

# Saffron, Coriander, & Cumin

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## Introduction

Saffron, coriander, and cumin are commercially significant spices that may have small-scale production potential in Kentucky's growing zones. Saffron is the dry stigma of the flower of the *Crocus sativa* L. plant. Coriander is the seed of cilantro (*Coriandrum sativum*), especially from cultivars selected for seed production. Cumin is derived from the dried seed of the herb *Cuminum cyminum* L.

All three crops are used worldwide as spices and food ingredients. Essential oils from saffron, coriander and cumin are used in fragrances, cosmetics, dyes, and as flavorings for tea and alcoholic beverages. The three crops have been used for medicinal purposes in various cultures; extracts from saffron and cumin are ingredients in some commercial pharmaceuticals and dietary supplements.

## Marketing

Saffron, coriander, and cumin are readily available through food retailers and wholesale market channels. Potentially profitable market niches exist for small-scale production of all three crops in Kentucky; however, producers must navigate both marketing and production challenges. These crops will likely be more successful in Kentucky if they are either part of a diverse, direct marketed crop mix or are sold in value-added products at profitable price points.

Direct markets (especially farmers markets, on-farm sales, and internet marketing) are common market channels for higher-value crops grown on a small scale. Saffron, coriander, and cumin may also be used in value-added agricultural products. For more information about each of these market



Saffron is the dry stigma (red) of the *Crocus sativa* L. plant.

channels, consult the [fact sheets about marketing and value-added agriculture](#) available from the Center for Crop Diversification. Producers considering saffron, coriander, and cumin will also benefit by consulting with growers in other regions that have developed markets for the crops.

Saffron is used in both culinary and medicinal applications. Saffron, often called the world's most expensive spice, is typically sold by the quarter-ounce

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in the U.S. Most saffron used in the U.S. is imported from Spain. Small-scale domestic saffron production centers developed in the 2010s in the West and New England, especially Vermont. Saffron production is also reported in Ohio, Pennsylvania, North Carolina, and Georgia. Small-scale saffron producers have focused on obtaining price premiums through direct markets including farmers markets, internet marketing, and selling directly to chefs. Other markets mentioned for nascent U.S. saffron production are health, beauty, and beverage ingredient markets.



Coriander (above) is the seed of cilantro (below).



Coriander is a common flavoring in curries, used to flavor meats and alcoholic beverages, and is also used in essential oils. Coriander seed is traded in two broad categories. Larger-seeded varieties, like those grown in Canada, are usually faster to maturity than smaller-seeded varieties, which are grown in Mediterranean climates. In Canada, especially the Prairie Provinces, coriander seed is usually marketed through contracts with processors that usually favor lighter-colored coriander with certain flavor and aroma characteristics.

Minimal foreign matter content (chaff, stems, insect parts) is also important in bulk coriander. Economies of scale, especially in harvest and cleaning, make it difficult for small producers to enter coriander commodity markets. Coriander seed grown for small-scale value-added production is a possibility for Kentucky direct markets. Regional food producers seeking to source coriander as a food ingredient are a potential market for larger-scale production. There is reportedly some demand for coriander as an ingredient in health and cosmetic products; producers should conduct due diligence and pay attention to regulations that could apply if producing a crop for health, medicinal, or dietary supplement uses.



White cumin seed.

Cumin, along with coriander, is one of the world's major spices that may be grown in a non-tropical climate. White cumin seed is the most common type for culinary uses. Black cumin seed is very popular in the Middle East, and black cumin is among spices used for health or pharmaceutical purposes in fish and livestock production, as well as some human health evaluations. It may be possible for Kentucky growers to process cumin seed on a small-scale for use in spice packets, meat rubs, and other value-added farm products.

Federal Drug Administration regulations specify the manner and labeling in which herbs and spices may be sold for health supplements and medicinal purposes. Producers should follow all state and local regulations surrounding the sale of products containing health claims. If growing for wholesale buyers, producers should understand any potential risks, including pricing, broken contracts, and product end uses. This fact

sheet in no way constitutes an endorsement, or guidelines and recommendations for, the sale of herbs and spices for health supplements or medicinal purposes. If you are choosing to grow herbs and spices be sure to check how you are affected by the Food Safety Modernization Act's Produce Safety Rule. You can read more about the FSMA PSR [here](#), and your local extension agent can help you determine how FSMA might affect you and your operation. A short quiz from the University of Kentucky to help you learn if FSMA applies to you is available [here](#).

## Market Outlook

The main centers of saffron production are Iran, India, the Middle East, and the Mediterranean region, particularly Spain, Italy, and Morocco. There is minor production in China, Turkey, and North America. Retail price points for U.S. grown saffron have been reported as significantly higher than the price of internationally sourced saffron, according to reports at the Saffron Research and Production Conference, hosted annually by the University of Vermont.

