GERMPLASM REVIEW – EVIDENCE AND APPROACHES THROUGH ACP-SRP FUNDED PROJECTS TO IMPROVING GENETIC DIVERSITY IN FIJI CROSSES

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Genetic resources are vital for efficient running of a conventional plant breeding program. In Fiji, numerous efforts had been undertaken to exploit and maintain genetic resources (Daniels et al., 1965; Brown et al., 1969; Singh et al., 2012). In 1990’s, there was an interval to this work after departure of experienced cane breeders. As a result, lack of genetic diversity was realized through results attained from a prototype trial in 2011 that was carried towards gaining experience and awaiting funds for an ACP-SRP funded project being a comparative study of family and individual mass selection methods as early selection criteria. There were 50 local crosses planted in this trial in 4 replicates, 20 seedlings per cross. It was found that there was no significant differences in %pocs, sugar and cane yield in the random samples taken from the crosses used with p values of 0.2, 0.6 and 0.3 respectively. This had prompted recommendations which resulted in importation of 52 varieties from Australia, Mauritius and Vietnam as well as 304 packets of fuzz from West Indies from 2011-2013. 42 of these varieties are already in the breeding plots and have been used in the sugarcane crosses in the last 2 years whereas 10 varieties have been planted for flowering this year. All of the West Indies fuzz were sown in 2012 and 2013 and the germinated seedlings have been utilized in the above mentioned ACP-SRP project which are ongoing whereas excess seedlings will undergo routine selection for inclusion in the breeding plots. Rigorous nobilization work has also been initiated from 2009 using Erianthus arundinaceus under another ACP-SRP funded project being Nobilization of Erianthus spp. and a total of 320 crosses have been made up to date. From these crosses, 270 crosses have been sown however no authentic hybrid have been produced and the program is still being pursued. From the above findings, it is realized that it is essential to customarily introduce foreign varieties in the gene pool and also to run an introgression program in parallel with current program whereby authentic hybrids could be introduced consistently into the breeding program.

MATERIALS/ METHODS

50 Fiji polycrosses (families) were planted in 4 replicates in RCBD design, 20 seedlings in each replicate as a prototype trial towards ACP-SRP/ EU funded project A comparative study of family and individual mass selection methods as early selection criteria. Eight stalks (1 per stalk) were sampled randomly from each family for biochemical analysis. All the families were harvested and weighed to ascertain sugarcane cane yield for each family. The data was analyzed for ANOVA using Statistix 9 package. The findings prompted importation of 52 varieties and 304 packets of fuzz from SRA—Australia, MSIRI—Mauritius, SRI—Vietnam and WICSB—West Indies respectively. The varieties were quarantined and have been planted in breeding plots whereas fuzz were sown, quarantined and seedlings have been planted for evaluation. A total of 320 nobilization crosses of Erianthus spp. with S. officinarum and high sugar commercial hybrids of which 270 crosses have been sown and evaluated to date.

RESULTS

Following are the ANOVA tables from analysis:

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>Rep</td>
<td>3</td>
<td>1107.4</td>
<td>369.132</td>
<td>0.93</td>
<td>0.6136</td>
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<tr>
<td>Trt</td>
<td>49</td>
<td>13375</td>
<td>272.958</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>147</td>
<td>43344.1</td>
<td>294.858</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>199</td>
<td></td>
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</tr>
</tbody>
</table>

The results showed no significant differences between the sugarcane families from Fijian crosses as p values were greater than 0.1 and 0.05. All the crosses were poly crosses and did not share same parental clones as female or same set of males in the poly groups. The breakdown of varieties imported is given below: Australia - 23, Mauritius - 10, Vietnam - 19 varieties. West Indies - 304 packets of fuzz. 320 nobilization crosses had been conducted out of 270 had been sown.

DISCUSSION/ CONCLUSION

The sugarcane crossing basis is for induced variation which is much dependent on the source parental materials being the germplasm as well as elite clones from final stage selection trials. A prototype trial that was conducted for ACP-SRP funded project on Family selection using Fijian polycrosses (conducted at SRIF) have shown no significant differences for sugar, cane yield and sugar yield which are the basis of early selection. The discussions with late Dr. Hogarth (personal communication, 2012-2013) led to conclusions that Fiji needs to re-institute genetic diversity into SRIF germplasm therefore the need to import and use of varieties from other breeding stations in the local breeding program. As a result, 52 varieties from MSIRI in Mauritius, SRA in Australia and SRI in Vietnam have been imported under MOU developed for exchange of germplasm. Also the need for continuation of introgression using Erianthus was also recommended which is ongoing since 2009 initiated under guide ship of Dr. Krishnamurthi and later became part of another ACP-SRP funded project. —Nobilization of Erianthus spp. Introgression was carried out routinely mostly with S. spontaneum in 1960 to early 1990 during times of Jo Daniels and Dr. Krishnamurthi (Daniels et al 1965; Brown et al, 1969 and Krishnamurthi et al, 1980) whereby materials from these became available and had been used extensively at that time. Some of this are still available in the germplasm. However, no success have been achieved so far in terms of attaining ‘true’ hybrids from Erianthus since inception of this program at SRIF in 2009 and research and experiments are still underway. The expertise of international scientists involved in Erianthus introgression was also sought via a workshop conducted in Fiji following which few recommendations have been adopted to improve introgression methods. An extensive review and restoration of existing germplasm was carried out by Singh et al in 2012 and a paper has already been presented on this at 2012 ASSCT conference in Cairns. It has become crucial as evident from above findings to routinely diversify the present germplasm to avoid narrowing down of the genetic base needed for inducing variation in the seedling populations.

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REFERENCE: