



- **Sugar Crop**

- **Sugarcane**

- **Origin**

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- **Major Breeding Procedures For Development Of Hybrids / Varieties**

SUGARCANE



Sugarcane, *Saccharum* (sp. X= 6,8,10) is an important sugar crop in all countries of Tropical Asia.

In India, U.P., Maharashtra, Haryana, A.P., Tamil Nadu, Karnataka, Bihar and Punjab are major Sugarcane growing states.

Origin

New Guinea for *S. officinarum* and
North India for *S. barberi* and *S. Sinense*

The sugar industry is the second largest agro-based industry in India.

Cultivated species :

- *Saccharum officinarum* ($2n=80$) also known as Noble canes because of their fine stem to differentiate them with thin canes of *S. barberi* and *S. sinense*

The process of crossing with *S. spontaneum* and backcrossing to the noble canes is called **Nobelization**.

Saccharum barberi ($2n=82-124$) these are indigeneous sub tropical

S. sinense ($2n= 118$) was distributed as “chinea” and become important commercial cultivar of Bihar and West Bengal.

Wild species :

S. spontaneum and *S. robustum*

Breeding objective



- High cane yield
- Moderate-high sucrose content
- Early to full season maturity
- Resistance to disease - Red rot, Smut, Wilt, Mosaic, Ratoon-stunting disease, Grassy shoot disease
- Resistance/tolerance to insects and pests
- Shoot borer, Cane borer, Pyrilla, Mealy bugs, White flies, Termites, White grub
- Tolerance to Abiotic stresses - Drought, Salinity, Flooding, High temperature

BREEDING PROCEDURE

Methods of sugarcane breeding based on following consideration-

- The sugarcane plant is a complex polyploidy and highly heterozygous
- The sugarcane plant does not flower freely except favorable climatic conditions
- Male sterility or self incompatibility is present
- Sugarcane clones may be propagated vegetatively by means of stem cuttings or setts

Introduction

S. barberi and *S. Sinense* - North Indian canes thin stem, low sugar but adaptable to Indian condition.

S. officinerum – New guinea region noble cane, tolerant to frost drought, high sugar, thick cane.

S. barberi* and *S. Sinense* X *S. officinerum



Nobelization of cane

Clonal Selection:

- Clonal selection is used to isolate desirable clones from genetically mixed populations.
- The mixed population may be native or unimproved, inbred populations or hybrid populations.
- Since wild or unimproved population will usually be mixtures of heterozygous clones it may be possible to isolate clones superior for particular characteristics, which can then be used for breeding.
- The most fruitful populations for the clonal selection are the hybrid populations created by breeder by careful choice of plant varieties.

Hybridization: Hybridization between clones followed by clonal selection within the hybrid population is the procedure by which sugarcane varieties are commonly developed. Since the sugarcane plant is heterozygous, segregation will occur within the F1 generation.

Hybridization techniques: the hybridization procedures are facilitated by the technique of using detached arrows. They are-

Field crosses: (common in India)

Often used in early days of sugarcane breeding are made simply by collecting seed from open pollinated tassel. In this case only female parent can be identified.

- **Biparental crosses**
- **Area crosses**
- **Melting pot crosses**

- Ripening and maturation phase in a twelve-month crop lasts for about three months starting from 270-360 days.
- Sugar synthesis and rapid accumulation of sugar takes place during this phase and vegetative growth is reduced.
- As ripening advances, simple sugars (monosaccharide viz., fructose and glucose) are converted into cane sugar (sucrose, a disaccharide).
- Cane ripening proceeds from bottom to the top and hence bottom portion contains more sugars than the top portions.
- The top of the stalk is relatively low in sucrose and therefore is of little value to the mill. The top 1/3 contains, however, many buds and a good supply of nutrients, which makes it valuable as seed cane for planting.

- Sugar cane has stout jointed fibrous stalks that are rich in sugar, and measure two to six meters (6 to 19 feet) tall.
- The main production of sugarcane is sucrose, which accumulates in the stalk internodes.
- Sugarcane is a tropical, perennial grass that forms lateral shoots at the base to produce multiple stems, typically three to four metres high and above five cm in diameter.
- The stems grow into cane stalk, which when mature constitutes approximately 75% of the entire plant.
- A mature stalk is typically composed of 11-16% fibre, 12-16% soluble sugars, 2-3% non-sugars, and 63-73% water.



Thanks