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RESPONSE OF NEW SUGAR CANE GENOTYPES IN SOUTHERN REGION OF KHYBER PAKHTUNKHWA

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ABSTRACT

The response of total seventy six new genotypes of sugar cane was studied in fifteen different trials at Agricultural Research Station Serai Naurang (Bannu) during 2006-07 and 2007-08. Variety NSG-555, S98CSSG-557 and Bannu-3 exhibited the highest significant and at par average cane yield of 121.10, 119.90 and 118.18 t ha^{-1} respectively. Variety S98CSSG-676 responded with maximum sugar recovery of 12.53 % closely followed by MS91CP-623, Bannu-3-having showing 12.34 and 12.17 % of sugar recovery. Variety Bannu-3 showed the highest sugar yield (14.10 t ha^{-1}) followed by S98 CSSG-709 producing average 13.34 and 12.64 t ha^{-1} of sugar yield.

Key words: Sugar cane varieties, yield, sugar potential.

INTRODUCTION

Sugar cane is now the major cash crop of southern areas of Khyber Pakhtunkhwa due to the existing Sugar Mills in the area. The area under sugar cane is gradually increasing but its local production is still poor and insufficient for smooth running of Sugar Mills. Hence sugar cane is imported from Punjab to the Sugar Mills. There are several limiting factors affecting the sugar cane production. However, major factor is the lack of improved technology.

Farmers usually adopt old, low sugar and susceptible varieties and the farming community maintains no pure/suitable varieties. Khyber Pakhtunkhwa shares 9.5 % area of Sugar cane and 9.7 % with respect to sugar production on National level. In D.I. Khan 65 % area has been occupied by inferior variety CO-1148 and the rest of the area by certain other improved varieties like CP77-400, CPF-240 CP43/33 etc. In Bannu variety Bannu-1 is supplied to growers with limited resources (Anonymous 2005). According to Majid. M.M and Afghan. S the per hectare cane yield is 45.5 t ha^{-1} with sugar recovery of 8.00 % in Khyber Pakhtunkhwa. The southern parts of the province certainly need early change to replace the old varieties with new better quality and suitable genotypes. To overcome the situation research activities are continuously under process to evaluate new most suitable varieties of sugar cane for this region of the province.

MATERIALS AND METHODS

The performance of total seventy six promising genotypes of Sugar cane was studied in fifteen different trials at Agricultural Research Station Serai Naurang (Bannu) during 2006-07 and 2007-08. All the trials were conducted in RCB design with three replications in net plot size of 3.0 x 5.0 m with rows 75 cm a part. Recommended doses of NP @ 150-56 kg were applied to the trials at appropriate stages. Phosphatic fertilizers were applied at the time of seedbeds preparation. To control the common weeds, weedicide Gazapex Combi was applied @5.6 kg/ha during the month of February in the trials. Necessary insecticide (Carbofuaran Granules) was applied @12 kg ha^{-1} in two equal doses with 25-30 days interval in the month of May-June. Nitrogenous fertilizers were applied in two uniform doses in the above

Duration / interval. All the cultural practices were uniformly adopted in the trials at proper stages. Observations were thoroughly collected on all major parameters. Data on cane yield was analyzed statistically through computer package M-STATC.

RESULT AND DISCUSSION

Cane yield

It is evident from table-8 that variety NSG-555 responded with the highest significant cane yield of 121.1 t ha^{-1} closely followed by varieties S99CSSG-557, Bannu-3 showing at par average cane yield of 119.90 and 118.18 t ha^{-1} respectively (table-10 & 14). Similar results were reported by Rasool *et al*., 2007 and found, SPF-213 with higher cane yield of 76.0 t ha^{-1}. Soomro *et al*., 2007 also recorded HoTh-2109 with maximum cane yield of 148.33 t ha^{-1}. Anonymous 2007 found, LRK-2004 with the highest cane yield of 186.21 t ha^{-1}.

Sugar percentage

According to the data in table-3, variety S98CSSG-676 exhibited the maximum sugar recovery of 12.53 % closely followed by varieties MS91CP-623, Bannu-3 possessing the next higher recovery of 12.34 and 12.17 % respectively (table-1&8). Other scientists also quoted similar findings. According to Rasool *et al*., 2007 variety Bannu-1 responded with higher sugar recovery of 11.47 %. Soomro *et al.*, 2007 found HoTh-2109 with highest CSS of 14.61 %. Similarly, MS91CP-623 was reported with average sugar recovery (11.41 %) by Anonymous 2006. Anonymous 2007 also found variety S98CSSG-567 with the highest CSS of 15.6 %.

Sugar yield

According to the data mentioned in table-10 variety Bannu-3 produced the maximum sugar yield of 14.10 t ha^{-1} followed by varieties NSG-555, S98CSSG-709 showing average sugar yield of 13.34 and 12.64 t ha^{-1} respectively (table-8). These findings are analogous with Anonymous 2006, who found, S98CSSG-557 with the highest sugar yield of 15.0 t ha^{-1}. Jamil. M and Majid. M.A, 2007 also recorded maximum sugar yield of 14.00 t ha^{-1} for S95HS-185. Bahader *et al*., 2005 concluded variety Bannu-3 with average sugar yield of 8.5 to 10.00 t ha^{-1}. Anonymous 2004 reported CP87-1628 with average sugar yield of 13.19 t ha^{-1}.

