From: Petty, Blake D.
To: David Palmer; McCutchen, Bill; Avant, Bob; Helms, Adam; lrooney@tamu.edu; Turner, Nancy; wlr@tamu.edu
Cc: [redacted]; Brummett, Robert G.; Schuerman, Peter L.
Subject: PreMark-Sorghum Evaluation
Date: Wednesday, October 14, 2009 5:56:41 PM

As followup to Tuesday's meeting, Robert Brummett is drafting an Evaluation License to manage the transfer of sorghum test material from AgriLife to PreMark for evaluation. Robert will coordinate with David Palmer to determine appropriate test quantities, then work with Dr. Rooney to determine appropriate timeframe/fee for transfer.

We are striving to quickly get these materials to PreMark for evaluation…we hope to determine both sides' interest in moving forward under commercialization/licensing plan asap.

I will remain on-point for this project. Let me know if you have any questions/concerns.

BP

Blake D. Petty
Business Development Manager
Texas A&M University System

Office of Technology Commercialization
3369 TAMU; College Station, TX; 77843-3369
Ph: (979) 847-8682
Fx: (979) 845-1402
blakepetty@tamu.edu

From:	Gould Mike
To:	John Mullet; Miller Travis; Nael El-Hout; Erik Mirkov; Bill Rooney; [redacted]
Cc:	Simpson Shay; Bob Avant; McCutchen Bill; Ted Wilson
Subject:	Presentation guidelines for Chevron Meeting in Weslaco
Date:	Thursday, October 08, 2009 9:17:03 AM
Attachments:	Agenda - Chevron Oct Review.doc ATT00043.htm

Everyone,

Attached is the near final agenda for the Chevron visit to Weslaco. We have very limited time for presentations in the afternoon of the 15th, so we need to make effective use of that time. I will act as Moderator of that session.

Chevron has informed us that what they would most like to hear in our presentations is:

- what we have learned so far (new understandings, not data)
- Does what we are learning validate the initial premises of the poject or calls for mid-course adjustments
- what adjustments need to be made to guide future project work

To meet their objective, please observe the following guidelines for your presentations:

Lignocellulose project:

- Gould, El-Hout, Mirkov and Mullet will present. Keep individual presentations at a high level - little or no data (they have that in the written reports).
` Presentations are limited to ten (!0) minutes each.
- Keep slides to a minimum - approx. 5 or 6 per presenter

There will be exhibits of tissue cultured and regenerated plants during the working lunch. Erik and Mayra and others will be available then to answer questions and discuss.

Oilseeds project:

- Miller and Thomasson will present. Keep individual presentations at a high level - little or no data (they have that in the written reports)
- Presentations are limited to 20 minutes each
- Slides should be kept to 10 or so.

All presenters: Remember that Chevron will have more detailed data in the review documents, and does not want to see it again. Please focus on the bigger picture - what are the goals of each project component, where are we related to those goals, what have we learned, and how is that affecting future work. Keep in mind that Chevron is funding this project for their purposes, not ours, so we need to make them comfortable that we are making progress towards meeting their objectives.

Also, there will be ample time during the field and mill tours for additional informal conversations with Chevron personnel.

PLEASE BRING YOUR PREsENTATIONS ON A MEMORY STICK.

Thanks for your cooperation during this important visit.

MIke

Mike Gould
Center Director

From:	Rene Clara
To:	Bill Rooney
Subject:	Presentation of my paper in PCCMCA meeting.
Date:	Saturday, August 08, 2009 10:42:35 PM
Attachments:	Presentación PCCMCA 2008.ppt

Dear Dr. Bill,

Attached I send to you the work that I will present in the PCCMCA meeting of Campeche, Mexico.

René

INTSORMIL

Sorghum, Millet and Other Grains CRSP

"INFORME DEL COMPORTAMIENTO DE LOS SORGOS HÍBRIDOS PARA GRANO DEL PCCMCA DURANTE EL 2008". [1]

René Clará Valencia2 - Coordinador, Rafael Obando y Nury Gutiérrez2 - ensayo CNIA, Salvador Zeledón2 –ensayos Santa Cruz Porrillo y San Andrés, Rigoberto Nolasco, Alberto Morán y Norman Danilo Escoto Gudiel 2 –ensayos Las Acacias, La. Lujosa y Cholutaca, Juan José Catalán2 -ensayo Las Vegas, Julián Ramírez y Juan Quiñónez2 – ensayo Cuyuta

OBJETIVOS

- Identificar los cultivares de mejor potencial de rendimiento y calidad de grano, tolerantes a los principales problemas bióticos, abióticos y de buena adaptación al clima y suelo de la región.

- Poner la información de los resultados de las evaluaciones a disposición de los países y empresas, para que les sea útil a sus intereses.

Cuadro 1. HÍBRIDOS DE SORGO EVALUADOS EN EL ENSAYO DEL PCCMCA 2008

No.	Nombre	Empresa
1	SR-340	PROSEMILLAS
2	SR-360	PROSEMILLAS
3	ESHG-3	CENTA
4	81T91	PIONEER
5	Bora	MONSANTO
6	MSG540	MONSANTO
7	MSG541	MONSANTO
8	CBH-8075	Cristiani Burkard
9	CBH-8076	Cristiani Burkard
10	CBH-8077	Cristiani Burkard
11	CBH-8078	Cristiani Burkard
12	AMBAR	Testigo común (TC)
13	Testigo local	Testigo local (TL)

Cuadro 2. LOCALIDADES DONDE SE ESTABLECIERON LOS ENSAYOS DE SORGO PCCMCA 2008.

Localidad	País	Técnico
• Las Vegas	Guatemala	Ing. Juan José Catalán
• Cuyuta	Guatemala	Ing. Julián Ramírez y Juan Quiñónez
• Santa Cruz Porrillo	El Salvador	Ing. Salvador Zeledón
• San Andrés	El Salvador	Ing. Salvador Zeledón
• INTA-CNIA	Nicaragua	Ing. Rafael Obando
• La Lujosa	Honduras	Ing. Alberto Morán y Rigoberto Nolasco
• Choluteca	Honduras	Ing. Alberto Morán y Rigoberto Nolasco
• Las Acacias, Jamastrán	Honduras	Ing. Norman Danilo Escoto Gudiel y Rigoberto Nolasco

Cuadro 3. DATOS CLIMÁTICOS DE LAS LOCALIDADES DEL ENSAYO DE SORGO PCCMCA 2008.

Localidad	Altitud	Latitud	Lluvia	Temperatura
• Hda. Las Vegas	15	14º 09’ 27’’ N	590.28	21.3º a 34.7º
Cuyuta	40	14º, 05’, 12” N	734.9	27º
• Santa Cruz Porrillo	30	13º 26’ 4’ N	929	28º
• San Andrés	460	13º 48’ 5’’	630	29.2º
• INTA-CNIA	50	12º 05’ N	384.0	27º
• Las Acacias	450	14º 01’ N	507.4	27.85º
• La Lujosa	45	13º 19’	695.2	27.77º
• Choluteca	52	14º 01’ N	538.8	27.85º

CUADRO 6. Análisis combinado de rendimiento de grano de 13 híbridos de sorgo evaluados en dos localidades de Guatemala en el ensayo del PCCMCA. 2008.

HIBRIDO	Rend. Gran (t ha^{-1})	Días flor	Alt plta (cm)	Largo Panoja (cm)	Color grano
AMBAR (TC)	5.70	68	150	27.4	R
MSG540	5.67	68	165	29.8	R
CBH-8075	5.46	64	150	31.4	R
SR-360	5.40	67	155	30.1	R
CBH-8076	5.40	70	159	30.0	R
ESHG-3	5.33	67	140	31.9	**B**
SR-340	5.29	67	152	30.4	R
BORA	5.24	66	130	27.8	R
MSG541	5.14	68	158	30.1	R
CBH-8078	4.92	65	147	30.9	R
Testigo local	4.87	70	150	30.0	----
81T91	4.78	66	154	25.1	R
CBH-8077	4.69	67	128	32.8	R
X	5.22	67	149	29	
Significancia	ns	*	*	**	
DMS (0.05)	1.39	2.7	17	2.5	
CV(%)	12.2	1.82	5.3	3.9	

CUADRO 9. Análisis combinado de rendimiento de 13 híbridos de sorgo evaluados en dos localidades de El Salvador en el ensayo del PCCMCA. 2008.

	HIBRIDO	Rend. (t ha-1)	Altura planta (cm)	Largo Panoja (cm)	Exersión (cm)	Enferm Foliares (1-5)	Asp Planta (1-5)
•	MSG540	6.71	143	28.1	12.2	2.4	2.4
•	MSG541	5.93	136	27.4	13.6	2.5	2.8
•	SR-340	5.83	126	31.1	17.2	2.4	2.6
•	ESHG-3	5.71	119	32.1	15.1	2.0	1.9
•	SR-360	5.67	126	29.5	15.9	2.2	2.5
•	AMBAR (TC)	5.60	127	33.1	13.0	2.4	2.7
•	CBH-8076	5.59	119	25.5	12.8	2.8	3.1
•	CBH-8078	5.46	125	31.0	17.2	2.2	2.5
•	CBH-8077	4.90	104	34.7	14.2	3.1	3.6
•	CBH-8075	4.83	127	29.6	16.8	2.5	2.8
•	BORA	4.76	106	27.6	15.6	2.6	3.1
•	81T91	4.43	134	24.6	17.1	2.4	2.8
•	Soberano (TL)	4.26	23	23.6	8.4	2.1	2.6
•	X	5.36	124	29.1	14.6	2.4	2.7
•	Significancia	ns	**	*	*	ns	**
•	DMS	1.31	10.2	5.9	4.3	0.5	0.5
•	CV(%)	11.2	3.7	9.3	13.6	10.0	7.8

CUADRO 13. Características agronómicas de 12 híbridos de sorgo evaluados en tres localidades de Honduras en el ensayo del PCCMCA. 2008.

HIBRIDO	Rend. (tn ha^{-1})	Días floración	Altura planta (cm)	Largo Panoja (cm)	Exerción (cm)	Enferm Foliares (1-5)
MSG540	5.87	63	169	28.0	17.6	2.6
SR-340	5.63	61	157	28.0	22.2	2.3
ESHG-3	5.53	63	142	30.2	22.4	1.3
AMBAR (TC)	5.23	59	152	26.1	15.2	2.6
SR-360	5.03	60	153	28.7	20.4	2.2
CBH-8077	5.03	58	115	30.9	16.7	3.7
MSG541	5.02	62	156	28.2	17.6	2.3
BORA	4.82	59	118	26.8	20.4	3.0
CBH-8078	4.81	59	147	27.6	20.2	2.6
CBH-8076	4.61	59	152	24.9	19.4	2.4
CBH-8075	4.16	57	148	28.8	19.4	3.2
81T91	3.32	57	150	23.9	20.7	3.3
X	4.92	60	147	27.7	19.3	2.6
Significancia	Ns	Ns	Ns	**	ns	**
DMS 1.34	5.4	10.3	2.5	4.7	0.8	
CV(%)	16.08	5.3	4.1	5.3	14.3	17.4

CUADRO 14. Características agronómicas de 13 híbridos de sorgo evaluados en el ensayo del PCCMCA. CNIA, Nicaragua, 2008.

HIBRIDO	Rend. ((t ha^{-1})	Días flor	Altura planta (cm)	Largo Panoja (cm)	Exerción (cm)	Enfermedades (1 a 5)	Acame (1-5)	Uniformidad (1 a 5)	Aspecto (1 a 5)
MSG541	8.37 a	61	173	28.0	13.3	3.1	1.0	1.1	1.9
MSG540	7.77 a b	61	186	26.8	16.8	3.1	1.0	1.8	2.1
ESHG-3	7.39 a b	60	163	30.8	19.0	2.5	1.0	1.4	1.1
CBH-8996 (TL)	7.38 a b	60	173	30.2	15.5	2.9	1.0	1.6	1.9
BORA	7.23 a b	59	141	25.8	15.8	2.6	1.0	1.5	2.2
CBH-8076	7.20 a b	63	182	25.0	22.8	3.0	1.0	1.3	1.8
SR-340	6.93 b	59	176	28.5	18.5	3.1	1.1	2.3	2.2
AMBAR (TC)	6.90 b	61	174	28.5	11.8	3.2	1.0	1.6	1.9
CBH-8075	6.74 b	57	170	30.2	16.3	3.5	1.0	2.2	2.6
SR-360	6.67 b	61	175	29.5	16.5	3.8	1.0	2.3	2.6
CBH-8078	6.59 b	59	165	28.0	21.2	3.2	1.0	2.0	2.2
81T91	6.41 b	58	178	21.8	18.0	3.5	1.0	2.3	3.1
CBH-8077	4.98 c	59	129	33.5	9.8	4.1	1.0	4.0	4.0
X	7.0	60	168	28.2	16.5	3.2	1.0	1.9	2.3
Significancia	Ns	ns	ns	ns	ns	ns	Ns	*	Ns
DMS (0.05)	1.12	1.6	7.70	2.52	5.59	1.05	0.09	0.72	0.8
CV(%)	9.14	1.88	3.2	6.23	23.6	22.8	6.9	25.9	26.1

CUADRO 15. Análisis combinado de rendimiento de grano de 12 híbridos de sorgo en siete localidades en Centroamérica del ensayo del PCCMCA 2008.

HIBRIDO	Rendimiento. (tn ha-1)	Días flor	Altura planta (cm)	Largo Panoja (cm)	Exerción (cm)	Enferm (1-5)	Color grano
MSG 540	6.08a	68	161	28.1	17.0	2.60	Rojo
MSG 541	5.76ab	67	152	28.6	14.8	2.40	Rojo
SR-340	5.46 bc	66	153	29.1	18.9	2.43	Rojo
AMBAR **(TC)**	5.38 bcd	66	147	27.4	14.7	2.67	Rojo
SR-360	5.34 bcd	66	151	29.3	18.6	2.58	Rojo
ESHG-3	5.19 bcde	68	137	30.7	19.9	1.85	Blanco
CBH-8078	4.97 cdef	65	145	28.5	17.9	2.60	Rojo
CBH-8076	4.95 cdef	68	150	26.8	18.4	2.55	Rojo
BORA	4.83 defg	65	122	27.5	18.4	2.72	Rojo
CBH-8075	4.73 efg	63	147	31.0	17.6	3.10	Rojo
CBH-8077	4.43 fg	64	118	32.7	14.6	3.67	Rojo
81T91	4.27 g	65	149	25.3	18.3	3.08	Rojo
X	5.12	66	145	28.6	17.2	2.66	
Significancia	**						
DMS	0.61						
CV(%)	16.95						

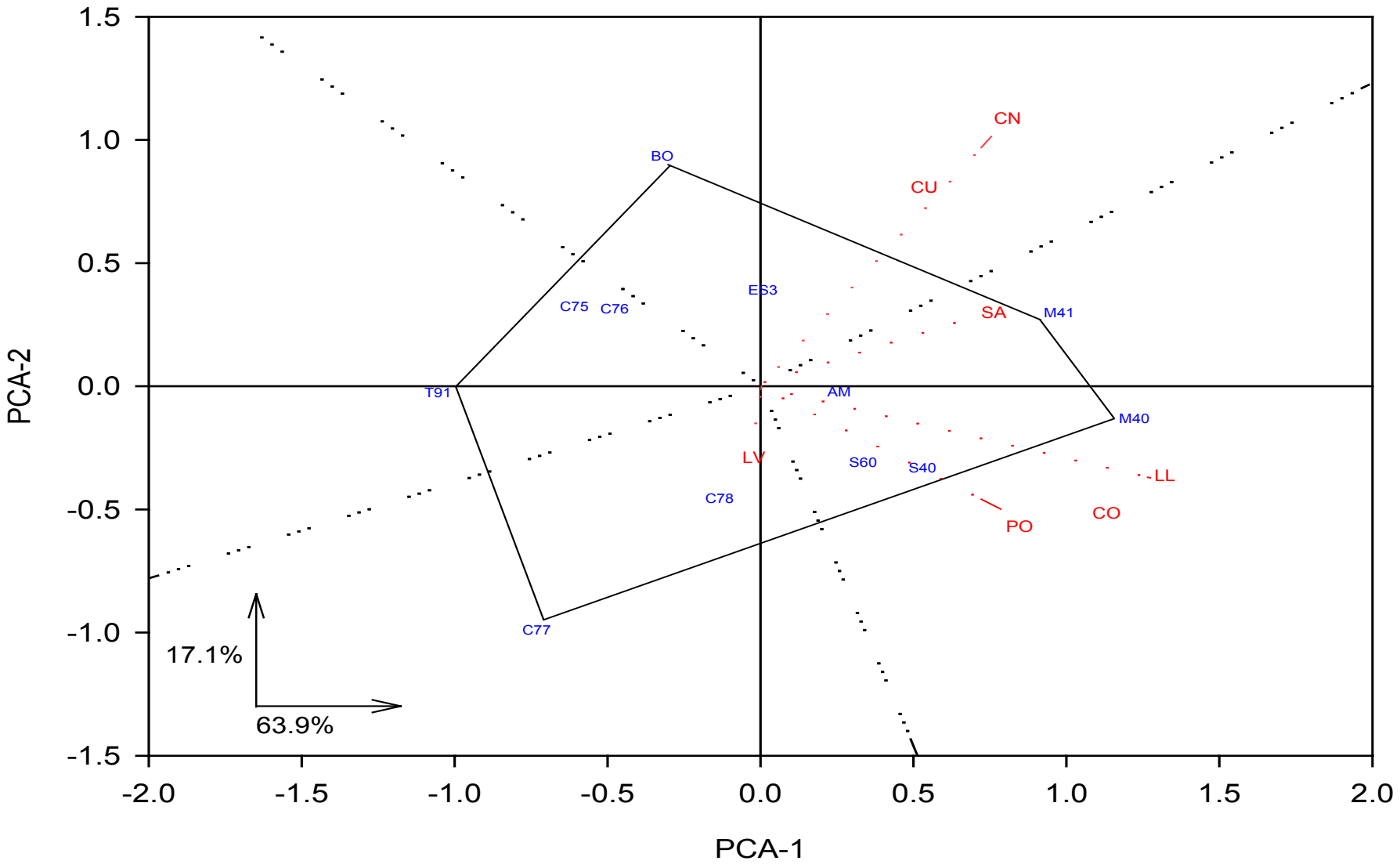

Figura 1. Puntuaciones del primer y segundo eje del componente principal de 12 sorgos en 7 ambientes de Centro América, 2008 (Biplot-GGE-SREG)

Cuadro 20. Rendimiento de los 12 híbridos en las distintas localidades de Centro América, 2008.

