

ROLE OF VARIETIES IN INCREASING SUGAR YIELD PER HECTARE

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Sugar Yield

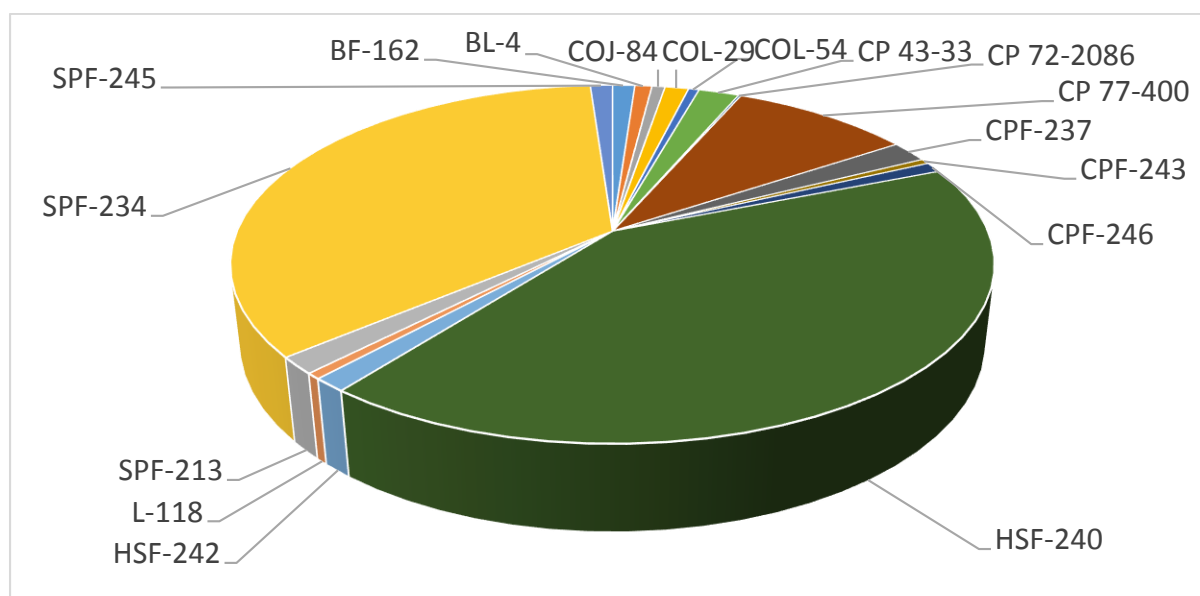
Combination of **cane yield** and **sugar recovery**

