STEVIA PLANT INTRODUCTION, ITS PRODUCTION TECHNOLOGY AND ITS THREPTIC USES

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Introduction:

Stevia (*Stevia Rebaudiana Bertoni)* is native to Paraguay in South America. It is variously known as sweet leaf, honey leaf, candy leaf, sweet weed or sweet herbs. Stevia is gaining significant popularity in different parts of the world and is expected to be a major source of high potency sweetener. The leaves of this popular plant are sweet and ideal for people who are conscious of sugar and carbohydrate intake. With zero calories, the plant is being recognized as a great replacement for sugar and other sweeteners. Worldwide, 32,000 hectares have been under stevia cultivation and China has a major chunk of 75%. It is a natural sweetener plant and is grown commercially in many parts of Brazil, Paraguay, Central America, Thailand, Korea and China. Japan is currently using large amounts of stevia. Several countries have now started its commercial cultivation. Stevia is a plant with carbohydrate-based compounds that are 200-300 times sweeter than sugar. It is reported that steviosides have insulinotropic effects in pancreatic beta cells because it increases insulin secretion and thereby decreases blood glucose level. It can be extracted and used as alternative sweeteners for sugars. Recent research has shown that, consuming stevia in its raw form, fresh or dried, helps to solve several health problems such as diabetes, allergies, digestive problems, anxiety, and high blood pressure. Stevia also contains vitamin C, calcium, beta-carotene, niacin, iron, magnesium, potassium, proteins and fiber. Changes in leaf yield and accumulation patterns of stevioside have been observed in response to different environmental conditions. Nutritional variations provide leads for developing strategies to increase stevia productivity under different agro-climatic conditions. Stevia is a good crop to promote resilience from pest infestation and a short-term crop to strengthen climate change adaptation in order to mitigate its adverse impacts in agriculture. In 1900, Ovidio Rebaudi first isolated the active ingredients, glycosides, responsible for sweetness of stevia leaf extract. The characterization of different glycosides of stevia was completed in 1931. Cultivation of stevia started in 1961. United States of America recognized stevia as a valid natural sweetener in 2008, while stevia has been approved by Canada for use in foods and beverages.

Distribution:

The first report on commercial cultivation of stevia in Paraguay was in 1964 [13]. Since then it has been introduced as a crop in a number of countries including Brazil, Korea, Mexico, United States, Indonesia, Tanzania and Canada since 1990 and also Kenya, Malaysia. Currently, its major production is centered in China and the major market is in Japan.

Cultivation Technology Climate:

Stevia is a perennial herbaceous plant native to between 22° to 24° south and 53° to 56° west in Paraguay and Brazil. Plants grown at higher latitudes actually have a higher percentage of sweet glycosides. Nutrition and climatic conditions play important roles on the growth and secondary metabolites of stevia plant. Vegetative growth is reduced when temperatures are below 20 ^{0C} and when day length is less than 12 hours. Increasing day length to 16 hours and

increasing light intensity can increase vegetative growth and stevioside levels. However, some varieties appear to be photoperiod insensitive. Early flowering lines tend to have higher stevioside content but lower total yield. Planting density and transplanting date are the most important agronomical factors that may affect the quality and quantity of the yield. The concentration of stevioside in the leaves increases when the stevia plants are grown under long days. The natural habitat of stevia is semi-humid subtropical climate.

Soil and nutrients requirement:

Stevia grows in well-drained fertile sandy loam or loamy soil, rich in organic matter. It prefers acidic to neutral (pH 6-7) soil for better growth and requires a consistent supply of moisture, but not waterlogged fields. Urea fertilizer should be applied in three splits viz. once at basal and remaining two applications after first and second cutting of leaves. Stevia plants prefer low nitrogen, but high level of phosphorus and potassium. Sometimes stevia shows the symptoms of boron deficiency, which leads to leaf spot that can easily manage by spraying Borax 6%. The feeder roots tend to be quite near the soil surface; addition of compost for extra nutrients is beneficial.