	GA-A	GA-A	GA-B	GA-B	GA-B	GA-B	GA-C	
	CNIA	Cuyuta	La Lujosa	San Andrés	Comayagua	SC Porrillo	Las Vegas	Promedio
MSG_540	7.77	6.21	5.35	6.87	4.80	6.43	4.93	6.24
MSG_541	8.38	5.65	5.34	6.71	4.56	5.15	4.44	5.96
SR_340	6.93	5.60	4.82	6.17	4.25	5.49	4.78	5.54
AMBAR	6.91	6.20	3.94	5.90	4.09	5.28	4.98	5.39
SR_360	6.67	5.69	4.59	6.07	4.00	5.26	4.92	5.38
ESHG_3	7.39	5.72	3.62	6.38	3.04	5.04	4.76	5.20
CBH_8078	6.59	4.73	3.72	5.75	3.64	5.17	4.90	4.93
CBH_8076	7.20	5.19	2.70	6.17	2.43	5.00	5.40	4.78
BORA	7.23	6.08	3.62	6.42	2.87	3.10	4.23	4.89
CBH_8075	6.74	5.93	2.87	5.08	2.64	4.58	4.79	4.64
CBH_8077	4.99	4.15	3.62	5.63	3.20	4.18	5.02	4.30
81T91	6.41	4.81	2.43	4.54	2.38	4.32	4.55	4.15
Promedio	**6.93**	**5.50**	**3.89**	**5.97**	**3.49**	**4.92**	**4.81**	**5.12**

Cuadro 16. Análisis de Taninos en el grano de los sorgos híbridos del ensayo del PCCMCA 2008.

No de laboratorio	Nombre de la Muestra	Prueba Detección de Taninos por método de Blanqueo
1	401 (MSG-540)	Negativo
2	402 (BORA)	“
3	403 (SOBERANO)	“
4	404 (SR-340)	“
5	405 (MSG-541)	“
6	406 (CBH-8077)	“
7	407 (CBH-8076)	“
8	408 (CBH-8075)	“
9	409 (ESHG-3)	“
10	410 (SR-360)	“
11	411 (AMBAR) Testigo común	“
12	412 (81T91)	“

CONCLUSIONES

- Los híbridos mas estables en rendimiento de grano a través de las siete localidades fueron AMBAR y MSG 540.

- Los híbridos que mejor respondieron a las condiciones ambientales prevalecientes en el ciclo del cultivo y presentaron mejores rendimiento de grano fueron MSG 540 y MSG-541.

- Los híbridos ESHG-3 y Bora presentaron mejor comportamiento en las localidades de Cuyuta (Guatemala) y CNIA (Nicaragua).

- Los híbridos MSG-40, MSG-41, SR-340 y SR-360 presentaron mejor comportamiento en San Andrés, La Lujosa, Choluteca y Santa Cruz Porrillo.

- Los granos de todos los híbridos evaluados no presentaron taninos perceptibles.

From: Sonnie Feagley
To: Bill L Rooney
Subject: Procard Statement - 08/05/09
Date: Monday, August 24, 2009 4:24:27 PM
Attachments: Procard Statement.pdf

Please approve statement, either by responding to this e-mail or by printing, signing and returning the statement to my office.

I approve the purchase of all items described in this document & that this order falls within the purpose for which the account was established. I will assist in resolving any problems associated with the delivery of payment of these goods or services.

Approved by:

CARDHOLDER STATEMENT (CENTRAL BILL)

Processor Hierarchy, Lvl: 1, Units: SOIL & CROP SCIENCES
Include Reference Numbers: True, Include POS Codes: False, Include Cards: Selected, Include Product Types: All, Include States: All,
Include Cities: All, Include Account Status: All , Include MCC Groups: All, Include MCC Actions: All
Include Original Currency: True, Include Transaction Notes: True, Include Line Item Detail: True, GSA Program: False

WILLIAM L ROONEY

MS 2474 - SOIL & CROP SCIENCE
SOIL & CROP SCIENCE
COLLEGE STATION, TX 778430001

Account #: **********969682

UNIT: SOIL & CROP SCIENCES
A/O: SHIAO-YEN KO

SPENDING CONTROLS

	Single Purchase	Daily	Cycle	MCC Groups:
Dollar Limits:	$5,000.00	$0.00	$5,000.00	TXAGGENERA Exclude
Volume Limits:		0	0	

TRANSACTIONS

Tran/Post Date / Purpose	Merchant & Location	Allocation / Notes/Details	Reference #	Orig Currency Amt/Code/ Conversion	Reported Tax	Transaction Amount
07/20/09	BIOTECHNOLOGY INDUSTRY		55417349202122023166002		(1)	$237.50
07/21/09	202-9629200, DC					
		405235-84721-080635215				
		08/18/09 - sf				
07/27/09	GRAIN SORGHUM PRODUCER		85430529209701896433670		(2)	$25.00
07/29/09	LUBBOCK, TX					
		405235-84721-080635215				
		08/18/09 - sf				
	Transactions Totals		**Count: 2**			**$262.50**

SUMMARY

	Tran Count	Reported Tax	Net Tran Amt
TRANSACTIONS TOTAL:	2	$0.00	$262.50
DIVERTED TRANSACTIONS TOTAL:	0	$0.00	$0.00
I-PURCHASE TRANSACTIONS TOTAL:	0	$0.00	$0.00
GRAND TOTAL	**2**	**$0.00**	**$262.50**

** Indicates a disputed transaction.*

SIGNATURES

Cardholder _____ Date _____

Approver _____ Date _____

From: Judy Young
To: undisclosed-recipients:
Subject: Promotion and Tenure Meeting - Monday, September 21st @ Noon
Date: Thursday, September 17, 2009 11:12:45 AM
Attachments: PnT_ALL-09i21_mtg_announc.doc
PnT_ALL-09i21_mtg_announc.pdf
Importance: High

** High Priority **

AgriLIFE RESEARCH & EXTENSION
Texas A&M System

TEXAS A&M UNIVERSITY

COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
Department of Soil and Crop Sciences

9/15/09
MEMORANDUM

TO: **ASSOCIATE AND FULL PROFESSORS**
DEPARTMENT OF SOIL & CROP SCIENCES

FROM: Dr. David Stelly, Promotion and Tenure Committee Chair
Dr. David Baltensperger, Department Head

SUBJECT: Promotion and Tenure Committee Meeting --
Monday, Sept. 21, 2009 Noon Rm 440 Heep Ctr

The annual Department of Soil & Crop Sciences SCSC Promotion and Tenure Committee *(all Associate and Full Professors)* will convene at noon this coming Monday, 9/21 at noon in Rm 440 Heep Ctr. For those who can only participate by telephone, the call-in information: 866-527-5741, participant code 413698.

We have a total of 7 candidates to consider, 3 for promotion and/or tenure, and 4 for mid-term review (3 of those 4 are tenure-track, one is not). ***You should review their documents before the P&T Meeting***. At the meeting, ad hoc reviews by the P&T Subcommittee will be briefly presented to stimulate additional insights by the Overall P&T Committee. We will vote on the candidates at the meeting, and results will be collated with absentee ballots. The categories of our candidates are as follows:

Promotion, Associate to Full Professor	Tony Provin
Tenure, only	Amir Ibrahim
Promotion (Asst. to Assoc. Prof.) and Tenure	Cristine Morgan
Mid-term review (Asst. to Assoc. Prof. and Tenure)	Jacqueline Aitkenhead-Peterson, Terry Gentry, Steven Hague
Mid-term review (Asst. to Assoc. Prof.)	Girisha Ganjegunte

Promotion packets can be viewed at the appropriate page in the Department website **(http://soilcrop.tamu.edu/promotion user name promotion, password 2good2know)**. All of the evaluation documents are there for your viewing; but the institution reminds us -- ***keep them confidential***. These include documents prepared by candidates, as well as letters of evaluation, and, in some cases, other information. In case of problems, please contact Judy Young at (979) 845-3041, or, if she is not available, Carol Rhodes at (979) 845-3001. For absentee voting, contact Judy Young at (979) 845-3041, or Carol Rhodes at (979) 845-3001.

Other reference materials that describe P&T guidelines, processes, and so on are also available at that same web page. Remember that our functions and thus performance criteria differ quite a bit among categories and levels. Should you have questions on eligibility and promotion criteria, you will those described by these documents.

- Faculty Promotion and Tenure College/AgriLife Research/Extension
- 2008-09 T&P Process Guidelines REV
- Suggested CV Outline
- Department of Soil and Crop Science Tenure and Promotion Procedures for Fiscal Year 2008
- College of Agriculture and Life Sciences Promotion and Tenure Recommendations 2008

Heep Center, 370 Olsen Boulevard
2474 TAMU
College Station, Texas 77843-2474

Tel. 979.845-3041
Fax. 979.845.0456
http://soilcrop.tamu.edu

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9/15/09
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Monday, Sept. 21, 2009 Noon Rm 440 Heep Ctr

The annual Department of Soil & Crop Sciences SCSC Promotion and Tenure Committee *(all Associate and Full Professors)* will convene at noon this coming Monday, 9/21 at noon in Rm 440 Heep Ctr. For those who can only participate by telephone, the call-in information: 866-527-5741, participant code 413698.

We have a total of 7 candidates to consider, 3 for promotion and/or tenure, and 4 for mid-term review (3 of those 4 are tenure-track, one is not). ***You should review their documents before the P&T Meeting***. At the meeting, ad hoc reviews by the P&T Subcommittee will be briefly presented to stimulate additional insights by the Overall P&T Committee. We will vote on the candidates at the meeting, and results will be collated with absentee ballots. The categories of our candidates are as follows:

Promotion, Associate to Full Professor	Tony Provin
Tenure, only	Amir Ibrahim
Promotion (Asst. to Assoc. Prof.) and Tenure	Cristine Morgan
Mid-term review (Asst. to Assoc. Prof. and Tenure)	Jacqueline Aitkenhead-Peterson, Terry Gentry, Steven Hague
Mid-term review (Asst. to Assoc. Prof.)	Girisha Ganjegunte

Promotion packets can be viewed at the appropriate page in the Department website **(http://soilcrop.tamu.edu/promotion user name promotion, password 2good2know)**. All of the evaluation documents are there for your viewing; but the institution reminds us -- ***keep them confidential***. These include documents prepared by candidates, as well as letters of evaluation, and, in some cases, other information. In case of problems, please contact Judy Young at (979) 845-3041, or, if she is not available, Carol Rhodes at (979) 845-3001. For absentee voting, contact Judy Young at (979) 845-3041, or Carol Rhodes at (979) 845-3001.

Other reference materials that describe P&T guidelines, processes, and so on are also available at that same web page. Remember that our functions and thus performance criteria differ quite a bit among categories and levels. Should you have questions on eligibility and promotion criteria, you will those described by these documents.

- Faculty Promotion and Tenure College/AgriLife Research/Extension
- 2008-09 T&P Process Guidelines REV
- Suggested CV Outline
- Department of Soil and Crop Science Tenure and Promotion Procedures for Fiscal Year 2008
- College of Agriculture and Life Sciences Promotion and Tenure Recommendations 2008

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From:	Wilfred Vermerris
To:	Seth C. Murray; Bill Rooney
Subject:	Proposed budget for DOE project
Date:	Wednesday, August 26, 2009 4:55:07 PM
Attachments:	TAMU-budget-DOE-WV082509.xls

Hi Bill and Seth,

How are you? Still busy in the field? Everything going OK?

I have attached the proposed budget for you for the DOE project. It has been a little challenging to balance the four budgets, but I think I got pretty close. In your case, I cut some of your supply and travel funds in order to make ends meet. This resulted in a reduction of $2,200 for the total project cost for the two years. I hope that is acceptable. If so, I will submit this budget for processing. Some more invoices from your sponsored programs office would be helpful (we've been billed for less than $2K so far). I know you guys have been working hard, though; it's just an administrative issue.

Please keep me posted on samples etc. We have made arrangements with the core facility at Cornell to do the expression profiling there.

Best regards,

Wilfred

DIRECT COSTS	Year 1 Requested	Year 1 Budgeted	Year 2 Requested
Salaries			
To Be Named Post-Doc 50% Time, 12 Cal/Mo,	20,000	20,000	20,000
Student Workers Hourly As Needed	3,746	3,746	3,746
Subtotal	23,746	23,746	23,746
Total Salaries and Wages	23,746	23,746	23,746
Fringe Benefits	7,302	7,302	7,302
Total Personnel Costs	31,048	31,048	31,048
Materials & Supplies	11,000	12,000	11,000
Pub & Dup		500	
Travel	4,000	5,000	4,000
Modified Total Direct Costs (MTDC)	46,048	48,548	46,048
Total Direct Costs	46,048	48,548	46,048
INDIRECT COSTS			
Indirect Costs MTDC *45.5%	20,952	22,089	20,952
TOTAL PROJECT COSTS	$67,000	$70,637	$67,000

Yr 2 allocated		
20,000		
3,746		
23,746		
23,746		
7,302		
31,048		
9,000		
2,000		
42,048		
42,048		
19,132		
$61,180	$131,817	allocated
	$134,000	requested

From:	Paul A Baumann
To:	Dirk Hays; Don Vietor; David Zuberer; Richard H Loeppert; Hays Dirk; Frank Hons; Charles Thomas Hallmark; Zhang Hongbin; Kevin Bronson; Kevin McInnes; Lloyd Nelson; Sam Feagley; Finlayson Scott; David M Stelly; Bill L Rooney
Cc:	David Baltensperger; Carol Rhodes; Judy Young; Travis Miller
Subject:	Provin Dossier Review
Date:	Tuesday, September 15, 2009 2:51:50 PM
Attachments:	Provin Dossier summary.doc

Dave,

Attached is my review of Tony Provin's promotion package. I will try to be at the meeting right a noon tomorrow but will need to leave at 12:15-20 to catch a plane.

Thanks.

Paul

Paul A. Baumann, PhD
Professor and Extension Weed Specialist
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979-845-4880

Paul A. Baumann, Professor and Extension Weed Specialist

Dr. Tony Provin-Dossier Review

As director of the Soil Testing Lab, Dr. Provin has been a cooperative, productive, and ingenious faculty member. What places Dr. Provin in the "exceptional" class, is his productivity beyond this appointment.

Upon his arrival at Texas A&M, he was greeted with adversity and discontent by clientele , and the prospect of managing employees who had dozens of years in the soil testing lab. Tony does not have the personality to shy away from controversy and quickly went to work to change the image of the soil testing lab and gain the trust and respect of employees who had seen the best and the worst of supervisors. The soil testing lab went from processing 30,000 samples annually when he arrived to between 40 and 60,000 today. With his lab personnel, and since his last promotion, Dr. Provin has responded to 28,734 phone calls, 83,764 emails, and 4,110 laboratory visits. He has worked with his laboratory staff to develop Quality Assurance Project Plans which are required for most federal grants. This qualification has played a role in acquisition of more than $10 million in funding.

Extension Specialists are largely measured by their impact on clientele. To this end, Dr. Provin has proven productivity as follows;

1) Bolstered by field studies, adopted the Mehlich III soil testing method which will continue to save producers money by not overestimating phosphorus requirements.
2) Worked with urban clientele to reduce nitrate-N over 65% from storm water runoff through an urban soil testing initiative in Travis Co.
3) Consistently works with County Extension Agents to promote soil testing programs, saving producers over $54 million annually.
4) Coordinated an urban soil testing program directed at reducing phosphorus applications by homeowners and subsequent impairment of surface water quality.
5) Worked with the poultry industry to develop novel methods of disinfecting, resulting in the conservation of 93 million gallons of water per year.
6) Promoted forage testing to improve the quality of forage production and the recognition of value in the eyes of both the producer and the buyer.
7) Responded to the emergency of hurricane Ike by working with other specialists and county agents to sample over 42,000 acres of crop land for salinity. The findings from this project saved producers over $82 million dollars that would have been lost trying to replant crops that could not have survived the adverse conditions.

Dr. Provin has given more than 200 county level programs at 130 venues. Considering his other responsibilities, this is a respectable number and reflects an acceptance by county agents and clientele. Presentations have concentrated on soil fertility in row crops, forages, turf, and home gardens. Dr. Provin has also been the point person on a number of county agent training programs in soil fertility.

