Government of the Punjab
Agriculture Department

SUGARCANE RESEARCH

ANNUAL REPORT (2017-18)

Sugarcane Research Institute,
AARI, Faisalabad
Punjab, PAKISTAN

TABLE OF CONTENTS

INTRODUCTION

Sugarcane (*Saccharum officinarum)* is an important cash crop of the Punjab province. It belongs to the family Poaceae and native of temperate humid to tropical regions of Asia. All sugarcane species interbreed and the major commercial cultivars are complex hybrids and products like table sugar, molasses and ethanol are directly obtained from sugarcane. The bagasse that remains after sugar cane crushing is burnt to provide heat and electricity. It is also utilized as raw material for paper, chipboard, and utensils, because of its high cellulose content. The sugarcane tops serve as fodder during scarcity of fodder period. The grower's economy and viability of sugar industry is based on this crop. Sugarcane crop plays a pivotal role in our domestic economy next to cotton as a cash crop. It has 0.7% share to Gross Domestic Product (GDP). In the Punjab, during 2017-18 sugarcane was grown on an acre of 859.88 thousand hectares with production of 55.1 million tones and average cane yield 695 mounds/acre. 1 % yield has been decreased as compared to last year.

The Sugarcane Research Station was established in 1934, in Lyallpur. Later on, this section was upgraded as Sugarcane Research Institute; Faisalabad in 1978.The Research work was focused on the main objectives of the evolution of high cane and sugar yielding, disease and insect pest's resistant varieties besides, the development of improved production technology.

The Annual Research Program is prepared to develop the research strategy for the coming crop year. The Research Program includes 49 experiments on various disciplines including Sugarcane Breeding (13), Agronomy (9), Pathology (10), Entomology (5) and Technology (2) ongoing trials including 10 new experiments in the current research year. The Sugarcane Breeding components includes collection of fuzz and cultivars, raising of seedlings, selection of seedlings, screening and selection of clones at various selection stages and varietal adaptability under different soil and climatic conditions. The research program work also includes cane flowering at Research Sub Station, Pail & Charapani, Murree. The Annual Program of Research Work for 2017-18 at Khanpur / Bahawalpur Stations includes 10 experiments.

OBJECTIVES

General

- Evolution of widely adaptable varieties having desired economic characters.
- To develop package of production technology for optimum cane and sugar yield.
- To evaluate varieties for higher sugar contents.

Specific

* To produce clones having desired parental characters and to raise seedlings for selection of elite clones.
* To evolve varieties having high yield and quality potential for different soil and climatic conditions.
* To evolve varieties resistant to insect pests, diseases, lodging, drought, frost and soil hazards.
* To determine optimum planting and harvesting schedule of varieties to obtain maximum cane and sugar yield.
* To develop package of production technology to improve cane and sugar yield from plant and ratoon crop.
* To find out most economical fertilizer doses for optimum yield.
* To develop technology to minimize sugar losses during harvesting and processing of cane.

The research work pertaining to varietal evolution consists of various selection stages from growing of seedlings from the cane fuzz collected from different sources to the final stage of selection. The promising clones are tested in different phases of selection i.e. seedling, nursery, semi-final and final varietal trials. The promising cultivars are further tested under different agro-ecological zones of the Punjab for their adaptability.

The variety development program is based mainly on the imported germ plasm including fuzz and cultivars from Sri Lanka, Mauritius, West Indies, South Africa, canal Point (Florida) USA, Australia and local sources include the collection of open pollinated cane fuzz from Murree.

The work on wider row planting is being concluded and will be an adoptable system for cane mechanization in the province. Studies on irrigation x fertilizer interaction with cane varieties are also important feature of research plan. The work is being carried out on ratoon yield improvement besides the varietal behavior of ratooning.

In variety selection work, main emphasis is laid on disease resistance/tolerance. The studies have helped to give information on reaction of promising lines to various insects. Identified new strains of Red Rot and evaluated resistant lines/clones against the strains.

The low sugar recovery and cane yields of the province can be improved with the introduction of high quality new germ-plasm and advance production technology.

BUDGET 2017-18

Budget allocation under different heads.

Object Classification	Budget Allocation (Rs.)	Total Expenditure (Rs.)
A01101-Pay of officers	2,53,19,000	2,57,22,164
A01151-Pay of other staff	1,62,20,000	1,62,29,828
A01201-Regular allowance	1,94,67,500	1,94,46,532
A01202-Other allowance	20,22,500	2,02,16,97
A03-Operational expenses	1,16,19,051	1,14,57,255
Total:	**7,46,48,051**	**7,48,77,476**

RESEARCH AREA

Sr. No.	Name of Institute / Station/Sub-Station	Location	Cultivated Area	Area under roads & buildings	Total
1.	Sugarcane Research Institute, Jhang Road Faisalabad.	Faisalabad	99.2 acres	11.9 acres	111.1 acres
2.	Sugarcane Research Station, Khanpur & Sugarcane Research Sub-Station, Bahawalpur	Khanpur Bahawalpur	39.1 acres 10.6 acres	7.0 acres 1.4 acres	46.1 acres 12.0 acres
3.	Sugarcane Breeding Research Sub-Station, Murree	Murree	2.75 acres (On lease)	-	2.75 acres

RESEARCH STAFF

1. Dr. Naeem Ahmad, Director
2. Dr. Arshad Mahmood, Sugarcane Specialist
3. Mr. M. Khurshid Anwar Sahi, Sugarcane Agronomist
4. Mr. Hafiz Muhammad Walayat Ali Khan, Sugarcane Virologist,
5. Muhammad Sarwar, Assistant Agronomist
6. Mr. M. Ashfaq Nadeem, Assistant Agronomist
7. Dr. Abdul Majeed, Asstt. Agri. Chemist
8. Mr. Zaheer Sikandar, Assistant Entomologist
9. Dr. Muhammad Ijaz Tabassum Assistant Botanist (Genetics)
10. Mr. Muhammad Younis, Assistant Botanist (Taxonomy)
11. Dr. Muhammad Yasin, Assistant Agronomist
12. Dr. Muhammad Azhar Munir, Assistant Research Officer
13. Dr. Muhammd Saeed, Assistant Research Officer
14. Mr. M. Akhlaq Mudassir, Assistant Research Officer
15. Mr. Naeem Fiaz, Assistant Research Officer
16. Dr. Mahmood-ul-Hussan, Assistant Research Officer
17. Miss Mubashra Yasin, Assistant Research Officer
18. Miss Salma Niaz, Assistant Research Officer
19. Miss Wardah Muzaffar, Assistant Research Officer
20. Dr. Muhammad Akhtar, Assistant Agronomist (Bahawalpur)
21. Mr. Muhammad Aslam, Assistant Research Officer (Khanpur)
22. Hafiz Abdul Rauf, Assistant Research Officer (Khanpur)
23. Mr. Muhammad Farooq Ahmad, Assistant Research Officer (Murree)

ANNUAL RESEARCH REPORT FOR THE YEAR 2017-2018

1. SUGARCANE BREEDING

Introduction

Sugarcane Breeding Sub-Station (SBSS), Murree was primarily established for breeding of superior sugarcane varieties with promising agro-economic characters. To accomplish this purpose, the station has two experimental sites at Charrapani and Pail (Pail site vacated on April, 2018). Though, both sites are at same latitude, former site has relatively good flowering due to its location. The station is still striving to achieve its goal and attempts to overcome the issues are being made at preliminary stages with the confidence that it will come to its full functioning.

Capital Available

There are total 9 sanctioned strength of this station as given in Annexure I below.

Annexure I: Capital available at SBSS, Murree for 2017-18.

A – Staff			
A.R.O	F.A.	Beldar	Chaukidar
01	01 (vacant)	06 (2 vacant)	01 (vacant)
B -Agricultural Land and Office Building			
Experimental Sites/office		Kanal	Marla
Pail (till April, 2018)		19	18
Charrapani (site I)		33	00
Charrapani (site II, from May, 2018)		05	00

Experimental site at Pail comprising 19 kanals and 18 Marla was surrendered due to difficulties of management and other issues. In addition to this surrendering, an area of 5 Kanal was acquired on lease adjacent to the site at Charrapani. Also the rented office building at Tret was shifted to a rented building at Charrapani.

1- Germplasm and Flowering Behavior

To view the flowering behavior, 158 lines varieties were planted at this sub-station. Row to row distance was maintained at 3 feet as compared to the previous 2.5 feet later offered the earthening difficulties. Length of the row varies from 3 to 5 meter subjected to plot layout. Routine agronomic practices were done at sowing.

Their flowering behavior will be studied in 2019 flowering season. In the flowering season of 2018, 200 lines (both from plant and Ratoon crop) were available for flowering studies. From these, 91 varieties/lines produced flags and 78 were available to produce the flowers. Almost 2030 flags were produced by 91 line/varieties and 1151 flowers/arrows were obtained from the 78 lines. Most of the flowering lines (36#) were late flowering and contributed very low amount of arrows to the total. Early flowering varieties/lines (28#) produced high number of flowers this may be due to their long flowering period as they flowered from November to May/June. Flowering behavior under natural conditions is provided in Annexure I below:

Annexure I: Flowering behavior of varieties/lines in 2018 flowering period.

Sr . #.	Variety/Line	Behavior	Sr. #.	Variety/Line	Behavior
1	Aus-3/77	Late	40	LCP-81-10	Late
2	BF-141	Intermediate	41	LHo-83-153	Late
3	BF-145	Late	42	LUNA	Late
4	BF-147	Late	43	N-53-216	Late
5	BJ-6431	Early	44	PR-980	Late
6	BL-3	Intermediate	45	Q-49	Late
7	BL-19	Early	46	Q-81	Late
8	BL-21	Early	47	S-84-US-1543	Early
9	C-21	Late	48	S-95-US-214	Late
10	C-185	Late	49	S-03-US-127	Late
11	Co-205	Intermediate	50	S-03-US-247	Late
12	Co-285	Intermediate	51	S-03-US-410	Late
13	Co-312	Early	52	S-03-US-463	Intermediate
14	Co-360	Late	53	S-03-US-694	Intermediate
15	Co-464	Early	54	S-03-US-704	Late
16	Co-548	Early	55	S-06-US-641	Early
17	Co-602	Early	56	S-06-US-904	Late
18	Co-637	Intermediate	57	S-04-FD-298	Early
19	Co-1129	Late	58	S-05-FD-307	Early
20	Co-1148	Late	59	S-05-FD-317	Early
21	CoK-31	Early	60	S-08-FD-17	Late
22	CoL-8	Early	61	S-08-FD-19	Early
23	CoL-36	Late	62	S-08-FD-25	Intermediate
24	CoL-38	Intermediate	63	S-07-Aus-370	Late
25	CoL-50	Late	64	S-08-Aus-107	Intermediate
26	CoL-54	Early	65	S-1976	Late

27	CoL-69	Early	66	S-27-70	Early
28	CP-50-20	Late	67	S-3641	Early
29	CP-57-603	Late	68	S-94-HS-229	Late
30	CP-70-1547	Intermediate	69	S-95-NSG-6	Early
31	CP-83-1968	Early	70	S-95-NSG-15	Early
32	CP-85-1491	Late	71	S-95-NSG-39	Early
33	CP-89-1945	Early	72	S-95-NSG-45	Early
34	CPF-198	Late	73	S-95-NSG-60	Early
35	CPF-237	Intermediate	74	S-95-NSG-311	Late
36	HSF-240	Early	75	S-96-SP-228	Late
37	HSF-242	Intermediate	76	S-96-SP-600	Intermediate
38	IF-195	Late	77	S-96-SP-680	Late
39	L-1	Early	78	SPF-232	Late

2- Fuzz Production

Open pollination

Fuzz at this sub-station is collected in the form of open pollination and from bi-parental crosses. However, most the fuzz collected is from open pollination. During this season a total of 3159 gram fuzz was collected from open pollination (1087 arrows, Annexure II below).

Annexure II: Production of fuzz from open pollination.

Sr. #.	Variety/line	Fuzz		Sr. #.	Variety/line	Fuzz	
		Arrows#	gram			Arrows#	gram
1	BF-141	7	27	31	LHo-83-153	3	9
2	BJ-6431	47	147	32	LUNA	3	7
3	BL-3	2	9	33	N-50-211	1	1
4	BL-19	20	37	34	N-53-216	16	52
5	BL-21	29	156	35	Q-49	19	66
6	C-21	3	5	36	S-84-US-1543	16	54
7	Co-285	8	28	37	S-03-US-127	17	43
8	Co-312	24	92	38	S-03-US-247	3	3
9	Co-360	2	3	39	S-03-US-410	3	10
10	Co-464	20	65	40	S-03-US-463	3	4
11	Co-548	4	15	41	S-03-US-694	2	2
12	Co-602	5	23	42	S-06-US-641	21	35
13	Co-637	13	51	43	S-06-US-904	25	150
14	CoK-31	2	3	44	S-04-FD-298	16	24
15	CoL-8	45	190	45	S-05-FD-307	49	181
16	CoL-38	11	17	46	S-05-FD-317	102	292
17	CoL-50	5	44	47	S-08-FD-17	1	1

18	CoL-54	7	20	48	S-08-FD-19	53	211
19	CoL-69	12	28	49	S-08-Aus-107	3	13
20	CP-57-603	4	22	50	S-1976	3	4
21	CP-70-1547	6	16	51	S-27-70	83	141
22	CP-83-1968	66	106	52	S-3641	82	102
23	CP-85-1491	7	20	53	S-94-HS-229	1	1
24	CP-89-1945	9	38	54	S-95-NSG-6	1	4
25	CPF-198	2	9	55	S-95-NSG-15	8	23
26	CPF-237	3	13	56	S-95-NSG-39	13	32
27	HSF-240	34	133	57	S-95-NSG-45	34	60
28	HSF-242	9	18	58	S-95-NSG-60	38	80
29	L-1	45	171	59	S-96-SP-228	11	35
30	LCP-81-10	2	4	60	S-96-SP-600	4	9
Total Arrows(#)			1087	Fuzz (gm)			3159

Bi-parental crosses

During this season 18 bi-parental crosses were attempted at this station producing 244 gram of fuzz. Crosses were made by bagging the adjacent flowers with cloth hanging on a ring and then collecting fuzz from both parents.

Annexure III: Fuzz produced from hybridization in 2018 flowering season

Sr #	Crosses			Fuzz (gm)
1	CoL-50	x	S-06-US-904	24
2	CoL-50	x	S-06-US-904	24
3	Co-205	x	CoL-50	24
4	CoL-50	x	S-06-US-904	6
5	Co-637	x	HSF-242	12
6	Co-637	x	S-06-US-904	14
7	CoL-50	x	CP-57-603	22
8	N-53-216	x	S-96-SP-228	10
9	CP-85-1491	x	S-03-US-127	7
10	Co-602	x	S-06-US-904	23
11	S-06-US-904	x	CoL-69	Destroyed by tree
12	S-95-NSG-15	x	Co-285	1
13	N-53-216	x	S-96-SP-228	16
14	Co-464	x	S-03-US-463	13
15	Co-1148	x	Q-49	10
16	CP-85-1491	x	S-03-US-127	6
17	CoL-69	x	S-06-US-904	17
18	BL-3	x	L-1	15
Total				**244**

3- Seedling Production

Fuzz produced locally was sown at this sub-station at Charrapani. Till June, 508 gram of fuzz from 19 lines was sown. However, till August, 1716gm of fuzz from open pollination and all fuzz (244gm) collected from bi-parental crosses was sown. But no seedlings obtained produced. However, from fuzz produced in 2017 season, 253 seedlings were shifted to Sugarcane Research Institute, Faisalabad in February this year. Rest of the fuzz is stored for sowing in May next year.

Project

To overcome this unpredicted behavior of fuzz viability and scattered flowering, a pilot project entitled "Flower induction and testing of fuzz viability in sugarcane" is being conducted here at this sub-station. Construction work of the project is about to complete in a week or so. Shy-flowering varieties will be tested under controlled conditions of factors limiting their flowering.

4. GROWING OF SUGARCANE FUZZ AND TRANSPLANTATING OF SEEDLINGS IN FIELD

Sugarcane fuzz of 159 crosses comprising Pakistani parent varieties including Sri Lankan sugarcane varieties were imported from Sri Lanka during the year 2015, and stored in deep freezer to maintain its viability. Theses crosses were spread on seed beds during July-August, 2017, in the research area of Sugarcane Research Institute, Faisalabad. Six to eight week old seedlings raised on seed beds were shifted in small clay pots. One hundred thirty-nine (139) crosses were belongs to bi-parent while 20 crosses were referred as poly-crosses. On the whole, among theses, One hundred fifteen (115) crosses could germinate and established in our local environment for their evaluation from 159 crosses and produced 22,340 seedlings. Successful potted seedlings of 55 crosses comprising 5920 seedlings were transplanted in field during Oct. 2017 and 15,864 seedlings of 62 crosses were shifted in the field during February 2018 for their further evaluation. Two hundred and fifty-four (254) seedlings from 2 crosses raised from local fuzz at Sugarcane Breeding Sub-station, Murree were also added in the field at research area of SRI, Faisalabad as mentioned in the Table 1.5.

Table 1.5. Seedlings raised from fuzz and their transplantation in field during 2017 & 2018.

Source of fuzz	Transplanted in October, 2017			Transplanted in February, 2018		Total seedling
	Parent belongs	Cross	Seedling	Cross	seedlings	
Sri Lanka	SRI, Fsd	10	1055	4	3530	4585
-do-	SSRI, Jhang	8	290	16	4890	5180
-do-	SRI, Sri Lanka	37	4575	40	7190	11,765
SBSS, Murree	-	-	-	2	254	254
Total	-	55	5920	62	15,864	21,784
Total cross: 159		Crosses= 115+ 2(Murree) = 117			**21,784**	

5. STUDY OF SUGARCANE SEEDLINGS IN FIELD AND SELECTION OF SINGLE PLANTS

Thirteen thousand and twenty-two (13,222) individual plants as seedlings were transplanted into the field during October, 2016, keeping plant to plant and row to row distance at 1.2 meter for their further study. Commercial varieties of CPF 247 and HSF 240 were also planted in the middle and at the border of the experimental field, respectively for their comparison purpose. Cultural and agronomic practices were carried out during the crop season. At the age of full grown seedlings, and when the temperature declines, selection process in the seedlings was initiated. Among 13,222 entries, three hundred and eleven (311) healthy & phenotypically superior plants were earmarked and selected, keeping in views the quality parameters as well as their vigour, plant height, tillering stalks diameter, inter-nodal length, aerial roots, fiber percentage, tolerant to disease & insect pests. Brix percentage was also recorded with the help of Hand Refracto-meter. Selected superior plants were promoted to Nursery-I for further study and evaluation. Selection number was also allotted to the 313 entries accordingly (Table-1.6).

Table-1.6: Characteristics of superior plants/selected in the seedlings and promoted to Nursery-I during October/November, 2017.

S. No	Code No.	Parentage	Potted seedlings shifted into the field during Feb/Mar., 2017	Selected superior plant during Oct/Nov, 2017	Brix%		Selection Number allotted (SLF. 2017 …)
					Min	Max	
1	SL 126	**HSF 240 x Open polycross**	430	3	16	18	SLF17. 1…3
2	SL 62	SL 09 01 x SL 92 4918	560	1	17	17	SLF 17. 4
3	SL 63	M 351 57 x SL 8754	340	2	16	17	SLF 17. 5…6
4	SL 64	Co 775 x SLC 0829 (Offi)	260	4	17	18	SLF 17.7…10
5	SL 70	SLC 1249 (Offi) x SL 8101	20	1	18		SLF 17. 11
6	SL 99	SL 8520 x SLC 10-12 (Offi)	680	16	17	18	SLF 17. 12…27
7	SL 100	H 82 1600 x SL 8212	60	2	16	17	SLF 17. 28…29
8	SL 102	SLC 1026 (Offi) x SL 92 5588	600	1	16		SLF 17. 30
9	SL 103	SLC 08 126 (Offi) x NS 12	380	1	18		SLF 17. 31…
	SL 126	**HSF 240 x Open polycross**	410	41	16	22	SLF 17. 32…72
10	SL 127	**HSF 240 x SL 90 5695**	250	24	18	23	SLF 17. 73…96
11	SL 134	**BL 04 x open polycross**	280	16	16	23	SLF 17. 97…112
12	SL 135	**SPF 245 x open polycross**	400	36	18	21	SLF 17. 113…148
13	M1	CoL 50	180	3	16		FD 17. 149…151
14	M4	CoL 36	34	1	17		FD 17. 152
15	M16	CoL 8		10	16	19	FD 17. 153…162
16	M 17	BL 21	3	2	19		FD 17. 163…164
17	SL 1	SL 92 4997 (Open poly cross)		15	17	19	SLF 17. 165…179
18	SL 13	SL 91 41 90 x Co 775		1	18		SLF 17. 180
19	SL 14	SLC 08 46 (Offi) x SL 94 2914		2	17	18	SLF 17. 181…182
20	SL 16	Co 775x M 115-66-6 Polycross)		1	20		SLF 17. 183
21	SL 20	SL 96 276 x SLC 1212 (Offi) (Open poly cross)	50	2	17	18	SLF 17. 184…185
22	SL 27	Co 8232 x BE 166	15	2	17	17	SLF 17. 186…187
23	SL 31	Kodayana x M 1176 77	90	7	16	18	SLF 17. 188…194
24	SL 32	M 442 51 x SL 8418	817	29	16	22	SLF 17. 195…223
25	SL 37	PR 980 x SL 84 0 6	30	1	17		
26	SL 41	SL 89 111 x H 44 2772	20	2	16		17
27	SL 43	H 82 1600 x SL 8702	30	1	18		
28	SL 68	Q.83 x SL 89 1675	200	5	17		18
29	SL 86	SL 91 4190 x SLC 1029 (Offi)	20	1	20		SLF 17. 233
30	SL 91	Mohana x H 55 4848	80	2	18		19
31	SL 48	M 115-66-6 x SL 89 2249	100	2	17		18
32	SL 84	SLC 1023 (Offi) x Helamula	60	1	17		SLF 17. 238
33	SL 87	SL 96 128 x SLC 08 109 (Offi)	160	2	18		18
34	SL 88	Co 775 x PH71-15	160	1	16		
35	**SL 105**	CSSG 676 x SL 982118	32	6	17		19
36	SL 10	**SLC 0901 (Offi) x Co J 84**	420	2	18		20

37	SL 110	**SPF 213 x open polycross**	98	14	18	21
38	SL 111	**SPF 238 x SL 80 04**	100	5	17	21
39	SL 113	**SPF 238 x SL 8303**	40	4	18	22
40	SL 114	**SPF 238 x SL 95 4444**	40	2	18	SLF 17. 273…274
41	SL 117	**SPF 245 x SL 95 4432**	20	2	18	20
42	SL 119	**SPF 238 x SLT 8407**	160	3	17	19
43	SL 125	**HSF 240 x SL 88 116**	100	5	16	21
44	SL 129	**SL 8511 x HSF 240**	20	2	17	20
45	SL 136	**SPF 245 x SL 95 4444**	5	14	19 23	SLF 17. 287…300
46	SL 138	**SPF 238 x SL 89 1673**	220	9	18	21
47	**SL139**	NSG 555 x open polycoss	193	1	18	SLF 17. 310
48	SL 140	**SL 91 4190 x CP 4333**	180	1	17	
Total	**48 crosses**	**Selected and promoted entries to the Nursery –I**		**311**		

Summary of crosses of different institutes promoted to Nursery-I during Oct./Nov., 2017

S.No.	Institute	Cross/parent	No. of entries
1	SRI, Sri-Lanka	26	105
2	SRI, Faisalabad	16	183
3	SSRI, Jhang	2	7
4	SBSS, Murree	4	16
	Total	**48**	**311**

6. SELECTION OF PHENOTYPICALLY SUPERIOR CLONES IN NURSERY- I

In Nursery-I, (2016-17), 313 clones were tested in a single row non-replicated experiment having a net plot size of 4 x 1.2 m. Keeping in view the desirable characters, such as growth vigor, erectness, brix %age, resistance to frost, lodging, insect pests and diseases, these clones were compared with five standard varieties i.e. HSF-240,SPF-245,CPF-246,CPF-248 & CPF-249.The brix reading was recorded by hand refracto-meter. After comparing the quantitative and qualitative characters, 66 clones were selected and promoted to Nursery-II, while 247 clones were rejected due to undesirable characters. List of promoted/rejected clones is given below.

List of promoted Clones:

SR. NO.	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
1	S2016-SL-1	13.0	14.0	14.2	Good growth, stand, mild lodging, no pith, smut, thin cane	REJECTED
2	S2016-SL-2	17.4	17.0	18.2	Good growth & stand, no lodging, no pith	PROMOTED
3	S2016-SL-3	11.0	10.0	10.4	Medium growth & stand, no lodging, no pith	REJECTED
4	S2016-SL-4	13.4	14.0	14.4	Medium growth, poor stand, no lodging, no pith, smut	REJECTED
5	S2016-SL-5	10.4	10.0	11.0	Medium growth & stand, mild lodging, no pith, bud sprouts	REJECTED
6	S2016-SL-6	15.0	14.0	13.0	Poor growth & stand, mild lodging, no pith, splits, borer	REJECTED
7	S2016-SL-7	15.0	15.4	14.0	Medium growth, poor stand, no lodging, no pith, splits	REJECTED
8	S2016-SL-8	14.0	13.0	14.0	Good growth, poor stand, no lodging, mild pith, splits	REJECTED
9	S2016-SL-9	10.4	10.0	11.0	Good growth & stand, no lodging, no pith	REJECTED
10	S2016-SL-10	11.0	12.0	12.6	Medium growth, good stand, mild lodging, high pith	REJECTED
11	S2016-SL-11	13.0	13.4	14.0	Good growth, medium stand, severe lodging, high pith	REJECTED
12	S2016-SL-12	13.0	13.0	13.0	Good growth & stand, severe lodging, high pith, splits	REJECTED
13	S2016-SL-13	13.0	13.2	15.2	Good growth, medium stand, no lodging, high pith	REJECTED
14	S2016-SL-14	11.0	11.4	12.0	Medium growth & stand, no lodging, high pith	REJECTED
15	S2016-SL-15	11.0	12.0	12.6	Medium growth & stand, no lodging, no pith, smut	REJECTED
16	S2016-SL-16	11.0	12.0	11.2	Good growth, medium stand, no lodging, no pith	REJECTED
17	S2016-SL-17	13.4	15.4	16.0	Good growth, medium stand, mild lodging, high pith, smut	REJECTED
18	S2016-SL-18	12.0	10.0	12.2	Good growth, medium stand, no lodging, mild pith	REJECTED
19	S2016-SL-19	16.0	16.0	15.8	Good growth, medium stand, mild lodging, mild pith	REJECTED
20	S2016-SL-20	12.0	11.2	12.2	Good growth & stand, no lodging, no pith	REJECTED
21	S2016-SL-21	11.0	13.0	12.0	Medium growth & stand, no lodging, no pith	REJECTED
22	S2016-SL-22	NO CANE				REJECTED
23	S2016-SL-23	13.2	15.0	15.2	Medium growth & stand, no lodging, no pith	REJECTED
24	S2016-SL-24	14.2	14.2	14.0	Good growth & stand, no lodging, mild pith	REJECTED
25	S2016-SL-25	9.8	10.0	11.0	Medium growth & stand, no lodging, no pith	REJECTED
26	S2016-SL-26	12.4	12.2	9.0	Good growth & stand, no lodging, no pith, splits	REJECTED
27	S2016-SL-27	10.0	11.0	12.0	Good growth, medium stand, mild lodging, no pith, borer	REJECTED
28	S2016-SL-28	10.0	14.0	15.0	Medium growth & stand, mild lodging, no pith, smut	REJECTED

29	S2016-SL-29	10.0	11.0	12.0	Poor growth & stand, no lodging, no pith	REJECTED
30	S2016-SL-30	12.0	11.0	10.0	Good growth & stand, mild lodging, no pith	REJECTED
31	S2016-SL-31	11.6	12.0	12.4	Medium growth, good stand, no lodging, no pith	REJECTED
32	S2016-SL-32	15.8	16.0	15.2	Good growth & stand, no lodging, no pith, smut	REJECTED
33	S2016-SL-33	11.0	12.0	13.0	Poor growth & stand, no lodging, no pith	REJECTED
34	S2016-SL-34	13.0	13.0	13.4	Medium growth, good stand, severe lodging, no pith	REJECTED
35	S2016-SL-35	11.0	12.0	12.6	Poor growth & stand, no lodging, no pith	REJECTED
36	S2016-SL-36	9.0	10.0	11.0	Medium growth & stand, mild lodging, no pith, thick cane	REJECTED
37	S2016-SL-37	11.0	12.0	12.6	Poor growth & stand, no lodging, no pith, smut	REJECTED
38	S2016-SL-38	NO CANE				REJECTED
39	S2016-SL-39	10.4	12.2	12.0	Medium growth & stand, no lodging, no pith	REJECTED
40	S2016-SL-40	13.0	14.0	14.2	Good growth, medium stand, no lodging, no pith, smut	REJECTED
41	S2016-SL-41	15.0	16.0	17.0	Good growth, medium stand, no lodging, no pith	PROMOTED
42	S2016-SL-42	NO CANE				REJECTED
43	S2016-SL-43	NO CANE				REJECTED
44	S2016-SL-44	NO CANE				REJECTED
45	S2016-SL-45	10.0	12.0	12.6	Medium growth & stand, no lodging, no pith	REJECTED
46	S2016-SL-46	13.0	13.0	13.0	Poor growth & stand, no lodging, no pith	REJECTED
47	S2016-SL-47	9.2	10.4	11.0	Good growth & stand, no lodging, no pith, smut	REJECTED
48	S2016-SL-48	8.8	9.4	11.0	Good growth, medium stand, no lodging, no pith	REJECTED
49	S2016-SL-49	9.0	11.0	11.6	medium growth, poor stand, no lodging, no pith	REJECTED
50	S2016-SL-50	12.0	11.0	12.0	Good growth & stand, mild lodging, high pith	REJECTED
51	S2016-SL-51	9.0	9.0	11.0	Medium growth & stand, mild lodging, no pith	REJECTED
52	S2016-SL-52	11.0	11.0	13.0	Good growth & stand, mild lodging, no pith	REJECTED
53	S2016-SL-53	8.0	9.0	10.0	Medium growth & stand, no lodging, hole, borer	REJECTED
54	S2016-SL-54	8.0	11.0	13.0	Medium growth & stand, mild lodging, no pith	REJECTED
55	S2016-SL-55	7.0	7.0	7.0	Good growth & stand, no lodging, high pith	REJECTED
56	S2016-SL-56	10.0	11.0	12.0	Poor growth & stand, no lodging, no pith, smut	REJECTED
57	S2016-SL-57	12.0	11.0	13.0	Good growth & stand, mild lodging, no pith, thin cane	REJECTED
58	S2016-SL-58	14.0	13.0	14.0	Medium growth & stand, mild lodging, mild pith	REJECTED
59	S2016-SL-59	16.0	17.0	18.0	Medium growth, poor stand, no lodging, high pith	REJECTED
60	S2016-SL-60	9.0	9.8	11.0	Medium growth, good stand, no lodging, no pith	REJECTED
61	S2016-SL-61	14.0	15.0	14.0	Good growth, medium stand, no lodging, no pith	REJECTED
62	S2016-SL-62	11.0	12.0	13.0	Good growth & stand, no lodging, high pith	REJECTED
63	S2016-SL-63	9.0	10.0	10.4	Good growth & stand, severe lodging, high pith	REJECTED
64	S2016-SL-64	10.2	11.0	11.6	Good growth & stand, no lodging, high pith	REJECTED
65	S2016-SL-65	9.0	9.0	10.0	Poor growth & stand, no lodging, high pith	REJECTED
66	S2016-SL-66	10.0	10.0	11.0	Good growth & stand, no lodging, high pith	REJECTED
67	S2016-SL-67	9.0	10.0	11.0	Good growth & stand, no lodging, no pith, thin cane	REJECTED
68	S2016-SL-68	10.4	11.0	12.0	Good growth & stand, no lodging, no pith, smut	REJECTED
69	S2016-SL-69	9.6	10.0	11.0	Medium growth & stand, no lodging, no pith	REJECTED

70	S2016-SL-70	8.0	8.8	10.0	Good growth & stand, no lodging, no pith, smut	REJECTED
71	S2016-SL-71	8.0	8.0	10.0	Good growth & stand, no lodging, high pith	REJECTED