Propagation:

Vegetative propagation is the best way for seed multiplication of stevia due to low seed germination capacity. Stevia is grown in the following season in the same field after uprooting the mother plant.

Irrigation:

Stevia cannot grow in dry conditions. Sprinkler irrigation is found to be best. During summer, watering at an interval of 3-5 days is done. By addition of mulches around the plant reduce the impact of drought and high temperature.

Harvesting Time:

The time of harvesting depends on soil type, variety and growing season. The first harvest of the crop can be done four months after planting and subsequent harvest once after every 3 months. The best harvesting time is mid-September to late September when plants are 50- 70 cm in height. The easiest harvesting technique is by cutting the branches off with pruning shears before stripping the leaves. On average, three commercial harvests can be obtained in a year. It is better to cut the plants leaving about 10 cm stem portion from the ground.

Drying:

Drying process is to eliminate moisture and leads to a reduction of the visual, organoleptic and functional characteristics of the stevia plants, which negatively affects its final quality parameters like color, texture, aroma, essential oil content and shape. High temperature negatively affects the final quality of the product, diminishing their medicinal properties and their commercial value. The freshly harvested plants can be hung upside down and dried in a 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 using a drying wagon. Depending on weather conditions and density of loading, it generally takes 24 to 48 hours to dry stevia at 40 to 500 C. On a moderately warm fall day, stevia can be quickly dried in the full sun in about 12 hrs. Longer drying time will lower the stevioside content of the final product. After adequate drying, the leaves are stripped of the stems / twigs, packed and stored in a cool and dry place.

Chemical Components:

Stevia is a natural sweetener plant. The leaves of stevia are the source of glycosides and high percentage of phenols, flavonoids and antioxidant activity. The two main glycosides are Stevioside, 5-10% of the dry weight of the leaves and Rebaudioside A, 2-4%; both are the sweetest compounds. There

are also other related compounds including Rebaudioside C (1-2%) and Dulcoside A & C, as well as minor glycosides, including flavonoid glycosides, coumarins, cinnamic acids, phenylpropanoids and some essential oils. Eight phytochemical properties of stevia glucosides were discovered, viz. dulcosides A, rebaudiosides A-E, steviobioside and stevioside.

Uses:

The leaves are used to prepare sauces but are best in herbal teas and for direct consumption. The leaves are used as a color and flavor enhancer as well as sweetener in teas, salads, fruit, and coffee, among others. Stevia is mainly used as a sweetener and flavor enhancer in the food and beverage industry. The plant can be utilized for the production of a natural sweetener, as a source of chlorophyll (Oral-hygiene product, medicine) and as a source of phytosterols. Fresh leaves have a mild licorice flavor. The remaining parts of the plant, including stems, seeds, flowers and even leaves that were not selected for industrialization, are collected and processed into animal feed or fertilizers. Japan is now the largest consumer of steviosides extracted from stevia leaves. Stevia plant is widely grown for its sweet leaves and medical value. The leaves have been traditionally used for hundreds of years in Paraguay and Brazil to sweeten local teas, medicines and as a 'sweet treat'.

Medicinal Uses:

Stevia is suited for diabetic, obese persons and prevention of type 2 diabetes. It also showed antibacterial, antiseptic, anti-inflammatory, anti-fertility, hypotensive, diuretic and cardiotonic property. It has shown good results in clearing up skin problems like dermatitis, eczema, wrinkles, skin blemishes, acne outbreaks, scarring, rashes and itchiness. Steviol regulates blood glucose level by enhancing insulin secretion. The leaves of stevia are the source of steviol glycosides, stevioside and rebaudioside, which are 300 times sweeter than sugar but also have no effect on blood sugar, so it is helpful for hypo glycaemia and type-2 diabetes and also nourishes the pancreas, helps to restore its normal function. Stevia contains a high percentage of phenols and flavonoids, which have a high antioxidant activity. Phenols are the secondary metabolites that cause the cardiac and cancer diseases to decrease. The plant may have cardio tonic actions, which normalize blood pressure and regulate the heartbeat. Stevioside has been found to reduce dental caries. It may exert its action by three different ways: antibacterial effect, production of low acidic condition and anti-plaque activity. Stevia possesses anti-fungal, anti-bacterial properties and can safely be used in herbal medicines, tonics for diabetic patients and also in daily usage products such as mouthwashes and toothpastes. Mild stevia leaf tea also offers excellent relief for an upset stomach.