In the area of scientific publications, Dr. Provin has had an appropriate role in the publishing of 16 journal articles since his last promotion, two book chapters, 37 abstracts, five Extension publications, 46 laboratory publications and three departmental publications. As an Extension Specialist, per AgriLife Extension promotion guidelines, specialists are not required to be a senior author on journal publications but are encouraged to play a significant role in their development as a co-author.

Dr. Provin has certainly demonstrated a cooperative nature with colleagues. It is particularly impressive that he has cooperated with 56 other faculty members and external professionals on a wide diversity of funded research projects. In addition, he has cooperated with peers on 29 field and greenhouse studies and 19 laboratory studies. These efforts have led to the garnering of more than $5.4 million since his last promotion of which $3.4 million went directly to his program. Career totals are $10.5 million and $7.1 million, respectively. Dr. Provin has also cooperated with soil and plant testing lab directors at the Univ. of Georgia, Univ. of Arkansas, Oklahoma State, Louisiana State University, and the Noble Foundation. These efforts have provided for more uniform testing and recommendation guidelines. Dr. Provin has also played informal, but significant roles in the development of biodiesel testing protocols and the creation of Material Safety Data Sheets.

Professionally, Tony has provided reviews for 48 manuscripts from nine journals. He is an active member of the Soil Science Society of America, having served on four committees. Dr. Provin has served numerous times as an advisor to the Texas Commission on Environmental Quality, The SERA-IEG-6 information exchange group, and the Brazos Valley Hay Producers Association. He has been active through 14 committee assignments within our department, four committees within AgriLife Extension, and is a member of the COALS Information Technology Advisory committee.

Internationally, Dr. Provin has cooperated with colleagues from Malawi, Afghanistan, Turkmenistan, Tunisia and Uzbekistan to address soil testing needs and analytical assessments. In addition, he has worked with TAMU faculty on laboratory analysis of imported samples.

In summary, Dr. Provin has been an extremely productive faculty member. As the soil testing lab director, his career could have been confined to the safe confines of the third floor. However, Tony recognized a need for field validation studies and cooperated with soil fertility, forage, field crops, and turf colleagues to develop the best recommendations possible. His grant acquisition and cooperative research program alone would compete favorably with most full professors in our department, despite having a full time job as the lab director. Let this guy get some sleep and promote him to Full Professor.

From: Bill Rooney
To: "Stelly David"
Subject: PT review of Ibrahim
Date: Tuesday, September 15, 2009 7:23:00 PM
Attachments: 09-15-09 Ibrahim Tenure.pdf

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
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AgriLIFE RESEARCH & EXTENSION
Texas A&M System

TEXAS A&M UNIVERSITY

COLLEGE OF AGRICULTURE
AND L FE SCIENCES

Department of Soil and Crop Sciences

August 19, 2009

To:

I have reviewed the tenure packet of Dr. Amir Ibrahim and based on the documentation, it is my recommendation that Amir be given tenure.

Dr. Ibrahim has been on faculty at Texas A&M University since 2007 as an Associate Professor and Small Grain Breeder. Prior to this position, Dr. Abrahim was a winter wheat breeder at South Dakota State University. At South Dakota State University, Amir started as an Assistant Professor and rose through the ranks to Associate Professor with tenure. At Texas A&M University, Amir is responsible for the small grain breeding program for both oat and winter wheat.

It is my recommendation that given tenure based on the following assessment.

1. Dr. Ibrahim developed and taught several courses at SDSU; he has continued that trend here at TAMU. He is now teaching an experimental design course that has had both good enrollment and good ratings. It is an important and needed course in our graduate student training.
2. Dr. Ibrahim has developed a strong graduate research training component to his breeding program. He serves as advisor for three students and co-advises another three (with other faculty in our department).
3. In the past two years, Dr. Ibrahim has reestablished the small grains breeding program at College Station to critical mass. I expect him to produce new and useful oat and wheat varieties for South and Central Texas.
4. Dr. Ibrahim has established his ability to procure traditional sources of funding to provide base funding for the breeding program. He is collaborating with additional scientists to procure funds from more non-traditional and competitive sources (ie, the AFRI grant).
5. Dr. Ibrahim is studying application of wheat production in new and innovative ways. While not all of these may be successful or adopted, it is the role of public breeding programs to develop innovative approaches and uses of our important crop plants.
6. With regard to publication, Amir has 18 published journal articles. In addition, over his career he has released eight wheat cultivars. This publication and release record is acceptable for a breeder. (He lists another 4 as submitted and 14 in preparation – I would remove these from the package and just provide those that are published, in press or accepted).

In summary, Dr. Ibrahim has established a small grain program that will be productive; he is already well know and received by his colleagues in wheat breeding. His program is funded and he is publishing the results of his research. It is my opinion that Dr. Ibrahim is certainly qualified for tenure in the Department of Soil and Crop Science at Texas A&M University.

Sorghum Breeding and Genetics
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2474 TAMU
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From:	Stelly David
To:	Hays Dirk; Zuberer David; Baumann Paul; Nelson Lloyd; Finlayson Scott; Bronson Kevin; Stelly David; Feagley Sam; Hallmark Tom; Zhang Hongbin; McInnes Kevin; Vietor Don; Hons Frank; Loeppert Dick; Rooney Bill; Hays Dirk
Cc:	Young Judy; Rhodes Carol; David Baltensperger
Subject:	P&T SCSC Subcommittee Update Sep 14
Date:	Tuesday, September 15, 2009 2:00:55 PM
Attachments:	p&t 2010 09i11ds 15th.xls.pdf ATT00047.htm
Importance:	High

Dear All,

Thanks!!! for agreeing to help with the analyses of P and/or T packages (7 total, but 4 are mid-term). Although prior commitments and some emergencies complicated the identification of ad hoc reviewers, we have 1 confirmed reviewers for all 7, 2 confirmed for all but two, and I am working further on securing those 2. I know the timing of this is tough on everyone, me too, so your help is all the more appreciated. At this time, no reviewer is responsible for more than one report, so your loads should not be overly burdensome, other than the timeframe and meetings involved.

Composition of our SubCommittee and the list of candiates, respectively, are shown in the attached table.

Admin reminds us -- info and proceedings are confidential.

If you have had any trouble logging in for the promotion packages, please contact me and/or the main office.

http://soilcrop.tamu.edu/promotion
User Name: promotion
password: 2good2know

Basically, we want to do the following:

by SEP 16 noon: send/share written **Ad Hoc Analysis for P&T draft reports** -- our target is 2 per candidate -- we prefer to have these in hand by noon tomorrow, before or at the meeting. If you send them to me before 10:30, I can print them and bring them to the meeting. Please cc to Judy Young. Our meeting tomorrow will be time-tight, so we need to be efficient, and get to the main points, some will be much easier than others, and for those, we should move quickly. I anticipate that there will be some follow-up discussion by email, telephone or in person on an ad hoc basis.

P&T Sub-Committee Meetiing WEDNESDAY SEP 16, 12-1:45: RM 437 HEEP CTR & CALL-IN NUMBER (866-527-5741, participant code 413698)
GOAL -- collectively redact and add to the reports; reflecting several priorities, we will start with the promotion & tenure candidates
12-12:10 Introduction
12-10-12:25 PROVIN ,
12:25-12:40 MORGAN and
12:40-12:55 IBRAHIM,

then move onto the Mid-term reviews, (IF we cannot complete these now ... it will

be more time-consuming, but not catastrophic, because they have a different bureaucratic time-line)
12:55-1:00 Revisit -- aims of mid-term review
1:00-1:10 AITKENHEAD-PETERSON, JACQUELINE
1:10-1:20 GENTRY, TERRY
1:20-1:30 HAGUE STEVEN
1:30-1:40 GANJEGUNTE, GIRISHA

12:40-12:45 Wrap up -- next steps

by MONDAY SEP 21 noon:
Ad hoc reviewers make the updated drafts, reflecting both ad hoc and Sub-committee comments; , copy to committee.
Ad hoc reviewers will need to prepare in their own ways for brief presentations to the Overall P&T Committee meeting to be held Monday at noon (Sept 21).

P&T Committee Meeting MONDAY SEP 21, 12-2 (possibly 3): RM 437 HEEP CTR & CALL-IN NUMBER (866-527-5741, participant code 413698)
(tentative agenda; identify timing of tabulations etc .. confer with Carol Rhodes on what will work best)
Intro
Mid-term reviews
Promotion only
GANJEGUNTE, GIRISHA
Promotion and Tenure
GENTRY, TERRY
HAGUE STEVEN
AITKENHEAD-PETERSON, JACQUELINE (last, to allow for Hallmark to arrive)
Dual Ballots: T and non-T
Promotion to Assoc, and Tenure
MORGAN (for
Tenure, only
IBRAHIM
Excuse Associate Profs
Promotion to Full
PROVIN
tentative:
Collate with absentee ballots
Amend statements per candidate, reflecting full committee comments and suggestions.
Communicate Votes and statements to Head before Sept. 25th

David
Begin forwarded message:

> I sent you an earlier email (12th) but have not gotten a response: I am wondering if you are in town??? .... and so left a voice mail, to which this is a complement.
>
> I need to know your availability/intentions regarding the request for you to analyze and provide a synopsis report on your assessment of Amir Ibrahim (Assoc. Prof.) for tenure. This is not a huge job, but an important one.

Essentially it involves

By noon tomorrow: [1] going through his documentation (on line) --
[2] listing key points in writing

Noon tomorrow (16th): Meet as sub-committee to discuss the reports
Noon 21st: Meet with and present to the analysis comments to overall P&T committee

Thanks -- hope everything is okay,

David

Begin forwarded message:

> **From:** Stelly_David <stelly@tamu.edu>
> **Date:** September 12, 2009 12:19:03 AM CDT
> **To:** Loeppert Dick <rloepper@ag.tamu.edu>, Hallmark Tom <hallmark@tamu.edu>, Zuberer David <dzuberer@ag.tamu.edu>, Zhang Hongbin <hbz7049@tamu.edu>, "Smith C. Wayne" <cwsmith@tamu.edu>, Scott Senseman <s-senseman@tamu.edu>, Baumann Paul <p-baumann@tamu.edu>, Joe Cothren <JCothren@ag.tamu.edu>, McInnes Kevin <k-mcinnes@tamu.edu>, "Chandler J. Michael" <jm-chandler@tamu.edu>, Rooney Bill <wlr@tamu.edu>, White Richard <rh-white@tamu.edu>, Sam Feagley <s-feagley@tamu.edu>, Kevin Bronson <k-bronson@tamu.edu>
> **Cc:** Young Judy <j-young@tamu.edu>, David Baltensperger <DBaltensperger@ag.tamu.edu>
> **Subject: P&T Subcommittee**
>
> Dear Gents,
>
> We are fast approaching the P&T process that we go through each fall, and the Department needs a few minutes of your time to facilitate this process. The target the overall SCSC P&T Committee voting will tentatively be **NOON Sept. 21 (Mon)**;
>
> Before then, we need a couple of individuals to conduct a detailed review of a each candidate and to subsequently report a short assessment to the overall SCSC P&T Committee, and add in those comments, to prepare for presentation to the overall P&T Committee. I developed a list of prospective reviewers in consultation with Dr. Baltensperger, and thus the prospective membership of this P&T Subcommittee.
>
> Please see the accompanying image of a Table in which I have indicated 2 diverse reviewers for each candidate (7), one a mentor and one not a mentor of the respective candidates. We need contrasting perspectives to be maximally effective. Please let me know ASAP if there is a glaring problem that you see in this strategy or ad hoc assignments.
>
> As a member of this Subcommittee you will called upon for only 1 assessment to complete for this Subcommittee,

1 written synopsis to prepare, share and orally present at the **prospective subcommittee meeting sometime Wed Sept 16**; incorporate subcommittee suggestions & comments
1 similar oral synopsis (perhaps also reflecting additional input by the subcommittee) to the Overall SCSC P&T Committee on Monday Sept 21.

Would you please do the following:

[1] INDICATE THAT YOU ARE WILLING TO SERVE ON THIS SUBCOMMITTEE?

[2] Conduct the indicated in-depth assessment?

[3] **SUBCOMMITTEE MTG:** State the times at which you are available (15-minute increments) **Sept. 16 (Wednesday)**, or times not available (TELL US WHICH YOU STATING -- available or unavailable)

[4] **OVERALL COMMITTEE MTG:** Whether or not you can attend the **Sept 21 Monday meeting**, 12 - 2(?), and if you cannot attend, who you think might be a good choice to present your synopsis to the Overall P&T Committee.

[5] PLEASE EMAIL the answers to the above to ME and to JUDY YOUNG, preferably using the SAME SUBJECT LINE.

THANKS!!

David Stelly

stelly@tamu.edu

O: (979) 845-2745

2009 FALL SCSC P&T
SUBCOMMITTEE DRAFT
09i11

	Primary	Secondary					
PROF Name	**TITLE**	**Reviewer-1**	**Reviewer-2**	**Type of Review (2009)**	**MENTORS**	**LOC**	
AITKENHEAD-PETERSON, JACQUELINE	ASST	**Loeppert -confirmed**	**Hallmark (confirmed; 16th after 12:30, 21st after 12:20)**	M (P&T)	Feagley, Hallmark	Campus	s
GENTRY, TERRY	ASST	**Zuberer - confirmed**	**Zhang- confirmed (unavail. 16th; written report; avail. 21st)**	M (P&T)	Zuberer, Hons	Campus	p
HAGUE STEVEN	ASST	**Nelson - confirmed (rpt, 16th?, OK/21) (Smith - OUT/Admin conflict(AH))**	**Hays - confirmed (Heilman - OUT/travel) (Senseman - OUT/travel)**	M (P&T)	Wayne Smith	Campus	P
PROVIN TONY L	ASSO	**Baumann - confirmed report, but out 16-21(noon)**	**Hons - confirmed (Cothren -OUT/emerg.)**	P	Feagley* Hons, Wiedenfeld (Weslaco)	Campus	s
MORGAN CRISTINE L	ASST	**McInnes -confirmed**	**Vietor -- confirmed L Rooney - OUT/travel (Chandler - OUT/emerg.)**	P&T (ext: 2009)	Hallmark, McInnes	Campus	s
IBRAHIM, AMIR	ASSO	**W Rooney - confirmed**	**Finlayson confirmed White _no response so far**	T	L Rooney, B Rooney, L. Nelson	Campus	p
GANJEGUNTE, GIRISHA	ASST	**Feagley - confirmed (unavail. 16th; written report; avail. 21st)**	**Bronson (LBB) - confirmed**	M (P)	Hallmark, Trostle, Feagley	El Paso	s

From:	Seth C. Murray
To:	jblumenthal@ag.tamu.edu; Bill Rooney; Wenwei Xu; kerry-mayfield; croptest@tamu.edu
Cc:	David D Baltensperger
Subject:	PUF vacuum planter
Date:	Tuesday, September 15, 2009 10:13:28 AM
Attachments:	Texas AgriLife Funding Request2.docx

All,

Dr. Baltensperger suggested that a vacuum plot planter is near the top of the list for PUF fund farm equipment requests for the department and that we should put in a proposal. We currently have $10,000 from Texas Corn Producers which expires December 31st. Dr. Baltensperger has said that the Texas Sorghum Producers have also approached him and would be willing to contribute $30,000-$40,000 towards this equipment.

Attached is a PUF request that hopefully you get a chance to provide feedback on by Friday afternoon.

I am expecting a new quote from Almaco this week to add in. After talking with various people, the Almaco is fine for nursery planting, the SRES is possible for nursery planting and the Winterstieger can not be used for nursery planting because of cross contamination. The SRES quote from January was for ~$142,000.

I have also been contacting industry to source if any used planter exists that might be available - if you have industry contacts worth talking to about this, please let me know.

Thanks,

Seth

--
Seth C. Murray
Assistant Professor
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TAMU MS 2474
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Office (979) 845-3469
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http://maizeandgenetics.tamu.edu/

Planter Investment to Improve Texas Public Corn and Sorghum Breeding and Research

Team Requesting: Seth Murray[1], Jurg Blumenthal[1], Bill Rooney[1], Wenwei Xu[2], Dennis Pietsch[1]
1. Department of Soil and Crop Sciences. 2. Lubbock Experiment Station.

I. INTRODUCTION:

In Texas, 2,250,000 acres of corn were planted in 2008, averaging 127 bushels per acre with a value of over one billion dollars (USDA/NASS). Also 3,050,000 acres of sorghum were planted in Texas for 2008, averaging 52 bushels per acre with a value of over half a billion dollars. Although yields differ markedly across locations, an average increase of one bushel per acre at $4/bu. would be worth an additional $9 million and $12 million dollars for corn for sorghum respectively to the State of Texas, much of which would go directly to growers. Additionally, though bioenergy numbers are not yet available, the industry is rapidly developing and increases in biomass yields would also increase future revenue to the State of Texas.

To continue to increase yields plant breeding and crop testing are critical for developing and evaluating superior corn, sorghum, and bioenergy hybrids. These crops challenge Texas growers with unique problems (drought, heat stress, aflatoxin, poor soils, salinity, mites, etc.) that remain minimally addressed by private industry, especially in an unbiased way. Many of these problems can be reduced by breeding for these stresses and then testing for appropriateness for resulting hybrids in the correct environments. The Texas AgriLife crop testing program utilizes 15 locations of AgriLife centers and growers fields across Texas to maximize the impact and relevancy of yield tests. By yield testing newly released varieties, we determine how they compare in terms of agronomics, yield and quality to what is already in the market place. The crop testing program works closely with the public plant breeding programs, and with private industry to maximize these results. This in turn allows researchers to select superior genetics and growers to select superior hybrids to further increase yield and quality while decreasing inputs. To maximize breeding and crop testing progress we want to ensure that our conditions are identical, or nearly identical to what a Texas producer experiences. In both cases of yield trials and breeding, uniform seed distribution is key for meaningful results. Uniform seed distribution is controlled at planting by a seeding unit.

Three types of seeding units are available for research and extension plot planters: traditional cone type seeders, precision cone type seeders, and vacuum seeders. Currently, the planter used to plant statewide yield trial plots and breeding nurseries is an older-style Almaco cone planter. This cone planter uses gravity to separate plot seed over a cone into 32 bins. Based on random sampling this leads to uneven seed distribution (anywhere from 0 – 10 seeds might occupy each bin). While this current cone planter continues to efficiently plant seed in research plot lengths (typically 10ft. – 45ft.), the resulting stands are not uniform, as would be found in a producer's field, instead plants are often "clumped" and "gapped" (see photo). This situation leads to excessive inter-plot plant completion from plants too close together, and a lack of plant competition for those spaced further apart. This reduces our ability to separate genetic from environmental effects to less than optimum levels.

Instead of gravity separating seeds on a cone, vacuum plot planters use a suction force behind a plate with a fixed number of holes to perfectly control the number of seeds picked up. A computer control then determines when each seed is released, resulting in a precision planting pattern with all plants spaced the same distance apart. The majority of Texas growers switched to these types of planters for their acreage many years ago, because of the increased accuracy and ???.

Comment [A1]: Why?

Because agronomic techniques used when evaluating crops should be conducted in the same manner of what is used by growers. To more accurately, consistently and appropriately plant, evaluate and yield test corn and sorghum for Texas, funding for a research vacuum planter is being requested from Texas AgriLife to supplement funding from commodity groups. Public corn and sorghum programs have been, and continue

to be important in improving germplasm for growers in Texas. By increasing the uniformity of breeding nurseries and yield testing sites across Texas, more accurate, and more relevant data can be collected.

Although a bulk seed vacuum planter and a research plot vacuum planter differ immensely in costs, both corn and sorghum commodity boards feel this will significantly improve result relevancy enough to financially support part of this equipment. Because neither of these two commodity boards typically supports equipment purchases, the demand is clear.

II. OBJECTIVES:

1. Conduct yield testing activities with improved planting distributions similar to that of commercial planted corn and sorghum, improving and evaluating corn for Texas environments.
2. Improve planting distributions in breeding nursery activities that improve corn and sorghum germplasm for Texas.
3. Use in experiments of planting density and precision planting of new and expanding bioenergy crops.

III. DESCRIPTION OF SPECIFIC PLANTER REQUEST:

We have looked at all three manufactures of research plot planters: Almaco, SRES, and Winterstieger. Almaco is the only company that produces a single planter that can safely plant crop testing programs and breeding programs. This will include all accessories needed.

IIII. BUDGET (Table 1):

Matching funds

The Texas Corn Producers Board has already awarded $10,000 for the purchase of this equipment. The Texas Sorghum Producers Board has agreed to $XXXXX.

Infrastructure: The planter would be managed jointly by the TAMU corn breeding program (Murray), the sorghum breeding program (Rooney) and crop testing program (Blumenthal/ Pietsch) in College Station. The planter will be primarily housed within the Brazos Bottom Farm Services complex and/ or the TAMU foundation seed building depending on time of year and use. It will be used for planting trials across the state including the Lubbock corn and sorghum breeding programs when possible (Xu / Peterson). This equipment would be available for other corn and sorghum researchers throughout the state at no cost except transportation. With our previous Almaco cone planter we have had no major maintenance or repair issues in the 10 years since purchase and believe we can expect a similar experience with this planter.

TABLE 1. Budget for Corn/ Sorghum Vaccuum Planter	**Cost**
Alamaco precision vacuum planter	**$140,000**
Less Matching (From Corn and Sorghum Commodity Groups)	*-$10,000*
Less Matching (From Faculty)	*-$1000*
TOTAL Texas AgriLife Request	**$129,000**

From: John Mullet
To: Bill Rooney
Subject: F2 seed?
Date: Wednesday, September 30, 2009 7:14:10 AM

Bill,

Do you have sufficient seed of the above F2 population so that we could obtain another ~200-300 seed? We planted one set mid-July and the early flowering F2's are now apparent. However the plants are so tall that I am not sure we can get the entire population through flowering in the greenhouse. I would like to plant another set now that days are short and finish them out during the winter.

Thanks,

John

From: John Mullet
To: Bill Rooney
Cc: Daryl Morishige Morishige
Subject: F2 seed (200 plants) and parental lines
Date: Tuesday, October 13, 2009 7:40:12 AM

Bill,

I know you are busy having just returned from traveling.

When there is time, if someone can pull seed for the above, I would like to grow these out in the greenhouse this Fall to map flowering time, etc., and to advance the population this winter (all should flower in our SD greenhouse).

Thanks,

John

PS: Daryl Morishige is the point of contact on this population is our group.

From:	Stelly David
To:	Rooney Bill
Cc:	Stelly David David M.
Subject:	Raska statement for Award
Date:	Wednesday, October 28, 2009 12:55:51 PM
Attachments:	Raska Award Statement.doc

Bill

Apparently they nomination packages are pretty stiffly defined. Here is what I interpret to be a potentially acceptable format and statement for Wayne Raska.

It does not say that I cannot provide a letter too, but I am guessing their desire is to have this 2-page d.spaced statement instead of a letter from the nominee.

David

Statement of Accomplishments, Achievements, and Impacts
for
Dwaine A. Raska – Nominee for Technical Staff Support

Longevity of Service: Dwaine A. Raska ("Wayne") has served the Cotton Cytogenetics / Wide-cross Introgression Project for 25 years, during most of which he has been the project's "right arm". His enduring contributions have provided great continuity and ever-increasing proficiency and efficiency. *Wayne's intellectual and practical contributions to project operations have been intrinsic to our Project's overall success, and especially for it core reputation as a world leader in Cotton Cytogenetics -- our project is well recognized for its forte, cotton cytogenetics, throughout the world cotton research community*. This reputation is an important component of the overall international reputation of SCSC, Texas AgriLife, TAMU and the College Station location (including USDA) as "a" if not "the" leading site in many aspects of cotton germplasm, research and genetic improvement. He has proven himself to be an indispensable part of this project and served with distinction for many years as our project's technical guru and research assistant.

Exceptional Work Ethics, Proficiency, Organization and Output: Many of Wayne's immense contributions resulted from efforts far beyond the call of duty. In numerous weeks, he has worked well over 100 hours; nights when he worked all night, and weekends where worked well over 16 hours. His proficiency allows the project to grow large populations in greenhouses (15,000 – 20,000 sq ft / year-round), space-transplanted nursery (2.5 acres) and direct-seeded cotton fields (5-10 acres), work-crew management (5-10 student workers year round), and to make very large numbers of cytogenetic preparations and cytological analyses for cotton

cytogenetic stock development (*Gossypium hirsutum* L.) and chromosome substitution (from three alien species), and many additional ad hoc projects.

Exceptionally Economization to the Project and Department: Wayne has time and time again gotten things done economically. His "one-man-army" work ethics have multiplied the benefits of his education, intelligence, organization and diverse handyman skills. There have been many situations where Wayne took the initiative to build or modify or fix items in our buildings (#955, 961, 963, 965), fields and equipment, and devise operation-smoothing and -economizing gadgets or procedures. A few simple examples include repairing equipment and rebuilding our roller gins, lightweight construction of lab items, building a bridge across the constantly flooded ditch between buildings 965 and 955 (we use both), building soil bins, building sidewalks, renovating/fixing greenhouses #961 and #963, and just last week, welding a bike rack. His contributions extend to aesthetics and social matters, too – for example, he has for years planted, replaced and kept up ornamentals in front of New Beasley Lab, which arguably has the best looking greenery of all buildings along Agronomy Rd., the grounds around most of which are poorly landscaped. On a number of occasions, he has provided decorations and time for SCSC Departmental functions. In our lab, he works directly with numerous hourly workers, and has on numerous occasions taken the lead in organizing lab socials that help keep up morale and work efforts.

Summary: I request your support in having the Department recognize Wayne at this time for his long-term dedication and many contributions to our lab, the Cotton Program, our Department and Texas AgriLife. They reflect exceptionally high degrees of competence, commitment,

multi-dimensionality, consistency, and persistent pursuit of perfection. ***David M. Stelly, 10/28/09***

From: Lea Dell Morris
To: Bill L Rooney
Subject: RE: 06E914693
Date: Wednesday, August 26, 2009 9:32:41 AM
Attachments: Little Rock lodging receipt.pdf

No show means that you had a reservation but you didn't show up. I have attached the lodging receipt I received from the hotel that was reserved on your hotel card. When you didn't show they charged a 1 night no show to it.

Sorry!

>>> "Bill Rooney" <wlr@tamu.edu> 8/26/2009 9:20 AM >>>
Lea

What does no show mean?

I didn't have and never had, to my knowledge a reservation in Little Rock. If I had, then it should have been removed long prior to the meeting. On this trip I stayed in Texarkana, Tx and returned the same day?

Regards,

Bill

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151

-----Original Message-----
From: Lea Dell Morris [mailto:LMorris@ag.tamu.edu]
Sent: Wednesday, August 26, 2009 9:18 AM
To: Bill Rooney
Subject: Fwd: 06E914693

Dr. Rooney,

What was the business reason for the "no show" in Little Rock, AR on 6/30/2009?

>>> Gwen Cortez 8/26/2009 8:40 AM >>>
Hi Lea Dell,

1. For document 06E914693 please give a business reason for the "no show" on the lodging expenses.

Thanks, Gwen

Gwen Cortez
Financial Accountant I

Texas Agrilife Research /
Texas Agrilife Extension Service
Wells Fargo Bldg Suite 540
979-845-6147/fax 979-458-3242
gwenc@tamu.edu

08/19/2009 14:24 FAX 5013763212 • 001

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Name & Address

ROONEY, BILL
TEXAS A AND M UNIVERSITY
SOIL AND CROP SCIENCE
COLLEGE STATION, TX 77843

Room
Arrival Date 6/29/2009
Departure Date 6/30/2009

Adult/Child 1/0
Room Rate 98.00

RATE PLAN C-FFO
HH#
AL:
CAR:

CONFIRMATION NUMBER : 82477947

8/19/2009 PAGE 1

DATE	REFERENCE	DESCRIPTION	AMOUNT
6/30/2009	1869133	GUARANTEED NO SHOW	$98.00
6/30/2009	1869133	SALES TAX - HOTEL	$8.36
6/30/2009	1869133	CITY TAX	$1.76
6/30/2009	1869134	MC *0367	($98.12)
		** BALANCE **	$0.00

EXPENSE REPORT SUMMARY

09 00:00:00 STAY TOTAL

ROOM & TAX	$98.12	$98.12
DAILY TOTAL	$98.12	$98.12

FOLIO

ACCOUNT NO. MC *0367

CARD MEMBER NAME
ROONEY, BILL

ESTABLISHMENT NO. & LOCATION — ESTABLISHMENT AGREES TO TRANSMIT TO CARD HOLDER FOR PAYMENT

CARD MEMBER'S SIGNATURE
X

MERCHANDISE AND/OR SERVICES PURCHASED ON THIS CARD SHALL NOT BE REBOLD OR RETURNED FOR A CASH REFUND.

DATE OF CHARGE 6/30/2009 FOLIO NO./CHECK NO. 97004 438696

AUTHORIZATION 097436 INITIAL

PURCHASES & SERVICES

TAXES

TIPS & MISC.

TOTAL AMOUNT -98.12

A

TheHiltonFamily | Hilton | CONRAD | DOUBLETREE | Embassy Suites | Hampton Inn | Hampton Inn & Suites | Hilton Garden Inn | Homewood Suites by Hilton

From:	Kuhlman, Les
To:	Bill Rooney
Subject:	RE: 09-105 - Revise Manuscript
Date:	Tuesday, September 01, 2009 9:51:23 AM
Attachments:	Introgression_Breeding_MS_v33.doc

Bill-

I've found a problem. The revised manuscript that you sent in has a different title than the manuscript that I actually submitted. I made some minor changes and took David Stelly's suggestion on the title prior to submitting the original manuscript. I probably didn't disseminate the submitted version of it to the group - sorry! I have attached the original submitted version of the manuscript here. Hopefully the revisions won't be difficult to make to this version for resubmission. Sorry about the confusion. Let me know if you need anything else.

Les

Les Kuhlman
Research Scientist
Pioneer Hi-Bred International, Inc.
Lawrence Soybean Research Center
1451 North 1823 Rd
Lawrence, KS 66044
Office: (785) 841-2229 x11
Cell: (785) 764-2186

-----Original Message-----
From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Thursday, August 27, 2009 7:17 AM
To: Kuhlman, Les
Subject: FW: 09-105 - Revise Manuscript

Les:

I realized I can send this to your Pioneer address as well. So in case you haven't yet, here it is.

I've made corrections and resubmitted the revised version (I've attached that to this e-mail).

I also have all of the permission to copyright forms (except yours) signed and I'll send those in.

What I don't know - they have a section for adding good files for images and tables. Do you have those files or should they simply use the revised manuscript? (ie, in the last manuscript, what did you send them?) If they are different files, do you have those files and can you upload them?

Regards,

Bill

P.S. I have approval to release Tx3361, so I am reworking the manuscript and submitting it for release. Before I submit, I'll send the registration manuscript up to you for approval.

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151

-----Original Message-----
From: Editorial Office [redacted]]
Sent: Thursday, August 06, 2009 8:32 PM
To: wlr@tamu.edu
Subject: 09-105 - Revise Manuscript

Dear William Rooney ,

Re: 09-105
Early-generation Germplasm Introgression from Sorghum macrospermum into Sorghum (S. bicolor) Les LCK Kuhlman, Byron BLB Burson, David Stelly, Patricia Klein, Robert R Klein, Harold James H.J. Price, and William WLR Rooney

Perry Gustafson has received and assessed reviewer comments for your manuscript. Based on the reviewer comments, Perry Gustafson recommends you submit a revised manuscript.

To submit a revised manuscript, log on to OSPrey at https://endeavour.cisti.nrc.ca/publisher/access.view?journalCode=GENOME and click on "Author" in the "Your Work Areas" box. Please DO NOT submit a new manuscript as this will lead to delays.

Below I have printed the reviewer comments and the comments of Perry Gustafson.

In addition, no work may be published in GENOME unless the publisher receives an assignment of copyright form from each author. You should have downloaded these forms during the submission process. If you have not done so already, please complete these forms and upload them with your revised manuscript files or fax them to the Editorial Office at 1-905-237-3645.

If your manuscript contains colour figures you need to fill out additional forms that I can provide by e-mail. Please ask if you need this form.

Sincerely,
Alistair Coulthard
Assistant to the Editor
GENOME
e-mail: [redacted]

Associate Editor's Comments:

I agree with the reviewer in that this is a very well written manuscript. However, it does need tot be carefully edited by the authors to make several small corrections as noted in the review.

Review 1
Questions/Answers

Q.There are four general questions for recommendation:
A.Accept as it stands

Comments

These are my general/specific comments:

The manuscript is well written. Properly methodology and protocol were followed in conducting the research. Conclusions drawn are proper.

The research adds new knowledge on the potential to introgress genes from other Sorghum species into S. bicolor.

Manuscript is acceptable for publication as submitted.

The reference Sharma (1999) on page 6 is not listed in the References.

Huelgas et al., reference - location is Tamworth, not Tomworth. (See Franzmann and Hardy)

Early-generation Germplasm Introgression from *Sorghum macrospermum* into Sorghum (*S. bicolor*)

Les C. Kuhlman, Byron L. Burson, David M. Stelly, Patricia E. Klein, Robert R. Klein, H.J. Price, and William L. Rooney

L.C. Kuhlman, D.M. Stelly, H.J. Price (Deceased), and W.L. Rooney[1]. Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843.

B.L. Burson and R.R. Klein. USDA-ARS, Southern Plains Agricultural Research Center, College Station, TX 77845.

P.E. Klein. Department of Horticulture, Texas A&M University, College Station, TX 77843.

[1]Corresponding author (979-845-2151, wlr@tamu.edu)

ABSTRACT

Most genetic improvements of sorghum (*S. bicolor* [L.] Moench) have resulted from public and private breeding efforts reliant on intra-specific crosses. Recent inter-specific hybridization of the Australian species *S. macrospermum* and *S. bicolor* and the definition of their respective genomic relationships AAB_1B_1YYZZ ($2n$=4x=40) versus AAB_1B_1 ($2n$=2x=20), suggested such crosses might be used for breeding. However, direct uses in sorghum improvement would require genetic recombination and introgression into the *S. bicolor* genome. We report here on these topics for early-generation backcross hybrids. Fifteen BC_1F_1 progeny were recovered using the interspecific hybrid as a female and embryo rescue. In these progeny, chromosome numbers ranged from 35 – 70 and all were essentially male sterile. Repeated backcrossing with *S. bicolor* pollen, produced BC_2F_1 seed on 3 of the 15 BC_1F_1 plants. BC_2F_1 progeny had varying levels of male fertility; selfed seed set ranged from 0 – 95% with only 2 being completely male sterile. Using AFLP and SSR markers, genomic introgression of *S. macrospermum* ranged from 0 – 18.6%. Cytogenetic analysis revealed chromosome numbers were 20, except for a single backcross with 21 chromosomes. Molecular cytogenetic analysis of BC_2F_1s confirmed the presence of recombinant introgression chromosomes as well as alien addition and alien substitution chromosomes.

