

STEVIA

0% Calorie, 100% Sweet, 100% Nature

All over world there is increasing tendency towards consuming natural products and thus living a natural life and. At the same time our life styles have changed so much over the last 4-5 decades that sweeteners (either high calorie natural or proceeded sugars or high potency and low calorie sweeteners such as Aspartame) have become integral part of our natural daily diet.

Due to sedentary life styles that we all tend to lead these days the incidence of obesity and diabetic conditions are increasing dramatically. In India number of diabetic people in the age group of 25-45 is about 15% and is increasing at an alarming pace. In addition, we are largest consumers of sugar in the world. This single factor, we have come to understand, would greatly contribute to increasing the number of diabetic people and related problems.

Stevia, botanically known as *Stevia rebaudiana* Bertoni (Family- Asteraceae) is a sweet herb. A perennial herb, Stevia is a member of the daisy family. The leaves are mid green and intensely sweet. The compounds in the leaves are called stevioside and rebaudioside and they can be more than 200 times sweeter than sugar. The plant bears greenish cream flowers in autumn.

Although Stevia has been in use in Asia and Europe for years, it was only in the past couple of years that it really started to capture attention in the India market as a healthy alternative sweetener to sugar. Stevia has no calcium cyclamate, no saccharin, no aspartame and no calories. It is safe for diabetics, as it does not affect blood sugar levels; it does not have the neurological or renal side effects associated with some of the artificial sweeteners.

Stevia is a new crop in that it is gaining very high popularity amongst all type of sweetener users as most ideal substitute for sugar. Sugar is basically a chemical that has grown in market over last many years. But in this age of changing life styles and people becoming more conscious of their health, the worldwide sugar consumption is going down and is getting replaced by low calorie sweeteners. Many of these Sweeteners are complex chemicals or many times naturals as well.

Stevia is gaining more acceptances amongst countries of eastern block such as Japan and Korea. There are many advantages of using Stevia over conventional sweeteners the main one being:

Stevia leaves are 20-30 times sweeter than sugar. Stevia leaves can be dried and stored. Stevia can be used in raw form. Stevia is short duration crop. It is harvested 3/4 times a year. The yearly yields can be in the range of 3-4 tons. Stevia can be sold @ 40-70 Rs per kilo so dried leaves and is thus economically extremely beneficial to growers.

Uses of Stevia leaves

Currently consumers have more inclination towards products that are claimed to be 'All Natural' and 'Low CHO'. Hence, the food industry could grab a major share in the market if Stevia, the natural sweetener, is used as sweetening agent in products like biscuits, jams, chocolates, ice-creams, baked foods, soft drinks, soda, candies and also common beverages like dip tea, coffee and herbal tea that are targeted particularly at the diabetics and also the health conscious consumers.

Application in bakery, confectionery and beverage sector

All cooked and baked food items like puddings; desserts can be sweetened with only very small quantities of Stevia leaf powder as compared to table sugar. Just 50 gms. of Stevia leaf can replace 1000 gms. of cane sugar. The sweetness of stevioside is non-fermenting and it does not display browning when cooked. This further widens its area of application in baking. This also enhances the quality and safety to usage with a longer shelf-life period. Breads made with Stevia as an ingredient (for diabetics patients) have been found to display improved texture, softness and an increased shelf life.

The confectionery industry is yet to reap the benefit of stevia, which has the potential to replace sugar as sweetening agent. The leaves can be used in chocolates and candies not only to meet the requirement of diabetic and health conscious consumers, but also to harvest the added advantage, that it does not encourage tooth decay. Stevia possesses an antimicrobial property and can be used in all the sweets that children are fond of. A mere fragment of the leaf is enough to sweeten the mouth for an hour. So stevia can also be used in the manufacture of chewing gums, mints, mouth refreshers and even in pan.

The soft drink manufacturers have introduced several health drinks and many food supplementary beverages, especially for the diabetics' patients. The addition of Stevia leaves (dried) as such or as powder in such products would not only aid in increasing the sweetness naturally but also helps in rejuvenating the pancreatic gland. Apart from this, Stevia is rich in nutrients, containing substantial amounts of protein, calcium and phosphorus.

Stevia consists of 10-12% of stevioside, which can be extracted as liquid concentrate that can be used directly in soft drinks, beverages, chocolates etc.

Medicinal Properties of Stevia

Stevia is versatile herb with incredible sweetness that can be safely used in herbal medicines; tonics for diabetic patients and also in the daily usage products, Stevia leaves can be used because of its anti-fungal and anti-bacterial property. Mild stevia leaf tea offers excellent relief for an upset stomach.

