# Camelina is a Potential Oilseed Crop for Washington

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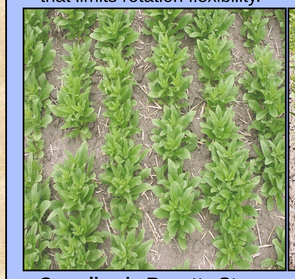
## Introduction

Camelina, *Camelina sativa* L, is a member of the mustard family that has also been called the popular names 'False-flax' and 'Gold-of-Pleasure'. Camelina is an ancient crop. Seeds and seed capsules of Camelina have been found in European Bronze Age excavations (1500 BCE). Camelina was a widely grown crop in Europe into the early 1940's when rapeseed and canola replaced it due to preferred oil profiles and higher yield potential under European intensive management practices.

Camelina seed contain 30-40% oil and the oil fatty acid profile is similar to flax oil. They are high in Omega-3 fatty acids. Camelina oil has historically been consumed and the meal has higher protein than canola meal. Camelina can be use as a biofuel feed stock. Camelina meal can be used as a high quality animal feed that will increase Omega-3 fatty acid levels in animal products. Currently meal is approved for broiler chickens and beef. Camelina seeds contain high levels of gamma tocopherol (Vitamin E) an anti-oxidant that stabilizes the oil and residual oil in meal.

Camelina crop production practices are being developed for seeding methods, fertilizer rates, and cultivar adaptation under Washington conditions to support commercial production. Camelina appears to be adapted to many Washington locations better than other oilseed crops. Other crop production issues include weed control, there is currently only a post-emergence grass herbicide labeled, and sensitivity of residual herbicides that limits rotation flexibility.



**Camelina in Rosette Stage**

**Camelina after bolting**

## Materials and Methods

- Camelina studies were conducted in Washington and Northern Idaho. The Pullman, WA, Moscow, and Greencreek, ID sites are high rainfall (20-24") but the Dusty and LaCrosse, WA sites are intermediate for rainfall (15-18").
- Randomized complete block experimental designs were used with four replications.
- Trials that were seeded used small plot drill having seven double disk openers with 6-7" spacing and packer wheels.
- Except in cultivar trials, the cultivar 'Calena' was grown.
- When dried and mature, seed was harvested with a small plot combine containing a 'canola' screen or a fine slotted screen set at a low winnowing airflow.

**2010 Pullman Crop Comparison Study**

## Camelina Cultivar Evaluations, 2007

| Cultivar | Moscow 2007 | Dusty 2007 | Greencreek 2007 | Moscow 2008 | LaCrosse 2008 | Pullman 2008 | Pullman Fall, 2009 | Pullman Spring, 2009 | Dusty Fall, 2009 | Pullman Spring, 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Seed Yield lb acre$^{-1}$ | | | | | | | | | |
| Blaine Creek | 2010 | 1435 | 970 | 1155 | 1695 | 1780 | 2980 | 2810 | 1720 | 2580 |
| Calena | 2085 | 1780 | 1105 | 1290 | 2015 | 1565 | 3780 | 3090 | 1930 | 2820 |
| Celine | --- | --- | --- | 1280 | 1765 | 1640 | 3620 | 3380 | 2020 | 2780 |
| Columbia | 2175 | 1460 | 1290 | 1225 | 1550 | 1515 | 3280 | 3060 | 1760 | 2700 |
| Ligena | 2045 | 1540 | 1175 | 1230 | 1740 | 1555 | --- | 3020 | --- | 2580 |
| Average | 2085 | 1490 | 1130 | 1235 | 1755 | 1610 | 3420 | 3070 | 1860 | 2690 |
| LSD, 0.05 | 125 | 480 | 175 | 150 | na | na | 330 | 450 | 220 | 310 |

## Camelina Seed Yield Response to Nitrogen Fertilizer

| Applied N rate | Moscow 2007 | Green-Creek 2007 | Moscow 2008 | Moscow 2009 | Pullman 2010 |
|---|---|---|---|---|---|
| | lb acre$^{-1}$ | | | | |
| 0 | 2020 | 760 | 630 | 1640 | 880 |
| 20 | 2115 | 920 | 670 | 1820 | 1220 |
| 40 | 2080 | 940 | 790 | 2020 | 1700 |
| 60 | 2150 | 1090 | 840 | 2280 | 1920 |
| 80 | 2150 | 1210 | 840 | 2590 | 2190 |
| 100 | 2025 | 1350 | 910 | 2620 | 2380 |
| Average | 2090 | 1045 | 780 | 2160 | 1715 |
| LSD, 0.05 | ns | 200 | 100 | 170 | 130 |
| Residual N: | 185 | 90 | 85 | 70 | 41 |

