NIA contribution towards high yield and recovery

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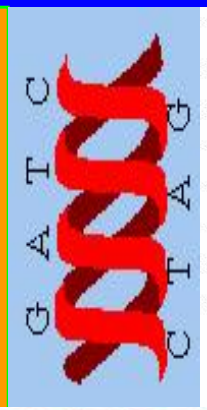
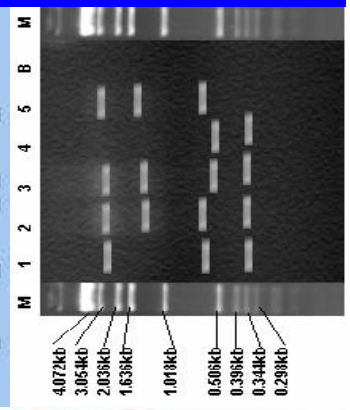




Sugarcane bio informatics

Genetic resources of Sugar in cane

- *Officinarum* (nobel cane)
- *robustum* (little / no sugar)

-ve correlation

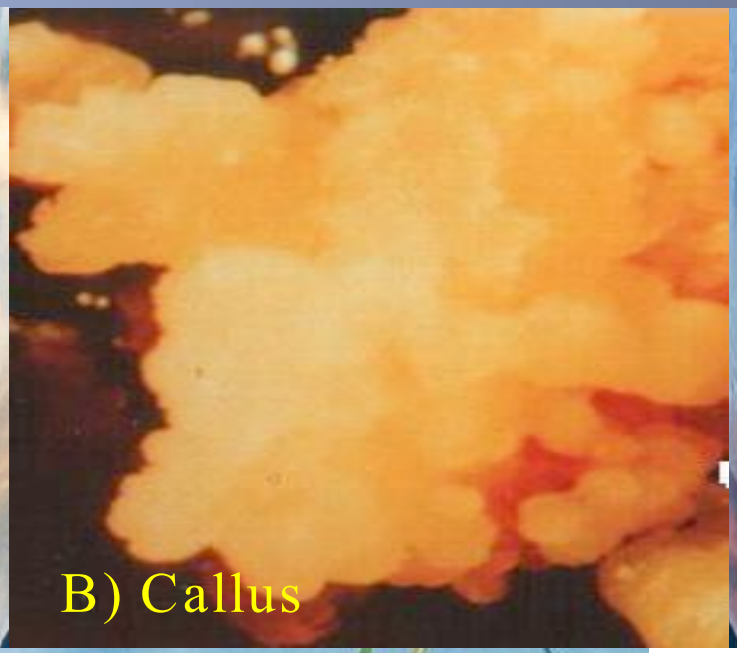
Genetic resources of tolerance in cane

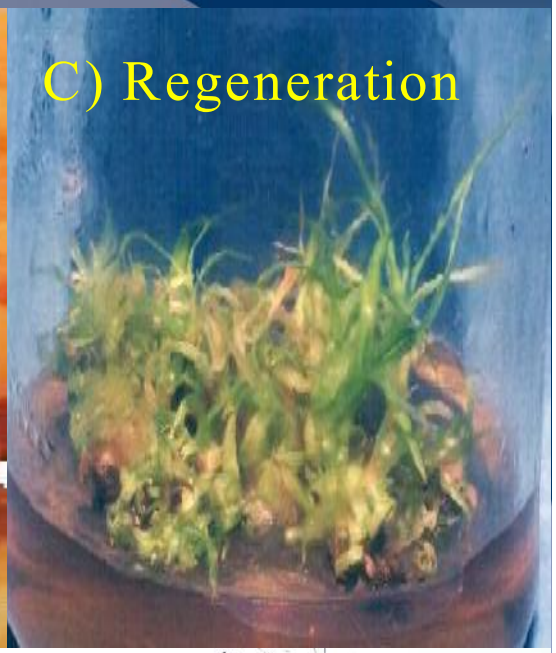
- *Spontaneum* (Source of tolerance) (Contain little or no sugar)

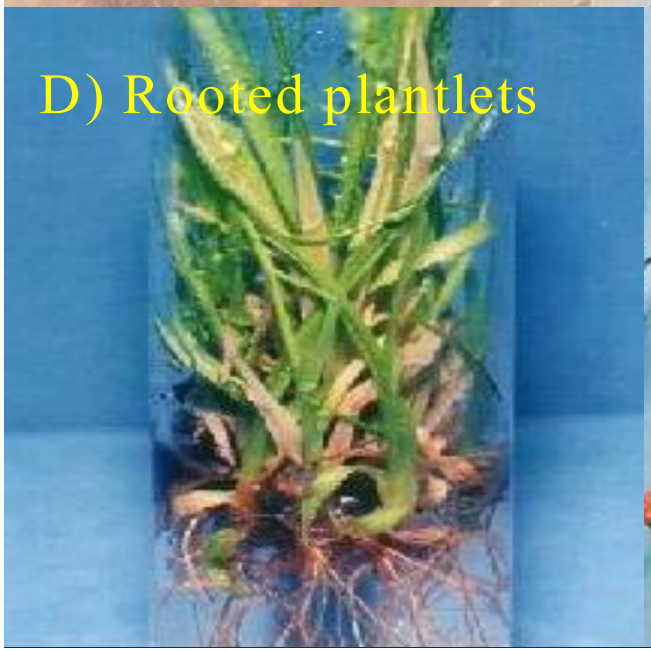
Modern sugarcane contain 80-85% officinarum blood and 8-10% spontaneum (Jannoo et al., Theor. Appl. Genet. 99:171-184. 1999)

