

sugarcane juice. In some regions, people use sugarcane reeds to make pens, mats, screens, and thatch. The young unexpanded inflorescence of tebu telor is eaten raw, steamed or toasted, and prepared in various ways in certain island communities of Indonesia.

3.2 Statistics of Sugarcane Production

Table 1: In the world

Country	Production (Tons)
 Brazil	672,157,000
 India	285,029,000
 People's Republic of China	116,251,272
 Thailand	66,816,400
 Pakistan	50,045,400
 Mexico	49,492,700
 Colombia	38,500,000
 Philippines	32,500,000
 Australia	30,284,000
 Argentina	29,000,000
World	1,743,068,525

Table 2: In India

State	Production (ton)
Uttar Pradesh	112636
Tamilnadu	23396
Maharashtra	21060
Andhra Pradesh	16170
Karnataka	15050
Gujarat	12550
Haryana	8060
Uttarakand	6441
Punjab	5330
Bihar	4042

Andhra Pradesh, a 6.6laks hectare of land is under sugarcane cultivation. For the processing of sugarcane there are around 30 factories in Andhra Pradesh and 500-600 in India.

3.3 Sugarcane Juice

Sugarcane juice is one of the most important extracts of sugarcane. It is consumed as a beverage worldwide, and especially in regions where sugarcane is commercially grown such as Southeast Asia, South Asia, and Latin America. It is coined with different names in different parts of the world. Garapa (var. Guarapa) or Caldo de cana is the Brazilian Portuguese term for the juice of raw sugarcane. Sugarcane juice is also known as "guarapo", "guarapo de caña", or "jugo de guarapo" in various dialects of Spanish, "ganne ka ras" or "roh" on the Indian subcontinent, (Cheruku Rasam in Telugu) "aseer asab" in Egypt, "air tebu" in Indonesia, Malaysia and Singapore, and "nuroc mia" in

Vietnam. It is the national drink of Pakistan, where it is called "roh" and sold fresh by roadside vendors only. In Egypt, sugarcane juice is an incredibly popular drink served by almost all fruit juice vendors, who can be found abundantly in most cities. In both Indonesia and Malaysia, sugarcane juice is sold nationwide especially among street vendors. It is also bottled for local distribution in some regions and sold at food courts daily. In Singapore, it is sold in food courts only.



Figure 2: Packed Sugarcane juice

The sugarcane juice is not only available near the road side vendors; they are also available in small cans and tins that are pre packed and sold in the market.

3.4 Benefits

3.4.1 Medicinal value of sugarcane juice

Sugar cane juice has several health benefits and medicinal properties most of which remains unknown to the masses. The sugarcane juice extracted from healthy canes has high medicinal value. Its medicinal properties get enhanced when mixed with juices of lemon and ginger. It strengthens the stomach, kidneys, heart, eyes, brain and sex organs. It can be used in the treatment of fevers, urinary related diseases, cancer. Ayurveda acharyas recommend this sweet liquid in diseases which arise due to vitiation of rakta (blood) and pitta. Sugar cane juice relieves the burning sensation which arises due to infections of the urinary tract. In folk lore medicines sugar cane juice is considered as an excellent remedy for jaundice.

3.4.2 Nutritional value of sugarcane Juice

Nutritionally, sugarcane juice has no simple sugar. Sugarcane juice is a mild laxative too due to its high potassium content. It is a rich source of iron and calcium also. The juice extracted from sugarcane not only pacifies the palate, but strengthens the body by providing several nutrients.

- Magnesium – 2.5 mg
- Calcium – 32.57 mg
- Calories – 111
- Fats – 0.09 g
- Water – 0.19 g
- Ash – 0.66 g
- Carbohydrates – 27.40 g
- Protein – 0.20 g

Sugarcane juice also contains iron and vitamins A, C, B1, B2, B3, B5, and B6, plus a high concentration of phytonutrients (including chlorophyll), antioxidants, proteins, soluble fiber and numerous other health supportive compounds.

4. Sugarcane Juice Machines

As sugarcane juice is widely consumed by different number of respondents, it has been taken as the main occupation by number of people. As Sugarcane juice is extracted by different machines that are available in the market and these are classified into sugarcane machine, sugarcane standing machine, table top sugarcane machine, automatic sugarcane extractor, commercial sugarcane machine, manual sugarcane extractor, heavy duty sugarcane machine, sugarcane juicer, Industrial sugarcane machine, stainless steel sugarcane crusher, domestic sugarcane machine. There are about 22,70,857 registered users of sugarcane juice machines in India.

Sugarcane juice is not the new invention. Even in the past sugarcane juice is extracted from the sugarcane with the help of bullocks which is the traditional way of extracting juice from sugarcane. It is mostly seen in Rajasthan. Earlier humans also used the traditional sugarcane juice machine to extract juice by rotating it by themselves.