Table-1 Varietal trial-Early season (Plant Crop 2006-2007)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	S-96-SP-1058	71.96	10.82	7.79
2	S-88-US-479	84.21	10.09	8.50
3	MS-91-CP-586	95.65	11.81	11.30
4	S-78-US-421	83.56	11.90	9.94
5	CP-89/846	77.76	11.66	9.07
6	Bannu-3	68.09	12.17	8.29
7	CP-88/1165	64.24	11.23	7.21
8	S-87-US-1819	72.93	11.60	8.46
9	S-96-SP-571	76.79	9.38	7.20
10	S-97-US-128	70.53	10.14	7.15
11	Naurang-98	66.11	9.25	6.11
12	CP-85/1491	70.65	10.68	7.55
13	MS-91-CP-90	65.70	11.10	7.29
14	S-87-US-1327	68.76	8.43	5.80
15	CPHS-35	97.57	9.18	8.96
16	CPF-236	58.12	9.58	5.57

Table-2 Varietal trial-Early season (2nd Ratoon crop 2006-2007)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	S-96-SP-1058	57.37	8.05	5.42
2	S-88-US-479	79.33	9.69	7.68
3	MS-91-CP-586	97.64	10.19	9.95
4	S-78-US-421	78.23	10.81	8.45
5	CP-89/846	66.36	9.69	6.43
6	Bannu-3	84.25	11.20	9.44
7	CP-88/1165	69.54	10.55	7.33
8	S-87-US-1819	64.95	10.47	6.80
9	S-96-SP-571	77.70	9.38	7.29
10	S-97-US-128	83.22	8.51	7.08
11	Naurang-98	75.52	9.22	6.96
12	CP-85/1491	94.09	10.68	10.05
13	MS-91-CP-90	89.64	8.92	8.00
14	S-87-US-1327	104.40	9.34	9.75
15	CPHS-35	82.03	11.12	9.12
16	CPF-236	87.48	10.42	9.11

Table-3 Varietal trial- mid season (Ratoon crop 2006-07)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	Bannu-1	73.26	10.67	7.82
2	Bannu Green	58.74	11.05	6.49
3	S-90-SP-889	65.73	9.09	5.97
4	MS-92-CP-727	73.72	11.10	8.18
5	NSG-555	84.22	10.70	9.01
6	S-96-SP-302	100.19	10.44	10.46
7	HSF-242	74.43	10.26	7.64
8	S-98-CSSG-676	76.12	12.53	9.54
9	S-94-HS-87	79.0	10.97	10.86
10	S-96-SP-28	83.07	9.98	8.29
11	S-92-SP-57	71.20	10.15	7.23
12	S-84-I-351	72.25	10.75	7.77
13	S-98-SP-341	64.10	9.19	5.89
14	SPHS-2	68.97	10.71	7.36
15	SPSG-394	82.00	10.17	8.34
16	S-86-US-1025	70.64	8.57	6.05

Table-4 Varietal trial mid season (Plant crop 2006-07)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	Bannu-1	66.34	10.54	7.0
2	Bannu Green	66.65	10.92	7.28
3	S-90-SP-889	64.42	8.51	5.48
4	MS-92-CP-727	55.14	9.80	5.40
5	NSG-555	76.37	10.51	8.03
6	S-96-SP-302	96.62	9.35	9.03
7	HSF-242	60.33	9.74	5.88
8	S-98-CSSG-676	100.11	10.34	10.35
9	S-94-HS-87	60.48	10.14	6.13
10	S-96-SP-28	81.00	8.18	6.63
11	S-92-SP-57	75.35	9.16	6.90
12	S-84-I-351	69.52	9.70	6.74
13	S-98-SP-341	92.08	8.72	8.03
14	SPHS-2	73.63	7.75	5.71
15	SPSG-394	56.26	7.76	4.37
16	S-86-US-1025	65.70	10.37	6.81

Table-5 Varietal trial- late season (Plant crop 2006-07)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	ROC-10	108.7	6.05	6.58
2	S-98-CSSG-557	90.74	10.46	9.49
3	MS-92-CP-716	90.13	7.48	6.74
4	MS-92-CP-717	88.49	8.86	7.84
5	SPF-238	94.12	8.47	7.97
6	CPF-237	95.45	9.27	8.85
7	TCP-3110	93.18	8.39	8.07
8	S-94-HS-229	83.68	9.68	8.07
9	COJ-84	94.00	9.86	9.27
10	S-98-CSSG-668	76.85	10.69	8.65
11	Thata-8	90.73	10.02	9.09
12	MT-70-611	64.11	10.82	6.94
13	HSF-240	70.08	10.15	7.11
14	NIA-98	79.87	8.63	6.89
15	CPF-240	77.31	10.60	8.19
16	HS-12	68.95	10.67	7.36

Table-6 Varietal trial promising (Plant crop 2006-07)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	MS-93-CP-223	61.43	11.32	6.95
2	S-98-CSSG-1144	64.69	9.26	5.99
3	S-98-CSSG-1944	78.21	9.43	7.37
4	MS-91-CP-611	93.25	9.92	9.25
5	CPHS-35	73.69	9.52	7.02
6	MS-91-CP-814	99.27	10.12	10.05
7	S-98-SP-108	92.75	9.16	8.5
8	NSG-555	84.55	9.37	7.93
9	S-98-CSSG-668	99.76	10.04	10.2
10	S-98-CSSG-676	82.72	10.67	8.82
11	ROC-10	73.2	6.93	5.07
12	HSF-40	73.4	9.47	6.95
13	S-97-US-214	87.72	9.62	8.44
14	S-97-US-141	75.46	10.65	8.04
15	MS-94-CP-90	79.76	9.94	7.93

Table-7 Varietal trial promising (Plant crop 2006-07)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	MS-91-CP-180	90.97	7.71	7.01
2	S-96-SP-1218	88.55	7.16	6.34
3	MS-91-CP-1135	75.47	9.26	7.0
4	S-96-SP-574	66.16	10.12	6.70
5	MS-91-CP-503	59.58	9.52	5.67
6	MS-91-CP-571	60.28	10.55	6.36
7	Thatta-34	78.2	10.6	8.29
8	Q-88	56.34	9.59	5.40
9	CP-85/1308	83.62	10.83	9.06
10	MS-91-CP-332	69.25	10.25	7.10
11	S-98-CSSG-676	112.62	9.40	10.59
12	SPF-234	94.22	10.81	10.19
13	MS-91-CP-814	108.78	9.85	10.71
14	MS-94-L-127	82.11	10.34	8.49
15	MS-92-CP-611	106.36	9.98	10.61
16	MS-94-CP-90	60.27	9.51	5.73

