

The Production and Marketing of GLA - Containing Oils

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GLA - Containing Oils in Commercial Use

- 1) Evening Primrose (*Oenothera* spp.)
- 2) Borage (*Borago officinalis* L.)
- 3) Blackcurrant (*Ribes nigrum* L.)
- 4) Fungi (eg. *Mortierella*)

Evening Primrose

- Most important commercial GLA source
- Originated in North America
- Now widespread in temperate regions
- Date of introduction in China?
- Harvested in China as 'wild sesame'
- First commercial crop for GLA in 1970 in England

Life Cycle of the Evening Primrose

- Three possible sowing times:
 - Early autumn, overwinters as plants
 - Late autumn, starts growing in early spring
 - Spring, starts growing later in spring
- Flowers June - September
- Harvest September - October
 - Later sowing gives later harvest

Agricultural Research on Evening Primrose

- Academic research from c. 1900
- Research on EP as crop started in 1973
- Still continues in UK and China
- Aim to improve:
 - Quality
 - Reliability
 - Yield

Production in the West

For:

- Mechanised production
- Modern varieties

Against:

- High farm incomes from other crops
- Incomplete weed control
- High seed cleaning losses
- High prices

Production of Evening Primrose in China

- Started exporting c. 1978 as 'wild sesame'
- Exports for GLA started c.1980
- First exports from wild harvest
- First crops grown 1996 onwards
- Now supplies mostly cultivated seed
- Wild seed still important in shortage years

Production in China

- For
 - Low wage costs
 - Hand labour
 - Good climate and soils
- Against
 - Low quality
 - Difficult for Western buyers

World Evening Primrose Supply

- Dominated by China (>90%) because of price
- Demand is steady and rising
- Supply is very variable year to year
- 5 to 7 year cycle of shortage and surplus
- Currently in shortage because of drought

World Evening Primrose Demand

- Total quantity difficult to estimate
- No global data
- Secrecy about sales
- Total use probably 1 - 2,000 tonnes oil p.a.
- Mostly traded as oil, extracted in China

Oil Extraction - 'Cold' Pressing

- Low capital cost
- OK when done well
- Risk from high temperatures (cis/trans)
- Risk of oxidation
- Low efficiency
- Need for refining

Oil Extraction - Use of Solvent

- High efficiency
- Risk of solvent residues
- Use of low grade solvent
- Risk of high Peroxide & Anisidine values
- High capital cost
- Need for refining

Oil Refining

- Cleans up oils after poor extraction...
 - ... but removes natural anti-oxidants
- Unrefined EPO has a very high level of anti-oxidants because of need to preserve wild seed in soil
- Gives good stability, even without vitamin E
- May increase effect in the body

Optimum Strategy

- Solvent extract to get high yield
- Use gentle conditions to preserve quality
- Remove as much solvent as possible (<2 ppm)
- Do not refine

Markets for GLA Oils

- Health food
 - Largest market
 - Primarily soft gel capsules
 - New products are mixtures with
 - Fish oils
 - Vitamins
 - Herbal extracts

Markets for GLA Oils

- Pharmaceutical
 - Evening Primrose only at present
 - Need licence
 - Big research investment
 - Currently for eczema and breast pain
 - Research on other diseases ongoing
 - Storage oil for concentrates

Markets for GLA Oils

- Cosmetics
 - Creams, lotions, shampoo, soap
- Veterinary
 - Primarily cats and dogs
 - Some work on horses
 - Zoos

Potential for Biotechnology

- Could produce GLA in major crop
 - eg. sunflower, soybean, canola
- GLA is produced by $\Delta 6$ -desaturase
- Gene has been isolated from borage
- Transformed tobacco produces GLA
- Should be possible to transform oilseed crop
- Could reduce cost of GLA by 90%
- Will take 3 - 8 years to commercialisation

Applications for Biotechnology

- May not be acceptable for health food
 - Evening primrose will remain dominant
- Use as pharmaceutical oil
- Use as source of GLA for concentration
 - Products based on high GLA %
 - Synthetic triglycerides
 - Combinatorial lipids
- Functional foods

Market Predictions

- Health food market
 - Will continue to grow
 - Evening primrose will dominate
- Functional foods
 - New market
 - Potential for large growth
 - Initially evening primrose
 - Transformed oils as well later

Market Predictions

- Pharmaceuticals
 - Potential for large growth
 - Natural oils will be replaced by concentrates
 - Raw material initially borage
 - Major use for transformed oils later

Conclusion

The Future is Bright!