

SWEET SORGHUM - ALTERNATIVE FEED STOCK IN FOOD INDUSTRY

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Sweet sorghum (*Sorghum bicolor*), which is also called sugar sorghum, is a variety of common grain sorghum. Like the common grain sorghum, it can also produce grain 1,500-7,500 kg/ha. But the essence of sweet sorghum is not from its seed, but from its stalk, which grows high and contains rich sugar. In general, it can produce stalk 45-75 t/ha. Sugar content in the juice of sweet sorghum varies in different kinds. The Brix ranges generally from 15- to 23%. According to the different positions of sugar contained in the stalks, it can be divided into saccharin-type sweet sorghum and syrup-type sweet sorghum. Saccharin-type sweet sorghum, which mainly contains sucrose, can be used for crystal sugar refining. Syrup-type sweet sorghum, which mainly contains glucose, can be used for producing syrup. In the meanwhile, syrup-type sweet sorghum is also a material of quality for making drinking wine and alcohol. Because of so many beneficial characteristics such as a wide adaptability, drought resistance, water lodging tolerance, saline-alkali resistance, fast growth, sugar accumulates rapidly and with a high yield of biomass. Many countries have been actively studying sweet sorghum and popularizing it with great efforts.

Sweet sorghum is a plant with C_4 photosynthetic pathway, so its photosynthetic rate and dry matter production in $g/m^2/day$ per unit of inputs are more than those of other sugar producing crops such as sugarcane and sugar beet. The physiological characters such as anatomical structure, physiological function and reaction to environmental conditions of CO_2 of C_4 plants differ from those of C_3 plants: 1) the compensating point of the concentration of C_4 plants such as sweet sorghum etc. is close to naught; while the saturation point is very high. 2) The photorespiration can not almost be measured; while 47-75% and 34-55% of photosynthetic products of soybean and sugar beet may be consumed by their photorespiration; 3) when the light intensity goes to the maximum, it can not reach the light saturation point of sweet sorghum. 4) Under high temperature, the photosynthetic capacity of C_4 plant is twice as large as that of C_3 plant. Therefore, the photosynthetic efficiency of sweet sorghum is over two times than that of C_3 plants such as soybean, sugar beet or wheat, etc. These characteristics make sweet sorghum have wider adaptability and be grown in regions up to 40° latitude, south and north of equator. The sugar content in the juice extracted from sweet sorghum varies from 16-23°Brix. Sweet sorghum also plays an important role in the production of ethanol, especially in dry areas where other crops are not easily grown. The sweet sorghum juice has a balanced nutritional profile containing protein, essential amino acids, minerals etc. Thus, its physical and chemical characteristics and nutritional profile open a wide spectrum of its utilization in food and pharmaceutical industry.

The use of sweet sorghum as an ingredient in food and pharmaceutical industry needs to be studied. This shall further strengthen the sweet sorghum value chain and thus provide additional livelihood opportunities to the farmers involved in its cultivation. There are some main advantages of sweet sorghum in food industry:

1. The growth period of sweet sorghum is short; it can be harvested for 1-3 times a year; while the growth period of sugarcane must last 8-24 months.
2. Sugarcane is propagated with stem, needs 4,500-6,000 kg/ha of stem sown, and it is not easy to sow with machine. While, sweet sorghum is sown with seed; 4.5-7.5 kg/ha of seed is enough; and it is feasible to sow with machine.
3. The quantity of water needed by sweet sorghum is only 1/3 of that needed by sugarcane.
4. Cost of cultivation of sweet sorghum is 3 times as low as that of sugarcane.
5. The stem contains 18-24% fiber; only burning a half of the remainder residue of the stem with an efficient boiler is enough to refine sugar constantly without other energy source.
6. The processing season is longer than that of sugarcane. So the grain can be used to produce alcohol or eatable wine with the brewery equipment in winter.
7. Sorghum contains such hard-to-find nutrients as iron, calcium and potassium. Before the invention of the daily vitamins, many doctors prescribed sorghum as a daily supplement for patients with a deficiency of those nutrients.

References:

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