

M.Sc. (sem - II)

Organic chemistry (Topic -

Disaccharide - Sucrose) Paper - VII, Hanendra Kr.

### Disaccharide

Sucrose ( $C_{12}H_{22}O_{11}$ ) :-

or (Cane Sugar or, Beet Sugar).

Occurrence - Sucrose is the ordinary table sugar which we eat every day. It occurs in sugar cane (16 to 20%), sugar beets (10-15%), pineapples (10-12%), maple sap (2-4%), apricot, banana, mango, almonds, coffee and honey.

Manufacture :- The two main commercial sources of sugar (Sucrose) are Sugar cane and Sugar beet. Sugar cane grows in tropical countries, while sugar beet is produced in temperate climates. India is the biggest producer of sugar cane among all the Asian countries. Therefore, sugar cane is the chief raw material for sugar manufacture in India.

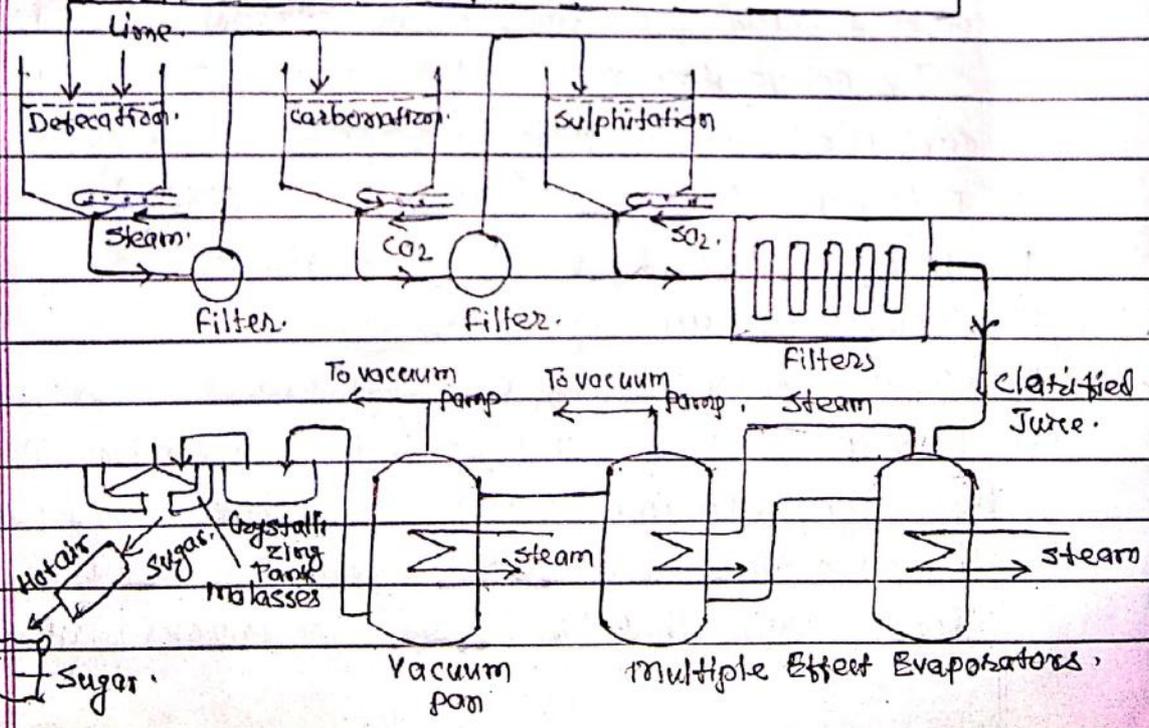
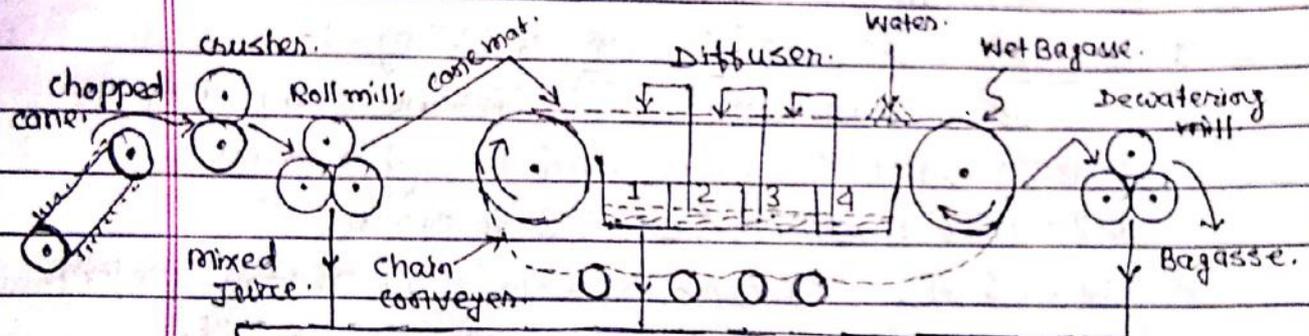
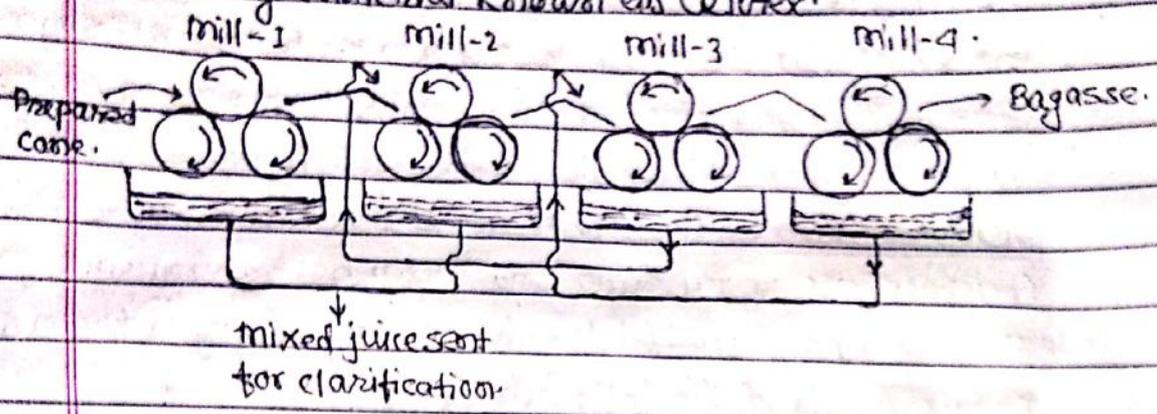
Ripe sugar cane is reaped from the field by hand-cutting or, by modern mechanical harvesters. The leaves and tops are removed from cane which is then delivered at the factory within 2 hours from the time of cutting in the field.