Figure 3: Sugarcane juice extraction with the help of bullocks



Figure 4: Sugarcane juice extraction by vendor

Different types of sugarcane juice machines available in the market are: Big Type Sugar Cane Juicer Machine, Cane Juice Four Roller Extractor, Cane Juice Machine, Cane Juice Wheel Concentrate, Cane Juicer Wheeled Machine, Cane Machine, Cane Manual Juicer Machines, Cane Small Type Juicer Machine, Cane Three Roller Appliance, High Quality Sugarcane, Fresh Sugar Cane Business, Hygienic Sugar Cane Juicer, Stainless Steel Sugarcane Crushing Rollers, Sugar Cane Chilled Squeezed Machine, Sugar Cane Chilled Squeezed Machine, Sugar Cane Gear Wheeled Extractor, Sugar Cane Three Roller Presser, Sugarcane Horizontal Domestic Machine, Sugarcane Juice Producer, Table Top Sugarcane Trendy Juicer, Big Sugar Cane Crusher, Box Type Cane Crusher, Cane Large Chiller Cum Crusher, Heavy Duty Sugarcane Crusher, Sugar Cane Chiller Cum Crusher, Sugar Cane Juice Concentrate, Sugar Cane Squeezebox Press, Sugarcane Crusher, Sugarcane Crusher

Horizontal Small Type, Sugarcane Hand Propelled Wheeled Crusher, Sugarcane Juicer, Sugarcane Machines, Sugarcane Press Machine, Sugarcane Rollers Crusher, Sugarcane Stainless Steel Manual Crusher, Citrus Cane Juice Extractor, Concentrated Cane Juice Extract, Small Sugar Cane Press Extractor, Cane Juice Machine, Sugar Cane Stainless Steel Manual Juicer, Sugar Cane Heavy Duty Crusher, Sugarcane horizontal machine, Sugarcane With Stand Along Built-In Waste bin, Sugarcane Juice Machine, Table Top Sugarcane Juicer, Cane juice extractor, Semi automatic Table top Sugarcane juice machine, Sugar Cane Juice Extractor.

All these sugarcane machines that have been developed earlier are still used in the present markets. But the new technology and new materials has been used in the latest machines for the better performance of the machines to make better extraction. In the past, the juice was extracted from a grime which works with the help of buffaloes which is made of wood. This method of juice extraction had become difficult for the people and even to clean the machine in the hygienic point of view. Rein(2007) showed the different changing trends in sugarcane harvesting, handling, cane preparation, milling, diffusion, juice screening, heating and clarification, evaporation, syrup clarification, crystallization, centrifugal separation, and boilers' performance in a commercial setup.

The technological features that were improved over a period of time were the material used for the construction of machine, efficiency of extraction of juice, hygienic condition of juice while extraction, consumption of power, maintenance, storage, design, operated technique of the machine, number of rollers installed, place of machines installed.

As the sugarcane is the widely cultivated crop in India many roadside vendors have come up to extract the juice from sugarcane. The sugarcane juice extraction has been adopted as the main occupation by the people for their livelihood. Not just roadside vendors but even restaurants are extracting sugarcane juice and commercially packing as cool drinks. So many machines had been developed commercially in the large scale sector for the juice extraction and preservation. Then the hand rotated machines were developed which were made of metal. The rollers are strong enough to extract juice from sugarcane while the person or the vendor rotates the wheel. Then the machines which worked on electricity with the help of motors were developed. Then emerged a problem of electricity and danger of hand injuries. Taking all these into considerations the machines that are having inbuilt motors came into existence. These machines have main features like production of hygienic juice, more efficient extraction of juice, consumption of less man power and energy, inbuilt storage facility etc. With all these features the machines have been developed all over the world using different materials. The main characteristic of the machine material is that it should not be rusted during the time of usage. Even though the inbuilt machines were emerged in the market the roadside vendors use only the two roller machine which runs on electricity. Maximum number of vendors are using the machine which is made of metal and steel where the cost of the machine differs with the type of material that is used for the construction of the machine.

An article on design features of an improved power crusher by Iqbal, M.T. (2007) in Bangladesh stated on a 5-roller horizontal mechanical power crusher with 2-3 step crushing mechanism. This was undertaken to identify juice extraction rate and crushing capacity of the developed crusher. The design feature and performance of the improved power crusher is better than all other types of existing crushers.

An article on abrasive wear effect of sugarcane juice on sugarcane rolls by Prado *et al.* (2010) showed the important factor affecting the wear of sugarcane rolls. It evaluated the corrosive effect of sugarcane juice on carbon steel rolls. The results showed that there was no improvement in abrasion of rolls when welded with stainless steel. The laboratory tests, synergy between corrosion and abrasion was found in carbon steel.

5. Common problems faced by the vendors with the machines are:

1. The vendors do not know how to operate the machine properly.
2. All the machines are not easy to clean.
3. All the machines are not user friendly.
4. The major problem of the sugarcane juice machines is rusting of the extracting rolls.
5. Accidents like hand injuries that are caused while working with the machine.



Figure 5: Hand Injury caused while juice extraction

The article on Knowledge, attitude, and practice of sugarcane crushers towards hand injury prevention strategies in India by David *et al.* (2001) in India stated that occupational injuries where 63% - carelessness of vendor, 16% - improved safety features are required, 40% - supported the use of special gloves, 38% - fatalistic, 50% - bad luck. The results showed that more education about safety for the workers in the work situ is needed. The government should provide local repair shops, station. There should be improvement in the design.

An article in "The Hindu" newspaper – 2010 stated about an accident which happened in Secunderabad where a 13 year old boy's right hand got crushed in the sugarcane juice machine due to the entangle of his shirt in the machine. An article in Malaysian paper stated that there was an unforeseen accident where the hand was crushed in the sugarcane juice machine.

6. Prospects

The first step in eliminating hazards to the arms, hands, and wrists is education. The workers need to be informed about the proper ways to operate a machine, and things to be done in case there is a problem. This could include proper instruction on areas not to touch on the machinery without gloves, as well as proper placement of the hands to ensure they are not injured.



Figure 6: Leather gloves

Rigger style leather gloves are useful for the vendor to handle the work in safe position. These gloves are thick enough to handle the work. They even have the tight fitting at the wrist where they can place the glove in position.

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