PROJECT NO. RU-9

ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE

PROJECT TITLE:

Characterization of Rice Straw to Enhance Utilization

PROJECT LEADER:

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LEVEL OF 1993 FUNDING

$22,314.00

OBJECTIVES & EXPERIMENTS CONDUCTED TO ACCOMPLISH OBJECTIVES:

Objectives:

The primary objective was to establish a broad data base which characterizes the chemical composition, fermentability, and gross energy for over fifty rice straw varieties. The secondary objective was to determine if the variability observed is sufficient to apply this information for effective straw incorporation and the exploitation of viable rice straw markets.

Fifty-four different rice varieties were harvested within the same week at the Rice Research Unit at UCD. The straw was processed and prepared for analyses after the height of each variety was determined. Each variety was divided into three equal sub-samples of about one-half pound each. One sub-sample was used for analyses and the other two sub-samples were treated with anhydrous ammonia and then analyzed. The following components were analyzed or are in the process of being analyzed: neutral detergent fiber, acid detergent fiber, cellulose, lignin, silica, nitrogen, fat, ash, calcium, magnesium, potassium, phosphorous, and fermentation characteristics. All analyses are on a dry matter basis.

SUMMARY OF 1993 RESEARCH (MAJOR ACCOMPLISHMENTS) BY OBJECTIVE:

The preliminary results and initial statistical analyses of the 1993 rice research are shown in Tables 1 through 5 . The composition among rice varieties was variable. The variability in composition is a positive finding because, if the rice growers are going to use this information, the first criteria is that composition be different among varieties. For example from Table 1, ash ranged from a low of 15.5% (L-203) to a high of 23.8% (C111050), silica ranged from a low of 10.3% (924596) to a high of 17.7% (C111050), the neutral detergent fiber ranged from a low of 56.6% (Basmati, 370) to a high of 68.6% (M-204), and nitrogen ranged from a low of .45% (M-201) to a high of .86% (Basmati, 370). As expected the gross energy was inversely correlated with ash content. The rice straw with the lowest energy content was C111050 (3.27 kcal/g) and the rice straw with the highest energy content was L-203 (3.61 kcal/g). If a market existed to utilize rice straw for energy production, the choice of which variety to choose for this market would be clear under the conditions of this experiment. The digestibility of fiber ranged from 21.2% (Akitakomachi) to 31.1% (Calrose, 76; M-204). These digestibilities were determined by measuring fiber remaining in a bag after 48 hours of fermentation. We are now determining digestibility by measuring gas production from fermentation. This method should be more accurate in determining the fermentation index of each rice straw. This information may be valuable in determining the incorporation of different varieties of rice straw.

As a treatment, anhydrous ammonia was applied to a sub-sample of all the varieties. As shown in Table 3, the most dramatic change from Table 1 is an increase in the nitrogen content (from .5 to 1.1). This change was expected because ammonia is known to become an integral part of the plant tissue when applied in a semi-closed system. The other findings of interest are an increase in the neutral detergent fiber digestion from an average of 27.2% to 33.8% and a decrease in neutral detergent fiber from an average of 62.7% (Table 1) to 61% (Table 3). The changes in fiber components were expected because application of basic compounds to grasses are known to alter the lignin-hemicellulose bonds and hence the digestibility of fiber. Table 5 shows statistical confirmation of the mean observations from Tables 1 and 3.

Tables 2 and 4 summarize the mineral analyses and the height of each variety at harvest (Table 2). These data provide a bases for future comparisons.

Table 1. Ash, fiber components, silica, nitrogen, fiber digested and gross energy of 54 varieties of rice straw[1].

