

http://res.agr.ca/lond/pmrc/faq/stevia_rev.html, July 4, 1998

CROP PRODUCTION

Stevia plants can be propagated from cuttings or seed. Since germination rates are poor and seedlings very slow to establish it is best grown as an annual or perennial transplanted crop. Clonal propagation is practical for small scale production, but is probably not economically viable for large scale stevia production where labor costs are high. The cost of producing vegetatively propagated transplants in Canada is high, so low cost transplants produced from seed is the only viable method on which to base stevia production.

In the temperate latitudes of the Northern hemisphere and South Western Ontario in Canada more specifically, the production cycle for annual stevia begins with the 6-7 week old plants grown from seed, in cells, in heated greenhouses. Seedlings are transplanted to the field in mid to late May. Fertilizer is banded along with the transplants. The crop is irrigated as required. Stevia is slow to establish under Canadian conditions and growth is sluggish until mid July. Most of the leaf yield is accumulated from July until mid to late September. The whole plant is harvested just above ground level, elevated into wagons and then dried. Following drying, the leaves are separated from the stems using a thesher. The leaves are then stored ready for processing.

Seed Production and Quality

Given stevia's daylength requirements, seed production in the Northern hemisphere would be best situated between 20 and 30E N latitude. The crop could be transplanted in February or March and seed collected in late summer. Flowering under these conditions should occur between 54-104 d following transplanting, depending on the daylength sensitivity of the cultivars used for seed production (Katayama et al. 1979). One-thousand seed weights for stevia seed usually range between 0.15 and 0.30 g and, depending on plant density, seed yields of up to 8.1 kg ha⁻¹ are possible (Carniero 1990). Seed germination is often poor and rates less than 50% are common (Miyazaki and Wantenabe 1974). Given the aforementioned conditions, seed produced on one ha could be enough to supply transplants for up to 200 ha of leaf production. Seed viability and yield are affected by growing conditions during pollination and seed filling. Excessive rainfall during pollination can affect both seed yield and germination (Carneiro 1990, Shuping and Shizhen 1995). Seed is best stored at 0E C, but even under low temperature conditions germination will still decline 50% over three years (Shuping and Shizhen 1995). Sealing of storage containers or using lower temperatures did not prevent the decrease in germination over time.

Cultural Practices

Planting densities ranging from 40,000 to 400,000 plants/ha have been tried in experiments conducted in Japan (Katayama et al. 1976). Leaf yield increased with increasing density up to 83,000 and 111,000 plants ha⁻¹ for the first year of production. The concentration of stevioside in the leaves of stevia increases when the plants are grown under long days (Metvier and Viana 1979). Since glycoside synthesis is reduced at or just before flowering, delaying flowering with long days allows more time for glycoside accumulation. It follows that stevia production would be best situated in a long day environment where vegetative period is longer and steviol glycoside yields will be higher.

Fertility requirements for stevia grown as an annual crop are moderate. Results from Japan demonstrate that, at the point of maximum dry matter accumulation, stevia plants consist of 1.4% N, 0.3% P, and 2.4% K (Katayama et al. 1976). In Ontario total biomass production of 7500 kg ha⁻¹ are possible and of that total, 26% would be roots, 35% stems, and 39% leaves (R. Beyaert pers. comm.). Based on the composition observed by Katayama leaves (R. Beyaert pers. comm.). Based on the composition observed by Katayama (from both soil and fertilizer. The actual rates of application will vary according to soil type and production environment, and need to be optimized for each specific situation.

Two fungal diseases, *Septoria steviae* and *Sclerotinia sclerotiorum*, have been reported in stevia grown in Canada (Lovering and Reeleder 1996; Chang et al. 1997). *Septoria* disease was characterized by depressed, angular, shiny olive gray lesions, sometimes surrounded by a chlorotic halo, that rapidly coalesce. *Sclerotinia* disease was characterized by brown lesions on the stem, near the soil line, followed by wilting and eventually by the complete collapse of affected individuals. No means of controlling these diseases have yet been published. Since stevia is very slow to establish and does not compete well with weeds, herbicides or other means will be essential to control weed growth to produce ample yield and a clean crop. The herbicide trifluralin appears to be well tolerated by stevia (Katamaya 1979).

Stevia is harvested just prior to flowering when steviol glycoside content in the leaves is at its maximum (Sumida 1980, Xiang 1983). Following harvest the whole plant is dried and the leaves separated from the stems for further processing (Murai 1988). The stems have very low concentrations of sweet glycosides and are removed to minimize processing costs (Brandle and Rosa 1992). Drying stevia under artificial conditions is affected by a number of factors including loading rate, temperature, and ambient air conditions (Van Hooren and Lester 1992). The effect of drying conditions on glycoside levels or processing quality of the leaves has not been investigated.

CONCLUSION

Stevia represents a new opportunity for researchers and farmers alike. A great deal of information relating to production practices and disease control is required to optimize annual transplant production for Canada. Such basic things as herbicide and fungicides registration, optimum planting and harvest times, fertilizer recommendations are all essential. Since markets exist for stevia now, production and optimization must occur in parallel. The production of remarkably high levels of one class of secondary metabolite is of significant interest for chemists, biochemists and geneticists and may prove to be a foundation for the production of new metabolites in the future.

TI: Natural non-calorie sweetener stevia (*Stevia rebaudiana* Bertoni) - a future crop of India.

AU: Chalapathi-MV; Thimmegowda-S; Sridhara-S; Parama-VRR; Prasad-TG; Ramakrishna-Parama-VR

SO: Crop-Research-Hisar. 1997, 14: 2, 347-350; 1 pl.; 7 ref.

AB: Japan markets a sweetener extracted from the leaves of *S. rebaudiana*. These leaves contain compounds about 250- to 300-times as sweet as sugar. To standardize the cultivation requirements of this crop on a commercial scale in India, agronomic and

physiological investigations are being conducted at the University of Agricultural Sciences, Bangalore, India.

OD: Stevia-rebaudiana

TI: A new character in the sweetener scenario.

SO: Sugar-Journal. 1995, 58: 2, 30; 2 pl.

AB: At Sinaloa on the Pacific coast of Mexico, the semi-desert soil and environment are ideal for drip-irrigated cultivation of Stevia. When flower primordia appear, leaves are collected, washed, dried, pressure packed and shipped to Japan for extraction of a glucoside 300X as sweet as cane sugar. The local market sells a new product called Azucar BC, at 35% above the price of cane sugar, in jars holding 3 kg. Made by Metco SA de CV, this consists of refined cane sugar whose sweetness has been doubled by blending with crystals of stevia glucoside; only 8 calories are added when it is used instead of a teaspoon of sugar to sweeten a beverage.