INTRODUCTION

Sorghum (*S. bicolor* [L.] Moench) is an important food and feed crop around the world. The 2006 U.S. grain sorghum crop was valued at approximately $715 million (USDA, 2006) and worldwide is the 5th most grown cereal grain. Plant breeders continuously improve the crop for yield potential, drought tolerance, disease and insect resistance, and other biotic and abiotic stresses. Genetic variation is the lifeblood of plant breeding so identification of useful new sources is a worthwhile endeavor.

Taxonomically, the genus *Sorghum* is separated in to 5 sections: *Eusorghum*, *Chaetosorghum*, *Heterosorghum*, *Parasorghum*, and *Stiposorghum* (Garber, 1950; de Wet, 1978). The cultivated species is grouped within section *Eusorghum* along with *S. propinquum* and the noxious weed *S. halepense*. Genetic improvements in sorghum have been made by utilizing genetic variation from within the primary gene pool, which contains all of the germplasm in the three subspecies of *S. bicolor*: ssp. *arundicum*, *bicolor*, and *drumondii* (de Wet, 1978; Cox et al., 1984; Duncan et al., 1991). The secondary gene pool is composed of the remaining two species in *Eusorghum*. Crosses between sorghum and *S. propinquum* are easily made, meiosis is normal in the interspecific hybrids, and progeny are fertile, but there has been little to no use of this germplasm in applied sorghum improvement (Wooten, 2001). Hybrids between sorghum and *S. halepense* are more difficult to produce but still possible. Most efforts in utilizing *S. halepense* as a genetic resource have been devoted to developing perennial grain crops (Piper and Kulakow, 1994; Cox et al., 2002; Dweikat, 2005). The tertiary gene pool contains the 17 remaining species within the four other sections. Until

recently, this gene pool was completely inaccessible as no hybrids had ever been recovered despite numerous efforts (Karper and Chisholm, 1936; Ayyanger and Ponnaiya, 1941; Garber, 1950; Endrizzi, 1957; Tang and Liang, 1988; Wu, 1990; Sun et al., 1991; Huelgas et al., 1996).

The cause of reproductive isolation between sorghum and the tertiary gene pool was unknown until Hodnett et al., (2005) determined that it was due to pollen-pistil incompatibilities. Pollen tube growth of wild species was inhibited in the stigma and style which prevented successful fertilization. The reproductive barriers proved to be strong but not complete as Price et al., (2005) finally recovered one interspecific hybrid between cytoplasmic male-sterile (CMS) sorghum and *S. macrospermum*. The efficiency of producing this hybrid improved dramatically by using a *S. bicolor* genotype homozygous for the *iap* allele. The *Iap* locus (*I*nhibition of *A*lien *P*ollen) controls a pistil barrier that prevents foreign species pollen tube growth; whereas, the recessive genotype (*iap iap*) allows pollen tube growth of maize as well as wild sorghum species (Laurie and Bennett, 1989; Price et al., 2006). Price et al., (2006) recovered hybrids between sorghum and *S. macrospermum*, *S. nitidum*, and *S. angustum* but only hybrids with *S. macrospermum* survived to maturity.

S. macrospermum ($2n = 40$) is the only member of the *Chaetosorghum* section and it is native to the Katherine area in the Northern Territory of Australia (Lazarides et al., 1991). While this species does not possess any obvious agronomically desirable traits, it does have significant pest resistance. It is either a non-host or has ovipositional non-preference to sorghum midge (*Stenodiplosis sorghicola* Coquillett) (Franzmann and

Hardy, 1996; Sharma and Franzmann, 2001). It is not susceptible to sorghum downy mildew (*Peronosclerospora sorghi* Weston and Uppal (Shaw)) (Kamala et al., 2002) and has high tolerance to shoot fly (*Atherigona soccata* Rond.) (Sharma et al., 2005). These beneficial traits, as well as the possibility that it holds other valuable unique genetic variation, make it attractive to use in an introgression breeding program.

Until recently, the genomic relationship between *S. macrospermum* and *S. bicolor* was not known. Several authors have described *S. bicolor* ($2n = 4x = 20$; AAB_1B_1) has an ancient tetraploid; its genomic formula was derived by analyzing meiosis in hybrids with *S. halepense* ($2n = 8x = 40$; $AAAAB_1B_1B_2B_2$) (Hadley, 1953; Celerier, 1958; Tang and Liang, 1988). Meiotic chromosome pairing behavior in interspecific hybrids between *S. bicolor* and *S. macrospermum* revealed that moderate levels of allosyndetic recombination occurred and the genomic formula AAB_1B_1YYZZ was proposed for *S. macrospermum* ($2n = 8x = 40$) (Kuhlman et al., 2008). Allosyndetic recombination was observed in subgenomes A and B_1, but the frequency was 2.5 times higher in subgenome A. The authors attempted to produce backcrosses using the interspecific hybrid as a male, but were not successful.

The tertiary gene pool species *S. macrospermum* is now available to plant breeders because hybrids can now be recovered by using specific *S. bicolor* germplasm (*iap iap*). The sorghum and wild species genomes undergo moderate levels of allosyndetic recombination; therefore, recovering introgression in backcross progeny is likely (Kuhlman et al. 2008). The remaining obstacle to using this species in an introgression program is determining how to recover backcrosses. The objectives of this

research were to produce $2n = 20$ introgression germplasm through backcrossing and to analyze introgression content in backcross progeny molecularly and cytologically.

MATERIALS AND METHODS

Plant Material

Interspecific hybrids were produced by hand emasculating 'NR481', the *S. bicolor* parent, and pollinating it with the wild species *S. macrospermum* (AusTRC Accession no. 302367). Female plants set approximately 25% hybrid seed, which had shrunken endosperm. Approximately 60% of hybrid seeds germinated on agar germination media and were transplanted into soil in small pots in a greenhouse during April, 2005 in College Station, TX. They were transplanted as growth demanded up to a final pot size of 15 gallons. Interspecific hybrids were tall (> 4.5m) and photoperiod sensitive (initiating anthesis in September). Backcrosses were made using pollen from both the recurrent parent NR481 and BTx623.

Embryo rescue was necessary to recover backcrosses and was performed 15 to 20 days after pollination. Enlarged ovaries were removed from the florets and surface sterilized in 30% bleach for 20 minutes. The soft pericarp tissue was removed and the immature embryos were placed in sealed Petri dishes on culture medium containing Murashige-Skoog basal salts and vitamins (Murashige and Skoog, 1962) supplemented with 10mg L^{-1} glycine, 10mg L^{-1} L-arginine, 10mg L^{-1} L-tyrosine, 100mg L^{-1} inositol, and 50 g L^{-1} sugrose, solidified with 0.7% plant tissue culture grade agar (Sharma, 1999). Dishes were placed in a growth chamber with 16 h light/8 h dark at 24ºC.

Germinated embryos with good root growth and 2-3 leaves were removed from the media and transplanted into a fine texture soil mixture in pots. These were placed in a plastic tray with a clear dome lid inside the growth chamber with wet paper towels to ensure high humidity. As plants grew they were hardened off and transferred to the greenhouse.

Germplasm Evaluation

Male gamete viability was estimated by collecting anthers from flowering plants and macerating them in a drop of 1% I_2-KI stain on a glass slide. Slides were analyzed under a microscope, pollen grains were counted and classified as fully stained, greater than 50% stained, less than 50% stained, and unstained. Plant height was measured in inches from the soil surface to the tip of the mature panicle. Some plants were also characterized for plant color, seed color, presence of awns, mid-rib type, days to 50% anthesis, and seed set. Field evaluation of selected BC_2F_1 progeny from family 101 was carried out in Weslaco, TX in fall, 2006. Plants were self pollinated and at harvest evaluated for plant height and seed color. Specific measure of seed set was not taken although no plants were identified as sterile. Evaluation of BC_2F_1 progeny from all three families was carried out in a greenhouse in winter 2006 in College Station, TX.

Molecular Marker Evaluation

DNA was extracted from backcross progeny and their parents using the FastDNA Spin Kits (MP Biomedicals, Solon, OH). AFLP templates, using both *EcoRI*/*MseI* and

PstI/*MseI* restriction enzyme combinations, were created using a modified procedure from Vos et al., (1995). The AFLP template, preamplification, and selective amplification reactions of the *EcoRI*/*MseI* and *PstI*/*MseI* fragments were as described by Klein et al (2000) and Menz et al (2002), respectively. Twenty *Pst*/*Mse* and 12 *EcoRI*/*Mse* AFLP primer combinations were used to amplify fragments in the DNA samples. IRD-labeled SSR primers, obtained from LI-COR (LI-COR Inc., Lincoln, NE), were used in amplification reactions as previously described (Klein et al., 1998). Twenty-eight SSR primer combinations were run on the DNA samples, but only 11 (39%) showed transferability by producing a band in the wild species. Amplification products were analyzed on a LI-COR model 4200 dual-dye automated DNA sequencing system. Electrophoresis conditions were as described by Klein et al. (2000). Gels were scored manually, AFLP bands that were present in *S. macrospermum* and absent in the recurrent *S. bicolor* parents were scored as unique. Unique bands that were also shared by backcross progeny were scored as introgression bands. The percent introgression was calculated by dividing the number of introgression bands a particular backcross produced by the total number of unique *S. macrospermum* bands. This number is an estimate of the amount of the *S. macrospermum* genome that is present in the backcross progeny. Since backcrosses were produced using the female interspecific hybrid gamete there is no question as their authenticity as true backcrosses, thus introgression bands can be interpreted as actually representing transfer of *S. macrospermum* DNA into the progeny.

Cytogenetic Evaluation

Somatic chromosome spreads were prepared from root tips using a modified procedure from Andras et al. (1999). Root tips were harvested into a saturated aqueous solution of α-bromonapthalene for 1.75 h at room temperature in the dark. Pretreated root tips were fixed in 95% ethanol/glacial acetic acid (4:1 v/v) for 24 h and stored in 70% ethanol. Root tips were graded based on size standards of 0.0 – 1.0 mm. The terminal 1mm of several same sized root tips were dissected into a 0.5ml epitube, rinsed in water several times, hydrolyzed for 10 min in 0.2*M* HCl, and rinsed 10 min in distilled water. Cell walls were digested by adding 100ul of an aqueous solution of 3% cellulase (Onozika R-10, Yakult Honsha Co. Ltd., Tokyo) and 1% pectolyase Y-23 (Seishin Corp., Tokyo) at pH 4.5 for 1-2 h at 37ºC. Digestion times were based on empirically determined values for a particular size standard. Digestion was stopped by adding 400ul distilled water and centrifuging the cell suspension at 2500rpm (~400G) for 10 min. Using a drawn glass pipette, the supernatant was removed being careful not to disturb the pellet of cells. The cells were washed with water and centrifuged at 2500rpm for 10 min., twice. After removal of the final wash water, 400ul of methanol/glacial acetic acid (4:1 v/v) was used to wash the cells followed by centrifugation at 2500rpm for 10 min., twice. After the final wash, all but ~50ul of the fixative was removed. The cells were resuspended in the remaining fixative, 2-8ul drops were placed on clean glass slides suspended over wet filter paper and allowed to dry. For chromosome counts, slides were stained with Azure Blue, made permanent with Permount, and analyzed with a Zeiss Universal II microscope (Carl Zeiss Inc., Gottingen, Germany). A minimum of four

quality spreads of highly condensed chromosomes was used to determine the somatic chromosome number of individual plants.

Fluorescent and Genomic *in situ* hybridization (FISH and GISH) were used to visualize introgression in backcross progeny. Plasmid CEN38 was used as a FISH probe to visually differentiate *S. bicolor* subgenomes A and B_1 (Gomez et al., 1998; Zwick et al., 2000). Genomic DNA of *S. macrospermum* and *S. bicolor* were used as GISH probes to detect introgression DNA in the backcrosses and to determine whether the chromosomes were recombinant. Detection of probes followed a modified protocol of Jewell and Islam-Faridi (1994), as described by Hanson et al. (1995) and Kim et al. (2002). Purified probe DNA was nick-translated with digoxigenin-11-dUTP or biotin-16-dUTP (Roche Diagnostics, Indianapolis, IN). Slides with somatic chromosome spreads were prepared as described above. Chromosomes on glass slides were denatured in 70% formamide in 2X SSC for 1.5 min at 70ºC, then dehydrated in 70 (-20ºC), 85 (RT), 95 (RT), and 100% (RT) ethanol, for 2 min each. The hybridization mixture (25ul per slide) contained 50ng labeled probe DNA, 50% formamide and 10% dextran sulfate in 2X SSC. The hybridization mixture was denatured for 10 min at 95ºC and chilled on ice. It was then added to the slide, sealed with rubber cement around a glass coverslip and incubated overnight at 37ºC. Following incubation, the slides were washed at 40ºC in 2X SSC and room temperature in 4X SSC plus 0.2% Tween-20, for 5 min each. Slides were blocked with 5% (w/v) BSA in 4X SSC plus 0.2% Tween-20 at room temperature. The digoxigenin and biotin-labeled probes were detected with CY3™-conjugated anti-digoxigenin anti-body and fluorescein isothiocyanate (FITC)-conjugated

streptavidin, respectively. Slides were washed in 37ºC 4X SSC plus 0.2% Tween-20. Chromosomes were counterstained with 25ul DAPI with Vectashield® (Vector Laboratories, Burlingame, CA). Slides were viewed through an Olympus AX-70 epifluorescence microscope and images captured with a Macprobe® v4.2.3 imaging system (Applied Imaging Corp., Santa Clara, CA).

RESULTS AND DISCUSSION

Breeding Methodology, Cytology, and Germplasm Phenotypic Evaluation

Interspecific Hybrids: Twenty interspecific hybrids were grown and their identity was confirmed by morphology and chromosome number ($2n = 30$). At maturity, hybrids flowered but anthers were non-dehiscent. Normal I_2-KI staining pollen grains were rare and F_2 seed did not develop on 15 selfed panicles (approximately 3,000 florets). Previous attempts to recover backcross progeny using the male hybrid gamete were difficult and inconclusive (Kuhlman et al. 2008). Interspecific hybrid panicles were pollinated with *S. bicolor* pollen, mostly from NR481 but a few also with BTx623. Backcross seed development was rare: a single seed with well developed endosperm was observed but it was not viable. Thus, embryo rescue was used to recover backcross progeny. In total, 7009 florets were pollinated and dissected revealing 86 (1.2%) with embryo development of which 15 (0.2%) survived into adult BC_1F_1 plants (Figure 1).

BC_1F_1 plants: All BC_1F_1s had awns and red plant color but varied in their height and vigor (Table 1). Most BC_1F_1 plants had little to no male fertility with non-dehiscent anthers and non-viable pollen; the seed that was produced was all red in pericarp color

(Table 1). Most BC_1F_1 plants were backcrossed using NR481 pollen; occasionally BTx623 was used when adequate supplies of NR481 pollen were unavailable. Embryo rescue was not needed as 3 BC_1F_1 plants (101, 102, and 107) set viable backcross seed (Table 1). Two other plants, 105 and 115, produced a single backcross seed that was not viable (Table 1).

BC_1F_1 101 was morphologically distinct from the others; it had wider leaves, larger florets, and had features reminiscent of BTx623; marker data confirmed that BC_1F_1 101 was derived from BTx623 fertilization of the interspecific hybrid. Phenotypic and molecular data confirmed that BC_1F_1 102 and 107 resulted from fertilization by NR481. Both of these BC_1F_1s produced significantly less backcross seed than did BC_1F_1 101 (Table 1). The increased seed set in BC_1F_1 101 could be due to increased heterozygosity resulting from its mixed pedigree.

Chromosome numbers in the BC_1F_1 plants ranged from 35 to 70 (Table 1, Figure 1). Such high chromosome numbers resulted from irregular meiosis in the interspecific hybrid (Kuhlman et al. 2008). BC_1F_1 plants with chromosome numbers between 35 and 39 likely resulted from transmission of 25-29 chromosomes through the female gamete and 10 chromosomes through the *S. bicolor* gamete. Transmission of 25-29 chromosomes from plants with $2n = 30$ is best explained by the formation of a restitution nucleus composed of the univalents during meiosis. Under this hypothesis, chromosomes would pair at meiosis, and those undergoing recombination would form bivalents at metaphase I and subsequently separate and move to the spindle poles. The remaining chromosomes would form univalents, some of which might distribute

themselves to the poles via spindle attachment, while the others would remain at the metaphase I plate and other intermediate positions. In cells with a pole-to-pole distribution of univalents, a restitution nucleus would sometimes form between the two poles, and the product would contain all or most chromosomes. Meiosis II typically conserves chromosome numbers of meiosis I products, so variable chromosome numbers among restitution and partial-restitution products from meiosis I would translate to megagametophytes with various chromosome numbers. Restitution nuclei have been implicated in transmission of univalents in multiple species (Singh, 2003). The two plants with $2n = 60$ and 70 chromosomes may have been produced due to meiotic irregularities (Singh, 2003) resulting in tetraploid ($2n = 60$) female gametes. Parthenogenesis of such a "4n" egg would result in $2n = 60$ progeny or fertilization of such an egg would result in $2n = 70$ progeny. BC_1F_1 104 ($2n = 12x = 60$), is hypothesized to be a naturally produced allododecaploid. It displayed slow growth and very stiff leaves, and complete sterility; backcrosses were not recovered.