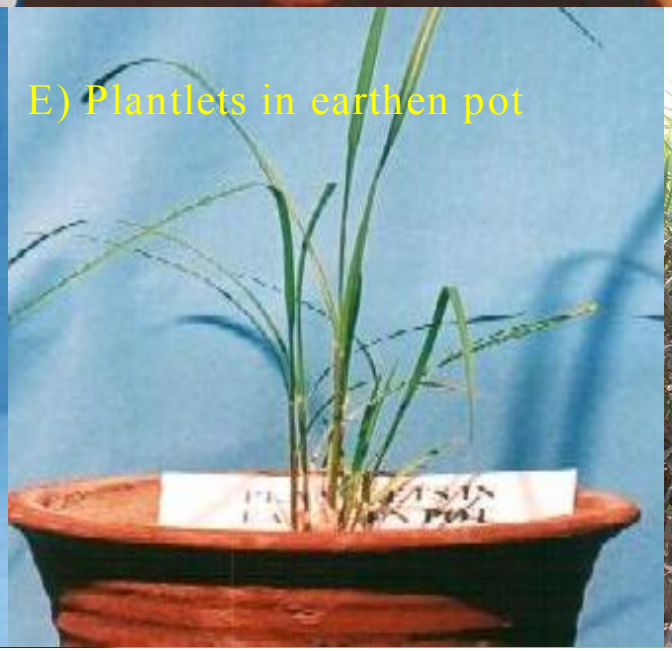
Callus culture studies in sugarcane

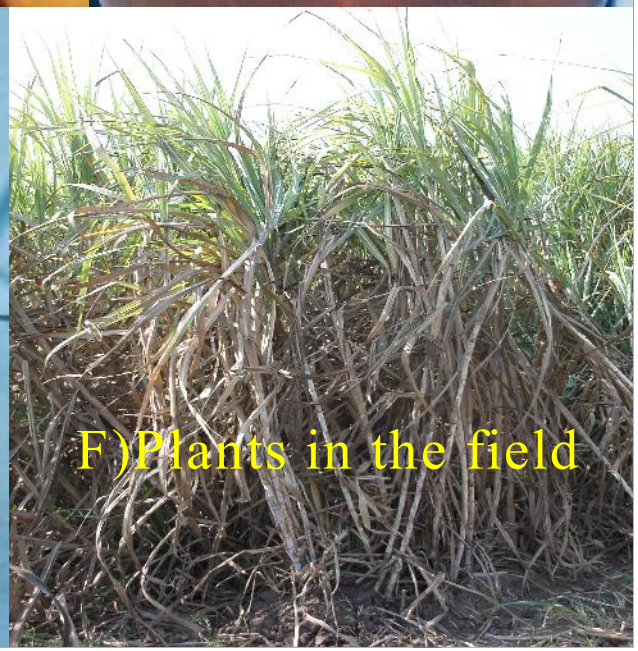

A) Explant

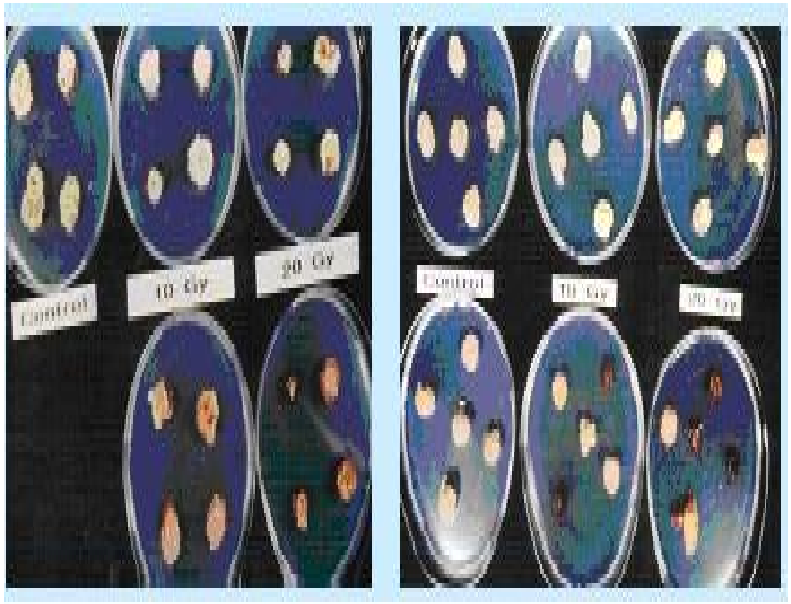

B) Callus


C) Regeneration

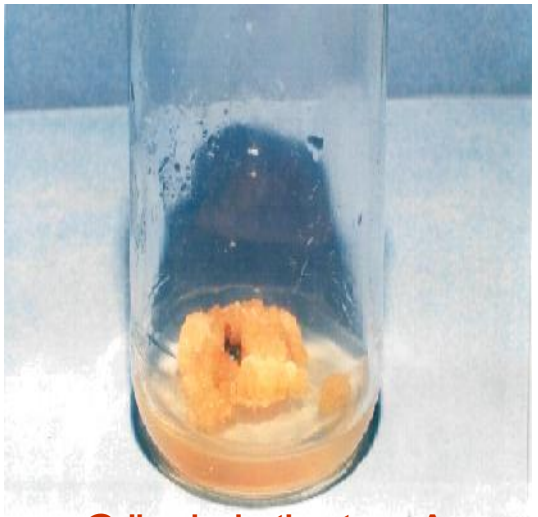

D) Rooted plantlets


