

National Symposium
on

Potential Crops for Food and Nutritional Security

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Tamil Nadu Agricultural University
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ABSTRACTS



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| THEME - I |

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PLANT GENETIC RESOURCES IN POTENTIAL CROPS
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GENETIC VARIATION FOR PHYSIOLOGICAL TRAITS IN INTROGRESSED HYBRIDS OF *Saccharum robustum* x *S. officinarum*

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Sugarcane is an important cash crop and to overcome yield loss due to abiotic stresses, a combined strategy of physiological, breeding and molecular methods is essential to develop varieties tolerant to more than one type of stress. Forty seven introgressed hybrids F₁ (25) and BC₁ (13) from crosses of *S.officinarum* (PIO) and *S.robustum* (PIR) viz., PIR 00-1157 x PIO 00-845, PIO 90-202 x PIR 96-475, SRH 13-92 x Co 0240 and PIR 00-1058 x SRH 13-394 were screened for physiological characters viz., chlorophyll content, nitrate reductase (NR), peroxidase (POX), superoxide dismutase (SOD) activity and total protein during formative FP (120 days) and grand growth phase, GGP (240 days). Leaf chlorophyll content and nitrate reductase activity plays a considerable role in plant metabolism and high significant differences were observed in genotypes for chlorophyll content and nitrate reductase activity. Total chlorophyll in F₁ and BC₁ hybrids ranged from 0.87-2.09 and 0.81-1.72 mg/gm of leaf and 1.10-2.35 and 0.92-1.93 mg/gm at 120 and 240d respectively. Total protein at FP is 0.161-0.422 (F₁) and 0.960-0.405 (BC₁) mg/gm of leaf. NR activity at FP varied as 1.21-3.37 (F₁) and 0.46-3.18 (BC₁) µmoles nitrite/gm/hr. Activity of anti-oxidative stress enzymes viz., SOD ranged 18.00-27.00 units/gm/min and POX 346.00-458.00 units/gm/min. The chlorophyll 'a' and chlorophyll 'b' at GGP in F₁ hybrids was 0.78-1.61 and 0.32-0.73 mg/gm FW of leaf respectively and in BC₁ hybrids is 0.62-1.34 and 0.30-0.59 mg/gm FW of leaf respectively. Six hybrids viz., SRH-13-92, SRH-13-105, SRH-13-272, SRH-13-177, SRH-14-415 and SRH-14-572 recorded highest total chlorophyll (GGP) of above 2.00 mg/gm FW of leaf, greater than the mean values of parents. Hybrids of PIR x PIO and PIO x PIR groups had positive correlation for yield (t/ha) with total chlorophyll ($r=0.4610^{**}$ and $r=0.4017^{**}$), NR activity ($r=0.4805^{**}$ and $r=0.4536^{**}$) and total protein ($r=0.5756^{**}$ and $r=0.5082^{**}$) respectively. NR activity was found to be more positively correlated with total protein ($r=0.6714^*$) in PIR x PIO hybrids. Overall fourteen hybrids identified with high NR activity >2.50 µmoles nitrite/gm/hr also had high amount of total chlorophyll >1.75 mg/gm, total protein >0.300 mg/gm and also high activity of SOD >30.00 units/gm/min and POX >500 units/gm/min at GGP were high yielding types with moderate quality and showed no natural incidence of smut in *S. robustum* progenies. The study indicates the potential of these highly metabolically active pre breeding (Back cross) material as donors in breeding programmes to improve photosynthetic rate and for development of clones with resistance to multiple stress factors.

MOLECULAR CHARACTERIZATION OF INTROGRESSED HYBRIDS OF SUGARCANE VARYING IN CELLULOSE CONTENT

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Sugarcane produces large lignocellulosic biomass and can be a highly potential alternative crop to fossil fuels. The recalcitrance of lignin reduces energy input/output ratio which necessitates gene identification, expression studies and marker identification of cellulose and lignin biosynthetic genes to diminish the effects of biomass recalcitrance and to improve the conversion efficiency. In the present study thirty-two introgressed hybrids: 17 genotypes representing high cellulose content of above 42.00% (fibre > 25.00%) and 15 genotypes with low cellulose content of < 35.00% (fibre < 17.00%) of different introgression groups [SSH (*S. officinarum* x *S. spontaneum*): 14 and SRH (*S. robustum* x *S. officinarum*): 18] were characterised using 14 SSR primers developed from cellulose synthase gene families of *Populus tomentosa*. The study aims to test the amplification efficiency of SSR primers of *CesA* gene developed in *Populus* for genetic diversity studies and marker identification in sugarcane. Primer pairs generated alleles ranging from 11 (PtCesA7-intron3) to 17 (PtCesA2-5' UTR) with an average of 12.43 alleles per primer and with a total of 94 polymorphic alleles. Polymorphism information content (PIC) varied from 0.46 to 0.82 with a mean value of 0.64. Dendrogram constructed from similarity matrices using UPGMA method with NTSYSpc v2.0 software grouped the 32 genotypes in to two major clusters with prominent discrimination between the hybrids with varied cellulose content. The similarity coefficient ranged from 0.53 to 0.71 with an average of 0.62. Primer, PtCesA6 (source: promoter region of *CesA*) amplified a marker PtCesA6₃₈₈, which showed 92.11% correspondence between the marker and trait (high cellulose content) and also found to be associated with 88.24% of hybrids with high fibre %. The study further recommends the evaluation of marker, PtCesA6₃₈₈ in different *Saccharum* species and cultivars for effective application in MAS for improved biomass accumulation.