72	S2016-SL-72	8.0	8.0	9.0	Good growth & stand, no lodging, no pith	REJECTED
73	S2016-SL-73	8.0	12.0	11.8	Medium growth & stand, no lodging, mild pith	REJECTED
74	S2016-SL-74	12.0	12.0	13.0	Good growth & stand, mild lodging, no pith	REJECTED
75	S2016-SL-75	9.0	9.0	9.0	Good growth & stand, no lodging, no pith	REJECTED
76	S2016-SL-76	11.0	12.0	12.4	Medium growth & stand, no lodging, high pith	REJECTED
77	S2016-SL-77	12.0	13.0	13.0	Medium growth & stand, no lodging, high pith, smut	REJECTED
78	S2016-SL-78	11.0	11.6	12.0	Good growth & stand, no lodging, high pith, splits	REJECTED
79	S2016-SL-79	10.6	11.0	12.0	Good growth & stand, no lodging, high pith, thin cane, smut	REJECTED
80	S2016-SL-80	17.4	18.0	18.0	Good growth & stand, no lodging, no pith	PROMOTED
81	S2016-SL-81	16.4	15.0	18.0	Medium growth, good stand, no lodging, no pith	PROMOTED
82	S2016-SL-82	14.0	14.4	14.4	Medium growth, good stand, no lodging, no pith	REJECTED
83	S2016-SL-83	18.6	18.6	18.6	Good growth, medium, stand, severe lodging, thin cane	PROMOTED
84	S2016-SL-84	14.0	14.0	13.0	Medium growth & stand, mild lodging, hole	REJECTED
85	S2016-SL-85	NO CANE				REJECTED
86	S2016-SL-86	11.0	14.0	12.0	Good growth & stand, no lodging, no pith	REJECTED
87	S2016-SL-87	11.0	11.0	11.0	Medium growth & stand, no lodging, no pith, thin cane	REJECTED
88	S2016-SL-88	12.0	12.0	8.0	Medium growth & stand, no lodging, no pith	REJECTED
89	S2016-SL-89	13.8	14.4	14.6	Medium growth & stand, no lodging, high pith	REJECTED
90	S2016-SL-90	14.4	16.0	17.0	Poor growth & stand, no lodging, mild pith, splits	REJECTED
91	S2016-SL-91	16.8	18.0	18.0	Medium growth & stand, no lodging, no pith, narrow leaves	PROMOTED
92	S2016-SL-92	14.6	14.8	15.0	Poor growth & stand, no lodging, high pith	REJECTED
93	S2016-SL-93	124	14.8	13.0	Poor growth & stand, mild lodging, high pith, splits , smut	REJECTED
94	S2016-SL-94	9.8	10.0	8.0	Good growth & stand, no lodging, mild pith	REJECTED
95	S2016-SL-95	12.8	14.0	14.8	Good growth & stand, no lodging, no pith	REJECTED
96	S2016-SL-96	10.0	10.0	10.8	Good growth & stand, no lodging, no pith	REJECTED
97	S2016-SL-97	11.4	12.0	14.0	Good growth & stand, no lodging, high pith	REJECTED
98	S2016-SL-98	13.4	13.0	13.0	Good growth & stand, no lodging, no pith, thin cane	REJECTED
99	S2016-SL-99	13.0	13.0	13.6	Good growth & stand, no lodging, no pith	REJECTED
100	S2016-SL-100	12.8	13.0	14.0	Good growth & stand, no lodging, no pith	REJECTED
101	S2016-SL-101	13.2	12.2	11.0	Medium growth & stand, no lodging, no pith, thin cane	REJECTED
102	S2016-SL-102	12.4	11.8	14.0	Medium growth & stand, no lodging, no pith	REJECTED
103	S2016-SL-103	11.2	12.0	12.2	Good growth & stand, no lodging, no pith	PROMOTED
104	S2016-SL-104	16.2	16.8	18.6	Good growth & stand, mild lodging, no pith	REJECTED
105	S2016-SL-105	9.0	10.0	10.0	Good growth & stand, no lodging, no pith	REJECTED
106	S2016-SL-106	11.0	11.4	12.0	Good growth & stand, severe lodging, no pith	REJECTED
107	S2016-SL-107	18.0	18.4	18.4	Good growth & stand, mild lodging, mild pith, smut	REJECTED
108	S2016-SL-108	14.5	15.0	15.4	Good growth & stand, mild lodging, high pith	REJECTED
109	S2016-SL-109	18.0	19.0	17.4	Good growth & stand, no lodging, no pith, narrow leaves	PROMOTED
110	S2016-SL-110	18.0	18.0	19.0	Good growth & stand, no lodging, no pith	PROMOTED

111	S2016-SL-111	14.0	13.0	13.2	Good growth & stand, no lodging, no pith	REJECTED
112	S2016-SL-112	12.8	14.0	14.4	Good growth & stand, no lodging, high pith	REJECTED
113	S2016-SL-113	11.0	10.4	11.8	Good growth & stand, no lodging, no pith	REJECTED
114	S2016-SL-114	16.0	16.4	17.8	Good growth, poor stand, no lodging, no pith, thin cane	PROMOTED
115	S2016-SL-115	12.2	13.0	13.4	Medium growth & stand, severe lodging, high pith	REJECTED
116	S2016-SL-116	12.8	13.0	13.2	Poor growth & stand, severe lodging, mild pith	REJECTED
117	S2016-SL-117	16.0	15.8	13.0	Medium growth & stand, no lodging, no pith, pokha boeng	REJECTED
118	S2016-SL-118	10.0	10.0	10.0	Medium growth & stand, no lodging, no pith	REJECTED
119	S2016-SL-119	8.0	9.0	10.4	Medium growth & stand, no lodging, no pith	REJECTED
120	S2016-SL-120	14.0	14.4	15.6	Medium growth & stand, no lodging, no pith	REJECTED
121	S2016-SL-121	16.8	16.8	17.0	Good growth & stand, no lodging, pol, smut	REJECTED
122	S2016-SL-122	10.4	11.0	12.0	Medium growth & stand, no lodging, high pith	REJECTED
123	S2016-SL-123	11.0	12.0	12.6	Medium growth & stand, severe lodging, high pith	REJECTED
124	S2016-SL-124	19.0	18.0	18.4	Good growth & stand, mild lodging, pol	PROMOTED
125	S2016-SL-125	15.0	14.0	15.4	Medium growth & stand, no lodging, hole	REJECTED
126	S2016-SL-126	12.0	12.8	14.4	Good growth & stand, no lodging, no pith, thick cane	REJECTED
127	S2016-SL-127	15.2	16.0	16.0	Good growth, medium stand, no lodging, no pith	PROMOTED
128	S2016-SL-128	15.0	17.8	18.0	Good growth, poor stand, no lodging, no pith	PROMOTED
129	S2016-SL-129	17.0	17.4	17.6	Good growth & stand, no lodging, no pith	PROMOTED
130	S2016-SL-130	17.0	17.0	17.0	Medium growth & stand, no lodging, no pith	PROMOTED
131	S2016-SL-131	16.0	15.6	17.6	Medium growth & stand, no lodging, no pith	PROMOTED
132	S2016-SL-132	17.0	17.0	17.0	Good growth & stand, no lodging, no pith	PROMOTED
133	S2016-SL-133	16.2	17.0	17.4	Medium growth & stand, no lodging, no pith, smut	REJECTED
134	S2016-SL-134	14.0	14.6	15.2	Poor growth, good stand, no lodging, no pith	REJECTED
135	S2016-SL-135	10.0	11.0	12.0	Good growth & stand, no lodging, no pith	REJECTED
136	S2016-SL-136	15.0	16.8	18.0	Good growth & stand, no lodging, no pith	PROMOTED
137	S2016-SL-137	10.6	11.0	12.2	Good growth & stand, no lodging, high pith	REJECTED
138	S2016-SL-138	12.0	13.0	14.0	Good growth & stand, no lodging, no pith	REJECTED
139	S2016-SL-139	14.2	15.0	15.4	Good growth & stand, no lodging, high pith	REJECTED
140	S2016-SL-140	12.6	12.6	13.4	Good growth & stand, no lodging, no pith	REJECTED
141	S2016-SL-141	14.0	14.0	15.0	Good growth & stand, no lodging, no pith	REJECTED
142	S2016-SL-142	16.0	16.4	16.8	Good growth & stand, no lodging, no pith	PROMOTED
143	S2016-SL-143	19.0	19.0	19.6	Good growth & stand, no lodging, no pith	PROMOTED
144	S2016-SL-144	11.4	12.0	12.0	Medium growth, good stand, no lodging, no pith	REJECTED
145	S2016-SL-145	16.6	16.0	16.8	Medium growth & stand, no lodging, high pith	REJECTED
146	S2016-SL-146	12.8	13.4	14.2	Medium growth & stand, no lodging, no pith	REJECTED
147	S2016-SL-147	12.4	12.4	13.0	Good growth & stand, mild lodging, mild pith, thin cane	REJECTED

148	S2016-SL-148	17.0	17.2	17.6	Poor growth & stand, no lodging, no pith	PROMOTED
149	S2016-SL-149	14.8	14.6	13.0	Poor growth & stand, no lodging, no pith	REJECTED
150	S2016-SL-150	12.4	13.0	10.6	Medium growth & stand, no lodging, no pith	REJECTED
151	S2016-SL-151	16.0	14.8	14.8	Poor growth & stand, no lodging, mild pith	REJECTED
152	S2016-SL-152	15.4	16.0	16.4	Good growth, med. stand, no lodging, high pith, thin cane	REJECTED
153	S2016-SL-153	13.6	14.0	14.4	Good growth, poor stand, no lodging, high pith	REJECTED
154	S2016-SL-154	15.8	16.0	16.0	Good growth & stand, no lodging, high pith	REJECTED
155	S2016-SL-155	12.6	13.0	13.1	Good growth & stand, no lodging, high pith	REJECTED
156	S2016-SL-156	15.4	15.6	15.6	Medium growth, good stand, no lodging, no pith	REJECTED
157	S2016-SL-157	NO CANE				REJECTED

SR. NO	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
158	S2016-SL-158	17.0	19.0	20.0	Medium growth, poor stand, no lodging, mild pith	PROMOTED
159	S2016-SL-159	12.6	13.0	11.0	Good growth, medium stand, no lodging, no pith	REJECTED
160	S2016-SL-160	16.0	16.0	17.0	Good growth & stand, mild lodging, high pith	REJECTED
161	S2016-SL-161	13.6	12.8	14.0	Good growth , medium stand, mild lodging, no pith	REJECTED
162	S2016-SL-162	15.4	16.8	16.8	Medium growth & stand, no lodging, no pith, thin cane	PROMOTED
163	S2016-SL-163	17.0	16.8	17.0	Good growth & stand, no lodging, no pith	PROMOTED
164	S2016-SL-164	15.0	16.0	16.4	Good growth & stand, no lodging, high pith	REJECTED
165	S2016-SL-165	12.0	13.0	14.0	Good growth & stand, no lodging, high pith	REJECTED
166	S2016-SL-166	14.6	15.0	15.0	Medium growth & stand, no lodging, high pith	REJECTED
167	S2016-SL-167	16.4	15.0	16.0	Good growth & stand, no lodging, no pith	PROMOTED
168	S2016-SL-168	16.0	16.8	17.0	Medium growth, good stand, no lodging, no pith	PROMOTED
169	S2016-SL-169	15.0	14.4	15.0	Medium growth, good stand, no lodging, no pith	REJECTED
170	S2016-SL-170	18.0	17.0	18.4	Medium growth good stand no lodging no pith, red rot, smut	REJECTED
171	S2016-SL-171	18.2	18.0	18.0	Good growth & stand, no lodging, no pith	PROMOTED
172	S2016-SL-172	14.8	15.4	14.8	Medium growth & stand, no lodging, no pith	REJECTED
173	S2016-SL-173	15.0	15.0	15.4	Poor growth, medium stand, no lodging, high pith	REJECTED
174	S2016-SL-174	10.4	11.0	12.0	Medium growth & stand, no lodging, no pith	REJECTED
175	S2016-SL-175	11.0	12.0	12.8	Poor growth, medium stand, no lodging, no pith	REJECTED
176	S2016-SL-176	13.0	14.0	14.6	Poor growth & stand, no lodging, no pith	REJECTED
177	S2016-SL-177	NO CANE				REJECTED
178	S2016-SL-178	NO CANE				REJECTED
179	S2016-SL-179	14.2	15.0	15.4	Poor growth & stand, no lodging, no pith	REJECTED
180	S2016-SL-180	17.8	18.2	18.0	Poor growth & stand, no lodging, no pith	PROMOTED
181	S2016-SL-181	16.2	16.6	16.2	Good growth & stand, no lodging, no pith, thin cane	PROMOTED
182	S2016-SL-182	15.2	16.4	16.6	Good growth & stand, no lodging, no pith	PROMOTED
183	S2016-SL-183	15.0	16.0	16.8	Medium growth & stand, no lodging, high pith	REJECTED
184	S2016-SL-184	11.8	12.4	13.0	Poor growth & stand, no lodging, no pith, thin cane	REJECTED
185	S2016-SL-185	15.4	14.0	15.0	Medium growth & stand, no lodging, high pith	REJECTED
186	S2016-SL-186	13.4	13.4	11.0	Good growth & stand, no lodging, no pith	REJECTED
187	S2016-SL-187	13.0	14.0	14.2	Medium growth & stand, no lodging, mild pith	REJECTED
188	S2016-SL-188	17.0	17.4	18.4	Medium growth & stand, no lodging, no pith	PROMOTED
189	S2016-SL-189	NO CANE				REJECTED

190	S2016-SL-190	15.8	16.6	16.8	Poor growth & stand, no lodging, no pith, red rot	REJECTED
191	S2016-SL-191	17.0	17.0	18.0	Medium growth & stand, no lodging, no pith	PROMOTED
192	S2016-SL-192	16.4	16.0	15.4	Good growth, medium stand, no lodging, no pith	PROMOTED
193	S2016-SL-193	13.0	14.0	16.0	Medium growth & stand, no lodging, no pith, pokha boeng	REJECTED
194	S2016-SL-194	14.8	15.2	12.0	Medium growth & stand, no lodging, no pith	REJECTED
195	S2016-SL-195	17.0	17.0	18.0	Medium growth, poor stand, no lodging, smut, thin cane	REJECTED
196	S2016-SL-196	16.0	15.4	14.8	Medium growth & stand, no lodging, no pith	REJECTED
197	S2016-SL-197	14.6	15.4	15.8	Medium growth & stand, no lodging, high pith	REJECTED
198	S2016-SL-198	15.0	16.0	16.2	Good growth & stand, mild lodging, mild pith	REJECTED
199	S2016-SL-199	11.6	12.0	13.0	Good growth & stand, no lodging, high pith, broad leaves	REJECTED
200	S2016-SL-200	11.0	8.0	11.0	Good growth & stand, no lodging, mild pith	REJECTED

SR. NO.	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
201	S2016-SL-201	10.0	10.2	11.0	Good growth & stand, no lodging, no pith	REJECTED
202	S2016-SL-202	13.0	13.8	12.4	Good growth & stand, no lodging, no pith	REJECTED
203	S2016-SL-203	12.0	12.6	13.2	Medium growth, good stand, no lodging, no pith	REJECTED
204	S2016-SL-204	10.8	11.6	10.0	Medium growth, good stand, mild lodging, mild pith	REJECTED
205	S2016-SL-205	10.0	10.4	11.0	Good growth & stand, no lodging, mild pith, thick cane, smut	REJECTED
206	S2016-SL-206	14.0	16.0	17.0	Medium growth, poor stand, no lodging, no pith	PROMOTED
207	S2016-SL-207	13.8	15.2	15.0	Medium growth, poor stand, no lodging, no pith	REJECTED
208	S2016-SL-208	14.0	13.8	13.8	Medium growth & stand, no lodging, no pith	REJECTED
209	S2016-SL-209	16.2	15.	14.8	Good growth & stand, no lodging, no pith, bud sprouts	PROMOTED
210	S2016-SL-210	17.0	17.0	17.6	Good growth & stand, no lodging, mild pith	PROMOTED
211	S2016-SL-211	16.4	16.0	16.0	Poor growth, good stand, no lodging, no pith, thin cane	REJECTED
212	S2016-SL-212	17.0	17.0	15.0	Poor growth & stand, no lodging, no pith	REJECTED
213	S2016-SL-213	12.0	12.2	12.6	Good growth & stand, no lodging, high pith	REJECTED
214	S2016-SL-214	NO CANE				REJECTED
215	S2016-SL-215	12.4	12.4	12.8	Medium growth & stand, no lodging, no pith	REJECTED
216	S2016-SL-216	12.2	13.8	15.0	Good growth, medium stand, no lodging, no pith	REJECTED
217	S2016-SL-217	16.0	17.8	17.8	Good growth, medium stand, no lodging, no pith, splits	PROMOTED
218	S2016-SL-218	16.2	18.4	18.4	Good growth, medium stand, no lodging, no pith	PROMOTED
219	S2016-SL-219	11.0	10.0	10.6	Good growth & stand, no lodging, mild pith	REJECTED
220	S2016-SL-220	13.0	14.8	14.8	Good growth & stand, no lodging, no pith	PROMOTED
221	S2016-SL-221	10.0	10.8	12.0	Poor growth & stand, no lodging, no pith	REJECTED
222	S2016-SL-222	11.0	11.4	12.0	Medium growth & stand, no lodging, no pith, thin cane	REJECTED
223	S2016-SL-223	NO CANE				REJECTED
224	S2016-SL-224	10.8	12.4	12.6	Medium growth, good stand, no lodging, no pith	REJECTED
225	S2016-SL-225	11.0	11.0	12.0	Good growth, medium stand, no lodging, no pith	REJECTED
226	S2016-SL-226	14.0	14.8	15.6	Good growth & stand, no lodging, mild pith	REJECTED
227	S2016-SL-227	11.0	13.0	14.2	Good growth & stand, no lodging, no pith, smut	REJECTED
228	S2016-SL-228	11.0	13.6	15.0	Good growth, poor stand, no lodging, no pith	REJECTED

229	S2016-SL-229	12.2	13.0	13.6	Medium growth & stand, no lodging, high pith	REJECTED
230	S2016-SL-230	14.6	14.8	15.0	Medium growth & stand, no lodging, no pith	REJECTED
231	S2016-SL-231	11.0	11.8	13.0	Medium growth, poor stand, no lodging, no pith, thin cane	REJECTED
232	S2016-SL-232	13.0	13.4	12.0	Good growth, medium stand, no lodging, no pith	REJECTED
233	S2016-SL-233	13.0	15.0	16.8	Medium growth & stand, no lodging, no pith, thick cane	PROMOTED
234	S2016-SL-234	17.4	19.0	19.0	Good growth & stand, no lodging, no pith	PROMOTED
235	S2016-SL-235	14.6	15.8	16.4	Good growth & stand, no lodging, high pith	REJECTED
236	S2016-SL-236	NO CANE				REJECTED
237	S2016-SL-237	19.0	18.0	17.0	Medium growth, poor stand, no lodging, no pith	PROMOTED
238	S2016-SL-238	16.6	17.0	16.8	Medium growth & stand, mild lodging, no pith	PROMOTED
239	S2016-SL-239	16.8	18.0	19.0	Medium growth & stand, mild lodging, mild pith	PROMOTED
240	S2016-SL-240	19.0	20.0	19.0	Good growth & stand, severe lodging, mild pith	PROMOTED
241	S2016-SL-241	15.0	15.2	13.0	Medium growth & stand, mild lodging, no pith	REJECTED
242	S2016-SL-242	13.2	17.2	17.0	Medium growth, poor stand, mild lodging, no pith	PROMOTED
243	S2016-SL-243	13.0	14.8	17.0	Medium growth & stand, no lodging, no pith, pokha boeng	REJECTED

SR. NO	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
244	S2016-SL-244	NO CANE				REJECTED
245	S2016-SL-245	NO CANE				REJECTED
246	S2016-SL-246	NO CANE				REJECTED
247	S2016-SL-247	10.4	10.4	12.0	Good growth, medium stand, no lodging, no pith	REJECTED
248	S2016-SL-248	11.0	11.0	12.0	Good growth & stand, no lodging, no pith	REJECTED
249	S2016-SL-249	14.4	15.8	16.0	Good growth, medium stand, no lodging, high pith	REJECTED
250	S2016-SL-250	10.0	11.0	14.2	Medium growth & stand, no lodging, no pith, borer	REJECTED
251	S2016-SL-251	10.0	14.0	15.0	Medium growth, poor stand, no lodging, no pith	REJECTED
252	S2016-SL-252	9.0	9.0	11.8	Medium growth, poor stand, no lodging, no pith	REJECTED
253	S2016-SL-253	10.4	11.0	12.2	Poor growth & stand, no lodging, no pith	REJECTED
254	S2016-SL-254	9.6	9.8	11.4	Medium growth & stand, mild lodging, no pith	REJECTED
255	S2016-SL-255	9.0	10.0	11.6	Good growth & stand, no lodging, no pith	REJECTED
256	S2016-SL-256	17.2	17.0	17.2	Poor growth & stand, no lodging, no pith	PROMOTED
257	S2016-SL-257	9.0	10.0	11.8	Good growth & stand, no lodging, mild pith	REJECTED
258	S2016-SL-258	4.0	5.0	5.0	Good growth & stand, no lodging, no pith	REJECTED
259	S2016-SL-259	5.0	6.0	8.0	Medium growth, good stand, no lodging, mild pith	REJECTED
260	S2016-SL-260	7.0	8.8	10.4	Good growth & stand, no lodging, no pith	REJECTED
261	S2016-SL-261	10.0	10.6	11.0	Good growth & stand, severe lodging, high pith	REJECTED
262	S2016-SL-262	10.0	10.4	11.6	Good growth & stand, mild lodging, high pith	REJECTED
263	S2016-SL-263	11.0	11.4	12.0	Good growth & stand, no lodging, mild pith	REJECTED
264	S2016-SL-264	7.0	8.0	9.0	Good growth & stand, no lodging, no pith	REJECTED
265	S2016-SL-265	13.0	14.0	15.0	Good growth, medium stand, mild lodging, no pith, smut	REJECTED
266	S2016-SL-266	11.4	12.4	15.0	Good growth & stand, no lodging, no pith	REJECTED
267	S2016-SL-267	11.0	12.2	14.0	Medium growth & stand, no lodging, no pith	REJECTED

268	S2016-SL-268	11.4	12.2	12.8	Poor growth & stand, no lodging, no pith	REJECTED
269	S2016-SL-269	NO CANE				REJECTED
270	S2016-SL-270	NO CANE				REJECTED
271	S2016-SL-271	NO CANE				REJECTED
272	S2016-SL-272	11.6	11.8	12.0	Poor growth & stand, no lodging, no pith	REJECTED
273	S2016-SL-273	12.4	14.0	15.4	Medium growth & stand, no lodging, no pith	PROMOTED
274	S2016-SL-274	17.4	19.4	19.0	Medium growth & stand, no lodging, no pith, smut	PROMOTED
275	S2016-SL-275	17.0	19.2	19.2	Poor growth & stand, no lodging, no pith	PROMOTED
276	S2016-SL-276	18.0	18.2	18.4	Good growth, medium stand, no lodging, mild pith	PROMOTED
277	S2016-SL-277	18.0	19.0	19.8	Good growth & stand, no lodging, no pith	PROMOTED
278	S2016-SL-278	13.2	14.0	14.4	Good growth & stand, no lodging, high pith, smut	REJECTED
279	S2016-SL-279	17.6	17.0	17.0	Good growth & stand, no lodging, no pith	PROMOTED
280	S2016-SL-280	10.0	11.4	12.2	Good growth & stand, no lodging, high pith	REJECTED
281	S2016-SL-281	13.0	14.0	16.0	Medium growth & stand, no lodging, no pith	PROMOTED
282	S2016-SL-282	14.8	15.0	18.4	Medium growth, poor stand, no lodging, no pith	PROMOTED
283	S2016-SL-283	14.0	14.0	15.6	Good growth & stand, no lodging, no pith, splits	PROMOTED
284	S2016-SL-284	14.8	17.0	17.8	Medium growth & stand, no lodging, no pith	PROMOTED
285	S2016-SL-285	NO CANE				REJECTED
286	S2016-SL-286	NO CANE				REJECTED

SR. NO	**VARIETIES**	**BRIX%**			**CHARACTERISTICS**	**REMARKS**
		TOP	**MID**	**BOT**		
287	S2016-SL-287	NO CANE				REJECTED
288	S2016-SL-288	NO CANE				REJECTED
289	S2016-SL-289	13.0	13.0	14.0	Medium growth & stand, mild lodging, no pith	REJECTED
290	S2016-SL-290	17.0	18.0	19.0	Medium growth, good stand, no lodging, no pith	PROMOTED
291	S2016-SL-291	15.0	15.4	16.0	Medium growth & stand, no lodging, no pith, smut	REJECTED
292	S2016-SL-292	10.0	11.0	12.6	Poor growth & stand, no lodging, no pith	REJECTED
293	S2016-SL-293	11.8	12.4	13.0	Poor growth & stand, no lodging, no pith	REJECTED
294	S2016-SL-294	13.0	14.0	15.0	Medium growth, poor stand, no lodging, no pith, smut	REJECTED
295	S2016-SL-295	14.0	15.0	15.2	Poor growth & stand, no lodging, high pith	REJECTED
296	S2016-SL-296	15.2	16.0	17.0	Medium growth & stand, no lodging, no pith	PROMOTED
297	S2016-SL-297	17.2	18.4	19.0	Good growth & stand, no lodging, no pith, thin cane	PROMOTED
298	S2016-SL-298	12.8	13.0	13.6	Medium growth & stand, no lodging, no pith	REJECTED
299	S2016-SL-299	15.8	14.0	14.0	Medium growth & stand, mild lodging, mild pith	REJECTED
300	S2016-SL-300	18.0	17.0	16.0	Poor growth & stand, no lodging, no pith	PROMOTED

301	S2016-SL-301	15.0	15.4	16.0	Medium growth & stand, no lodging, high pith, thin cane	REJECTED
302	S2016-SL-302	13.0	13.0	13.0	Good growth, medium stand, no lodging, no pith	REJECTED
303	S2016-SL-303	19.6	20.6	12.4	Medium growth & stand, no lodging, high pith	REJECTED
304	S2016-SL-304	14.0	13.8	15.0	Good growth & stand, no lodging, no pith	PROMOTED
305	S2016-SL-305	15.0	16.4	16.8	Medium growth, poor stand, no lodging, no pith	PROMOTED
306	S2016-SL-306	14.0	16.0	16.4	Good growth, medium stand, no lodging, no pith	PROMOTED
307	S2016-FD-307	NO CANE				REJECTED
308	S2016-FD-308	15.2	16.0	17.0	Medium growth & stand, no lodging, no pith	PROMOTED
309	S2016-FD-309	13.6	14.0	14.4	Poor growth & stand, no lodging, no pith	REJECTED
310	S2016-FD-310	NO CANE				REJECTED
311	S2016-FD-311	NO CANE				REJECTED
312	S2016-FD-312	15.0	18.4	17.8	Poor growth & stand, no lodging, no pith	PROMOTED
313	S2016-FD-313	15.4	17.4	17.0	Poor growth & stand, no lodging, no pith	PROMOTED
-	HSF -240	14.0	15.4	16.0		STANDARD
-	SPF-245	17.0	18.0	18.0		STANDARD
-	CPF-246	14.6	17.2	17.2		STANDARD
-	CPF-248	17.2	17.0	17.0		STANDARD
-	CPF-249	16.0	18.0	19.0		STANDARD

7. SELECTION OF PHENOTYPICALLY SUPERIOR CLONES IN NURSERY-II

In Nursery-II, (2016-17), 113 clones were tested in a double row non-replicated experiment having a net plot size of 4 x 2.4 m. Keeping in view the desirable characters, such as growth vigor, erectness, brix %age, resistance to frost, lodging, insect pests and diseases, these clones were compared with five standard varieties i.e. HSF-240,SPF-245, CPF-246, CPF-248 & CPF-249. The brix reading was recorded by hand refracto-meter. After comparing the quantitative and qualitative characters, 34 clones were selected and promoted to Nursery-III, while 4 clones were retained in Nursery-II (2017-18) and 75 clones were rejected due to undesirable characters. Lists of promoted and retained clones are given below.

