



Hot Peppers and Specialty Sweet Peppers

Cheryl Kaiser¹ and Matt Ernst²

Introduction

Hot peppers, also known as chili (or chile) peppers, owe most of their “heat” or pungency to a chemical substance called capsaicin. This chemical is concentrated in the cross walls of the fruit and around the developing seeds. Chili peppers can be mild to fiery hot, depending on the amount of capsaicin present. The amount of capsaicin in peppers is measured in Scoville Heat Units (SHU). Currently, the hottest pepper is considered to be the ‘Carolina Reaper’ which has 2.2 million SHUs. A combination of genetics and environment are responsible for the amount of heat in hot peppers. Peppers that do not contain capsaicin, such as bell peppers (0 SHUs), are considered “sweet.” In addition to the hot types, other specialty peppers include sweet varieties of unusual shape, size and/or color.

Types of Hot and Specialty Sweet Peppers

Unless otherwise noted, the following peppers are classified as the species *Capsicum annuum*.

ANAHEIM peppers, also known as **NEW MEXICAN CHILE**, are a mild to hot pepper that are considerably longer than jalapeños. They are bright green to red when fresh and brownish red when dried.

BANANA peppers have long fruits that are pale yellow-green to yellow, maturing to bright red. Both hot and mild (sweet) varieties are available. Some varieties of hot banana peppers are referred to as Hungarian Wax.

CHERRY peppers are small ($\frac{3}{4}$ inch to $1\frac{1}{2}$ inches) sweet to hot peppers. They are medium green when immature and ripen to red.



POBLANO and **ANCHO** peppers are mild to hot. They are called Poblano when they are green and Ancho when dried.

PIMENTOS or **PIMENTOS** or are sweet,



HABANERO PEPPERS

HABANEROS (*Capsicum chinense*) are extremely hot peppers that are small and lantern-shaped. They are light green to bright orange when ripe.

ITALIAN or **CUBANELLE** types are sweet to mildly hot, long, and somewhat flattened. These flavorful peppers change from yellow-green to orange, and then to red as they ripen.

JALAPEÑO peppers range from sweet to mild to very hot. They are bright green to purplish-green at the immature stage and ripen to red. The skin of the ripened fruit of some varieties shows a characteristic cracking or “checking” that may or may not be a desirable trait, depending on the buyer.

¹Cheryl Kaiser is a former Extension Associate with the Center for Crop Diversification.

²Matt Ernst is an independent contractor with the Center for Crop Diversification.

heart-shaped peppers that ripen from green to red. When dried and ground, pimientos are sold as sweet paprika.

SERRANOS are small and usually very hot peppers that ripen from green to red.

SPECIALTY BELL peppers include sweet bell cultivars that ripen to a color other than red. They may be yellow, orange, brown, and even purple at maturity. Good potential exists for high tunnel or rain shelter production of colored bell peppers in Kentucky. Miniature bell peppers are 1 to 2 inches at maturity and ripen from green to yellow or red.

TABASCO peppers (*Capsicum frutescens*) are small but extremely hot. These peppers grow pointing upward and are generally harvested when red. They are grown primarily for hot sauces.

UBA TUBA (*Capsicum baccatum*) is a mild pepper with a distinctive flavor. The novel flower-shaped fruit ripens from green to ruby red; fully ripened fruit are sweet. Researchers at the University of Kentucky have evaluated this pepper for both culinary and ornamental uses. Samples of the culinary peppers were distributed to a small number of chefs; those chefs having “high end” clientele were very interested and used them stuffed with various ingredients as appetizers. The product was equally desirable when consumed fresh or cooked. Those chefs having a more general clientele were not as interested because of the preparation time involved in cleaning the center from the pepper. The novel appearance of the peppers attracted a great deal of attention and the taste was distinct from that of other peppers.



