MORPHOLOGICAL & PHYSIOLOGICAL STUDY OF EXOTIC SUGARCANE CLONES AT ADVANCE NURSERY STAGE

M. Zafar, Shafiq Ahmad, M. Azhar Munir, Abdul Ghaffar, Shahid Bashir, M. Walyat Ali and M. Afzal
Sugarcane Research Institute, Faisalabad

ABSTRACT

To evaluate 110 clones against standard variety CP77-400 a non replicated double row trial was laid out having net plot size measuring 5X2.4m Keeping in view the desirable characters, 42 clones having desirable birx % growth and other quantitative characters were selected and were promoted to preliminary varietal trial while 68 clones were rejected due to undesirable characters, However 5.45%, 10.90%, 9.09%, 3.63%, 8.18% 4.54% and 2.72 clones were rejected, due to poor growth, pithiness, low brix %age, aerial roots, cracks sprouts disease susceptibility, insect/pest infestation, hairiness lodging and short needed length respectively.

Key words: Clone, standard variety, trial, nursery, desirable character, pithiness, brix.

INTRODUCTION

Sugarcane is an important cash crop of Pakistan (Ahmad *et al.,* 1991, Rehman *et al.,* 1992), which plays an important role in economic uplift of farmers, Moreover feeding of ever expanding sugar industry totally depends upon cane cultivation. However, the notional average cane yield is 53.2 tones/ha which is far below the potential of existing cane varieties (Ann. 2007). The yield can be enhanced by adopting the improved package of technology and by growing high yielding varieties (Heinz 1987). However development of new sugarcane varieties is not feasible in Pakistan because of intricate flowering of the plant and non availability of sugarcane breeding facilities and acclimatization (Javed *et al.,* 2001). Thus selection in general, forms the base line for the cane agronomist in Pakistan to develop new varieties. The variety improvement in sugarcane is equally important from the breeders and growers point of view. Potential of new genotypes needs to be tested in local environment over various locations for different years before deciding to release as new cultivar in a particular region (Basfor and Cooper 1998, Pollock 1975 Ruschell 1977, Tai *et al*., 1982, Kanf and Millers 1984, Milligan *et al.,* 1990, Khan 1981 and Khan *et al.,* 2000). The clonel selection at the pre commercial stages helps in identification of improved genotypes for commercial production of sugarcane (Claz *et al.,* 2000). All the stages in varietal selection programme are important but establishment of a good nursery is of prime importance, because evolution of durable and dependable variety can be expected if it expands from a good nursery. Keeping in view the importance of the nursery, present study was conducted under agro-climatic conditions of Faisalabad.

MATERIALS AND METHODS

In advance nursery 110 clones having 14 parent crosses of exotic origin received from primary Nursery stage were tested in a non-replicated double row trial (Augmented design) having net plot size 5X2.4m during 2008. These clones were compared with standard variety CP77-400. Keeping in view the desirable characters such as growth vigor, frost resistance, erectness, resistance to lodging, hairiness cracks, aerial roots, tillering, sprouts, disease susceptibility and insect pest infestation, damage by sun burn and brix% age etc. The brix reading was recorded by hand refractometer. After comparing the quantitative and qualitative characters of all clones with standard variety CP77-400, 42 clones (38.19%) were promoted to preliminary varietal trials while, 68 clones (61.81%) were rejected due to undesirable characters. The selection was made by the committee of experts in the field.

RESULTS AND DISCUSSION

The performance of clones under evaluation for varietal selection programme are given in table I and II. Significant 42 clones were selected as given in table I and clones which fell under the categories of un-required characters of the sugarcane plant are given in table No. II. Two parent crosses gave 100% selection. One parent cross showed 90% selection and one parent cross exhibited 80% selection for promotion to Advance Nursery trial. So the selection remained 38.19% that is 42 clones and rejection was 61.81% that is 68 clones. Characters studied in experiment are discussed as under.

1. Growth performance: In good agronomic practices the growth performance is a character that effect the yield of the cane crop. Growth habits, erectness, internodal length, girth of cane and stooling depends upon genetic make up which may be detected by overall performance of the cane. Keeping in view the growth performance 6 clones 5.45% were rejected on the basis of poor growth.

2. Pithiness: Hollow stem of cane plant is negative character which leads to lodging and disease infestation and lowers the cane quality. In this trial 12 clones (10.90%) were rejected due to pithiness.

3. Brix %: It is the percentage by weight of sucrose in pure sugar solution (Meade 1964). It was recorded by Hand Refractometer. Higher Brix% results in higher sugar recovery and vice versa. In this context 10 clones 9.09% were rejected due to low Brix %.

4. Aerial roots: These are secondary roots which spoil the quality of the cane as well as lowers the growth speed and deteriorate the crop stand, 4 clones (3.63%) were found carrier of this bad character so were rejected.

5. Cracks: The cracks on stem of the cane plants deteriorate the cane quality a well as tissues due to enhancement of transpiration rat (Dillefwijn 1952) and make plants susceptible to the diseases. 4 clones (3.63%) showed this weak character and were rejected.

6. Sprouts: Due to bud sprouting, which adversely affect the quality of the cane and germination of the new crop is lowered. This character appeared in 7 clones (6.63%) and these were rejected in this trial.

7. Disease Infestation: Only 9 clones (8.18%) were rejected due to the infestation by different diseases in this trial. So were rejected.

8. Insect/Pest: Severe insect pest attack was observed on 5 clones (4.54) and these were rejected.

9. Hairiness: It is undesired character which makes intercultural practices difficult as well as the harvesting of the crop and 3 clones (2.72%) were rejected due to Hairiness.

