

# Stevia

Cheryl Kaiser<sup>1</sup> and Matt Ernst<sup>2</sup>

## Introduction

Stevia (*Stevia rebaudiana*) is a small, herbaceous plant in the sunflower family (Asteraceae). It is a perennial in its native South America, but is grown as an annual in all but the warmest areas of the United States. Stevia is commonly called “sweetleaf” or “sugarleaf” because it contains a glycoside in its leaves that imparts a sugary taste. Ground-up stevia leaves, as well as crude leaf extracts, have been used as a natural sweetener all over the world. Until recently, stevia products could be marketed in the U.S. only as dietary supplements. However, a new U.S. Food and Drug Administration (FDA) ruling has cleared the way for stevia’s expanded use and increased the market potential of this crop.

Stevia is a largely untested crop for Kentucky, so prospective growers would be wise to proceed very cautiously. Interested producers should start small, planting several different cultivars and/or seed sources in trial plantings. It is advisable to evaluate this crop over several seasons and test-market it before investing much time or money in stevia production. Larger plantings should not be attempted unless the grower has an established market.

## Marketing

Growing stevia for bedding plant production is likely the most viable market for Kentucky growers interested in this crop. Greenhouse



herb and bedding plant growers could consider adding stevia to their production line. One herb supplier advertises plug trays of stevia that can be ready for resale as 4-inch potted plants in about eight weeks.

Additionally, marketing dried stevia leaves (whole, ground, or powdered) directly to consumers (e.g. at farmers markets or on the Internet) or to health food stores may be possible. Stevia could be included as one of several herb selections sold at farmers markets. Adding the dried leaves to tea blends is another popular way to market stevia. Producers should always exercise caution when making any health claims about a crop like stevia, as such claims may open a producer up to additional regulation and liability issues.



<sup>1</sup>Cheryl Kaiser is a former Extension Associate with the Center for Crop Diversification.

<sup>2</sup>Matt Ernst is an independent contractor with the Department of Agricultural Economics.

Stevia is not viable for large-scale wholesale production for Kentucky growers due to the existing international supply chain. Most large U.S. processors have their own wholesale supply chain and obtain their stevia from South American and Asian sources. It is extremely difficult for new, untested growers to break into this market. Large-scale growers who have demonstrated success in growing stevia may eventually be able to secure a contract with domestic or foreign buyers.

### **Market Outlook**

Stevia is currently a niche market, but with some future potential for expansion. Because stevia has generated considerable media attention and interest in recent years, Kentucky producers could benefit from the growing consumer awareness of this crop. Stevia may prove to be profitable for small-scale growers who are willing to develop or cultivate a market through local farmers markets, other direct markets, or for wholesale to smaller distributors. Growers promoting an organically grown product could have a marketing edge.

The greatest potential for stevia production in Kentucky is probably as a potted plant option for herb gardens and landscapes. There is a growing interest among homeowners in planting stevia as a summer annual. As consumers become more aware of the natural sweetening qualities of the plant, stevia's popularity with homeowners is expected to increase.

Growers wanting to market dried or processed forms of stevia should proceed with extreme care. A number of products made from stevia are currently on the market as dietary supplements in liquid, powdered, and tablet form. Unfortunately, stevioside, the main sugar compound present in stevia plants, can have a slightly bitter aftertaste. Because individual plants vary in sugar levels and bitterness, the resulting products can also vary considerably. Some manufacturers claim to have developed strains of the stevia plant lacking the unpleasant aftertaste; others have resorted to mixing stevioside extracts with additional natural

sweeteners to mask the bitterness. Producers should market such products with caution and be aware of the legal implications of making certain health claims about natural products.

More recently, another sugar derived from stevia has been used to produce several calorie-free sweeteners. While rebaudioside-A (trade name rebiana) is present in lower concentrations in the plant, the processed product lacks the bitterness associated with stevioside. Late in 2008, the FDA issued a "no objection" approval for the Generally Recognized as Safe (GRAS) status of rebiana, thus making the product exempt from the FDA's pre-market approval requirements. It is important to note, however, that only one stevia compound (rebiana) was granted GRAS status as a food additive; the food-supplement-only status of the stevia plant itself, along with its other extracts, remains unchanged.

The FDA ruling is significant because rebiana can now be used in foods and beverages. Rebiana-containing products are expected to flood the market in the coming months and years. PepsiCo and Coca-Cola, who were instrumental in obtaining the GRAS status, will soon be releasing beverage products containing their respective rebiana sweeteners. Rebiana is also available under various marketing labels as a table sugar substitute. As the use and acceptance of rebiana products increase, the demand for stevia is expected to rise. With an increase in the number of stevia-based products, the need for more stevia production could also increase.