LIST OF PROMOTEDED CLONES (NURSERY II)

SR. NO	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
1	S-2015-SL-07	14.2	17.0	16.8	Medium growth & stand, no lodging, no pith, smut	REJECTED
2	S-2015-SL-10	14.4	17.0	16.0	Good growth & stand, no lodging , no pith, splits	PROMOTED
3	S-2015-SL-16	15.6	16.0	16.0	Medium growth & stand, no lodging, high pith	REJECTED
4	S-2015-SL-25	16.0	16.0	18.2	Medium growth & stand, no lodging, no pith, thin cane	PROMOTED
5	S-2015-SL-26	15.0	16.0	16.4	Medium growth & stand, no lodging, no pith, MS to red rot	REJECTED
6	S-2015-SL-43	13.0	13.0	13.6	Good growth, Medium stand, no lodging, mild pith	REJECTED

7	S-2015-SL-53	17.0	16.6	17.0	Good growth & stand, no lodging, mild pith	PROMOTED
8	S-2015-SL-55	18.4	17.0	17.6	Good growth, Medium stand, no lodging, no pith, red rot	REJECTED
9	S-2015-SL-58	15.0	16.0	15.4	Good growth & stand, no lodging, no pith, MR to red rot	PROMOTED
10	S-2015-SL-64	13.0	15.6	17.0	Medium growth & stand, no lodging, no pith, MS to red rot	REJECTED
11	S-2015-SL-65	11.0	11.0	11.0	Good growth & stand, no lodging, no pith, MR to red rot	REJECTED
12	S-2015-SL-66	16.6	16.6	17.0	Good growth & stand, mild lodging, no pith, MS to red rot	REJECTED
13	S-2015-SL-70	14.4	15.0	15.2	Good growth & stand, no lodging , no pith, smut, thin cane	REJECTED
14	S-2015-SL-73	12.0	12.0	14.0	Good growth & stand, severe lodging , no pith, thin cane	REJECTED
15	S-2015-SL-76	14.8	15.0	16.4	Good growth & stand, no lodging , no pith, thin cane	PROMOTED
16	S-2015-SL-77	14.8	15.4	16.0	Good growth & stand, mild lodging , mild pith, red rot, smut	REJECTED
17	S-2015-SL-86	19.0	18.0	18.2	Medium growth & stand, no lodging, no pith, MS to red rot	REJECTED
18	S-2015-SL-89	17.0	17.2	16.8	Good growth & stand, no lodging , no pith, MR to red rot	PROMOTED
19	S-2015-SL-90	18.0	16.0	17.4	Good growth, mild stand, no lodging , pol, MR to red rot	PROMOTED
20	S-2015-SL-91	14.8	15.2	17.0	Good growth & stand, no lodging , mild pith, MR to red rot	REJECTED
21	S-2015-SL-92	17.8	19.0	19.6	Medium growth & stand, no lodging, no pith,	PROMOTED
22	S-2015-SL-96	15.0	15.6	16.0	Medium growth & stand, no lodging, no pith,	REJECTED
23	S-2015-SL-97	16.0	16.0	16.8	Good growth & stand, mild lodging , no pith, MR to red rot	PROMOTED
24	S-2015-SL-101	16.0	15.4	15.4	Medium growth, good stand, no lodging & pith, MR to red rot	PROMOTED
25	S-2015-SL-102	14.0	15.0	15.6	Medium growth, poor stand, mild pith, MS to red rot, smut	REJECTED
26	S-2015-SL-108	11.2	13.2	17.0	Medium growth & stand, no lodging, no pith	PROMOTED
27	S-2015-SL-122	8.0	10.4	13.0	Medium growth & stand, no lodging, no pith	REJECTED
28	S-2015-SL-123	12.4	14.0	13.8	Poor growth & stand, no lodging, no pith	REJECTED
29	S-2015-SL-127	13.0	14.6	17.6	Medium growth & stand, no lodging, mild pith, smut	REJECTED
30	S-2015-SL-136	11.4	13.0	14.6	Medium growth, good stand, no lodging, no pith	REJECTED

SR. NO	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
31	S-2015-SL-156	12.4	11.0	13.0	Poor growth, medium stand, no lodging, no pith	REJECTED
32	S-2015-SL-158	13.0	16.0	16.6	Medium growth & stand, no lodging, mild pith, broad leaves	PROMOTED
33	S-2015-SL-166	14.2	16.2	18.6	Medium growth & stand, no lodging, no pith, MR to red rot	PROMOTED
34	S-2015-SL-168	11.4	13.0	15.0	Poor growth & stand, no lodging, no pith	REJECTED
35	S-2015-SL-176	10.0	11.6	12.0	Poor growth & stand, no lodging, no pith	REJECTED
36	S-2015-SL-177	13.4	16.0	16.0	Medium growth & stand, no lodging, no pith, narrow leaves	PROMOTED
37	S-2015-SL-183	11.0	11.4	12.0	Medium growth & stand, no lodging, no pith	REJECTED
38	S-2015-SL-189	14.0	15.4	15.6	Poor growth & stand, no lodging, no pith, splits	REJECTED
39	S-2015-SL-201	14.4	15.0	16.0	Medium growth & stand, no lodging, no pith	REJECTED
40	S-2015-SL-223	10.0	11.0	13.0	Poor growth & stand, no lodging, mild pith	REJECTED
41	S-2015-SL-244	11.4	16.2	18.0	Good growth & stand, no lodging, no pith	PROMOTED
42	S-2015-SL-257	16.4	16.6	18.6	Good growth & stand, no lodging, no pith, red rot	REJECTED
43	S-2015-SL-265	11.0	12.0	14.0	Poor growth & stand, no lodging, no pith, red rot	REJECTED
44	S-2015-SL-273	13.2	15.0	15.0	Medium growth, good stand, no lodging, pol, MR to red rot	REJECTED
45	S-2015-SL-280	15.2	15.4	13.0	Good growth & stand, mild lodging, no pith, MR to red rot	REJECTED
46	S-2015-SL-282	16.0	17.0	17.4	Medium growth & stand, severe lodging, MR to red rot	REJECTED
47	S-2015-SL-283	14.8	15.6	16.0	Good growth & stand, mild lodging, MS to red rot	REJECTED
48	S-2015-SL-285	12.4	13.6	14.0	Medium growth & stand, no lodging, no pith, red rot	REJECTED
49	S-2015-SL-286	17.0	18.0	18.2	Poor growth & stand, no lodging, no pith, red rot	REJECTED
50	S-2015-SL-288	14.0	13.6	13.2	Good growth, medium stand, no lodging, no pith, smut	REJECTED
51	S-2015-SL-289	17.0	18.4	18.6	Medium growth & stand, no lodging, no pith	PROMOTED
52	S-2015-SL-290	12.0	15.0	16.0	Good growth & stand, no lodging, no pith	PROMOTED
53	S-2015-SL-294	15.0	16.0	16.4	Good growth & stand, no lodging, high pith, thin cane	REJECTED
54	S-2015-SL-296	14.0	13.0	14.0	Good growth & stand, mild lodging, no pith	REJECTED
55	S-2015-SL-300	14.0	14.6	14.0	Medium growth & stand, severe lodging, no pith	REJECTED
56	S-2015-SL-302	15.4	17.0	18.4	Medium growth, good stand, no lodging, hole	PROMOTED
57	S-2015-SL-304	16.0	17.0	17.0	Poor growth & stand, no lodging, pol, red rot, MS to red rot	REJECTED
58	S-2015-SL-310	14.0	15.0	16.0	Good growth & stand, mild lodging, high pith, red rot	REJECTED
59	S-2015-SL-320	14.4	15.0	15.8	Medium growth & stand, no lodging, high pith	REJECTED
60	S-2015-SL-324	16.0	17.0	18.0	Medium growth, poor stand, no pith, smut, MS to red rot	REJECTED
61	S-2015-SL-343	9.0	11.0	14.0	Good growth, mild stand, no lodging, no pith	REJECTED
62	S-2015-SL-354	15.6	16.4	16.6	Poor growth & stand, no lodging, no pith, borer attack	REJECTED
63	S-2015-SL-367	16.0	15.2	16.4	Poor growth & stand, no lodging, no pith, MR to red rot	REJECTED
64	S-2015-SL-369	13.0	14.0	15.0	Poor growth & stand, no lodging, no pith	REJECTED
65	S-2015-SL-374	15.6	16.0	16.4	Poor growth & stand, no lodging, no pith, smut	REJECTED
66	S-2015-SL-382	16.0	16.0	18.0	Poor growth, medium stand, no lodging, no pith	PROMOTED
67	S-2015-SL-392	16.4	18.2	17.4	Poor growth & stand, no lodging, no pith	RETAIN

68	S-2015-SL-394	13.2	14.0	15.0	Good growth & stand, no lodging, no pith, smut, red rot	REJECTED
69	S-2015-SL-395	17.4	18.0	20.0	Medium growth, poor stand, no lodging, no pith	PROMOTED
70	S-2015-SL-396	18.0	19.0	19.0	Good growth, poor stand, no lodging, no pith	PROMOTED
71	S-2015-SL-404	23.0	20.4	19.4	Medium growth & stand, no lodging, no pith, thin cane	PROMOTED
72	S-2015-SL-406	15.8	16.0	16.4	Good growth, medium stand, no lodging, no pith, splits	REJECTED
73	S-2015-SL-409	14.8	15.0	15.4	Good growth, medium stand, severe lodging, mild pith	REJECTED
74	S-2015-SL-410	13.0	14.0	15.0	Medium growth & stand, mild lodging, no pith, smut	REJECTED

SR. NO	VARIETIES	BRIX%			CHARACTERISTICS	REMARKS
		TOP	MID	BOT		
75	S-2015-SL-413	16.6	18.4	18.2	Medium growth & stand, no lodging, no pith, splits	PROMOTED
76	S-2015-SL-416	16.0	18.2	19.0	Medium growth & stand, no lodging, no pith, splits	PROMOTED
77	S-2015-SL-417	15.2	16.2	16.4	Good growth & stand, no lodging, high pith	REJECTED
78	S-2015-SL-421	14.0	19.0	19.4	Poor growth & stand, no lodging, no pith	PROMOTED
79	S-2015-SL-425	14.0	12.0	14.8	Medium growth & stand, no lodging, no pith, smut	REJECTED
80	S-2015-SL-429	19.0	20.0	22.0	Poor growth, medium stand, no lodging, tube	RETAIN
81	S-2015-SL-432	16.4	18.4	18.0	Medium growth, good stand, no lodging, MS to red rot	REJECTED
82	S-2015-SL-435	16.0	17.0	17.6	Medium growth & stand, no lodging, mild pith, red rot	REJECTED
83	S-2015-SL-437	16.8	18.0	18.2	Medium growth & stand, severe lodging, no pith	RETAIN
84	S-2015-SL-441	16.0	17.0	17.4	Medium growth, good stand, no lodging, no pith, splits	PROMOTED
85	S-2015-SL-443	14.0	13.0	12.0	Medium growth & stand, no lodging, no pith	REJECTED
86	S-2015-SL-444	15.4	18.4	19.6	Good growth & stand, no lodging, no pith	PROMOTED
87	S-2015-SL-446	15.6	16.4	16.0	Medium growth & stand, no lodging no pith, thin cane, borer	REJECTED
88	S-2015-SL-448	16.0	13.0	13.0	Good growth & stand, no lodging, no pith	REJECTED
89	S-2015-SL-461	15.2	16.0	16.4	Good growth & stand, no lodging, no pith, red rot	REJECTED
90	S-2015-SL-463	11.4	11.6	13.0	Poor growth & stand, no lodging, no pith, red rot	REJECTED
91	S-2015-SL-466	15.4	1.0	16.2	Medium growth & stand, no lodging, no pith, red rot	REJECTED
92	S-2015-SL-468	16.0	16.0	16.0	Medium growth & stand, no lodging, mild pith	REJECTED
93	S-2015-SL-485	14.2	15.4	15.8	Poor growth & stand, no lodging, no pith, thin cane	REJECTED
94	S-2015-SL-486	16.0	15.8	17.0	Medium growth, medium stand, no lodging, hole, borer	REJECTED
95	S-2015-SL-503	17.0	18.0	19.0	Medium growth & stand, severe lodging, mild pith, ariel root	PROMOTED
96	S-2015-SL-540	20.0	16.2	18.0	Good growth & stand, no lodging, no pith	PROMOTED
97	S-2015-SL-546	14.2	14.4	15.0	Medium growth & stand, no lodging, no pith	REJECTED
98	S-2015-SL-554	15.4	15.4	15.4	Medium growth & stand, mild lodging, no pith	REJECTED
99	S-2015-SL-547	14.0	15.0	18.0	Medium growth & stand, no lodging, no pith	PROMOTED
100	S-2015-SL-549	15.6	16.0	16.4	Good growth & stand, no lodging, no pith	RETAIN
101	S-2015-SL-566	16.0	17.0	18.0	Good growth & stand, mild lodging, no pith, thin cane	PROMOTED
102	S-2015-SL-569	14.0	13.0	15.0	Medium growth. good stand, no lodging, no pith, splits	REJECTED
103	S-2015-SL-572	13.0	12.6	15.0	Good growth & stand, no lodging, no pith, MR to red rot	REJECTED
104	S-2015-SL-574	16.0	17.0	18.0	Good growth & stand, mild lodging, no pith	PROMOTED

105	S-2015-SL-575	15.0	16.0	16.4	Medium growth & stand, no lodging, mild pith, ariel roots	REJECTED
106	S-2015-SL-580	12.0	13.0	14.0	Medium growth, good stand, no lodging, no pith, thin cane	REJECTED
107	S-2015-SL-592	13.4	14.0	14.8	Good growth & stand, severe lodging, no pith, splits	REJECTED
108	S-2015-SL-593	16.4	17.0	17.2	Good growth & stand, severe lodging, high pith	REJECTED
109	S-2015-SL-598	16.4	16.0	17.0	Good growth & stand, no lodging, no pith, red rot	REJECTED
110	S-2015-SL-599	14.6	15.0	15.4	Medium growth & stand, mild lodging, no pith, thin cane	REJECTED
111	S-2015-SL-618	15.0	15.0	16.0	Medium growth & stand, no lodging, no pith, red rot	REJECTED
112	S-2015-SL-624	18.0	17.0	18.4	Good growth & stand, no lodging, no pith	PROMOTED
113	S-2015-SL-636	16.0	17.4	17.0	Good growth & stand, no lodging, no pith	PROMOTED
-	HSF-240	14.8	16.0	17.2		STANDARD
-	SPF-245	17.0	17.0	17.8		STANDARD
-	CPF-246	16.0	17.0	17.6		STANDARD
-	CPF-248	15.8	17.0	17.0		STANDARD
-	CPF-249	15.6	17.8	18.6		STANDARD

8. PRELIMINARY VARIETAL TRIAL (NURSERY-III)

During the year under report, 09 sets of preliminary varietal yield trial consisting of 125 test entries and two check verities (HSF-240 and CPF-249), was laid out in REBD with three replications. Experiment was sown on 08-11-2016 with net plot size of 4mx3.6m by keeping inter-row spacing of 120cm. The observations pertaining to germination %, no of tillers/ plant, no. of canes/ha, Brix % and cane yield t/ ha were recorded at per growth stages. The results are summarized as under.

In set–I, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. All clones were rejected due to low sugar recovery, Smut, Red Rot, high pith, lodging trend, and poor growth performance.

In set-II, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studies. All clones were rejected to low sugar recovery, Smut, Red Rot, high pith, lodging trend, and poor growth performance.

In set III, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 01 clone (S 2014-SL 1089) was selected and promoted to Semi-Finial varietal trial for further study on the basis of good growth performance. The selected clone (S 2014-8L-1089) gave higher cane yield (70.80 t/ha) with sugar yield of 8.95 t/ha. The remaining 13 clones were rejected due to Smut, Red Rot, pith, lodging and poor growth performance.

In set IV, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 03 clones (i.e. S2014-SL-1322, S2014-SL-1359 and S2014-SL-1372) were selected and promoted to Semi- Final varietal trial for further study on the basis of good growth performance. The clone S2014-SL-1322 gave higher cane yield of 71.51 t/ha with sugar yield of 8.78 t/ha which was followed by S2014-SL-1372 having 71.31t/ha cane yield with sugar yield of 8.71 t/ha. Whereas, the clone S2014-SL-1359 gave 68.56 t/ha cane yield with 8.34 t/ha sugar yield respectively. The remaining 11 clones were rejected due to Smut, Red Rot, high Pith and poor growth performance.

In set V, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 01 clone (S 2014-SL 1537) was selected and promoted to Semi-Finial varietal trial for further study on the basis of good growth performance. The selected clone (S 2014-SL-1537) gave higher cane yield (68.58 t/ha) with sugar yield of 8.53 t/ha. The remaining 13 clones were rejected due to Smut, Red Rot, pith, lodging and poor growth performance.

In set VI, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 01 clone (S 2014-SL 1700) was selected and promoted to Semi-Finial varietal trial for further study on the basis of good growth performance. The selected clone (S 2014-SL-1700) gave higher cane yield (69.35 t/ha) with sugar yield of 9.22 t/ha. The remaining 13 clones were rejected due to Smut, Red Rot, pith, lodging and poor growth performance.

In set VII, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 04 clones (i.e. S2014-SL-1878, S2014-SL-2006, S2014-SL-2070 and S2014-SL-2076) were selected and promoted to Semi- Final varietal trial for further study on the basis of good growth performance. The clone S2014-SL-2076 gave higher cane yield of 69.65 t/ha with sugar yield of 8.05 t/ha which was followed by S2014-SL-2006 with cane yield 68.57 t/ha and sugar yield of 7.93 t/ha. Whereas, the clone S2014-SL-1878 gave good cane yield of 68.15 t/ha with sugar yield 7.88 t/ha which was further followed by S2014- SL-2070 giving 67.11 t/ha cane yield with 7.76 t/ha sugar yield respectively. The remaining 10 clones were rejected due to Smut, Red Rot, high Pith, lodging, splits, aerial roots and poor growth performance.

In set VIII, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 03 clones (i.e. S2014-SL-2200, S2014-SL-2290 and S2014-SL-2350) were selected and promoted to Semi- Final varietal trial for further study on the basis of good growth performance. The clone S2014-SL-2350 gave higher cane yield of 70.15 t/ha with

sugar yield of 8.23 t/ha which was followed by S2014-SL-2200 with cane yield of 69.65 t/ha with sugar yield of 8.17 t/ha. Whereas, the clone S2014-SL-2290 gave good cane yield of 67.15 t/ha with sugar yield 7.88 t/ha. The remaining 11 clones were rejected due to Smut, Red Rot, high Pith, lodging, aerial roots and poor growth performance.

In set IX, 14 clones along with 02 standard verities (HSF-240 and CPF-249) were studied. Out of which 02 clones (i.e. S2014-SL-2463 and S2014-SL-2477) were selected and promoted to Semi- Final varietal trial for further study on the basis of good growth performance. The clone S2014-SL-2477 gave higher cane yield of 86.41 t/ha with sugar yield of 10.35 t/ha which was followed by S2014-SL-2463 with cane yield of 74.35 and sugar yield of 8.91 t/ha. The remaining 12 clones were rejected due to Smut, Red Rot, high Pith, lodging, and poor growth performance.

LIST OF CLONES (NURSERY III)

Sr. No.	Variety / Clone	Germination %	Tillers per Plant	Cane Count (000 ha^{-1})	Cane Yield (t ha-1)	Sugar Yield (t ha-1)	Remarks
1	S2013-M-72	17.47 P	0.82 K	52.65 H	48.59 K	5.98	Rejected due to smut & thin cane
2	S2013-US-876	26.34 I	1.14 E	69.42 A	52.36 F	6.44	Rejected due to high pith & poor cane stand
3	S2013-US-969	17.67 O	1.35 B	35.96 O	32.28 P	3.97	Rejected due to pith & lodging trend.
4	S2014-SL-347	32.44 E	0.98 I	65.92 B	58.37 A	7.18	Rejected due to aerial roots and high pith
5	S2014-SL-349	26.39 H	0.81 K	45.13 M	36.03 O	4.43	Rejected due to Smut
6	S2014-SL-353	19.13 N	1.08 G	56.92 E	48.64 J	5.99	Rejected due to deep splits, lodging & smut.
7	S2014-SL-360	19.31 M	1.08 G	47.90 K	50.66 H	6.23	Rejected due to deep splits, lodging & smut.
8	S2014-SL-365	36.44 C	0.58 L	48.56 J	38.87 N	4.78	Rejected due to thin cane & smut
9	HSF-240 (St)	39.54 B	1.31 C	55.52 F	55.49 C	6.83	Check
10	CPF-249 (St)	41.69 A	1.42 A	60.41 D	58.33 B	7.18	Check
11	S2014-SL-367	34.42 D	1.35 B	52.07 I	54.16 D	6.66	Rejected due to smut & pith
12	S2014-SL-380	27.46 G	0.82 K	43.04 N	47.91 L	5.89	Rejected due to smut & pith

13	S2014-SL-389	25.19 J	0.91 J	54.84 G	49.29 I	6.06	Rejected due to Pith & Smut
14	S2014-SL-396	30.52 F	1.01 H	55.54 F	51.37 G	6.32	Rejected due to splits, lodging & smut
15	S2014-JG-525	21.44 L	1.12 F	45.82 L	45.82 M	5.64	Rejected due to lodging & high pith
16	S2014-SL-592	23.75 K	1.17 D	63.87 C	53.47 E	6.58	Rejected due to Red Rot
	LSD at 0.05	0.0125	0.0122	0.0680	0.0268	5.087	

Set-II

Sr. No.	Variety / Clone	Germination %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha^{-1})	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-602	18.40 M	0.42 M	56.93 I	56.94 D	6.73	Rejected due to Pith & Smut
2	S2014-SL-636	25.93 I	1.16 D	54.84 J	53.46 H	6.32	Rejected due to Red Rot
3	S2014-SL-675	30.25 H	1.22 C	54.15 K	52.75 J	6.24	Rejected due to Pith & Smut
4	S2014-SL-680	23.65 J	0.68 K	59.01 F	54.85 G	6.49	Rejected due to lodging & high pith
5	S2014-SL-681	36.24 C	0.57 L	57.62 H	57.34 C	6.78	Rejected due to Pith & Smut
6	S2014-SL-753	35.57 D	0.75 I	59.62 E	58.33 B	6.90	Rejected due to high lodging & pith
7	S2014-SL-775	37.55 B	0.80 J	57.64 H	55.96 F	6.62	Rejected due to smut & Red Rot
8	S2014-SL-779	32.73 F	0.73 J	58.33 G	52.76 J	6.24	Rejected due to smut & Red Rot
9	HSF-240 (St)	37.67 B	1.22 C	59.73 D	61.08 A	7.22	Check
10	CPF-249 (St)	40.56 A	1.31 A	64.56 A	56.25 E	6.65	Check
11	S2014-SL-781	33.32 E	1.15 D	61.08 C	51.36 K	6.07	Rejected due to lodging & smut
12	S2014-SL-916	19.57 L	1.05 E	49.28 N	42.36 M	5.01	Rejected due to Red Rot
13	S2014-SL-921	31.44 G	0.93 F	58.33 G	56.92 D	6.73	Rejected due to Red Rot
14	S2014-SL-941	21.31 K	0.78 H	52.07 L	47.92 L	5.67	Rejected due to lodging & high pith
15	S2014-SL-951	30.45 H	1.27 B	63.17 B	52.80 I	6.24	Rejected due to high lodging & deep splits

16	S2014-SL-955	18.63 M	0.37 N	50.68 M	56.94 D	6.73	Rejected due thin cane & smut
	LSD at 0.05	0.2419	0.0143	0.0214	0.0245	5.087	

Set-III

Sr. No.	**Variety / Clone**	**Germination %**	**Tillers per Plant**	**Cane Count (000 ha^{-1}**	**Cane Yield (t ha^{-1})**	**Sugar Yield (t ha-1)**	**Remarks**
1	S2014-SL-966	24.58 M	1.21 D	67.37 G	69.37 B	8.76	Rejected due to high lodging & smut
2	S2014-SL-968	34.62 H	0.91 H	68.74 F	66.08 D	8.35	Rejected due to smut & pith
3	S2014-SL-973	27.47 K	0.66 L	61.78 K	65.96 E	8.33	Rejected due to pith, lodging & Red Rot
4	S2014-SL-974	39.37 D	1.37 B	70.13 D	68.03 C	8.60	Rejected due to high lodging & smut
5	S2014-SL-1022	21.61 P	1.00 G	67.36 G	65.96 E	8.33	Rejected due to Red Rot & pith
6	S2014-SL-1024	38.86 E	1.16 E	57.63 N	61.08 J	7.72	Rejected due to lodging & high pith
7	S2014-SL-1079	40.41 C	0.75 K	59.75 L	63.16 I	7.98	Rejected due to Red Rot & lodging
8	S2014-SL-1081	34.40 I	0.83 I	62.48 I	64.54 G	8.15	Rejected due to thin cane & high pith
9	HSF-240 (St)	37.63 G	0.92 H	82.55 B	65.25 F	8.24	Check
10	CPF-249 (St)	40.45 B	1.23 C	74.42 C	63.92 H	8.07	Check
11	S2014-SL-1087	24.56 N	0.47 N	69.43 E	65.93 E	8.33	Rejected due to smut
12	**S2014-SL-1089**	**41.75 A**	**1.75 A**	**89.44 A**	**70.80 A**	**8.95**	**Selected &** promoted
13	S2014-SL-1102	33.78 J	0.84 I	64.57 H	64.58 G	8.16	Rejected due to high Smut
14	S2014-SL-1111	27.45 L	0.78 J	59.03 M	54.82 L	6.92	Rejected due to lodging & Smut
15	S2014-SL-1124	38.51 F	1.05 F	62.49 I	60.42 K	7.63	Rejected due to high Smut
16	S2014-SL-1145	23.42 O	0.54 M	62.45 J	64.57 G	8.15	Rejected due to Pith & lodging
	LSD at 0.05	0.0169	0.0132	0.0293	0.0567	8.31	

Set - IV

Sr. No.	Variety / Clone	Germination %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha^{-1})	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-1179	12.87 P	1.62 F	62.48 G	65.96 E	8.05	Rejected due to lodging & Smut
2	S2014-SL-1212	26.24 I	1.84 A	59.70 L	62.46 I	7.62	Rejected due to lodging & high pith
3	S2014-SL-1215	33.43 G	0.64 M	59.92 K	59.02 N	7.20	Rejected due to Red Rot
4	S2014-SL-1224	37.68 E	0.82 K	68.03 D	67.33 D	8.21	Rejected due to Red Rot & Smut
5	S2014-SL-1288	24.57 M	0.56 O	60.42 I	59.70 M	7.29	Rejected due to lodging & Red Rot
6	S2014-SL-1307	44.49 B	1.68 D	59.01 M	62.48 I	7.62	Rejected due to smut & Red Rot
7	**S2014-SL-1322**	**44.53 A**	**1.02 J**	**84.54 C**	**71.51 A**	**8.78**	**Selected &** promoted
8	S2014-SL-1336	31.52 H	0.77 L	59.71 L	64.56 F	7.88	Rejected due to smut & Pith
9	HSF-240 (St)	21.82 O	1.64 E	64.28 F	60.27 L	7.35	Check
10	CPF-249 (St)	25.84 J	1.70 C	62.49 G	63.18 H	7.71	Check
11	S2014-SL-1337	34.34 F	1.47 H	62.38 H	61.79 J	7.54	Rejected due to Red Rot
12	S2014-SL-1351	24.22 N	0.60 N	56.24 N	63.87 G	7.79	Rejected due to Pith, lodging & Smut
13	**S2014-SL-1359**	**39.59 D**	**1.51 G**	**94.16 A**	**68.56 C**	**8.34**	**Selected &** promoted
14	S2014-SL-1362	25.57 K	1.24 I	60.37 J	61.08 K	7.45	Rejected due to Pith, lodging & Smut
15	**S2014-SL-1372**	**41.85 C**	**1.76 B**	**86.65 B**	**71.31 B**	**8.71**	**Selected &** promoted
16	S2014-SL-1399	25.32 L	1.02 J	65.56 E	64.57 F	7.88	Rejected due to Red Rot
	LSD at 0.05	0.0149	0.0194	0.0332	0.0355	6.664	

Set-V

Sr. No.	Variety / Clone	Germination %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha^{-1})	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-1412	19.33 O	1.36 E	55.53 M	58.32 L	7.25	Rejected due to lodging & Smut
2	S2014-SL-1425	17.62 P	1.15 H	62.50 H	63.13 I	7.85	Rejected due to Pith, lodging & Smut

3	S2014-SL-1442	28.51 F	1.41 D	62.44 H	63.87 G	7.94	Rejected due to Aerial roots, Smut & Pith
4	S2014-SL-1469	24.48 H	1.01 I	59.72 J	63.87 G	7.94	Rejected due to Aerial roots, Smut & Pith
5	S2014-SL-1474	22.43 L	0.76 L	65.25 D	62.48 J	7.77	Rejected due to high Pith & lodging
6	S2014-SL-1475	27.87 G	1.02 I	56.24 L	59.00 K	7.34	Rejected due to Pith & Smut
7	S2014-SL-1503	24.41 I	1.17 G	61.75 I	64.56 F	8.03	Rejected due to high Pith & lodging
8	S2014-SL-1520	23.50 J	0.81 K	62.48 H	63.18 H	7.86	Rejected due to Pith, lodging & Smut
9	HSF-240 (St)	29.47 D	1.47 C	64.57 E	68.06 B	8.46	Check
10	CPF-249 (St)	43.12 B	1.49 B	65.75 C	63.18 H	7.86	Check
11	S2014-SL-1527	21.32 N	1.40 D	61.77 I	65.26 E	8.11	Rejected due to smut
12	S2014-SL-1535	29.32 E	0.91 J	58.31 K	63.18 H	7.86	Rejected due to Pith, lodging & Smut
13	**S2014-SL-1537**	**44.50 A**	**1.63 A**	**86.59 A**	**68.58 A**	**8.53**	**Selected &** promoted
14	S2014-SL-1540	23.37 K	1.21 F	68.04 B	67.04 D	8.34	Rejected due to thin Cane & Smut
15	S2014-SL-1574	29.72 C	1.37 E	63.85 F	63.87 G	7.94	Rejected due to Aerial roots, Smut
16	S2014-SL-1576	21.39 M	0.46 M	63.43 G	67.34 C	8.37	Rejected due to small internode & Smut
	LSD at 0.05	0.0131	0.0105	0.0774	0.0257	6.92	

Set-VI

Sr. No.	Variety / Clone	Germination %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha^{-1})	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-1593	29.19 K	1.44 D	63.17 E	57.62 L	7.66	Rejected due to Split & Smut
2	S2014-SL-1613	30.12 I	0.93 J	62.49 G	64.57 F	8.59	Rejected due to lodging & Smut
3	S2014-SL-1617	33.49 E	0.93 J	56.94 M	57.65 K	7.67	Rejected due to high Pith & lodging
4	S2014-SL-1621	29.26 J	1.01 I	61.05 I	63.18 H	8.40	Rejected due to Red Rot & Smut

5	S2014-SL-1624	31.52 G	1.05 H	66.65 B	65.81 E	8.75	Rejected due to deep Split & Smut
6	S2014-SL-1626	24.08 O	1.17 G	60.43 J	61.79 J	8.22	Rejected due to high Pith & lodging
7	S2014-SL-1631	24.17 N	1.38 F	60.41 J	63.17 H	8.40	Rejected due to small internode & Smut
8	S2014-SL-1643	37.39 D	1.17 G	61.79 H	62.49 I	8.31	Rejected due to high Pith
9	HSF-240 (St)	38.24 C	1.58 C	65.93 C	68.05 B	9.05	Check
10	CPF-249 (St)	39.29 B	1.62 B	63.05 F	61.79 J	8.22	Check
11	S2014-SL-1699	22.60 P	0.65 K	63.86 D	67.34 C	8.95	Rejected due to deep Split & Smut
12	**S2014-SL-1700**	**40.64 A**	**1.87 A**	**75.86 A**	**69.35 A**	**9.22**	**Selected &** promoted
13	S2014-SL-1706	26.54 L	1.01 I	59.73 K	64.40 G	8.56	Rejected due to smut
14	S2014-SL-1716	30.71 H	1.44 D	63.16 E	67.34 C	8.95	Rejected due to high Pith, lodging & Smut
15	S2014-SL-1802	26.41 M	1.41 E	58.31 L	54.15 M	7.20	Rejected due to high Pith, lodging & Smut
16	S2014-SL-1838	31.67 F	1.38 F	61.77 H	65.96 D	8.77	Rejected due to high Pith & lodging
	LSD at 0.05	0.0126	0.0116	0.0263	0.0325	7.535	

Set-VII

Sr. No.	Variety / Clone	Germina-tion %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha-1)	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-1871	31.58 M	2.33 A	57.63 J	59.72 L	6.90	Rejected due to Red Rot
2	S2014-SL-1876	26.34 O	1.14 I	60.42 H	64.57 G	7.46	Rejected due to Split, Aerial roots & Pith
3	**S2014-SL-1878**	**45.61 B**	**2.17 B**	**67.89 A**	**68.15 C**	**7.88**	**Selected &** promoted
4	S2014-SL-1882	36.44 I	1.11 J	61.81 F	64.57 G	7.46	Rejected due to smut & lodging
5	S2014-SL-1933	30.52 N	0.95 M	55.56 K	58.32 M	6.74	Rejected due to Red Rot
6	S2014-SL-1936	37.52 F	1.08 K	61.11 G	64.67 F	7.48	Rejected due to high Pith & Smut
7	**S2014-SL-2006**	**42.51 E**	**1.85 E**	**66.46 C**	**68.57 B**	**7.93**	**Selected &** promoted

8	S2014-SL-2045	25.46 P	2.00 D	60.41 H	62.49 H	7.22	Rejected due to Red Rot
9	HSF-240 (St)	37.41 G	1.28 H	61.81 F	61.79 I	7.14	Check
10	CPF-249 (St)	48.33 A	1.45 G	63.17 E	65.96 E	7.62	Check
11	S2014-SL-2049	34.30 K	1.14 I	59.71 I	62.49 H	7.22	Rejected due to high Pith & Smut
12	S2014-SL-2069	32.38 L	0.68 N	61.81 F	65.96 E	7.62	Rejected due to high Pith & Smut
13	**S2014-SL-2070**	**44.52 C**	**1.65 F**	**65.57 D**	**67.11 D**	**7.76**	**Selected &** promoted
14	**S2014-SL-2076**	**44.22 D**	**2.05 C**	**67.25 B**	**69.65 A**	**8.05**	**Selected &** promoted
15	S2014-SL-2128	36.35 J	1.02 L	53.46 L	61.10 J	7.06	Rejected due to Red Rot
16	S2014-SL-2133	37.08 H	1.14 I	59.72 I	60.40 K	6.98	Rejected due to Red Rot
	LSD at 0.05	9.384E-03	0.0115	0.0156	0.0466	7.687	

Set-VIII

Sr. No.	Variety / Clone	Germina-tion %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha-1)	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-2136	25.80 O	1.51 I	53.46 M	61.10 I	7.17	Rejected due to Red Rot
2	S2014-SL-2138	31.76 I	1.52 I	56.94 I	62.49 G	7.33	Rejected due to high Smut
3	S2014-SL-2142	28.22 L	2.01 D	61.11 F	59.02 M	6.93	Rejected due to Red Rot
4	S2014-SL-2143	34.52 E	1.55 H	60.41 G	61.80 H	7.25	Rejected due to Red Rot & Smut
5	S2014-SL-2154	32.86 F	1.94 E	62.48 D	64.57 F	7.58	Rejected due to high Pith & lodging
6	S2014-SL-2176	32.83 G	0.47 N	54.16 L	61.81 H	7.25	Rejected due to Red Rot
7	S2014-SL-2186	32.62 H	1.74 G	51.38 N	54.85 O	6.44	Rejected due to Red Rot & Smut
8	**S2014-SL-2200**	**45.83 A**	**2.19 B**	**66.76 B**	**69.65 B**	**8.17**	**Selected &** promoted
9	HSF-240 (St)	43.42 C	2.18 C	54.85 K	60.15 K	7.06	Check

10	CPF-249 (St)	45.37 B	1.81 F	61.80 E	64.89 E	7.61	Check
11	S2014-SL-2201	29.31 K	1.10 K	59.49 H	60.41 J	7.09	Rejected due to Red Rot
12	S2014-SL-2246	27.74 M	1.29 J	55.55 J	65.27 D	7.66	Rejected due to high Aerial Roots & lodging
13	**S2014-SL-2290**	**40.51 D**	**2.50 A**	**64.58 C**	**67.15 C**	**7.88**	**Selected &** promoted
14	S2014-SL-2349	21.58 P	1.04 L	60.40 G	59.72 L	7.01	Rejected due to Red Rot
15	**S2014-SL-2350**	**27.22 N**	**2.18 C**	**67.57 A**	**70.15 A**	**8.23**	**Selected &** promoted
16	S2014-SL-2384	29.62 J	0.91 M	55.56 J	56.23 N	6.60	Rejected due to Red Rot & Smut
	LSD at 0.05	0.0228	0.0136	0.0157	0.2468	0.0305	

Set-IX

Sr. No.	Variety / Clone	Germina-tion %	Tillers per Plant	Cane Count (000 ha^{-1}	Cane Yield (t ha-1)	Sugar Yield (t ha-1)	Remarks
1	S2014-SL-2392	30.46 K	2.04 B	62.49 BC	56.94 M	6.82	Rejected due to Red Rot
2	S2014-SL-2456	30.08 L	1.18 M	60.42 CD	56.96 L	6.82	Rejected due to high Smut & lodging
3	S2014-SL-2457	32.75 H	1.52 G	59.03 DE	54.86 N	6.57	Rejected due to high Smut & lodging
4	**S2014-SL-2463**	**40.43 C**	**1.88 D**	**65.55 B**	**74.35 C**	**8.91**	**Selected &** promoted
5	S2014-SL-2465	38.43 D	1.33 J	57.64 DE	59.02 H	7.07	Rejected due to thin Cane & high Pith
6	S2014-SL-2466	32.29 I	1.24 K	56.95 E	57.64 K	6.90	Rejected due to Red Rot
7	S2014-SL-2469	30.50 J	1.19 L	58.33 DE	62.49 G	7.49	Rejected due to Red Rot & Pith
8	S2014-SL-2471	36.26 G	1.75 E	58.34 DE	56.93 M	6.82	Rejected due to Red Rot & Smut
9	HSF-240 (St)	38.30 E	1.42 H	56.24 E	58.59 I	7.02	Check
10	CPF-249 (St)	38.15 F	2.00 C	60.51 CD	64.12 D	7.68	Check

11	**S2014-SL-2477**	**49.47 A**	**1.60 F**	**72.14 A**	**86.41 A**	**10.35**	**Selected &** promoted
12	**S2014-SL-2491**	**41.66 B**	**2.43 A**	**71.32 A**	**84.61 B**	**10.14**	**Selected &** promoted
13	S2014-SL-2494	26.31 O	1.34 I	57.63 DE	58.32 J	6.99	Rejected due to Red Rot & lodging
14	S2014-SL-2503	27.79 N	0.63 O	60.97 CD	63.18 F	7.57	Rejected due to Red Rot & lodging
15	S2014-SL-2567	28.84 M	1.00 N	56.94 E	63.87 E	7.65	Rejected due to Red Rot
	LSD at 0.05	0.0242	8.840 E-03	3.3559	0.0166	3.288	

9. FINAL VARIETAL TRIAL (2017-18)

Sixteen (16) clones were tested against two standard varieties HSF 240 and CPF 249. The trials was comprised of two sets and was laid out in RCBD with five repeats (2 for periodic juice analysis) keeping a net plot size of 4 m x 8.4 m. Planting was done on 17 March, 2017 using standard seeding rate of 50,000 TBS ha^{-1} and fertilizer @ 168-112-112 kg NPK ha^{-1}. Germination% and data on tillering were recorded at 50 and 90 days after planting, respectively while cane count and cane yield were recorded at the time of harvest. Juice analysis was done in Sugarcane Technology Laboratory, Sugarcane Research Institute, Faisalabad at fortnightly interval starting from November to March. Data were analyzed statistically using Fisher analysis of variance technique and LSD test was used to compare means of varieties at 0.05 level of probability.