Variety	ROWS	SAMPLE	ID	ASH	NDF	ADF	LIG	SIL	N	NFDIG	GE
				% dry matter							kcal/g
C111048	76-80	1	1	20.1	63.2	38.6	4.9	15.3	0.5	29.4	3.4
C111049	81-85	2	1	21.7	58.3	35.8	4.3	16.0	0.7	29.0	3.4
C111050	86-90	3	1	23.8	60.1	36.4	4.6	17.7	0.6	27.2	3.3
LABELLE	256-260	8	1	19.4	65.4	39.6	4.2	14.3	0.6	30.3	3.5
M-9	539	44	1	18.2	66.0	40.2	4.1	12.8	0.5	27.6	3.5
M-302	550,588,851	45	1	18.7	62.9	38.3	3.8	13.9	0.5	25.6	3.5
M-5	847	53	1	16.9	62.1	38.0	3.7	11.8	0.5	25.0	3.5
Calmochi:202	861	54	1	16.9	61.8	37.0	3.4	12.1	0.5	29.6	3.6
M-204	291-300	11	2	19.4	61.6	38.3	4.1	14.4	0.5	31.1	3.4
M-201	3185-88	22	2	17.4	63.6	38.2	3.8	13.0	0.4	23.0	3.5
M-202	3189-92	23	2	17.3	58.3	34.2	3.7	12.8	0.5	28.7	3.5
M-203	3193-96	24	2	19.1	63.3	35.9	4.0	14.8	0.5	28.0	3.5
M-204	3197-3200	25	2	18.6	68.6	41.0	4.3	13.9	0.5	28.0	3.5
M-401	3261-64	26	2	19.3	64.6	37.5	4.2	14.4	0.5	28.6	3.4
DD2	176-180	6	3	15.9	57.7	35.2	3.7	11.3	0.5	27.7	3.6
CALROSE 76	281-285	9	3	19.4	62.0	37.9	4.1	14.2	0.6	31.1	3.5
M-101	286-290	10	3	20.0	63.0	39.4	4.3	13.7	0.5	28.5	3.4
DOONGARA	1311-20	13	3	20.0	63.0	37.0	4.2	14.9	0.5	29.3	3.4
BOGAN	1381-90	14	3	18.7	68.0	41.2	4.5	12.5	0.5	31.1	3.5
CHUNGSTUN	1401-10	15	3	18.4	66.5	40.2	4.4	13.0	0.5	30.1	3.5
C11403	3011-15	16	3	19.0	64.2	38.4	4.3	13.9	0.5	29.2	3.5
S-101	3172-76	19	3	17.7	63.0	36.2	3.8	12.6	0.5	25.7	3.5
S-201	3177-80	20	3	18.3	66.0	38.6	4.2	13.9	0.5	25.4	3.5
S-301	3181-84	21	3	17.5	65.2	39.1	4.0	12.7	0.5	26.1	3.5
AKITAKOMACHI	3273-76	29	3	16.7	58.8	35.1	3.7	12.1	0.5	21.2	3.6
KOSHIHIKARI	3277-80	30	3	18.7	61.0	37.7	4.1	13.4	0.5	23.9	3.5
M-101 WAXY	131-135	31	3	20.3	63.8	38.9	4.3	14.7	0.6	25.7	3.4
Maratelli	425	32	3	19.1	64.9	39.6	4.5	12.8	0.6	24.8	3.5