GE: Mexico-

PT: Journal-article

AN: 950314029

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<http://www.gks.com/library/stevia/stv-faq.txt>

Stevia Leaf - Too Good To Be Legal?

Rob McCaleb

Herb Research Foundation

For hundreds of years, people in Paraguay and Brazil have used a sweet leaf to sweeten bitter herbal teas including mate. For nearly 20 years, Japanese consumers by the millions have used extracts of the same plant as a safe, natural, non-caloric sweetener. The plant is stevia, formally known as *Stevia rebaudiana*, and today it is under wholesale attack by the U.S. Food and Drug Administration.

Stevia is a fairly unassuming perennial shrub of the aster family (Asteraceae), native to the northern regions of South America. It has now been grown commercially in Brazil, Paraguay, Uruguay, Central America, the United States, Israel, Thailand and China. The leaves contain several chemicals called glycosides, which taste sweet, but do not provide calories. The major glycoside is called stevioside, and is one of the major sweeteners in use in Japan and Korea. Stevia and its extracts have captured over 40% of the Japanese market. Major multinational food companies like Coca Cola and Beatrice foods,

convinced of its safety, use stevia extracts to sweeten foods for sale in Japan, Brazil, and other countries where it is approved. Europeans first learned of stevia when the Spanish Conquistadors of the Sixteenth Century sent word to Spain that the natives of South America had used the plant to sweeten herbal tea since "ancient times".

The saga of American interest in stevia began around the turn of the Twentieth Century when researchers in Brazil started hearing about "a plant with leaves so sweet that a part of one would sweeten a whole gourd full of mate." The plant had been described in 1899 by Dr. M. S. Bertoni. In 1921 the American Trade Commissioner to Paraguay commented in a letter "Although known to science for thirty years and used by the Indians for a much longer period nothing has been done commercially with the plant. This has been due to a lack of interest on the part of capital and to the difficulty of cultivation."

Dr. Bertoni wrote some of the earliest articles on the plant in 1905 and 1918. In the latter article he notes: "The principal importance of Ka he'e (stevia) is due to the possibility of substituting it for saccharine. It presents these great advantages over saccharine:

- 1. It is not toxic but, on the contrary, it is healthful, as shown by long experience and according to the studies of Dr. Rebaudi.**

- 2. It is a sweetening agent of great power.**
- 3. It can be employed directly in its natural state, (pulverized leaves).**
- 4. It is much cheaper than saccharine."**

Unfortunately, this last point may have been the undoing of stevia. Noncaloric sweeteners are a big business in the U.S., as are caloric sweeteners like sugar and the sugar-alcohols, sorbitol, mannitol and xylitol. It is small wonder that the powerful sweetener interests here, do not want the natural, inexpensive, and non-patentable stevia approved in the U.S. In the 1970s, the Japanese government approved the plant, and food manufacturers began using stevia extracts to sweeten everything from sweet soy sauce and pickles to diet Coke. Researchers found the extract interesting, resulting in dozens of well-designed studies of its safety, chemistry and stability for use in different food products. Various writers have praised the taste of the extracts, which has much less of the bitter aftertaste prevalent in most noncaloric sweeteners. In addition to Japan, other governments have approved stevia and stevioside, including those of Brazil, China and South Korea, among others. Unfortunately, the US was destined to be a different story. Stevia has been safely used in this country for over ten years, but a few years ago, the trouble began.

FDA ATTACK ON STEVIA

Around 1987, FDA inspectors began visiting herb companies who were selling stevia, telling them to stop using it because it is an "unapproved food additive". By mid 1990 several companies had been visited. In one case FDA's inspector reportedly told a company president they were trying to get people to stop using stevia "because Nutra Sweet complained to FDA." The Herb Research Foundation(HRF), which has extensive scientific files on stevia, became concerned and filed a Freedom of Information Act request with FDA for information about contacts between Nutra Sweet and FDA about stevia. It took over a year to get any information from the FDA, but the identity of the company who prompted the FDA action was masked by the agency.

In May, 1991 FDA acted by imposing an import alert on stevia to prevent it from being imported into the US. They also began formally warning companies to stop using the "illegal" herb. By the beginning of 1991, the American Herbal Products Association (AHPA) was working to defend stevia. At their general meeting at Natural Products Expo West, members of the industry pledged most of the needed funds to support work to convince FDA of the safety of stevia. AHPA contracted HRF to produce a professional review of the stevia literature. The review was conducted by Doug Kinghorn, PhD., one

of the world's leading authorities on stevia and other natural non-nutritive sweeteners. Dr. Kinghorn's report was peer-reviewed by several other plant safety experts and concluded that historical and current common use of stevia, and the scientific evidence all support the safety of this plant for use in foods. Based on this report, and other evidence, AHPA filed a petition with FDA in late October asking FDA's "acquiescence and concurrence" that stevia leaf is exempt from food additive regulations and can be used in foods.

FDA, apparently attempting to regulate this herb as they would a new food additive, contends that there is inadequate evidence to approve stevia. However, because of its use in Japan, there is much more scientific evidence of stevia's safety than for most foods and additives. The extent of evidence FDA is demanding for the approval of stevia, far exceeds that which has been required to approve even new synthetic food chemicals like aspartame (Nutra Sweet).

AHPA's petition points out that FDA's food additive laws were meant to protect consumers from synthetic chemicals added to food. FDA is trying, in the case of stevia to claim that stevia is the same as a chemical food additive. But as the AHPA petition points out, Congress did not intend food additive legislation to regulate natural constituents of food itself. In fact, Congressman Delaney said in 1956, "There is hardly a food sold in the

market today which has not had some chemicals used on or in it at some stage in its production, processing, packaging, transportation or storage." He stressed that his proposed bill was to assure the safety of "new chemicals that are being used in our daily food supply," and when asked if the regulations would apply to whole foods, he replied "No, to food chemicals only." AHPA contends that stevia is a food, which is already recognized as safe because of its long history of food use. Foods which have a long history of safe use are exempted by law from the extensive laboratory tests required of new food chemicals. The AHPA petition, however, supports the safe use of stevia with both the historical record, and references to the numerous toxicology studies conducted during the approval process in Japan, and studies by interested researchers in other countries.