Set-1:

The data presented in Table 1.7 reveal significant differences among the means of varieties. Maximum germination of 50.1%was recorded in S2009FD-18, whereas the minimum (28.3%) was noted in PSR 97-41. The maximum tillers per plant (1.61) were observed in PSR 97-41against the minimum (0.78) in S2008AUS-134. The S2011 FD-18 surpassed all the other clones with maximum number of millable canes (137thousand ha^{-1}) as compared to minimum (40thousand ha^{-1}) were recorded in PSR 97-41.on an average maximum cane yield (127.4 t ha^{-1}) was recorded in S2011 FD-18 and lowest (44.1 t ha^{-1}) in S2011 SL-62. Highest sugar recovery (11.54%) was observed in CPF 249 followed by S2009-SA 8 with average sugar recovery of 11.43% against the lowest (9.03) in M2238-89.

Set-2:

The data presented in Table- 1.7 showed that S2012 M-791exhibited highest germination (55.8%) whereas lowest (26.8%) was recorded in CPF 249. Maximum tillers per plant (2.45) were observed in CPF 249 against the minimum (1.01) in S2012 M-791.The maximum number of millable canes (124thousand ha^{-1}) was recorded in S2012 M-791whereas minimum (59.0thousand ha^{-1}) were recorded in CPF 249. The HSF 240 exhibited highest cane yield (117.4 t ha^{-1}) and lowest (52.4 t ha^{-1}) was observed in S2012 M-780. As regard of sugar recovery, S2012 SL-443 surpassed all other clones and standards with average sugar recovery of 12.17.

Out of 16 clones in this trial, nine (09) were rejected due to their susceptibility to diseases, poor growth, cane yield, pithiness and sugar recovery whereas six (06) were retained for further studies.

Table-1.7: Final varietal trial

Clone	Germ. (%)	Tillers /plant	Millable cane (000/ha)	Cane yield (t/ha)	S.rec. (%) (1st Nov. to 15th Feb.)	Remarks
Set-1						
S2008 FD-25	45.9 AB	0.91 BC	62 CDE	52.1 C	9.45	Rejected due to poor growth, yield& red rot susceptibility
S2008 AUS-134	48.5 AB	0.78 C	99 B	110.1 AB	10.15	Rejected due to red rot susceptibility & high smut attack
S2009 SA-8	40.6 BC	1.42 AB	82 BC	64.2 C	11.43	Retained
S2011FD-18	50.1 A	1.28 ABC	137 A	127.4 A	10.36	Retained
S2011 SL-62	41.3 BC	0.99 BC	49 DE	44.1 C	10.53	Rejected due to poor growth, stand, yield, low s.rec%& smut

M2238-89	40.2 BC	1.00 BC	70 CD	55.2 C	9.03	Rejected due to poor growth, stand, yield& low s.rec%
PSR 97-41	28.3 D	1.61 A	40 E	44.5 C	10.86	Retained
VMC 88-354	43.9 ABC	1.20 ABC	82 BC	95.5 B	9.41	Rejected due to red rot susceptibility& low s.rec%
CPF 249	36.8 C	1.16 ABC	67 CD	65.3 C	11.54	Check
HSF 240	46.4 AB	1.21 ABC	106 B	114.2 AB	11.11	Check
LSD value	**8.3741**	**0.5941**	**24.431**	**28.81**		
Set-2						
S2012 SL-426	50.8 ABC	1.05 B	76 B	76.0 BC	12.12	promoted
S2012 SL-443	34.6 E	1.46 B	60 B	68.8 CD	12.17	Retained
S2012 SL-883	42.3 D	1.53 B	93 AB	95.1 AB	10.42	Rejected due to red rot susceptibility &low s.rec%
S2012 M-632	44.3 CD	1.22 B	90 AB	80.5 BC	9.73	Rejected due to lodging, thin cane & low s.rec%
S2012 M-780	41.3 DE	1.32 B	77 B	52.4 D	10.93	Rejected due to high pith, thin cane, sever lodging & low cane
S2012 M-791	55.8 A	1.01 B	124 A	94.8 AB	10.38	Rejected due to pithiness, smut attack &low s.rec%
S2012 M-1362	53.1 AB	1.14 B	88 AB	79.5 BC	11.24	Retained
S2012 M-1379	43.9 CD	1.36 B	71 B	70.5 CD	10.58	Retained
CPF 249	26.8 F	2.45 A	59 B	59.0 CD	11.42	Check
HSF 240	46.0 BCD	1.11 B	118 A	117.4 A	11.33	Check
LSD value	**7.2003**	**0.7576**	**40.11**	**23.392**		

10. a <u>NATIONAL UNIFORM VARIETAL YIELD TRIAL (1st YEAR) 2017-19</u>

The experiment was conducted to study the growth, yield and quality performance of eighteen (18) sugarcane clones against standard varieties CPF 249 and HSF 240. The trial was laid out in randomized complete block design with three replications. The crop was planted at 120 cm apart trenches in plots measuring 4m x 6m on 29.09.2016. All the experimental units received all recommended agronomic practices uniformly.

The highest cane yield of 142.8 was recorded for PS-TJ-41 and lowest (63.9 t ha^{-1}) was produced by NIFA-1. The clones HoCP 810, HoCP 832, HoCP 840 and HoCP 846 are having thin cane and showed sever lodging tendency. The highest (12.9%) sugar recovery was associated with CPSG-2525 and lowest (7.93%) was exhibited by PS-TJ-41.

Table 1.8: Results of National Uniform Varietal Yield Trial, Set – I (First Year)

CLONE	Germ. (%)	Tillers /plant	Cane girth (cm)	Cane height (m)	Millable cane (000/ha)	Cane yield (t/ha)	Sugar recovery (%)	Sugar Yield (t/ha)
S2008-AUS-130	68.6 ABC	0.90 GH	2.40 ABCD	2.61 A	89 DEFG	98.0 CDEFG	12.10 ABC	12.6 ABC
S2008-AUS-134	66.2 BCD	1.90 GH	2.35 ABCD	2.62 A	86 DEFG	113.6 BCD	10.30 EFGHI	12.4 ABC
Ganj Bakhsh	25.5 H	2.22 A	2.67 A	2.32 ABCD	50 G	73.9 GHIJK	10.70 CDEFGH	8.43 D
PS-TJ-41	65 BCD	0.86 GH	2.37 ABCD	2.38 ABCD	112 CDE	142.8 A	7.93 J	12.1 BC
MS-2003-CP-368	66 BCD	2.01 AB	2.48 ABCD	2.51 ABC	101 CDEF	104.4 CDE	11.67 ABCDE	12.9 ABC
MS-2003-CP-380	67 ABCD	1.80 ABC	2.55 ABC	2.14 CD	128 BCD	99.1 CDEF	12.0 ABCD	12.7 ABC
MS-2003-CP-389	67.6 ABCD	1.64 BCDE	2.57 AB	2.31 ABCD	92 CDEFG	74.4 FGHIJK	12.40 AB	9.83 CD
S-9883-CSSG-155	58.4 DE	1.21 EFG	2.36 ABCD	2.30 ABCD	117 CDE	118.6 ABC	11.73 ABCDE	14.9 AB
Th-1312	44.4 G	0.81 GH	2.47 ABCD	2.12 CD	60 FG	75.0 FGHIJK	10.60 DEFGHI	8.53 D
NIFA-1	46.8 FG	1.87 ABC	2.52 ABCD	2.38 ABCD	55 G	63.9 K	12.23 AB	8.33 D
SL-96-061	65.9 BCD	1.67 BCDE	2.43 ABCD	2.38 ABCD	116 CDE	95.3 CDEFGHI	9.80 GHI	9.87 CD
SL-771	69.6 ABC	1.60 BCDEF	2.35 ABCD	2.31 ABCD	102 CDEF	97.5 CDEFGH	9.43 HI	9.73 CD
HoCP-810	73.9 AB	1.27 DEFG	2.05 D	2.14 CD	120 BCD	72.8 HIJK	10.2 FGHI	7.87 D
HoCP-832	67.3 ABCD	1.91 AB	2.35 ABCD	2.55 AB	198 A	89.2 DEFGHIJ	9.20 IJ	8.77 D
HoCP-840	69.7 ABC	1.74 ABCD	2.09 BCD	2.08 D	160 AB	69.7 JK	11.53 ABCDEF	8.47 D
HoCP-846	75.5 A	1.65 BCDE	2.36 ABCD	2.14 BCD	132 BC	77.5 FGHIJK	12.20 AB	10.1 CD
CPSG-2525	62.1 CDE	0.70 H	2.07 CD	2.21 ABCD	77 EFG	70.8 IJK	12.90 A	9.70 CD
CPSG-2730	62.1 CDE	1.13 FGH	2.19 ABCD	2.58 A	106 CDE	131.9 AB	11.13 BCDEFG	15.5 A
HSF 240	55.1 EF	1.86 ABC	2.27 ABCD	2.56 A	104 CDE	105 CDE	11.10 BCDEFG	12.5 ABC
CPF 249	60.5 CDE	1.41 CDEF	2.26 ABCD	2.33 ABCD	88 DEFG	86.7 EFGHIJK	11.23 BCDEFG	10.3 CD
LSD Value	**9.252**	**0.4868**	**0.4836**	**0.412**	**42.892**	**25.0**	**1.4588**	**3.2498**

b. NATIONAL UNIFORM VARIETAL YIELD TRIAL (2nd YEAR) 2016-18

The experiment was carried out to study the growth, yield and qualitative performance of nine (9) varieties against standard variety CPF 248. The experiment was laid out in randomized complete block design with three replications. The crop was planted at 120 cm

apart trenches in plots measuring 4m x 6m on 26.09.2016. The clone S2008 US-658 was found to be superior with highest cane yield of 123 t ha^{-1} as against the lowest (91.7 t ha^{-1}) for CPF 248. Whereas, maximum sugar recovery (12.4%) was recorded for MS-91-CP-523 and lowest (10.0%) in Th-1210.

Table 1.9: Results of National Uniform Varietal Yield Trial at Faisalabad - Set II (2nd Year)

CLONE	Germ. (%)	Tillers per plant	Cane girth (cm)	Cane height (m)	Millable cane	Cane yield (t/ha)	Sugar recovery (%)	Sugar yield (t/ha)
S2006 US-658	61.1 CDE	1.29 BCD	2.74 A	2.55 BC	103 AB	123 A	11.9 AB	14.6 A
S2006 US-272	76 A	1.18 BCD	2.57 B	2.50 C	78 D	98 BC	10.9 AB	10.6 BC
S2008 FD-19	52.5 E	2.01 A	2.31 C	2.31 D	104 ABC	116.3 AB	11.2 AB	13.0 AB
CPSG-06	71.8 AB	1.29 BCD	2.33 C	2.72 AB	115 A	114.7 AB	11.1 AB	12.7 ABC
NSG-197	64.1 BCD	1.54 B	2.26 C	2.72 AB	107 AB	122.3 A	10.8 AB	13.2 AB
Th-1210	69.7 ABC	1.05 D	2.71 AB	2.51 C	92 ABCD	98.3 BC	10.0 B	9.83 C
Th-7201	64.7 BCD	1.53 B	2.59 AB	2.77 A	100 ABCD	112 AB	11.6 AB	12.9 AB
MS-2000-HO-535	63.1 BCD	1.43 BCD	2.58 AB	2.50 C	97 ABCD	106.7 ABC	11.4 AB	12.1 AB
MS-91-CP-523	63.5 BCD	1.47 BC	2.34 C	2.43 CD	81 CD	104 ABC	12.4 A	12.9 AB
CPF 248 (Check)	57.0 DE	1.06 CD	2.59 AB	2.49 C	84 BCD	91.7 C	11.7 AB	10.7 BC
LSD Value	**8.9351**	**0.4144**	**0.1773**	**0.1773**	**23.998**	**27.043**	**2.2832**	**2.9041**

11. ZONAL VARIETAL TRIALS

1. Mian Aftab Ahmed, Kotli Mahtam Karam Pur, Mailsi

The data in table-1 revealed that the sugarcane clones S 2003-US-127, S 2008-FD-19 and S 2008-AUS-133 produced statistically high significant cane yield tones/ha i.e.139.06, 138.52 & 138.52 respectively. The aforesaid sugarcane clones were statistically at par with S 2003-US-633, CPF-249, S 2006-US-65 and S 2008-AUS-130 / ha, gave the cane yield tones/ha 134.68, 134.29, 133.47 & 131.69 respectively. The sugarcane variety HSF-240 produced the statistically low cane yield 120.64 tones/ha. As for as Brix% concerned the sugarcane clones S 2003-US-633 gone 23.6% which was followed by S 2003-US-127 and CPF-249 i.e. 22.7 & 22.3 respectively. The sugarcane clones S2008-AUS-133 gave the lowest Brix % i.e. 18.13.

1. Mian Aftab Ahmed, Kotli Mahtam Karam Pur, Mailsi						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	S2003-US-127	47.04 BC	1.54	118.54 CD	139.06 A	22.7
2	S2003-US-633	54.18 A	1.52	127.94 BC	134.68 AB	23.6
3	S2005-US-54	47.72 B	1.06	108.25 D	122.25 B	20.47
4	S2006-US-658	40.42 E	1.13	114.05 CD	133.47 AB	20.17
5	S2008-FD-19	48.36 B	1.91	152.11 A	138.52 A	20.53
6	S2008-AUS-130	43.49 CDE	1.32	150.41 A	131.69 AB	19.76
7	S2008-AUS-133	53.7 A	1.09	103.31 D	138.52 A	18.13
8	S2008-AUS-134	48.31 B	1.39	114.74 CD	121.13 B	18.19
9	SL-96-175	42.7 DE	1.05	101.33 D	120.89 B	19.43
10	CPF-249	45.34 BCD	1.15	136.49 AB	134.29 AB	22.3
11	HSF-240	44.87 BCD	1.08	146.89 A	120.64 B	20.06
	LSD at 0.05	1.7223	N.S	8.3336	6.7655	N.S

2. Ghulam Murtaza, Chak No.142/TDA lalazar, Layyah

The data in table-2 revealed that the sugarcane clone S 2003-US-127 gave the statistically significant cane yield 127.56 tones/ha. The sugarcane variety CPF-249 and sugarcane clones SL-96-175, S 2003-US-633 and S 2006-US-658 produced cane yield 127.12, 123.98, 123.62, and 122.48 tones/ha statistically at par with S 2003-US-127. The sugarcane clone S 2008-AUS-130 produced the statistically low cane yield 99.59 tones/ha. As for as Brix% concerned the sugarcane clone S 2003-US-633 gave more i.e. 24.86% whereas the sugarcane clone S 2008-AUS-134 produced the lower brix i.e. 18.13%.

2. Ghulam Murtaza, Chak No.142/TDA lalazar, Layyah						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	S2003-US-127	52.75 BC	1.003 C	107.32 BC	127.56 A	22.73
2	S2003-US-633	61.58 A	1.38 B	135.27 A	123.62 ABC	24.86
3	S2005-US-54	54.50 B	1.03 C	101.17 C	102.42 D	20.73
4	S2006-US-658	46.72 DEF	1.07 BC	121.92 AB	122.48 ABC	22.2
5	S2008-FD-19	44.92 EF	1.80 A	114.98 BC	109.74 CD	21.5
6	S2008-AUS-130	49.15 CDE	1.26 BC	116.55 B	99.59 D	21.73
7	S2008-AUS-134	49.47 CD	1.38 B	116.59 B	109.96 BCD	18.13
8	SL 96-175	43.86 F	1.05 BC	111.45 BC	123.98 ABC	19.67
9	CPF-249	47.72 DEF	1.03 C	120.56 AB	127.12 AB	23.46
10	HSF-240	47.88 DEF	1.10 BC	132.72 A	109.52 CD	21.13
	LSD at 0.05	2.069	0.1602	7.135	8.2307	

3. Naveed Ahmad, Mauza Mudwala Ali Pur

Data in table-3 depicted that the sugarcane clones S 2003-US-127 and S 2008-FD-19 gave the statistically significant cane yield 120.00 and 117.20 tones/ha respectively. The sugarcane

clones S-2003-US-633, S 2008-AUS-134 and S 2006-US-658 produced the cane yield 115.22, 112.21 and 110.50 tone/ha respectively that were statistically at par with S 2003-US-127 and S 2008-FD-19 in cane yield tones/ha. In case of brix % sugarcane clone S2003-US-633 gave the maximum 24.74 while the sugarcane clone S2008-AUS134 gave the lowest i.e. 18.19.

3. Naveed Ahmad, Mauza Mudwala Ali Pur						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	s2003-US-127	56.96 B	1.02	100 DE	120 A	22.8
2	S2003-US-633	77.18 A	1.32	110 C	115.22 AB	24.74
3	S2005-US-54	79.70 A	1.12	95.78 E	104.28 CD	20.93
4	S2006-US-658	75.33 A	1.15	103.89 CD	110.50 ABC	22.05
5	S2008-FD-19	59.63 B	1.56	126.94 A	117.20 A	21.59
6	S2008-AUS-130	59.11 B	1.44	104.83 CD	104.50 CD	19.76
7	S2008-AUS-133					
8	S2008-AUS-134	76.25 A	1.28	108.54 C	112.21 ABC	18.19
9	SL-96-175					
10	CPF-249	73.04 A	1	103.89 CD	105.39 BCD	22.54
11	HSF-240	59.33 B	1.09	118.22 B	98.04 D	21.49
	LSD at 0.05	5.1936	N.S	3.2731	5.0257	

4. Zaeem Ahmad, Chak No.8/p Khanpur

Data in table-4 showed that sugarcane clones S 2003-US-127, and S 2006-US-658 produced the statistically higher cane yield 11.95 and 110.83 tones/ha as compared to all other sugarcane clones and varieties. The sugarcane variety HSF-240 produced the statistically lowest cane yield 84.35 tones/ha. The Sugarcane clone S 2006-US-633 gave the highest Brix% 24.67 but the sugarcane clones S 2006-US-658 and sugarcane variety HSF-240 produced the lowest Brix% 21.67 and 21.00 respectively.

4. Zaeem Ahmad, Chak No.8/p Khanpur						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	S2003-US-127	48.00 B	2.01 AB	96.39 CD	111.95 A	23.67
2	S2003-US-633	49.33 B	1.60 BC	103.06 CD	102.69 B	24.67
3	S2005-US-54	66.00 A	1.11 D	98.89 CD	106.11 B	21
4	S2006-US-658	64.45 A	1,14 D	100.56 CD	110.83 A	21.67
5	S2008-FD-19	44.22 BC	2.12 A	124.26 A	90.74 C	22.67
6	S2008-AUS-130	45.78 B	1.39 CD	108.15 BC	91.57 C	22.33
7	S2008-AUS-133	37.56 CD	1.18 D	87.69 D	105.74 B	24
8	S2008-AUS-134	47.11 B	1.38 CD	109.72 ABC	93.70 C	23
9	CPF-249	34.89 D	2.07 A	109.91 ABC	103.70 B	22
10	CHSF-240	65.56 A	1.20 D	119.63 AB	84.35 D	21
	LSD at 0.05	6.99	0.43	15.75	4.31	N.S

5. Chohan Farm Chak NO. 160/E.B Vehari

Data in table -5 illustrated that the sugarcane clone S 2003-US-633 produced the statistically high cane yield 137.42 tones/ha as compared to all other sugarcane clones and varieties presented in table. The sugarcane clone S2008-AUS-130 produced the statistically lower cane yield 110.22 tones/ha. In case of sugar contents the sugarcane clone S 2003-US-633 gave the higher Brix% 24.53 followed by S 2003-US-127 and CPF-249 which produced 23.8% and 23.2% Brix respectively. The lowest Brix% was obtained by S 2008-AUS-130 i.e. 19.26%.

5. Chohan Farm Chak NO. 160/E.B Vehari						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	s2003-US-127	47.52 CD	0.64 B	125.10 B	129.90 B	23.8
2	S2003-US-633	52.20 AB	0.67 B	157.94 A	137.42 A	24.53
3	S2006-US-658	46.78 CD	0.68 B	125.58 B	132.14 B	20.36
4	S2008-FD-19	50.02 BC	0.98 A	147.93 A	127.73 B	22.4
5	S2008-AUS-130	54.07 A	0.53 BC	109.98 C	110.22 E	19.26
6	S2008-AUS-133	42.81 EF	0.42 C	110.89 C	119.02 CD	19.83
7	CPF-249	40.35 F	1.03 A	108.91 C	126.57 BC	23.2
8	HSF-240	45.38 DE	1.02 A	153.06 A	115.73 DE	20.3
	LSD-0.05	1.6301	0.0864	5.2409	3.815	

6. Ghulam Mustafa Sumra LSM Farm Layyah (September Sowing)

The data in table-6 indicated that the sugarcane clone S 2006-US-658 and S 2003-US-633 produced the statistically significant higher cane yield 137.33 and 133.26 tones/ha as compared to other sugarcane clones given in table. The sugarcane variety HSF-240 gave the statistically lower cane yield 106.69 tones/ha. As for as sugarcane contents concerned the sugarcane clone S 2003-US-633 and S 2003-US-127 produced the higher Brix% 24.4 and 23% respectively. The sugarcane clones S 2006-US-658 and S 2008-AUS-133 produced the low Brix% 19.53 and 18.87 respectively as compared to others.

6. Ghulam Mustafa Sumra LSM Farm Layyah (September Sowing)						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	s2003-US-127	44.87 C	0.94 BC	111.84 CD	120.44 BC	23
2	S2003-US-633	45.98 C	1.38 A	131.54 AB	133.26 A	24.4
3	S2006-US-658	49.21 BC	1.13 AB	108.67 CD	137.33 A	19.53
4	S2008-FD-19	48.57 BC	1.03 BC	114.20 BCD	116.29 CD	22.8
5	S2008-AUS-130	63.65 A	0.85 BCD	138.49 A	118.27 BC	21.5
6	S2008-133	46.67 C	0.56 DE	99.17 D	121.93 BC	18.87
7	CPF-249	53.75 B	0.42 E	125.71 ABC	127.71 AB	22.33
8	HSF-240	47.88 BC	0.78 CD	121.01 ABC	106.69 D	21.33
	LSD-0.05	3.0779	0.1504	8.9056	5.1161	

7. Ashraf Sugar Mill Farm Bahawalpur (September Sowing)

The data in table-7 illustrated that the sugarcane clones S 2003-US-633 and S 2008-AUS-133 produced the statistically significant cane yield 125.66 and 126.31 tones/ha respectively. The aforesaid sugarcane clones statistically at par with S 2006-US-658 and HSF-240 which was produced the cane yield 121.15 and 122.64 tones/ha. The sugarcane clone S 2008-AUS-130 produced the statistically low cane yield 105.48 tones/ha. In case of Brix% the sugarcane clone S 2003-US-633 gave the more 23.14% as compared to others while the sugarcane clones S 2008-AUS-130 gave the lowest Brix% 19.33.

7. Ashraf Sugar Mill Farm Bahawalpur (September Sowing)						
Sr. No.	**Varieties/Clones**	**Germination%**	**Tiller/plant**	**Canes/Ha (000)**	**Cane Yield (t/ha)**	**Brix%**
1	s2003-US-127	58.36 C	1.99	134.46 BC	125.16 B	24.53
2	S2003-US-633	71.06 ABC	1.74	144.51 A	126.23 B	22.17
3	S2006-US-658	73.81 AB	1.36	136.18 B	132.59 A	19.37
4	S2008-FD-19	64.97 BC	2.18	142.15 A	133.40 A	20.6
5	S2008-AUS-130	80.28 A	1.73	110.24 E	112.83 C	18.73
6	S2008-133	70.37 ABC	1.35	121.61 D	113.55 C	18.87
7	CPF-249	66.82 BC	1.73	130.72 C	122.02 B	22.03
8	HSF-240	60.63 BC	2.13	118.59 D	112.36 C	20.3
	LSD-0.05	6.1979	N.S	2.496	2.654	

8. Safina Sugar Mill Ltd, Lallian Zonal Trial (February, 2017-18)

This zonal trial comprised of ten varieties of sugarcane. The experiment was laid out in RCBD having three repeats. The crop was sown @ 50000 TBS / ha on Ist March,2017. All other agronomic practices were kept normal and uniform. It is obvious from the Table No.2 that all the varieties gave the different cane yield significantly. So S2003-US-127 gave the maximum cane yield of 128t/ha having brix of 17 % it was followed by S2008-FDS-19 and S2005-US-54 giving cane yield of 120 t/ha and 117 t/ha with brix of 20 % and 21 % respectively.

8. Safina Sugar Mill Ltd, Lallian Zonal Trial (February, 2017-18

Sr. No.	Treatments	Germination (%)	Tillers/Plant	Thousand cane 1/ha	Cane yield(t/ha)	Brix %
1	FDS-19	51.33 abc	1.70 a	125 ab	120 ab	20 bcd
2	S2003-US-127	44.66 c	1.51 d	130 a	128 a	17 de
3	S2006-US-658	51.00 abc	1.19 d	103 d	111 ab	26 ab
4	S2008-AUS-130	52.00 ab	1.34 bcd	108 bcd	106 bc	25 a

5	S2005-US-633	54.66 ab	1.56 ab	110 bcd	90 c	21 bc
6	CPF-249	52.00 a	1.15 d	112 bcd	101 bc	22 ab
7	S2008-AUS-133	51.66ab	1.54 d	102 d	103 bc	20 bcd
8	HSF-240	47.00 bc	1.29 cd	118 abcd	110 abc	18 cde
9	S2008-AUS-134	46.33 bc	1.21 bc	105 cd	108 abc	16 e
10	S2005-US-54	54.00 a	1.53 ab	120 a	117ab	21 bc
	LSD=0.05	**3.2596**	**0.1100**	**8.1600**	**9.8210**	**1.8479**

9. GOVT. Seed Farm, Chalianwala Zonal Trial (September, 2016-17).

This zonal trial was laid out in RCBD with three repeats. It was comprised of eight sugarcane varieties. The crop was sown @ 50000 TBS / ha in autumn season. All other agronomic practises were kept normal and uniform. It is obvious from the Table No.1 that S2008-FD-19 gave the maximum cane yield of 148.57 t/ha with CCS% of 11.99. It was followed by S2008-AUS-130 giving cane yield of 137.73 % t/ha with CCS % of 11.48.

9. GOVT. Seed Farm, Chalianwala Zonal Trial (September, 2016-17).

Sr. No.	Varieties / clones	Germination %	Tillers / plant	Thousands Canes /ha	Yield (t/ha)	CCS %
1	S2008-FD-19	61.88 c	2.19 a	159.13 a	148.57 a	11.99 c
2	S2006-US-658	57.22 d	1.68 b	147.73 e	114.87 e	10.86 e
3	S2003-US-633	76.55 a	1.43 bc	138.30 de	116.05 de	13.82 a
4	S2003-US-127	54.05 e	1.43 bc	129.70 c	129.00 c	12.70 b
5	S2008-AUS-130	64.78 b	1.75 b	152.20 b	137.73 b	11.48 d
6	S2008-AUS-133	56.11 de	1.37 d	117.17 g	101.77 g	11.67 d
7	HSF 240	51.55 f	2.10 a	134.07 f	108.23 f	11.45 d
8	CPF249	75.88 a	1.35 de	110.23 d	120.80 d	12.75 b
LSD 0.05		**1.952**	**0.195**	**6.657**	**5.750**	**0.516**

10. GOVT. SEED FARM, CHALIANWALA, ZONAL TRIAL (FEBRUARY, 2017-18).

This zonal trial was also comprised of ten varieties of sugarcane. The experiment was laid out in RCBD having three repeats the crop was sown @ 50000 TBS / ha on 7th March,2017. All other agronomic practices were kept normal and uniform. It is obvious from the Table No. 3 that all the varieties gave the different cane yield significantly. So S2006-US-658 gave the maximum cane yield of 122.37 t/ha

having CCS % of 12.70. It was followed by S2008-FDS-19 giving cane yield of 118 t/ha with CCS % of 13.19.

