

Prairie Carnation (Saponaria vaccaria) – A Potential New Industrial/Medicinal Crop for the Prairies

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BACKGROUND

Saponaria vaccaria, commonly known as cow cockle, is a member of the carnation family (Caryophyllaceae) which is native to Europe and Asia. In China, the seed has been used for centuries, as a herbal medicine, usually as one component of a multi-component formula, for treating such conditions as irregular menstruation, breast infections, and some cancers.

In North America, the plant is an introduced species, well known as an annual weed, which was commonly found in grain fields. Today, as a consequence of the changes that have occurred in farming practices over the last decade or so, it is no longer seen as frequently. Several perennial relatives, such as white cockle and night flowering catch-fly however, are sometimes mistaken for it. Although the seed is used as a medicine in China, in North America it is listed as being toxic to livestock.

The plant is a prolific producer of seed, which superficially resembles canola in size, shape, and color. Unlike canola however the bulk of the seed is composed of a unique small-grained starch (ca. 65%) in addition to protein (11–15%) and a small amount of oil (3–4%). The seed also contains a number of phytochemicals which are the components likely responsible for its medicinal properties in humans and toxic properties in some animals. These include quillaja-type saponins (2-4%), cyclopeptides (0.3–1%), and phenolics (0.4–1%).

The plant was previously investigated as a potential new crop as early as the 1960's in Montana and subsequently in Manitoba (1970's – 90's). The early investigations focused mainly on the agronomics of the plant based on processing of the seed for production of specialty starches.

Our current interest has focused on profiling the phytochemicals in the seed as value-added components and developing specific varieties which will be labeled as prairie carnation in order to distinguish them from their weedy relatives.

AGRONOMICS

Some of the general agronomic characteristics are listed in the table below:

Characteristics	Comments
Seed similar to canola in size and shape - 58 lbs/bu; 0.6 gm/ 100 seed	Equipment for seeding and harvesting canola can be used for cow cockle
Yield (seed) – dependent on variety, weather, and N	400 – 1200 kg/acre
Days to Maturity – similar to canola	95-100 days
Shattering – no problem	Reglone may be required
Diseases	Susceptible to <i>Alternaria</i> . Fungicide coating (seed) may help
Herbicides	Tolerant to Poast, Assert, Converge Pro. Completely controlled by Odyssey, Basagran, Roundup. Set-back by MCPA.
Resistant to Insects	
Tolerates heat and drought (once established)	
Fall or early Spring seeding possible	Seedlings very cold tolerant
Nitrogen	Responds to N strongly, use rates similar to canola
Seeding rate	Similar to canola – typically 5–7 lbs/acre
Seed dormancy	New seed is dormant under lab conditions (constant temp.) – no problems in field. Seed is long lived.

Table 1. General agronomic characteristics of *Saponaria vaccaria*.

SEED COMPOSITION

The seed composition is listed in Table 2. Seed may contain up to 10% moisture.

Component	%	Comments
Starch	60-65	Very small uniform particle size – number of specialty applications possible – see References below.
Protein	11-15	Amino acid profile similar to soy protein, high in glutamic, aspartic acids and arginine; contains ribosome inactivating protein pyramidatine – currently being investigated for use in cancer treatment.
Oil	3-4%	70% Triglycerides: mainly linoleic (43%), oleic (37%), and palmitic (13%); 25% phospholipids:
Fiber	10-11%	Mainly in the hull – some soluble fiber present
Ash	9-11%	Mainly K, Ca, Mg
Saponins	2-4%	Mainly Quillaja-type saponins – many potential industrial and medicinal applications
Phenolics	0.4-1%	Possible applications as food preservatives and nutraceuticals (antioxidants)
Cyclopeptides	0.3-1%	Possible pharmaceutical precursors; nutraceuticals

Table 2. Main components of *Saponaria vaccaria* seed.