UBA TUBA PEPPERS

Marketing

Specialty peppers are grown in Kentucky primarily for fresh market sales, although a few red bell and banana peppers are still harvested for processing. Some hot peppers are also sold dried.

Fresh market options include roadside stands, local wholesalers and retailers, wholesale markets, farmers markets, community supported agriculture, and produce auctions. Hot peppers, which are popular in

Latin American, Cajun, and Asian cuisine, may be marketed to restaurants specializing in those dishes. Ethnic grocers may also be interested in fresh, locally grown hot and specialty peppers.

Market Outlook

Specialty peppers have become more popular as consumers seek more ethnic cuisine, spicier foods, and unique locally grown ingredients for recipes and preserves. Per capita use of all chilies (fresh and processed) in the U.S. increased from 5.2 to 6.6 pounds (27 percent) between 2000 and 2010. Use grew at a similar rate between 2010 and 2017, reaching 7.7 pounds.

Specialty peppers add variety and color at direct market outlets and may be sourced as an ingredient by value-added food producers. In addition, many consumers find uniquely colored bell peppers aesthetically pleasing and are willing to pay the higher market price this crop demands. The popularity of spicy foods has also increased the demand for locally grown fresh chili peppers. Consumer interest appears to be persisting in many of the food trends that helped support growth in hot and specialty pepper usage since 2000.

Production considerations

Plant and cultivar selection

Cultivar selection is a critical decision for commercial pepper growers, but with thousands of varieties available it can seem a daunting task. The great diversity of pepper types and cultivars makes it extremely important to know what characteristics buyers prefer. Pepper varieties differ in fruit size, color, shape, number of lobes, flavor, capsaicin levels, and disease resistance. The level of pungency, which can vary even between cultivars of the same pepper type, is a major consideration in selecting chili peppers. Fruit color and shape are important in selecting specialty sweet peppers. While standard bell cultivars ripen from green to red, specialty bells may ripen to various shades of yellow, orange, brown, white and purple. Compared to green bell peppers, colored bells are more difficult and expensive to produce because a longer time to maturity is required.

Disease resistance to *Phytophthora* blight, various virus diseases, and bacterial spot is available in some hot and specialty pepper cultivars. Due to the prevalence of bacterial spot in Kentucky, it is highly recom-

mended that commercial growers select hybrid varieties with resistance to this disease, whenever possible. Although resistant jalapeño, banana, and cubanelle varieties are available, many hot and specialty peppers are more susceptible to bacterial spot than resistant bell pepper varieties, and special precautions should be taken. For cultivars that are resistant to bacterial spot, see Page 69 of the University of Kentucky publication ID-36, Vegetable Production Guide for Commercial Growers (<http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf>). While resistance to bacterial spot has helped reduce losses to this devastating disease, new races of the pathogen have been isolated to which there is currently no resistance. Growing bell peppers to full maturity will also increase their exposure and susceptibility to anthracnose; rain shelters or high tunnels can help reduce incidence of this important fungal disease.

Growers should select well-adapted varieties that have the qualities in demand for the intended market. Hot and specialty peppers are a niche item and should be market-tested before growing large acreages.

Site selection and planting

Most (but not all) types of hot and specialty peppers can be grown using the same techniques and spacing used for bell pepper production. Peppers prefer deep, moderately fertile, well-drained soils with a pH between 6.0 and 7.0. Avoid planting in low-lying fields next to creeks and rivers since these sites are subject to high humidity and moisture conditions and, therefore, especially prone to bacterial spot epidemics (refer to the section on Peppers in the latest edition of Kentucky's Vegetable Production Guide for Commercial Growers – ID 36).

Pepper fields should be located as far away from tobacco plantings as possible due to potential spread of aphid-vectored viruses from tobacco to peppers. It is also advisable not to grow peppers after tobacco, tomatoes, potatoes, eggplants or vine crops for a period of three years since these crops are susceptible to some of the same diseases. Producers should also avoid fields where long-residual corn or soybean herbicides have been used, because herbicide carry-over can cause serious injury to peppers. Peppers do extremely well following fescue sod.

