Saffron: A Good Fit for New England

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What is Saffron?

*Crocus sativus* (=cultivated)

- The most expensive spice in the world
  over $3,000-9,000/lb!
- Origin: Probably Greece or Crete
- Flowering: autumn
- Reproduction: Corm
- In cultivation for over 3,500 yr
Why grow SAFFRON in the Northeast?

**Over 90% of farms in the Northeast are ranked as “Small”.**

- Small farms = less than $350,000 gross farm income.
- 82% of all US farms are small FAMILY Farms.
- 40 acres are lost to development every hour in the US.
- 42% of all developed land in the US is in the East.
- **Crop diversification is key to success for small farms.**
What is Saffron good for?

- Culinary spice
- Medicinal herb
- Medicinal extract
- Perfume
- Ornamental plant
- Fabric dye
- Liqueur
In 2016 the US imported **46 tons** of saffron! Imports are estimated to **triple** by 2025.
Why is Saffron so expensive?

Currently most harvesting is done by hand.

One acre (field-grown) in Iran produces about three pounds of saffron.
Why is Saffron so expensive?

Currently all processing is done by hand.

4,000 blooms = 1 oz of saffron
Saffron in Spain, 2016

Price in Spain:
1 g (0.035 oz) for 7.50 Euros ($8.36)
Equal to: $3,792/pound

Price in the US:
~$20/g = $9,072/pound

Price of gold: $40/g

40 flowers (120 threads) = ¼ gram = ½ teaspoon
Potential of Saffron for Diversified Farmers

- High value crop with long shelf live
- Low input (except harvesting & processing)
- Production is relatively simple
- Most labor outputs are for 4 weeks in Oct./Nov.
- Fits into traditional vegetable production cycle
- Lots of possible value-added products

- Saffron honey
- Saffron flavored oil
- Saffron flavored syrup
- Saffron safes
Saffron Production Cycle

- **Vegetative stage**: Dec. – Mar.
- **Flowering/harvesting/drying**: Oct.-Nov.
- **Sprouting**: Sept.
- **Plant corms**: Aug.-Sept.
- **Dormancy**: July-Aug.
- **Corm development**: Apr. – June.
Where can Saffron be grown commercially in New England?

Our Hypothesis:
In high tunnels in colder zones
In the field in warmer zones

Zones 4-5?

Zones 6-7?
High Tunnel Growing Methods Tested 2015-2016

Raised beds

Milk crates
Why High Tunnels?

- Low cost to erect and operate
- Protected environment but not too hot
- Used for other traditional crops
Why Milk Crates?

✓ Easy to move so growers can start other high-value crops like tomatoes in spring
✓ Inexpensive (often free) and readily available
✓ Suitable depth for growing saffron
✓ Light weight but sturdy and durable
✓ Protect corms from rodent predation
Production Methods

Source of Corms: PA (2015); Holland (2016)

Corm size: 9-10 cm circumference

Planting date: Aug. 25-Sept. 1

Irrigation: top watering

MILK CRATES

✓ Milk crates (11 in. tall) covered inside with 2 strips of weed cloth.
✓ Crate filled with 4 in. top soil.
✓ Corms placed tip end up on top soil, covered with 2 in. of top soil and 4 in. perennial potting mix with compost.
✓ 11 corms planted/crate (=118 corms/m²)
Production Methods

RAISED BEDS

✓ Raised beds (12 in. tall), bottom covered with hardware cloth (2016 only)
✓ Corms planted 2 in. deep in top soil covered with 4 in potting mix
✓ Planting density: 118 corms/m²
Harvesting and Drying Methods

Harvest Period ~35 days: October 12-November 20

✓ Harvested by hand every 2 days.

✓ Stigmas, stamens and petals separated and dried.

✓ Fresh and dry weight of each part recorded.

✓ Drying methods tested:
  • Air dried 48 hr.
  • Air dried 24 hr, oven 1 hr at 35°C.
Post Harvest Procedures

✓ Check for rodent damage
✓ Weed beds
✓ Water as needed
✓ Corms reach dormancy by June (leaves turn brown)
Factors We Assessed

✓ Saffron yield
✓ Saffron quality
✓ Corm yield/survival
2015 & 2016 Stigma Yield

- Greater yield in crates than in raised beds (rodent damage)
- Yield increased in Year 2
- Our estimated saffron net revenue = $4.03 – 5.25/ft²
- Estimated yield/acre: 5,624 gr [12.6 lb] = $112,480
- Greater yield than Iran (0.34 gr/m²) and Spain (0.60 gr/m²)
- Greater revenue per sq ft than tomatoes ($3.51) or winter greens ($1.81)
Why was our yield higher than Iran and Spain?

- Soil fertility
- Soil moisture
- Protection from rain and wind damage
Corm Yield

<table>
<thead>
<tr>
<th>Treatment</th>
<th># primary corms 2015</th>
<th># secondary corms in 2016</th>
<th>Average wt/corm 2015</th>
<th>Average wt/corm 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>In ground</td>
<td>465</td>
<td>407</td>
<td>11.2 grams</td>
<td>10.3 grams</td>
</tr>
<tr>
<td>In crates</td>
<td>465</td>
<td>756</td>
<td>11.2 grams</td>
<td>7.7 grams</td>
</tr>
</tbody>
</table>

- Almost 2 times more corms harvested from crates than from raised beds.
  Major factor: rodent feeding in raised beds

- Corms from raised beds were 1/3 heavier than those from crates.
  Major factor: soil moisture deficit in crates
Rodent Damage

Rabbits

Voles & Moles

Crates

2016 flowering patterns

Raised beds
All that Glitters is NOT Gold!

Mexican Saffron is not the real thing.

It is safflower (Carthamus tinctorius), a frequent filler or fraudulent product.

Saffron is the most frequently adulterated spice in the world.
Saffron quality

Analyses by Dr. Charles Cantrell, USDA ARS, Natural Products Utilization Research Lab, University, MS
Local Market Opportunities: 
Product Quality & Authenticity

Present certification of Greek Organic Saffron.
Can processing be mechanized to reduce labor costs?
Necessity is the Mother of Invention.

Blue Monkey Gathering Saffron
Fresco from the Palace of Knossos on Crete (1500 BC).
Summary

- Saffron yield higher in crates than in raised beds.
- Saffron yield greater in high tunnels than in fields in Iran and Spain.
- In 2015 saffron quality similar to other products.
- Corm yield greater in crates than raised beds. Rodent damage and water availability were factors.
- Corm size and weight greater in raised beds than in crates.
- Revenue from saffron greater than tomatoes or winter greens.
Current Research & Outreach

• Field production in different VT coldhardiness zones.
• Compare saffron yield over time (years).
• Assess saffron quality relative to coldhardiness zones.
• Test different ways to minimize rodent and bulb mite damage.
• Workshop in March 2018.
• Moderate Saffronnet (internet listserv).

Future Research

• Field vs high tunnel vs low tunnel production in different coldhardiness zones.
• Market analysis and production cost study.
• Determine factors affecting saffron quality.
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