$$\text{Sugar yield} = (\text{Cane yield} \times \text{Sugar recovery}) / 100$$

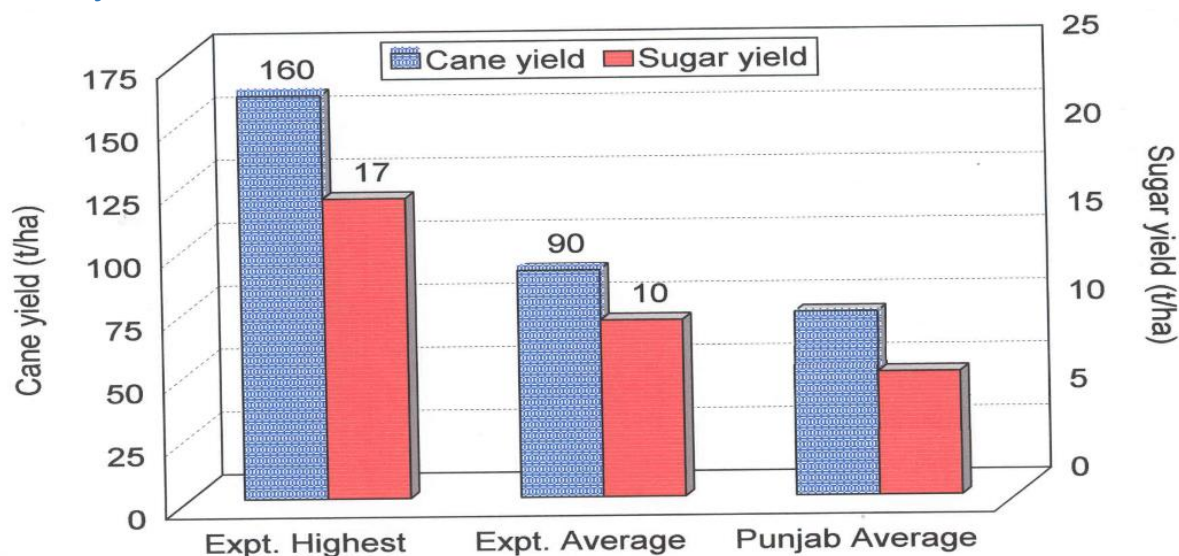
Increase in Sugar Yield in Punjab

Comparison	1999-00	2014-15	% increase
Area (000 ha)	672.10	756.75	12.59
Sugar Yield (million tones)	2.91	6.74	131.62
Cane Yield (tones/ha)	37.20	67.50	55.24
Recovery (%)	7.82	9.98	27.62

VARIETAL COMPOSITION OF SRI VARIETIES IN PUNJAB 2014-15



Cane & Sugar Yield Gap in Experimental and Average Yield / Recovery in Punjab



Impact of Better Management Practices

- **Varieties** 10%
- Deep tillage 10%
- Trench planting 15%
- Autumn planting 10%
- Spring planting 8%
- Seed rate 10%
- Time of planting 16%
- Fertilizer
- Drilling in fresh crop 15%
- Drilling in ratoon crop 10%
- Weedicide 14%
- Trench irrigation 12%
- Alternate skip 8%

Steps to Increase Sugar Yield per Hectare

- **Selection of high yielding varieties**
- Planting time and irrigation schedule
- Hoeing and Weed management
- Earthing up
- Integrated insect pest management
- Harvesting schedule (crop maturity)
- Reduction in cut to crush time

Strategies for Improving Sugar Recovery

- **Varieties & varietal scheduling**
- **Use of early maturing high sugar varieties**
- Healthy seed program

- Peak maturity of cane
- Clean cane supply
- Optimum cane harvest rate to meet the crushing rate
- Start crushing at 10% sugar recovery in November
- Efficient labor force
- Efficient transportation

VARIETY EVOLUTION OBJECTIVES

Cane Variety Evolution Program:

- **High cane yield**
- **High sugar recovery**
- Good ratoon
- Resistance to abiotic stresses (drought, frost, salinity) and biotic stresses (insects, diseases, and weeds)
- High fiber varieties for co-generation

How SRI Addressing?

- **Variety Development**
 - Collaboration with Sri-Lanka for high sugar yield cane fuzz production
 - Import of quality fuzz from Mauritius, Philippines, U.S.A., Barbados & Bangladesh
 - Exchange of cane germplasm with Sri-Lanka, Mauritius & Philippines
- **High Cane Yield**
 - Approval of high cane yielding varieties
 - Improved production technology
- **High Sugar Recovery**
 - Consolidated variety selection program
 - Introduction of high sugar recovery germplasm from foreign countries

Healthy Seed Program

- Under commercial cultivation most of the sugarcane varieties degenerate due to build up of diseases (Particularly Red Rot, Smut etc.) poor growing conditions (Salinity, alkalinity, moisture stress, waterlogging etc.) and improper crop management (less water and nutrients). Varieties lose not only yield potential but also quality
- To maintain a high recovery level, having a healthy 3-tier seed nursery program is indispensable

PARB PROJECTS AT SRI

- PARB Project No. 101
- PARB Project No. 163
- PARB Project No. 193

ACHIEVEMENTS OF PARB 163

- More than 30,000 seedlings of 300 crosses have germinated, singled and transplanted during 2014-15
- Zonal trials of 9 advanced lines along with 3 standard varieties were planted at 11 locations across Punjab. Three clones performed better than standard varieties