Growers can produce their own transplants or purchase



SPECIALTY BELL PEPPERS

certified disease-free plants from a reputable dealer. Greenhouse-grown transplants can be set by hand or with a mechanical setter, such as a tobacco setter. Growing hybrid bell pepper varieties in double rows on raised beds covered with black plastic mulch and drip irrigation has resulted in high yields of excellent quality peppers. The same system has also worked well for hot and specialty peppers. Infrared transmitting mulches, which increase soil warming, may also be used; multi-year research trials in Kentucky showed infrared mulch providing either some yield benefits or no significant yield increase for Uba Tuba peppers, compared to black plastic. A bed shaper/plastic layer and a setter that will transplant through plastic are essential for plastic mulch production systems.

Some specialty pepper types benefit from staking and tying when grown with plasticulture at high plant populations in Kentucky; these include serrano peppers, Anaheims, poblanos, and some cubanelle varieties. Tomato stakes are placed every 6 to 10 feet on each side of the double row beds. Tomato twine is looped and tightened around each stake at 7 to 9 inches above the soil to fence in the plants. Second and third strings can be used higher on the stakes as needed during the season. Even bell peppers may benefit from short stakes and strings on the outside of the beds in areas exposed to high winds. Most specialty peppers, like tomatoes, may also be grown in high tunnels.

Pest management

Bacterial spot remains a serious risk to pepper plantings in many parts of the state. Specialty peppers can vary in their tolerance or resistance to this disease. It is recommended that Kentucky growers

use varieties with high tolerance or resistance when available. Growers should also be extremely careful when growing their own transplants or purchasing plants from out-of-state sources. Transplants infected with bacterial spot can result in complete losses for growers. It is recommended that Kentucky growers follow a preventative spray program. Other diseases that can result in crop losses include Phytophthora blight, viruses, anthracnose fruit rot and bacterial soft rot.

Historically, the most important insect pest of peppers is the European corn borer. Using pheromone traps and scouting to monitor populations can help the grower determine when and how often insecticides should be applied. Organic commercial-scale bell pepper production is also feasible by releasing tiny wasps (*Trichogramma ostriniae*) that attack European corn borer eggs. Companion planting with buckwheat also increased the effectiveness of these wasps. This system has been successful in eliminating corn borer sprays both in small plots at UK research farms and in farmers' fields. The use of Bt corn has suppressed European corn borer moth numbers and reduced the damage caused by this pest.

Brown marmorated stink bug has been established in Kentucky and may become the key pest of specialty peppers. This pest is beginning to build to damaging levels. UK Entomology research has shown that 1/6-inch mesh netting or smaller will exclude access to plants by brown marmorated stink bug adults, reducing damage by this pest, while still allowing some natural enemies of pests to pass. The netting is draped over a frame similar to a mini hoop house and secured along the ground to exclude the pest. Brown marmorated stink bug will likely increase the need for insecticide use on specialty peppers.

Fruit allowed to fully color in the field are more susceptible to disease and insect damage, as well as growth cracks and sunscald. Controlling weeds will also aid in disease and insect pest control. Herbicides, plastic mulch and a good rotation system can help control weeds.

Harvest and storage

Peppers are hand-picked at the appropriate maturity stage. Colored bell peppers are allowed to fully ripen and color on the plant. Many chili peppers are harvested green for fresh market sales or allowed to

fully ripen for drying or processing. Hot peppers can be dried in the sun or artificially dried.

Fruit must be handled carefully to prevent skin breakage and punctures that could lead to decay. Cooling peppers as soon after harvest as possible will extend their shelf life. Storage temperature must be carefully monitored since fruit ripening, and therefore coloring, can continue to occur at temperatures above 50° F and chilling injury can occur below 45° F. Do not store with ethylene-producing fruit, such as apples, melons, peaches, pears and tomatoes.