10. Govt. Seed Farm, Chalianwala, Zonal Trial (February, 2017-18).

Sr. No.	Varieties / clones	Germ. %	Tillers / plant	Thousands Canes / ha	Yield (t/ha)	CCS %
1	S2008-FD-19	61.96 c	1.91 a	142.27 c	118.00 b	13.19
2	S2006-US-658	57.90 d	1.78 b	168.07 a	122.37 a	12.70
3	S2003-US-633	55.98 e	1.76 b	161.10 b	85.55 g	14.45
4	S2003-US-127	46.89 g	1.54 c	143.10 c	91.23 f	13.45
5	CPF249	63.15 b	1.52 c	131.97 d	113.53 c	14.18
6	S2005-US-54	68.02 a	1.14 e	113.33 g	85.75 g	13.96
7	S2008-AUS-130	47.07 g	1.75 b	130.63 d	86.13 g	14.02
8	S2008-AUS-134	56.02 e	1.55 c	125.60 e	95.80 e	12.88
9	HSF 240	52.42 f	1.15 e	119.85 f	92.45 f	12.92
10	S2008-AUS-133	47.95 g	1.42 d	120.85 f	107.85 d	13.25
LSD at 0.05		**1.758**	**0.205**	**7.155**	**3.278**	**N.S**

11. Village Mora, Bochekey District Nankana, Zonal Trial (February, 2017-18).

This zonal trial was comprised of ten varieties of sugarcane. The experiment was laid out in RCBD having three repeats. The crop was sown @ 50000 TBS / ha on 13th March,2017. All other agronomic practises were kept normal and uniform. It is obvious from the Table No.4 that all the varieties of sugarcane gave the different cane yield significantly. So S2006-US-658 gave the maximum cane yield of 125 t/ha with brix % of 24. It was followed by variety of S2005-US-54 that gave cane yield of 112 t/ha with brix % of 19.

11. Village Mora, Bochekey District Nankana, Zonal Trial (February, 2017-18).

Sr. No.	Treatments	Germination (%)	Tillers/ Plant	Thousand Canes /ha	Cane yield (t/ha)	Brix %
1	FDS-19	45.67 b	1.75 a	135 a	101 abc	20.66 bcd
2	S2003-US-127	34.33 e	1.09 e	125 ab	110.66 ab	24 a
3	S2006-US-658	38.00 cd	1.26 cde	122.33 abc	125. a	19.66 cde
4	S2008-AUS-130	41.67 b	1.36 bcd	123.33 abc	108.33 ab	22 abc
5	S2005-US-633	47.67 a	1.43 bc	129.33 ab	85.33 bc	23 ab
6	CPF-249	40.67 bc	1.18 de	104.33 c	90.33 bc	21 bcd
7	S2008-AUS-133	47.67 a	1.17 de	105 c	103.33 abc	20.66 bcd

8	HSF-240	33.67 e	1.25 cde	125 ab	91.66 bc	20 cde
9	S2008-AUS-134	35.33 de	1.53 b	112 bc	102 abc	17.66 e
10	S2005-US-54	42.33 b	1.17 e	120 abc	112 ab	19 de
LSD=0.05		**1.5651**	**0.0995**	**9.0852**	**14.294**	**1.1189**

12. INTRODUCTION AND MAINTENANCE OF GENE POOL

Introduction, a breeding technique which is used for the increase and to expand the already available germ-plasm. During 2017.18 416 varieties included in the experiment were sown as fresh crop. A list of the countries from which gene pool belongs is presented in the table given below:

Country	**Nos.**	**Country**	**Nos.**
Australia	9	Mauritius	01
Bangladesh	3	Mexico	09
Brazil	13	Pakistan	113
China	02	Taiwan	02
India	11	U.S.A.	113
Indonesia	01	Gen pool from	107
West Indies (Barbados)	23	Murree	
		Total:	**416**

13. TAXONOMIC CLASSIFICATION OF CANE VARIETIES/CLONES

To identify new sugarcane varieties/lines, eleven (18) entries were studied taxonomically. Ten (10) matured plants were selected randomly from each variety. Number of mill able canes regarding each plot was recorded. One healthy cane from each selected plant was taken out to study other characteristics. Qualitative characters were recorded by visual observations and quantitative characters were recorded by measuring the characters; whereas brix %age was recorded by hand refrecto-meter and then average was calculated.

New sugarcane varieties / lines were studied taxonomically during 2017-18. Detailed taxonomy of the above varieties is shown in the Table.

Table 1.10 - Detailed taxonomy of the above varieties

CHARACTER	S-2008-AUS-133	S-2005-US-54	S-2008-FD-25	S-2008-AUS-134	S-2009-SA-8	S-2011-FD-18	S-2011-SL-62	M-2238-89	PSR-97-41
1. PLANT									
Height at maturity (cm)	421	405	401	446	455	425	429	427	423
Growth Habit	Semi erect	Semi erect	Erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect
Tillering	Good	Good	Good	Good	Good	Good	Good	Good	Good
Stooling	6	7	6	7	7	9	6	6	8
Tops	Heavy	Light	Light	Heavy	Medium	Medium	Medium	light	Heavy
Trash	clinging	Loose	Medium	Medium	Loose	Loose	Loose	Loose	Medium
2. LEAF									
No. of Leaves/ Plant	29	25	25	26	21	26	32	26	26
Length (cm)	133	136	163	172	177	133	145	143	138
Width (cm)	45	4.0		3.37	4.37	4.37	4.4	4.25	4.55
Color	Green	Green	Green	Green	Green	Green	Green	Green	Green
Attitude	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect
Surface	Plain	Plain	Plain	Plain	Plain	Plain	Plain	Plain	Plain
Margins	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated
Ligule	Crescent	S Crescent	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid
Auricle	Long lance late	Absent	Present	Present	Present	Absent	Absent	Long lanceolate	Long lanceolate

3. SHEATH									
Length (cm)	32	31	31	33	30	31	24	32	33
Spines	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent
Clasping	Light	Loose	Loose	Loose	Light	Loose	Loose	Loose	Loose
Trashing	Clinging	Loose	Loose	Loose	Loose	Loose	Loose	Loose	Loose
Colour	Green	Green	Green	Green	Green	Green	Green	Green	Green
Pubescence	Absent	Absent	Present	Present	Absent	Absent	Absent	Present	Absent
Anthocyanin	Present	Absent	Present	Absent	Absent	Absent	Absent	Present	Absent
Wax	Absent	Absent	Present	Absent	Absent	Present	Present	Present	Present
Dewlap Color	Green	Green	Green	Green	Green	Green	Green	Green	Green
Dewlap shape	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid
Dewlap wax	Absent	Present	Present	Absent	Present	Present	Present	Present	Present
4. CANE									
Cane Length (m)	2.2	2.1	2.08	2.79	2.37	2.25	2.62	2.37	2.25
Thickness									
Color (Exposed)	Yellowish	Green	Yellowish white	Greenish yellow	Green	Yellowish	Yellowish Green	Purplish Yellow	Light Green
Color (Unexposed)	Yellowish Green	Greenish	Yellowish	Yellowish	Yellow	Yellow	Greenish yellow	Yellowish	Yellowish Green
Cane hardness	Hard	Soft	Soft	Soft	Soft	Medium	Soft	Soft	Soft
Internode Length (cm)	1312	16.0	16.0	14.32		15.25			
Shape	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical
Splits	Absent	Present	Absent	Absent	Absent	Present	Absent	Present	Absent

5. INTERNODE									
Length (cm)	13.2	13.5	12.9	17.07	13.87	14	16	15	14
Diameter									
Shape	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical
Splits	Absent	Present	Present	Absent	Absent	Present	Absent	Present	Absent
Depth of splits	Absent	Shallow	Absent	Absent	Absent	Absent	Absent	Present	Absent
Ivory marking	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Bud grove	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Present
5. BUD									
Groove depth	Absent	Absent	Long	Absent	Absent	Absent			
Colour	Yellow	Yellow	Green	Green	Yellow	Yellow			
Base	At scare	At scare	At scare	At scare	At scare	At scare	At scare	At scare	At scare
Growth ring shape	Swollen	Even	Swollen	Swollen	Even	Even			
Root band rows	2	2	2	2	2	2	2	2	2
Root band width (mm)	10	11	5.5	7.5	5.0	5	6	5	5
Color exposed	Yellowish	Yellowish	Yellowish Green	Greenish yellow	Green	Yellowish	Yellowish	Purplish	Light Green
Color unexposed	Yellowish Green	Greenish	Yellowish	Yellowish	Yellow	Yellow	Greenish yellow	Yellowish	Yellowish Green
Flowering	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Lodging	Absent	Absent	Absent	Medium	Lodging	Absent	Absent	Absent	Absent
1. PLANT									

Height at maturity (cm)	425	489	456	494	508	477	483	455	466
Growth Habit	Semi Erect	Semi Erect	Semi Erect	Semi Erect	Semi Erect	Semi Erect	Semi Erect	Semi Erect	Semi Erect
Tillering	Good	Good	Good	Good	Good	Good	Good	Good	Good
Stooling	8	7	6	8	7	5	6	7	8
Tops	Light	Heavy	Light	Light	Light	Heavy	Light	Medium	Light
Trash	Medium	Medium	Loose	Loose	Loose	Loose	Loose	Loose	Loose
2. LEAF									
No. of Leaves/ Plant	28	29	30	26	26	40	31	35	31
Length (cm)	150	189	179	165	151	159	169	142	138
Width (cm)	4.12	3.96	5.82	4.05	4.30	4.65	3.02	4.20	3.48
Color	Green	Green	Green	Green	Green	Green	Green	Green	Green
Attitude	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect	Semi erect
Surface	Plain	Plain	Plain	Plain	Plain	Plain	Plain	Plain	Plain
Margins	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated	Serrated
Ligule	Crescent	Crescent	Semi Crescent	Crescent	Crescent	Crescent	Crescent	Crescent	Deltoid
Auricle	Present long	Present long	Present	Present	Present	Present	Present	Present	
3. SHEATH									
Length (cm)	30	35	35.47	36.75	35.7	31	35-35	31.5	31
Spines	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Clasping	Clinging	Clinging	Clinging	Clinging	Clinging	Clinging	Clinging	Clinging	Loose
Trashing	Medium	Medium	Loose	Loose	Loose	Loose	Loose	Loose	Loose
Colour	Green	Green	Green	Green	Green	Green	Green	Green	Green

Pubescence	Present	Absent	Absent	Present	Present	Present	Present	Present	Absent
Anthocyanin	Present	Present	Absent	Present	Present	Present	Present	Present	Present
Wax	Present	Present	Present	Present	Present	Present	Present	Present	Present
Ligule Shape	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	
Auricle Size	Medium	Medium	Medium	Small	Absent	Small	Small	Small	Deltoid
Auricle Shape	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Present
Dewlap Color	Green	Green	Green	Green	Green	Green	Green	Green	Green
Dewlap shape	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid	Deltoid
Dewlap wax	Present	Present	Present	Present	Present	Present	Present	Present	Present
4. CANE									
Cane Length (m)	2.15	2.74	2.57	2.61	2.90	2.65	2.67	2.94	2.55
Thickness (cm)	2.8	2.5	2.3	2.45	2.44	2.15	2.48	2.56	
Colour (Exposed)	Yellowish	Yellowish	Yellowish	Greenish	Yellowish green	Yellowish	Greenish	Purplish Green	Purplish
Colour (Unexposed)	Yellowish	Yellowish Green	Yellowish	Yellowish Green	Yellowish	Yellowish	White Green	Yellowish Green	Greenish
Cane hardness	Soft	Hard	Hard	Hard	Soft	Hard	Soft	Hard	Soft
Internode Length (cm)	12.7	14.3	14.25	13	120	16.25	15.1	14.5	15
Internode Diameter(cm)	2.8	2.5	2.3	2.45	2.44	2.15	2.45	2.56	2.50
Shape	Cylindrical	Cylindrical	Bobbin	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical
Position	Aligned	Zigzag	Zigzag	Zigzag	Aligned	Aligned	Zigzag	Zigzag	Aligned
Wax	Present	Present	Present	Present	Present	Present	Present	Present	Present
Splits	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent

Streaks	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Pith	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Flesh color	Whitish	Whitish	Whitish	Whitish	Whitish	Whitish	Whitish	Whitish	Whitish
5. INTERNODE									
Length (cm)	12.7	14.3	14.25	13	12	16.25	15.1	14.25	15
Diameter (cm)	2.8	2.5	2.3	2.45	2.44	2.15	2.45	2.56	2.50
Shape	Cylindrical	Cylindrical	Bobbin	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical	Cylindrical
Splits	Absent	Absent	Present	Absent	Absent	Absent	Absent	Present	Absent
Depth of splits			Shallow					Deep	Absent
Ivory marking	Present	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent
Bud grove	Present	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent
6. NODE/ BUD									
Groove depth	Present	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent
Colour	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Base	At scar	At scar	At scar	At scar	At scar	At scar	At scar	At scar	At scar
Growth ring shape	Swollen	Even	Even	Swollen	Even	Even	Even	Even	Even
Root band rows	2	2	2	2	2	2	2	2	2
Root band width (mm)	7	8	9	10	8	10	8	7	5
Colour exposed	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Purplish
Colour unexposed	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green
Flowering	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Lodging	Absent	Absent	Absent	Lodging	Absent	Present		Severe Lodging	Present
Bud Shape	Round	Round	Round	Round	Round	Ovate	Ovate	Round	Round

2. SUGARCANE AGRONOMY

1. INTEGRATED WEED MANAGEMENT IN SUGARCANE

The experiment was planted in spring 2017 to find out the most effective combination of weed control in sugarcane. According to the results, the treatment T_6 (Manual weeding 30 DAP* + one mechanical weeding 60 DAP + earthing up 90-100 DAP) gave significantly higher cane yield (103.22 t/ha) followed by T_3 (Scope 80 W.P @ 1 kg /acre pre-emergence + Sunstar @ 20 g /acre post emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP) which gave cane yield of 102.78 t/ha. However, minimum cane yield (66.05 t/ha) was recorded in T_7 (control).

*(DAP) Days after planting

Table 2.1: Integrated Weed Management in Sugarcane

Treatment	Tiller/ plant	No. of canes (000 ha^{-1})	Cane height (m)	Cane yield (t ha^{-1})
T_1: Dual gold @ 800 ml/acre pre-em + one mechanical weeding 60 DAP + earthing up 90-100 DAP.	2.49 d	81.28 e	2.41 c	81.86 e
T_2 : Scope 80 W.P @ 1 kg /acre pre-em + one mechanical weeding 60 DAP + earthing up 90-100 DAP	2.88 b	97.95 b	2.59 b	94.15 b
T_3: Scope 80 W.P @ 1 kg /acre pre-em + Sunstar @ 20 g /acre post em + one mechanical weeding 60 DAP + earthing up 90-100 DAP	2.86 b	100.48 ab	2.78 ab	102.78 a
T_4: Falisto gold @ 1000 ml/acre post-em. + one mechanical weeding 60 DAP + earthing up 90-100 DAP	2.35 e	84.35 d	2.57 b	88.95 c
T_5: Atrazine @ 1000 ml/acre post-em + one mechanical weeding 60 DAP + earthing up 90-100 DAP	2.65 c	88.22 c	2.51 bc	84.55 d
T_6: Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP	3.05 a	102.28 a	2.92 a	103.22 a
T_7: Control	2.18 f	64.45 f	2.27 d	66.05 f
LSD (P ≤ 0.05)	**0.15**	**3.22**	**0.17**	**2.15**

2. WEED MANAGEMENT IN SUGARCANE

The experiment was planted in spring 2017 to find out the integrated weed management in plant crop. According to the results, the treatment T_2 (Mesotrione + Atrazine + Holosulfuron @ 600g /acre post-emergence + one mechanical weeding 60-65 DAP + earthing up 100 DAP) produced significantly higher cane yield (99.25 t/ha) followed by T_6 (Interculture (Tractor) 30 DAP + one mechanical weeding 60-65 DAP + earthing up100 DAP) and T_5 (Interculture (Tractor) 30 DAP + S-metolachlor @ 1000 ml/acre post-em + one mechanical weeding 60-65 DAP + earthing up 100 DAP) which produced cane yield of 97.54

and 97.23 t/ha respectively. However, minimum cane yield (62.68 t/ha) was recorded inT_7 (control).

Table 2.2:- Weed Management in Sugarcane

Treatment	Tiller/ plant	No. of canes (000 ha^{-1})	Cane height (m)	Cane yield (t ha^{-1})
T_1: Ametryn + Atrazine 50 WP @ 1000 ml/acre post-emergence + one mechanical weeding 60-65 DAP (Days After Planting) + earthing up 100 DAP.	2.52 c	127.48 b	2.42 c	86.54 b
T_2 : Mesotrione + Atrazine + Holosulfuron @ 600g /acre post-emergence + one mechanical weeding 60-65 DAP + earthing up 100 DAP	2.79 b	128.22 b	2.69 a	99.25 a
T_3: Topramesone + Atrazine @ 1000ml /acre post-emergence + one mechanical weeding 60-65 DAP + earthing up100 DAP	2.78 b	130.92 ab	2.58 ab	88.25 b
T_4: Mesotrione + Atrazine 550 SC @ 1000 ml/acre post-em. + one mechanical weeding 60-65 DAP + earthing up 100 DAP	2.52 c	123.29 c	2.53 b	89.48 b
T_5: Interculture (Tractor) 30 DAP + S-metolachlor @ 1000 ml/acre post-em + one mechanical weeding 60-65 DAP + earthing up 100 DAP	2.56 c	119.36 d	2.48 bc	97.23 a
T_6: Interculture (Tractor) 30 DAP + one mechanical weeding 60-65 DAP + earthing up100 DAP	2.98 a	132.18 a	2.64 a	97.54 a
T_7: Control (Weedy check)	2.06 d	116.55 e	2.35 d	62.68 c
LSD (P ≤ 0.05)	**0.138**	**3.125**	**0.152**	**4.654**

3. PERFORMANCE OF CLONES/ VARIETY IN PIPELINE UNDER DIFFERENT MOISTURE REGIMES.

The trial was laid out in RCBD under split plot arrangement with three repeats having net plot size 9.6 m x 4m. The crop was planted on 5th April 2017. Three irrigation levels VIZ 1.0, 0.8 and 0.6 co-efficient were kept in main plot while the four clones i.e. S2003-US-127, S2005-US-54, S.2008-AUS-130, S2008-AUS-134 and CPF-249 (Standard) were planted in sub-plots. Irrigation scheduling with respect to co-efficient was set after earthing up of crop. Data regarding germination and tillering was noted during formative stage, while cane count, cane yield and sugar recovery were recorded at the time of harvest.

A. Irrigation Levels
B. Varieties
C. (A x B) Irrigation x Varieties

Effect of Irrigation level

Irrigation co. efficient 1.0 showed the statistically significant effect on cane yield tones/ha in cloves i.e. S2003-US-127, S2008-AUS-130 and S2005-US-54 gave 124.36, 120.07 &118.05 t/ha, respectively.

The same trend was observed in $I_{2=0.8}$ co-efficient. The 3rd irrigation level 0.6 co-efficient showed the significantly low performance, while the S. Cane clone S2008-AUS-130 showed the statistically better performance i.e. 100.43 t/ha as compared to other S. Cane clones at this level. Consequently, the irrigation levels 1.0 and 0.8 co-efficient produced the good result but the CCS % have no effect by irrigation level statistically.

2.3. Performance of Clones/ Variety In Pipeline Under Different Moisture Regimes.

Treatment	Germination%	Tillers/plant	No of (000) canes/ha	Cane yield 1/ha	CCs%
A)Irrigation Levels					
1.0 Co-efficient	53.750 a	1.060	111.47 a	115.11 a	13.275
0.8 Co-efficient	52.042 b	1.033	103.84 b	110.57 b	13.727
0.6 Co-efficient	50.805 c	1.088	101.74 b	94.99 c	13.421
LSD 0.05	0.189	----	1.668	0.724	----
B) Varieties					
V_1S2008-AUS-130	52.130 b	1.071	110.23 a	112.74 a	14.061 a
V_2S2003-US-127	52.130 b	1.085	106.95 ab	112.69 a	14.442 a
V_3S2005-US—54	54.143 a	1.118	106.92 ab	107.92	12.726 c
V_4s2008-AUS-134	50.278 c	1.012	97.95 c	97.97 d	13.323 b
LDS 0.05	0.479	----	1.840	1.248	0.249
A x B) Irrigation Level x Varieties					
I_1X V_1	53.403	1.017	115.130	120.07 ab	13.95
I_1X V_2	53.750	1.097	113.653	124.36 a	14.18
I_1X V_3	56.597	1.103	115.535	118.05 b	12.87
I_1X V_4	54.444	1.033	110.790	106.78 cd	12.40
I_1X V_5	50.556	1.050	102.208	106.29 cd	12.98
I_2 X V_1	52.083	1.070	106.445	117.72 b	14.44
I_2 X V_2	52.222	1.050	103.847	120.49 ab	14.79
I_2 X V_3	53.889	1.033	105.958	110.47 c	12.76
I_2 X V_4	52.083	1.050	106.695	104.47 c	12.76
I_2 X V_5	49.931	0.990	96.250	99.38 fg	13.34
I_3 X V_1	50.903	1.127	109.111	100.43 ef	13.80
I_3 X V_2	50.417	1.110	103.365	93.22 h	14.36
I_3 X V_3	51.944	1.247	99.278	95.25 gh	12.83

I_3 X V_4	50.417	0.960	101.564	97.81 fg	12.46
I_3 X V_5	50.347	0.997	95.403	88.25 i	13.66
LSD 0.05	----	----	----	2.163	-----

The said data was analyzed statistically using Fisher's analyzed of variance Techniques and LSD test was used to compare treatment means at 0.05 level of probability. The result given is table showed that minimum germination of 54.14% was recorded in S2005-US-54 while the minimum 50.28% was noted in CPF-249. As for as irrigation level concerned 1.0 co efficient gave the statistically significant. Germination %i.e. 53.75a,No. of "000" canes/ha 111.47a and cane yield tones/he i.e. 115.11awhich was followed by other two irrigation levels i.e. 0.8 and 0.6 co-efficient. These both showed the statistically minimum results i.e. germination (52.04 %, no. of "000" cane/ha 103.84 & 101.74 and cane yield t/ha 110.57 & 94.99 respectively.

The sugarcane cloves S2008-AUS-130 and S2003-US-127produced statistically same/at par with respect to millable canes/ha, cane yield t/he and CCS% i.e. 110.23, 106.95 "000" canes/ha, cane yield 112.74 & 112.69 t/ha, the CCS % 14.06 & 14.44. These two clones at par with S2005-US-54 in "000" cane/he i.e. 106.92 only other contributing factors statistically less. The S. Cane variety CPF-249 produced statistically less no. of "000" cane/ha i.e. 97.95, cane yield tones/ha 97.97 where as in CCS % the sugarcane clone S2008-AUS-134 gave the statistically lowest i.e. 12.72.

It is obvious from the data-table that the sugarcane clone S2003-US-127 excellent in sugar recovery 14.44% over other genotypes and minimum sugar recovery of 12.72% was recorded in S2008-AUS-134, while irrigation co-efficient have no effect on sugar recovery.

4. PERFORMANCE/ RESPONSE OF S. CANE CLONES/ VARIETIES AT DIFFERENT NITROGEN LEVEL

The experiment was laid out in RCBD with split plot arrangements having three replications on 7th April 2017. The basal dose of Phosphorus and Potash were applied at the planting time but the nitrogen was applied in the form of urea in three splits. Three S. Cane clones and two S. Cane varieties were planted with four nitrogen levels. Data regarding germination and tillering were taken during formative stage, while cane count, cane yield and sugar recovery at the time of harvest.

2.4. Performance/ Response of S. Cane Clones/ Varieties at Different Nitrogen Level

Treatment	Germination%	Tillers/plant	No of (000) canes/ha	Cane yield 1/ha	CCs%
A) Fertilizer Levels					
F_1 26-112-112 NPK kg/ha	51.69	1.679 b	93.299	89.57 c	13.78
F_1 68-112-112- NPK kg/ha	51.22	1.613 b	94.366	108.84 b	13.83
F_3 10-112-112 NPK kg/ha	51.53	1.701 b	97.578	123.09 a	13.83
F_4 252-112-112 NPK kg/ha	50.93	2.077 a	95.278	124.52 a	13.39
LSD (P < 0.05)	----	0.128	----	0.991	----
B) Varieties					
V_1 CPF-246	51.597 b	1.296 b	93.717 c	105.43 c	14.19 b
V_2 S2005-US-54	52.396 ab	1.522 b	100.217 b	117.96 b	13.05 d
V_3 S2006-US-658	50.165 c	1.416 b	85.894 d	117.48 b	12.44 e
V_4S2003-US-633	52.969 a	3.135 b	108.47 a	120.53 a	15.06 a
V_5 CPF-248	49.583 c	1.373 b	87.348 d	96.14 d	13.54 c
LSD(P< 0.05)	0.414	0.144	1.778	0.603	0.189
C) Application of Nitrogen					
T_1 = 45,85,115	51.40	1.76	95.37	108.90 b	13.77 a
T_2 = 45,85,115,145	51.28	1.74	94.89	114.11 a	13.54 b
LSD(P<0.05)	----	----	----	0.292	0.189
A x 3) Fertilizer Levels x Varieties					
F_1 x V_1	51.63	1.218	95.139	89.497	14.43
F_1 x V_2	52.36	1.492	98.047	92.795	13.27
F_1 x V_3	51.28	1.337	81.641	93.316	12.63
F_1 x V_4	53.26	2.867	105.339	93..924	15.03
F_1 x V_5	49.90	1.183	86.328	78.342	13.54
F_2 x V_1	51.53	1.085	91.363	101.128	14.18
F_2x V_2	51.94	1.222	101.606	114.974	13.15
F_2 x V_3	49.55	1.333	82.422	144.627	12.85
F_2 x V_4	53.30	3.173	110.7644	116.406	15.22
F_2 x V_5	49.79	1.252	85.677	97.049	13.77
F_3 x V_1	51.91	1.217	94.488	113.628	14.27
F_3 x V_2	53.13	1.253	101.172	131.684	13.22
F_3 x V_3	50.10	1.297	92.535	130.686	12.29
F_3 x V_4	53.13	3.238	109.592	135.156	15.04
F_3 x V_5	49.38	1.498	90.104	104.297	13.27
F_4 x V_1	51.32	1.665	93.880	117.448	13.89
F_4 x V_2	52.15	2.123	100.043	132.378	12.57
F_4 x V_3	49.72	1.777	86.979	131.293	11.98
F_4 x V_4	52.19	3.262	108.203	136.632	14.93
F_4 x V_5	49.27	1.560	87.283	104.861	13.56
LSD 0.05	----	----	----	----	----

Data of the said experiments were analyzed statistically using Fisher's analysis of variance techniques and LSD test used to compare treatment means at 0.05 level of probability. Data illustrated in table showed that fertilize levels having non-significant effect over germination% "000" canes/ha and CCS%. Maximum cane yield tones/he was obtained at fertilize levels F_3 & F_4 i.e. 123.09 and 124.52 t/ha having the statistically same letter.

The fertilize level F1 126-112-112 NPK (kg ha) produced statistical lowest cane yield 89.57 tones/ha while the fertilizer level F_2 168-112-112-NPK (kg ha) gave cane yield 108.84 tones/ha which was followed by aforesaid two fertilize levels.

The tillers/ plant were produced statistically significant F_4. 252-112-112 NPK (kg/ha) 2.07, F_3 210-112-112 NPK (Kg/ha) 1.70 respectively followed by other fertilizer levels F_1 126-112-112 NPK (kg/ha) and F_2 168-112-112 NPK (kg/ha) gave the statistically less no. of tillers/plant 1.62 and 1.61.

Sugarcane clones/ Varieties:

The S. Cane clone S2003-US-633 gave statistically more germination % 52.97 which statistically at par with S. Cane clone S2005-US-54 in germination % 52.40. The sugarcane clone S2003-US-633 produced the statistically significant tillers/plant 3.14 while the other two sugarcane clones and two sugarcane varieties namely S2005-US-54 , S2006-US-658, CPF-248 and CPF-246 produced statistically less No. of tiller/plant i.e. 1.52, 1.44, 1.37 and 1.30 respectively.

The sugarcane clone S2003-US-633 gave the statistically highly significant No. of "000" canes and cane yield 108.47 thousand canes/ha and 120.53 tones/ha followed by S2005-US-54, which gave 100.22 "000" canes/ha and 117.96 tones/ha cane yield. The sugarcane variety CPF-248.

5. EFFECT OF DIFFERENT HARVESATING DATES ON YIELD AND QUALITY OF SUGARCANE

The experiment was planted in February 2017 to evaluate the effect of different harvesting dates on yield and quality of sugarcane clones. The experiment was designed in Randomized Complete Design in Split plot arrangement with three repeats. There are three varieties / clones comprising of S2003-US-127, S2005-US-54, HSF-240and five harvesting dates i.e. 15 November, 15 December, 15 January, 15 February, 15 March.

The data of germination was tabulated in the table-2.5 (a) which revealed that highest germination percentage was found in HSF-240 (47.1 %) which was at par with S2003-US-127 (46.3 %). As concerned with tillering, maximum no. of tillers per plant was observed in HSF-240 (1.7 Tillers per plant) following by S2005-US-54 (1.5 tillers per plant). In

interaction, maximum tillers were noted in V3 HD3 treatment.

Table-2.5 (b) prevails that maximum no. of canes per hectare was observed in HSF-240 (86.3 thousand per hectare) following by S2003-US-127 (84.7 thousand /hectare). In interaction, maximum number of canes was found (97.3 thousand/ hectare) in V3 HD4 treatment (HSF-240 & 15 February) which is at par with the treatment V1 HD4 (95 thousand per hectare).

In table-2.5 (c), the highest cane yield per hectare was observed in HSF-240 (88.9 thousand kg/ hectare) following by S2003-US-127 (86.7 thousand kg /hectare).While maximum cane yield was found in HD4 (15 February). In interaction, maximum cane yield (99.7 thousand kg per ha.) was found in V3 HD4 treatment (HSF-240 & 15 February) which is at par with the treatment V1 HD4 (99 thousand /hectare).

In table-2.5(d), the highest sugar yield per hectare was noted in HSF-240 (10.2 thousand kg/ hectare) following by S2003-US-127 (10.1 thousand kg/ hectare). While maximum sugar yield was found (11.4 thousand kg/hectare) in HD4 (15 February). In interaction, maximum sugar yield (11.7 thousand kg per ha.) was found in V3 HD4 treatment (HSF-240 was harvested on 15 February) which is at par with the treatment V1 HD4 (11.6 thousand/ hectare).

In table-2.5 (e), the highest brix percentage was noted in S2003-US-127 (19.1 %) following by HSF-240 (18.9 %). While among harvesting dates, maximum brix was found (20.2 %) in HD3 (15 January). In interaction, maximum brix percentage (20.5 %) was found in V1 HD3 treatment (S2003-US-127 & 15 January).

The data in table-2.5(f) showed that highest CCS % was noted in HSF-240 (11.7 %) following by S2003-US-127 AND S2005-US-54 (11.6 %). While among harvesting dates, maximum CCS% was observed (12.6 %) in HD3 (15 January). In interaction, maximum CCS percentage (13.4%) was found in V1 HD3 treatment (S2003-US-127 & 15 January).