BC_2F_1 families: Three BC_2F_1 families consisting of 45 seed from the three partially fertile BC_1F_1s (101, 102, 107) were planted and evaluated. Pollen samples were taken from plants of each family and scored for pollen stainability. All three BC_2 families had significantly lower mean pollen stainability than NR481. Family 101 had higher pollen stainability than 102 and 107, which were not different (Table 2). BC_2F_1 families 102 and 107 displayed significantly lower seed set (1.3% and 1.4%) than family 101 and NR481 (87% and 94%), which were not different (Table 2). The vastly lower

seed set from families 102 and 107 made obtaining selfed seed difficult and limited the evaluation of the BC_2F_2 generation.

Chromosome number for plants within family 101 were $2n = 20$ for 14 of 15 plants analyzed; one plant was $2n = 21$. Two plants each from families 102 and 107 had $2n = 20$ chromosomes (Table 2). BC_2F_1 progeny ($2n = 20$) were produced without embryo rescue from parents that contained 36, 37, and 38 chromosomes. Whereas the restitution nucleus conferred survivability to the rescued BC_1F_1 embryos, it appears that it was selected against when embryos were not rescued and seeds were produced. Of those surveyed, 95% of BC_2F_1 plants had 20 chromosomes.

All BC_2 individuals were tall, had red plant and seed color, and a dry midrib like the recurrent *S. bicolor* parent (NR481), except the BC_2s in family 101 in which three individuals had white seed color, two individuals had juicy midribs, and one was short (102cm) (Table 2). These traits are recessively inherited and should not be present in a population of BC_2F_1 individuals whose pollen parent (NR481) is tall, red seeded, has a dry midrib, and has not been observed to segregate for these traits. Pollen contamination from a different genotype was impossible since no other genotypes were grown in the greenhouse during that time. The simplest explanation is self-pollination, however, fertile pollen was never observed. Parthenogenesis of an unfertilized egg cell is not possible as segregation was observed in selfed progeny (Table 2). Alternatively, 2n gametes ($n = 20$) could be produced via failed cytokenesis of the dyads during the second stage of meiosis (Singh, 2003). As an example, a pollen mother cell, in this case possessing 36 chromosomes with 10II and 16I at metaphase, could produce two dyad

cells with 10 and 26 chromosomes, assuming the univalents segregated as a restitution nucleus. If cytokenesis failed during meiosis II, the sister chromatids would separate, and following macrogametogenesis form an egg cell with 20 chromosomes. If this cell developed into an embryo parthenogenically, it would not necessarily be 100% homozygous since the chromosomes underwent recombination during meiosis I, resulting in the sister chromatids being genetically different. This $2n = 20$ progeny plant could not be differentiated from a selfed plant. Therefore, BC_2F_1 progeny produced from BC_1F_1 101 are potentially a mix of pedigrees: backcross derived BC_2F_1s, selfed BC_1F_2s, and parthenogenic progeny from diploid gametes. As separation of all individuals into these classes is not possible, this generation will still be referred to as BC_2F_1.

BC_2F_2 progeny were evaluated for visual expressions of introgression in both the field and greenhouse. Overall, BC_2F_2 progeny deriving from family 101 had adequate seed set and segregated for traits polymorphic between BTx623 and NR481, such as seed color and plant height. This significant variability in the population made identifying phenotypic evidence of introgression virtually impossible. BC_2F_2 plants in families 102 and 107 showed one obvious sign of introgression: male-sterility. Female fertility was unaffected as backcross seed set was normal. Partial male sterility in the BC_2F_1 plants in these families was likely caused by *S. macrospermum* introgression and the plants were presumed to be heterozygous for any introgression. BC_2F_2 plants were expected to segregate for male-sterility, but lack of segregation suggests that the BC_2F_1 plants were homozygous for such introgression (Table 2). This could be possible if the

BC_2F_1s were actually the result of selfing, but this is unlikely as stainable pollen was rarely observed. Some form of asexual reproduction, as described for family 101, could also be causing progeny to be homozygous for introgression. There would also have to be high selection pressure for the sterility inducing introgression as all BC_2F_1 plants from these two families produced sterile progeny.

Molecular Marker Analysis of Introgression

The amount of *S. macrospermum* genome that was introgressed into the BC_2 generation was evaluated using AFLP markers. In total, 32 primer combinations produced 528 AFLP markers unique to *S. macrospermum*. The total amount of *S. macrospermum* genome detected in the BC_2F_1 generation was 26% (138 of 528 unique *S. macrospermum* markers). Most introgression bands (82%) were found in single individuals, while 5% were shared by between 6 and 14 BC_2F_1s. Each family possessed three types of introgression: unique to that family, shared between two families, and shared by all three families (Figure 2). Estimates for introgression on an individual basis ranged widely from 0-18.6% (Table 2), although the amount of introgression did not significantly differ on a family mean basis (0.75% - 1.07%).

Eleven of the BC_2F_1s from family 101 (44%) did not have detectable levels of introgression, while two had the highest levels (3.7% and 18.6%). The total amount of introgression detected within family 101 was high (22.9%), although it was derived primarily from the two outstanding individuals. Introgression was detected in all BC_2F_1 individuals within families 102 and 107, but the range was narrow, from 0.38%-1.17%

(Table 2). The total amount of introgression detected in families 102 and 107 was 3.4% and 1.5%, respectively. A majority of introgression markers detected in families 102 and 107 (56% and 88%, respectively) were present in multiple (4 to 6) individuals within the family, indicating that common introgression sequences were inherited. Thus, inheritance of introgression in these two families does not appear to be random. This data in combination with the phenotypic male-sterility that is expressed by all individuals in these two families suggests there was selection of gametes carrying a common block of introgression. In contrast, almost half of individuals within family 101 had no detectable introgression and few markers were present in multiple family members (3.4%, excluding individuals 206, 209, and 222). Common introgression was found between the three excluded individuals, but overall introgression in the family 101 appeared random.

The two individuals that were distinctly different from the rest were BC_2F_1s 209 and 222, both of which were from family 101 and had 18.6% and 3.7% of the *S. macrospermum* genome detected within their DNA. Selected SSR markers were run on these DNA samples to confirm introgression. Two different SSRs confirmed independent introgression of *S. macrospermum* DNA in these plants. Txp482 confirmed introgression in BC_2F_1 209 but was absent in BC_2F_1 222, while the opposite confirmation occurred with Txp523. Txp482 and Txp523 are located on SBI-01 of the genetic map by Menz et al. (2002) at approximately 31cM and 28cM, respectively (http://sorgblast3.tamu.edu). SSR markers surrounding these two locations showed that no introgression had occurred in both plants. This indicates that if the introgressed SSR

sequences are on SBI-01, they are part of a small introgression segment. Alternatively, the *S. macrospermum* SSR sequence may not have been homoeologous to SBI-01, and thus be on another *S. bicolor* chromosome, or it was not introgressed into the *S. bicolor* genome at all and be located on a whole *S. macrospermum* addition chromosome.

Molecular Cytogenetic Analysis

Multiple types of *S. macrospermum* introgression were found in the BC_2 generation. BC_2F_1 209 (18.6% introgression) ($2n = 20$) visibly shows two *S. macrospermum* chromosomes and 18 *S. bicolor* chromosomes in its genome (Figure 3, A). Visualization of the *S. bicolor* genome reveals that the *S. macrospermum* chromosomes are non recombinant (Figure 3, B). The *S. bicolor* chromosomes, evidenced by the CEN38 probe, are 10 from the A subgenome and 8 from the B_1 subgenome. This plant is an example of an alien substitution line: two B_1 *S. bicolor* chromosomes have been replaced with two *S. macrospermum* chromosomes. The introgression detected by molecular markers, including Txp482, is largely located on two *S. macrospermum* alien substitution chromosomes. The cytogenetic evidence, however, cannot disprove the existence of small introgression blocks within the *S. bicolor* genome. This type of introgression has been used extensively in wheat breeding where alien substitution is well tolerated by the genome (Jiang et al., 1994; Jones et al., 1995; Jauhar and Chibbar, 1999). Seed set was slightly lower than the check but still reasonably high (72%). Morphologically this plant appeared to be in the range of that for segregation between BTx623 and NR481; therefore, no phenotypic trait can

presently be assigned to the alien chromosomes. It is surprising that the plant tolerates this level of alien substitution as *S. bicolor* trisomic lines have been recovered (Schertz, 1966) but monosomic lines have not. This indicates that homoeologous chromosomes from the *S. macrospermum* genome must compensate for the missing *S. bicolor* chromosomes.

GISH using *S. macrospermum* DNA as probe reveals that BC_2F_1 222 (3.7% introgression) ($2n = 21$) was an alien addition line; it had one non-recombinant *S. macrospermum* chromosome along with 20 *S. bicolor* chromosomes (Figure 3, C and D). The introgression detected using molecular markers in this plant is most likely located on a single *S. macrospermum* chromosome, however, the presence of small introgression blocks cannot be disproven. Txp523, which detected introgression in this plant, most likely is homoeologous to a sequence on the *S. macrospermum* chromosome. This plant displays no deleterious effects of the introgression in that seed set was high (85%) and the plant was vigorous. One potential phenotype influenced by introgression was the presence of normal and shriveled endosperm seeds produced by selfing. The approximate ratio of normal to shriveled seed was not different from a 3:1 ratio ($\chi^2 = 1.12^{ns}$). This would be consistent with reduced seed size for progeny inheriting two copies of the alien chromosome. This presumes, however, that normal segregation of an alien chromosome occurs through both gametes. The fitness of gametes carrying an extra chromosome is normally reduced; thus, the transmission rate of an alien chromosome would also likely be low. It is possible that this phenotype is controlled by

the transmission of an alien chromosome, but this hypothesis needs cytological verification.

SSR markers Txp482 and Txp523 were detected in BC_2F_1s 209 and 222, respectively, but neither marker was present in both plants. This indicates that the alien addition chromosome in 222 is different from both substitution chromosomes in 209. AFLP data is consistent with this hypothesis as only 3 introgression markers are shared out of 98 present in BC_2F_1 209 and 19 present in 222. Both SSR markers map to chromosome 1 in the *S. bicolor* genome, which may indicate that the two detected *S. macrospermum* chromosomes are both homoeologous to SBI-01, perhaps the related chromosomes from subgenomes A_m and B_{1m} (Kuhlman et al. 2008). The introgression estimate for 209 is much higher than 222. Introgression estimates were based on AFLP markers which are mostly dominant, therefore being homozygous for an introgression marker does not increase the introgression estimate. Thus, it would be unlikely for BC_2F_1 209 to contain two homologous *S. macrospermum* substitution chromosomes and still have a five fold increase in estimated introgression. Neither *S. bicolor* nor *S. macrospermum* karyotypes show that broad of range for chromosome size, therefore, inheritance of larger homologous chromosomes does not explain the increased introgression (Wu, 1990; Kim et al., 2005). BC_2F_1 209 most likely contains two different *S. macrospermum* substitution chromosomes, both of which are different from the addition chromosome in BC_2F_1 222.

GISH using *S. macrospermum* DNA as probe revealed BC_2F_1s 228 and 244 ($2n$ = 20, 20; 1.1% and 0.57% introgression, respectively) both contain two chromosomes with

S. macrospermum introgression. The introgression chromosomes also show hybridization with the *S. bicolor* probe (Fig. 3, F) and strong hybridization with CEN38; therefore, they are members of the A subgenome. Using morphology to identify somatic chromosomes, the introgression sites appear to be located on SBI-01 homologous chromosomes. These two plants are examples of introgression backcrosses, as they contain *S. macrospermum* DNA introgressed into the *S. bicolor* genome. These two plants show phenotypic evidence of introgression like all members of their respective families (102 and 107). Individuals 228 and 244 had low selfed seed set (2.1% and 0.1%, respectively) and all their BC_2F_2 progeny were completely male-sterile. Backcross seed set was normal. This strongly supports the hypothesis that these plants, and possibly all plants in these families, are homozygous for the introgression that they contain.

66% of the AFLP introgression bands in BC_2F_1 244 are common to BC_2F_1 228. In fact, 17 of 19 BC_2F_1 plants from families 102 and 107 share some common introgression with BC_2F_1 244. A portion of the introgression block present in BC_2F_1 244 seems to have been preferentially transmitted to most progeny deriving from BC_1F_1s 102 and 107. None of the 25 BC_2F_1 progeny from BC_1F_1 101 share any of the introgression block found in BC_2F_1 244. This molecular evidence along with the suggestion that both 228 and 244 have introgression blocks on homologous SBI-01 chromosomes strongly supports the hypothesis that inheritance of this introgression block was not random. It appears that strong selection was operating to transmit portions of this introgression block to apparently all BC_2F_1 progeny in these two families.

BC_2F_1 206 ($2n = 20$; 1.72% introgression) contains common introgression with BC_2F_1 209. Seven of its 9 introgression AFLP markers are also detected in BC_2F_1 209. Although not analyzed with GISH, this individual likely contains a recombinant introgression block homologous to a portion of one of the alien substitution chromosomes present in 209.

SUMMARY

Introgression breeding utilizing the tertiary gene pool species *S. macrospermum* has resulted in the recovery of $2n = 20$ chromosome backcrosses that contain wild species introgression. BC_1F_1s were successfully recovered using the female hybrid gamete in combination with embryo rescue. Chromosome numbers were high and sterility a problem; however, viable BC_2F_1 seed was set under backcrossing on 20% of the BC_1 plants. It is unclear what proportion of BC_2F_1 individuals were produced through sexual backcrossing versus parthenogenesis of 20 chromosome egg cells, but both likely occurred.

Molecular markers verified that BC_2F_1 individuals contained *S. macrospermum* introgression and measurements were between 0 and 18.6%. Molecular cytogenetic techniques, FISH and GISH, revealed that the introgression in the BC_2F_1 plants was of three types: alien substitution, alien addition, and alien introgression lines. Male-sterility was the only obvious phenotypic trait observed that is likely caused by the introgression DNA.

Family differences were apparent in this germplasm. BC_1F_1 101 and its BC_2 progeny showed the highest levels of fertility compared with families 102 and 107. BC_2s from this family were the only examples of alien substitution and addition lines observed. It is unknown whether the mixed pedigree of BC_1F_1 101 is the cause of the increased fertility but it is a reasonable hypothesis. The family may have possessed a mix of alleles that facilitated recovery of alien addition and substitution lines as well as buffered the deleterious effects of recovered introgression. Such a hypothesis would suggest that using a complex and highly heterozygous population in introgression breeding may maximize the amount of recovered introgression as well as reduce the associated fertility problems.

The germplasm produced by from this investigation confirm that introgression and recovery of recombinants is possible through wide hybridization in sorghum. The introgression described herein documents an approach to introgression in sorghum that may not be limited to the Sorghum species. In the case of *S. macrospermum*, the value will only be known if derivatives are characterized. Using this research as a starting point, the true value of *S. macrospermum* genetic diversity can be determined.

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Table 1. Chromosome number and phenotypic data of BC_1F_1 individuals ((*S. bicolor* x *S. macrospermum*) x *S. bicolor*) recovered using embryo rescue

BC_1F_1	(2*n*)	HT*	Total Seed	Seed Set (%)
101	37	244	126	2.99[A]
102	36	305	28	1.65[B]
103	70	244	0	0
104	60	198	0	0
105	39	457	1	0.06
106	38	305	0	0
107	38	366	36	1.94[B]
108		61	0	0
109	38	366	0	0
110	39	366	0	0
111		183	0	0
112	36	305	0	0
113	38	274	0	0
114	35	198	0	0
115		183	1	0.36

*HT is height (cm). Seed set is after pollination by *S. bicolor*.
Seed set percentages followed by different letters are significantly different ($p<.05$)

Table 2. Phenotypic data and *S. macrospermum* introgression estimates of BC_2F_1 individuals ((*S. bicolor* x *S. macrospermum*) x *S. bicolor*) and the recurrent parent. Phenotypic data for BC_2F_2 progeny are given for some individuals.