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Stevia

Here is what I have learned about stevia as of today. I have six additional pages [by email] and 20 additional pages in a file on growing it in the home or on the farm. Ken Hargesheimer

Where I am coming from: . It is a natural, non-caloric sweetener. Also, I am searching crops to be grown and sold at farmers markets by market gardeners and small farmers here and in third world countries.

You can grow it in your home and grind the leaves to a powder. It is 20-30 times sweeter than sugar. Processed it is 300 times sweeter than sugar. It is available in health food stores or by the pound over the internet or in grocery stores in parts of Mexico [Azucar BC is sugar cane and stevia mixed].

Japan uses it in over 70 food products, including candy, ice cream, cookies, soft drinks, pickles, and chewing gum. Today stevia is used as a sweetener in many countries, including Paraguay, Brazil, Korea, Thailand, and China. No negative clinical reports have appeared in any of these countries where stevia is readily available. I have read that Coca Cola uses it in South America.

Subj: Re: Stevia-a sugar substitute [The following was edited-Ken]

Date: 7/24/99

From: pracko@earthlink.net (Paul n Shelley)

Ken;

**Just got off the phone with John Lingle of Lingle's Herbs in Long Beach
<<http://www.linglesherbs.com>>.**

The deal with processing the "powder" is by drying the leaves and then breaking them up through a series of finer screens that will turn the dried leaf into a powder. It is often sold in Latin American stores.

The liquid form is processed by taking fresh leaves, steeping them in water, and then crushing the leaves into a green liquidy paste which tastes somewhat like green tea.

It is used in baking [recipes must be adjusted; see a recipe book], drinks and teas and to sweeten foods which have already been cooked, e.g. sprinkling it on top of oatmeal.

The reason it's not used in processed foods in the US is because the FDA will not approve it as a food additive due to pressure from the sugar industry. When you realize that Stevia now costs six times more than sugar, yet is 300 times sweeter, you can obviously see the economic advantage of using Stevia. Of course, the key to cheaper Stevia is an economy of scale, and complicated processing is not required as it is with sugar.

**For a sweeter future,
Paul Racko, Executive Director
Long Beach Organic, Inc.
[Http://longbeachorganic.org](http://longbeachorganic.org)**

The FDA approves Stevia as a herb but not as a sweetener. Aspartane is owned by the Monsanto Corp. Many people believe, including me, that Monsanto's powerful lobby prevents the FDA from approving it as a sweetener. The FDA is on the same side as the

multinational corporations instead of on the side of the consumer. In the USA, you can grow it, sell it, etc but do not advertise it as a sugar substitute and all will be legal. A store in Arlington was “invaded” by the FBI saying that they were going to destroy all books on Stevia. The owner told them his wife was going to video it. They left. ¿¿This in America?? Just proof of how powerful the multinational corporations are within the US government.

Books:

Now that you have it growing what do you do with it? Check out Jeffrey Goettemoeller's new book Stevia Sweet Recipes: Sugar Free---Naturally. There are recipes for everything from Breakfast to Dessert. Jeffrey Goettemoeller 221 South Saunders Street, Maryville, MO 64468. <jgoettemoeller@hotmail.com>. WWW.PRAIRIEOAKPUBLISHING.COM

“My cookbook utilizes both green stevia powder and white stevia extract. The green powder can be made by simply processing dried leaves (no stems) in a kitchen blender. I grow stevia here in MO. It grows even in humid summers, but I like to use raised beds, mulch, and a soaker hose. Pinch the tips out every month or so to promote branching. Check out my web page for some links dealing with stevia: <http://homestead.com/stevia/>”. Jeff

“Stevia Rebaudiana, Nature's Sweet Secret” 2000 edition with growing info.

<jgoettemoeller@hotmail.com>

<http://www.steviaplant.com>, www.rain-tree.com/stevia.htm

Growing Stevia: [I have five additional pages on growing stevia.]

<http://res.agr.ca/lond/pmrc/faq/stevia.html>,

http://www.stevianow.com/growing_stevia.htm

<http://www.fastlane.net/~kirkland/stevia/stevia.htm>

Using Stevia:

<http://www.diabeticgourmet.com/forum/sweeteners/> [Started in Aug. Anyone may read & write comments.]

<http://www.healthfree.com/stevlife.htm> [1992 info]

<http://www.samplegalleria.com/steviaread.htm>

<http://www.gks.com/library/stevia/stv-faq.txt>, [Stevia - Too Good To Be Legal?]

Stevia plugs are available from: <mvg@spiralcomm.net>,

<mulberrycreek@yahoo.com> & Canada- <orderdesk@richters.com> Seed are available from WWW.PRAIRIEOAKPUBLISHING.COM.

Stevia Seeds

\$3.20



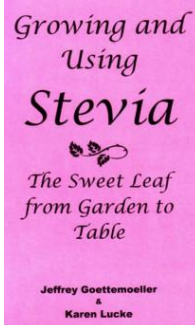
Stevia rebaudiana. Grow your own! Sweeter than sugar.

Clean, U.S. grown, high germination stevia seeds with bristles removed for easy handling or automated sowing. Tender perennial best grown as an annual, started indoors and transplanted to the garden. Can also be a neat potted plant. Seed starting instructions included.

Available sizes: 20 seeds for \$3.20; 100 for \$11.20; 500 for \$39.20; 1000 for \$62.70; 5000 for \$188.00

Growing and Using Stevia

\$6.00



Grow your own! "Growing and Using Stevia: The Sweet Leaf from Garden to Table." Complete growing

instructions and 20 recipes using homegrown stevia. Your complete stevia guide, from garden to table. Chapters about growing and propagating stevia, indoors and out. Stevia rebaudiana is non-caloric, non-glycemic, and fun to grow! By Jeffrey Goettemoeller and Karen

[[More Information](#)]

Lucke. 49 pages. Lay-flat binding.

[[More Information](#)]

Stevia Garden Special

\$7.60



Half price stevia seeds with purchase of a stevia growing book! One packet Stevia rebaudiana seeds (20 seeds) for \$1.60 (half price) and one copy Growing and Using Stevia: The Sweet Leaf from Garden to Table. Includes complete home growing information and 20 recipes. Grow your own sweet herb!

[[More Information](#)]

Marketing Stevia Rebaudiana

By Jeffrey Goettemoeller

Stevia has a great market potential. At farm stands, nurseries, and farmer's markets, it practically sells itself once the customer tastes a leaf and learns this sweet herb is non-glycemic and practically calorie free. If you have not been introduced to stevia, visit www.GrowingStevia.com for an overview. In this article, I will outline some strategies for marketing stevia. The best way for most growers to get started is by selling bedding plants or seeds. Field production for local shops or the wholesale trade is another possibility.