Table-8 Varietal trial promising (Ratoon crop 2006-07)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	S-98-CSSG-1144	44.31	10.24	4.54
2	S-98-SP-108	97.82	8.01	7.84
3	HSF-240	81.93	10.19	8.35
4	S-97-US-214	45.98	10.48	4.82
5	S-98-CSSG-1944	60.48	8.35	5.05
6	CPHS-35	101.15	10.19	10.31
7	SPF-234	75.24	11.56	8.70
8	S-98-CSSG-709	110.35	11.45	12.64
9	S-98-CSSG-612	90.22	10.41	9.38
10	S-98-CSSG-2086	45.97	10.30	4.61
11	ROC-10	102.79	10.51	10.8
12	MS-91-CP-814	100.31	10.52	10.55
13	MS-94-L-127	98.66	11.49	11.34
14	MS-91-CP-623	78.58	12.34	9.70
15	MS-91-CP-611	103.69	10.54	10.93
16	MS-94-CP-90	90.29	10.99	9.92
17	MS-91-CP-288	74.33	11.75	8.73
18	MS-93-CP-223	78.57	10.96	8.61
19	S-97-US-141	76.74	10.09	7.74
20	S-98-CSSG-668	56.83	11.34	6.50
21	S-98-CSSG-676	83.86	12.01	10.7
22	NSG-555	121.10	11.05	13.34

Table-9 Varietal trial-Early season (2nd Ratoon crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	S-96-SP-1058	84.22	11.29	9.50
2	S-88-US-479	55.24	10.20	5.63
3	MS-91-CP-586	59.06	10.30	6.08
4	S-78-US-421	77.46	10.34	8.00
5	CP-89/846	101.85	10.88	11.08
6	Bannu-3	118.18	11.93	14.10
7	CP-88/1165	111.14	10.69	11.88
8	S-87-US-1819	69.75	10.96	7.64
9	S-96-SP-571	75.61	9.75	7.37
10	S-97-US-128	65.64	9.33	6.12
11	Naurang-98	109.31	10.30	11.26
12	CP-85/1491	67.80	10.31	7.00
13	MS-91-CP-90	86.45	9.27	8.01
14	S-87-US-1327	94.80	9.26	8.78
15	CPHS-35	103.42	9.13	9.44
16	CPF-236	59.77	10.53	6.29

Table-10 Varietal trial-mid season (Ratoon crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	Bannu-1	50.71	9.44	4.78
2	Bannu Green	71.70	10.24	5.29
3	S-90-SP-889	60.18	8.80	5.29
4	MS-92-CP-727	73.06	9.58	6.99
5	NSG-555	81.93	10.08	8.25
6	S-96-SP-302	57.57	10.04	5.78
7	HSF-242	75.12	9.93	7.45
8	S-98-CSSG-676	43.05	10.58	4.55
9	S-94-HS-87	58.95	10.43	6.14
10	S-96-SP-228	84.25	8.91	7.50
11	S-92-SP-57	63.33	9.57	6.06
12	S-84-I-351	50.75	9.98	5.06
13	S-98-SP-341	82.86	9.15	7.58
14	SPHS-2	67.57	9.55	6.45
15	SPSG-394	56.61	9.14	5.17
16	S-86-US-1025	57.90	9.26	5.36

Table-11 Varietal trial late season (plant crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	S-98-CSSG-557	76.39	10.73	8.20
2	MS-92-CP-717	70.78	9.76	6.51
3	MS-94-HS-229	76.85	9.37	7.20
4	COJ-84	83.82	8.99	7.53
5	S-98-CSSG-1144	47.17	9.57	4.32
6	NIA-98	55.41	7.54	4.18
7	S-98-CSSG-668	60.9	10.4	6.33
8	TCP-3110	68.61	9.21	6.32
9	S-97-US-214	48.43	9.82	4.77
10	ROC-10	64.05	7.65	4.90

Table-12 Varietal trial late season (Ratoon crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	ROC-10	74.69	6.54	4.88
2	S-98-CSSG-557	119.90	10.33	12.38
3	MS-92-CP-716	73.79	8.27	6.10
4	MS-92-CP-717	67.44	9.73	6.56
5	SPF-238	108.65	8.94	9.71
6	CPF-237	52.04	10.77	5.49
7	TCP-3110	52.95	9.65	5.10
8	S-94-HS-229	58.87	9.91	5.83
9	COJ-84	100.94	7.87	7.94
10	S-98-CSSG-668	64.73	9.70	6.28
11	Thata-8	103.66	6.95	7.20
12	MT-70611	66.09	9.49	6.27
13	HSF-240	76.50	9.56	7.31
14	NIA-98	55.47	8.93	4.95
15	CPF-240	60.52	9.28	5.61
16	HS-12	110.18	10.21	11.25

Table-13 Varietal trial promising (Ratoon crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	MS-93-CP-223	66.72	11.68	7.79
2	S-98-CSSG-1144	66.92	11.18	7.48
3	S-98-CSSG-1944	71.98	11.19	8.05
4	MS-91-CP-611	75.25	11.22	8.44
5	CPHS-35	45.98	11.68	5.37
6	MS-91-CP-814	83.02	11.04	9.10
7	S-98-SP-108	75.40	11.20	8.44
8	NSG-555	89.29	11.17	9.97
9	S-98-CSSG-668	102.33	10.87	11.12
10	S-98-CSSG-676	60.25	11.11	6.69
11	ROC-10	78.75	7.81	6.15
12	HSF-40	106.04	10.33	10.95
13	S-97-US-214	68.52	10.24	7.02
14	S-97-US-141	84.69	11.01	9.32
15	MS-94-CP-90	82.39	10.78	8.88

Table-14 Varietal trial promising (Plant crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	ROC-10	65.18	6.39	4.16
2	S-98-SP-108	47.96	8.98	4.31
3	NSG-555	22.82	10.49	6.59
4	CPHS-35	67.98	11.85	8.05
5	MS-94-CP-90	70.36	10.91	7.67
6	S-98-CSSG-676	64.26	11.05	7.10
7	Thatta-34	72.27	10.88	7.86
8	S-88-US-479	86.66	9.68	8.39
9	MS-91-CP-586	53.17	11.45	6.09
10	CP-85-1491	58.67	11.27	6.61

Table-15 Varietal trial promising (Ratoon crop 2007-08)