		Individual BC_2F_1 Plant Data										BC_2F_2 Progeny Data			
BC_1 Family	BC_2F_1	2*n*	DY*	PL	SD	AW	HT	MR	% INT†	% PS	% SS	HT‡	AW	SD	Mean % SS¶
101	201	20	62	R	R	Y	102	D	0.38	62.6	95.0	S	-	R	-
	202	20	57	R	R	N	193	J	0.00	-	95.0	SEG	-	R	-
	203	20	55	R	R	N	183	D	0.57	63.0	73.0	SEG	-	SEG	-
	204	-	55	R	R	Y	180	D	0.00	70.4	95.0	SEG	-	SEG	-
	205	-	-	R	R	N	196	D	0.19	72.7	80.0	T	-	R	-
	206	20	-	R	R	N	168	D	1.72	40.4	56.0	T	-	R	-
	207	20	56	R	R	N	175	D	0.00	55.8	95.0	T	-	SEG	-
	208	-	55	R	R	N	157	D	0.00	-	95.0	SEG	-	SEG	-
	209	20	-	R	R	Y	168	D	18.56	-	72.0	T	-	SEG	-
	210	-	56	R	R	N	124	D	0.19	-	95.0	SEG	-	SEG	-
	211	20	58	R	R	Y	180	D	0.19	-	95.0	T	-	SEG	-
	212	20	43	R	R	N	160	J	0.19	56.8	95.0				
	213	20	41	R	R	N	224	D	0.00	-	88.0				
	214	20	41	R	R	Y	206	D	0.00	-	95.0				
	215	20	39	R	R	Y	201	D	0.00	-	75.0				
	216	-	48	R	R	N	211	D	0.39	-	95.0				
	217	-	40	R	W	N	165	D	0.00	-	95.0	SEG	SEG	W	57
	218	-	43	R	R	N	163	D	0.00	57.1	84.0				
	219	-	41	R	W	Y	224	D	0.00	-	95.0	SEG	Y	W	52
	220	20	39	R	W	Y	198	D	0.00	-	82.0	T	Y	W	63
	221	20	39	R	R	Y	193	D	0.19	-	95.0				
	222	21	40	R	R	N	206	D	3.66	-	85.0				
	223	20	40	R	R	N	135	D	0.19	-	95.0				
	224	-	41	R	R	N	241	D	0.19	-	78.0				

	225	-	45	R	R	N	249	D	0.19	49.4	82.0				
	Mean		**47**	**R**			**183**		**1.07**	**58.7**	**87.4**				**>50**
102	226	-	41	R	R	Y	234	D	1.14	-	0.1	T	Y	-	0
	227	-	44	R	-	Y	188	D	1.17	17.9	0.0				
	228	20	41	R	R	Y	201	D	1.14	15.2	2.1	T	Y	-	0
	229	-	43	R	R	N	178	D	0.57	-	0.6	T	Y	-	0
	230	-	45	R	R	Y	224	D	0.38	-	0.1	T	Y	-	0
	231	-	43	R	R	Y	229	D	0.95	51.5	1.5	T	Y	-	0
	232	-	42	R	R	N	226	D	0.76	11.5	4.5	T	Y	-	0
	233	-	42	R	R	N	173	D	0.76	4.0	0.1				
	234	-	44	R	R	Y	211	D	1.14	22.1	3.0	T	Y	-	0
	235	20	45	R	R	Y	224	D	0.97	10.0	1.3	T	Y	-	0
	247	-	43	R	R	N	170	D	0.76	-	1.0	T	Y	-	0
	Mean		**43**	**R**	**R**		**206**	**D**	**0.88**	**18.9**	**1.3**				**0**
107	237	-	44	R	R	Y	221	D	0.38	-	0.1	T	Y	-	0
	238	-	44	R	R	N	203	D	1.16	41.6	5.5	T	SEG	-	0
	239	-	43	R	R	Y	170	D	0.76	13.4	1.3	T	Y	-	0
	240	-	43	R	R	N	203	D	0.58	35.1	3.4	T	SEG	-	0
	241	-	46	R	R	N	218	D	0.95	-	0.3	T	SEG	-	0
	242	20	45	R	-	N	216	D	0.76	-	0.0				
	243	-	44	R	R	Y	196	D	0.77	8.6	0.5	T	Y	-	0
	244	20	43	R	R	N	216	D	0.57	0.0	0.1	T	Y	-	0
	Mean		**44**	**R**	**R**		**191**	**D**	**0.74**	**19.7**	**1.4**				
NR481	**Mean**	**20**	**57**	**R**	**R**	**Y**	**206**	**D**	**0.00**	**88.3**	**94.2**				
	LSD(.05)		6.1				36.6		2.68	15.8	8.4				
	ANOVA‖		**				NS		NS	**	**				

* DY, PL, SD, AW, HT, MR, PS, SS are days to flowering, plant color, seed color, awns, height (cm), midrib, pollen stainability and seed set

respectively

† % INT is introgression, the percent of the *S. macrospermum* genome detected via AFLP markers in the respective plant

‡ HT in the BC_2F_2 generation potentially segregated for dwarfing genes, S is short, T is tall, and SEG is segregating

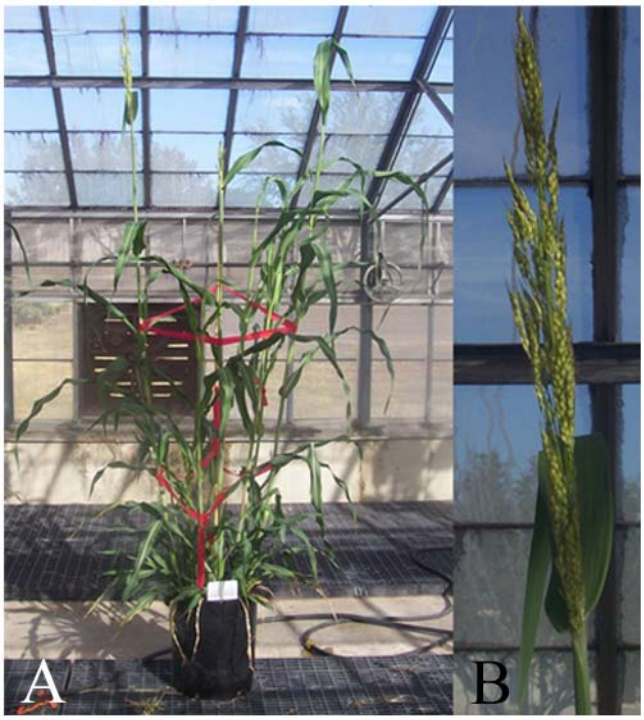
§ Seed set was not measured for BC_2F_2 progeny from plants 201-211 as these were field evaluated in Weslaco, TX, however seed was harvested from each plant and no sterile plants were found. All other BC_2F_2 evaluation was carried out in the greenhouse.

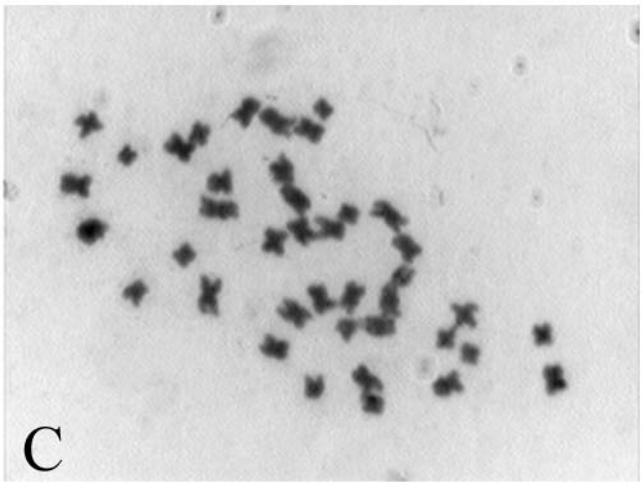
|| Analysis of variance between mean values for families and check, not individuals

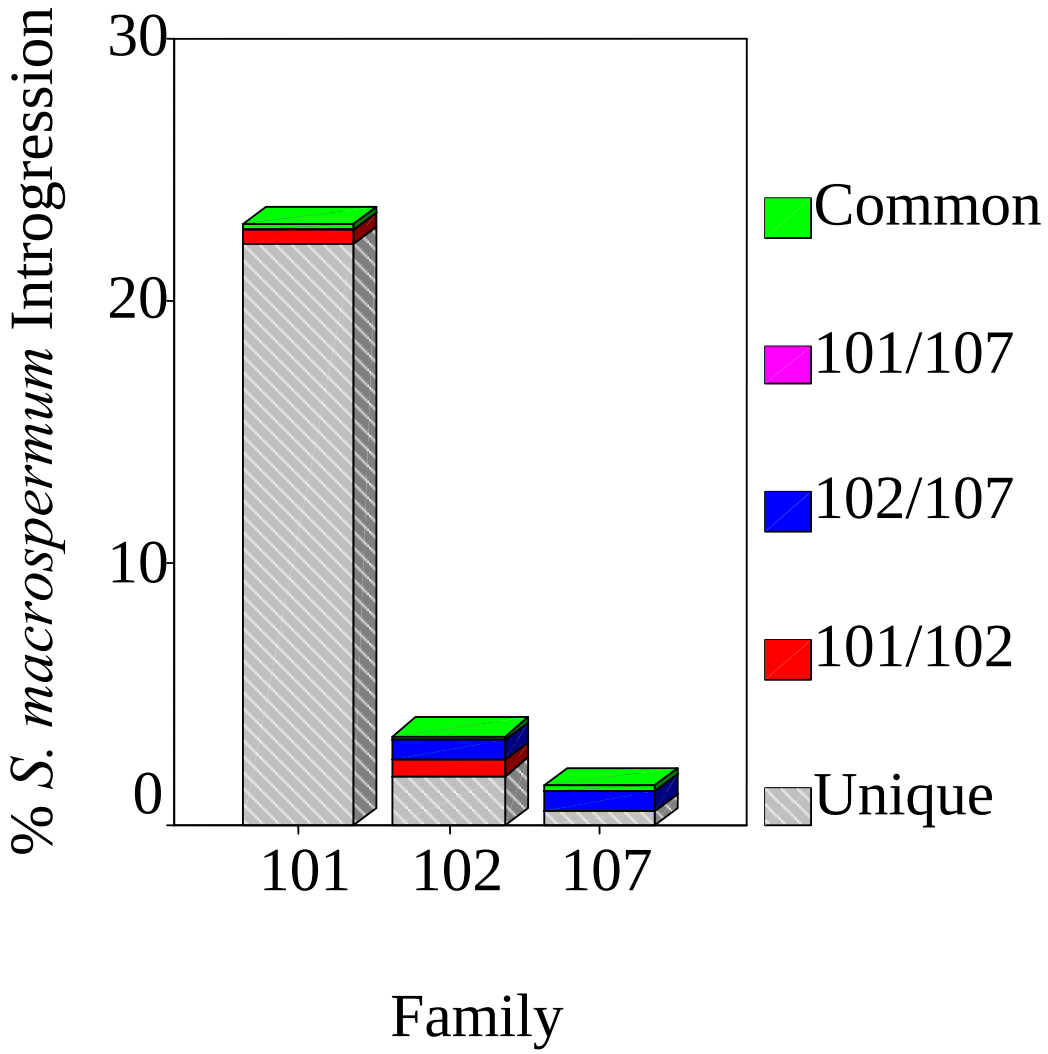
Figure 1. Interspecific BC_1F_1 generation with pedigree: (*S. bicolor* x *S. macrospermum*) x *S. bicolor*. (A) Vigorous growth of adult BC_1F_1 101 with (B) large panicle at maturity. (C) Somatic chromosome spread of BC_1F_1 106 with $2n = 38$ chromosomes.

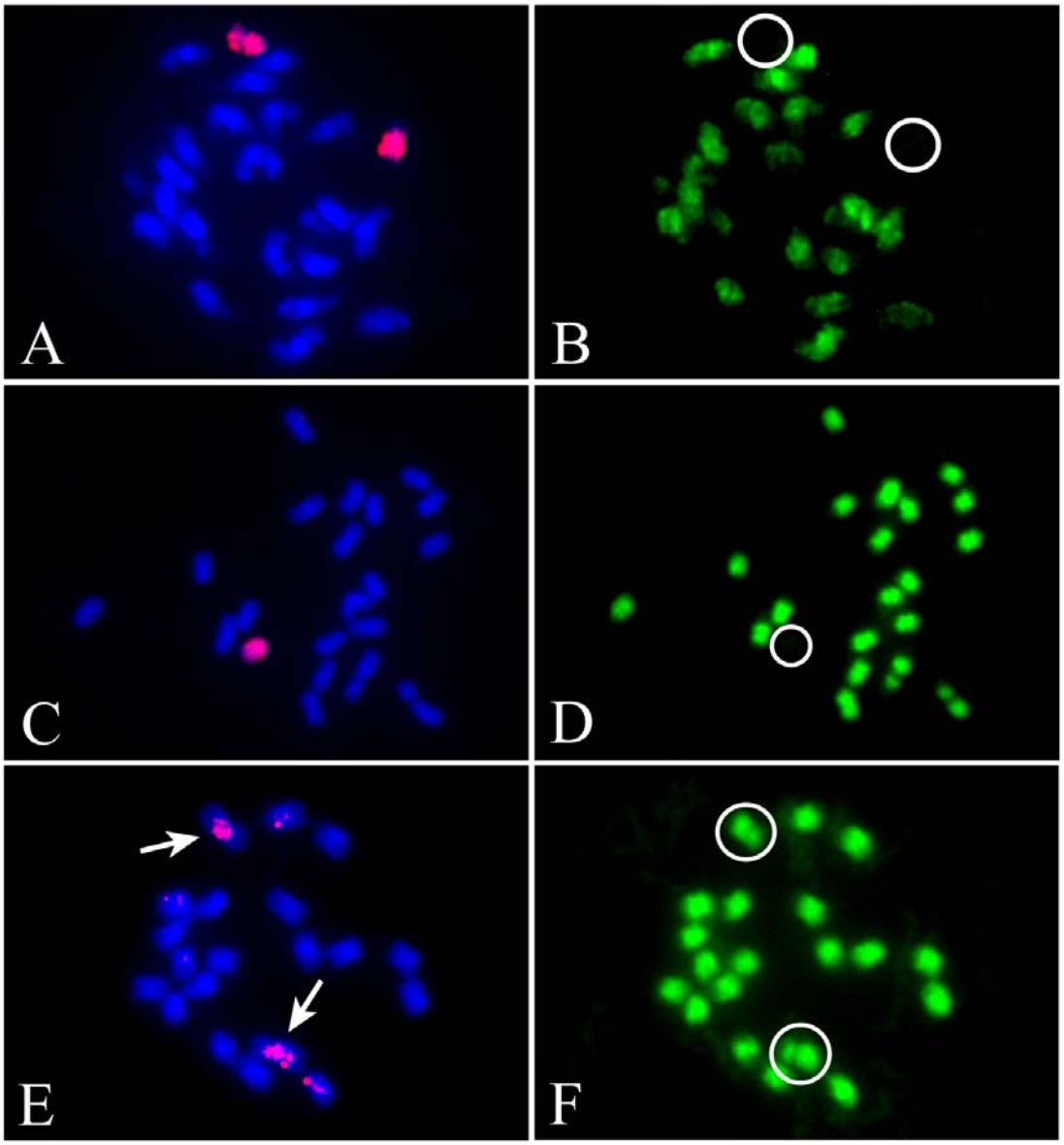
Figure 2. Graph depicting *S. macrospermum* introgression, as detected using AFLP markers, of BC_2F_1 individuals summed by family. Stacked bars represent introgression that is unique to a family, shared by two families, or common to all three families.

Figure 3. Genomic *in situ* hybridization of somatic chromosome spreads from introgression BC_2F_1 generation. (A, C, E) Chromosomes hybridized with *S. macrospermum* GISH probe (red) and stained with DAPI (blue). (B, D, F) Chromosomes hybridized with *S. bicolor* GISH probe (green). (A) BC_2F_1 209 ($2n = 20$) showing two chromosomes with significant *S. macrospermum* hybridization (red), (B) lack of *S. bicolor* hybridization (circles) indicates they are non recombinant whole *S. macrospermum* chromosomes. (C) BC_2F_1 222 ($2n = 21$) showing one chromosome with significant *S. macrospermum* hybridization (red), (D) lack of *S. bicolor* hybridization (circle) indicates it is a non recombinant whole *S. macrospermum* chromosome. (E) BC_2F_1 244 ($2n = 20$) showing two chromosomes with *S. macrospermum* hybridization sites (arrows) which also show (F) *S. bicolor* hybridization (circles) indicating these are recombinant chromosomes with *S. macrospermum* introgression.


A
B


C


% S. macrospermum Introgression
30
20
10
0
101
102
107
Family
Common
101/107
102/107
101/102
Unique


A
B
C
D
E
F

From: Brummett, Robert G.
To: Bill Rooney
Cc: Brummett, Robert G.
Subject: RE:
Date: Wednesday, September 23, 2009 8:02:13 AM
Attachments: image001.png

That's the list from the original agreement we did earlier this year.

Here's the list for this one:

Thanks,
Robert

Robert Brummett,
Licensing Associate
The Texas A&M University System
Office of Technology Commercialization
3369 TAMU
800 Raymond Stotzer Parkway
College Station, TX 77845
(979) 862-3002 direct
(979) 204-0766 cell
(979) 847-8682 office
(979) 845-1402 fax
brummettr@tamu.edu
http://technology.tamu.edu

From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Wednesday, September 23, 2009 7:58 AM
To: Brummett, Robert G.
Subject:

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151

From: Stefaniak, Thomas R
To: "Bill Rooney"
Subject: RE:
Date: Thursday, September 17, 2009 7:19:44 PM

Bill:
Thanks for keeping me in the loop. I hope your sorghum is growing well. I suppose it is not and you are observing great separation for drought tolerance. We on the other hand, have had about the most favorable growing season I can remember. Our data will no doubt indicate a bumber crop.
Cheers

Thomas R. Stefaniak Ph.D.
Plant and Soil Sciences Department
College of Agriculture
1405 Veterans Drive
322 Plant and Soil Sciences Building
Lexington, KY 40546-0312
Office: 859-257-5020 ext. 80295
Fax: 859-257-7125
email: trstef1@uky.edu

-----Original Message-----
From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Thursday, September 17, 2009 8:58 AM
To: Stefaniak, Thomas R
Subject: RE:

Thomas:

I know that Nilesh has an informal offer of employment and he was waiting on the formal, in writing, offer. I expect that once he gets that he will give me an official timeline for his departure.

So, it is very likely, I will start the process to replace him. We'll have to do that formally and you will have to officially apply, but I will keep you posted as we start that process.