10. Lodging: It is a bad character and exerts harmful effect on sugarcane yield (Borden-1942), spoils the cane quality, brix %age and growth of sugarcane crops, In this contexts 5 clones (4.54%) were rejected.

11. Needle Problem: Key shorter longer internodel length is required so, 3 Clones 2.72% were rejected due to needle length problem.

Table-1 Parentage selection

Sr. No.	Parentage	Total Clones	Selected clones	Clone Re-jected	Brix Range	Selection %age
1.	Roc-1X795-2954	12	1	11	7.5-14	8.33
2.	86A-35X795-2924	9	1	8	11-17	11.11
3.	H60-3802X795-2954	1	0	1	12-14	0
4.	N60-3802X795-2954	15	2	13	10-20	13.33
5.	78N-465XKQ87-8075	17	2	15	8-14	11.76
6.	MQ79-141X67N-3184	6	3	3	6.9-13	50.0%
7.	Q79+VMC-7139	7	2	5	7-14.5	28.57
8.	CL73-239XMQ-77-340	10	6	4	9-17	60.0%
9.	KQ-912-616XMQ79-1030	7	7	0	14-18.5	100%
10.	MQ83-304X86A-3626	4	2	2	10-18	50%
11.	KQ97-6460XN-14	5	1	4	12.5-15.0	20
12.	Roc-1XKQ02-235	11	10	1	12-18	90.90
13.	MQ 77-34XKQ 91-1707	5	4	1	11-18	80.00
14.	79P-2954XHS2-663	1	1	0	13-15	100%
	Total	110	42	68		

Sr. No.	Factor	No. of clones S-2008-Misc-------	Total Clones	Rejection %
1	Growth	60, 61, 85, 104, 110, 156.	6	5.45
2	Pithiness	11,16,28,56,59,63,77,86,91,93,100,119.	12	10.90
3	Brix	8,24,58,64,69,79,87,127,139,155.	10	9.09
4	Aerial Roots	1,3,18,65	4	3.63
5	Cracks	132,164,167,188.	4	3.63
6	Sprouts	20,27,76,94,125,128,166.	7	6.63
7	Disease Infestation	15,29,44,45,48,55,74,92,181.	9	8.18
8	Insect/Pest susceptibility	47,49,114,116,123	5	4.54
9	Hairiness	43,73,160.	3	2.72
10	Lodging	9,12,21,96,101	5	4.54
11	Needal Length	36,52,115	3	2.72

REFERENCES

1. Anonymous. 2000 Agricultural Statistics of Pakistan, 1999-2000 Govt. Pakistan Ministry of food, Agriculture & Livestock, Islamabad. pp 27-28.
2. Ahmad, R., M. Saleem and M. S. S. Nazir, 1991. Autumn ratooning potential of five sugarcane varieties Pak. J, Agric. Res. 13:26-29.
3. Basford, K.E. and M. Cooper, 1988. Genotype environment interactions and some consideration of their implication for wheat breeding in Australia, Aust. J. A Agri. Res., 49(2): 153-174.
4. Bordgen, 1942.. Juice quality effected by lodging. Haw. plant res.46, 39-42.
5. Dillewijin, C-vam1952 Botany of Sugarcane. The chronica Botanic Co. Book Deptt. Waltham. Mass U.S.A.P.P.9.
6. Gomez, B., J. C. Comstock, P. Y. T. Tai., J. D. Miller, J. Follis, J. S. Brown and I. Z. Lang. 2000. Evaluation of new canal point sugarcane Clones, 1999-2000. Harvest season USDA, Agric. Res. Service, ARS 157, pp.28.
7. Heinz, D. J. 1987. Sugarcane improvement: Current productivity and future opportunities. Copersucar International Sugarcane proceeding work.
8. Javed, M., A. Khatri, I. A. Khan and R. Ansri. 2001. NIA 98 a newly sugarcane variety. Agriculture and Technology. The DAWN. Monday, July 16.P.III. Short interned reduces recovery and in nears fiver %age 80.
9. Kang, M, S. and J. D. Miller. 1984. Genotype environment interaction for cane and sugar yield land their implication in sugarcane breeding. Crop Sci., 24(2): 435-440.
10. Khan, A.Q.1981. Varietal buffering in sugarcane. Indian sugar 31:409-411.
11. Khan, I. A., A. Khatri, M. A. Jawed, S. H. Siddique, M. Ahmad, N. A. Dahar, M. H. Khanzadz and R. Khan. 2000. Cane and sugar yield potential of sugarcane line AEC81-15. Pak. J. Bot., 32(1):101-104.
12. Meade, G. P. 1964. Cane sugar hand book 9th (ED). John Willy & sons new York, London, Sydney PP.466.
13. Milligan, S. B., K. A. Gravios., K. P. Bischoff., and F. A. Martin. 1990. Crop effects on broad base heritability and genetic variance of sugarcane yield components. Crop Sci., 35:36-38.
14. Pollock, J.S. 1975. Selection consequences of differential performance of standard cones across environments Sugarcane breed, Newsl. Int. Sco. Sugarcane technology. 35:36-38.
15. Rehman, S., G. S. Khan and I. Khan, 1992 Coordinated uniform national varietal trail on sugarcane. Pak. J. Agric. Res. 13: 136-140.
16. Gruschell, R. 1977. Phenotypic stability of some sugarcane varieties (*Saccharum* spp) in Brazil. Proc. Int. Soc. sugarcan Tchnol., 16:275-281.
17. Tai, P. Y. P., E. R. Rice., V. Chew and J. D. Miller, 1982. Phenotypic analysis of sugarcane cultivar performance tests. Crop Sci., 22 (6): 1179-1148.