Selling Stevia Plants and Seeds

If you have a venue for selling plants or seeds, stevia will likely be a successful venture. This could take the form of on-farm sales, catalogs, plant nurseries, or farmer's markets. Keys to success include offering solid how-to information and free samples if possible.

Keep a potted plant or two for the purpose of display at your selling point. It will attract attention and serve as a focal point for conversation. It should be a plant that has been pruned every few weeks as it grows. This will result in a nicely branched plant with lots of leaves. If samples are allowed at your selling location, pluck leaves from the plant and invite shoppers to chew on them. The taste sensation will create immediate excitement in most cases and generate plenty of questions. The vendor needs to be prepared with the answers and assurance of further help should the customer decide to purchase a plant. After a bit of conversation about the virtues of stevia, it's difficult for plant lovers to resist purchasing plants or seeds. You'll end up with leafless branches on your sample stevia plant. Simply cut off these branches and new ones will sprout back. If you give lots of samples, you might need multiple plants to rotate for sampling. These plants will require a pot size of at least 4-8 inches in diameter.

Another great point-of-sale marketing approach is to give away small re-closeable bags with a few dried stevia leaves inside. I've found that most people, after hearing your pitch, are quite happy that you introduced them to stevia. Practically everyone, after all, knows someone who is diabetic, hypoglycemic, or wants to avoid calories, not to mention how enjoyable it is to grow stevia. If customers like these leaves, they'll want to grow some of their own with your plants or seeds. You might even sell dried stevia leaves for those who don't care to grow their own.

2-inch wide by 3-inch tall re-closeable bags are available in craft stores or in bulk from www.aplasticbag.com at a reasonable price. I use the 4 mil thickness, but 2 mil would probably work just fine. Put an adhesive label on each bag, letting the customer know that these are stevia leaves for making herbal tea by steeping in hot water. Also include your contact information as a supplier of stevia plants and seeds. Standard return address labels work fine. They come 30 to a sheet. You can get a box of 100 sheets from www.onlinelabels.com. Office supply stores should have them as well. Be sure to specify laser or inkjet printing.

Informing the Customer

Customers are more likely to try growing stevia if they have information about how to grow and use it. This can start with a conversation, but you should also have a free information sheet available with the basics about stevia. Even better, make my book, *Growing & Using Stevia: The Sweet Leaf from Garden to Table*, available to your customers. This book provides complete home growing and harvesting instructions along with 20 recipes featuring home-grown stevia. Customers can make a green powder by drying leaves, then processing in a blender. This book gives them the information they need to really use

and enjoy stevia. I offer a discount when a book is purchased with a packet of my stevia seeds. Most customers happily take advantage of the offer.

You can purchase *Growing and Using Stevia* at the wholesale discount. Just request the wholesale stevia brochure, which includes seeds and books, by sending me an email at jgoettemoeller@hotmail.com or call 660-541-1040.

Growing Stevia Plants for Resale

Start with cuttings or seeds. *Growing and Using Stevia* gives details for both methods. The stevia seeds I produce and sell feature a minimum 80% germination rate. They're as easy to germinate as tomato seeds. For most gardeners, a pot size of 2-4 inches across will be ideal. They can maintain a potted plant by transplanting to a larger pot or they can transplant to their garden outdoors. Those with larger gardens might want a six-pack with younger plants. An 11 by 21 inch plastic tray will hold 12 of these six-packs. The younger plants will take 8-10 weeks from seed.

Be sure your customers know that stevia is sensitive to frost. It can be grown as an annual outdoors, starting with new plants each spring, or plants can be dug up and brought indoors before the first frost.

Buying Stevia Seeds Wholesale

Some of your customers might want to try their hand at starting their own plants from seeds. You can accommodate them by purchasing my stevia seeds at a wholesale discount for resale to your customers.

I grow these top quality stevia seeds right here in Missouri. Use my packets or repackage with your own label. Try selling a copy of *Growing & Using Stevia* with the seeds so customers will have all the information they need for stevia success.

Selling Dried Stevia Leaves

It doesn't take many stevia plants to yield a large amount of leaves. These can be sold at farmer's markets and farm stands alongside plants. Some eager customers will not want to wait for their own harvest before trying stevia tea or the other recipes in *Growing and Using Stevia*. They can buy your dried stevia leaves and steep them for tea or grind them in a blender to make their own green stevia powder. Local herb shops or health food stores might be interested in your stevia leaves as well.

If you decide to step up your production, some of the companies listed in the *Directory of Flower & Herb Buyers* (Prairie Oak Publishing) might be interested in your stevia leaves. Check the index under "stevia." Grow test plots for a year or two and contact these buyers about their needs and any processing or packaging requirements. Organic certification is often a plus for wholesale buyers.

For large plantings, consider plastic mulch and drip irrigation. One vegetable grower uses the same drip system, plastic mulch, and transplanting rig that he uses for vegetables such as tomatoes. His growing beds accommodate two rows of stevia plants. I would recommend an in-row plant spacing of 12-14 inches for commercial production. Bed width will vary depending on your equipment. You'll want tractor tires to always run in the paths, avoiding compaction of the beds.

A Kansas State University stevia trial resulted in a yield of 2365 lbs. per acre (dry weight). They report bulk prices ranging anywhere from \$6.50 to \$36.77 per pound (dry weight). Read the full report at www.oznet.ksu.edu/ksherbs/stevia.htm. Please note the report mentions typical stevia seed germination rate of 30%, which is no longer valid in the case of the seeds I produce and sell through Prairie Oak Publishing. My seeds deliver at least 80% germination.

I wish you every success in your stevia enterprise. Feel free to email or call me with questions or to let me know about your stevia experiences.

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Jeffrey Goettemoeller is the publisher and stevia expert at Prairie Oak Publishing.