Sr. No.	Variety	Cane yield Mt ha^{-1}	Recovery %	Sugar yield Mt ha^{-1}
1	MS-91-CP-180	69.89	11.09	7.68
2	S-96-SP-1218	102.02	8.55	8.72
3	MS-91-CP-1135	80.28	7.02	5.63
4	S-96-SP-574	86.92	9.91	8.61
5	MS-91-CP-503	81.47	10.81	8.8
6	MS-91-CP-571	67.0	10.40	6.97
7	Thatta-34	101.0	10.44	10.54
8	Q-88	59.51	9.65	5.74
9	CP-85-1308	72.95	8.99	6.56
10	MS-91-CP-232	62.25	9.92	6.17
11	S-98-CSSG-676	69.28	11.62	8.05
12	SPF-234	56.58	10.9	6.16
13	MS-91-CP-814	79.2	10.47	8.27
14	MS-94-L-127	82.56	10.2	8.42
15	MS-92-CP-611	71.77	8.61	6.17
16	MS-94-CP-90	74.6	10.2	7.61

REFERENCES

1. Anonymous, 2004. Annual Progress Report of Sugar Crops Research Institute Mardan 2003-2004. 1-88.P.P.6
2. Anonymous, 2005. New Varieties of Sugar Cane for NWFP in Pakistan. Quarterly Publication of SAARC Agricultural Information Centre. SAIC News Letter 15(3) July-Sept: 2005. 1-11, P.P-10
3. Anonymous, 2006. Annual Progress Report of Agricultural Research Station Serai Naurang, Bannu. 2005-06. 1-39. PP.X1
4. Anonymous, 2007. Annual Technical Report of Pakistan Agricultural Research Council 2007. 1-78.P.P-72, 74
5. Jamil, M and M. A. Majid. 2007. Performance of Sugar cane varieties in National Uniform Varietal Yield Trial. Pak: Sugar Journal. 22(1):
6. Majid, M.A and S. Afghan. 2007. Overview of sugar crops situation in Pakistan. Pak: Sugar Journal. 22(4):
7. Rasool, G, Khan. N. Hashim; M. M and N. Khalid. 2007. Comparative study of some promising Sugar cane Genotypes at ARI DI Khan. Pak: Sugar Journal. 22(5):
8. Soomoro, A. F., D. B. Panhwar., G. M. Jenejo and M.A., Hassan 2007. Cane and quality potential of newly developed sugar cane genotypes under agro climatic condition of Thata Sindh. Pak: Sugar Journal. 22(5):

COMPARATIVE SUGARCANE CLONAL STUDIES AT ADVANCE NURSERY SELECTION STAGE

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ABSTRACT

Comparative performance of 251 clones against standard variety CP77-400 was conducted in a non-replicated trial, having net plot size measuring 2.4 x 5 m. Keeping in view the desirable characters, 133 clones were selected and promoted to preliminary varietal trial while 47% clones were rejected due to undesirable characters. In general 2.39%, 5.58%, 11.15%, 4.78%, 2.78%, 5.58%, 5.18%, 2.79% and 6.77% clones were rejected because of poor growth, pithiness, low brix, aerial roots, cracks, sprouts, disease susceptibility, insect pest infestation and lodging, respectively.

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

INTRODUCTION

Sugarcane is an important cash crop of Pakistan (Ahmad *et al.*, 19991, Rehman *et aI*., 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 National average yield is about 50 tones/ha, which is far below the existing potential (Ann. 2004). Adapting the improved package of production technology and growing high , yielding cane varieties can enhance the yield (Heinz 1987). Development of new sugar cane varieties is not feasible in Pakistan because of intricate flowering of the plant and Non-availability of sugar cane breeding facility and acclimatization (Javed *et al*., 2001).

The introduction in general form is the base line for the cane agronomist in Pakistan to develop new varieties. The variety improvement in sugar cane is equally important for the breeders and growers point of view, Potential of new genotypes is be tested in local environment of over various locations for different years before deciding the release as a new cultivars in particular region (Basfor and Cooper 1998, Pollock 1975, Ruschell 1977. Taj *et al.*, 1982, Kang and millers 1984, Milligan *et al.*, 1990, Khan 1981 and Khan *et al.*, 2000). The clonal selection at the pre-commercial stages help in identification of improved Genotypes for commercial production of sugar cane (Claz *et al.*, 2000) All the stages in Varietal selection programme are important but establishment of good nursery is of prime importance because evolution of a durable and dependable variety can be expected if it expands from a good nursery. Study was conducted under the agro climatic condition of Faisalabad.

MATERIALS AND METHODS

In advance nursery selection, 251 clones having 81 parent crosses of USA origin received from Nursery-I were tested in a non replicated double row trial having the net plot size 5X 2.4 m during 2004. These clones were compared with standard variety CP77-400 keeping in view the desirable character such as growth vigour, frost resistance, erectness, pithiness, resistance to lodging, hairiness, cracks, aerial roots, tillering, sprouts. Disease susceptibility, insect pest infestation damage by sunburn and brix %. The brix reading was recorded by hand refractometer.

After comparing the quantitative and qualitative characters of all clones with standard Variety, 133 clones were promoted to preliminary varietal trial, while 118 clones (47%) were rejected due to undesirable characters. The committee of experts made the selection in the field.

RESULTS AND DISCUSSION

The results of the performance of clones under evaluation of varietals selection performance are given in table-2 and 1 significant clones (133) were selected as given in the table-1 and clones which fell under the categories of unrequited characters of sugarcane plant are given in the table-2. In table-1 (20) parent gave highest selection %age of 100 followed by parent CP84-98 X CP84-1274 and parent CP78-2114 X CP92-P3.

These exhibit 85.71% and 83.33% selection for promotion to advance nursery. So the selection remained 53% that is 133 clones and rejection was 47% that is 118 clones.

Parameters studied in experiment are discussed as under.

1. Growth performance: In good agronomic practices the growth performance is a character that affect the yield of cane crop. Growth habits, erectness, internodal length, girth of cane, length of cane and stooling depends upon genetic make up which may be detected by the over all performance of clone. So 6 clones (2.39%) were rejected on the basis of poor growth.