COMMERCIALIZATION/MARKETING PLAN

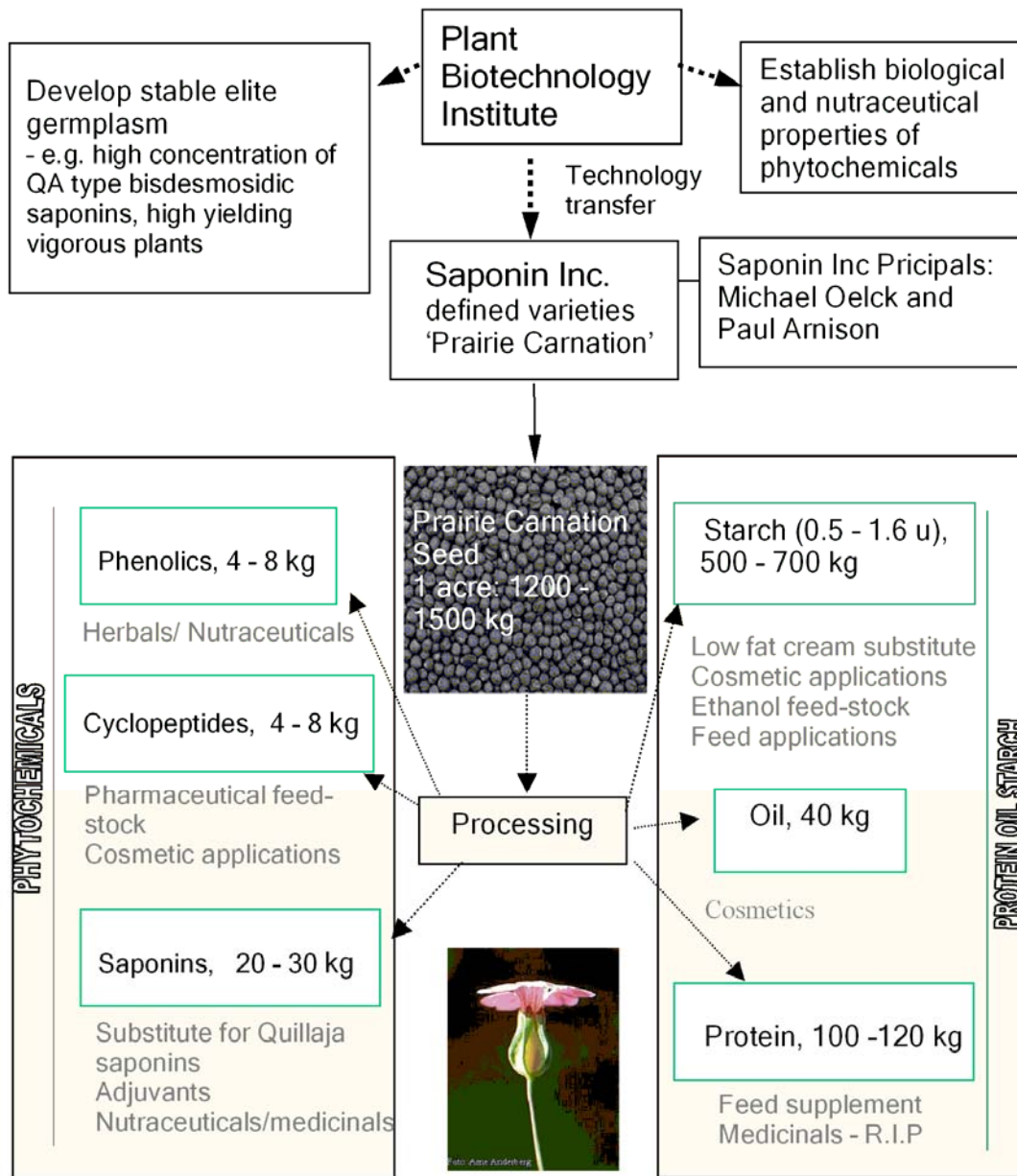


Fig.1. Outline of Commercialization/Marketing Plan, based on estimated crop and processing yields theoretically possible with selected varieties.

CONCLUSIONS

Saponaria vaccaria has excellent agronomic characteristics and can be grown on large scale. A number of different 'chemotypes' are currently available.

For crop potential to be achieved, efficient large-scale processing and fractionation methods need to be developed, and markets for various fractions need to be found.

Overall, even if successful, prairie carnation will likely be a small-acreage, 'niche', non-food crop.

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US patent 3,622,389 (Assignee: Montana Agricultural Research Corporation, 1971) discloses a process for producing purified starch from cow cockle seed.

US patent 4,279,949 (Assignee: National Starch and Chemical Corporation, 1981) discloses a use of cow cockle starch as a clouding agent in food and beverage fluids.

US patent 5,370,894 (Assignee: The Nutrasweet Company, 1994) discloses a process for producing a carbohydrate cream fat substitute by modifying starches having a small particle size. Starches utilized were: taro (1.4-4.0 microns), cow cockle (0.5-1.6 microns), pigweed (0.75-1.25 microns) and buckwheat (1.3-12 microns).