Labor requirements

Production will require approximately 25 hours per acre for transplanting. Harvest will require 140 hours per acre, with an additional 75 hours for grading and packing. Harvest times can vary by pepper variety, size and pack preference. Post-harvest black plastic removal will require additional equipment and about 10 hours per acre.

Economic considerations

Initial investments include land preparation and the purchase of seed or transplants. Additional start-up costs can include the purchase or rental of equipment needed to apply black plastic mulch and install drip irrigation. Production costs for fresh market jalapeño peppers (trickle irrigated) were estimated in 2017 at \$4,820 per acre, with harvest and marketing costs at \$7,225 per acre. Total expenses per acre, including both variable and fixed costs, are approximately \$13,075.

Because returns vary depending on actual yields and market prices, the following per acre returns to land and management are based on three different economic scenarios. Conservative estimates represent the University of Kentucky's average statewide cost and return estimates for 2017.

PESSIMISTIC	CONSERVATIVE	OPTIMISTIC
\$(1,105)*	\$1,320	\$4,105

**Parentheses indicate a negative number, i.e. a net loss*

Hot and specialty peppers can be a profitable crop addition for smaller-scale producers with access to customers willing to pay for spicy or novel pepper varieties. The UK 2017 small-scale vegetable budget estimate projected a jalapeño pepper return to

operator labor, land and capital of \$52 per 100-foot row assuming 45 boxes produced sold at an equivalent of \$12 per box.

Selected Resources

- IPM Scouting Guide for Common Pests of Solanaceous Crops in Kentucky, ID-172 (University of Kentucky, 2008) 2 MB file
<http://www.ca.uky.edu/agc/pubs/id/id172/id172.pdf>
- Kentucky Pepper Integrated Crop Management (University of Kentucky, 2000)
<http://ipm.ca.uky.edu/files/ipm13pep.pdf>
- Vegetable and Melon Budgets (University of Kentucky, 2017)
<http://www.uky.edu/ccd/tools/budgets>
- Vegetable Production Guide for Commercial Growers, ID-36, see Pages 68-76 (University of Kentucky) <http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf>
- Page 29 in 2013 Fruit and Vegetable Research Report, PR-673 (University of Kentucky)
<http://www2.ca.uky.edu/agcomm/pubs/pr/pr673/pr673.pdf>

- Bell and Chili Peppers (Agricultural Marketing Resource Center, 2017)
<https://www.agmrc.org/commodities-products/vegetables/bell-and-chili-peppers/>
- Chile Pepper Institute (New Mexico State University) <http://www.chilepepperinstitute.org/>
- Pepper, Chili (University of Florida, 2015)
<http://edis.ifas.ufl.edu/mv112>
- Local Foods No. 5 — Hot Peppers (Chili Peppers) (ATTRA, 2010) <http://attra.ncat.org/attra-pub/summaries/summary.php?pub=348>

Suggested Citation:

Kaiser, C. and M. Ernst. (2018). *Hot Peppers and Specialty Sweet Peppers*. CCD-CP-101. Lexington, KY: Center for Crop Diversification, University of Kentucky College of Agriculture, Food and Environment. Available: <http://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/hotpeppers.pdf>

Reviewed by Rachel Rudolph, UK Extension Vegetable Specialist, and Brent Rowell, UK Extension Specialist, International and Sustainable Horticulture

Photos courtesy of Pixabay.com (Pages 1 and 3), and Brent Rowell (Page 2)

April 2018

For additional information, contact your local **County Extension** agent

Educational programs of Kentucky Cooperative Extension serve all people regardless of economic or social status and will not discriminate on the basis of race, color, ethnic origin, national origin, creed, religion, political belief, sex, sexual orientation, gender identity, gender expression, pregnancy, marital status, genetic information, age, veteran status, or physical or mental disability.