A wet Stevia leaf bag provides a cooling effect on eyes (similar to using cucumber). The leaves effectively tighten the skin and are good for wrinkles. Stevia has proved to give exceptional benefits when used regularly in skin care. It also has a healing effect on blemishes, wounds, cuts and scratches.

Stevia is helpful in weight and blood pressure management. It has also been reported that stevia lowers incident of colds and flu.

Commercial Cultivation

You need not be a South American farmer to be a successful Stevia grower. A short day plant, it only reaches a height of 45 cm in three months. The concentration of Stevioside in the leaves of Stevia increases when the plants are grown under long day condition.

Stevia grows best in upland areas in sub-tropical climate. In other places it can be grown as an annual. The plant prefers a lightly textured, well-drained soil to which organic matter has been added. It needs ample water so that the soil is consistently moist, but not wet. In hot, sunny climates it will do best in semi-shade. Propagation is from seed sown in spring, but germination rates can be low-expect half the seeds sown not to germinate. Plant seedlings out once all danger of frost is over. Leaves are best harvested just before flowering. The plants will also grow from cuttings, which are best taken in late winter.

The concentration of stevioside in the leaves of Stevia increasing when the plants are grown under long day condition. While, cultivating stevia on a large scale, it can be grown in well-drained red soil and sandy loam soil. The soil should be in the pH range of 6.5-7.5. Saline soils should be avoided to cultivate this plant.

Stevia can be successfully cultivated all around the year all over India except the areas, which receive snowfall, or temperatures go below 5 degree celcius in winter. The summer temperatures actually do not affect this plant if the high summer temperatures have already been factored in the cultivation practices.

Since seed germination rate is very poor, it is propagated vegetatively. Though stem cuttings are used for vegetative tissue culture plants have proven to be the best planting material for Stevia. Tissue culture plants of Stevia are genetically pure,

free from pathogens and have excellent vigour. The tissue culture plants can be planted throughout the year, except during peak summer. An ideal planting density is 30,000 plants per acre with spacing of 25x40 cm in a raised bed system. The soil can be enriched with a basal dressing of 25 tons of well rotten farmyard manure/hectare.

Land preparation

Land should be ploughed initially with a disc plough or harrowed to break down the clods. Fine tilth is required. One to two times ploughing has to be done after harrowing. Around 25 MT of FYM/Ac has to be applied as a basal dressing during the last ploughing to incorporate the manure with soil.

Soil Type

Stevia requires very good drainage any soil that retain the moisture for very long period of time are unsuitable for Stevia cultivation and should be religiously avoided. Similarly black cotton soils with very heavy clay content should also be avoided. It is mandatory that before planting, each and every soil sample should be properly tested and analyzed by an expert. Red soil and sandy loam with a 6-7 pH are best for the cultivation of Stevia.

Raised bed preparation

Forming raised beds is the most economical way to grow Stevia. The raised bed should be of 15 cm in height and 60 cm in width. The distance between each plant 23 cm. This would give a plant population of around 30,000 per acre.

Planting

Stevia can be planted in many ways. The types of agronomic practices generally depend on type of soil and climate conditions. Generally it is advisable to plant minimum of 40,000 plants per acre. Since the economical part is the leaves it is very important to achieve highest vegetative growth.

Planting Material

There are basically two options for multiplication. The first is the tissue culture and second the stem cutting. Tissue culture is the best option but many farmers are tempted to try the stem cutting method for multiplication. As per practical experience, stem cutting is sometimes more expensive to produce than the tissue culture since the success rate of the stem cuttings establishment is very low, it takes minimum of 25 weeks for the stem cutting to develop in proper feeding roots for transplantation (younger stem cuttings transplants have shown more than 50% mortality in first few weeks of transplants in main field). It is also noticed that Stevioside content of the stem cutting plants is lower by at least cutting plants is lower by at least 2% points in Indian conditions.

Plant Varieties

There are about 90 varieties of stevia rebaudiana developed all around the world. Basically all these varieties have been developed for different climate requirements, many times these varieties perform strangely in different climate conditions. At the end of the day, just like sugarcane, it is the stevioside and rebaudioside content in the Stevia leaves that determine the price and marketability of Stevia leaves. In many causes in south India it was observed that stevioside content was as low as 3.5%, which was below the minimum market requirement of 9%. Hence it becomes imperative that the grower selects proper varieties with adequate guarantees from the planting material suppliers about minimum assured stevioside and rebaudioside contents.

Irrigation

Stevia requires ample supply of good water all year around. As the plant cannot tolerate drought, frequent irrigation is required. Micro sprinklers are the best method of irrigation would not supply the required amount of water at the right time.