E) Plantlets in earthen pot


F)Plants in the field

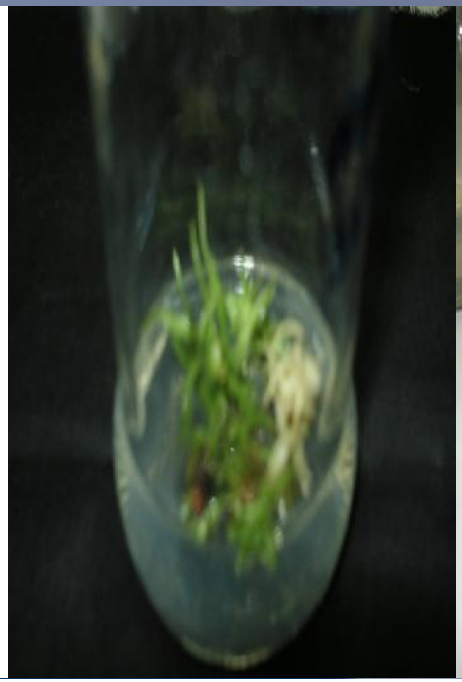


Explant of sugarcane



Callus induction type A

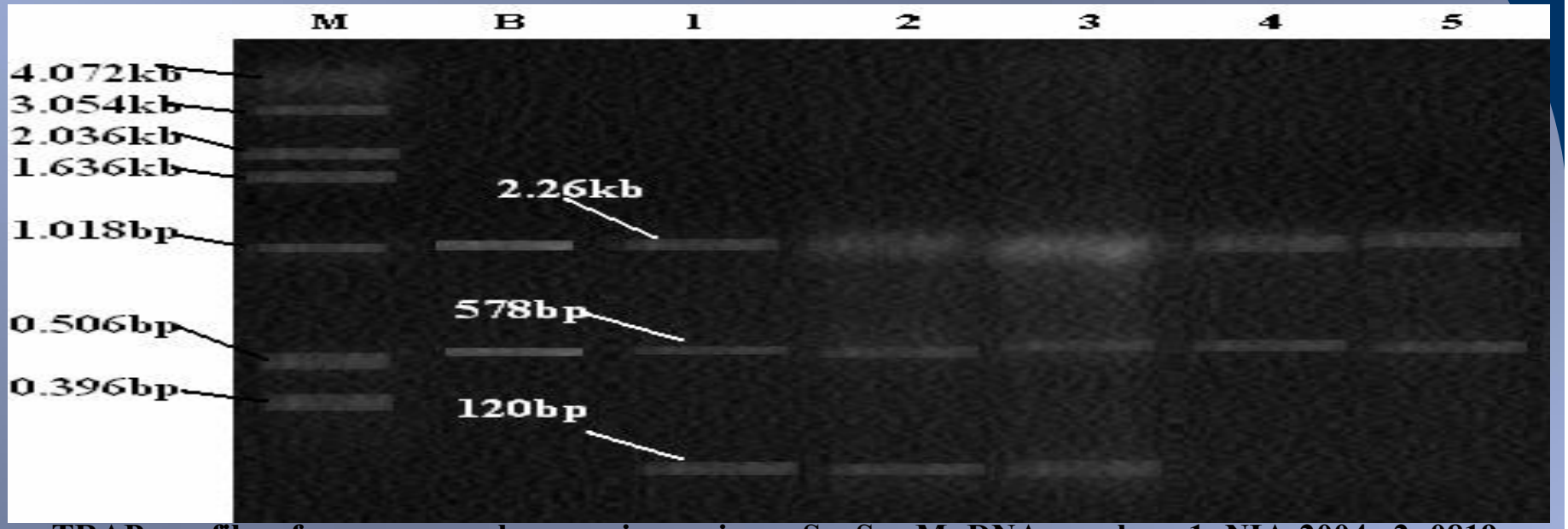
In vitro mutagenesis studies



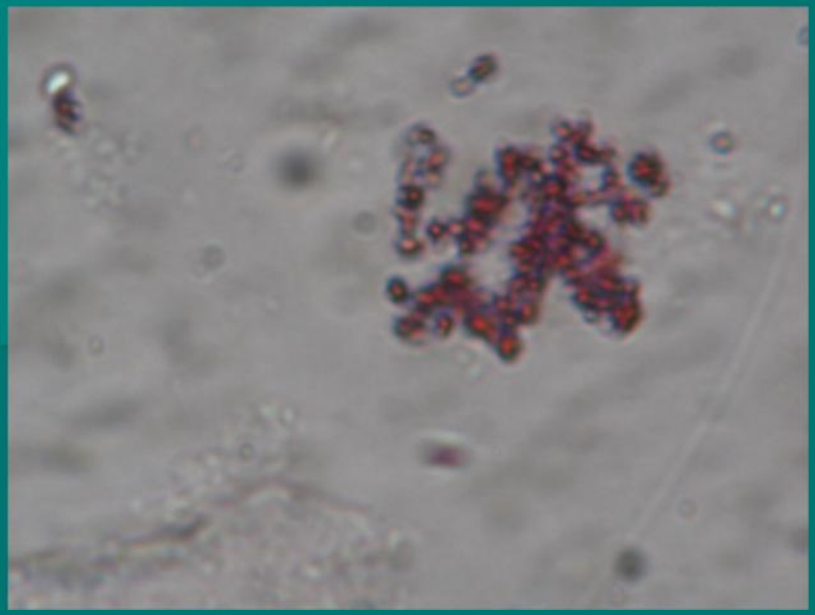