Stevia seeds and *Growing & Using Stevia* are available at wholesale or retail from: Prairie Oak Publishing; 221 South Saunders St.; Maryville MO 64468 jgoettemoeller@hotmail.com

Subj: Re: stevia

Date: 5/8/00 3:52:51 PM Central Daylight Time

From: jgoettemoeller@hotmail.com (jeff Goettemoeller)

WWW.PRAIRIEOAKPUBLISHING.COM

To: Minifarms@gmail.com

Hi Ken,

Thanks for the update. I enjoyed reading about your trip as well. Stevia really is hard to get established initially. The plants can look great, but when transplanted into the field they are easily shocked. Once established, they do better. Especially when young, the plants must be neither too wet or too dry. A heavy clay soil retains too much moisture. Raised beds certainly help, but even the a rainy spell can cause stem rot. Good compost work into the ground is helpful as with most any plant. On the other hand, stevia does not like to dry out. I think partial shade would help if it's very hot and sunny soon after transplanting. Perhaps shade netting over wire hoops or newspaper "tents" on the south side. I suppose "hardening off" might help as well. In a nice warm, moist greenhouse, the stems become very soft and succulent. This makes them susceptible to shock and rot. In a warmer climate with a long season, like Texas or Central America, I think I would prefer to start cutting outdoors in beds with drip hoses, and then transplant to the field. They

root easily that way in the spring. Starting from seed would be good if the plants would produce enough good seeds. The few plants I've grown from seed have transplanted very successfully and grown vigorously.

I'm going to send you a complimentary copy of "Stevia rebaudiana, Nature's Sweet Secret." It has the chapter I wrote about growing stevia. I'll also send a complimentary copy of the new Spanish edition of my recipe book. You are in a position to make use of both of those and spread the word about them. They're also available at Amazon.com. I've also got a web site to which I'll be adding more stuff: www.homestead.com/stevia

My recipe book continues to sell very well, but I know many more can benefit from it, as you found out with the show of hands regarding diabetes. The Spanish edition will expand the readership, hopefully.

The problem is that a plant produces only a small percentage of those good seeds, but all get harvested together. The bulk of the seeds are really light, empty shells that are tan in color. I think the problem is that the plants over-produce flower buds and cannot provide enough nutrition to actually form embryos for all the seeds. Restricted nutrition or some kind of shock during flower bud formation might cut down on the number of flower buds

initiated. In other species, it has been shown that competition from grass limits flower bud production and increases the number of good seeds produced.

It would be nice if the black seeds could be separated out. It's time consuming by hand. Perhaps the greater weight of good seeds would allow for winnowing.

Thanks for doing work that really changes lives.

Peace,

Jeff Goettemoeller WWW.PRAIRIEOAKPUBLISHING.COM



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Growing Stevia

Growing Stevia from scratch can be difficult (from seeds that is). Even if you could get the seeds to germinate stevioside levels can vary greatly from plant grown from seeds. It is best to buy starter plants. You should try and get Stevia plants that have been grown from cuttings of plants that were high in stevioside. Young Stevia plants are sensitive to low temperatures so you should wait until frost chance of frost has passed and soil temperatures are into the 50's and 60's before transplanting them into your garden.

Stevia plants should be put in rows 20 to 24 inches apart and 18 inches between plants. Your plants will grow a height of around 30 inches and widths of 18 to 24 inches. Stevia plants enjoy a rich loamy soil. Stevia's feeder roots are near the surface so it is a good idea to add compost for extra nutrients if your soil is sandy. Stevia roots are sensitive to excessive moisture. Be careful when watering and make sure their soil drains easily. Frequent light watering is best during the summer months. Add a layer of mulch around each plant to keep the shallow feeder roots from drying out.

Stevia plants prefer fertilizers with lower nitrogen content instead of Phosphoric acid or potash content. Organic fertilizers (fish emulsion, cow manure, etc.) are good since they release their nitrogen slowly. Waiting as late as possible to harvest can intensify the sweetness of the plants due to cool autumn temperatures and shorter days while they evolve into their reproductive state. You should cover your plants in the early frost so you can gain a few weeks growing and greater sweetness.

When it comes time to harvest you should prune off the branches before removing the leaves. You can also cut the tips off the stems since they can also be high in stevioside. If you live in a frost-free climate you can leave your plants outside but do not cut the branches too short, leave around 4 inches of stem. Your second year harvest will then be more successful.

You should replace the plants after 2 years with new cuttings. Cuttings must be rooted before planting. You can use commercial rooting hormones or make your own from willow tree tips made liquid in your blender. Dip cuttings in your preparation and plant in a rooting type soil for 2 to 3 weeks. Once the root system has had a chance to form you can plant in 4.5 inch pots. Place plants in a sunny, no draft location until spring. You can grow Stevia indoors; hydroponics systems work well or a 10 to 12 inch container filled with a light weight growing mix. Again, adding some mulch around the top. From: http://www.stevianow.com/growing_stevia.htm

Stevia grows in a variety of soils and conditions. Expect yield of 1/2 pound of dried leaves per plant. Canada is growing it and the CD of Ag is researching it fast. Seeds have low [10%] germination rate.

The Cultivation of Stevia

"Nature's Sweetener" May 26, 1997 Mike Columbus, Alternative Crop Specialist, OMAFRA OMAFRA

Introduction

The stevia plant belongs to the Compositae (sunflower family of plants). Centuries ago, Natives of Paraguay used the leaves of this small, herbaceous, semi-bushy, perennial shrub to sweeten their bitter drinks. Originating in the South American wild, it could be found growing in semi-arid habitat ranging from grassland to scrub forest to mountain terrain. The plant made its way to Pacific Rim countries where in recent decades it became cultivated domestically, used in its raw leaf form and now is commercially processed into sweetener.

Similar soil and climatic conditions exist in Southern Ontario as that found where stevia originated. As a transplanted annual plant, stevia tends to grow well on a variety of soil types ranging from coarse textured sands to well drained loams but not clay or poorly drained sites. During the growing season, it seems to thrive in a temperature range of 15°C to 30°C provided all input resources and good management practices are incorporated. Similar cultivation practices to that of other transplanted horticultural crops are required for stevia.

From the leaves of stevia (*S. rebaudiana*), stevioside, sweet crystalline diterpene glycosides are extracted. Stevioside is non-caloric, however, measured to be 200-300 times sweeter than that of sucrose. Other attributes of this natural, high-intensity sweetener include non-fermentable, non-discolouring, maintains heat stability at 95°C and features a lengthy shelf life. The product can be added to cooked/baked goods or processed foods and beverages. In the Pacific Rim countries, China, Korea and Japan, stevia is regularly used in preparation of food and pharmaceutical products. In Japan alone, an estimated 50 tons of stevioside is used annually with sales valued in the order of \$220 million Canadian.

The market opportunity appears great. Statistics indicate that in some countries up to 30% of their needed sugar is replaced by chemical-based (synthetic) stevioside-like sweetness products.