So through micro sprinklers, the water can be sprinkled once in a day in winter and two to four times in a day in summer depending upon the heat and relative humidity in the air. Watering frequency should be scheduled so that the plants do not wilt for want of water.

Fertilizer application

The recommended dose of fertilizer is 110:45:45 NPK/ac. This requires 4½ bags of urea, 2 bags of DAP and 2 bags of Potash. The entire dose of DAP is applied as the basal dressing. The Nitrogen and Potash fertilizer can be split and applied as 10 doses in every month. Nitrogen application is a must for the production of dry matters.

Plant protection

Organic gardeners in particular should find stevia an ideal addition to their yield. Though nontoxic, stevia plants have been found to have insect-repelling tendencies. Their very sweetness, in fact, may be a kind of natural defense mechanism against aphids and other bugs that find it not to their taste. Perhaps that's why crop-devouring grasshoppers have been reported to bypass stevia under cultivation. In case any disease symptoms are noticed, spraying of neem oil diluted in water is the best organic method.

Weeding

Removal of weeds can be done manually. Since the crop is grown in raised beds, inter-cultural operations are easier by manual labour.

Maintenance

Stevia plants do best in a rich, loamy soil-the same kind in which common garden-variety plants thrive. Since the feeder roots tend to be quite near the surface, it is good idea to add compost for extra nutrients if the soil in your area is sandy.

Besides being sensitive to cold during their development stage, the roots can be also be adversely affected by excessive levels of moisture. So take care not to over-water them and to make sure the soil in which they are planted drains easily and isn't soggy or subject to flooding.

Frequent light watering is recommended during the summer months. Adding a layer of compost or your favourite mulch around each Stevia plant will help keep the shallow feeder roots from drying out.

Stevia plants respond well to fertilizers with lower nitrogen content than the fertilizer's phosphoric acid or potash content. Most organic fertilizers would work well, since they release nitrogen slowly.

Flowering of the plant should be avoided. Since Stevia has a significant apical dominance, the plant tends to grow tall and lanky. Pinching of the apical bud would enhance bushy growth of the plant with side branches.

Harvesting

Depending on climate conditions one can achieve the yields of 2000-4000 Kilos in three to six harvests annually. Another important aspect of harvesting is the timing of harvest. It should be noted that at no point of time plants should be allowed to flower since after flowering the Stevioside percentage goes down rapidly and leaves are rendered unmarketable. Leaves are harvested by plucking in a small quantity, or the entire plant with the side branches is cut leaving 10 to 15 cm from the base.

The first harvesting can be done four to five months after planting. Subsequent harvesting can be done every three months, for three consecutive years. The sweetener in the leaf is maximum till the plant flowers. Just before flowering, the plant should be cut completely leaving 10 cm from the ground. The new flush of leaves will sprout from here. The new plant will be ready for harvest again in three months. The plant yields around 3000 kg of dried leaves from an acre of plantation every

year. Harvesting should be done as late as possible, since cool autumn temperatures and shorter days tend to intensify the sweetness of the plants as they evolve into a reproductive state.

Unlocking the sweetness in your harvest

Once all leaves have been harvested it's required to dry them. This can be accomplished on a net. The drying process is not one that requires excessive heat; more important is good air circulation. On a moderately warm fall day, stevia crop can be quickly dried in the full sun in about 12 hours. (Drying times longer than that will lower the stevioside content of the final product.)

Crushing the dried leaves is the final step in releasing stevia's sweetening power. The dried leaves are powdered, sieved and the fine powder is stored in containers. This can be done either by hand or, for greater effect, in a coffee grinder or in a special blender for herbs.

Fresh Stevia leaves

This form of stevia is the herb in its most natural, unrefined state. A leaf picked from a stevia plant and chewed will impart an extremely sweet taste sensation reminiscent of licorice that lasts for quite a while. For stevia to have a more practical application as a tea or sweetener, the leaves must be dried or put through an extraction process, which makes the sweet taste even more potent.

Dried leaves

For more of the flavour and sweet constituents of the stevia leaf to be released, drying and crushing is necessary. A dried leaf is considerably sweeter than a fresh one, and is the form of stevia used in brewing herbal tea.

Stevia extracts

The form in which Stevia is primarily used as a sweetener in Japan is that of a white powdered extract. In this form it is approximately 200 to 300 times sweeter than sugar (by weight). This white powder is an extract of the sweet glycosides (natural sweetening agents) in the Stevia leaf.