### **Production considerations**

#### **GREENHOUSE-GROWN TRANSPLANTS**

Stevia transplants can be produced under similar greenhouse conditions as common flower and vegetable transplants. Plants can be produced in multi-pack containers or in individual 4- or 6-inch containers. Plants can be produced from seed or cuttings, and small greenhouse producers should consider purchasing plugs from wholesale plug specialists for finishing in larger containers. Vegetatively produced propagules from reliable

sources are preferred to ensure production of plants with consistent sugar (glucoside) profiles.

#### FIELD-GROWN

Stevia prefers well-drained soil rich in organic matter. Do not plant in field sites subject to flooding or puddling, or in saline soils. While plants are somewhat drought-tolerant, a consistent source of moisture should be supplied via trickle irrigation. Most sources recommend frequent, shallow irrigations because stevia's feeder roots tend to be produced near the soil surface. Research in Ontario has shown that stevia has low nutrient requirements, and excess nitrogen can result in profuse plant growth with poor flavor.

Stevia is planted in spring after all danger of frost has passed. Vegetative propagation via tissue culture or rooted cuttings is preferred for obtaining the most consistent results in terms of plant characteristics, but may be cost prohibitive compared to seeds. Stevia can vary in sweetness from plant to plant; therefore, cuttings should be taken only from sources known to have high concentrations of sugar.

Seeds can germinate poorly, so direct-seeding to fields is not recommended; however, plants can be propagated from seed in the greenhouse. Plugs may be purchased from herb wholesalers, or growers could produce their own transplants from high-quality seed. Research has shown that only the black or dark seeds are viable, while the clear to tan ones are often sterile. Several seeds should be placed in each plug cell, and then thinned to one seedling per cell once seeds have germinated. Time from seed-to-transplant is approximately seven to eight weeks. An estimated 20,000 to 40,000 plants will be needed for a 1-acre planting.

#### *Pest Management*

Field-grown stevia is not known to have serious insect pest problems and is often reported as exhibiting insect-repellant qualities. Similarly, documented disease problems are few and

seemingly insignificant. Septoria diseases have caused damage on overly mature plants. Aphids, thrips and white flies can become a serious problem on stevia in greenhouses, which could significantly impact transplant production. Research in Kansas indicated that rabbit and deer feeding was not a problem in their stevia plots. The lack of herbicides registered for use with stevia means growers will need to control weeds with alternative methods, such as mechanical cultivation and by hand.

#### *Harvest and Storage*

Stevia is harvested when plants are mature and blooms have just begun to form, generally in late summer. Sweetness is intensified by cooler temperatures and short days; however, sugar levels decline after flowering. Large-scale commercial growers use a specially designed harvester that cuts the crop at ground level, but small plots are often harvested by hand. It is possible that a rotary mower with a bag attachment could be adapted for plots too large for hand-harvesting, but be sure to use a separate, designated unit to prevent contamination from other crops.

Harvested plants are dried with low heat and good air circulation for 24 to 48 hours. An alfalfa or grain dryer could be used or plants can be dried in the sun. Dried plants are then threshed to separate the sweet leaves from the bitter stems.

Once dried, leaves can be stored for long periods in air-tight containers or plastic bags. Canadian growers store the dried leaves in sealed, plastic-lined boxes prior to processing. Home processing generally involves either crushing the ground leaves or making a crude extract using a water extraction process. Commercial processing to isolate pure rebaudioside-A for the various sugar substitutes on the market involves a much more complicated procedure. Some of these extraction processes are patented.

#### *Labor requirements*

Potential labor needs for field-produced stevia will be highly variable depending on market

channel and product marketed. Hand planting, harvest, and packing products for retail would make stevia a labor-intensive crop, similar to culinary herb crops that are dried and packaged. Stevia grown for bedding plant production would have similar labor requirements as other annuals that are planted, transplanted, and harvested for sale as bedding plants.

### **Economic considerations**

Initial investments for greenhouse-produced transplants are consistent with other greenhouse-produced bedding plants. When produced as an additional transplant species within an existing product mix, average production costs are approximately \$1.50 per square foot of greenhouse space.

Initial investments for field-produced plants include land preparation, purchase of seed or transplants, and installation of an irrigation system. Additional costs for a minor niche crop like stevia may include product and market development, advertising and consumer education.

Wholesale and retail prices for stevia are highly variable, and this price instability indicates that stevia is still an emerging and experimental new crop. It is likely that stevia, when grown in a 1-acre mix of other edibles and bedding plants, could help generate returns to land, labor, and management similar to culinary herb production. Producers should never plant a new niche crop without a well-defined plan for marketing and selling their crop.

### **Selected Resources**

- Cultivation of Stevia, Nature's Sweetener (Ministry of Agriculture Food and Rural Affairs, Ontario, Canada, 1997)  
<http://www.omafra.gov.on.ca/english/crops/facts/stevia.htm>
- Grower's Guide: Stevia (Kansas State University, 2004)  
<http://www.bookstore.ksre.ksu.edu/pubs/MF2630.pdf>