CS-M3	459	34	3	17.2	65.7	40.5	4.0	11.7	0.5	26.9	3.5
Amaroo	463	35	3	18.7	66.9	40.2	4.3	13.8	0.5	30.4	3.5
Colusa	480	36	3	18.1	62.5	37.8	3.8	13.4	0.5	25.1	3.5
Ricol	514	40	3	19.1	60.6	36.5	4.1	15.1	0.5	26.6	3.5
Echuca	515	41	3	20.0	66.5	41.1	4.2	14.9	0.4	28.4	3.4
Calrose	532,872,873	42	3	17.1	60.8	37.2	4.2	12.6	0.5	22.3	3.5
Italica Livorno	534,902+++	43	3	18.7	66.3	43.2	4.4	13.1	0.5	28.3	3.5
Calmochi: 101	625,860	47	3	19.6	61.0	38.2	4.4	14.3	0.5	26.8	3.4
M-103	Border	55	3	19.3	63.2	38.1	3.8	13.8	0.5	28.1	3.5
IR50 R	286-90	12	4	19.4	65.7	37.4	3.9	13.9	0.6	30.7	3.4
Rasi	449	33	4	18.9	63.8	38.1	3.8	13.8	0.5	29.9	3.5
Hunan E. Dwarf4	483	37	4	19.6	63.5	38.1	4.0	14.1	0.6	30.1	3.4
Basmati: 370	728	50	4	16.1	56.6	33.6	3.4	11.0	0.9	21.7	3.6
Dular	763	51	4	18.7	64.3	39.5	3.6	13.5	0.5	23.9	3.5
L-202	3265-68	27	5	17.6	64.6	36.8	4.2	13.4	0.6	28.9	3.5
L-203	3269-72	28	5	15.3	58.5	34.0	3.6	10.8	0.5	25.8	3.6
Lemont	626,868	48	5	21.4	63.2	37.7	4.4	15.9	0.7	27.2	3.4
C111054	106-110	4	6	20.0	60.5	37.2	4.4	14.5	0.5	27.6	3.4
P1506230	166-170	5	6	17.8	61.4	36.8	4.4	13.0	0.5	30.6	3.5
API	206-210	7	6	17.8	58.3	35.8	4.5	11.7	0.7	22.2	3.5
924594	3016-25	17	6	17.4	62.7	36.2	4.0	13.1	0.5	27.8	3.5
924596	3021-25	18	6	15.4	61.6	35.8	3.8	10.3	0.5	26.5	3.6
Quing Qun Wang	496	38	6	21.7	60.1	35.7	4.6	15.6	0.7	24.1	3.4
Cal pearl	512	39	6	17.9	57.6	34.3	4.1	13.2	0.5	25.2	3.5
Sadri	708	49	6	17.0	60.0	36.9	3.2	11.5	0.5	27.1	3.5
Sadri Rice 1	771	52	6	18.3	60.8	38.3	4.0	12.1	0.6	26.1	3.5
		AVG[2]		18.6	62.7	37.8	4.1	13.5	0.5	27.2	3.5
		MIN		15.3	56.6	33.6	3.2	10.3	0.4	21.2	3.3
		MAX		23.8	68.6	43.2	4.9	17.7	0.9	31.1	3.6
		STDS		1.6	2.8	2.0	0.3	1.4	0.1	2.5	0.1