TABLE-2.5 (a) GERMINATION %

VARIETY	HD1 (15-Nov.)	HD2 (15-Dec)	HD3 (15-Jan)	HD4 (15-Feb)	HD5 (15-Mar)	AVERAGE
V1(S2003-US-127)	48.7 AB	45.7 ABCD	44 BCD	49.3 AB	44 BCD	46.3 A
V2(S2005-US-54)	43.7 BCD	41.7 CD	45 ABCD	46.7 ABC	45.3 ABCD	44.46 A
V3(HSF-240)	49.7 AB	39.7 D	46.3 ABC	50.7 A	49 AB	47.1 A
AVEARGE	47.3 AB	42.3 C	45.1 BC	48.9 A	46.1 AB	

LSD V: 3.9728, HD: 3.1982, V*HD: 5.5394

TABLE-2.5 (a) NO OF TILLERS PER PLANT

VARIETY	HD1	HD2	HD3	HD4	HD5	AVERAGE
V1 (S2003-US-127)	1.1 DE	0.93 EF	0.77 F	0.8 F	0.96 EF	0.9 C
V2 (S2005-US-54)	1.2 DE	1.7 BC	1.7 AB	1.7 AB	1.6 AB	1.5 D
V3 (HSF-240)	1.8 AB	1.3 CD	1.9 A	1.7 AB	1.8 AB	1.7 A
AVEARGE	1.4 AB	1.3 B	1.5 A	1.4 AB	1.5 A	

LSD V: 0.0991, HD: 0.1640, V*HD: 0.2841

TABLE-2.5 (b) NUMBER OF CANES (000 ha^{-1})

VARIETY	HD1	HD2	HD3	HD4	HD5	AVERAGE
V1 (S2003-US-127)	93 A	71.2 G	85.7 BC	95 A	78.3 DEF	84.7 A
V2 (S2005-US-54)	73.7 FG	77.33 EF	79 DEF	87.7 B	83.3 BCD	80.2 B
V3 (HSF-240)	78.3 DEF	80.7 CDE	87.3 B	97.3 A	87.7 B	86.3 A
AVEARGE	81.7 B	76.6 C	84.0 B	93.3 A	83.1 B	

LSD V:1.7065, HD: 3.1660, V*HD: 5.4836

TABLE-2.5 (c) CANE YIELD (000 kg ha^{-1})

VARIETY	HD1	HD2	HD3	HD4	HD5	AVERAGE
V1 (S2003-US-127)	92.7 B	76.7 I	86.7 CDE	99 A	78.3 HI	86.7 B
V2 (S2005-US-54)	82.3 EFGH	78.9 GHI	79.7 HGI	89.7 BC	83 EFG	82.7 C
V3 (HSF-240)	80 FGHL	84.7 DEF	92.7 B	99.7 A	87.8 CD	88.9 A
AVEARGE	85 BC	80 D	86.3 B	96.1 A	83 C	

LSD V:1.1208, HD: 2.7633, V*HD: 4.7862

TABLE-2.5 (d) SUGAR YIELD (000 kg ha^{-1})

VARIETY	HD1	HD2	HD3	HD4	HD5	AVERAGE
V1 (S2003-US-127)	9.3 DEF	8.9 EFG	11.6 A	11.6 A	9.2 DEFG	10.1 AB
V2 (S2005-US-54)	8.7 FG	8.7 FG	9.7 CDE	10.8 AB	10 BCD	9.6 B
V3 (HSF-240)	8.2 G	9.6 CDEF	11.3 A	11.7 A	10.3 DC	10.2 A
AVEARGE	8.7 C	9.1 C	10.9 A	11.4 A	9.8 B	

LSD V: 0.5224, HD: 0.5569, V*HD: 0.9647

TABLE-2.5 (e) BRIX %

VARIETY	HD1	HD2	HD3	HD4	HD5	AVERAGE
V1 (S2003-US-127)	18.2 C	18.7 C	20.5 A	18.8 C	18.4 C	19.1 A
V2 (S2005-US-54)	18.6 C	18.3 C	18.9 BC	18.8 C	18.9 BC	18.7 A
V3 (HSF-240)	18.2 C	18.8	20B	18.6	18. C	8.9 A
AVEARGE	18.3 B	18.6 B	20.2 A	18.8 B	18.7 B	

LSD V: 0.5801, HD: 0.6669, V*HD: 1.1551

TABLE-2.5 (f) CCS %

VARIETY	HD1	HD2	HD3	HD4	HD5	AVERAGE
V1 (S2003-US-127)	9.9 D	11.5 BCD	13.4 A	11.7 BC	11.7 BC	11.6 A
V2 (S2005-US-54)	10.5 CD	11.0 BCD	12.1 AB	12.1 AB	12.1 AB	11.6 A
V3 (HSF-240)	10.2 CD	11.3 BC	12.2 AB	1.7 BC	134 A	1.7 A
AVEARGE	10.2 C	11.3 B	12.6 A	11.8 AB	12.4 A	

LSD V: 0.8943, HD: 0.8832, V*HD: 1.5298

6. PERFORMANCE OF PROMISING SUGARCANE VARIETIES AT DIFFERENT PLANT POPULATION.

The experiment was laid out according to RCBD (split-plot-arrangement) with three replications having net plot size of 4x9.6 m. The five varieties/ clones (Factor-A) $V_{1=}$ S2003-US-127, V_2 HSF-240, $V_{3=}$ S2003-AUS-658, V_4 = S2003-US-633 and V_5 = S2008-AUS-134 were sown at different three seed rates (Factor-B); S_1 = 25000TBS/ha, S_2 = 50000 TBS/ha and S_3 = 75000 TBS/ha in spring season. The varieties were sown in main plots and seed rates were placed in sub-plots. All other agronomic practices were kept normal. The data of germination (%age), no of tillers /plant, no of thousand canes/ha, stripped cane yield (t/ha) and sugar recovery was recorded. The variety HSF-240 was sown as standard variety.

It is obvious from the Table-I that the variety S2008-US-134 gave the maximum cane yield of 115.04 t/ha which is at par with variety S2006-US-658 having cane yield of 104.20 (t/ha) significantly supported by all other yield parameters. It is also obvious table-III of interaction that the sugarcane variety S2008-US-134 gave maximum

stripped can yield of 122.91 (t/ha) while using seed rate of 75000 t/ha with maximum sugar yield t/ha of 13.06 t/ha.

TABLE-IA- VARIETIES

Sr. No.	Treatments	Germination (%)	Tillers/Plant	Thousand Cane /ha	Cane yield(t/ha)	Sugar Recovery (%)	Sugar Yield (t/ha)
V1	S2003-US-127	37.11 c	1.22 d	65.68 b	51.87 c	13.66 a	7.04 c
V2	HSF-240	47.22 b	1.40 c	101.12 a	98.02 a	12.81 b	12.50 ab
V3	S2006-US-658	54.22 a	1.61 b	104.20 a	100.62 a	11.84 c	12.30 ab
V4	S2005-US-633	45.00 b	1.40 c	92.34 ab	73.84 b	13.97 a	10.27 b
V5	S2008-AUS-134	54.55 a	1.80 a	101.94 a	115.04 a	11.23 d	12.79 a
LSD=0.05		**2.1640**	**0.0438**	**14.299**	**7.8192**	**0.1967**	**1.0453**

TABLE-II B- SEED RATE.

Sr. No.	Treatments	Germination (%)	Tillers/Plant	Thousand Cane /ha	Cane yield(t/ha)	Sugar Recovery (%)	Sugar Yield (t/ha)
S1	25000TBS/ha	45.20 b	1.50	87.72	80.27	12.90	10.27
S2	50000TBS/ha	48.86 a	1.44	102.26	90.96	12.67	11.17
S3	75000TBS/ha	48.20 a	1.52	88.72	92.39	12.53	11.49
LSD=0.05		**1.2661**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**

TABLE- III C- VARIETIES X SEED RATES

Sr. No.	Treatments	Germina-tion (%)	Tillers /Plant	Thousand cane /ha	Cane yield(t/ha)	Sugar Recovery (%)	Sugar Yield (t/ha)
1	V1 S1	34.33 e	1.15 d	68.49 bc	5067 e	13.32 ab	6.74 c
2	V1 S2	35.33 e	1.25 cd	68.83 bc	53.47 e	14.02 a	7.70 ab
3	V1 S3	41.66 d	1.28 cd	59.72 c	51.47 e	13.78 a	6.89 ab
4	V2 S1	44.33 cd	1.43 bc	88.99 abc	85.55 bcd	13.26 abc	11.29 ab

5	V2 S2	48.00 cd	1.36 cd	116.10 a	108.33 ab	12.40 cde	13.42 a
6	V2 S3	49.33 bc	1.41 c	98.27 abc	100.16 abc	12.76 bcd	12.77 a
7	V3 S1	55.66 ab	1.66 ab	111.24 a	95.02 abc	11.96 de	11.46 ab
8	V3 S2	60.00 a	1.44 bc	95.83 abc	106.24abc	12.06 de	12.67 a
9	V3 S3	47.00 cd	1.73 a	105.55 ab	100.60 abc	11.51 ef	12.75 a
10	V4 S1	43.66 cd	1.45 bc	78.91 abc	63.19 de	13.88 a	8.77 bc
11	V4 S2	43.33 cd	1.44 bc	86.10 abc	71.52 cde	14.04 a	10.40 abc
12	V4 S3	48.00 cd	1.31 cd	112.04 a	86.80 bcd	13.98 a	11.98 ab
13	V5 S1	48.00 cd	1.81 a	85.41 abc	106.94 ab	12.24 de	13.09 a
14	V5 S2	57.66 a	1.70 a	105.55 ab	115.27 ab	10.84 f	12.21 ab
15	V5 S3	58.66 a	1.88 a	113.32 a	122.91 a	10.67 f	13.06 a
LSD=0.05		**2.8310**	**0.1246**	**15.447**	**14.900**	**0.4411**	**1.7345**

7. RADIATION USE EFFICIENCY RESPONSE OF VARIOUS SUGARCANE CLONES/VARIETIES AT DIFFERENT ROW ORIENTATION

The results showed significant differences ($P<0.01$) among both orientations (East-West and North-South), varieties and interaction for germination (%), Tillers per plant, cane yield (t ha^{-1}), sugar recovery (%), maximum leaf area index (LAI) and radiation use efficiency (RUE). Germination (%), tillers per plant, max. LAI, cane yield (t ha^{-1}) was found higher for variety S2003-US-633 when it is planted at orientation of East west whereas radiation use efficiency of S2003-US-633 is statistically at par with S2005-US-54 when planted in East to West direction. Maximum sugar recovery was recorded in HSF-240, which is statistically at par with CPF-249 when both are planted in east-west direction. The Minimum germination (%), tillers per plant, cane yield (t ha^{-1}), radiation use efficiency was recorded for CPF-249 when it was planted at orientation of North-South.

Table: 2.6 Radiation Use Efficiency Response of Various Sugarcane Clones/Varieties at Different Row Orientation

Row Orientation	Variety	Germination (%)	Tillers per Plant	Cane Yield (t ha^{-1})	Sugar Rec. (%)	Max. LAI	RUE (g/MJ)
East-West	V1=S2003-US-633	59.44 a	2.37 a	116.5 a	11.56 cd	7.83 a	2.37 ab
	V2= S2005-US-54	52.91 d	1.99 d	104.1 f	11.96 b	7.46 b	2.41 a
	V3= S2003-US-127	55.39 b	2.35 a	111 c	12.16 b	6.66 fg	2.19 cd
	V4= HSF-240	50.64 f	2.17 c	106.8 e	12.96 a	6.43 h	2.29 b
	V5= CPF-249	53.51 c	1.94 d	103.2 g	12.93 a	6.86 de	2.29 bc
North-South	V1=S2003-US-633	55.14 b	2.24 bc	111.5 b	11.18 de	7.03 d	2.13 d
	V2= S2005-US-54	50.51 f	1.81 e	100.6 h	10.86 ef	7.16 c	2.11 d
	V3= S2003-US-127	53.57 c	2.26 b	109.2 d	10.77 f	6.49 gh	2 e
	V4= HSF-240	49.37 g	1.96 d	103.5 g	11.67 bc	6.16 i	1.91 e
	V5= CPF-249	51.56 e	1.85 e	101 h	11.57 bc	6.69 ef	1.96 e
HSD @ 0.05		0.56	0.11	1.01	1.21	0.19	0.17

8. REDUCING THE DOSE OF HERBICIDE BY USING SORGHUM WATER EXTRACTS TO CONTROL WEEDS IN SUGARCANE

The experiment planted in spring 2017 to find out the most effective combination of weed control in sugarcane.

According to the results, the treatment T_2 (Ametryn + Atrazine @ 500 g / acre + Sorghum water extracts @ 3 L acre^{-1}) gave significantly higher cane yield (106.44 t/ha) followed by T_3 (Ethoxy- sulphuron @ 50 g / acre + Sorghum water extracts @ 3 L acre^{-1}) which gave cane yield of 101.98 t/ha. However, minimum cane yield (74.91 t/ha) was recorded from T_1 (control).

Table: -2.7 Reducing the Dose of Herbicide by Using Sorghum Water Extracts To Control Weeds in Sugarcane

Treatment	Tiller/ plant	No. of weeds/ m^2	Canes/ha (000)	Cane yield (t ha^{-1})	CCS %
T_0: Control (Weedy Check)	2.17 c	73.85 a	81.03 C	74.91 c	14.49
T_1 : Sorghum water extracts @ 6 L acre^{-1}	2.54 b	59.87 ab	95.64 B	89.06 b	14.91
T_2: Ametryn + Atrazine @ 500 g / acre + Sorghum water extracts @ 3 L acre^{-1}	2.79 a	53.35 b	112.91 A	106.44 a	14.83
T_3: Ethoxy- sulphuron @ 50 g / acre + Sorghum water extracts @ 3 L acre^{-1}	2.75a	43.15 b	112.64 A	101.98 ab	14.60
T_4: Ametryn + Atrazine @ 1000 g / acre	2.60 b	51.19 b	101.53 B	92.19 b	14.98
T_5: Ethoxy- sulphuron @ 100 g / acre	2.63 b	53.40 b	102.13 AB	95.16 ab	14.86
LSD(P≤0.05)	**0.13**	**16.8**	**11.73**	**12.39**	N.S

9. EFFECT OF HARVESTING DATES ON YIELD AND QUALITY OF DIFFERENT SUGARCANE VARIETIES IN RATOON CROP (2016-18)

The trial was carried out to evaluate the ratooning ability of various sugarcane clones at 05 different harvesting dates of plant crop *viz.* 15th November, 15th December, 15th January, 15th February and 15th March. The experiment was laid out in RCBD under split plot arrangements with three replications keeping a net plot size of 4 m x 4.8 m. Four sugarcane clones were tested against the standard variety HSF 240 and trial was planted in spring-2016. The plant crop was harvested as per treatment plan. The varieties/clones were placed in main plots whereas the harvesting dates of plant crop in sub-plots.

The data on sprouting, no. of canes, cane yield and quality analysis was carried out during the course of study as per standard procedures. The perusal of data revealed that on an average highest (91 t ha^{-1}) cane yield was produced by subsequent ratoon of S2005 US-54 as against the lowest (32 t ha^{-1}) in S009 SA-111. The yield difference among the ratoon crop of sugarcane closes was due different genetic behavior, sprouting potential, no. of tillers to mature and resistant against insect pests and diseases. All the clones exhibited highest ratoon cane yield when plant crop was harvested on 15th March (68 t ha^{-1}) which was at par with 15th February (66 t ha^{-1}) whereas lowest cane yield (39 t ha^{-1}) was recorded for subsequent ratoon of 15th November. This difference in ratoon crop yield was mainly due to the crop environments as the December and January were the frostiest months of the year, which badly affected the sprouting of subsequent ratoon crop and ultimately resulted in yield loss.

Effect of harvesting dates on number of sprouts (000 /ha^{-1}) of different sugarcane varieties / clones in ratoon crop

	Harvesting dates of plant crop					
Varieties / Clones	15-Nov	15-Dec	15-Jan	15-Feb	15-Mar	**Average**
S2005 US-54	91	96	138	143	139	121 A
S2008 AUS-130	78	86	115	128	129	107 AB
S2008 AUS-133	59	57	95	103	108	84 BC
S2009 SA-111	28	38	59	64	72	52 C
HSF 240	56	60	76	88	96	75 BC
Average	62 C	67 C	97 B	105 A	109 A	

LSD at 0.05 (Varieties = 33.658, Harvesting dates = 8.6053 & HxD = 19.242)

Effect of harvesting dates on no. of canes (000 /ha) of different sugarcane varieties / clones in ratoon crop

Varieties / Clones	Harvesting dates of plant crop					Average
	15-Nov	15-Dec	15-Jan	15-Feb	15-Mar	
S2005 US-54	80	85	105	118	111	100 A
S2008 AUS-130	60	62	93	92	95	80 B
S2008 AUS-133	32	34	53	56	57	46 C
S2009 SA-111	23	28	47	60	64	44 C
HSF 240	33	34	62	77	78	57 C
Average	46 C	49 C	72 C	81 A	81 A	

LSD at 0.05 (Varieties = 19.155, Harvesting dates = 7.1251 & HxD = 15.932)

Effect of harvesting dates on cane yield (t ha^{-1}) of different sugarcane varieties / clones in ratoon crop

Varieties / Clones	Harvesting dates of plant crop					Average
	15-Nov	15-Dec	15-Jan	15-Feb	15-Mar	
S2005 US-54	76	80	98	100	102	91 A
S2008 AUS-130	48	51	78	76	78	66 B
S2008 AUS-133	30	34	50	59	60	46 BC
S2009 SA-111	19	25	34	40	41	32 C
HSF 240	22	26	38	57	59	40 C
Average	39 C	43 C	59 B	66 A	68 A	

LSD at 0.05 (Varieties = 22.428, Harvesting dates = 4.3638 & HxD = 9.7578)

Effect of harvesting dates on CCS (%) of different sugarcane varieties / clones in ratoon crop

Varieties / Clones	Harvesting dates of plant crop					Average
	15-Nov	15-Dec	15-Jan	15-Feb	15-Mar	
S2005 US-54	12.51	12.42	12.48	12.50	12.54	12.49 D
S2008 AUS-130	13.26	13.27	13.27	13.33	13.36	13.30 C
S2008 AUS-133	13.44	13.46	13.52	13.53	13.58	13.51 B
S2009 SA-111	14.09	13.90	14.00	14.00	14.12	14.02 A
HSF 240	12.52	12.52	12.52	12.51	12.59	12.53 D
Average	13.17 BC	13.11 C	13.13 BC	13.17 AB	13.23 A	

LSD at 0.05 (Varieties = 0.1277, Harvesting dates = 0.0617 & HxD = 0.1380)

Effect of harvesting dates on sugar yield (t ha^{-1}) of different sugarcane varieties / clones in ratoon crop

Varieties / Clones	Harvesting dates of plant crop					Average
	15-Nov	15-Dec	15-Jan	15-Feb	15-Mar	
S2005 US-54	9.54	9.89	12.21	12.46	12.78	11.38 A
S2008 AUS-130	6.41	6.73	10.35	10.15	10.37	8.80 AB
S2008 AUS-133	4.04	4.55	6.74	7.97	8.11	6.28 BC
S2009 SA-111	2.68	3.40	4.80	5.63	5.83	5.05 C
HSF 240	2.75	3.24	4.71	7.18	7.39	4.47 C
Average	5.08 C	5.56 C	7.76 B	4.68 A	8.89 A	

LSD at 0.05 (Varieties = 2.8940, Harvesting dates = 0.5682 & HxD = 1.2704)

3. SUGARCANE PATHOLOGY

In sugarcane pathological studies, screening against major diseases was done for selecting disease resistant/tolerant clones/lines. The major diseases are Red Rot (*Colletotrichum falcatum*), Whip smut (*Ustilago scitaminea*), Red stripe *(Xanthomonas rubrilineans*), Pokkah Boeng *(Fusarium moniliformae*) and Sugarcane rust (*Puccinia melanocephala*). The work done during the year is reported as under:

1. SCREENING OF SUGARCANE LINES AGAINST RED ROT (*Colletotrichum falcatum*) IN FRESH CROP

Fifteen promising sugarcane lines were subjected to artificial inoculations. Sugarcane lines were injected with disease inoculum using plug technique. Line reaction was assessed on the basis of Srinivasan and Bhats, rating scal (0-9). Among 15 lines, 09 was found resistant, 01 moderately resistant, and 05 susceptible. The detailed data is given in Table 3.1.

2. SCREENING OF SUGARCANE LINES AGAINST WHIP SMUT (*Ustilago scitaminea*) IN FRESH CROP

Seed setts of 15 lines were dipped for five minutes in spore suspension of *Ustilago scitaminea*before planting. Varietal reaction was recorded on the basis of infected cane percentage. Nine (9) were found resistant, 02 moderately resistant, and 04 susceptible to whip smut. The detailed data is given in Table 3.1.

3. SCREENING OF SUGARCANE LINES AGAINST POKKAH BOENG *(Fusarium moniliformae*).

The growing point of 15 sugarcane lines in fresh crop and 15 entries in ratoon crop were injected with spore suspension of causal fungus *"Fusarium moniliformae*" during the month of August. Assessment of the disease was done on the basis of chlorosis of young growing tops and top rot of canes. All the lines/entries were found free from the disease. The detailed data is given in Table 3.1 and 3.2.

4. SCREENING OF SUGARCANE LINES AGAINST RED STRIPE *(Xanthomonas rubrilineans*).

Fifteen sugarcane lines in fresh crop and 15 entries/lines in ratoon crop were screen against red stripe disease by injecting causal bacterium near the growing point of

standing canes. Assessment of the disease was made on the basis of reddish streaks and top rotting. This year, the check line S2011 BD 1283 showed 75 % infection. But the test lines/ entries remained free from the disease under discussion. The detailed data is given in table 3.1 and 3.2.

5. SCREENING OF SUGARCANE LINES AGAINST RUST (*Puccinia melanocephala*).

Fifteen sugarcane lines in fresh crop and 15 entries/lines in ratoon crop were screen against sugarcane rust. A highly susceptible variety BF-162 was planted as spreader and check variety between the test lines. Rust intensity was recorded by counting rust pustules on the you4g leaves. All the lines were found resistant to the disease. The detailed data is given in Table 3.1and 3.2.

7. BEHAVIOUR OF SUGARCANE LINES AGAINST RED ROT IN NURSERY-II & NURSERY-III

NURSERY-II

In Nursery-II, one hundred thirteen lines (113) were artificially inoculated with red rot pathogen. Seventy-three(73) lines were found resistant, 15 moderately resistant, 13 moderately susceptible and 12 susceptible. The detailed data is given in Table 3.3.

NURSERY-III

One hundred and forty four (144) lines of the trial were inoculated with red rot pathogen. Fifty-four (54) were found resistant, thirty 30 were moderately resistant, 9 moderately susceptible and 51 were susceptible to the disease. The detail data is given in Table 3.4. and 3.5.

8. BEHAVIOUR OF SUGARCANE LINES AGAINST RED ROT IN VARIETAL TRIALS OF SUGARCANE

a. Semi-final varietal trials.

In semi-final, 14 lines were artificially inoculated and evaluated against Red Rot. Eight (08) were found resistant, one (01) was moderately susceptible and 03 were moderately susceptible and two (02) were susceptible to the disease respectively. The detailed data is given in Table 3.6 and 3.7.

b. Final varietal trials.

(Early and medium late final varietal trials).

Ninteen (19) advanced lines were evaluated in the final varietals trials against Red Rot. Out of 19 lines, 7 were found resistant, 05 moderately resistant, 02 moderately susceptible and 05 susceptible. The detailed data is given in Table 3.8 and 3.9.

c. Coordinated varietal trials (NUVYT):

Forty (40) sugarcane lines were artificially inoculated with Red Rot pathogen. 13 were resistant, 11 moderately resistant, 04 moderately susceptible and 12 were found susceptible against Red Rot disease. The detailed data is given in table 4.2 and 4.3.

d. Sugarcane research station Khanpur;

In preliminary trials, Autumn trials and varietal trials about thirty five clones/ promising lines of sugarcane were artificially inoculated to estimate the disease under the climatic condition of South Punjab. Thirteen (13) were found resistant eight (05) moderately resistant, three (04) moderately susceptible and nine (13) susceptible to the disease. The detailed data is given in table 4.1 and 4.2.

9. Drenching of fungicide to control red rot disease.

The experiment was conducted the February sowing crop to evaluate the efficacy of fungicide. Fungicides were applied through irrigation water after 30 days. 2nd and 3rd application was made after complete can formation. Out of the six fungicides applied against the disease, Thiophenate methyl and Fosetyl- Al showed the better result by controlling the disease upto 65 % and 50 % respectively.

10. Management of whip smut disease through fungi toxicants

The experiment was conducted in Feb. sowing crop HSF-240 was dipped in spore suspension of fungus @ 4 g/litter per 30 minutes. Than inoculated setts were treated with fungicides at the recommended doses. Out of six fungicides tested non was effective against disease as compared to control.

Criteria for the assessment of varietal reaction against diseases in sugarcane.

a. (Whip Smut, Pokkah Boeng, Red Stripe and Rust)

Reaction to disease		Disease infection
Resistant (R)	=	0 – 5 %
Moderately resistant (MR)	=	5.1 – 15 %
Moderately susceptible (MS)	=	15.1 – 30 %
Susceptible (S)	=	above 30%

Reference: (G.P. Rao *et al.*, 1996)

b. Red Rot

Reaction to disease		Disease score
Resistant (R)	=	0.00 – 2.00
Moderately resistant (MR)	=	2.1 – 4.00
Moderately susceptible (MS)	=	4.1 – 6.00
Susceptible (S)	=	6.1 – 8.00
Highly susceptible (HS)	=	Above 8.00

Reference: (T. Kalaimani, 2000)

Table 3.1:- Screening of sugarcane lines against diseases in fresh crop (2016-17).

Sr. #.	Name of Varieties Lines	Reaction to diseases				
		Red Rot	Whip Smut	Pokkah Boeng	Red stripe	Rust
1	S2009-SA111	S	R	R	R	All Resistant
2	M-2238/89	S	MR	R	R	
3	M-34	R	MR	R	R	
4	S2008-US-130	S	R	R	R	
5	S2011-SL-809	R	R	R	R	
6	PSR-97/41	R	S	R	R	
7	FD-18	R	S	R	R	
8	VMC-88/354	R	R	R	R	
9	S2011-SL-392	R	S	R	R	
10	FD-19	R	S	R	R	
11	2008-AUS-133	R	R	R	R	
12	SA-79	R	R	R	R	
13	S2008-AUS-134	S	R	R	R	
14	FD-17	MR	R	R	R	
15	VMC-87/599	S	R	R	R	

Table:- 3.2 **Summary of fresh crop:**

	No. of line				
Reaction to diseases	**Red Rot**	**Whip Smut**	**Pokkah Boeng**	**Red Stripe**	**Rust**
Resistant (R)	9	9	15	15	15
Moderately resistant (MR)	1	2	0	0	0
Moderately susceptible (MS)	0	0	0	0	0
Susceptible (S)	5	4	0	0	0
Total	15	15	15	15	15

Table:- 3.3 **Summary OF N-II:**

Red Rot diseases	No. of clones
Resistant (R)	73
Moderately resistant (MR)	15
Moderately susceptible (MS)	13
Susceptible (S)	12
Total	**113**

Table 3.4:- Screening of Sugarcane Clones in Nursery-III during 2016-17

Sr#	Clones	Reaction (Red Rot)	Sr.#.	Clones	Reaction (Red Rot)
1	013-M-72	R	74	HSF-240	R
2	013-US-876	MR	75	CPF-249	S
3	013-US969	S	76	014-SL-1527	MR
4	014-SL-347	R	77	014-SL-1535	R
5	014-SL-349	R	78	014-SL-1537	R
6	014-SL-353	MS	79	014-SL-1540	R
7	014-SL-360	MR	80	014-SL-1574	R
8	014-SL-365	S	81	014-SL-1570	R
9	HSF-240	R	82	014-SL-1593	MR
10	CPF-249	S	83	014-SL-1613	R
11	014-SL-367	S	84	014-SL-1617	MS
12	014-SL-380	R	85	014-SL-1621	S
13	014-SL-389	R	86	014-SL-1624	R
14	014-SL-396	MR	87	014-SL-1626	R
15	014-SL-525	MS	88	014-SL-1631	R
16	014-SL-592	S	89	HSF-240	R
17	014-SL-602	MR	90	CPF-249	S
18	014-SL-636	S	91	014-SL-1699	MR
19	014-SL-675	S	92	014-SL-1700	MR
20	014-SL-680	R	93	014-SL-1706	MR
21	014-SL-681	R	94	014-SL-1716	MR
22	014-SL-753	S	95	014-SL-1802	S
23	014-SL-775	MR	96	014-SL-1838	R
24	014-SL-779	S	97	014-SL-1871	S
25	014-SL-781	R	98	014-SL-1876	R
26	014-CPF-249	S	99	014-SL-1878	R
27	HSF-240	R	100	014-SL-1878	R
28	014-SL-916	MS	101	014-SL-1882	MR
29	014-SL-921	S	102	014-SL-1933	R

30	014-SL-941	R	103	014-SL-1936	S
31	014-SL-951	R	104	014-SL-2006	R
32	014-SL-955	R	105	HSF-204	R
33	014-SL-966	R	106	CPF-249	S
34	014-SL-966	R	107	014-SL-2049	R
35	014-SL-968	R	108	014-SL-2069	MR
36	014-SL-973	MS	109	014-SL-2070	R
37	014-SL-974	R	110	014-SL-2076	R
38	014-SL-1022	S	111	014-SL-2128	S
39	014-SL-1024	R	112	014-SL-2133	S
40	014-SL-1079	MR	113	014-SL-2136	S
42	014-SL-1081	S	114	014-SL-2138	MR
43	HSF-240	R	115	014-SL-2142	S
44	CPF-249	S	116	014-SL-2143	S
45	014-SL-1087	S	117	014-SL-2154	R
46	014-SL-1089	MR	118	014-SL-2176	S
47	014-SL-1102	R	119	014-SL-2186	R
48	014-SL-1111	R	120	014-SL-2200	R
49	014-SL-1124	R	121	HSF-240	R
50	014-SL-1145	R	122	CPF-249	S
51	014-SL-1179	R	123	014-SL-2201	S
52	014-SL-1212	R	124	014-SL-2246	R
53	014-SL-1215	MS	125	014-SL-2290	MR
54	014-SL-1224	S	126	014-SL-2349	MS
55	014-SL-1288	S	127	014-SL-2350	R
56	014-SL-1307	R	128	014-SL-2384	MS
57	014-SL-1322	MR	129	014-SL-2392	S
58	014-SL-1336	R	130	014-SL-2456	R
59	HSF-240	R	131	014-SL-2457	R
60	CPF-249	S	132	014-SL-2463	MR
61	014-SL-1339	S	133	014-SL-2465	R
62	014-SL-1359	R	134	014-SL-2466	MS
63	014-SL-1362	S	135	014-SL-2469	MR
64	014-SL-1372	S	136	014-SL-2471	S
65	014-SL-1399	S	138	CPF-249	S
66	01-SL-1412	MR	139	HSF-240	R
67	014-SL-1425	MR	140	014-SL-2477	MR
68	014-SL-1442	MR	141	014-SL-2491	MR
69	014-SL-1469	R	142	014-SL-2494	S
70	014-SL-1474	MR	143	014-SL-2503	S
71	014-SL-1475	R	144	014-SL-2567	MS
72	014-SL-1503	R			
73	014-SL-1520	R			

Table-3.5: **Summary**

Reaction to Red Rot	**No. of clones**
Resistant	54
Moderately resistant	30
Moderately susceptible	9
Susceptible	51
Total	144

Tab.3.6:- Screening of sugarcane clones in semi-final varietal Trials.

Sr.#	Clones	Reaction(Red rot)
1	CPF-249	S
2	HSF-240	R
3	013-M-46	R
4	013-M-642	R
5	013-M-113	R
6	013-M-264	R
7	013-M-45	MR
8	013-US-917	MS
9	07-PSR-219	R
10	PSR-07-70	S
11	PSR-07-45	MS
12	013-US-920	R
13	PSR-07-145	MS
14	SL-04-688	MR

Table:-3.7 SUMMARY OF SEMI-FINAL

Reaction to Red rot	No of clones
Resistant	8
Moderately resistant	1
Moderately susceptible	3
Susceptible	2
Total	14

Tab.3.8:- Screening of sugarcane clones in Final varietal Trials.

Sr.#	Clones	Reaction(Red rot)
1	FD-25	MS
2	AUS-134	S
3	SA-08	MR
4	FD-18	R
5	011-SL-62	MR
6	M-2238/89	R
7	PSR-97/41	MR

8	VMC-88-354	MS
9	CPF-249	S
10	HSF-240	R
11	012-SL-426	R
12	012-SL-443	S
13	012-883	S
14	012-M-632	M
15	012-M-780	R
16	012-M-791	R
17	012-M-1362	MR
18	012-M-1379	MR
19	CPF-247	S

Table :-3.9 SUMMARY OF FINAL VARIATAL TRIAL

Reaction to Red rot	No of clones
Resistant	7
Moderately resistant	5
Moderately susceptible	2
Susceptible	5
Total	19

Table:- 4.00 Screening of sugarcane clones at SRI Khanpur

Sr.#	Clones	Reaction(Red rot)
1	FD-19	R
2	M-24	R
3	SA-57	R
4	SA-67	MS
5	08-AUS-133	R
6	08-AUS-134	S
7	08-AUS-138	S
8	SL-96-128	MR
9	SPF-234	S
10	CPF-247	S
11	FD-22	MR
12	FD-25	MS
13	MCB-88/354	S
14	VMC-87/599	S
15	SL-92	MS
16	011-SL-392	R
17	011-SL-809	R
18	PSR-97/41	MR
19	PSR-97/45	R
20	SL-96/175	R
21	M-2238/89	S
22	CPF-248	S
23	07-M-107	S

24	09-SA-08	MR
25	09-SA-79	R
26	09-SA111	MS
27	03-US-127	S
28	SPF-213	R
29	CPF-77400	R
30	HSF-240	MR
31	06-US-658	R
32	03-US-633	S
33	CPF-246	S
34	SP-93	S
35	CPF-247	S

Table:-4.1 SUMMARY SUGARCANE CLONES AT SRI KHANPUR

Reaction to Red rot	No of clones
Resistant	13
Moderately resistant	5
Moderately susceptible	4
Susceptible	13
Total	35

Tab.4.2:- Screening of National Uniform Varietal Yield Trial (NUVYT)OF sugarcane against red for the year 2017-18.