Directly regenerated plantlets

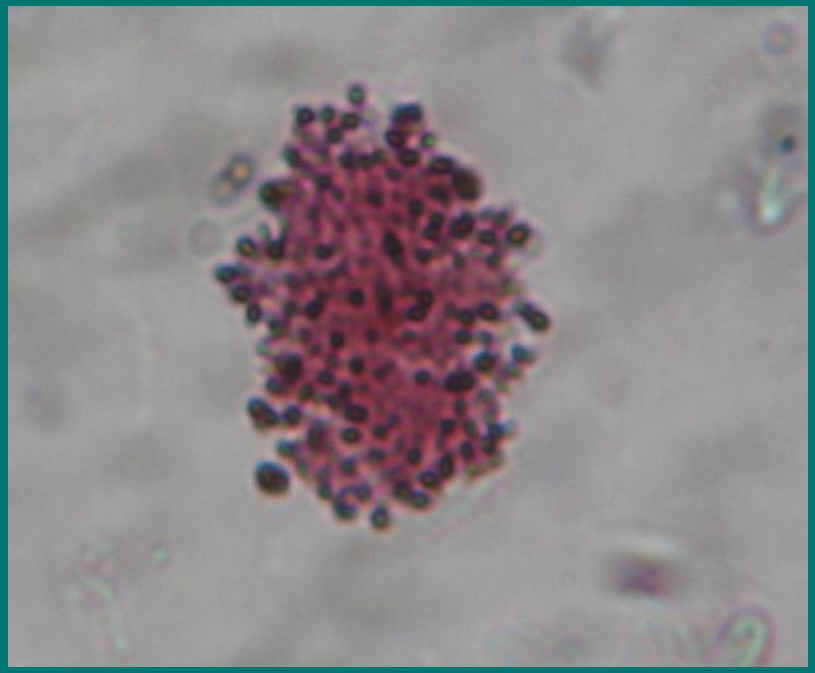
Chlorophyll mutants

Profile of sucrose producing gene Sucrose synthetase



TRAP profile of sugarcane clones using primer SucSy, M=DNA marker, 1=NIA-2004, 2=0819, 3=L116, 4= NIA-98, 5=LRK-2001





