



FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

STEVIA

Stevia rebaudiana,

Asteraceae

Stevia is a subtropical perennial that produces sweet steviol glycosides in the leaves for which it also known as 'Cheeni Tulsi' or 'Mou Tulsi'. Plants grown at higher latitudes actually have a higher percentage of sweet glycosides. The plant can be utilized as a source for the production of natural sweetener (food), as a source of chlorophyll, phytosterols (non-food: medicine). The sweetener can be converted into gibberellins by fermentation (Non-food — Agrochemicals), the vegetative residue can be used as animal feed and the stalks can be used as a source of cellulose (Non-food: Cellulose industry).

Its medicinal uses include regulating blood sugar, preventing hypertension, treatment of skin disorders, and prevention of tooth decay. The compound obtained from stevia is considered to be the best alternate source for diabetes sufferer. The added value for this new crop can go up to a considerable extent.

Market potential

Market opportunity appears great. Statistics indicate that in some countries up to 30 % of their needed sugar is replaced by stevioside-like sweetness products.

Soil

Stevia prefers a well-drained fertile sandy loam or loam soil, high in organic matter with ample supply of water. It prefers acidic to neutral (pH 6-7) soil for better growth. It requires a consistent supply of moisture, but not waterlogged. Too much soil moisture can cause rot.

Climate

It is a semi-humid subtropical plant that shows higher leaf production under high light intensity and warm temperature. Day length is more critical than light intensity. Long spring and summer days favour leaf growth. Short days trigger blossoming. Stevia prefers partial shade during considerable summer sunshine.

Variety

There are 3 named varieties developed by Sun Fruits Pvt Ltd, Pune viz,

- 1) S.R.B-123:** It can be harvested 5 times in year. The glycoside content is in between 9-12% found suitable for South.
- 2) S.R.B-512:** It is suitable for Northern India and the Glycoside content is in

between 9-12%.

3) S.R.B-128: Highest stevioside content up to 21%. Found suitable for Northern India.

4) Material that yields Stevioside in the range of 9 – 12% or above can be used as good material for commercial cultivation and should be maintained by vegetative propagation only.

Propagation

Stevia is usually propagated by stem cuttings, which root easily. Sweetness in leaves varies with varieties. Therefore, for propagation cutting should be obtained from a source, which is high in stevioside and low in associated bitterness. Rooting can be enhanced by using commercial rooting hormones. Cutting should be 2-4 inches long, from leaf axils of current year growth with atleast two leaf buds above ground. All the lower leaves are removed keeping 2or 3 small leaves. Treatment with Paclobutrazol @ 100 ppm has been found to induce the root initiation in short time. Effective outcome of this treatment can be obtained when the cuttings are planted during the month of February-March. Propagation can be done in other period also with varying success.

Land Preparation

Land is either disced and /or harrowed twice to prepare a fairly smooth, firm-planting surface. Around 50 MT of FYM / ha has to be applied as a basal dressing during the last ploughing to incorporate the manure with the soil. With proper drainage and irrigation channels the field is divided into plots of convenient size.

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 two rows should be 40 cm and that between each plant 23 cm. This would give a plant population of around 75,000 per hectare.

Planting

March to mid May gives better results. Immediate after planting one irrigation is necessary. The concentration of stevioside in the leaves increases when the plants are grown under long day condition where vegetative period is longer and steviol glycoside yields will be higher.

Irrigation

It needs irrigation, as Stevia cannot stand drought. Sprinkler irrigation (micro sprinklers) is found to be advantageous since the herb is highly sensitive to water stress and requires frequent light irrigation. During summer irrigation at 3-5 days interval gives best results.

Mulching

In order to reduce the impact of drought and high temperature, addition of mulches around the plant is recommended.

Nutrient uptake

Study revealed that at the point of maximum dry matter accumulation, stevia plants consist of 1.4 % N, 0.3% P and 2.4 % K. When biomass production is 7500 kg/ha, it is constituted by 26 % roots, 35 % stems and 39 % leaves. Such biomass would require about 105 kg N, 23 kg P and 180 kg K from both soil and fertilizer. Therefore, the actual rate of application will vary according to soil type and production environment, and need to be optimized for each specific situation.

Manuring and fertilization

Under average condition application of FYM @ 50 t/ha and fertilizers N-60 kg, P₂O₅ 30 kg and K₂O 45 kg/ha is recommended. N is applied in three splits once at basal and remaining two applications after first and second cutting. Stevia plants prefer low nitrogen, but high level of phosphorus and potassium. Slow release nitrogen sources are better due to requirement of low level of N and steady release of N from source. Sometimes stevia shows the symptoms of boron deficiency, which leads to leaf spot and that can be rectified by spraying Borax 6 %. Since the feeder roots tend to be quite near the surface, addition of compost for extra nutrients is beneficial.

Plant protection

No serious pest and diseases have been observed. Neem oil diluted in water may be sprayed against aphids if appear. Deer and rabbits are fond of Stevia due to sweet taste. Fencing is necessary.

Harvesting

Time of harvesting depends on land type, variety and growing season. The first harvest of the crop can be had in four months after planting and subsequent harvest once every 3 months. Generally it can be scheduled for mid to late September when plants are 50-70 cm in height. Short days induce flowering. Optimum yield (biomass) and stevioside quality and quantity is best obtained just before flowering. The easiest harvesting technique is to cut the branches off with pruning shears before stripping the leaves. The tips of the stems can be clipped off and added to harvest yield, as they contain as much stevioside as do the leaves. On an average three commercial harvests can be obtained per year. It is better to cut the plants leaving about 10 cm stem portion from the ground. This will facilitate new flushes to emerge, which can be harvested as the next crop. For domestic use leaves may be used fresh for tea or may be combined with mint leaves.

Drying

Immediately after harvest the herb is dried. This can be accomplished on a screen or net. The freshly harvested plants can be hung upside down and dried in shade. It can also be dried using simple drying racks inside transparent poly house or transparent glass roofing or by passing dry air just above room temperature. Drying of the stem and

soft green leaf material is completed immediately after harvesting utilizing a drying wagon or a kiln or done naturally in case of large-scale production. Depending on weather conditions and density of loading, it generally takes 24 to 48 hours to dry stevia at 400 to 500 C. The drying process does not require excessive heat; more important is good air circulation. On a moderately warm fall day, stevia can be quick dried in the full sun in about 12 hours. (Longer drying time will lower the stevioside content of the final product). A home dehydrator can also be used, although sun drying is the preferred method. After adequate drying, the leaves are stripped of the stems / twigs and packed and stored in cool, dry place. For large-scale commercial production artificial drying and threshing of the dry herbs to separate leaves may be employed.

Yield

About 15,000kg/ha of green herb is obtained which on drying gives about 4166-kg/ha. After separating stems this yields about 3000 kg/ha in the first year. Yield goes on decreasing from 3rd year of planting and hence terminated.

Packaging

Dry leaves are stored in plastic lined cardboard boxes, sealed, strapped and labeled for further processing. After powdering it is to be packed and leveled properly.

Replacement and replanting

From the subsequent years some plants will die off due to various reasons, these gaps should immediately be filled up by well-developed seedlings raised in large size poly bags. Depending on soil type and management the productivity will decline after 2-3 years and this should be replaced with new plantation.

Growing Stevia in home garden

Stevia can be grown either in pots on balcony or any sunny spot. It does well in “container gardens”. A 10 to 12 inches diameter container filled with a lightweight growing mix is an ideal size for each plant. A little mulch on the top will help retain the moisture in the shallow root zone.