Sr.#	Clones	Reaction(Red rot)
1	CPF-248	S
2	MS-523	R
3	MS-35	R
4	MS-535	R
5	TH-1210	S
6	NSG-197	R
7	CPS-G06	R
8	FD-19	MR
9	06US-658	R
10	08-US-130	R
11	08-US-134	S
12	CPF-247	S
13	MS-41	S
14	MS-2003-CP368	S
15	MS-2003-CP380	R
16	MS-2003-CPF-389	MR
17	CSSG-155	S
18	TH-1312	MR
19	NIFA-1	MS
20	SL-96-0-61	S
21	SL-771	S

22	TH-1210	S
23	CPF-248	S
24	CPSG-06	R
25	FD-19	MR
26	MS-535	R
27	US-272	S
28	TH-77	MR
29	NGS-197	MR
30	MS-523	R
31	CPSG-2525	MS
32	HSF-240	R
33	HOCP-832	R
34	HOCP-842	MS
35	SL-771	S
36	HOCP-810	R
37	HOCP-846	MR
38	Gang BAKSH	R
39	CPSG-2730	R
40	CPSG-368	MS

Table:-4.3SUMMARY OF NUVYT

Reaction to Red rot	No of clones
Resistant	13
Moderately resistant	11
Moderately susceptible	4
Susceptible	12
Total	40

4. SUGARCANE ENTOMOLOGY

During the year 2017-18, new varieties / advanced lines planted at Sugarcane Research Institute, Faisalabad in different varietal trials were screened for resistance against sugarcane borers viz., top borer, stem borer, root borer, and Gurdaspur borer. The tiller infestation was recorded at tillering stage of the crop by counting the total infested tillers from central two rows of each plant. "Dead hearts % age was calculated by using the following formula.

$$\text{Dead heart \%} = \frac{\text{Number of dead hearts}}{\text{Total No. of tillers}} \times 100$$

At harvest time samples of 10 canes of each variety / clone were randomly collected from 3 replications. The canes were splitted longitudinally and closely observed for each borer damage. The internode damage was recorded by counting the total number of internodes along with attacked internodes by each borer separately. The internode damage was calculated by using the following formula.

$$\text{Internode Damage \%} = \frac{\text{Number of attacked internodes}}{\text{Total No. of internodes}} \times 100$$

1. SCREENING OF ADVANCED LINES OF SEMI FINAL VARIETAL TRIALS AGAINST SUGARCANE BORERS (INSECTICIDE APPLIED).

Fourteen clones / varieties included in Semi Final varietal trials were planted at Research Area of Sugarcane Research Institute, Faisalabad under normal input requirements, following Randomized Complete Block Design having a plot size of 4mx4.80m with three replications during the month of March 2017. Dead heart % age was recorded from two central rows of each plot twice during May and June with one month interval. At harvest time, internode damage % age was recorded and data recorded in Table-I.

Table-I: Semi Final Varietal Trial (Insecticide Applied)

Sr. No.	Clone	Tiller Infestation (%)	Internode Damage (%)				Resistance Status
			Top Borer	Stem Borer	Root Borer	Cumulative Internode Damage	
1	013-M-45	3.35	0.00	1.14	0.00	1.14	R*
2	013-M-46	2.96	0.00	2.29	1.14	3.43	R
3	013-M-113	4.83	0.00	3.65	0.00	3.65	R
4	013-M-264	1.15	0.00	0.66	1.32	1.98	R
5	B-642	4.83	0.00	2.35	3.53	5.88	R
6	US-917	4.96	0.00	0.84	0.84	1.68	R
7	HSF-240	4.19	0.00	1.19	0.00	1.19	R
8	US-920	5.04	0.00	5.20	2.31	7.51	R
9	SL-04-688	7.99	0.00	1.82	1.82	3.64	R
10	PSR-07-14J	7.11	0.16	7.10	3.28	10.54	MR**
11	PSR-07-70	6.51	0.00	0.00	3.19	3.19	R
12	PSR-07-45	6.49	0.00	4.30	1.07	5.37	R
13	013PSR-07-219	8.51	0.00	1.84	2.29	4.13	R
14	CPF-249	3.63	0.00	0.00	3.51	3.51	R

*R-Resistant **MR-Moderately Resistant

The results (Table-I) revealed that out of fourteen clones / varieties, minimum tiller infestation was recorded on 013-M-264 (1.15%) followed by 013-M-46 (2.96%), 013-M-45(3.35%) and CPF-249(3.36%), while maximum tiller infestation was recorded on 013-PSR-07-219 (8.51%) by SL-04-688 (7.99%), PSR-07-14 J (7.11%) and PSR-07-70 (6.51%).

With respect to internode damage, no internode damage by top borer was recorded on any advanced line except PSR-07- 14 J (0.16%). No internode damage by stem borer on PSR-07-70 and CPF-249 while minimum was recorded on 013-M-264 (0.66%) followed by US-917(0.84%), 013-M-4.5 (1.14%) and HSF-240 (1.19%). Maximum internode damage by stem borer was recorded on PSR-07-14 J (7.10%) followed by US-920 (5.20%), PSR-07-45(4.30%) and 013-M-113 (3.65%). No internode damage by root borer on 013-M-45, 013-M-113 and HSF-240 and minimum on US-917(0.84%) followed by PSR-07-45 (1.07%), 013-M-46 (1.14%) and 013-M-264 (1. 32%) was recorded while maximum internode damage was recorded on B-642 (3.35%) followed by CPF 249(3.51%), PSR-07-14 J (3.28%) and PSR-07-70 (3.19%). The attack of Gurdaspur Borer was found nil during the crop season.

Minimum cumulative internode damage was recorded on 013-M-45 (1.14%) followed by HSF-240 (1.19%), US-917 (1.86%) and 013-m-264 (1.98%) while maximum cumulative internode damage was recorded on PSR-07-14 J (10.54%) followed by US-920 (7.51%), B-642 (5.88%) and PSR-07-45 (5.37%). Out of 14 clones/ varieties 13 were found resistant and one was moderately resistant against sugarcane borers.

2. SCREENING OF ADVANCED LINES OF SEMI FINAL VARIETAL TRIALS AGAINST SUGARCANE BORERS (INSECTICIDE NOT APPLIED)

Fourteen clones / varieties included in Semi Final varietals trials were separately planted at Research Area of Sugarcane Research Institute, Faisalabad under normal input requirements, except insecticide application following Randomized Complete Block Design having a plot size of 4mx4.80m with three replications during the month of March 2017. Dead heart % age was recorded from two central rows of each plot twice during May and June with one-month interval. At harvest time, internode damage % age was recorded and data recorded in Table-II

Table-II: Semi Final Varietal Trial (Insecticide Not Applied)

Sr. No.	Clone	Tiller Infestation (%)	Internode Damage (%)				Resistance Status
			Top Borer	Stem Borer	Root Borer	Cumulative Internode Damage	
1	013-M-45	4.35	0.00	1.14	0.00	1.14	R*
2	013-M-46	5.25	0.00	2.29	1.84	4.13	R
3	013-M-113	9.14	0.00	13.65	0.00	13.65	MR**
4	013-M-264	6.48	0.00	0.66	2.14	2.80	R
5	B-642	8.89	0.21	2.35	3.53	6.09	R
6	US-917	7.89	0.00	0.84	2.01	2.85	R
7	HSF-240	8.59	1.00	1.19	0.85	2.77	R
8	US-920	7.98	0.00	15.20	3.54	18.74	MR
9	SL-04-688	9.58	0.34	1.82	5.24	7.40	R
10	PSR-07-14J	7.98	0.95	7.10	4.25	12.30	MR
11	PSR-07-70	11.21	0.00	0.00	5.25	5.25	R
12	PSR-07-45	9.65	0.00	14.30	2.14	16.44	MR
13	013PSR-07-219	10.21	0.00	1.84	4.29	6.13	R
14	CPF-249	6.58	0.00	0.00	3.52	3.52	R

*R-Resistant **MR-Moderately Resistant

The results (Table-II) revealed that out of fourteen clones / varieties, minimum tiller infestation was recorded on 013-M-45 (4.35%) followed by 013-M-46 (5.25%), M-264(6.48%) and CPF-249 (6.58%) while maximum tiller infection was recorded on PSR-07-70 (11.21%) followed by 013-PSR-07-219 (10.21%), PSR-07-45 (9.65%) and SL-04-688 (9.58%).

With respect to internode damage, no internode damage by top borer on most of the clones / varieties while very low on B-642 (0.21%) followed by SL-04-688 (0.34%), PSR-07-14 J (0.95%) and HSF-240 (1.00%) was recorded. No internode damage by stem borer on PSR-07-70 and CPF-249 and minimum on M-264 (0.66%) followed by US-917 (0.84%), 013-M-45 (1.14%) and HSF-240 (1.19%) was recorded, while maximum internode damage was recorded on US-920 (15.20%) followed by PSR-07-45 (14.30%), 013-M-113 (13.65%) and PSR-07-14 J (7.10%). No internode damage by root borer on 013-M-45 and 013-m-113 and minimum on HSF-240 (0.58%) followed by 013-M-46 (1.84%), US-917 (2.01%) and M-264 (2.14%), PSR-07-45 (2.14%) was recorded while maximum internode damage was recorded on PSR-07-70 (5.25%) followed by SL-04-688 (5.24%) , 013 PSR-07-219 (4.29%) and PSR-07-14J (4.25%). The attack of Gurdaspur Borer was found nil during the crop season.

With respect to cumulative internode damage, minimum internode damage was recorded on 013-M-45 (1.14%) followed by HSF-240 (2.77%), M-264 (2.80%) and US-917(2.85%) while maximum on US-920 (18.74%) followed by PSR-07-45 (16.44%), 013-M-113 (13.65%) and PSR-07-14 J (12.30%). Out of 14 clones/varieties 10 were found resistant and 4 moderately resistant against sugarcane borers.

3. SCREENING OF DIFFERENT ADVANCED LINES / VARIETIES OF FINAL VARIETAL TRIAL FOR RESISTANCE AGAINST SUGARCANE BORERS (INSECTICIDE APPLIED)

Eighteen clones / varieties included in Final Varietal Trial were planted at research area of Sugarcane Research Institute, Faisalabad under normal input requirements following Randomized Complete Block Design having a plot size of 3mx3.60m with three replications during the month of March 2017. Dead heart % age was recorded from central two rows of each plot by counting the total number of tillers along with infested tillers twice during May and June with one-month interval. At harvest time a sample of 10 canes randomly selected was collected from each plot. The canes were splitted longitudinally and closely observed for recording internode damage by each borer separately. Results of cumulative internode damage was calculated and presented in Table-III.

Table-III: Final Varietal Trial (Insecticide Applied)

Sr. No.	Clone	Tiller Infestation (%)	Internode Damage (%)				Resistance Status
			Top Borer	Stem Borer	Root Borer	Cumulative Internode Damage	
1	S-2008-FD-25	4.57	0.00	0.00	0.00	0.00	R*
2	S-2008-AUG-134	8.10	0.00	0.84	0.00	0.84	R
3	S-2009-SA-8	9.73	0.00	0.00	0.00	0.00	R
4	S-2011-FD-18	11.16	0.00	0.00	0.00	0.00	R
5	S-2011-SL-62	9.85	0.00	1.19	0.00	1.19	R
6	M-2238-89	8.15	0.00	1.19	0.00	1.19	R
7	PSR-97-41	9.07	0.00	0.00	0.00	0.00	R
8	VMC-88-354	6.74	0.00	0.00	0.00	0.00	R
9	S2012-SL-426	12.19	0.00	3.30	0.00	3.30	R
10	S-2012-SL-443	11.31	0.00	6.17	0.00	6.17	R
11	S-2012-SL-883	11.54	0.00	0.00	0.00	0.00	R
12	S-2012-M-632	8.15	0.00	1.59	0.00	1.59	R
13	S-2012-M-780	11.45	0.00	1.55	0.00	1.55	R
14	S-2012-M-791	9.85	0.00	1.14	0.00	1.14	R
15	S-2012-M-1362	7.60	0.00	1.80	0.00	1.80	R
16	S-2012-M-1379	10.55	0.00	1.11	0.00	1.11	R
17	CPF-249	7.04	0.00	1.19	1.65	2.84	R
18	HSF-240	4.47	0.00	1.78	0.00	1.78	R

*R = Resistant

The results of the final varietal trial (Table-III) revealed that out of 18 clones / varieties, minimum (6.74%) and CPF-249 (7.04%) while maximum tiller infection was recorded on S-2012-SL-426 (12.19%) followed by S-2012-SL-883 (11.54%), S-2012-M-780 (11.45%) and S-2012-Sl-443 (11.31%).

With respect to internode damage, no internode damage by top borer was recorded on any of the advanced lines / varieties. No internode damage by stem borer on S-2008-FD-25, S-2009-SA-8, S-2011-FD-18, PSR 97-41, UMC-88-354 and S-2012-SL-883 and minimum on S-2008-AUS-134 (0.84%) followed by S-2012-M-1379 (1.11%), S-2012-M-791 (1.14%) and S-2011-SL-62 (1.19%) , M-2238-89 (1.19%) was recorded. The attack of Gurdaspur Borer was found nil during the crop season.

Cumulative internode damage was observed nil in case of S-2008-FD-25, S-2009-SA-8, S-2011-FD-18, PSR 97-41, VMC-88-354 and S-2012-SL-883. Minimum cumulative internode damage was observed in case of S-2008-AUS-134 (0.84%) followed by S-2012-M-1379 (1.11), S-2012-M-791 (1.14%) and S-2011-SL-62(1.19%), M-2238-89 (1.19%) while maximum cumulative internode damage was observed of S-2012-SL-443 (6.17%) followed by S-2013-SL-426 (3.30%), SPF-249 (2.84%) and HSF-240 (1.78%). Out of 18 clones/varieties all were found resistant against sugarcane borers.

4. SCREENING OF DIFFERENT ADVANCED LINES / VARIETIES OF FINAL VARIETAL TRIAL FOR RESISTANCE AGAINST SUGARCANE BORERS (INSECTICIDE NOT APPLIED).

Eighteen clones / varieties included in final varietal trial were planted at research area of Sugarcane Research Institute, Faisalabad under normal input requirements except insecticide application, following Randomized Complete Block Design having a plot size of 3mx3.60m with three replications during the month of the March 2017. Dead heart % age was recorded from central two rows of each plot by counting the total numbers of tillers along with infested tillers twice during May and June with one-month interval. At harvest time a sample of 10 canes randomly selected was collected from each plot. The canes were splitted longitudinally and closely observed for recording internode damage by each separately. Results of cumulative internode damage was calculated and presented in Table-IV.

Table-IV: Final Varietal Trial (Insecticide Not Applied)

Sr. No.	Clone	Tiller Infestation (%)	Internode Damage (%)				Resistance Status
			Top Borer	Stem Borer	Root Borer	Cumulative Internode Damage	
1	S-2008-FD-25	7.58	0.49	9.84	4.14	14.47	MR*
2	S-2008-AUG-134	9.80	0.43	8.33	3.55	12.31	MR
3	S-2009-SA-8	9.87	0.00	8.81	5.02	13.83	MR
4	S-2011-FD-18	11.91	0.00	9.90	3.23	13.13	MR
5	S-2011-SL-62	10.24	0.59	8.00	4.39	12.98	MR
6	M-2238-89	9.15	0.00	7.50	3.04	10.54	MR
7	PSR97-41	9.87	0.00	8.00	4.06	12.06	MR
8	VMC-88-354	6.89	0.49	9.11	4.52	14.12	MR
9	S-2012-SL-426	14.02	0.22	5.95	4.17	10.34	MR
10	S-2012-SL-443	12.85	0.00	9.36	5.03	14.39	MR
11	S-2012-SL-883	13.52	0.56	8.13	4.89	13.58	MR
12	S-2012-M-632	8.87	0.00	7.61	3.66	11.27	MR
13	S-2012-M-780	17.45	0.00	9.35	3.30	12.65	MR
14	S-2012-M-791	15.85	0.00	8.16	4.01	12.17	MR
15	S-2012-M-1362	9.60	0.00	8.33	3.63	11.96	MR
16	S-2012-M-1379	13.55	0.56	7.99	4.84	13.39	MR
17	CPF-249	15.04	0.00	7.05	1.52	8.57	R**
18	HSF-240	9.47	0.00	4.63	2.60	7.23	R

*R-Resistant **MR-Moderately Resistant

The results (Table-IV) revealed that out of 18 clones / varieties, minimum tiller infestation was recorded on VMC-88-354 (6.89%) followed by S-2008-FD-25 (7.58%), S-2012-M-623 (8.87%) and M-2238-89 (9.15%) and maximum tiller infestation was recorded on S-2012-M-780 (17.45%) followed by S-2012-M-791 (15.85%), CPF-249 (15.04%) and S-2012-SL-426 (14.02%).

With respect to internode damage, top borer inflicted minimum damage (< 1%) on a few entries viz., S-2012-SL-426 (0.22%), S-2008-AUS-134 (0.43%), S2008-FD-25 (0.49%), VMC-88-354 (0.49%), S-2012-SL-883 (0.56%), S-2012-M-1379 (0.56%) and S-2012-SL-62 (0.59%) while all others verities remained clear of internode damage.

In case of stem borer minimum internode damage was recorded on HSF-240 (4.63%) followed by S-2012-SL-426 (5.95%), CPF-249 (7.05%) while its maximum internode damage was recorded on S-2011-FD-18 (9.90%) followed by S-2008-FD-25 (9.84%), S-2012-SL-443 (9.36%) and S-2012-M-780 (9.35%)

In case of root borer, minimum internode damage was recorded on CPF-249 (1.52%) followed by HSF-240 (2.60%), M-2238-89 (3.04%) and S-2012-M-780 (3.30%) while maximum internode damage was recorded on S-2012-SL-443 (5.03%) followed by S-2009-SA-8 (5.02%), S-2012-SL-883 (4.89%) and S-2012-M-1379 (4.84%). The attack of Gurdaspur Borer was found nil during the crop season.

Minimum cumulative internode damage was recorded on HSF-240 (7.23%) followed by CPF-249 (8.57%), S-2012-SL-426 (10.34%) and M-2238-89 (10.54%) while maximum cumulative internode damage was recorded on S-2008-FD-25 (14.47%) followed by SL-2012-SL-443 (14.39%), VMC-88-354 (14.12%) and S-2009-SA-8 (13.83%). Out of 18 clones/varieties 2 were found resistant and 16 moderately resistant against sugarcane borers.

5. SCREENING OF ADVANCED LINES OF NATIONAL UNIFORM VARIETAL YIELD TRIAL (NUVYT) FOR RESISTANCE AGAINST SUGARCANE BORERS (SET I).

The results of National Uniform Varietal Yield Trials (Table-V) revealed that out of 10 varieties minimum tiller infestation was recorded on NSG-197 (1.38%) followed by MS-2000-HO-535 (1.49%), S2006-US-658 (1.62%) and MS-91-CP-523 9 (1.66%) whereas maximum tiller infestation was recorded on CPSG-06 (2.19%) followed by S-2008-FD-19 (2.06%), CPF-248 (1.91%) and TH-7210 (1.87%).

No internode damage by top borer was observed on CPF-248, M-2000-HO-535, NSG-197, CPSG-06, S2008-FD-19 and S2006-US-658 while its minimum damage was recorded on TH-7210 (0.33%) and maximum on TH-1210 (1.67%).

Minimum internode damage by stem borer was recorded on NSG-197 (0.34%) followed by S2008-FD-19 (1.18%), S2006-US-272 (2.36%) and MS-2000-HO-535 (2.91%) while its maximum internode damage was recorded on TH-1210 (11.24%) followed by CPF-248 (6.23%), S-200-US-2006-US-658 (5.37%) and TH-7210 (3.55%).

No internode damage by root borer was observed on NSG-197, whereas its minimum damage was recorded on S2008-FD-19 (0.17%) followed by TH-7210 (0.49%), MS-2000-HO-535 (1.35%) and CPSG-06 (1.39%) while maximum internode damage was recorded on MS-91-CP-523 (3.83%) followed by S-2006-US-658 (2.87%), S 2006-US-272 (2.19%) and CPF-248 (1.98%). The attack of Gurdaspur Borer was found nil during the crop season.

With respect to cumulative internode damage minimum damage was recorded on NSG-197 (0.34) followed by S2008-FD-19 (1.35%), MS-2000-HO-535 (4.26%) and TH-7210 (4.37%) whereas maximum cumulative damage was recorded on TH-1210 (14.58%) followed by S2006-US-658 (8.24%), CPF-248 (8.21%) and MS-91-CP-523 (7.80%). Out of 10 clones 9 were found resistant and 01 was moderately resistant.

Table-V: National Uniform Varietal Yield Trial (NUVYT) (Insecticide Applied)
Set-I

Sr. No.	Clone	Tiller Infestation (%)	Internode Damage (%)				Resistance Status
			Top Borer	Stem Borer	Root Borer	Cumulative Internode Damage	
1	CPF-248	1.91	0.00	6.23	1.98	8.21	R*
2	MS-91-CP-523	1.66	0.74	3.23	3.83	7.80	R
3	MS-2000-HO-535	1.49	0.00	2.91	1.35	4.26	R
4	Th-7210	1.87	0.33	3.55	0.49	4.37	R
5	Th-1210	1.79	1.67	11.24	1.67	14.58	MR**
6	NSG-197	1.38	0.00	0.34	0.00	0.34	R
7	CPSG-06	2.19	0.00	3.50	1.39	4.89	R
8	S-2008-FD-19	2.06	0.00	1.18	0.17	1.35	R
9	S-2006-US-272	1.75	0.34	2.36	2.19	4.89	R
10	S-2006-US-658	1.62	0.00	5.37	2.87	8.24	R

*R-Resistant **MR-Moderately Resistant

SCREENING OF ADVANCED LINES OF NATIONAL UNIFORM VARIETAL YIELD TRIAL (NUVYT) FOR RESISTANCE AGAINST SUGARCANE BORERS (SET II).

The results of National Uniform Varietal Yield Trials (Table-VI) revealed that minimum tiller infestation was recorded on S-9883-CSSG-155 (0.94%) followed by SL-771 (1.00%), MS-2003-CP-380 (1.04%) , SL-96-061 (1.04%) and Th-1312 (1.07%) and maximum tiller infestation was recorded on PS-TJ-41 (1.71%) followed by S-2008-AUS-130 (1.67%), MS-2003-CP-389 (1.47%) and NIFA-1(1.44%), HOCP-832 (1.44%).

Nominal internode damage by top borer was recorded on HOCP 846 (0.18%), HSF-240 (0.30%), CPF-249 (0.31%), HOCP-810 (0.35%) and CPSG-2525 (0.68%) whereas no internode damage was observed on the remaining varieties.

No internode damage by stem borer was observed on SL-96-061 whereas minimum internode damage was recorded on CPSG-2730 (0.53%) followed by S-2008-AUG-134 (0.98%), MS-2003-CP-380 (1.17%) and SL-771 (1.34%) while maximum internode damage was recorded on HOCP-832 (6.71%) followed by S9883-CSSG-155 (5.87%), MS-2003-CP-389 (5.58%) and HOCP-840 (3.77%).

Minimum internode damage by root borer was recorded on SL-96-061 (0.39%) followed by HSF-240 (0.47%), HOCP-846 (0.56%) and CPSG-2730 (0.68%) while its maximum internode damage was recorded on HOCP-810 (2.35%) followed by S-9883-CSSG-155 (2.09%), HOCP-832 (2.07%) and CPSG-2525 (1.87%). The attack of Gurdaspur Borer was found nil during the crop season.

With respect to cumulative internode damage, minimum internode damage was recorded on SL-96-061 (0.39%) followed by CPSG-2730 (1.21%), HSF-240 (2.37%) and S-2008-AUS-134 (2.42%) whereas maximum internode damage was recorded on HOCP-832 (8.78%) followed by S-9883-CSSG-155 (7.96%), MS -2003-CP-389 (7.14%) and CPSG-2525 (6.3%). Out of 20 clones all were found resistant against sugarcane borers.

Table-VI: National Uniform Varietal Yield Trial (NUVYT) (Insecticide Applied) SET II

Sr. No.	Advanced Clone	Tiller Infestation (%)	Internode Damage (%)				Resistance Status
			Top Borer	Stem Borer	Root Borer	Cumulative Internode Damage	
1	CPSG-2525	1.33	0.68	3.75	1.87	6.3	R*
2	NIFA-1	1.44	0.00	3.11	1.06	4.17	R
3	HSF-240	1.37	0.30	1.60	0.47	2.37	R
4	HOCP-832	1.44	0.00	6.71	2.07	8.78	R
5	HOCP-840	1.41	0.00	3.77	1.19	4.96	R
6	SL-771	1.00	0.00	1.34	1.09	2.43	R
7	HOCP-810	1.18	0.35	2.06	2.35	4.76	R
8	HOCP-846	1.41	0.18	1.71	0.56	2.45	R
9	Ganjbaksh	1.16	0.00	2.97	1.61	4.58	R
10	CPSG-2730	1.24	0.00	0.53	0.68	1.21	R
11	MS- 2003-CP-368	1.33	0.00	2.08	1.86	3.94	R
12	CPF 249	1.17	0.31	2.67	1.40	4.38	R
13	S-2008-AUS-130	1.65	0.00	3.01	1.80	4.81	R
14	S- 9883-CSSG-155	0.94	0.00	5.87	2.09	7.96	R
15	Th-1312	1.07	0.00	2.80	1.44	4.24	R
16	PS-TJ-41	1.71	0.00	3.27	1.17	4.44	R
17	MS-2003-CP-389	1.47	0.00	5.58	1.56	7.14	R
18	MS-2003-CP-380	1.04	0.00	1.17	1.77	2.94	R
19	SL-96-061	1.04	0.00	0.00	0.39	0.39	R
20	S-2008-AUS-134	1.20	0.00	0.98	1.44	2.42	R

*R-Resistant

5. SUGARCANE TECHNOLOGY

1. Quality Evaluation of Sugarcane Clones

Qualitative analysis of different cane varieties for their juice is an important mandate of varietal development program. The parameters of juice quality analysis are Brix%, Pol%, Purity% and CCS% of juice. Two different sets of sugarcane clones i.e. sixteen clones as final varietal trial, twelve as semi final varietal trial were studied for evaluation of best juice quality in order to assess CCS (%), sugar recovery and the stage of maturity. Four sets of different cane clones / varieties were studied in this experiment, i.e., Final Varietal Trial Set-I, Final Varietal Trial Set-II and Semi-Final Varietal Trial Set-I and Semi-Final Varietal Trial Set-II. The analysis of various clones was conducted for juice quality parameters starting from November-2017 till February-2018 on bi-monthly basis.

Final Varietal Trial:

In final varietal trial Set- I and II, the mean maximum CCS% was recorded by S 2012-SL- 443 (12.95) followed by S- 2012- SL- 426 (12.89) as compared to HSF-240 (12.05) & CPF-249 (12.15) as standard (Table 1 and 2). In this final varietal trial, twenty (20) different varieties, including CPF-249 and HSF-240 as standard, were studied. The quality parameters data Table-1 and 2 showed that CCS% gradually improved with the maturity of crop. It was lower during the month of November and much improved up to the month of February. The highest CCS% (14.62) was observed in S 2012-SL 426 in February-2018 and lowest (7.13) in M-2238-89 during November, 2017. However, on average basis (from November to February) Table: 1 and 2, the maximum CCS% was recorded by S 2012-SL- 443 (12.95) followed by S- 2012- SL- 426 (12.89) as compared to HSF-240 (12.05) & CPF-249 (12.15) as standard.

Table – 1 Qualitative Analysis (CCS %) of Final Varietal Trial Set –I

Final Varietal Trial Set-I											
Sr. No.	Variety	Nov		Dec		Jan		February		Avg.	S Rec %
		2/11/2017	16/11/17	5-Dec	19-12-17	2/1/2018	16/01/18	2/2/2018	16/02/18		
1	S2008-FD-25	7.49	8.45	8.88	9.59	10.25	11.34	12.00	12.43	10.05	9.45
2	S2008-AUS-134	7.83	8.25	10.38	10.78	11.89	11.56	12.30	13.38	10.80	10.15
3	S2009-SA-8	10.15	10.38	11.89	11.79	12.39	12.56	13.39	14.74	12.16	11.43
4	S2011-FD-18	9.26	10.71	10.80	10.65	10.93	11.63	11.51	12.68	11.02	10.36

5	S2011-SL-62	9.40	10.76	10.45	11.07	11.62	11.40	12.16	12.72	11.20	10.53
6	M 2238-89	7.13	7.71	8.91	9.19	9.83	10.48	11.77	11.80	9.60	9.03
7	PSR-97-41	8.27	9.01	11.58	11.98	12.24	12.34	13.13	13.89	11.56	10.86
8	VMC88-354	8.44	8.85	9.54	9.47	9.89	9.47	11.66	12.80	10.02	9.41
9	CPF-249	10.05	10.31	11.91	12.32	12.85	12.91	13.99	13.91	12.28	11.54
10	HSF-240	9.74	11.44	11.76	11.62	12.40	12.23	12.66	12.68	11.82	11.11

Table – 2 Qualitative Analysis (CCS %) of Final Varietal Trial Set –II

Final Varietal Trial Set-II											
Sr.No.	Variety	Nov		Dec		Jan		February		Avg.	S. Rec %
		2/11/2017	16/11/17	5-Dec	19-12-17	2/1/2018	16/01/18	2/2/2018	16/02/18		
1	S2012-SL-426	10.46	11.78	12.05	13.15	13.08	13.67	14.30	14.62	12.89	12.12
2	S2012-SL-443	11.99	12.21	12.31	12.63	12.66	13.62	13.84	14.31	12.95	12.17
3	S2012-SL-883	8.66	9.43	10.19	10.27	12.07	12.63	12.38	13.08	11.09	10.42
4	S2012-M-632	7.24	7.91	9.73	9.79	11.29	11.95	12.10	12.81	10.35	9.73
5	S2012-M-780	9.04	10.07	11.63	11.96	12.26	12.09	12.65	13.32	11.63	10.93
6	S2012-M-791	8.79	9.52	9.95	10.67	11.82	12.00	12.43	13.15	11.04	10.38
7	S2012-M-1362	11.16	11.46	11.07	11.49	12.40	12.57	12.79	12.74	11.96	11.24
8	S2012-M-1379	9.31	9.80	10.77	10.58	11.26	12.83	12.65	12.87	11.26	10.58
9	CPF-249	10.42	10.59	11.46	11.77	12.88	13.21	13.64	13.21	12.15	11.42
10	HSF-240	9.41	10.71	12.13	12.65	12.61	12.50	12.66	13.74	12.05	11.33

Semi-Final Varietal Trial:

In this experiment, the qualitative analysis of totals sixteen (16) varieties including CPF-249 and HSF-240 as standard was performed from October-2017 to January-2018. In semi-final varietal trial set-I, (Table-3) mean maximum CCS% was observed in S-2013-M-45 (13.01) followed by S-2013-M-113 (12.83) and S-2013-M-46 (12.50) as compared to HSF-240 (12.14) & CPF-249 (12.92) as standard. The data Table-3 showed that CCS% gradually improved with the maturity of crop. Similarly, in set-II, (Table-4) maximum CCS% was noted in PSR-07-45 (13.0) followed by S2013-US-920 (12.83) as compared to HSF-240 (12.29) & CPF-249 (12.81) as standard.