The conventional method for the recovery of sugar from cane consists of the following steps -

- i. Extraction of the juice (Crushing or Milling)
- ii. Purification of the juice (Clarification)
- iii. Concentration and Crystallisation
- iv. Separation and Drying and Crystals.

(i) Extraction of the juice :- In the conventional method, the cane prepared in the manner described above is passed through a series of three-roller mills. The juice is thus expressed from the cane which travels as a continuous blanket of fibrous

mass from one mill to the other. Further along the mill-train on trandern as it is called, water is sprayed onto the partly exhausted fibre. The imbibition and circulation of extracted juice in the trandern is done so as to ensure maximum recovery of sucrose from the canes. The cellulosic material discharged from the last mill is called bagasse. It is used as fuel under boilers and also in the manufacture of the insulating material known as celotex.



The modern diffusion of Juice Extraction :- In this process the crusher and the first three rollers mill used in the conventional method are retained. Therefore the cane mat coming from the roller mill is passed into a long rectangular tank fitted with a chain conveyor below which there are a number of compartments. The sucrose is extracted from the partially exhausted cane mat as it passes on the conveyor by washing with cold or hot water and dilute juice by a counter-current method. Water is sprayed onto the mat near the exit when almost all sucrose has been removed from it. The dilute juice from each compartment is used to spray on the preceding portion until the richest juice is delivered onto the mat near the entrance of the diffuser. The juice from compartment 1 and the mill is then pumped to the clarification unit.

This method is called 'Diffusion Process' as it is believed that washing of the cane mat with water and juice extracts sucrose from even the unruptured cells by true diffusion. The sugar extraction by this method is on the average 98% compared to 90-94% of the conventional milling.

2. Purification of the juice :- The mixed juice or raw juice as it is called, from step (1) contain 15 to 20% sucrose and much impurity. The impurity commonly includes organic acid (oxalic acid, citric acid and amino acids) mineral phosphates proteins, and colloidal colouring matter. The raw juice is slightly acidic in reaction and is at once processed for purification or clarification by the following operation. Otherwise, the presence of acids cause further loss of sucrose by inversion.

(i) Defecation - The raw juice is transferred into tanks where it is heated by steam and treated with 2 to 3% lime. This operation called defecation removes the organic acids and