Not all Stevia extract powders are the same. The taste, sweetness and cost of the various white stevia powders will likely depend on their degree of refinement and the quality of the stevia plant used. Since extracted stevia powder is so intensely sweet, it is always recommended that it be used by the pinch (or drop if diluted in water). Once mixed, this solution should be stored in the refrigerator.

Liquid concentrates

These come in several forms. There's a syrup black liquid (that result from boiling the leaves in water), which can enhance the flavour of many foods. Steeping stevia leaves in distilled water or a mix of water and grain alcohol makes another type.

Future of honey leaf (Madhu-Patraa) Stevia

The leaves of this splendid plant are 30 times sweeter than sugar; with zero calories whereas pure extract is 300 times sweeter than sugar. This sweet-honey-leaf herb is likely to become the major source of high potency sweetener for the growing natural food market, in the years to come.

Stevia finds its use as a natural sweetener, replacing the chemical sweeteners and even table sugar; the sweetness in leaf is due to the presence of an intensive-sweetening agent called stevioside and the leaf by itself is about 20 to 30 times sweeter than sugar. The leaf has stevioside of 10-12% on dry weight basis.

Stevia is a new promising renewable raw material for the food market. The market potential for this natural sweetener is still untapped. It is estimated that about 30 million Indians are presently suffering from diabetes and it is estimated that by 2025 India's contribution to the diabetic global population would be a whopping 89 million. With such a huge share of the population being diabetic, the new ventures in the food industry are focused entirely on them.

The soft drink manufacturers in India are yet to exploit the sweetness of this herb by its addition in their product. Though many soft drinks are introduced in the market with the prefix 'dia' connoting that it meant for the diabetics, the usage of stevia in such products would fetch a greater demand than for the one with artificial sweeteners.

The beverage industries like tea and coffee manufacturers have just started introducing new products for the diabetic patients, realizing the major share held by them in the consumer market. As tea and coffee has been the non-replaceable and the best beverage for every Indian, this sector has enormous potential to come up when the natural sweetener Stevia is used in their products.

All those 'dia' prefixed products in the market at present are sweetened with artificial sweeteners that is, of course, equally sweet, but with undetectable side effects in due course. Stevia is a fully plant-based, natural sweetener can be used to replace the artificial sweeteners completely. As stevia leaf powder with no processing is highly safe to use, calorie-free and moreover around 20-30 times sweeter than cane-sugar, it can replace cane-sugar too. The process of manufacturing Stevia leaf powder is quite simple, when compared to the tedious steps involved in cane sugar manufacture.

Market potential

India being largest consumer of cane sugar along with largest diabetic population in the world, Stevia is ideally poised to make significant contribution in satisfying the Indian demand of natural low calories sweetener.

Today Stevia rebaudiana extract accounts for 40% of the sweetener market in countries such as Japan, Korea and Malaysia.

Stevia is relatively new to Indian market. Hence there is plenty of confusion with regard to marketing of this unique product. There are some farmers insist on buy back arrangement.

There are reputed business houses those offer buy back @ of Rs. 60-70 per kilo. This price is on lower side; on an average the farmer should get a price of Rs. 100 to break even in first year.

International market

There is growing international market for Stevia as well as. There are offers to buy container loads of Stevia leaves at a price of 25 dollars per kilo. As mentioned earlier international demand is only for high quality Stevia leaves having minimum 9% Stevioside content. There is no buyer for Stevia leaves having less than 8% Stevioside content.

Stevia cultivation can be successful venture provided you are able to produce high quality leaves having minimum Stevioside content of 9% at the same time produce optimum quality of marketable leaves per acre to keep the production cost below Rs. 25 per kilo on five years basis.

Conclusion

The demand for high potency sweeteners is expected to increase Worldwide. The increasing in the number of diabetic patients and health conscious individuals would push forward the need for alternatives to sugar.

Stevia is a potential alternative source for replacing artificial sweeteners like saccharin, aspartame, asulfam, etc. Unlike many low calorie sweeteners, stevioside is stable at. High temperature and over a pH range of 3-9. Steps need to be properly aligned to exploit the natural sweetness of Stevia.

Food industrialists have to start launching new products utilizing stevia. This would obviously provoke the need to grow more and finally result in more area under stevia cultivation.

In India several important and necessary steps have to be taken up for its propagation. Development of seedlings suitable to India would be the first requirement. A crop production system, providing information on optimized crop inputs, weed and disease control, harvesting and handling methods would have to be detailed out. Awareness has to be created about the natural herb and the products manufactured out of it by the industries.

It's time to streamline necessary forces to have access to Stevia. Initiative needs to be undertaken to promote this natural sweetener and create product awareness. This would be the right approach to unlock the sweetness of this herb in our day-to-day life.

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