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Original Research Article

A review on stability improvement of sugarcane juice by using natural preservatives

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ABSTRACT

Sugarcane juice is liquid extract as a drinking beverage in India, possesses therapeutic value. Stability or shelf life is very less due to spoilage or degradation of sugarcane juice because of presence of simple sugar in sugarcane juice. Microorganisms like *Leuconostoc* bacteria prone to degradation of sugarcane juice. Which convert sucrose into dextran as deteriorating agent. Shelf life or stability can be improved by using natural preservatives also chemical preservatives; having a therapeutic value. In this article improvement of stability of sugarcane juice by using natural preservatives such as lemon extract, ginger extract, also may be moringa extract over the chemical preservatives. Citric acid in lemon extract acts as antimicrobial agent while ascorbic acid in ginger extract both improves stability of sugarcane juice. Stabilization of sugarcane juice improved by using naturally obtained preservatives up to several days with good quality.

1. Introduction

Sugarcane juice is extract which is obtained from sugarcane crop. This is liquid generally as a drinking beverage possesses the therapeutic value. Sugarcane having biological scientific name (Saccharum officinarum Linn.) is well familiar crop of the family *Poaceae.* Saccharum is derived from the Greek word *"Sakcharon"* meaning sugar, especially sucrose After Brazil; India is a major producer of sugarcane. Sugarcane juice contains *apigenin,luteoline,tricin and swertisin, vitexin, schaftoside & orientin* as a glycoside and have been reported to be the main ingredients. Various steroids & policosanol are also found in different parts of the body of Sugarcane. The sugarcane stalk having thick-walled cells present on external surface, also contains vascular groups and parenchyma tissue; the skin and vascular packs comprise the sinewy segment, the parenchyma establishes the substance. Parenchyma cells contain squeeze are rich in sugar component and are easily cracked, containing high fluid from these cells. The juice having high quantity can be found in vascular packs, notwithstanding, this juice is weakened and of low virtue and variable structure. [1–4]

In this article stability or shelf life of cane juice can be improved by using natural preservatives such as lemon extract (citric acid), ginger extract (Ascorbic acid), also moringa extract can be used. Chemical preservatives also improve shelf life of sugarcane juice; but it may be gives disadvantages compared to natural preservative.

1.1. Contents of sugarcane juice

Sugarcane juice is rich in enzymes. Sugarcane juice of 100ml containing 40 Kcal, 6 μg of carotene and 10 mg of iron. Water (75% -85%), sugar reduction (0.3-3.0%), sugar-free (e.g. unsaturated sugar) (10-21%). [5–7]

1.2. Sugarcane juice characteristics

When shaded, sugarcane juice is a turbid liquid that changes colour from light grey to dark green. Because of the colloidal matter content, the new juice extracted is slightly acidic and difficult to sift. The green colour comes from the

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Table 1: Contents of sugarcane juice

	Composition	% Content
Sugars	Sucrose	81–87
	Reducing sugars	3–6
	Oligosaccharides	0.06–0.6
	Polysaccharides	0.2–0.8
	Inorganic salts	1.5–3.7
	Organic acids	0.7–1.3
Organics	Amino acids	0.5–2.5
	Dextran	0.1–0.6
	Starch	0.11–0.5
	Gums	0.02–0.05
Insoluble	Waxes, fats, phospholipids	0.05–0.15
	Colorants	0.1
	Sand, bagasse, etc.	0.15–1

stick ferric salts in the juice, which react with the tannins in the juice to produce the green colour note that stick juice contains sucrose, sugar-lowering carbohydrates, inorganic salts, natural salts, natural acids, gelatin, gums, proteins, colors, tannins, and mixtures of solubilized iron; it also contains suspended bagasse, dust, chlorophyll, wax, egg whites, air, and soil. Stick juice has a pH between 4.9 and 5.5 and is acidic. For e.g., the existence of colloidal and silica-based substances, starch, proteins, waxes, and gums, prompts the juice's turbidity and gives it a misty appearance. If the conditions are modified, colloidal substances can settle, while stick juice purification or the expansion of additives causes flocculation or coagulation state that there is a mixture of chlorophyll and anthocyanin in the skin cells present in the sugarcane stalks, while the stick fiber contains Saccharetin.[8–11]

1.3. Uses of sugarcane juice

Sugarcane has been used in various parts of the world to treat various ailments. Main objective to use of stabilized sugarcane juice is to health benefits and marketing purpose. Preparation of syrup from sugarcane juice may useful in medicinal use. Sugarcane is used as a single medicine or in conjunction with other herbal materials in the Ayurvedic system. Regular use of sugar cane juice can make the flow of urine smoother and quicker, helping the kidneys do their job correctly. Lemon juice and ginger juice are also used to make the most of the juice. It is also used as an aphrodisiac, laxative, tonic, antiseptic, tonic and cooling agent. Sugarcane juice is the safest treatment for patients with jaundice when on the Unani medical program. It is considered good for the liver and it is advised that the patient take a large amount of sugarcane juice to instantly alleviate jaundice. Traditional Indian medicine has shown that sugarcane has numerous biological properties, such as anti-inflammatory, analgesic, antihyperglycemic, diuretic, and hepatoprotective effects, based on modern pharmaceutical research.[12–16]

