Field Pennycress:
A winter energy crop grown on unused land in the Mid-West Corn Belt

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What is Pennycress?

- Member of Mustard family
- Winter annual
- Native to Eurasia
- North America for 200 years
- High Seed yields
- Right chemistry for biofuels

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Field Pennycress (Thlaspi arvense)
Competitive Advantages as Energy Crop

- Grown as winter crop on unused land
- 40 million acres available in mid-west corn belt
- Low cost to produce, no herbicides or insecticides
- Low demand on soil nutrition and water

- Planted in fall and harvested in spring
- Uses conventional farming equipment
- Allows double cropping with soybeans
- Extra income for farmers; AND decision not OR

- 36% oil content (twice soybeans), right chemistry
- Oil easily extractible, no refining for high quality
- Oil convertible to biodiesel and aviation fuels
- Presscake 32% protein animal feed ingredient
Pennycress Growing Region
3 Billion gallons of seed oil
No impact to conventional corn and soybean supply
Pennycress Seeds
Planting Into Harvested Corn
No-till Drill or Air-flow Seeding
Aerial Seeding of Pennycress into standing corn
Pennycress Production Between Corn and Soybean Crops
Planted in fall, harvested in spring before soybean planting

May       Sep    Nov   April   May   June   Nov

<---------Year 1---------->  <---------Year 2---------->

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Pennycress in the Fall
Pennycress in the Spring
Pennycress Seedpods
Pennycress Harvest
Pennycress Seed Harvest
Mechanical Crushing for Oil Extraction
A LIFE CYCLE ASSESSMENT OF PENNYCRESS 
(*Thlaspi arvense* L.) DERIVED JET FUEL AND DIESEL

Jiqing Fan, David R. Shonnard, Tom N. Kalnes
Peter B. Johnsen, and Serin Rao

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Soybean Seed Yield and Quality as a Response to Field Pennycress Residue
Pennycress Development Activities

• Genetic improvements
  • Seed and oil yield
  • Harvest date

• Agronomic improvements
  • Seed treatments
  • Planting density
  • Optimum harvest time and methods

• Cropping systems analysis
  • Impact on soil nutrition and other crops
  • Impact as cover crop

• Presscake utilization
  • Animal feed use
ARVEGENIX Pennycress Germplasm
US: 21 states; 220 locations; 700 accessions (proprietary)
International: USDA collection

Not shown: Manitoba, Afghanistan
Genetic Improvement of Pennycress

- Sequencing of entire collection
- Alignment with close relative *Arabidopsis*
- Marker assisted selections and breeding
Ai Field Yield trials from 40-acre field with three planting densities.

Company Confidential
Determination of harvest date based on planting date and total oil

![Graph showing percent total oil over time for different planting dates. The x-axis represents planting dates from 1-Sep to 3-Nov, and the y-axis represents percent total oil. Three lines are plotted for different planting dates: 24-May, 27-May, and 1-Jun. The lines show a decreasing trend in percent total oil over time, with the 1-Jun planting date showing the highest total oil levels at the beginning and a steeper decrease than the other dates.]
Presscake Utilization Research

- Meal 32% crude protein
- Glucosinolate is Sinigrin
- Myrosinase inactivated by heat
Arvegenix Research Partners

USDA Agricultural Research Service Peoria IL

Western Illinois University

University of Missouri

Donald Danforth Plant Science Center
Developing a Pathway for Sustainable Biofuels Feedstock

**Capacity:**
Mid-west and Illinois in particular is ideally suited
Research capacity available and experienced
Commercial interests are active

**Needs:**
Coordinating frame work
Leadership from important institutions
Commitment from stakeholders
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