[1] ID = tentative classification: 1 = J1 (J=Japonica), 2 = J2, 3 = J3, 4 = Indica, 5 = B1, 6 = unclassified; NDF=neutral detergent fiber; ADF = acid detergent fiber; LIG = lignin; N = nitrogen; NFDIG=NDF digested in 48 hrs; GE = gross energy.

[2] AVG = average across varieties; MIN = minimum; MAX = maximum; STDS = sample standard deviation.

Table 2. Mineral composition and height of 54 varieties of rice straw.[1]

Variety	ROWS	SAMPLE	ID	Ca (% dry matter)	Mg (% dry matter)	K (% dry matter)	P (% dry matter)	cm Height
C111048	76-80	1	1	0.20	0.36	1.95	0.05	89.7
C111049	81-85	2	1	0.21	0.36	2.40	0.08	71.3
C111050	86-90	3	1	0.19	0.39	2.35	0.12	74.0
LABELLE	256-260	8	1	0.16	0.39	2.16	0.09	97.0
M-9	539	44	1	0.15	0.31	2.28	0.05	78.3
M-302	550,588,851	45	1	0.17	0.33	1.83	0.03	79.3
M-5	847	53	1	0.16	0.31	1.81	0.04	84.7
Calmochi:202	861	54	1	0.15	0.27	1.93	0.03	79.0
M-204	291-300	11	2	0.16	0.32	1.78	0.02	77.3
M-201	3185-88	22	2	0.17	0.29	1.81	0.02	71.0
M-202	3189-92	23	2	0.16	0.32	1.96	0.07	84.7
M-203	3193-96	24	2	0.19	0.31	2.03	0.05	78.0
M-204	3197-3200	25	2	0.18	0.30	1.37	0.03	80.7
M-401	3261-64	26	2	0.19	0.31	1.82	0.03	77.0
DD2	176-180	6	3	0.15	0.28	1.71	0.05	68.7
CALROSE 76	281-285	9	3	0.16	0.28	2.00	0.04	83.7
M-101	286-290	10	3	0.17	0.35	1.92	0.03	73.0
DOONGARA	1311-20	13	3	0.21	0.36	1.70	0.07	70.3
BOGAN	1381-90	14	3	0.17	0.28	1.98	0.03	87.0
CHUNGSTUN	1401-10	15	3	0.16	0.30	1.89	0.03	92.0
C11403	3011-15	16	3	0.16	0.29	1.91	0.05	117.0
S-101	3172-76	19	3	0.16	0.29	1.77	0.03	77.3
S-201	3177-80	20	3	0.16	0.25	1.51	0.02	77.7
S-301	3181-84	21	3	0.17	0.29	1.94	0.03	79.0
AKITAKOMACHI	3273-76	29	3	0.16	0.23	1.06	0.05	71.3
KOSHIHIKARI	3277-80	30	3	0.17	0.31	1.38	0.04	92.0
M-101 WAXY	131-135	31	3	0.19	0.40	1.77	0.03	80.3
Maratelli	425	32	3	0.16	0.32	2.01	0.03	84.0
CS-M3	459	34	3	0.15	0.29	2.01	0.03	106.3
Amaroo	463	35	3	0.17	0.28	2.01	0.02	83.7
Colusa	480	36	3	0.14	0.25	2.02	0.04	89.0
Ricol	514	40	3	0.14	0.25	1.74	0.04	77.7
Echuca	515	41	3	0.17	0.32	1.95	0.00	85.7
Calrose	532,872,873	42	3	0.15	0.26	1.70	0.03	84.7
Italica Livorno	534,902+++	43	3	0.15	0.33	2.20	0.01	96.0
Calmochi: 101	625,860	47	3	0.17	0.33	1.81	0.02	75.7
M-103	Border	55	3	0.18	0.33	2.09	0.03	83.0
IR50 R	286-90	12	4	0.22	0.36	1.98	0.04	64.0
Rasi	449	33	4	0.18	0.34	2.08	0.09	80.0
Hunan E. Dwarf4	483	37	4	0.20	0.37	2.25	0.03	63.7
Basmati: 370	728	50	4	0.15	0.39	1.85	0.10	102.7
Dular	763	51	4	0.15	0.27	1.89	0.02	116.7
L-202	3265-68	27	5	0.23	0.36	1.66	0.10	64.0
L-203	3269-72	28	5	0.19	0.32	1.28	0.10	61.7
Lemont	626,868	48	5	0.19	0.39	1.76	0.08	64.7
C111054	106-110	4	6	0.14	0.28	2.20	0.04	103.0
P1506230	166-170	5	6	0.17	0.30	1.64	0.04	88.3
API	206-210	7	6	0.14	0.40	2.48	0.04	108.0
924594	3016-25	17	6	0.18	0.30	1.57	0.05	80.3
924596	3021-25	18	6	0.16	0.27	1.60	0.04	93.3
Quing Qun Wang	496	38	6	0.21	0.39	2.29	0.05	63.0
Cal pearl	512	39	6	0.15	0.28	1.76	0.05	71.0
Sadri	708	49	6	0.15	0.38	1.72	0.07	124.0
Sadri Rice 1	771	52	6	0.16	0.34	2.47	0.08	135.3
		AVG[2]		0.17	0.32	1.89	0.05	84.1
		MIN		0.14	0.23	1.06	0.00	61.7
		MAX		0.23	0.40	2.48	0.12	135.3
		STDS		0.02	0.04	0.29	0.03	15.7

1 ID = tentative classification: 1 = J1 (J=Japonica), 2 = J2, 3 = J3, 4 = Indica, 5 = B1, 6 = unclassified; Ca = Calcium, Mg = magnesium, K = potassium, P = phosphorous.

2 AVG = average across varieties; MIN = minimum; MAX = maximum; STDS = sample standard deviation.

Table 3. Ash, fiber components, silica, nitrogen, and fiber digested of 54 varieties of rice straw treated with anhydrous ammonia[1].