Crop nursery from the sugarcane setts of Tissue Cultured plants

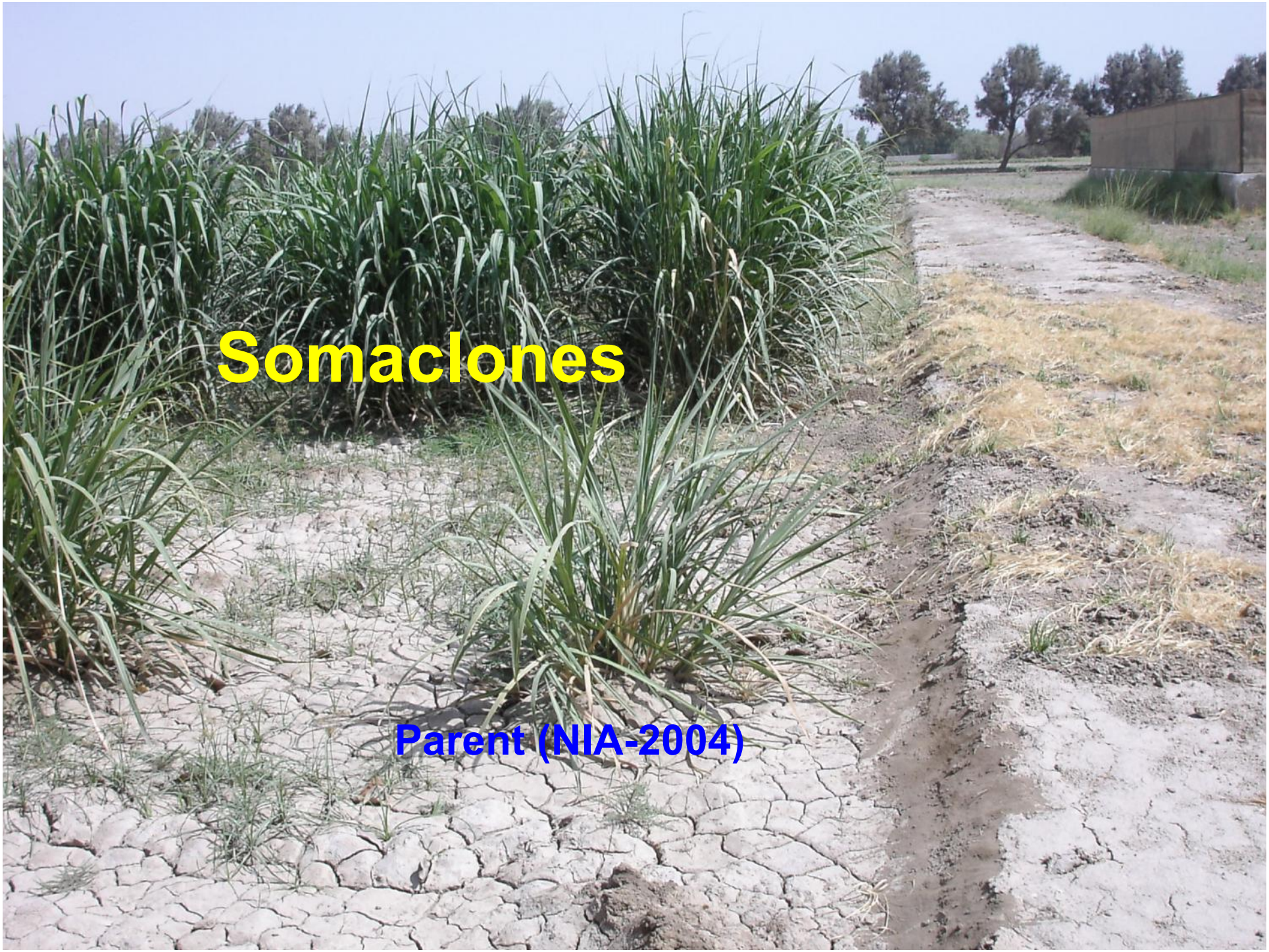

Parent of NIA92-912


Parent


Somaclones


In vitro mutagenesis


Direct Regeneration


Somaclones
Parent (NIA-2004)

NIA-2004


NIA-2010


NIA-2011


NIA-2012

SUGAR MILLS CO-ORDINATED TRIAL

Mehran sugar Mills Farm, Tando Allahyar	Genotype Planted
Matiari Sugar Mills Farm, Matiari	NIA-2004
Faran Sugar Mills Farm, Sheikh Berkio	NIA82-1026/P5
Pangrio Sugar Mills Farm, Pangrio	NIA81-0819/P5
	CPF-237


Variety: NIA-2011
Faran Sugar Mills Ltd


Variety: NIA-2011
Faran Sugar Mills Ltd


NIA AND FSM
COORDINATED
TRIAL PLOT


P5-1026
D.O.P:-04-09-2009


P5-1026
NIA FSM


NIA-2009


NIA-2011


NIA-2004


NIA-2010

Sugarcane Field day

Performance of promising sugarcane clones during 2011-12

Clones	CCS % (28 Nov.)	Cane yield (t/hec)	Sugar yield (t/hec)
BL4-P70	10.14	119	12.10
NIATC04-1198/P18	**13.65**	**88**	**12.03**
0819-P5	**13.38**	**81**	**10.87**
NIA-98	10.88	98	10.75
NIA-2004	11.13	90	10.08
BL4	9.61	75	7.21
GHULABI95	9.89	78	7.72
Thatta-10	10.25	83	8.52

Performance of promising sugarcane clones in Station varietal trial at NIA, Tando Jam during 2011-12.