India is the global leader in coriander production. Canada, producing field-grown coriander in the Prairie Provinces and Ontario, usually exports more than half its crop to the U.S. Morocco, Romania, Bulgaria, Argentina, and India are also significant coriander exporters to North America. Coriander seed is also used for essential oil extraction, as well as health and beauty uses. Markets for these purposes appear to favor large traders purchasing globally sourced products from lower-cost producers.

Cumin, used to flavor many curries, is widely grown in Asia, the Middle East, and Africa. India is also the world's leader in cumin production, and large production areas occur in Iran, Morocco, Pakistan, and other regions in the Middle East and Africa. Cumin is also grown in commercial quantities in the Americas,

including Mexico. Research in Bangladesh has indicated potential benefits of black cumin managing fungal diseases in commercial fish. Like coriander, cumin is also used in health and beauty products, and these markets favor larger, low-cost producers.

## Production Considerations

### *Planting*

Saffron is cultivated from corms, short swollen stems that store food. Plant disease-free corms from reputable and established sources. Coriander and cumin are both grown from seed and transplanted in smaller plantings. Commercial coriander and cumin plant-

ings are direct seeded. Coriander seed can be harvested from both large-seeded and small-seeded plants; the small-seeded coriander plants tend to be taller and have higher essential oils content, according to production recommendations from Saskatchewan. Small-scale producers can benefit by purchasing coriander or cumin seed from cultivars with the



Saffron is cultivated from corms planted in late summer.

desired culinary or essential oil characteristics.

Plant saffron, coriander, and cumin in well-drained soils rich in organic matter and in full sun. Saffron has been grown in Vermont both in the field in planting beds, raised beds, or milk crates, or in high tunnels in the ground, raised beds, or milk crates. Coriander and cumin may be seeded in the spring. Coriander seedlings are more frost-tolerant than cumin; follow guidelines for the variety and plant zone. Commercial coriander producers sow the crop using press drills in rows 6 to 12 inches apart, with a spacing of 1 to 2 inches between seeds.

Saffron corms are planted in late summer with flowering, harvesting of the flowers, stripping of the stigmas, and drying in October and November. The plant grows vegetation from December to March, and daughter corms (cormlets) are produced from April to June before a dormant period. There are two dormancy periods for saffron, according to research in Rhode Island:



deep dormancy in June and July, which is the best time for replanting daughter corms; and shallow dormancy, in August and September. Soil fertility, as well as field layout, will impact corm spacing. Recommendations developed for the U.S. may be accessed at the [North American Center for Saffron Research & Production](#).

### *Irrigation*

If grown in the field, saffron should not require irrigation – rainfall should be sufficient. If grown in a high tunnel, the soil should be moist but not too wet. Irrigation needs of cilantro depend on soil conditions; overhead watering can be used to soften the soil before tilling, preparing seedbeds, and for germination. Cilantro grows best with frequent, short irrigations because it has a shallow root system. After germination, furrows or drip tapes work best for irrigating cilantro, but growers should be careful not to overwater the crop as this can lead to disease problems. Cilantro seedlings need about 1 inch of water per week. Cumin needs to be watered regularly using drip irrigation. The soil should be allowed to become almost totally dry between waterings, then should be soaked.

### *Fertilization and weed management*

Fertilizer and lime requirements for saffron, coriander, and cumin will vary depending on soil type and soil health. Conduct a standard soil test and consult published recommendations, along with recommendations from experienced growers, to best determine fertility needs. For coriander, seeding rates and fertility requirements for coriander seed production may differ from requirements for fresh cilantro.

Saffron, coriander, and cumin can experience heavy weed pressure. All three crops require vigilant weed management. Coriander, in particular, is a poor competitor. Small-scale producers should plan for effective weed control using recommended seeding rates, mulches, cultivation, approved weed control products, or a combination of controls. Mulching and hand weeding are reported as the most common weed control methods for saffron grown in the Northeast. Planting coriander and cumin transplants into mulched beds can limit weed competition.

### *Pest management*

Saffron researchers in New England report saffron is susceptible to a wide range of pests. Foremost are rodents. Saffron bulb mites (*Rhizoglyphus robini*), a pest

hosted by potatoes, onions, garlic, and members of the iris family, are another challenge. Thrips and blister beetles (*Meloe proscarabaeus* L.) are major saffron insect pests. Corm rots, resulting from fusarium and aspergillus, and corm neck rot (*Rhizoctonia crocorum*) are major diseases.

Coriander, a member of the *Umbelliferae* (carrot) family, is susceptible to many diseases affecting members of the carrot family, like aster yellows disease. Practice crop rotations to avoid aster yellows and similar diseases. Soilborne diseases affecting coriander seed and seedlings include *Fusarium* spp. and *Rhizoctonia*. For seed production, blossom blight (*Aureobasidium* spp. and *Ascochyta* spp.) can be devastating in coriander. Bacterial leaf spot can impact the growing plant. Thrips are among the economically significant pests of coriander in Canada.

