove difficult to develop a biodiesel industry

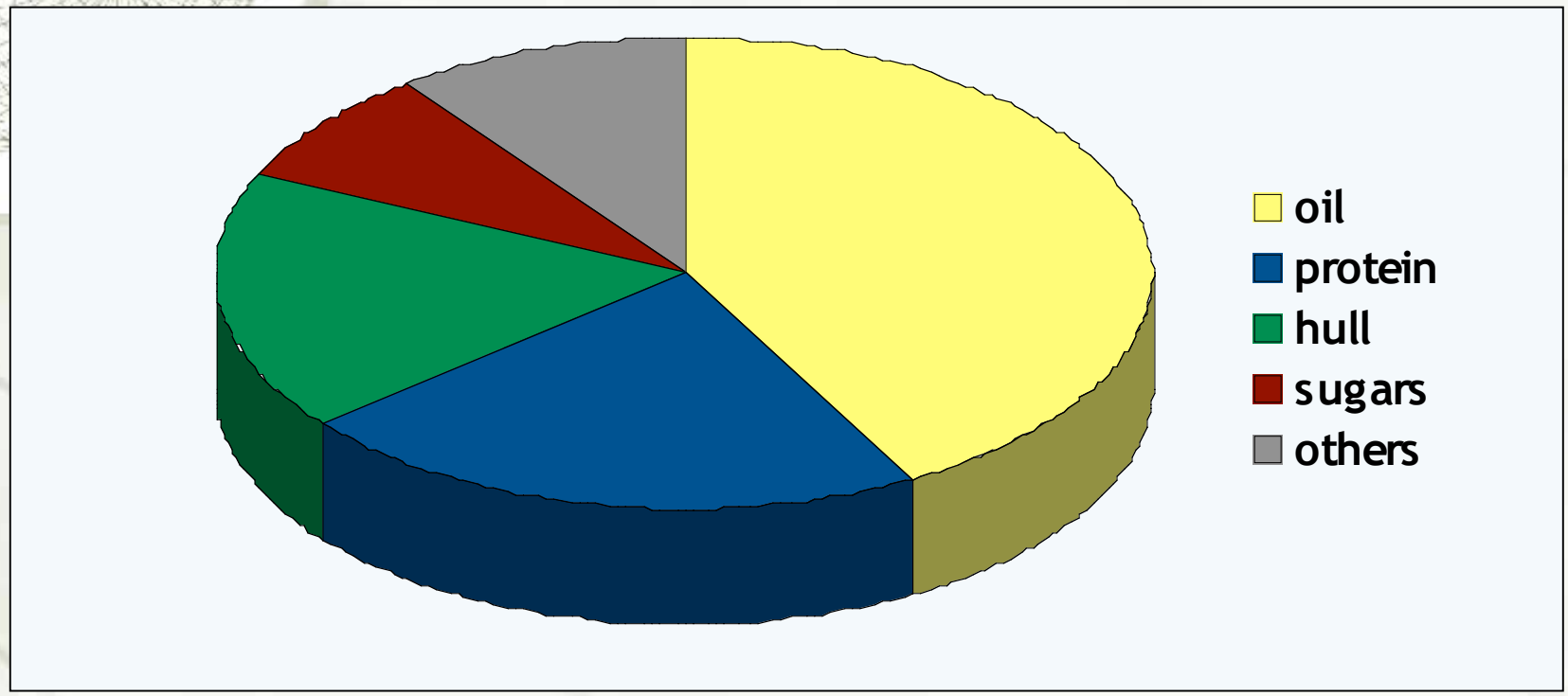
# *Canola seed composition*



# *Sugars*

- Canola is not a good source of sugar
- But it is left over from making protein concentrates
- There is enough sugar in canola meal to make most of the alcohol used in biodiesel production

# *Canola seed composition*



# *Hull and other materials*

- The hull is somewhat like tree bark
  - It may contain useful compounds but it is not good feed
- The other materials are potentially very valuable and could be harvested in the future for profitable business opportunities

*The downside to biodiesel…*


CHEAP
CHAT
LIPID
QUALITY & UTILIZATION

# *Team Phat*

- Cynthia Schock
- Tama Kendel
- Yuong-Hua Jia
- Rachna Saini
- Kornsulee Ratanapariyanuch
- Amber Faye
- Sun-Min Wang
- Bonnie Li
- Thilina Bandara
- Dave Howarth
- Jill Thomson
- Lester Young