Clones	CCS % (Nov.)	Cane yield (t/hec)	Sugar yield (t/hec)
92-105	10.30c	91.87a	9.46b
NIAS-3	12.93b	71.25c	9.21b
BL4-P105	10.63c	62.50d	6.64d
71-1632	12.91b	59.37d	7.66c
78-2114	9.83d	70.00c	6.88d
BL4-P36	9.49d	70.62c	6.70d
81-1254	**13.06a**	**80.62b**	**10.53a**
NIATC-195	12.08b	78.12b	9.44b
BL4	10.74c	73.12c	7.85c
L116	9.98d	55.62d	5.55e

Sugar Mills Coordinated trial (2010-2012)

Clones / Locations	Stalk / stool (Nos)	Cane length (cm)	Cane girth (cm)	Weight/ stool (kg)	Cane yield (t/ha)	CCS %	CCS (t/ha)
NIA82-0819/P5	**5.8ab**	**276.6 a**	**2.57 c**	**5.67 b**	**136.67 a**	**16.14 a**	**22.05a**
NIA-2010	5.3bc	230.8 b	2.38 d	5.23 b	137.0a	14.27 b	15.26 b
NIA-2004	5.0c	215.0 c	2.43 d	4.55 c	125.25 ab	15.56 b	19.49 a
CPF-237	6.4a	226.6bc	3.03 a	5.31 b	109.50 b	14.48 b	15.85 b
Thatta-10	4.8c	214.1 c	2.75 b	6.68 a	118.83 ab	13.67 c	16.24 b

Sugar analysis made at Matiari Sugar Mills

Clones	Sug Rec % (03.09.12)	Sug Rec % (22.09.12)	Sug Rec % (04.10.12)	Sug Rec % (19.10.12)	Sug Rec % (11.11.12)	Sug Rec % (21.11.12)
NIA-2004	7.327	8.138	8.115	8.44	8.132	10.445
NSG-555	6.357	7.818	--	8.170	8.24	--
CPF-237	6.325	7.750	6.905	7.761	8.21	--
NIA-2011	**8.035**	**8.597**	**8.791**	**8.764**	**8.954**	**10.164**
NIA-2010	**6.425**	**6.299**	**7.453**	**6.79**	**9.170**	**9.076**
T-10	7.097	--	---	8.092	8.153	--

Faran Sugar Mills data

Clones	Sug. Rec. (18.07.12)	Sug. Rec. (12.08.12)	Sug. Rec. (27.09.12)	Sug. Rec. (25.10.12)	Sug. Rec. (8.11.12)
NIA0819/P5	7.55	8.04	10.01	10.97	10.64
NIA-2004	3.80	7.14	10.01	8.36	10.38
NIA1026/P5	2.42	5.59	7.76	8.82	9.44
CPF-237	6.40	9.71	9.67	10.17	10.03

Habib Sugar Mills Coordinated trial 2011-2012

Clones / Locations	Stalk / stool (Nos)	Cane length (cm)	Cane girth (cm)	Weight/ stool (kg)	Cane yield (t/ha)	CCS %	CCS (t/ha)
NIA82-0819/P5	**5.8ab**	**276.6 a**	**2.57 c**	**5.67 b**	**136.67 a**	**16.14 a**	**22.05a**
NIA-2010	5.3bc	230.8 b	2.38 d	5.23 b	137.0a	14.27 b	15.26 b
NIA-2004	5.0c	215.0 c	2.43 d	4.55 c	125.25 ab	15.56 b	19.49 a
HS-2	6.4a	226.6b c	3.03 a	5.31 b	109.50 b	14.48 b	15.85 b
SPF-234	4.8c	214.1 c	2.75 b	6.68 a	118.83 ab	13.67 c	16.24 b

Low water requirement

Ten sugarcane genotypes were evaluated through TRAP, STS markers and their field performance to assess the low water requirement and sucrose content endowed with high cane/sugar yield. TRAP markers were use to assess the genetic polymorphism for sucrose synthase gene and drought tolerance was examine through DREB2 sequences via STS method.