Commercial cumin production requirements are not described for North America. Larger-scale plantings could be subject to insect and disease pressure that are not present in home gardens and small-scale plantings. Research and develop a suitable integrated pest management (IPM) plan for both cumin and coriander before starting large-scale plantings.

### *Harvest and yield*

Saffron flowers are harvested by hand. Approximately 4,000 blooms produce enough stigmas to yield 1 ounce of saffron, according to the North America Center for Saffron Research & Development. This results in a yield of less than 4 pounds per acre.

Flowers are often picked in the earlier morning, before they are open, but may also be picked when the flower is partially or fully open. The red stigmas are then separated from the flower petals and yellow stamens. This should be done as soon as possible, as wilted flowers make it harder to remove the stigma. Some producers pick the stigmas directly from the flower in the field. The stigmas must then be dried using temperatures less than 170 degrees F. For more details about this time-consuming process, consult “[Saffron Harvesting and Processing](#)” from the University of Rhode Island, as well as the [University of VT Entomology & Saffron Research YouTube channel](#).

Smaller plantings of coriander and cumin may be har-



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vested by cutting the stems with shears and then separating seed by hand. Seed must be properly dried and cleaned for use. Mechanical harvest, using combines and windrowers used for oilseeds and pulses, are used to harvest coriander seed in Canada.

#### *Postharvest handling and storage*

Postharvest handling and processing are essential for market success with spices and herbs. Improper handling may result in severe product quality decline. Detailed postharvest handling methods for saffron are available from the [North American Center for Saffron Research & Development](#). For cumin and coriander, small-scale techniques used internationally could apply. Refer to traditional practices and updated techniques, including those in the FAO report, “Herbs, spices and essential oils,” referenced at the end of this publication.

#### *Labor requirements*

Planting and production labor will vary according to crop, harvest system, and post-harvest processing. Harvest and postharvest labor will be high for small-scale production of these crops because mechanization is likely cost-prohibitive. Harvest labor is especially an issue for saffron, according to the North American Center for Saffron Research & Development.

## **Economic Considerations**

Producers should estimate their costs of producing a crop before planting. This allows a producer to knowledgeably pursue markets where customers are willing to pay a price higher than the cost of producing the crop. Include the costs of marketing the crop when calculating production costs. There may be significant marketing costs if a producer is far from a suitable market outlet or if existing customers are unfamiliar with saffron, coriander, and cumin and the value-added products made from these crops.

Site preparation and planting costs may be significant for new producers. Producers should determine the actual purchase prices of seeds or corms from reliable suppliers, including the shipping costs associated with the purchase. In addition to seed costs, there may be costs incurred to produce coriander and cumin transplants. These costs can include facility costs for growing transplants (like grow lights and tables or a small greenhouse), containers, labor, and the growing media. New producers might also incur costs necessary to establishing and preparing raised beds. Construction and maintenance costs might be incurred if any of the crops are grown or started in protected structures, like high tunnels.

Other preharvest production costs can include irrigation, weed control, and pest management. These costs can vary depending on a producer’s experience and existing equipment. For example, a producer that already owns irrigation equipment may be able to use some of his or her existing equipment for producing a new crop. Remember to estimate both fixed costs and variable costs. Fixed costs do not change with the amount produced. For example, the cost of purchasing an irrigation pump is the same whether that pump is used on  $\frac{1}{2}$  acre or 1 acre. Variable costs do change with the amount produced. For example, more drip irrigation tape will be needed to irrigate 1 acre than for  $\frac{1}{2}$  acre using the same row spacing.

Small-scale herb and spice production is usually labor-intensive. This can especially be true of the harvest phase. Saffron stigmas must be removed from the flower. Coriander and cumin seeds must be dried, cleaned, and packaged or processed. Some saffron producers in New England have creatively addressed their need for production labor by holding a farm festival around saffron planting.

Reports at the University of Vermont's 2019 saffron conference indicated that growers should investigate developing different products to maximize revenue from a saffron enterprise. Products could include dry petals, plants, and processed saffron. Although differences in saffron farm production situations and cultivation techniques make it difficult to generalize saffron production costs, capturing retail prices by direct marketing saffron to end users is likely needed to achieve profitable returns to a farm owner/operator's labor and management.

The most recent costs and returns of farm production for coriander (2011 in Saskatchewan) indicated returns to labor and management were similar to specialty pulses like peas. Cost and return data are not reported for cumin in North America.