Regards,

Bill

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151

-----Original Message-----
From: Stefaniak, Thomas R [mailto:trstef1@uky.edu]
Sent: Thursday, September 10, 2009 2:26 PM
To: Bill Rooney
Subject: RE:

Bill:
I hope I am not being a nuisance but have you heard anything about your

post-doc? T.S. _____
From: Bill Rooney [wlr@tamu.edu]
Sent: Friday, August 21, 2009 9:54 PM
To: Stefaniak, Thomas R
Subject: RE:

Thomas:

Thanks, I'll know more in a couple of weeks.

bill

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151
-----Original Message-----
From: Stefaniak, Thomas R [mailto:trstef1@uky.edu]
Sent: Friday, August 21, 2009 8:11 AM
To: 'Bill Rooney'
Subject: RE:

Bill
I am very interested in this potential position. I have recently read the Murray et al. papers and am excited about the prospects of improving both grain and juice characteristics simultaneously. I would love to contribute to the continuation of fine work your group is doing. I look forward to hearing from you in the future. Respectfully

Thomas R. Stefaniak Ph.D.
Plant and Soil Sciences Department
College of Agriculture
1405 Veterans Drive
322 Plant and Soil Sciences Building
Lexington, KY 40546-0312
Office: 859-257-5020 ext. 80295
Fax: 859-257-7125
email: trstef1@uky.edu

_____
From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Thursday, August 20, 2009 6:13 PM
To: Stefaniak, Thomas R
Subject: RE:

Thomas:

Thanks for your message. I may have a post-doctoral opening in the very near future (current post-doc is interviewing for a position with Monsanto and will likely get a position with them). The position will have two major responsibilities: (i) manage a NIR lab primarily estimating bioenergy sorghum composition (but also grain sorghum and other biomass samples), and (ii) assist with the sorghum breeding program including but not limited to pollinations, selections and evaluations of a wide range of traits and sorghum types. I need an individual who wants to work in the field but has the ability to manage a composition lab (NIR only, no wet chemistry).

If you're interested please let me know. I'll know whether or not I have an opening by the end of August. If I do, then I'll be in contact in the very near future if you are interested.

regards,

bill

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151
-----Original Message-----
From: Stefaniak, Thomas R [mailto:trstef1@uky.edu]
Sent: Thursday, August 20, 2009 2:47 PM
To: 'wlr@tamu.edu'
Subject:
Dr. Rooney
My name is Thomas Stefaniak and I have been working with Drs. Barrett and Pfeiffer on our portion of the DOE sorghum trial grant at the University of Kentucky. During this time I have become very interested in sorghum and bioenergy. I am writing you in search of post-doc opportunities either in your group or in similar projects at Texas A&M. I have extensive experience in stress response evaluation in bermudagrass, as well as field and lab experience with sorghum that I think could be an asset to your project. More details concerning my education and experience can be found in my C.V., transcripts and a generic letter of application I am attaching to this email. I would be grateful if you could consider me for current or future research opportunities, and or forward these documents to someone you think could benefit from my services.

Respectfully
Thomas R. Stefaniak Ph.D.
Plant and Soil Sciences Department
College of Agriculture
1405 Veterans Drive
322 Plant and Soil Sciences Building
Lexington, KY 40546-0312
Office: 859-257-5020 ext. 80295
Fax: 859-257-7125
email: trstef1@uky.edu

From:	Kuhlman, Les
To:	Bill Rooney
Subject:	RE: 09-105 - Revise Manuscript
Date:	Sunday, August 30, 2009 3:21:21 PM
Attachments:	fig 2.DOC IntroMS Fig 3.psd IntroMS Fig 1.psd

Bill-

Great to hear this went through with minimal changes!

I logged onto the genome author site, but couldn't submit these images to the manuscript - I guess since you are marked as the corresponding author. When I submitted the original manuscript I uploaded these three files which are the high quality original images for figs 1-3. You may need to upload these along with the revised submission.

I will send my signed copyright form directly to Genome. Let me know if you need anything else. Thanks,

Les

Les Kuhlman
Research Scientist
Pioneer Hi-Bred International, Inc.
Lawrence Soybean Research Center
1451 North 1823 Rd
Lawrence, KS 66044
Office: (785) 841-2229 x11
Cell: (785) 764-2186

-----Original Message-----
From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Thursday, August 27, 2009 7:17 AM
To: Kuhlman, Les
Subject: FW: 09-105 - Revise Manuscript

Les:

I realized I can send this to your Pioneer address as well. So in case you haven't yet, here it is.

I've made corrections and resubmitted the revised version (I've attached that to this e-mail).

I also have all of the permission to copyright forms (except yours) signed and I'll send those in.

What I don't know - they have a section for adding good files for images and tables. Do you have those files or should they simply use the revised manuscript? (ie, in the last manuscript, what did you send them?) If they are different files, do you have those files and can you upload them?

Regards,

Bill

P.S. I have approval to release so I am reworking the manuscript and submitting it for release. Before I submit, I'll send the registration manuscript up to you for approval.

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151

-----Original Message-----
From: Editorial Office [redacted]
Sent: Thursday, August 06, 2009 8:32 PM
To: wlr@tamu.edu
Subject: 09-105 - Revise Manuscript

Dear William Rooney ,

Re: 09-105
Early-generation Germplasm Introgression from Sorghum macrospermum into Sorghum (S. bicolor) Les LCK Kuhlman, Byron BLB Burson, David Stelly, Patricia Klein, Robert R Klein, Harold James H.J. Price, and William WLR Rooney

Perry Gustafson has received and assessed reviewer comments for your manuscript. Based on the reviewer comments, Perry Gustafson recommends you submit a revised manuscript.

To submit a revised manuscript, log on to OSPrey at https://endeavour.cisti.nrc.ca/publisher/access.view?journalCode=GENOME and click on "Author" in the "Your Work Areas" box. Please DO NOT submit a new manuscript as this will lead to delays.

Below I have printed the reviewer comments and the comments of Perry Gustafson.

In addition, no work may be published in GENOME unless the publisher receives an assignment of copyright form from each author. You should have downloaded these forms during the submission process. If you have not done so already, please complete these forms and upload them with your revised manuscript files or fax them to the Editorial Office at 1-905-237-3645.

If your manuscript contains colour figures you need to fill out additional forms that I can provide by e-mail. Please ask if you need this form.

Sincerely,
Alistair Coulthard
Assistant to the Editor
GENOME
e-mail: [redacted]

Associate Editor's Comments:

I agree with the reviewer in that this is a very well written manuscript. However, it does need tot be carefully edited by the authors to make several small corrections as noted in the review.

Review 1
Questions/Answers

Q.There are four general questions for recommendation:
A.Accept as it stands

Comments

These are my general/specific comments:

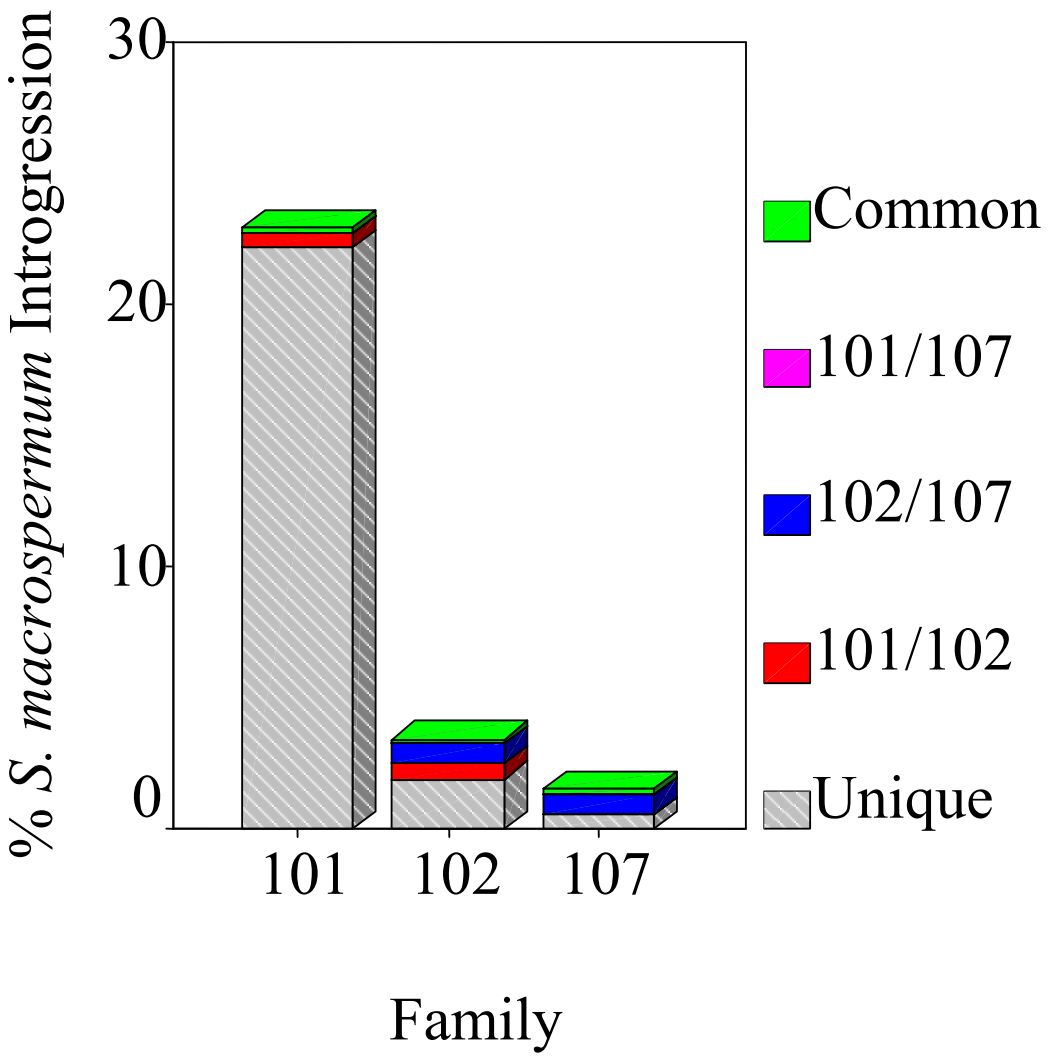
The manuscript is well written. Properly methodology and protocol were followed in conducting the research. Conclusions drawn are proper.

The research adds new knowledge on the potential to introgress genes from other Sorghum species into S. bicolor.

Manuscript is acceptable for publication as submitted.

The reference Sharma (1999) on page 6 is not listed in the References.

Huelgas et al., reference - location is Tamworth, not Tomworth. (See Franzmann and Hardy)


% S. macrospermum Introgression
30
20
10
0
101
102
107
Family
Common
101/107
102/107
101/102
Unique

From: Abernathy, Chris
To: Bill Rooney
Cc: [redacted]
Subject: RE: 2008 Sorghum Trials
Date: Wednesday, October 07, 2009 10:54:17 AM
Attachments: 2008 Sorghum Data-Pfeiffer.xls

Bill,

If you remember, back in July you sent me a data template for sorghum that I incorporated into a template for SGI data to go into the KDF. I transferred some of the data, that you just sent me, to the template for sorghum and there are several missing and/or additional fields that I could not fill.

I am happy to amend the template but I need it to be consistent across all the trials. I have attached the original template with some of your data in it for comparision. Please let me know which changes you want made in the template.

Also, for purposes of querying the KDF in the future, we will need one datasheet (Excel file) per field trial per year. For the data you just submitted I will separate the data but in the future, we are going need one file per trial.

Thanks,

Chris

From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Tuesday, October 06, 2009 6:08 AM
To: Abernathy, Chris
Cc: [redacted]
Subject: RE: 2008 Sorghum Trials

Chris:

My apologies in the delay to get you this information, but as usual everything takes longer than it should. I'm sending you both raw data and analyzed data from the 2008 trials on sorghum. While there is some variation from location to location, there is a core set of information that should be of value. What I don't have compiled would be relative weather data. Don't know if you need/want it, but we can request it from the cooperators when we start collecting 2009 data (which will be pretty soon now).

Take a look – if you have questions, please let us know.

Regards,

Bill

From: Abernathy, Chris [mailto:abernathycr@ornl.gov]
Sent: Tuesday, August 18, 2009 6:52 AM
To: Bill Rooney
Cc: [redacted]
Subject: RE: 2008 Sorghum Trials

Thanks Bill. That is great.

DoE is pushing for almost anything at this point, but is VERY aware of the impact the funding delays caused.

Chris

P.S. hooray for grad students!

From: Bill Rooney [mailto:wlr@tamu.edu]
Sent: Tuesday, August 18, 2009 7:45 AM
To: Abernathy, Chris
Cc: [redacted]
Subject: RE: 2008 Sorghum Trials

Chris

We have data for 2008 - we've been compiling it in bits and pieces from the cooperators this summer. Because I was doing such a poor job (didn't have time), I've assigned a graduate student to compile the data for both 2008 and 2009. He will be in contact with the data as soon as I have a chance to approve what he has.

regards,

bill

Dr. William L. Rooney
Professor, Sorghum Breeding and Genetics
Chair, Plant Release Committee
Texas A&M University
College Station, Texas 77843-2474
979 845 2151

> -----Original Message-----
> **From:** Abernathy, Chris [mailto:abernathycr@ornl.gov]
> **Sent:** Monday, August 17, 2009 9:59 AM
> **To:** William Rooney (wlr@tamu.edu)
> **Subject:** 2008 Sorghum Trials
>
> Bill,
>
> Were there any sorghum trials planted in 2008? If so, were data collected on them? If not, are there trials in place now for 2009?
>
> I am trying to determine which trials I can expect data for 2008.
>
> Thanks for your help,

-Chris

****

Chris Abernathy

Environmental Project Manager

Environmental Sciences Division

Oak Ridge National Laboratory

(865) 241-5877 (office); (865) 576-9939 (fax)

2009 Sorghum Yield Data

Please report in METRIC UNITS

Entry	Type	Rep	Fresh Weight kg/ha	Moisture Content %	Dry Weight kg/ha	Brix %	Grain Yield* kg/ha	Plant height cm	Days to Flowering days	Lodging %	Disease Rating*	Insect Rating*	Carbohydrate Composition (%) Glucan	Xylan	Lignin	Soluble
22053	PS Silage bmr	1	18086.20		6197.54	14.74										
22053	PS Silage bmr	1				12 5										
22053	PS Silage bmr	1														
22053	PS Silage bmr	2	5004.93			12										
22053	PS Silage bmr	2														
22053	PS Silage bmr	2				12.25										
M81-E	Sweet	1	20303.64		7345.93	14.25										
M81-E	Sweet	1				14.25										
M81-E	Sweet	1				15.50										
M81-E	Sweet	2	22480.71		8574.79	1.35										
M81-E	Sweet	2														
M81-E	Sweet	2				0.36										
Graze-n-Bale	PS sorg-sudan	1	14912 54		4543.38	10.75										
Graze-n-Bale	PS sorg-sudan	1				10.50										
Graze-n-Bale	PS sorg-sudan	1				11.00										
Graze-n-Bale	PS sorg-sudan	2	13936.13		4507.86	11.00										
Graze-n-Bale	PS sorg-sudan	2				10.25										
Graze-n-Bale	PS sorg-sudan	2				11.50										
Graze All 3	PI sorg-sudan	1	7954.79		3579.66	13.50										
Graze All 3	PI sorg-sudan	1				11.50										
Graze All 3	PI sorg-sudan	1				12.00										
Graze All 3	PI sorg-sudan	2	10213 04		5106.52	12.00										
Graze All 3	PI sorg-sudan	2				10.75										
Graze All 3	PI sorg-sudan	2				10.75										
Sugar T	Sweet Silage	1	6693.13		2944.98	9.00										
Sugar T	Sweet Silage	1														
Sugar T	Sweet Silage	1				10.75										
Sugar T	Sweet Silage	2	5370.92		2228.39	13.25										
Sugar T	Sweet Silage	2				13.00										
Sugar T	Sweet Silage	2				8.00										

* Not all hybrids will produce grain. In those that do, grain yield will be estimated by measuring panicle weight and estimating grain yield on a threshing percentage.
* Disease and Insect Ratings will be made as appropriate to each environment.
* Carbohydrate composition will be completed on each location using NIR scanning technology and composition curves developed collaboratively between NREL and Texas A&M University.

SITE DESCRIPTION

PI for Field Trial	PMC Number (Golden Field Office Project Management Center)	Experiment Name	Organization/Institution	State	County
Todd Pfeiffer	GFO-07-135-17	Kentucky Sorghum Trials	U. of Kentucky	KY	

Previous land use history (one year before minimum)	Total experimental area (acres)	Individual plot size (acres)	Field Latitude (decimal degrees) *	Field Longitude (decimal degrees)*

* Lat/Long should be taken at the SE corner of the field

FIELD LEVEL DATA

Plot	Planting Date	Harvest Date	Second Harvest Date (if applicable)	Tillage Operations	Pesticide Applications	Pesticide Application Rate	Pesticide Application Rate-UNITS	Fertilizer application
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								
A								
B								
C								

Fertilizer application rate	Fertilizer app rate-UNITS	Irrigation Date	Amount Irrigation applied (mm)

MONTHLY TEMPERATURE & PRECIPITATION I

GFO-number		Jan	Feb	Mar	Apr	May	Jun
Average Temp (Celcius)	30 yr						
	2008						
	2009						
	2010						
	2011						
	2012						
Average Precip (mm)	30 yr						
	2008						
	2009						
	2010						
	2011						
	2012						

DATA

Jul	Aug	Sep	Oct	Nov	Dec

DAILY TEMPERATURE DATA (Celcius)													DAILY PRECIPITATION DATA (mm)											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1																								
2																								
3																								
4																								
5																								
6																								
7																								
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31																								
Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Mean	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Max	0	0	0	0	0	0	0	0	0	0	0	0	Max	0	0	0	0	0	0	0	0	0	0	0	0
Min	0	0	0	0	0	0	0	0	0	0	0	0	Min	0	0	0	0	0	0	0	0	0	0	0	0