PAKISTAN'S TEXTILE INDUSTRY AND ITS ROLE IN ECONOMIC PROGRESS

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Textile industry indeed plays a very vital role in the progress and development in the economy of a nation. The fact of the matter is that it is the most significant manufacturing sector and has the longest production chain. As per reliable and authentic information, the present global apparel market is worth US$ 1.7 trillion, and it amounts to 2 percent of the world's GDP. EU, USA and China are the world's largest apparel markets with a combined share of almost 54 percent. The major 8 apparel consuming nations form a

dominating share of 70 percent of the worldwide apparel market size.

In Pakistan, textile sector also contributes a lot to national exchequer besides offering employment to about 40 percent of industrial labor force. Textile products have sustained an average share of about 60 percent in nationwide exports. It is basically a backbone of Pakistan's economy. Being value added segment of textile industry made-up sector comprises different sub groups namely towels, tents & canvas, cotton bags, bedwear hosiery, knitwear & readymade garments counting fashion apparels. The government statistics also revealed that the sector sustains directly livelihood of 210,000 skilled workers and 490,000 unskilled workers. Another 350,000 people benefit in allied cottage industries. Thus, the industry offers directly and indirectly sustenance to well over a million people. Knitwear exports consists of knitted and processed fabrics knitted garments; knitted bed sheets, socks etc. and has the largest share 35 percent in textile exports.

Pakistani textile experts also said that the readymade garment industry has emerged as one of the significant small scale industries in the country. Its products have large demand both at home and abroad. The local requirements of readymade garments are approximately totally met by this industry. This industry is predominantly export-based and its growth has all the time depended on export outlets. In term of quantity during July-February FY2018 it was registered at 20.239 thousand dozen as against to 33.919 thousand dozen during the corresponding period previous year thus explaining decline of 40.33 percent. But unfortunately Pakistani textile industry considered as the backbone of the export sector is facing some problems which require urgent attention. The high energy prices, struck up refunds and tight monetary policy are the major causes of which are adversely affecting this sector. The government must take serious initiatives to safeguard local industry which is the highest foreign exchange earner and largest urban employment provider.

The Harappa civilization emerged four thousand years ago happened to reside in the land of the Pakistan. This provided the country with the heritage of spinning and weaving. Since then Pakistan has carried forward this age old tradition and prospered to become the eighth largest exporter of textile products in Asia. The country is also the fourth largest producer of cotton and after India and China, and has the largest spinning capacity in Asia. Pakistan is a land with 442 spinning mills, 1260 ginning units, 2550 garment manufacturing companies, and 600 knitwear producing units. Pakistan is an international exporter of textile products like carpets, rugs, towels, tents, home textiles, hosiery and apparels to countries like US, Hong Kong, United Kingdom, Germany, Italy, France, Netherlands, Dubai and Afghanistan. Textile is a strong pillar supporting the economy of Pakistan. Textile products and garments constitute almost 50 per cent of the total international exports, and accounting to almost 8.5 per cent of the GDP of the country employing 38 per cent of the production labour work force. Energy crisis is a major cause of concern as the government neglect and failure of not fulfilling the promise of installing continuous electricity and gas plants to boost power supply has crumbled the growth of this sector. Manufacturers having no option used to move to alternative methods of producing electricity like generators and invertors, ultimately leading to rise in the costs of the production. The shortage of electricity hence increased expenses and reduced profitability for textile exporters of the country. As a result of lack of power supplies many factories closed down and thousands of individuals remained unemployed.

Last but not the least: Serious efforts are required on the part of the government to solve all the problems; the textile sector is facing today. By doing so, this sector will start flourishing and resultantly the economy will grow and Pakistan will become prosper. .