2. Pithiness: Hollow stem of cane is negative character, leads to lodging and disease infestation and lowers the cane quality. In the trial 14 clones (5.58%) were rejected due to pithiness.

3. Brix %age: It is the percentage by weight of sucrose in pure sugar solution (Meade 1964). It was recorded by hand refractometer. Higher brix %age will result in higher sugar recovery and vice versa. In this context 28 clones (11.15%) were rejected due to low brix %age.

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 12 clones (4.78%) were found carrier of bad character so were rejected.

5. Cracks: These are the cracks on stem of the cane plant. These deteriorate the cane quality as well as tissues due to enhancement of the transpiration rate (Dillewijn 1952) and make s susceptible plant to the disease attack 7 clones (2.79%) showed this undesirable character and were rejected.

6. Sprouts: These are the buds sprouting which adversely affect the quality of the cane and germination of the new crop is lowered if sets are affected by sprouting. These characters appeared in 14 clones (5.58%) and theses were rejected in this trial.

7. Disease infestation: Only 13 clones (5.18%) were rejected due to severe attack of different diseases in this trial.
8. Insect/ Pest: Insect pest attack was observed on 7 clones (2.788%) and these were rejected.
9. Lodging: Lodging exerts harmful effects on sugar yield (Borden 1942). Spoils the cane quality, brix% age and growth of the sugar cane crop. So 17 clones 6.773% showed lower resistance for lodging and hence were rejected.

Table- 1 Character wise rejection of clones of sugarcane

Sr. No.	Character/Factor	N0.of Clones/ S2001-US…	Total	Rejection %
1.	Poor Growth	215, 253, 324, 510, 583, 664	6	2.39
2.	Pittiness	52, 141, 143, 203, 207, 231, 291, 273, 264, 461, 493, 588, 627, 732	14	5.577
3.	Low Brix %age	10, 16, 34, 85, 112, 173, 152, 197, 202, 213, 227, 245, 260, 270, 323, 345, 364, 369, 404, 421, 445, 464, 504, 531, 536, 574, 610, 744	28	11.155
4.	Aerial Routs	40, 84, 363, 370, 389, 448, 547, 549, 556, 571,573, 579	12	4.78
5.	Cracks	35, 156, 259, 267, 564, 717, 721	7	2.788
6.	Sprouts	91, 99, 328, 252, 256, 342, 426, 442, 490, 577, 582, 469, 740, 766	14	5.577
7.	Disease susceptibility	121, 148, 171, 262, 284, 422, 431, 480, 566, 567, 570, 601, 771,	13	5.179
8.	Insect Pest infestation	17, 206, 416, 467, 562, 650, 710	7	2.788
9.	Lodging	68, 106, 164, 178, 198, 210, 211, 230, 236, 276, 296, 458, 471, 483, 551, 568, 588	17	6.773
	Total		118	47%

Table-2 Study on the quantitative and qualitative characters of nursery II

Sr. No.	Total clones	Parentage	Clone Promoted	Clone S-2002-US……	Clone rejected	Brix Range	Selection (% age)
1	1	CP87-1018 X CP85-1491	0	-	1	20	0
2	2	CP89-1289XCP85-1432	0	-	2	18-18.5	0
3	4	CP85-1207XCP86-454	1	36	3	14.5-18.5	25
4	1	CP87-1018 X CP851491	1	44	0	20	100
5	1	CP89-1289 X CP85-1432	0	-	1	16	0
6	2	CP85-1207 X CP86-454	1	55	1	17-20.5	50
7	14	CP78-1628 X CP87-1733	8	87, 89, 90, 92, 102, 105, 109, 114	6	15-20	57
8	11	CP88-1561 X CP85-1491	7	116, 118, 120, 120, 133, 134, 140, 145	4	13-21	63.63
9	3	CP88-2043 X CP85-1491	1	155	2	18-20	33.33
10	1	CP87-1226 X CP85-1432	1	162	0	18	100
11	2	CP87-1628 X CP72-1210	1	168	1	14.5-16	50
12	2	CP88-1836 X CP84-1714	0	-	2	13-17	0
13	2	CP84-1322 X CP84-1491	1	177	1	18-20	50
14	1	CP86-1427 X CP84-1827	1	184	0	18	100
15	13	CP84-1185 SP79-5362	3	204, 212, 217	10	13-20.5	23.07
16	10	CP88-2030 X CP86-1663	5	224, 225, 226, 234, 237	5	13-20	50
17	1	CP84-1185 X CP78-1628	0	-	1	17	0
18	5	CP81-1238 X CP86-1747	2	249, 254	3	9-19	40
19	2	CP85-1491 X CP72-1210	0	-	2	18-19	0
20	2	CP97-1773 X CP86-1664	0	-	2	16-22	0
21	1	92-MISC	0	-	1	20	0
22	15	CL75-0853 X CP86-1180	7	271, 287, 298, 299, 301, 312, 317	8	13-23	46.66
23	2	CL75-0853 X CP86-1180	2	327, 334	0	20-21	100
24	4	CP89-879 X CP70-956	2	341, 343	2	18-21	50
25	1	HOCP44-828 X HOCP92-631	1	358	0	22	100
26	1	HO94-856 X HOCP92-631	1	359	0	20.5	100
27	2	US96-6 X HOCP93-775	0	-	2	16-18	0
28	1	HOCP93-750 X CP97-614	1	368	0	22	100
29	3	HOCP93-746 X 97-P12	1	371	2	17-17	33.3
30	1	CP90-997 X CP90-956	1	373	0	18.5	100