Putative pedigree of ten sugarcane clones and their salient features

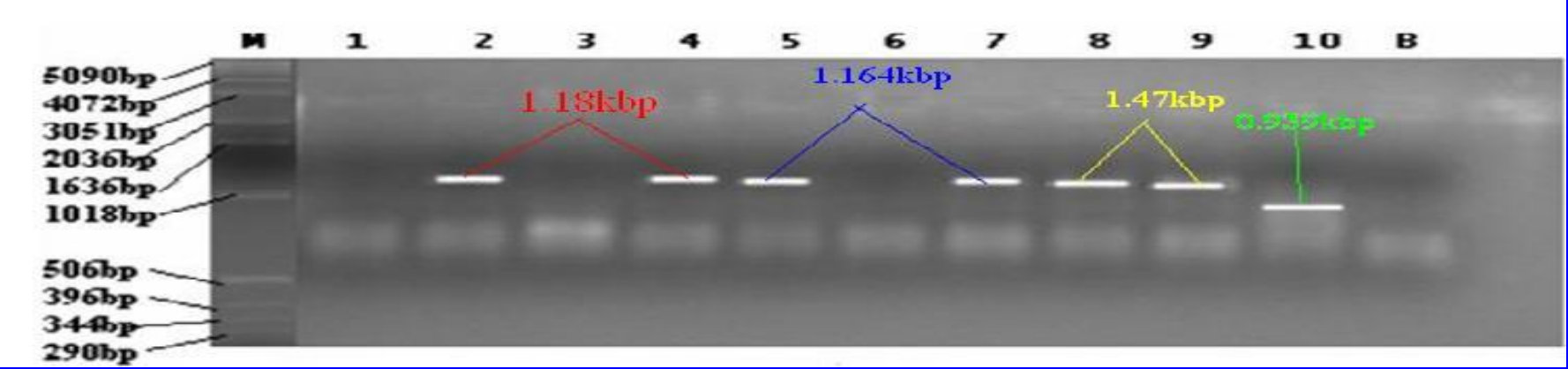
Clone	Female parent	Male parent	Salient features
AEC82-1026	Cl47-83	CP57-614	High yielding and good ratooner
GT-11	CP49-50	Co-419	High yielding and mid maturing
AEC92-105	Cl47-83	CP57-614	High yielding, mid maturing and good ratooner
AEC81-0819	NCo-310	CP57-614	Early maturing, high yielding and drought tolerant
Thatta-10	L-113	Unknown (polycross)	Early maturing, high yielding and drought tolerant
AEC82-223	F31-436	F31-412	High yielding, mid maturing and good ratooner
AEC70-2011	Co-547 (mutant)	---	High yielding, late maturing and good ratooner
NIA-2004	NCo-310	CP57-614	Early maturing, high yielding and drought tolerant
L116	CoL-29	Unknown (polycross)	Early maturing and good ratooner
NIA86-328	NCo-310	CP57-614	Early maturing and high yielding

Quantitative and qualitative data of sugarcane varieties

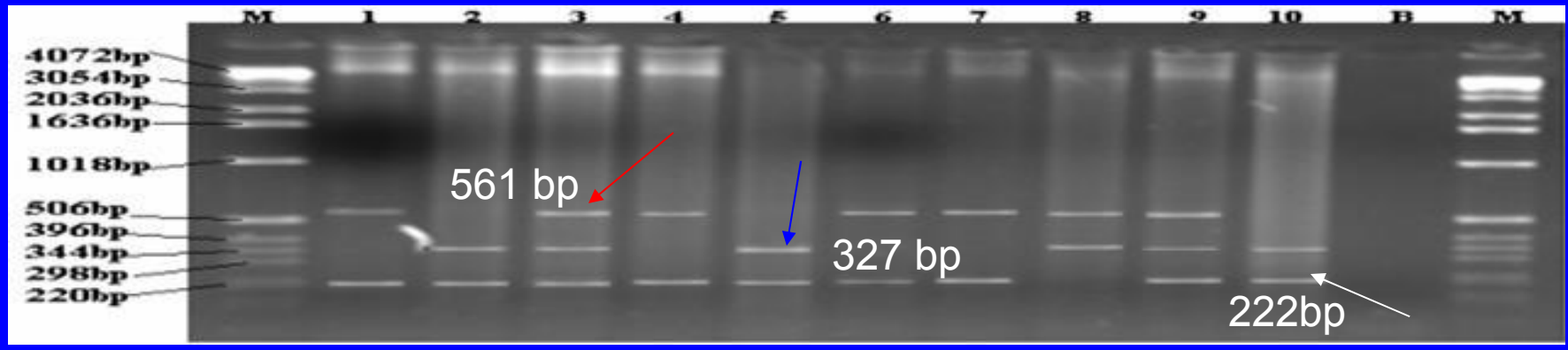
Clone	Tiller (no.)	Weight (kg.)	cane girth (cm)	Cane yield (t/ha)	Fiber (%)	Sugar Recovery (%)	Sugar yield (t/ha)
30 irrigation							
AEC82-1026	6.67	11.33a	2.80b	113c	11.74	13.72b	16.54b
GT-11	6.33	8.67b	2.77b	86d	11.95	9.87e	8.48d
AEC92-105	7.00	8.00b	2.79b	135b	11.15	11.58d	16.62b
AEC81-0819	7.67	8.17b	2.74b	156a	10.25	14.82a	22.33a
Thatta-10	5.67	8.50b	2.90b	85d	11.52	13.46b	11.44c
AEC82-223	6.00	8.83b	3.10a	88d	12.93	11.35d	10.68c
AEC70-2011	7.33	6.67c	2.89b	66ef	11.95	12.14c	8.60d
NIA-2004	7.00	7.33bc	2.83b	73e	11.15	14.47a	11.27c
L116	7.67	6.00c	2.65b	60f	10.25	12.59c	8.04d
NIA86-328	6.67	8.00b	3.65a	80d	11.52	11.42d	9.73d