1.4. Nutritional aspects

Sugarcane juice is very helpful in urinating less. Lastly urine flow is clear and helps the kidneys to function on their own it works well. Sugar is highly regarded by ordinary people. It also includes iron and vitamins A, C, B1, B2, B3, B5, B6, as well as large phytonutrient concentrations (including chlorophyll), antioxidants, proteins, soluble fiber, and several other health-promoting combinations. It operates in harmony, supplying the most health-promoting foods learned from its role in the fight against cancer, stabilizing blood sugar levels in people with diabetes, helping weight loss, decreasing fever, eliminating kidneys, preventing tooth decay, and many other health benefits. Once again, due to high acidity, gonorrhea, curved enlargement and cystitis, it is necessary for heat micturition. Sugarcane juice is a food that is exhausted. For a thin body, it is also an effective solution. Immediate weight gain can be achieved by its regular use. Sugarcane juice is a significant biological effect of immune system enhancement. Sugarcane juice is abundant in bioactive blends, with iron, zinc, potassium, minerals, and phytonutrients in its content.[17]

1.5. Practical applicatios

In India, sugarcane juice is commonly consumed. But the production process is not completed through mass production by mechanical manufacturing. It is a challenging problem to store raw sugarcane juice because it spoils within hours of being released. Manufacturers rely on chemicals that preserve the shelf life of sugar cane juice, thereby inhibiting its manufacturing. In order to improve the health status of the sugarcane shelf by natural resources, research work has been carried out to eliminate the chemical barrier. It has been found that the combination of natural preservatives and low-temperature preservatives has been a successful alternative with adequate emotional symptoms for over a month. These results would pave the way for sugarcane to be sold.[18]

1.6. Degradation / spoilage of sugarcane juice

Degradation/Spoilage by the presence of simple sugars of sugar cane juice. Microorganisms, primarily *Leuconostoc sp.*, are responsible for bio-degradation. *(L. mesenteroides and L. dextranium),* respectively. These species convert sucrose into polysaccharides such as dextran, resulting in sugarcane juice deterioration. The degradation process begins as soon as sugarcane is harvested; the endogenous invertase enzyme activates and induces spoilage. The microbial count (bacteria, yeast, fungi) increases during the storage of sugar cane juice; the number of lactic acid bacteria increases primarily, contributing to the spoilage of sugar cane juice. PPO (polyphenol oxidase) and POD (peroxidase) are the enzymes in sugarcane juice leads to change in color to detection of spoilage of juice.

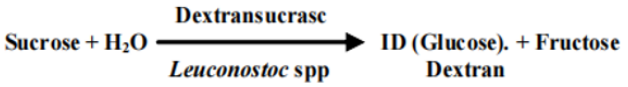

Fig. 1:

2. Preservation Methods

2.1. Sample collection

2.2. Preparation of sugarcane (saccharum officinarum) extraction

It is possible to use new sugarcane for the extraction of sugarcane juice. In order to remove sugar cane from any dust and soil, the extracted sugar cane is then rinsed with running tap water. Using a curved metal knife to cut the skin and nodes of the sugarcane plant. Sugarcane juice can be processed by a powerful machine with an electric motor. The collected sugarcane juice should be filtered through a muscle tissue to extract external issue. The further process can be done on filtrate as sugarcane juice.[19]

2.3. Extraction of lemon (citrus aurantifolia)

With the aid of a sharp knife, lemons can be divided into two parts. The lemon slices are then lightened by a squeezer and the lemon with a muslin cloth is removed to remove the foreign matter and seeds.

2.4. Ginger preparation (zingiber officinale)

With the aid of a sharp metal, ginger can be peeled. The sliced bits of ginger are then cut into small pieces. The extracted material was then wrapped in muslin cloth and fitted with strength to make extraction easier.

2.5. Physiochemical characteristics

Sugarcane juice generally degraded in two to three days. Due to presence of simple sugar the physiochemical characteristics also changes with spoilage of sugarcane juice. These physiochemical characteristics can be evaluated by some tests such as PH and titratable acidity, acid and base degradation testing, Brix; acid ratio. The sensory evaluations tests such as smell, Color, Sweetness can be performed. Determination of enzymatic activity of enzymes PPO (Polyphenol Oxidase) & POD (Peroxidase) can be performed. Microbiological evaluation can be performed to study the shelf life of sugarcane juice. Evaluation of stability of sugarcane juice can be determined by same as determination of Physicochemical characteristics. The sensory, microbial, enzymatic evaluation testing may confirm the sugarcane juice shelf life with their quality and safety.[20,21]

1. **Physiochemical e valuations**:
2. **Determination of PH:** PH can be determined by using digital PH meter
3. **Titratable acidity:** Titration of Sugarcane juice can be done using the alkaline solution with suitable PH adjustment
4. **Determination of enzymatic activity:** Enzymes in sugarcane juice mainly leads to deterioration of sugarcane juice with change of color and taste. The (PPO) Polyphenol Oxidase & (POD) Peroxidase enzyme activity resulting in degradation. Enzyme activity can be determined by using incubation method to determining growth of bacteria.
5. **Change in color:** It can be determined by using colorimeter.
6. Total Soluble Solids Contents
7. HPTLC can be used to determining impurity profiling and determination of contents present in sugarcane juice.
8. FTNIR Spectroscopy
9. **Sensory evaluation:** Aroma/ Fragrance or Smell, Taste and flavor can be determined to detection of stability of sugarcane juice.
10. **Microbial evaluations:** Microbial growth is major factor of spoilage of sugarcane juice and which can be determined by using incubation method, E. Coli presence, yeast and molds count.

3. Source of Funding

None.

4. Conflict of Interest

None.

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