Sr. No.	Total clones	Parentage	Clone Promoted	Clone S-2002-US……	Clone rejected	Brix Range	Selection (% age)
31	2	CP89-831 X CP70-1133	1	388	1	14.5-19	50
32	2	HOCP85-345 X LCP85-384	1	400	1	19	50
33	1	HOCP93-746 X L94-378	1	409	0	16	100
34	1	HOCP94-856 X CP89-837	0	-	1	16.5	0
35	3	HO94-808 X US96-6	1	424	2	17-17.5	33.33
36	2	LCP85-384 X 97-P18	0	-	2	16-17	0
37	1	HOCP93-750 X HOCP92-631	0	-	1	15	0
38	1	HOCP94-836 X HOCP93-750	0	-	1	15	0
39	5	CP 90-956 X CP90-9	4	447, 451, 452, 454	1	15-20	80
40	2	HOCP90-941 X HOCP94-856	1	457	1	16-17.5	50
41	2	US96-1 XLCP86-454	1	460	1	16-17.5	50
42	3	CP89-884XLCP86-454	2	463, 466	1	16.5-18	66.66
43	1	CP89-837 X CP76-331	0	-	1	16.5	0
44	2	HOCP93-746 X US95-1014	1	468	1	14-16	50.00
45	9	CP81-1238 X CP86-1747	6	476, 477, 484, 487, 489, 491	3	14-20	66.66
46	1	US90-1081 X CP85-1491	0	-	1	17.5	0
47	3	N-52-216	3	497, 498, 499	0	16-16.5	100
48	6	CP81-1384 X CP 72-1210	4	502, 506, 511, 512	2	14-18.5	66.66
49	4	CP78-2114 X CP-1210	4	514, 516, 521, 522	0	14-19	100
50	7	CP87-1628 X US90-1090	5	526, 527, 528, 532, 535	2	15-21	17.42
51	6	CP80-1557 X CP 83-0632	4	537, 538, 539, 541	2	13.5-19	66.667
52	2	US90-1070 X CP87-1628	1	554	1	17-18.5	50
53	2	CP83-1432 X CP87-1628	2	558, 559	0	18-19	100
54	1	CP85-1332 X NG 57-134	1	561	0	18	100
55	9	CP78-2114 X CP78-1628	2	563, 569	7	15-19	22.22
56	4	CP81-1238 X CP85	0	-	4	16-19	0
57	2	CP88-1836 X 85-1491	0	-	2	15-18	0
58	1	US90-1084 X CP85-1491	1	585	0	13	100
59	2	US90-1070 X CP87-1628	1	587	1	14.5-17	50
60	1	CL61-620 X CP85-1491	1	591	0	17	100
61	1	CP84-1198 X CP82	0	-	1	12	0
62	7	CP84-98 X CP84-1274	6	607, 609, 614, 619, 623, 624	1	16-20	85.71
63	2	US90-1090 X CP72-1210	1	628	1	16-117	50
64	1	CP88-1561 X CP83-0632	1	632	0	15.5-20	100
65	2	IJ76-2316 X CP80-1827	2	635,636	0	17-20	100
66	1	CP87- X CP86-1633	1	642	0	18	100
67	1	CP88-1196 X CP72-1210	1	645	0	17	100
68	5	CP87-1334 X CP72-2086	3	651,653,656	2	13-18	60
69	6	CP78-2114 X CP92-P3	5	660,661,662,666,667	1	15—18	83033
70	1	US 90-1 X CP89837	0	-	1	18	0
71	1	HOCP93-750 X COP86-454	1	696	0	19.5	100
72	1	HOCP90-941 COCP93-750	0	-	1	16	0
73	1	HOCP90-941 X CP89-837	0	-	1	13	0
74	2	HOCP94-839 X CP99-378	1	723	1	14-18	50
75	3	HO94-808 X HO94-851	2	734,736	1	14-15	66.66
76	1	CP86-1427 X CP78-1628	0	-	1	13	0
77	1	CP81-1302 X CP85-1308	0	-	1	16	0
78	1	CP88-1573 X CP86-1633	1	747	0	13-17	100
79	4	S-277 MURREE	3	750,754,755	1	15-17	25
80	4	COK-31 MURREE	4	759,760,762,763	0	15-17	100
81	6	N-53-216 MURREE	4	765,767,768,769	2	13-18	66.66
Total	251		133		118		

100% 53% 47%

REFERENCES

1. Anonymous. 2004. Agriculture Statistics of Pakistan, 2003-04 Govt. Pakistan. pp 27-28.
2. Ahmad, R., M. Saleem and M. S. S. Nazir. 1991. Autumn rationing potential of five sugarcane Varieties. Pak. J . Agric. Res., 13 :26-29
3. Basford, K.E and M. Cooper. 1998. Genotype environment interaction and some consideration of their implications for wheat breeding in Australia. Agric. Res,.49(2):153-174.
4. Bordgen, 1942. Juice quality effected by lodging. Haw, plant Res, 46 : 39-42
5. Dillewijin, C-Van. 1952. Botany of Sugarcane. The chronic a Botanica Co Book Dept. 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 Land. 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, R. Ansari. 2001. NIA 98 a newly sugarcane variety. Agriculture and Technology. The DAWN. Monday, July 16.Pill.
9. Kang, M. S. and J. D. Miller. 1984. Genotype environment interaction for cane and sugar yield and their implications in sugarcane breeding, Crop Sci., 24 (2): 435-450.
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. Siddiqui M. Ahmad N. A. Dahar M. H. Khanzada and R. Khan. 2000. Cane and sugar yield potential of sugarcane line AEC81-8415. Pak. J. Bot., 32 (1): 101-104.
12. Meade, G. P. 1964. Cane sugar handbook 9th (ED). John Willy & Sons New York, London, Sydney PP .466.
13. Miolligan, S. B., K. A. Gravios K. P. Bischoff and F. A. Martin.1990. Crop effects on broad base heritabilites and genetic variances of sugarcane yield components. Crops Sci., 30 (2): 344-349.
14. Pollock, J. S. 1975. Selection consequences of differential performance of standard clones across environments. Sugarcane Breed. News. Int. Sco. Sugarcane technology, 35:36-38.
15. Rehman, S., Khan, G.S. and khan, I. 1992. Coordinate uniform national varitel on sugarcane. Pak. J. Agric. Res., 13:136-140.
16. Ruschell, R. 1977. Phenotypic stability of some sugarcane varieties (*Saccharum* spp.) in r''Brazil. Proc. Int. Soc. Sugarcane Technol., 16:275-281.
17. Tai, P.Y.P., E.R. Rice, V. Chew and J.D. Miller. 1982. Phenotypic Stability analysis of sugarcane cultivar performance tests. Crop Sci., 22 (6): 1179-1148.