Clone	Tiller (no.)	Weig ht (kg.)	cane girth (cm)	Cane yield (t/ha)	Fiber (%)	Sugar Recovery (%)	Sugar yield (t/ha)
			24 irrigation				
AEC82-1026	5.68b	8.24a	2.18b	80bc	11.80b	13.01b	10.40b
GT-11	6.32b	8.62a	2.76b	85b	11.84b	9.88e	8.40c
AEC92-105	5.24b	6.34	2.10b	95b	12.10ab	11.01d	10.54b
AEC81-0819	7.54a	8.15a	2.75b	154a	10.10c	14.85a	22.86a
Thatta-10	5.62b	7.12ab	2.42b	80bc	11.50b	13.50b	10.80b
AEC82-223	4.26c	6.14b	2.76b	68cd	13.10a	11.18d	7.60c
AEC70-2011	6.53b	6.24b	2.61b	67cd	11.95b	12.15c	8.14c
NIA-2004	6.87b	7.14ab	2.80b	72cd	11.11bc	14.37a	10.36b
L116	7.51a	6.00b	2.61b	60d	12.34ab	12.50bc	7.50c
NIA86-328	6.66b	8.00a	3.10a	73cd	11.41b	11.34d	8.27c

Clone	Tiller (no.)	Weight (kg.)	cane girth (cm)	Cane yield (t/ha)	Fiber (%)	Sugar Recovery (%)	Sugar yield (t/ha)
18 irrigation							
AEC82-1026	3.24cd	4.25d	2.10b	40d	11.81c	13.46c	5.38c
GT-11	6.04b	6.68b	2.35ab	65b	11.83c	10.21f	6.63c
AEC92-105	3.26cd	3.84e	1.19c	52c	12.06c	11.53e	6.00c
AEC81-0819	7.00a	7.85a	2.65ab	135a	10.13	15.64a	21.11a
Thatta-10	4.21c	5.24c	2.21b	70b	11.90c	13.96c	9.77b
AEC82-223	2.84d	3.14e	2.10b	43d	13.09a	11.78e	5.06c
AEC70-2011	3.56c	4.21d	2.24b	60bc	11.94c	12.20de	7.32c
NIA-2004	6.80ab	6.79b	2.68ab	64b	11.03c	14.78b	9.46b
L116	7.00a	4.21d	2.56ab	52c	12.54b	12.68d	6.59c
NIA86-328	6.65b	6.12b	2.88a	60bc	11.48c	11.98e	7.19c



STS profile of sugarcane genotype using DREB sequence; M=DNA marker, 1= AEC82-1026, 2= GT-11, 3= AEC92-105, 4= AEC71-2011, 5= Thatta-10, 6= AEC82-223, 7= AEC81-0819, 8= NIA-2004, 9= AEC86-328, 10= L116, B= Blank



TRAP profile of sugarcane genotype using surose synthase; M=DNA marker, 1= AEC82-1026, 2= GT-11, 3= AEC92-105, 4= AEC71-2011, 5= Thatta-10, 6= AEC82-223, 7= AEC81-0819, 8= NIA-2004, 9= AEC86-328, 10= L116, B= Blank

Rust attack on CPF-237 at Nawabshah

No rust attack on NIA-2011

Field videos

Bunesh Kumar Field

NIA-2004

NIA-2010

NIA-2011

Haji Aslam Farm Mirpurkhas

Field 1

Field 2

Field 3

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ACCEPTANCE LETTER

We are pleased to inform that your chapter entitled "Biotechnology for Sugarcane Improvement" by Saboohi Raza, Javed Ahmed Qureshi and **Imtiaz Ahmed Khan** has been accepted for publication in **Agricultural Systems in the 21st Century by the editor of the book, Dr. Amir Raza.**

We thank you for submitting your work to this book.

Sincerely,
Carra Feagaiga
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BOOK

The book contain the information about non-conventional methods for sugarcane improvement. this information will help the scientist for developing new genotype through in vitro culture methods.Global interest in sugarcane has increased significantly in recent years due to its economic impact on sustainable energy production. Sugarcane breeding and better agronomic practices have contributed to a huge increase in sugarcane yield in the last 30 years. Additional increases in sugarcane yield are expected to result from the use of biotechnology tools in the near future. Genetically modified (GM) sugarcane that incorporates genes to increase resistance to biotic and abiotic stresses could play a major role in achieving this goal. However, to bring GM sugarcane to the market, it is necessary to follow a regulatory process that will evaluate the environmental and health impacts of this crop.

Imtiaz Khan

Dr. Imtiaz Ahmed Khan Principal Scientist Date of Birth: 24-07-1962 Present Address: Nuclear Institute of Agriculture, Tando Jam Field of Specialization: Genetic Engineering and Biotechnology Contact Numbers: 0092-300-2979874 email imtiaz19622000@yahoo.com Impact Factor = 105.409

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non-conventional methods

Khan

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Non-conventional methods for sugarcane improvement

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