Introduction to Ontario, Canada

The writer was first introduced to stevia at the request of a major Canadian food processor who had learned of the product and questioned whether or not the plant could be grown commercially and processed in Ontario. Through an acquaintance, who was visiting China, the first seeds plus cultivation practices printed in a Chinese language arrived in Ontario. In 1987 an attempt was made to grow stevia plants. Results were poor, attributed primarily to immature seed. In 1989 the crop was introduced to Dr. Cheng of the Agriculture Canada, Delhi Research Station. Dr. Cheng was on a work exchange in China and returned with an additional seed supply which was propagated and planted out during the 1989 and 1990 growing seasons. Since that time, several researchers based at the Agriculture and Agri-Food Canada, Pest Management Research Centre (Delhi) have been involved in plant breeding, plant pathology and agronomy.

A collaborative research agreement between Agriculture and Agri-Food Canada and Royal Sweet International Technologies Ltd. (RSIT) has been entered into. At the same time, RSIT of Vancouver,

British Columbia in partnership with the Alberta Research Council, Edmonton, are developing new stevia processing technology which could result in a new natural, competitive sweetener. Research trials conducted at Delhi indicate attainable yields in the order of 2,000-3,000 kg/ha dry leaf and stevioside content ranging 15-20%, double that of other parts of the world where stevia has already been grown and processed commercially.

In the year 1995, six Southern Ontario farmers, located within the tobacco district, each planted one hectare of stevia on sandy soils. The six hectare experimental crop of stevia was grown under agreement with Royal Sweet International Technologies Ltd.

Agronomic Practices

Land Preparation - The six experimental crop sites were plowed and either disced and/or cultivated twice to prepare a fairly smooth, firm planting surface.

Transplants - Transplants from cuttings would be superior, however cost makes it prohibitive. Stevia must be propagated from seed in plug trays placed in a greenhouse for a period of 7 to 8 weeks.

Planting - In early to mid-May the stevia plug plants are planted into the field on either 53 cm or 61 cm row spacing with a total plant density in the order of 100,000 plants per hectare.

Fertilization - The plant appears to have low nutrient requirements, however a soil test should be conducted. For the year 1995, the recommended fertilizer program was 100 kg/ha of 6-24-24 prior at planting and 140 kg/ha of urea in a split application.

Irrigation - Normally, the stevia plant requires frequent, shallow irrigation. Generally, one applies irrigation if the stem tips are drooping. During the hot, dry 1995 growing season, irrigation was required at least one time per week. Generally, co-operators irrigated 5 to 10 times, some even more.

Weed Control - In 1995, co-operators mechanically row-cultivated numerous times. The crop also required hand hoeing and weeding.

Pests - Insect pest pressures other than cutworm are minimal. Septoria disease caused considerable damage to the over-mature 1995 crop. Deer seem to like the sweet taste of stevia, too.

Harvesting - Time of harvesting depends on land race variety and growing season. Generally it can be scheduled for mid to late September when plants are 40-60 centimetres in height. Shorter days induce flowering. Optimum yield (biomass) and stevioside quality and quantity is best just prior to flowering. The plant will tolerate temperatures to -6°C. A specially designed and fabricated tractor mounted, one-row harvester cuts the plant at ground level and conveys it into a drying wagon.

Drying - Drying of the woody stems plus the soft green leaf material is completed immediately after harvesting utilising a drying wagon or a kiln. Depending on weather conditions and density of loading, it generally takes 24 to 48 hours to dry stevia at 40°C to 50°C. An estimated 21,500 kg/ha of green weight is dried down to 6,000 kg/ha of dry weight.

Threshing - Immediately following drying, a specially designed thresher/separator is necessary to separate dry stevia leaves from the stevia stem. Stem and leaf portions tend to be equally represented at 3,000 kg/ha each.

Packaging - Dry leaves are stored in plastic lined cardboard boxes, sealed, strapped and labelled for further processing.

Economics of Production

The cost of production for the first experimental crop averaged in the order of \$8,500/ha. Sample leaf yields taken at optimum harvest period indicate potentially attainable yields of 2,850 kg/ha. Preliminary results indicate that in the order of 2,200 kg/ha of dried stevioside leaves are required to break even. Stevia could potentially become a viable crop for Southern Ontario farmers.

<http://www.spiritone.com/~canfarms/>

Stevia as a crop

The Stevia plant is a perennial. Mature plants produce two annual harvests in low fertility soil. The leaves measure from 2 to 3 inches long and up to 1 inch wide. When the plant reaches maturity, it is about 2-3 feet tall. The yield of twenty pounds of dried leaves leaves of good quality produces 2 pounds of Stevioside, the main sweetening principal of the leaf. For the home gardener, 6-8 plants should provide a years supply of leaves to dry and add to your tea and herbal blends.

The Stevia plant is currently being cultivated in Paraguay, Brazil, South Korea, Mexico, and the Far East, which is the largest producer in the world. All of the production of the Far East, except for small quantities exported to the USA, is entirely absorbed by the Japanese food industry.

More information at WWW.PRAIRIEOAKPUBLISHING.COM

<http://www.gks.com/library/stevia/stv-faq.txt>

Stevia Leaf - Too Good To Be Legal?

Rob McCaleb, Herb Research Foundation

For hundreds of years, people in Paraguay and Brazil have used a sweet leaf to sweeten bitter herbal teas including mate. For nearly 20 years, Japanese consumers by the millions have used extracts of the same plant as a safe, natural, non-caloric sweetener. The plant is stevia, formally known as *Stevia rebaudiana*, and today it is under wholesale attack by the U.S. Food and Drug Administration.

Stevia is a fairly unassuming perennial shrub of the aster family (*Asteraceae*), native to the northern regions of South America. It has now been grown commercially in Brazil, Paraguay, Uruguay, Central America, the United States, Israel, Thailand and China. The leaves contain several chemicals called glycosides, which taste sweet, but do not provide calories. The major glycoside is called stevioside, and is one of the major sweeteners in use in Japan and Korea. Stevia and its extracts have captured over 40% of the Japanese market. Major multinational food companies like Coca Cola and Beatrice foods, convinced of its safety, use stevia extracts to sweeten foods for sale in Japan, Brazil, and

other countries where it is approved. Europeans first learned of stevia when the Spanish Conquistadors of the Sixteenth Century sent word to Spain that the natives of South America had used the plant to sweeten herbal tea since "ancient times".

The saga of American interest in stevia began around the turn of the Twentieth Century when researchers in Brazil started hearing about "a plant with leaves so sweet that a part of one would sweeten a whole gourd full of mate." The plant had been described in 1899 by Dr. M. S. Bertoni. In 1921 the American Trade Commissioner to Paraguay commented in a letter "Although known to science for thirty years and used by the Indians for a much longer period nothing has been done commercially with the plant. This has been due to a lack of interest on the part of capital and to the difficulty of cultivation."