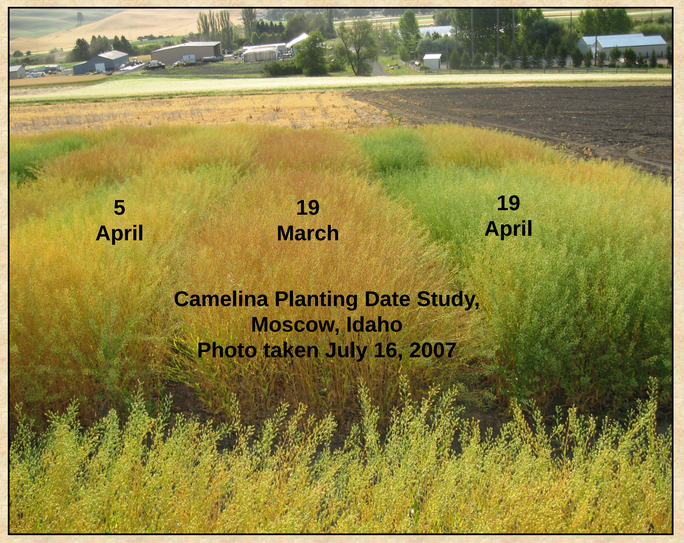
## Camelina Seeding Evaluation at Moscow, 2007

| Seeding | | Seed Yield | Grain Density | Plant Height |
|---|---|---|---|---|
| Date | Method | lb acre$^{-1}$ | lb bu. $^{-1}$ | inches |
| 19 March | Drill | 2170 | 51.8 | 35 |
| 19 March | Broadcast | 2125 | 51.7 | 33 |
| 5 April | Drill | 2065 | 50.9 | 37 |
| 5 April | Broadcast | 1985 | 50.1 | 36 |
| 19 April | Drill | 1650 | 50.9 | 34 |
| 19 April | Broadcast | 1385 | 51.1 | 32 |
| | Average | 1870 | 51.2 | 33 |
| | LSD, 0.05 | 260 | 0.5 | 2 |

## Camelina Compared to Other Spring Crops

| Spring Crop | Moscow 2005* | Moscow 2006* | Moscow 2008 | Pullman 2009 | Pullman 2010 |
|---|---|---|---|---|---|
| | lb acre$^{-1}$ | | | | |
| Camelina | 2300 | 2250 | 1890 | 2580 | 1710 |
| Canola | 1650 | 970 | 700 | 1610 | 670 |
| Yellow Mustard | | 720 | 1390 | 1640 | 690 |
| Oriental Mustard | | 1420 | 910 | 2290 | 700 |
| Wheat | | | 3750 | 3920 | 1700 |
| Barley | | | 4620 | 5490 | 3520 |
| Dry Pea | | | 1890 | 250 | 840 |
| Lentil | | | 1080 | 740 | 480 |

* Comparison between adjacent trials, other comparisons are replicated



**5 April** **19 March** **19 April**

**Camelina Planting Date Study, Moscow, Idaho**
**Photo taken July 16, 2007**

## Results

**Cultivar Trials**

- Camelina average seed yield ranged from 1130 to 3420 pounds per acre and was 2035 lb acre-1 across locations.
- The two highest yielding cultivars were Calena and Celine.
- Seed weights (not reported) varied more among varieties than between sites, and Ligena had the highest average 500 seed weight of 0.69 grams.
- Grain density of cleaned grain varied little across sites and less than 5% among varieties within a site..
- Plant height was directly related to yield among sites, but not among varieties.

**N fertilizer Trials**

- Camelina respond to N fertilizer more as soil residual N decreased, but response was limited in some cases by low yield potential.
- For most agronomic management situations, Camelina responds well to fertilizer nitrogen application and needs 5-7 lb per 100 lb of seed production, unless other management limits yield potential.

**Seeding Trials**

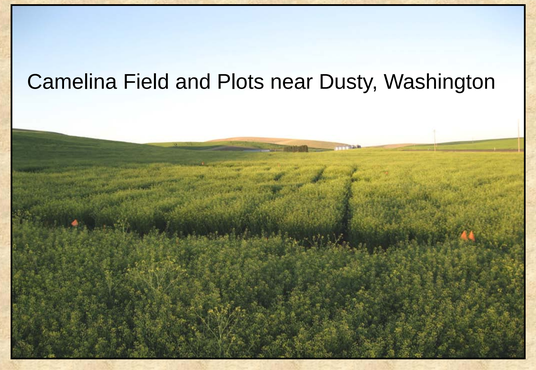
- Seed yield decreased rapidly as seeding date progressed, early spring seeding produces the best results.
- Drilling was the best seeding method especially at later seeding when there was less surface moisture.

**Crop Comparisons**

- Camelina will yield more and is more consistent in yield than other mustard and canola crops.
- Economic analysis shows Camelina will produce good returns if priced similar to canola and should be a good rotation crop to wheat.

## Conclusions

- Camelina appears to be adapted to Eastern Washington and other areas of the Palouse.
- Camelina should require fewer inputs than many other crops due to:
  - Low seeding rates and low seed costs
  - Little or no pest control needs, e.g. flea beetles, aphid, cabbage seed pod weevil were not observed to attack Camelina, unlike canola and mustards
  - Efficient use of water and nutrients.
- Seeding Camelina early in the spring produces the highest yields and grain density and it is resistant to cold and frost.
- Surface seeding can be successful when there is high moisture present, but if that is in doubt, then placing the seed beneath the soil is beneficial.
- Camelina responds well to nitrogen application was soil is deficient.
- A harvest index assessment of Camelina showed a 33% grain/biomass ratio, much higher than Canola.



Camelina Field and Plots near Dusty, Washington