ACHIEVEMENTS OF PARB 101

- Three irrigation levels of 100%, 80% and 60% were applied to 110 clones of CPF-248, CPF-246, HSF-240 and CSSG-668. Seventy-seven (77) clones of four varieties were promoted based on their performance
- For frost tolerance, 321 clones of CPF-248, CPF-246, HSF-240 and CSSG-668 were tested. Eighty-three (83) were selected based on their comparative performance and sown for further testing
- The salinity tolerance experiment consists of 91 clones of CP-248 CPF-246, HSF-240 and CSSG-668 sown at SSRI, PindiBhattian. All the clones were promoted for second year testing

INTERNATIONAL COLLABORATION OF SRI, FAISALABAD

- Sugarcane Field Station, Canal Point, **USA**
- Sugarcane Research Institute (SRI), **Sri Lanka**
- Philippine Sugar Research Institute, **Philippine**
- Mauritius Sugar Industry Research Institute, **Mauritius**
- South African Sugarcane Research Institute, **South Africa**
- Bangladesh Sugarcane Research Institute (BSRI), **Bangladesh**
- West Indies Central Sugar Cane Breeding Station, **West Indies**

SUCCESS STORY OF VARIETY EVOLUTION AT SRI FAISALABAD

International collaboration:

- Varieties of **CP** origin like **CPF-246, CPF-247, CPF-248** are very successful in Pakistan, fuzz imported from **U.S.A.**
- Varieties like **CP77-400, CP72-2086 & CP43-33** were directly imported from **U.S.A.**
- Varieties of **SP** origin like **SPF-213** is successful in all Punjab and **SPF-234**, a good performer in Southern Punjab, fuzz imported from **Brazil**
- Several advance lines of SRI, Faisalabad belong to germplasm imported from **U.S.A. and Australia**

National collaboration:

- **HSF-240** and **HSF-242** are joint collaborative effort of **Habib Sugar Mills** and **SRI Faisalabad**

Sugarcane Research and Development Activities

- Establishment of Sugarcane Research and Development Board
- R & D funds for sugarcane
- Work as bridge in sugarcane research and sugar industry

- Finally, improve sugarcane yield and sugar recovery in the province

VARIETY DEVELOPMENT PLAN

- Fuzz production of desired characteristics at Sri-Lanka
- Approval of cane varieties from existing germplasm that are superior to varieties in vogue
- Establishment/Strengthening of infrastructure for Sugarcane Research and Development in Punjab
- Site-specific studies in different agro-ecological zones for variety development and productivity enhancement at mill level
- Extensive efforts for development of model seed farms at each sugar mil

VARIETY DEVELOPMENT PLAN

- Significantly expand and strengthen sugarcane breeding and selection program
- Approval of site-specific varieties and development of production technology for different districts of Punjab using Digital Soil Mapping (DSM)
- Production of true seed (fuzz) of desired characteristics
- High fiber varieties for co-generation

VARIETY DEVELOPMENT PLAN

- Capacity building of scientists
- Introduction of Genetically Modified (GMO) sugarcane varieties tolerant against abiotic stresses like frost, drought, salinity and biotic stresses like disease and insect pests
- Micro-management practices to enhance productivity

BOP (Bio Organic Phosphate)

- Bioconversion of phosphate rock (70%) ore into soluble phosphates (that are directly used by plants) in presence of an organic manure (30%) using phosphorus mobilizing bacteria.
- BOP has been found to be an excellent, less expensive, substitute to synthetic phosphate fertilizers such as SSP, MAP and DAP.
- Inorganic phosphorus is available to crop for 1 week only, while BOP for 14 weeks
- Registered by Pakistan Standard and Quality Control Authority, Karachi

New Planting Technique



Conclusion

- Propagation of high sugar varieties will ensure high sugar yield.
- Cane varieties resistant to different biotic and abiotic stress are need of time to cope with changing environment.
- Cane yields can be enhanced by adopting latest recommended package of cane production technologies.
- Role of sugar industry in cane area development is of prime importance.
- The de-zoning of cane area is mandatory for cane development activities.
- Use of cost reduction technologies like sugarcane knife and BOP can help improve farmer yield and production.
- Public private research institutes collaboration is necessary for universal solution of problem like sugar yield and sugar recovery.
- Government initiative in the form of SR&DB is first step to provide a platform for cane research and development in the Punjab.