Dr. Bertoni wrote some of the earliest articles on the plant in 1905 and 1918. In the latter article he notes: "The principal importance of Ka he'e (stevia) is due to the possibility of substituting it for saccharine. It presents these great advantages over saccharine:

- 1. It is not toxic but, on the contrary, it is healthful, as shown by long experience and according to the studies of Dr. Rebaudi.**
- 2. It is a sweetening agent of great power.**

- 3. It can be employed directly in its natural state, (pulverized leaves).**
- 4. It is much cheaper than saccharine."**

Unfortunately, this last point may have been the undoing of stevia. Noncaloric sweeteners are a big business in the U.S., as are caloric sweeteners like sugar and the sugar-alcohols, sorbital, mannitol and xylitol. It is small wonder that the powerful sweetener interests here, do not want the natural, inexpensive, and non-patentable stevia approved in the U.S. In the 1970s, the Japanese government approved the plant, and food manufacturers began using stevia extracts to sweeten everything from sweet soy sauce and pickles to diet Coke. Researchers found the extract interesting, resulting in dozens of well-designed studies of its safety, chemistry and stability for use in different food products. Various writers have praised the taste of the extracts, which has much less of the bitter aftertaste prevalent in most noncaloric sweeteners. In addition to Japan, other governments have approved stevia and stevioside, including those of Brazil, China and South Korea, among others. Unfortunately, the US was destined to be a different story. Stevia has been safely used in this country for over ten years, but a few years ago, the trouble began.

http://res.agr.ca/lond/pmrc/faq/stevia_rev.html, July 4, 1998

CROP PRODUCTION

Stevia plants can be propagated from cuttings or seed. Since germination rates are poor and seedlings very slow to establish it is best grown as an annual or perennial transplanted crop. Clonal propagation is practical for small scale production, but is probably not economically viable for large scale stevia production where labor costs are high. The cost of producing vegetatively propagated transplants in Canada is high, so low cost transplants produced from seed is the only viable method on which to base stevia production.

In the temperate latitudes of the Northern hemisphere and South Western Ontario in Canada more specifically, the production cycle for annual stevia begins with the 6-7 week old plants grown from seed, in cells, in heated greenhouses. Seedlings are transplanted to the field in mid to late May. Fertilizer is banded along with the transplants. The crop is irrigated as required. Stevia is slow to establish under Canadian conditions and growth is sluggish until mid July. Most of the leaf yield is accumulated from July until mid to late September. The whole plant is harvested just above ground level, elevated into wagons and then dried. Following drying, the leaves are separated from the stems using a thresher. The leaves are then stored ready for processing.

Seed Production and Quality

Given stevia's daylength requirements, seed production in the Northern hemisphere would be best situated between 20 and 30E N latitude. The crop could be transplanted in February or March and seed collected in late summer. Flowering under these conditions should occur between 54-104 d following transplanting, depending on the daylength sensitivity of the cultivars used for seed production (Katayama et al. 1979). One-thousand seed weights for stevia seed usually range between 0.15 and 0.30 g and, depending on plant density, seed yields of up to 8.1 kg ha⁻¹ are possible (Carniero 1990). Seed germination is often poor and rates less than 50% are common (Miyazaki and Wantenabe 1974). Given the aforementioned conditions, seed produced on one ha could be enough to supply transplants for up to 200 ha of leaf production. Seed viability and yield are affected by growing conditions during pollination and seed filling. Excessive rainfall during pollination can affect both seed yield and germination (Carneiro 1990, Shuping and Shizhen 1995). Seed is best stored at 0E C, but even under low temperature conditions germination will still decline 50% over three years (Shuping and Shizhen 1995). Sealing of storage containers or using lower temperatures did not prevent the decrease in germination over time.

Cultural Practices

Planting densities ranging from 40,000 to 400,000 plants/ha have been tried in experiments conducted in Japan (Katayama et al. 1976). Leaf yield increased with increasing density up to 83,000 and 111,000 plants ha⁻¹ for the first year of production. The concentration of stevioside in the leaves of stevia increases when the plants are grown under long days (Metvier and Viana 1979). Since glycoside synthesis is reduced at or just before flowering, delaying flowering with long days allows more time for glycoside accumulation. It follows that stevia production would be best situated in a long day environment where vegetative period is longer and steviol glycoside yields will be higher.

Fertility requirements for stevia grown as an annual crop are moderate. Results from Japan demonstrate that, at the point of maximum dry matter accumulation, stevia plants consist of 1.4% N, 0.3% P, and 2.4% K (Katayama et al. 1976). In Ontario total biomass production of 7500 kg ha⁻¹ are possible and of that total, 26% would be roots, 35% stems, and 39% leaves (R. Beyaert pers. comm.). Based on the composition observed by Katayama leaves (R. Beyaert pers. comm.). Based on the composition observed by Katayama (from both soil and fertilizer. The actual rates of application will vary according to soil type and production environment, and need to be optimized for each specific situation.

Two fungal diseases, *Septoria steviae* and *Sclerotinia sclerotiorum*, have been reported in stevia grown in Canada (Lovering and Reeleder 1996; Chang et al. 1997). *Septoria* disease was characterized by depressed, angular, shiny olive gray lesions, sometimes surrounded by a chlorotic halo, that rapidly coalesce. *Sclerotinia* disease was characterized by brown lesions on the stem, near the soil line, followed by wilting and eventually by the complete collapse of affected individuals. No means of controlling these diseases have yet been published. Since stevia is very slow to establish and does not compete well with weeds, herbicides or other means will be essential to control weed growth to produce ample yield and a clean crop. The herbicide trifluralin appears to be well tolerated by stevia (Katamaya 1979).

Stevia is harvested just prior to flowering when steviol glycoside content in the leaves is at its maximum (Sumida 1980, Xiang 1983). Following harvest the whole plant is dried and the leaves separated from the stems for further processing (Murai 1988). The stems have very low concentrations of sweet glycosides and are removed to minimize processing costs (Brandle and Rosa 1992). Drying stevia under artificial conditions is affected by a number of factors including loading rate, temperature, and ambient air conditions (Van Hooren and Lester 1992). The effect of drying conditions on glycoside levels or processing quality of the leaves has not been investigated.

