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An Oil-Seed Biofuel Multi- Use Crop Grown with Saltwater

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July 2025

The Idea

Grow a salt-tolerant, oil-seed, multi-use crop on saline land or dry land that can be irrigated with brackish water or seawater, thus freeing fresh water and high quality soil for food and feed and bringing poor land into production.

The Problem

- Fossil fuel dependence - Dwindling fossil fuel reserves at a time of escalating worldwide demand, coupled with issues of security of foreign supply, raises concerns.
- Impending food and feed shortage - Food supplies for humans and livestock will become more stressed as the human population increases and we supplement fossil fuels with biofuels.
- Freshwater shortage - Increased population and per capita water demand are limiting available freshwater. Increased upstream river water withdrawal and ground water pumping exacerbate salinization problems.
- Increasing amounts of salty soil worldwide – Saline soil may be due to traditional crop irrigation, geologic origin, sea level rise, or saltwater intrusion. Rising sea level is salinizing rivers, coastal ground water & farmland.
- Global warming - Changes in rainfall patterns associated with global change create waterlogged soils in some places and drought conditions in other places, both of which limit most crops.
- Annual planting - A substantial amount of energy is consumed by the annual planting and cultivation of the most commonly used biofuel crops.
- Farm to market transportation - Transporting biofuels long distance from producers to users reduces net energy gain. Populations are concentrated in coastal areas.

The Solution

- Seashore Mallow - Kosteletzkya pentacarpos, formerly K. virginica, is a herbaceous perennial oil-seed halophyte.

The Plant's Features

- Perennial (10 years)
- Salt-tolerant, drought-tolerant, & waterlogging-tolerant
- Seeds do not shatter readily & no known diseases
- Not invasive
- Plants can be sown and harvested with traditional farm equipment
- Stores carbon belowground in large perennating carrot-like root

The Potential Products from the Plant

- **Oil from seed for biodiesel fuel and other bio-based products** - The seeds are similar to those of cotton in fatty acid composition. Seeds are ~ 18-20% oil. Highest seed yield to date was ~22 bu/acre with saltwater irrigation and no selection/breeding.

- **Protein-rich animal feed from seed meal cake** - Residual seed meal is ~30% protein.
- **Stem products** – Stem fractions are very absorbent and can be used for kitty litter, small animal bedding, e.g. chickens, bio adsorbent for organic liquids, and hydromulch for erosion control. First year plants typically produce one stem and second year four to seven. Older plants may produce many more per plant each year (record is >100).
- **Carbon credits** – Carbon storage takes place in the perennial roots.

Research Needs

- **Refine agronomic and production techniques** – Evaluate techniques to maximize yield (seeding density, salinity, and harvest refinement), irrigation techniques (flood, sprinkle, drip, etc.) and frequency, fertilization; and increased pest resistance; evaluate halophytic winter annuals as cover crops; explore herbicides (needed when salinity is low).
- **Crop improvement** – Continue a breeding program to increase yield. Assess plants grown from seeds collected from its range along the mid-Atlantic, Southeast, & Gulf coasts. Refine tissue culture & transformation protocols.
- **Market development** – Interactions between growers and commercial entities need to be formed to develop and advertise uses and promote sales outlets.

About the Authors

After more than three decades of research on salt-tolerant plants, Jack and Denise are retired and living in Lewes, DE.

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About this Publication

Written: circa 2010

Revised: 2025