Table – 3 Qualitative Analysis (CCS %) of Semi Final Varietal Trial Set –I

Semi Final Varietal Trial Set-I							
Sr. No.	Variety	October	November	December	January	Avg. CCS%	Avg. S. Rec. %
		30/10/17	30/11/2017	27/12/2017	30/1/2018		
1	S2013-M-45	9.84	13.55	13.62	15.05	13.01	12.23
2	S2013-M-46	11.16	11.71	13.52	13.62	12.50	11.75
3	S2013-M-113	11.48	12.58	13.37	13.90	12.83	12.06
4	S2013-M-264	9.86	10.57	11.36	12.07	10.96	10.31
5	s2013-B-642	9.96	11.35	11.84	13.17	11.58	10.89
6	S2013-US-917	11.58	12.29	13.43	13.97	12.82	12.05
7	HSF-240	9.96	11.79	13.25	13.57	12.14	11.41
8	CPF-249	10.20	13.04	13.60	14.84	12.92	12.14

Table – 4 Qualitative Analysis (CCS %) of Semi Final Varietal Trial Set –II

Semi Final Varietal Trial Set-II							
Sr. No.	Variety	October	November	December	January	Avg. CCS%	Avg. S.Rec. %
		30/10/17	30/11/2017	27/12/2017	30/1/2018		
1	S2013-US-920	11.16	12.26	13.69	14.22	12.83	12.06
2	SL-04-688	10.74	11.04	12.47	13.71	11.99	11.27
3	PSR-07-45	12.39	12.94	13.03	13.63	13.00	12.22
4	PSR-07-70	10.52	11.86	12.06	12.96	11.85	11.14
5	PSR-07-145	10.37	11.38	12.81	13.29	11.96	11.24
6	PSR-07-219	10.47	11.73	12.87	13.03	12.02	11.30
7	HSF-240	10.11	11.60	13.63	13.81	12.29	11.55
8	CPF-249	10.92	12.81	13.55	13.94	12.81	12.04

2. Survey and Collection of Sugarcane Samples from Farmer Field for Quality Analysis

The sugarcane samples were collected from December to January (2017-18) to evaluate the qualitative performance of sugarcane varieties cultivated in different areas of Faisalabad district. Samples of five varieties (HSF-240, CPF-246, CPF-248, CPF-249 and CP 77-400) were collected and analyzed for sugar recovery (%), the results depicted that sugar recovery % increase in January as compared to month of December (Table -5 and 6).

The sugar recovery (%) of different varieties and from different location was in the range of 10.94 to 11.92% and 11.72 to 13.16% in the month of December and January respectively.

Table – 5 **Average Sugar Recovery (%) for the month of December, 2017**

Sr. No	Variety	Sugar Recovery (%)			
		Sumandri	Tandlianwala	Jaranwala	ChakJhumra
1	HSF-240	11.12	11.21	11.18	10.94
2	CPF-246	11.48	11.52	11.32	11.02
3	CPF-248	11.92	11.24	11.64	10.84
4	CPF-249	11.72	11.64	11.23	11.11
5	CP77-400	11.61	11.54	11.78	11.18

Table – 6 **Average Sugar Recovery (%) for the month of January, 2018**

Sr. No	Variety	Sugar Recovery (%)			
		Sumandri	Tandlianwala	Jaranwala	ChakJhumra
1	HSF-240	12.17	12.01	11.92	11.72
2	CPF-246	12.56	12.94	13.16	12.06
3	CPF-248	12.23	12.48	11.96	11.31
4	CPF-249	12.48	12.06	12.88	11.78
5	CP77-400	13.11	13.02	12.93	12.11

6. SUGARCANE RESEARCH STATION KHANPUR & BAHAWALPUR

RESEARCH EXPERIMENTS

A brief methodology and results of the experiments conducted at Sugarcane Research Station, Khanpur/ Bahawalpur during the year under report is discussed in the lines to follow:-

1. PRELIMINARY VARIETAL TRIAL OF SUGARCANE

Twelve sugarcane strains were tested in Randomized Complete Block Design having three replications and a net plot size of 3.6 x 10 m. All cultural practices were kept uniform at recommended level. The clones were compared with the standard for germination, tillering, cane formation, yield and quality during the course of study. The data thus collected were subjected to Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data presented in Table-1 show significant differences among the varieties for germination. The clone S2011-SL-392 gave the highest germination of 64.31% matchingly followed by S2011-SL-62. The lowest germination of 29.97% has been recorded for S2008-FD-25. The tested strains behaved significantly in tillers formation. Maximum tillers per plant of 2.64 were given by the clone S2008-FD-22, matchingly followed by S2008-FD-25. The least tillers per plant of 1.08 were noted for VMC-87-599. In case of plant population the varietal behavior was statistically non significant. However, the most thick plant density of 126.58 thousand canes per hectare was established by S2011-SL-392 followed by M-2238-89. The lowest millable canes of 92.13 thousand per hectare were recorded for S2011-SL-62. Cane yield data depict significant variations among the tested strains. The highest final cane yield of 106.76 t/ha was given by SL-96-175 followed by VMC-87-599. The minimum cane yield of 71.95 t/ha was recorded for PSR-97-41. So for as cane quality is concerned, SPF-234 surpassed the list with a sugar yield of 11.76 t/ha.

Table-6.1:- Performance of sugarcane varieties under Preliminary varietal trial of sugarcane (2017)

S. No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha
1	S2008-Fsd-22	30.37*f*	2.64*a*	97.22	72.50*fg*	10.34	7.50
2	S2008-Fsd-25	29.97*f*	2.44*a*	105.93	78.61*def*	10.36	8.14
3	VMC-88-354	56.97*ab*	1.60*bc*	93.89	84.26*d*	9.81	8.27
4	VMC-87-599	54.54*bc*	1.08*c*	108.70	101.67*ab*	11.29	11.48
5	S2011-SL-62	63.03*a*	1.32*bc*	92.13	74.54*fg*	10.45	7.79
6	S2011-SL-392	64.31*a*	1.54*bc*	126.58	76.76*efg*	10.39	7.98
7	S2011-SL-809	59.06*ab*	2.28*a*	99.63	94.54*c*	9.15	7.65
8	PSR-97-41	43.03*e*	1.65*b*	111.30	71.95*g*	10.85	7.81
9	PSR-97-45	44.24*de*	1.60*bc*	107.50	82.41*de*	11.90	9.81
10	SL-96-175	51.31*bcd*	1.61*bc*	99.35	106.76*a*	9.57	10.22
11	M-2238-89	53.73*bc*	1.67*b*	117.32	94.63*c*	10.23	9.68
12	SPF-234	47.47*cde*	1.59*bc*	113.52	96.39*bc*	12.20	11.76
LSD 0.05		8.12	0.56	N.S	6.53	---	---

Values with different letter(s) differ significantly (P=0.05)

2. SEMI FINAL VARIETAL TRIAL OF SUGARCANE

Eight sugarcane clones were planted in this trial for comparative study of their qualitative and quantitative traits under Randomized Complete Block Design having three replications and a net plot size of 3.6 x 10 m. All the cultural practices were kept uniform at recommended level. Varieties were compared with the standard for germination, tillering, cane formation, yield and quality during the course of study. The data thus collected were subjected to Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data presented in Table-2 show significant differences among the varieties for germination. The standard variety CPF-249 gave the highest germination of 58.11% followed by S2008-M-107 giving out the germination of 45.45 %. The lowest germination of 31.65% has been recorded for S2009-SA-111. In tiller formation, all the clones vary significantly and the clone S2009-SA-8 superseded the tested strains with 2.34 tillers per plant followed by S2009-SA-111. The lowest tiller per plant of 1.14 has been recorded for S2009-SA-79. In case of plant population the varietal behavior was statistically significant. The clone S2009-SA-111 remained at the top of the list with 105.00 thousand canes per hectare and it was statistically at par with the standard variety CPF-249 producing 102.22 thousand canes per hectare. The most thin plant stand of 83.15 thousand canes per hectare was recorded for

S2009-SA-79. The varieties behaved differently in final cane yield. The highest tonnage of 111.30 t/ha was given out by SL-96-128 followed by S2009-SA-57, while minimum cane yield of 79.82 t/ha was noted in S2009-SA-111. Highest tonnage of commercial cane sugar of 12.40 t/ha was fetched by the clone SL-96-128.

Table 6.2:- Performance of sugarcane varieties under Semi Final varietal trial of sugarcane(2017)

S. No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha
1	S2008-M-107	45.45*b*	1.62*c*	96.48*abc*	91.39*de*	12.31	11.25
2	S2009-SA-8	34.55*de*	2.34*a*	97.41*ab*	87.50*e*	12.50	10.94
3	S2009-SA-57	36.77*de*	1.45*cd*	86.85*bc*	101.30*b*	10.88	11.02
4	S2009-SA-79	35.49*de*	1.14*d*	83.15*c*	98.61*bc*	10.20	10.06
5	S2009-SA-111	31.65*e*	2.07*ab*	105.00*a*	79.82*f*	11.96	9.55
6	SL-96-128	44.19*bc*	1.35*cd*	96.85*ab*	111.30*a*	11.14	12.40
7	CPF-249	58.11*a*	1.28*d*	102.22*a*	91.57*de*	12.10	11.08
8	SPF-234	39.06*cd*	1.99*b*	100.00*ab*	94.63*cd*	12.33	11.67
LSD 0.05		6.33	0.33	13.55	5.23	---	---

Values with different letter(s) differ significantly (P=0.05)

3. FINAL VARIETAL TRIAL OF SUGARCANE

In this experiment eight promising sugarcane lines were planted for their evaluation in yield and quality. Two approved varieties SPF-234 and CPF-247 were kept as standard. The field study was carried out in Randomized Complete Block Design with a net plot size of 3.6 x 10 m with three replications. All the spring planted genomes were grown under uniform cultural practices and all the inputs were applied according to the recommended level. The data on germination, tillering, cane stand, yield and quality attributing characters were recorded during the course of study using established procedures. The data thus collected were subjected to Analysis of Variance Technique and Least Significant Difference Test at five percent level of probability was applied to compare the varietal means accurately.

The statistically analysed data given in Table 3 explicate significant differences among the varieties for germination. The promising sugarcane clone S2006-AUS-133 superseded by giving 65.12% germination followed by S2006-AUS-134. The tested strains behaved

differently in tillers formation. Maximum tillers per plant of 2.30 were exhibited by the clone S2008-M-42 followed by S2008-FD-19, while minimum tillers per plant of 1.28 were recorded in S2008-AUS-133. The statistical analysis of the data on stalk density disclosed non-significant genotypic differences among the collated strains. However, the clone S2006-FD-19 surpassed the list by producing 101.48 thousand millable canes per hectare followed by S2008-AUS-134. The most thin cane stalk density of 85.65 thousand canes per hectare has been recorded for the standard variety CPF-247. The data on stripped cane yield reveal significant differences among the tested genotypes. The promising sugarcane clone S2008-AUS-133 gave the highest tonnage of 114.44 tons per hectare which remained statistically at par with S2008-AUS-138 with a clean cane yield of 109.72 t/ha. While minimum cane yield of 88.61 t/ha was recorded for the standard variety CPF-247. Maximum sugar yield of 14.90 t/ha was produced by the promising sugarcane clone S2008-AUS-133.

Table 6.3:- Performance of sugarcane varieties under Final varietal trial (2017)

S. No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha
1	S2008-FD-19	52.86*cd*	1.95*b*	101.48	91.48*d*	11.77	10.77
2	S2008-M-42	51.58*d*	2.30*a*	88.70	93.61*d*	12.09	11.32
3	S2006-US-658	54.75*bcd*	1.40*d*	93.43	104.63*bc*	11.67	12.21
4	S2008-AUS-133	65.12*a*	1.28*d*	96.30	114.44*a*	13.02	14.90
5	S2008-AUS-134	61.75*ab*	1.50*cd*	98.24	101.39*c*	10.83	10.98
6	S2008-AUS-138	59.66*abc*	1.29*d*	95.46	109.72*ab*	12.04	13.21
7	CPF-247	56.36*bcd*	1.73*bc*	85.65	88.61*d*	11.78	10.44
8	SPF-234	42.42*e*	1.86*b*	91.39	91.30*d*	12.49	11.40
LSD 0.05		7.12	0.26	N.S	5.30	---	---

Values with different letter(s) differ significantly (P=0.05)

4. AUTUMN PLANTED SUGARCANE VARIETAL TRIAL, SET-I

This experiment included ten promising sugarcane strains for their evaluation under extended growth period in autumn season. The varietal performance was studied under Randomized Complete Block Design with three replications and a net plot size of 3.6 x 10 m. Each varietal treatment received uniform cultural practices and inputs at recommended level. The data on germination, tillering, cane stand and yield were recorded during the course of study using established procedures. Cane juice was analysed to work out the CCS% cane and sugar yield per hectare. The recorded data were statistically analysed using Analysis of

Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data recorded in Table 4 depict significant germinability varietal differences. The best germination of 67.67% was recorded for S2008-AUS-138 which was statistically at par with SL-96-128, S2008-AUS-133, S2008-M-42, S2008-AUS-134, CPF-247 and S2008-FD-19. While the poor most germination of 51.31% was recorded for the clone S2009-SA-67. The data on tillering potential evince significant genotypic differences with the best figure of 3.50 tillers per plant for the standard variety CPF-247 statistically at par with S2008-M-42 and S2008-FD-19. While most poor tillers per plant of 2.00 were noted for the clone S2008-AUS-133. Cane formation data depict non significant genotypic response in establishing final millable cane stand. However, the approved sugarcane variety SPF-234 gave the most thick plant population of 104.88 thousand canes per hectare followed by CPF-247. Minimum cane stalk population was noted in S2009-SA-57. The final cane yield produced by the tested clones varied measurably. The highest cane yield of 118.42 t/ha was recorded for S2008-AUS-133 followed by SL-96-128 while the lowest cane yield of 72.38 t/ha was noted for the clone S2009-SA-67. The promising sugarcane clone S2008-AUS-133 produced maximum sugar yield of 15.80 t/ha.

Table 6.4:- Performance of sugarcane varieties under Autumn planted varietal trial , Set-I (2017)

S. No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha
1	S2008-Fsd-19	63.37*a*	3.29*a*	98.28	88.71*e*	11.81	10.48
2	S2008-M-42	64.37*a*	3.33*a*	85.82	91.46*de*	12.64	11.57
3	S2009-SA-57	55.35*b*	2.06*cd*	80.64	94.51*d*	11.64	11.00
4	S2009-SA-67	51.31*b*	3.11*ab*	82.72	72.38*f*	12.55	9.08
5	S2008-Aus-133	64.37*a*	2.00*d*	98.79	118.42*a*	13.34	15.80
6	S2008-Aus-134	64.11*a*	2.75*abcd*	97.74	104.64*c*	12.41	12.99
7	S2008-Aus-138	67.67*a*	2.67*abcd*	99.06	113.72*b*	13.28	15.10
8	SL.96-128	65.05*a*	2.95*abc*	99.48	115.57*ab*	10.63	12.29
9	SPF.234	55.75*b*	2.29*bcd*	104.88	101.38*c*	12.37	12.54
10	CPF.247	64.05*a*	3.50*a*	100.87	92.76*de*	11.97	11.10
LSD 0.05		5.66	0.94	N.S	4.40	--	--

Values with different letter(s) differ significantly (P=0.05)

5. AUTUMN PLANTED SUGARCANE VARIETAL TRIAL, SET-II

This experiment included twelve promising sugarcane strains for their evaluation under extended growth period in autumn season. The varietal performance was studied under Randomized Complete Block Design with three replications and a net plot size of 3.6 x 10 m.

Each varietal treatment received uniform cultural practices and inputs at recommended level. The data on germination, tillering, cane stand and yield were recorded during the course of study using established procedures. Cane juice was analysed to work out the CCS% cane and sugar yield per hectare. The recorded data were statistically analysed using Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data presented in Table 5 depict significant germinability varietal differences. The best germination of 62.69% was recorded for S2011-SL-392 which remained at par with PSR-97-45 and CPF-248. While poor most germination of 35.28% was recorded for the clone S2008-FD-25. The data on tillering potential evince significant genotypic differences among the tested clones with the best figure of 2.99 tillers per plant for the clone PSR-97-45, statistically at par with PSR-97-41 and S2011-SL-809. While the lowest number of tillers per plant of 1.20 were noted for the clone S2008-FD-25. Cane formation data depict significant genotypic response in establishing final millable cane count. However, the strain VMC-87-599 gave the most thick plant population of 118.52 thousand canes per hectare matchingly followed by M-2238-89. Minimum number of cane stalks were noted in S2011-SL-62. The final cane yield produced by the tested clones varied measurably. The highest cane yield of 111.85 t/ha was recorded for SL-96-175, followed by VMC-87-599. While the lowest cane yield of 74.63 t/ha was noted for the clone S2008-FD-22. The sugarcane clone VMC-87-599 produced maximum sugar yield of 10.44 t/ha.

Table- 6.5:- Performance of sugarcane varieties under Autumn planted varietal trial, Set-II (2017)

S.No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha
1	S2008-Fd-22	35.75*d*	2.65*ab*	93.89*cd*	74.63*g*	10.50	7.84
2	S2008-Fd-25	35.28*d*	1.20*e*	101.76*abcd*	82.69*ef*	9.45	7.81
3	VMC 88-354	58.18*a*	1.88*cd*	97.50*bcd*	89.35*cd*	11.28	10.08
4	VMC 87-599	59.19*a*	1.92*cd*	118.52*a*	104.54*b*	9.99	10.44
5	S2011-SL-62	59.05*a*	2.88*a*	91.57*d*	78.52*fg*	9.16	7.19
6	S2011-SL-392	62.69*a*	2.54*ab*	111.30*abc*	77.78*fg*	10.65	8.28
7	S2011-SL-809	57.23*ab*	2.89*a*	96.85*bcd*	93.24*c*	8.83	8.23
8	PSR 97-41	49.56*bc*	2.91*a*	114.63*ab*	76.39*g*	10.53	8.04
9	PSR 97-45	61.94*a*	2.99*a*	109.17*abcd*	84.72*de*	12.01	10.17

10	SL 96-175	44.17*c*	1.70*de*	96.20*cd*	111.85*a*	8.22	9.19
11	M 2238-89	49.02*c*	2.25*bc*	117.59*a*	101.48*b*	8.45	8.58
12	CPF-248	59.79*a*	1.46*de*	110.74*abc*	99.72*b*	10.12	10.09
LSD 0.05		7.95	0.55	18.03	6.06	--	--

Values with different letter(s) differ significantly (P=0.05).

6. **RATOONABILITY OF SUGARCANE VARIETIES**

The present studies were carried out to explore the stubble sprouting and hence the final yield of promising sugarcane varieties as their popularity among the farming community depends upon their ratooning potential. Ten sugarcane clones were tested against the standard SPF-234 and CPF-247 in Randomized Complete Block Design having three replications and a net plot size of 4.8 x 7 m. All cultural practices were kept uniform at standard level. The Strains were compared with the standard for stubble sprouting, cane formation, yield and quality during the course of study. The data thus collected were subjected to Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data presented in Table 6 show statistically significant differences among the varieties for stubble sprouting. The sugarcane clone S2008-M-42 gave the highest number of sprouts of 148.41 thousand per hectare, followed by S2006-SP-93. The lowest number of sprouts of 118.65 thousand per hectare was recorded for the clone S2008-AUS-138. Data regarding cane stalk population have shown non significant variation among the varieties. The clone S2008-M-42 gave the highest cane density of 117.36 thousand canes per hectare, followed by S2008-FD-19. While the lowest cane density of 99.60 thousand per hectare was recorded for the clone S2008-AUS-133. The differences among the varieties for stripped cane yield revealed statistically significant behavior. The highest final stripped cane yield of 104.96 t/ha was given by S2008-AUS-133 followed by S2008-AUS-138. Maximum sugar yield of 14.33 t/ha was produced by the clone S2008-AUS-133.

Table 6.6 Ratoonability of promising sugarcane varieties, (2017)

S. No	Variety	Sprouts 000/ha	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha
1	S2008-FD-19	134.13*bc*	116.67	81.65*cd*	12.25	10.00
2	S2008-M-42	148.41*a*	117.36	84.62*c*	12.79	10.82
3	S2006-SP-93	138.89*ab*	110.22	93.65*b*	11.61	10.87
4	S2006-US-321	119.44*d*	100.40	77.48*d*	12.08	9.36
5	S2006-US-658	120.63*d*	113.29	95.73*b*	11.96	11.45
6	S2008-AUS-133	122.22*d*	99.60	104.96*a*	13.65	14.33
7	S2008-AUS-134	126.59*cd*	102.88	95.24*b*	11.27	10.73
8	S2008-AUS-138	118.65*d*	100.40	99.50*ab*	11.39	12.87
9	CPF-247	134.13*bc*	114.88	85.32*c*	12.67	10.81
10	SPF-234	126.98*cd*	99.80	94.54*b*	13.44	12.71
LSD 0.05		11.16	N.S	6.21	--	--

Values with different letter(s) differ significantly (P=0.05).

7. SOWING METHOD TRIAL OF SUGARCANE

This trial has been conducted to quantify the impact of different sowing methods on the growth and yield of Sugarcane. Four treatments were included in the trial *i.e* P_1- Pit planting (2 x 2 ft, RxR=1.2 m), P_2-Trench planting (RxR=1.2 m), P_3-Ladder Planting (RxR=1.2 m) and P_4-Furrow planting (RxR=0.75 m). The experiment was planted in Randomized Complete Block Design with three replications and a net plot size of 20 ft x 24 ft. The data on germination, tillering, cane stand and yield were recorded during the course of study using the standard procedures. The recorded data were analysed using Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data presented in Table 7 has shown non significant behavior of germination among the treatments. However, maximum germination percentage of 46.66 was recorded in Ladder Planting, followed by Trench planting. While minimum germination percentage of 39.03 was noted in Furrow planting. The tillers per plant also have shown non significant behavior among the treatments. However, maximum tillers per plant of 1.52 was given by Pit planting followed by Trench planting and minimum tillers per plant of 1.32 was recorded in Furrow planting. Data regarding cane stalk population have also shown non significant variation among the treatments. Furrow planting gave the highest cane density of 103.04

thousand canes per hectare, followed by Ladder Planting. While the lowest cane density of 91.18 was recorded for Trench planting. The perusal of stripped cane yield data revealed statistically significant behavior. The highest final cane yield of 92.15 t/ha was given by Trench planting matchingly followed by Pit planting. While minimum stripped cane yield of 73.04 t/ha was harvested from Furrow planted sugarcane.

Table 6.7: ***SOWING METHOD TRIAL OF SUGARCANE (2017)***

S. No	Treatment	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha
P_1	Pit planting (2 x 2 ft) (RxR=1.2m)	41.94	1.52	92.30	89.93*a*
P_2	Trench Sowing (RxR=1.2m)	45.37	1.46	91.18	92.15*a*
P_3	Ladder Planting(RxR=1.2m)	46.66	1.35	92.81	78.81*b*
P_4	Furrow Sowing (RxR=0.75m)	39.03	1.32	103.04	73.04*c*
LSD 0.05		N.S	N.S	N.S	4.37

Values with different letter(s) differ significantly (P=0.05).

8. MANAGEMENT PRACTICES TO CONTROL LODGING IN SUGARCANE

This trial has been conducted to quantify the impact of different management practices on lodging and hence yield and quality of sugarcane. Two varieties and eight treatments were included in the trial. The experiment was laid out in split plot design with three replications and a net plot size of 4.8 x 7 m. The data on germination, tillering, cane stand and yield were recorded during the course of study using the established procedures. Cane juice was analysed to work out the CCS% cane and sugar yield per hectare. The recorded data were analysed using Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data presented in Table 8 depict that both the varieties vary non significantly in germination percentage. However, SPF-234 gave maximum germination of 44.82% followed by S2003-US-633 (31.34%). In tillers per plant, both the varieties have shown non significant differential behavior and SPF-234 produced maximum tillers per plant (2.00). Data regarding cane stalk population have also shown non significant variation among the varieties. However, the promising clone S2003-US-633 produced highest plant population of 109.48 thousand canes per hectare. The cane yield data presented in the table depict significant variation among varieties with maximum value of 104.07 t/ha produced by SPF-234. The top yielder took an edge in sugar production (11.46 t/ha). So for as Cane lodging is concerned, S2003-US-633

has shown more lodging tendency as compared to SPF-234.

The treatments remained statistically alike in germination. In tillers formation a mixed trend was noted. Deep cultivation + Earthing up (P_8) gave maximum tillers per plant of 2.38 which was matchingly followed by Shallow sowing + No Earthing up (P_1). The lowest tillering has been recorded in the treatment Shallow cultivation + Earthing up. In final millable cane stand the treatments remained at par with one another while the cane yield recorded for the treatments varied significantly. Over all the earthing up treatments produced higher cane yields than no earthing up treatments with a maximum final cane yield of 107.04 t/ha for Deep cultivation + Earthing up and minimum cane yield of 91.57 t/ha for Shallow sowing + No Earthing up. The earthing up reduced sugarcane lodging which showed an impact on CCS and as such greater sugar yield has been recorded for earthed up plots.

Table 6.8: ***MANAGEMENT PRACTICES TO CONTROLE LODGING IN SUGARCANE (2017)***

S. No	Treatment	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	CCS %	Sugar Yield t/ha	**Lodging (0--9)**
	Variety (Main plot)							
V_1	SPF-234	44.82	2.00	105.95	104.07*a*	11.01	11.46	3.87
V_2	S2003-US-633	31.34	1.96	109.48	93.06*b*	11.74	10.93	5.00
	LSD 0.05	*N.S*	*N.S*	*N.S*	*1.64*			
	Planting method (Sub plot)							
P_1	Shallow sowing(6") + No Earthing up	34.82	2.22*ab*	107.30	91.57*d*	10.04	9.19	7.5
P_2	Deep sowing(12") + No Earthing up	37.08	2.12*bc*	106.46	93.55*cd*	10.64	9.95	5.5
P_3	Shallow cultivation(12")+ No Earthing up	36.28	1.82*def*	103.32	92.26*cd*	10.20	9.41	7.0
P_4	Deep cultivation(18") +No Earthing up	38.54	2.05*bcd*	108.30	94.54*c*	10.94	10.34	4.5
P_5	Shallow sowing(6") + Earthing up	39.96	1.88*cde*	109.00	103.57*b*	11.87	12.29	3.5
P_6	Deep sowing(12") + Earthing up	38.78	1.71*ef*	108.12	103.97*b*	12.57	13.07	2.5
P_7	Shallow cultivation(12") +Earthing up	39.75	1.61*f*	106.55	102.58*b*	11.67	11.97	3.5
P_8	Deep cultivation(18")+ Earthing up	39.44	2.38*a*	111.53	107.04*a*	13.08	14.00	1.5
LSD 0.05		*N.S*	*0.25*	*N.S*	*2.38*			

Values with different letter(s) differ significantly (P=0.05)

9. PERFORMANCE OF SUGARCANE VARIETIES AT SRSS, BWP SET-I

In this experiment eight promising sugarcane clones were planted for their evaluation in yield and quality. The commercial sugarcane variety CPF-246 was kept as standard. The varietal performance was studied under Randomized Complete Block Design with three replications and a net plot size of 3.6 x 9 m. Each genotypic treatment received uniform cultural practices and inputs at recommended level. The data on germination, tillering, cane stand and yield were recorded during the course of study using established procedures. The recorded data were then analysed using Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data recorded in Table 9 depict significant germinability varietal differences. The best germination percentage of 63.09 has been recorded for S2009-SA-171 followed by S2009-SA-57. While minimum germination percentage of 42.04 was noted in S2009-SA-41. The data on tillering potential evince significant varietal differences with the best figure of

2.97 tillers per plant for S2009-SA-171 followed by S2009-SA-111. The lowest tillers formation has been observed for S2008-AUS-129 and it gave 1.48 tillers per plant. Cane formation data depict non significantly different genotypic response. However, the promising clone S2009-SA-171 gave the most thick plant population of 124.78, followed by S2009-SA-57. While the least plant population of 117.99 thousand canes stalks per hectare were noted for clone S2008-AUS-129. The final cane yield produced by the tested genomes varied measurably. The highest cane yield of 101.37 t/ha has been recorded for CPF-246 which was however, statistically at par with S2009-SA-57, S2009-SA-171, S2008-AUS-129 and S2009-SA-111. While minimum cane yield of 81.00 t/ha was recorded by the clone S2009-SA-67. In quality data S2009-SA-8 surpassed the tested strains giving a field brix of 22.8%.

Performance of sugarcane varieties at SRSS Bahawalpur Set-I

S.No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	Brix (%)
1	S2009-SA-67	49.45*cd*	1.86*b*	121.60	81.00 *b*	20.4
2	S2008Aus-129	46.02*de*	1.48*c*	117.99	87.99 *ab*	22.4
3	S2009-SA-8	44.71*de*	1.64*bc*	118.83	86.34 *ab*	22.8
4	S2009-SA-57	58.09*ab*	2.00*bc*	122.62	98.34 *ab*	21.3
5	S2009-SA-41	42.04*e*	1.71*bc*	119.54	84.08 *ab*	21.2
6	S2009-SA-171	63.09*a*	2.97*a*	124.78	90.33 *ab*	20.4
7	S2009-SA-111	48.42*de*	2.13*b*	122.01	87.33 *ab*	20.0
8	CPF-246	55.68*bc*	2.02*b*	121.20	101.37 *a*	20.9
LSD 0.05		6.98	0.58	NS	19.587	--

10. PERFORMANCE OF SUGARCANE VARIETIES AT SRSS,BWP SET-II

In this experiment eight promising sugarcane clones were planted for their evaluation of yield and quality. The commercial sugarcane variety SPF-234 was kept as standard. The varietal performance was studied under Randomized Complete Block Design with three replications and a net plot size of 3.6 x 9 m. Each genotypic treatment received uniform cultural practices and inputs at recommended level. The data on germination, tillering, cane stand and yield were recorded during the course of study using standard procedures. The recorded data were then analysed using Analysis of Variance Technique and Least Significant Difference Test was applied to compare the varietal means at five percent level of probability.

The data recorded in Table 10 depict significant germinability varietal differences. The

best germination percentage of 59.87 has been recorded for S2008-AUS-138 followed by S2008-FD-19. While minimum germination percentage of 41.00 was noted in SPF-234. The data on tillering potential evince significant varietal differences with the best figure of 2.50 tillers per plant for S2008-M-42 which remained statistically at par with S2008-AUS-133, S2008-AUS-138, S2008-AUS-134, S2008-FD-19 and S2006-US-658. The lowest tillers formation has been observed for S2003-US-127 (1.72 tillers per plant). Cane formation data depict non significantly different genotypic response. However, the promising clone S2008-FD-19 gave the most thick plant population of 124.07 followed by S2008-M-42. While the lowest plant population of 112.13 thousand canes per hectare were noted for clone S2008-AUS-134. The final cane yield produced by the tested genomes varied measurably. The highest cane yield of 117.00 t/ha has been recorded for the clone S2006-US-658 which was however, statistically at par with S2008-SA-138. While minimum cane yield of 92.00 t/ha was recorded for the clone S2008-AUS-134. In quality data S2008-AUS-138 surpassed the tested strains giving a field brix of 22.0%.

Table 6.10: **Performance of sugarcane varieties at SRSS Bahawalpur Set-II**

S.No	Variety	Germin-ation %	Tillers Plant^{-1}	Cane stand 000/ha	Cane Yield t/ha	**Brix (%)**
1	S2008-FD-19	53.70 *ab*	2.16 *ab*	124.07	98.66 *ab*	21.2
2	S2008Aus-133	49.72 *bc*	2.30 *ab*	116.57	108.00 *ab*	21.9
3	S2008Aus-134	44.65 *cd*	2.17 *ab*	112.13	92.00 *b*	21.7
4	S2008Aus-138	59.87 *a*	2.28 *ab*	116.67	115.58 *a*	22.0
5	S2006-US-658	45.81 *cd*	2.13 *ab*	117.38	117.00 *a*	21.0
6	S2008-M-42	48.00 *bc*	2.50 *a*	122.93	103.31 *ab*	21.7
7	S2003-US-127	41.15 *d*	1.72 *b*	118.43	99.35 *ab*	21.7
8	SPF-234	41.00 *d*	1.83 *ab*	115.34	92.68 *b*	20.9
LSD 0.05		6.23	0.68	NS	22.09	--