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

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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.

SUGAR INDUSTRY ABSTRACTS

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Effect of harvest method on microclimate and sugarcane yield in Florida and Costa Rica
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Agronomy, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010 P.29

There is worldwide pressure on sugarcane industries to adopt green cane harvesting systems that do not involve burning. The objective of this study was to compare the effect of sugarcane harvest methods on cane productivity and microclimate in Florida, U.S.A. and Costa Rica. The treatments included 1) burnt cane, 2) green cane, and 3) green cane with residue management. These treatments were implemented at three sites: A) Everglades Research and Education Center (EREC), Belle Glade, Florida on an Entisol with sandy texture, and C) Azucrera EI Viejo mill in Guanacaste, Costa Rica on a clay loam Inceptisol. The green cane residue provided a buffering effect on soil temperatures (15-cm depth) at the Florida muck site. There was a trend for higher biomass yields in burnt cane when harvested early (November-early January), and a significant cumulative 3 – year difference of 22 t/ha of cane favouring burnt vs. green cane treatments. However, cane yields were not different when harvested late in the season (mid-February-March)). On the Florida sand site. a decline in tiller population, particularly in green cane, was linked to frost events in February, 2006. Air temperatures at 10-cm aboveground were lower in green cane during frosts, which led to significantly lower tiller population in green cane in the first ratoon crop. Cane biomass yields on sand followed similar trends to those on the muck soil with burnt cane recording higher yields when harvested early but not significantly different when harvested late. At the Inceptisol site in Costa Rica, trash content, biomass and sucrose yields were not significantly different in green vs. burnt cane in the plant cane and first ratoon crops. In Costa Rica, cane residues reduced maximum soil temperatures by 5-10ºC for 3 months from harvest to canopy closure. Our results indicate the green cane residues have a significant effect on microclimate and that green harvest in Florida would be better suited for late rather than early harvest time periods.

Agroclimatic zoning and climatic risks for sugarcane in Mexico: A preliminary study considering climate change scenarios
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Agronomy, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010, P.30

In the existing scenario of current agricultural management systems and climatic standards, a new source of uncertainties must be taken into account, namely, the temperature scenarios and water availability resulting from climate changes. In this respect, agricultural zoning, supported by the climatic and edaphological potential of a region, and the climate scenarios, along with the associated risks, have become highly relevant. This paper considers an example of the sugarcane crop in Mexico, indicating possible potential areas for crop development, and what are the climatic risks during plant growth, based on crop zoning criteria, as well as the impact of global warming in future scenarios. The agro climatic scope and the edaphological and climatic zoning were defined through the quantification of physical resources and the water balance parameters of different regions, indicating the relationship between energy availability, water supply and crop water demand. The study further determined the influence of climate changes in the quantification of the water balance for the regions and the effects of this anomaly in sugarcane development. The study was based on meteorological data from historic series from Mexican research institutes and from the National Metrological Service of Mexico, accessible via the Web. The available products are: monthly and annual air temperature; monthly and annual total rainfall, monthly and fortnightly values of water deficit and surplus; drought probability at monthly and fortnightly level and maps of frost. As a result, maps of agro climatic suitability for the various regions in Mexico were produced with the current climate standards as well as considering the increase in meteorological adversities and the change in the scenarios due to global warming. Climatic risks associated with high or low temperatures and the probability of drought events are shown for both agro meteorological and meteorological factors, with an indication of the regions that are more suitable for the development of this crop.

Effect of altitude on sugarcane flowering synchronization in Cuba
Victor Caraballoso Torrecilla, Alberto Gonzalez Marrero, Felix Gonzalez Pupo and Hector Garcia Perez.
Breeding, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010. P.71

Sugarcane breeders have found some difficulties in making crosses associated with flowering induction and synchronization. The objectives of this investigation were to evaluate the relative importance of the factors involved in the altitude for sugarcane flowering induction and to establish the basis of a controlled breeding program. This study is related to flowering of 100 sugarcane cultivars from 1990-2007 at three altitudes (100, 400 and 800 m above sea level) in Cuba. Sugarcane flowering is primarily in response to photoperiod, and it is conditioned by additional factors that can reduce, inhibit or delay it. In September, the average maximum (28-30ºC) and minimum (21-22ºC) temperatures were optimum for flowering. The extent of flowering was much greater at 400 m, with a marked reduction at 100 m, and intermediate at 800 m. In Cuba, late-flowering sugarcane cultivars start to tassel in the first week of December. At lower altitude, the same cultivars have earlier flowering by an average of 2-4 weeks. A negative linear between percentage of pollen fertility and altitude was observed. In the study, a rise in altitude was accompanied by a large drop in maximum temperature and very little change in the minimum range. Growing cultivars in nurseries at different altitudes proved a useful tool to increase the clonal range and extent of flowering in Cuba.

Development of sugarcane varieties in Colombia for site-specific agriculture
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Breeding, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010 P.72

Sugarcane variety CC 85-92 is currently planted on more than 69% of the area in sugarcane in Colombia, a situation that is of concern in light of possible disease problems that could affect the productivity of the industry. Thus, CENICANA has focused on selecting varieties within the framework of site-specific agriculture. After the regional trials, from three to five varieties per series that are equal to or better than the check used in these trials are made available to the sugar mills. The most promising varieties then undergo a process of multiplication and monitoring to determine response to different agro ecological zones and to make available to the growers more varieties with site-specific adaptation. To date, varieties CC92-2804, CC93-3895 and CC 93-4418 stand our. In the semidry zone, these three varieties yielded equal to or better than CC 85-92, thereby constituting promise for the industry.

