Evaluation of *Camelina sativa* as an Alternative Seed Crop and Feedstock for Biofuel and Developing Replacement Heifers

Bret Hess (Wyoming – Research & Education Grant)

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Title: Evaluation of *Camelina sativa* as an Alternative Seed Crop and Feedstock for Biofuel and Developing Replacement Heifers

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Camelina seed.

Producers:
Charles Rife, Oilseed Breeder, Blue Sun Biodiesel, Westminster, Colorado
Jim Kintz, Managing Director, Energy Fuel Dynamics, Gillette, Wyoming

Cooperators:
James Krall, Professor of Agronomy, Extension Agronomist, University of WY
James Jacobs, Professor of Agricultural and Applied Economics, Univ. of WY
Thomas Foulke, Assistant Research Scientist, University of Wyoming
Duane Johnson, Superintendent and Associate Professor
Dept. of Research Centers, University of Montana, Kalispell, Montana
Chengci Chen, Assistant Professor of Agronomy
University of Montana, Moccasin, Montana

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Camelina sprouting.

Situation:

Rising fuel prices are hampering the economic viability of agricultural producers. At the same time, producers on the northern High Plains would like to identify an ecologically and economically sustainable alternative to the traditional winter wheat-fallow production systems.

Camelina, an underutilized crop that can be produced in the semi-arid environment of the High Plains at lower cost and higher yield than other vegetable oil crops (canola, for example), could meet both challenges.

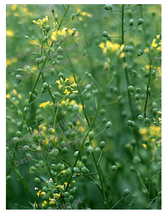
Camelina (*Camelina sativa*) can:

- Yield an oil that produces a low-pour-point biodiesel competitive in price and performance with traditional petroleum products
- Serve as an alternative to fallow in winter wheat-fallow systems
- Generate co-products from oil processing that provide nutritious feeds for livestock

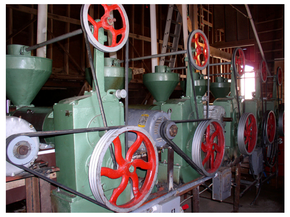
The biodiesel industry is still in its infancy. Supply is limited by availability and cost of feedstocks. Demand is limited by consumer lack of knowledge. Developing synergies between agricultural producers and the biofuels industry could help producers financially, stimulate the industry and help reduce U.S. dependency on oil imports.

Objectives:

1. Evaluate field production of camelina in Montana and Wyoming
2. Evaluate camelina oil for production of biodiesel
3. Evaluate camelina co-products in diets of developing replacement beef heifers
4. Evaluate the ecological impact and economic potential of camelina



Camelina pre-harvest.



Camelina oil press.

Actions:

To evaluate the production potential of camelina, the research team set up trials to assess yield, quality, growth patterns, climate and soil properties:

- 10- to 20-acre plots on grower fields in Wyoming and Montana
- A 10-acre plot at the Montana State University Experiment Station
- A plot at the University of Wyoming Sustainable Agriculture Research and Education Center (SAREC), Lingle

Cropping rotations tested at each site:

	Year 1	Year 2	Year 3
• Traditional winter wheat-fallow	winter wheat	fallow	winter wheat
• Traditional fallow-winter wheat	fallow	winter wheat	fallow
• Winter wheat-camelina	winter wheat	camelina	winter wheat
• Camelina-winter wheat	camelina	winter wheat	camelina

To evaluate camelina oil for production of biodiesel, Energy Fuel Dynamics LLC and Blue Sun Biodiesel are processing the camelina and manufacturing biodiesel, which will be sent to a commercial lab for quality testing.

The feed trials are being conducted at the UW R&E Center in Laramie. In randomized complete block designed experiments:

- camelina meal is replacing soybean meal as supplemental protein
- glycerin is replacing corn as supplemental energy

Agriculture economists will develop enterprise budgets showing units costs and returns for cropping systems and supplemental feeding, extrapolating economic inferences for small- and medium-size farms as well as for rural communities.

The ecological sustainability of cropping systems will be compared by calculating an annual Soil Conditioning Index, a tool for measuring soil organic matter trends.

Heifers eating camelina meal.

Results:

Cooperators have met to assure consistent methods and procedures at all sites. Industry partners have helped identify varieties and growers who can test them.

Seed grown in Wyoming in 2006 was purchased for crushing at a Nebraska biodiesel facility. The resulting oil was used to produce biodiesel and the meal was shipped to the University of Wyoming, where it and the crude glycerin were used in the first of two heifer feeding trials.

Growth and reproductive performance of replacement heifers fed camelina biodiesel co-products

Item	Control	Camelina	Glycerin	SEM	P-value
30-d BW	737.19	737.45	730.44	3.4	0.308
1st 30-d gain	74.75	74.02	71.9	3.6	0.848
1st 30-d ADG	2.67	2.64	2.57	0.13	0.855
Final BW	806.78	808.69	804.09	2.6	0.476
2nd 30-d gain	69.59	71.24	73.66	4.23	0.797
2nd 30-d ADG	2.25	2.30	2.38	0.14	0.798
Total gain	144.34	145.26	145.56	3.42	0.967
Total ADG	2.45	2.46	2.46	0.06	0.978
% detected in estrus	38.1	36.67	49.05	13.63	0.787
1st service conception to AI, %	65.34	58.10	53.33	7.35	0.541

Heifers were fed at 2.5% of BW of a diet consisting of 87.4% bromegrass hay (12.6% CP, as fed) and 12.6% supplement (0.3% of BW as supplement). Supplements were: control (50% ground corn & 50% soybean meal); camelina meal (25.45% CP, as fed); and glycerin (50% soybean meal; 33% ground corn, 15% crude glycerin; 2% corn gluten meal, as fed).

Oil discharge.

Sowing camelina seed.

Potential Benefits:

If camelina can be economically produced and processed in the High Plains region:

- Producers could achieve net returns per acre greater than those for wheat and canola.
- Livestock operations would have access to locally produced sources of protein (camelina meal) and energy (glycerin).
- Soil quality would be improved and erosion reduced by replacing summer fallow.
- Disease and insect cycles could be broken.
- Residual N in the soil could be taken up, potentially reducing ground and surface pollution.