### Selected Resources

- North American Center for Saffron Research & Development <https://www.uvm.edu/~saffron/index.html>
- Saffron Cultivation: Descriptions of Planting Methods (University of Vermont, 2021) <https://www.uvm.edu/~saffron/pages/factsheets/SaffronplantingSept2021.pdf>
- Saffron Pests and Diseases <https://www.uvm.edu/~saffron/Old/Workshops/Saffron%20Workshop%202017/SaffronPests-ArashG.pdf>
- Saffron Post-Harvest Handling Best Practice Recommendations (University of Vermont, Rodale Institute, American Herbal Products Association, 2023) <https://www.uvm.edu/~saffron/pages/factsheets/SaffronBMPMar2023.pdf>
- 2021 Online Saffron Workshop Proceedings (University of Vermont) <https://www.uvm.edu/~saffron/info/UVM%20Saffron%20Workshop%20Proceedings%202021.pdf>
- Saffron: A Golden Opportunity - A New Crop to Support Small Family Farms (University of Vermont, 2021) <https://www.uvm.edu/~saffron/pages/factsheets/SaffronfactshandoutFeb2021.pdf>
- Saffron Corm Harvesting (University of Vermont, 2021) <https://www.uvm.edu/~saffron/pages/factsheets/Cormharvesting2021.pdf>
- Harvesting Saffron Flowers (University of Vermont, 2021) <https://www.uvm.edu/~saffron/pages/factsheets/HarvestingSaffronAugust2021.pdf>
- Saffron Drying Methods (University of Vermont, 2021) <https://www.uvm.edu/~saffron/pages/factsheets/DryingSaffron2021.pdf>

[factsheets/DryingSaffron2021.pdf](https://www.uvm.edu/~saffron/Old/Workshops/Saffron%20Workshop%202018/Saffron%20From%20Production%20to%20Processing%20-%20Arash%20G.pdf)

- Saffron: From Production to Processing (University of Vermont, 2018) <https://www.uvm.edu/~saffron/Old/Workshops/Saffron%20Workshop%202018/Saffron%20From%20Production%20to%20Processing%20-%20Arash%20G.pdf>
- Practical Produce Safely for Small-scale Saffron Production (University of Vermont) <https://www.uvm.edu/~saffron/Old/Workshops/Saffron%20Workshop%202020/Pres/Saffron%20Produce%20Safety%20-%20Estrin.pdf>
- Saffron by the Numbers (University of Vermont, 2020) <https://www.uvm.edu/~saffron/pages/factsheets/SaffronbythenumbersJan2020.pdf>
- Saffron and Solar Farms: A Win/Win for the Environment and Agriculture (University of Vermont, 2022) <https://www.uvm.edu/~saffron/info/reports/FinalreportiSunFebruary22022.pdf>
- Video Resources (List of video resources from the North American Center for Saffron Research & Development, University of Vermont) <https://www.uvm.edu/~saffron/pages/factsheets/Videos%20from%20the%20North%20American%20Center%20for%20Saffron%20Research.pdf>
- How to Grow Saffron in Rhode Island (University of Rhode Island, 2021) [https://digitalcommons.uri.edu/cgi/viewcontent.cgi?article=1045&context=riaes\\_bulletin](https://digitalcommons.uri.edu/cgi/viewcontent.cgi?article=1045&context=riaes_bulletin)
- Coriander – Production and Management (Manitoba Agriculture) <https://www.gov.mb.ca/agriculture/crops/crop-management/coriander.html>
- “Coriander,” (Alberta Agriculture & Forestry, 2016) <https://open.alberta.ca/dataset/4266869>
- “Coriander,” Saskatchewan Agriculture, Natural Resources & Industry <https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/crops-and-irrigation/field-crops/specialty-crops/herbs-and-spices/coriander>
- Cilantro <http://worldcrops.org/crops/cilantro>
- Cilantro (Horticulture Production Guide, Southern Illinois University-Carbondale, 2007) [https://academics.siu.edu/agriculture/\\_common/documents/horticulture/cilantro-horticultural-factsheet.pdf](https://academics.siu.edu/agriculture/_common/documents/horticulture/cilantro-horticultural-factsheet.pdf)
- Cilantro (FDA, UC-Davis Western Institute for Food Safety and Security) [https://www.wifss.ucdavis.edu/wp-content/uploads/2016/10/Cilantro\\_PDF.pdf](https://www.wifss.ucdavis.edu/wp-content/uploads/2016/10/Cilantro_PDF.pdf)

- Cuminum cyminum (N.C. State University) <https://plants.ces.ncsu.edu/plants/cuminum-cyminum/>
- “Use of low-cost chemotherapeutic and medicinal plants against Thai silver barb.” Journal of the Bangladesh Agricultural University, 10, 2 (2012) <https://ageconsearch.umn.edu/record/209730?ln=en>
- Herbs, spices and essential oils – Post-harvest operations in developing countries. UNIDO/FAO (2005) <http://www.fao.org/3/a-ad420e.pdf>

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