Effects of fipronil bait on sugarcane yield in Okinawa, Japan
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Entomology, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010 P.98

Fipronil bait (Prince Bait, BASF Agro), newly registered as a sugarcane insecticide in 2006 in Japan, has been shown to reduce sugarcane wireworm, Melanotus sakishimensis and M. okinawawesis (Coleoptera: Elateridae), damage and increase sugarcane yield. In January 2008, a high sugarcane growth rate was observed in fipronil bait-treated areas in minami-daito Island. To comfirm this high growth rate, we investigated sugarcane growth and yield in two fields on Minami-daitou Island. To confirm this high rate, we investigated sugarcane growth and yield in two fields on Minami-daitou Island from March to December 2008. Moreover, as we suspected that fipronil has a phytostimulatory effect that promotes sugarcane growth, we conducted a simple test using sorghum, also a gramineous C4 crop and a species with a high degree of cullinearity with sugarcane. Research on Minami-daitou Island showed that sugarcane growth in the fipronil bait-treated area was significantly higher than the areas treated with ethylthiodemeton granule insecticide (TD Ace, Sankyou Agro). Further, cane yield in the fipronil bait-treated area was also significantly increased as compared with that in the ethylthiodemeton granule and isoxathion granule insecticide- treated areas. Sorghum tests showed that the coleoptile length of sorghum seeds increased when treated with 0 to 10 ppm of fipronil, and then decreased for concentrations over 10 ppm. It was concluded that fipronil bait treatment in sugarcane fields can significantly increase both the growth and yield of sugarcane. Moreover, it was suggested that fipronil at low concentrations may have a phytostimulatory effect on sorghum seedlings.

Combating sugarcane pests in South Africa: From researching biotic interactions to bio-intensive integrated pest management in the field
R.S. Rutherford and D.E. Conlong
Entomology, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010. p.99.

The most common definition of conventional Integrated Pest Management (IPM) is “a decision-making process using multiple pest management tactics to prevent economically damaging out breaks while reducing risks to human health and the environment. Low-level IPM is the most often employed form, consiting of the most basic of IPM practices-scouting and insecticide applications according to economic thresholds. Some growers have progressed to medium-level IPM, the adoption of a few additional preventive measures, e.g. cultural controls and plant resistance, coupled with efforts to cut back on broad spectrum pesticide use in order to protect beneficial organisms. These IPM strategies are mainly targeted towards single pest species and do not consider all of the pests in a specific agro-ecosystem. High-level, or bio-intensive IPM, is where multiple interventions are integrated in a bio-intensive approach targeting multiple pests. Bio-intensive IPM is based on holistic agro-ecosystem interactions, in which knowledge about insects, their symbionts, pathogens, natural enemies, plants, endophytes and interactions between all of these are combined to develop IPM in an area-wide, environmentally friendly manner. Reviewed here are advances in knowledge of biotic interactions between direct, indirect and induced plant resistance, plant nutrition, habitat management, chemical ecology, natural enemies, soil-health, micro-organisms such as endophytic fungi and wolbachia and phylogenetics and phylogeography. All of these are potential building blocks of a bio-intensive IPM system under construction at SASRI. Also discussed are opportunities and challenges in these areas of research, taking into account bio-security threats to the South African sugar industry and possible limitations in current sugarcane plant breeding material.

Resistance screening of promising sugarcane clones to two races of gumming disease bacterium
S. Dhayan and A. S. Saumtally
Breeding, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010 P.128

Two races of the gumming disease bacterium (*Xanthomonas axonopodis* pv. Vasculorum), races 1 and 2, commonly infect sugarcane varieties in Mauritius. Clones selected from the 3rd clonal stage (years 4-5) of the breeding program are disease resistance trials in localities where the races are prevalent. Inoculated spreader rows of a susceptible variety act as the source of inoculum for the test varieties. Evaluation to race 1 was carried out at one site; whereas, testing against race 2 was conducted at two to four sites. Screening showed that 99 % of clones were immune to race 1 of the 9 clones that showed infection, seven were classified as resistant, one slightly susceptible and one susceptible. In contrast, the percentage of clones showing immunity to race 2 was much lower (14 %). Resistance, slight susceptibility, susceptible and high susceptible to race 2 were 44%, 23%, 13 % and 6%, respectively, among the remainder of the clones. Ratings were consistent across locations for 78% of clones. Evaluation at more than one site was consequently justified. The pathogen was isolated from commercial fields in regions prone to the disease and in germplasm collections during the period 1998-2007. Race characterization was based on cultural characteristics and pathogenicity tests, race 1 was readily recovered in noble cane collections. Apart from one instance in 1998, it was absent in commercial fields. These surveys confirmed that commercial varieties were highly resistant to race 1and, therefore, of insignificant importance in *Saccharum* hybrids. Gumming disease prevalent in plantations was therefore almost exclusively caused by Race 2. This race was predominant and resistance screening against it in different environments is necessary.

Distribution of sugarcane yellow leaf virus (SCYLV) in commercial cultivars in Mauritius and its potential impact on yield
M. H. R. Khoodoo, N. Behary Paray, S. Ganeshan and A. S. Saumtally
Breeding, Proc. Int. Soc. Sugar Cane Technol., Vol.27, 2010 P.129

Sugarcane yellow leaf virus (ScYLV) is present in most sugarcane producing countries and has been shown to be the cause of yellow leaf disease of sugarcane. This study focused on the distribution of ScYLV in commercial sugarcane varieties in Mauritius and attempted to assess its impact on cane and sucrose yields of three varieties: M52/78 (early maturing), M1400/86 (middle maturing) and M2593/92 (late maturing). An island wide survey of 88 fields planted with 20 different varieties revealed that ScYLV was widely distrubted in all varieties except M1176/77 which always tested negative for the presence of the virus by tissue blot immunoassay (TBIA) and reverse transcriptase PCR. The incidence of ScYLV did not reflect that of the aphid vector *Melanaphis sacchari* which was collected from 8% of fields only, implying that the main cause of the spread of the virus in Mauritius was infected cane setts. The potential impact of yellow leaf on Mauritian cultivars was assessed by measuring and comparing yield parameters of TBIA positive and TBIA negative cane stool samples in pair wise design under commercial field conditions. This study showed that, for plant cane yields were comparable for varieties M52/78, M1400/86 while, im M2593/92, TBIA positive stools had higher sucrose content but lower weight than TBIA negative stools. These findings highlight the need for additional research on the main commercial varieties of sugarcane in order to determine the economic importance of the disease in Mauritius.

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