The Safflower Co-existence Working Group

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USDA 87th Agricultural Outlook Forum
GLA Safflower – What it is.

A conventional safflower variety genetically engineered to contain 70% gamma linolenic acid (GLA)

It is visually indistinguishable from conventional safflower in the field

Conventional Safflower

GLA Safflower
The Genetic Engineering Part

18:0 stearic acid $\xrightarrow{\Delta 9}$ 18:1 oleic acid $\xrightarrow{\Delta 12 \text{ desaturase}}$ 18:2 linoleic acid $\xrightarrow{\Delta 6 \text{ desaturase}}$ 18:3 $\gamma$-linolenic acid (GLA) $\alpha$-linolenic acid
## Fatty Acid Comparison

<table>
<thead>
<tr>
<th>Fatty acids (%)</th>
<th>Common name</th>
<th>SONOVA 400</th>
<th>Oleic Safflower Oil</th>
<th>Linoleic Safflower Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:0</td>
<td>palmitic acid</td>
<td>7.1</td>
<td>5.1</td>
<td>7.3</td>
</tr>
<tr>
<td>18:0</td>
<td>stearic acid</td>
<td>2.1</td>
<td>1.9</td>
<td>2.7</td>
</tr>
<tr>
<td>18:1</td>
<td>oleic acid</td>
<td>35</td>
<td>80.3</td>
<td>13.4</td>
</tr>
<tr>
<td>18:2</td>
<td>linoleic acid</td>
<td>12.2</td>
<td>11.4</td>
<td>74.9</td>
</tr>
<tr>
<td>18:3 GLA</td>
<td>gamma-linolenic acid</td>
<td>41.7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18:3 ALA</td>
<td>alpha-linolenic acid</td>
<td>0.2</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>20:0</td>
<td>arachidic acid</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>20:1</td>
<td>gadoleic acid</td>
<td>0.3</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>22:0</td>
<td>behenic acid</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Sold as SONOVA 400
(400 mg GLA per gram oil)

Completed the FDA New Dietary Ingredient process November 25, 2009

Used alone in capsules and in blends with flaxseed and fish oils
Why Safflower

- A good starting fatty acid profile
- Transformable
- A minor oilseed crop
- Reduced demand for safflower oil and reduced acreage over past 18 to 20 years
- Safflower growers interested in an alternative
# Farms and Acreage

<table>
<thead>
<tr>
<th>Crop</th>
<th>Farms</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safflower</td>
<td>255</td>
<td>47,550</td>
</tr>
<tr>
<td>USA</td>
<td>766</td>
<td>164,003</td>
</tr>
<tr>
<td>Alfalfa Hay</td>
<td>3,587</td>
<td>986,982</td>
</tr>
<tr>
<td>USA</td>
<td>290,726</td>
<td>20,244,497</td>
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<tr>
<td>Corn (grain)</td>
<td>606</td>
<td>189,965</td>
</tr>
<tr>
<td>USA</td>
<td>347,760</td>
<td>86,248,542</td>
</tr>
</tbody>
</table>

Source: USDA NASS Census of Agriculture 2007
GLA safflower is a Specialty Crop

- All growing contracted and managed by Arcadia
- Planting seed, growing, harvested grain and finished product production managed by Arcadia
- All under an Identity Preservation System
- The derived commercial product is a Dietary Supplement
Critical Control points are identified

Standard Operating Procedures (SOP) are in place for all crop and product management activities with the focus on preventing a loss of containment

Forms are used to record actions associated with the SOPs – including confirmation of the activity and verification

Systems are audited

SOPs are modified as necessary to ensure the efficiency of the system
In 2006 following a USDA Notification for field trials with GLA safflower, a California seed and oil company expressed concern about ensuring the identity of their safflower oil market.

Through discussions with the USDA, California safflower growers and agricultural organizations, we determined that a forum for interaction and information sharing could resolve the concerns.

In 2007 the Safflower Co-existence Working Group was officially formed as a sub-committee within the California Seed Association.
Meet as often as needed but at least annually in advance of safflower planting

Arcadia identifies all field trial and production areas and maps them through the California Crop Improvement Association “pinning” system

If there are issues or concerns about locations, these are addressed through the SCWG
CCIA Mapping

All pins are displayed

YOUR pins will be yellow

Pins for Arcadia GLA Safflower are purple
The circle represents the desired Isolation Zone – 2 miles.
GLA safflower is a Specialty Crop

- All growing contracted and managed by Arcadia
- Planting seed, growing, harvested grain and finished product production managed by Arcadia
- All under an Identity Preservation System

A defined and controlled growing region

Processed in a facility certified for food grade vegetable oils

The derived product, SONOVA 400, is a dietary supplement with no food uses
Our target production area was California

Safflower production is limited to a defined area

A small number of growers

GLA safflower is grown under Identity Preservation

Contracting with growers, we can identify production locations well in advance of safflower planting time

All planned GLA production locations can be mapped with the locations identified to all members of the SCWG
Where Can this Process Work?

- It can be applied to smaller acreage specialty crops.
- It can be used with a commodity crop during the pre-commercial stages of development.
- Applied at a local or county level with the cooperation of Agricultural Commissioners, growers, farm groups and individual growers
- Communication and decisions that are science based