CONCLUSION

Stevia represents a new opportunity for researchers and farmers alike. A great deal of information relating to production practices and disease control is required to optimize annual transplant production for Canada. Such basic things as herbicide and fungicides registration, optimum planting and harvest times, fertilizer recommendations are all essential. Since markets exist for stevia now, production and optimization must occur in parallel. The production of remarkably high levels of one class of secondary metabolite is of significant interest for chemists, biochemists and geneticists and may prove to be a foundation for the production of new metabolites in the future.

Stevia really is hard to get established initially. The plants can look great, but when transplanted into the field they are easily shocked. Once established, they do better. Especially when young, the plants must be niether too wet or too dry. A heavy clay soil retains too much moisture. Raised beds certainly help, but even the a rainy spell can cause stem rot. Good compost work into the ground is helpful as with most any plant. On the other hand, stevia does not like to dry out. I think partial shade would help if it's very hot and sunny soon after transplanting. Perhaps shade netting over wire hoops or newspaper "tents" on the south side. I suppose "hardening off" might help as well. In a nice warm, moist greenhouse, the stems become very soft and succulent. This makes them succptible to shock and rot. In a warmer climate with a long season, like Texas or

Central America, I think I would prefer to start cutting outdoors in beds with drip hoses, and then transplant to the field. They root easily that way in the spring. Starting from seed would be good if the plants would produce enough good seeds. The few plants I've grown from seed have transplanted very successfully and grown vigorously.

I'm going to send you a complimentary copy of "Stevia rebaudiana, Nature's Sweet Secret." It has the chapter I wrote about growing stevia. I'll also send a complimentary copy of the new Spanish edition of my recipe book. You are in a position to make use of both of those and spread the word about them. They're also available at Amazon.com. I've also got a web site to which I'll be adding more stuff: www.homestead.com/stevia

My recipe book continues to sell very well, but I know many more can benefit from it, as you found out with the show of hands regarding diabetes. The Spanish edition will expand the readership, hopefully.

The problem is that a plant produces only a small percentage of those good seeds, but all get harvested together. The bulk of the seeds are really light, empty shells that are tan in color. I think the problem is that the plants over-produce flower buds and cannot provide enough nutrition to actually form embryos for all the seeds. Restricted nutrition or some kind of shock during flower bud formation might cut down on the number of flower buds

initiated. In other species, it has been shown that competition from grass limits flower bud production and increases the number of good seeds produced.

It would be nice if the black seeds could be separated out. It's time consuming by hand. Perhaps the greater weight of good seeds would allow for winnowing.

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Agronomic Practices

Land Preparation - The six experimental crop sites were plowed and either disced and/or cultivated twice to prepare a fairly smooth, firm planting surface.

Transplants - Transplants from cuttings would be superior, however cost makes it prohibitive. Stevia must be propagated from seed in plug trays placed in a greenhouse for a period of 7 to 8 weeks.

Planting - In early to mid-May the stevia plug plants are planted into the field on either 53 cm or 61 cm row spacing with a total plant density in the order of 100,000 plants per hectare.

Fertilization - The plant appears to have low nutrient requirements, however a soil test should be conducted. For the year 1995, the recommended fertilizer program was 100 kg/ha of 6-24-24 prior at planting and 140 kg/ha of urea in a split application.

Irrigation - Normally, the stevia plant requires frequent, shallow irrigation. Generally, one applies irrigation if the stem tips are drooping. During the hot, dry 1995 growing season, irrigation was required at least one time per week. Generally, co-operators irrigated 5 to 10 times, some even more.

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Pests - Insect pest pressures other than cutworm are minimal. Septoria disease caused considerable damage to the over-mature 1995 crop. Deer seem to like the sweet taste of stevia, too.

Harvesting - Time of harvesting depends on land race variety and growing season. Generally it can be scheduled for mid to late September when plants are 40-60 centimetres in height. Shorter days induce flowering. Optimum yield (biomass) and stevioside quality and quantity is best just prior to flowering. The plant will tolerate

temperatures to -6°C. A specially designed and fabricated tractor mounted, one-row harvester cuts the plant at ground level and conveys it into a drying wagon.

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Threshing - Immediately following drying, a specially designed thresher/separator is necessary to separate dry stevia leaves from the stevia stem. Stem and leaf portions tend to be equally represented at 3,000 kg/ha each.

Packaging - Dry leaves are stored in plastic lined cardboard boxes, sealed, strapped and labelled for further processing.

Economics of Production

The cost of production for the first experimental crop averaged in the order of \$8,500/ha. Sample leaf yields taken at optimum harvest period indicate potentially attainable yields of 2,850 kg/ha. Preliminary results indicate that in the order of 2,200 kg/ha of dried

stevioside leaves are required to break even. Stevia could potentially become a viable crop for Southern Ontario farmers.

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Stevia as a crop

The Stevia plant is a perennial. Mature plants produce two annual harvests in low fertility soil. The leaves measure from 2 to 3 inches long and up to 1 inch wide. When the plant reaches maturity, it is about 2-3 feet tall. The yield of twenty pounds of dried leaves of good quality produces 2 pounds of Stevioside, the main sweetening principal of the leaf. For the home gardener, 6-8 plants should provide a years supply of leaves to dry and add to your tea and herbal blends.

The Stevia plant is currently being cultivated in Paraguay, Brazil, South Korea, Mexico, and the Far East.

How to make a liquid extract from the leaves of the Stevia Plant!

At the end of October, 1998, I harvested my stevia plants from my garden. (I live in Texas and the weather has just started to turn cool!) The plants were starting to flower and the

word from my friends in Brazil was that it was time to harvest. So I cut the stems of the plants and brought the cuttings inside. I washed the cuttings and then I grabbed the bottom of the stem (where it was cut) and with one hand firmly holding the stem, the other pinched the stem while I pulled down on the stem, sliding my hand downwards. This was a really quick way to remove all of the leaves with no problem. (It actually reminded me of harvesting oregano or basil). Since I didn't have many plants to begin with, I ended up with about six cups of fresh stevia leaves. I placed two cups of water into a large pot and brought it to a boil. Then I placed the 6 cups of stevia leaves into the water and covered it, allowing it to boil for about 3-5 minutes and then removed it from the heat and let it steep for about 20 minutes. I then removed the leaves and squeezed any remaining liquid out of them. I then put the liquid "tea" into a smaller pot and over low heat reduced the liquid by 1/2. The end product was about a cup of very strong, and very sweet liquid stevia extract. I estimate that 1 tsp. of the liquid was about as sweet as 5 tsp. of sugar. Of course this will depend on the quality of the leaves and when you harvested them.

Ken Hargesheimer, minifarms@gmail.com

WWW.PRAIRIEOAKPUBLISHING.COM