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

Bret Hess (Research & Education Grant Program)

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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.

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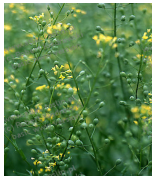

Camelina pre-harvest.

Western SARE Grant: $155,500

Camelina sprouting.

Situation:

Agriculture plays an important role in the rapidly growing commercial biodiesel industry as:

- Vegetable oils and animal fats and their derivatives are attractive as alternative fuels, fuel extenders and fuel additives for diesel engines
- People desire personal energy independence
- The promotion of cleaner energy sources has led many farmers to consider oilseed crops as a source of biodiesel and feed and fuel components

Camelina, with a relatively high oil content and possible adaptability, may have potential as a biofuel crop on the High Plains, and biodiesel and co-products produced from camelina may serve as feedstock for biodiesel and meal for cattle feed.

Objectives:

1. Evaluate field production of camelina for Montana and Wyoming
2. Evaluate camelina for oil 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 in place of fallow, as a feedstock for biofuel and as a co-product in diets of developing replacement heifers

Camelina oil press.

Heifers eating camelina meal.

Oil Discharge.

Material and Methods:

Field Evaluation

A Montana crop rotation study compared winter wheat-camelina continuous cropping to traditional winter wheat-fallow. A randomized complete block design with four replications was conducted in 2008, 2009 and 2010.

In Wyoming, a winter wheat-camelina rotation was compared with winter wheat-fallow in large-block, replicated trials for 2008, 2009 and 2010.

Oil Evaluation

Camelina seed purchased from four producers in Carbon and Niobrara counties was shipped to a commercial processing facility for mechanical extraction and biodiesel production. Seed produced in the Wyoming trials was processed into camelina biodiesel, tested for quality and used on a cooperator farm in Otto.

Co-product Evaluation

A two-year study was conducted on camelina biodiesel co-products in the diets of developing replacement beef heifers. The randomized complete block experiment used Angus Gelbvieh rotationally crossed heifers sorted by body weight.

The heifers were offered one of three supplements:

- A control of 50% finely ground corn and 50% soybean meal
- 100% extracted camelina meal
- A crude glycerin supplement of 50% soybean meal, 33% finely ground corn, 15% crude glycerin and 20% corn gluten meal

Economic Evaluation

Budgeting software was used to evaluate:

- Cost and returns of growing camelina in place of fallow
- Pressing costs
- Substitution of camelina meal for other grains as a feed supplement
- Cost of producing biodiesel from the oil

Results:

Field Evaluation

Camelina adapted well to Montana, with an average yield of 1,100 kg ha in 2009 and 2010. The camelina-winter wheat system returned more organic material to the soil (5,237 kg ha) than the fallow winter wheat system (3,377 kg ha).

In Wyoming, camelina was found to be best suited to limited and full irrigation.

Oil Evaluation

Camelina biodiesel produced at Otto tested similar to the spent vegetable oil the producer had been using, and worked just as well as other fuels in the cooperator's farm equipment.

Co-product Evaluation

A 17% improvement in final pregnancy rate observed for heifers fed camelina meal versus heifers fed the control supplement was consistent with results from other studies in which heifers are fed fat supplements.

Economic Evaluation

The break-even operating yield for camelina was estimated at 521 pounds per acre, which would make it difficult to cover operating costs in eastern Wyoming unless prices for camelina were to rise.

The greater yields in Montana suggest that camelina is a more attractive replacement for fallow, although the current cost of producing on-farm biodiesel from camelina, at $4.89 per gallon, would likely be cost prohibitive.

Feeding heifers camelina biodiesel co-products is economically feasible compared with feeding supplements containing corn and soybean meal.

Impacts of Results/Outcomes:

This study found that camelina:

- Is a marginal dryland crop for eastern Wyoming, both in yield and economic feasibility
- Is more suitable in Montana as dryland yields are high enough to make growing camelina economically feasible
- Produces on-farm biodiesel similar to other on-farm biodiesels
- Co-products (meal and crude glycerin) are suitable substitutes for corn-soybean meal supplements fed to replacement beef heifers for 60 days before estrus synchronization

The project increased producer knowledge and awareness of:

- How to grow and harvest camelina
- How to press camelina seeds and use the oil to produce biodiesel
- How ruminant livestock respond when fed camelina co-products

While the current economics do not favor adoption of camelina in rotations, the project collected data that will be useful to early adopters.

A Wyoming farmer's reactor, wash and diesel tanks for producing camelina biodiesel.