Variety	ROWS	SAMPLE	ID	% dry matter						
				ASH	NDF	ADF	LIG	SIL	N	NDFDIG
C111048	76-80	1	1	20.2	61.7	39.4	4.3	15.7	1.0	35.6
C111049	81-85	2	1	21.8	57.4	36.5	3.7	16.4	1.3	34.3
C111050	86-90	3	1	23.4	58.3	36.2	4.1	18.8	1.0	36.4
LABELLE	256-260	8	1	19.1	61.9	39.2	4.5	14.5	1.1	35.3
M-9	539	44	1	18.5	64.1	39.0	4.0	14.8	1.0	35.2
M-302	550,588,851	45	1	18.1	62.5	38.8	4.1	13.6	1.1	34.3
M-5	847	53	1	17.1	59.8	38.2	3.9	13.1	1.1	28.8
Calmochi:202	861	54	1	16.8	60.1	38.4	3.5	12.1	1.1	36.5
M-204	291-300	11	2	19.0	61.2	38.8	4.2	14.8	1.0	34.4
M-201	3185-88	22	2	17.2	63.6	37.4	3.6	13.9	1.0	33.8
M-202	3189-92	23	2	17.5	56.6	34.4	3.6	13.0	1.1	31.0
M-203	3193-96	24	2	18.7	61.3	37.0	4.3	14.5	1.1	33.1
M-204	3197-3200	25	2	18.4	65.8	40.2	4.7	14.6	0.9	36.5
M-401	3261-64	26	2	18.7	62.8	37.9	3.7	14.8	1.0	34.1
DD2	176-180	6	3	15.5	57.4	34.7	3.8	11.7	1.1	33.2
CALROSE 76	281-285	9	3	19.0	62.1	38.1	4.1	15.0	1.0	33.4
M-101	286-290	10	3	19.4	61.3	38.9	4.5	14.9	1.0	33.0
DOONGARA	1311-20	13	3	19.7	60.5	37.5	3.8	15.9	1.1	35.1
BOGAN	1381-90	14	3	18.2	65.0	40.5	4.1	13.8	1.0	36.5
CHUNGSTUN	1401-10	15	3	18.1	63.4	41.2	4.4	13.2	1.0	34.0
C11403	3011-15	16	3	18.5	60.7	38.1	4.0	14.1	1.0	34.8
S-101	3172-76	19	3	17.0	60.8	37.5	4.3	13.0	1.1	34.6
S-201	3177-80	20	3	17.9	64.2	40.1	4.2	13.4	1.0	36.5
S-301	3181-84	21	3	17.4	62.1	38.5	4.4	13.5	1.0	30.1
AKITAKOMACHI	3273-76	29	3	16.3	56.7	35.6	3.5	11.9	1.1	29.4
KOSHIHIKARI	3277-80	30	3	17.6	60.7	38.2	3.3	13.7	1.1	31.8
M-101 WAXY	131-135	31	3	20.0	62.0	39.0	4.0	14.8	1.0	33.3
Maratelli	425	32	3	18.1	63.2	40.5	4.8	13.0	1.0	30.3
CS-M3	459	34	3	17.2	64.7	39.7	4.2	13.1	1.0	34.8
Amaroo	463	35	3	18.4	66.9	40.9	4.7	13.8	1.0	35.9
Colusa	480	36	3	18.4	61.8	37.2	4.0	14.4	1.0	34.1
Ricol	514	40	3	19.1	59.9	36.5	3.7	15.2	1.0	33.5
Echuca	515	41	3	19.6	64.4	41.5	4.1	15.3	1.0	38.0
Calrose	532,872,873	42	3	17.1	58.4	37.4	3.8	12.7	1.1	30.0
Italica Livorno	534,902+++	43	3	19.0	63.5	41.2	4.7	14.1	0.9	33.9
Calmochi: 101	625,860	47	3	19.5	58.9	[illegible]	3.5	15.7	1.1	32.1
M-103	Border	55	3	18.5	60.2	[illegible]	4.1	14.0	1.1	34.5
IR50 R	286-90	12	4	18.9	63.0	[illegible]	3.9	14.7	1.0	36.4
Rasi	449	33	4	18.4	63.4	38.7	3.9	13.3	1.1	36.7
Hunan E. Dwarf4	483	37	4	20.2	61.6	37.4	3.8	15.2	1.1	[illegible]
Basmati: 370	728	50	4	15.4	55.1	34.0	3.4	11.3	1.5	28.1
Dular	763	51	4	18.3	62.5	40.3	3.9	13.9	1.1	35.9
L-202	3265-68	27	5	17.6	62.8	37.6	3.9	13.6	1.0	37.2
L-203	3269-72	28	5	15.3	56.5	34.5	2.7	10.5	1.0	31.9
Lemont	626,868	48	5	21.3	60.7	38.1	4.4	16.0	1.2	35.5
C111054	106-110	4	6	19.9	59.4	38.1	4.4	14.6	1.0	32.1
P1506230	166-170	5	6	17.7	60.8	37.1	4.5	14.0	1.0	33.3
API	206-210	7	6	17.7	57.7	37.0	4.5	11.7	1.2	29.3
924594	3016-25	17	6	17.8	60.1	36.9	4.0	14.1	1.1	33.5
924596	3021-25	18	6	15.3	58.1	36.1	3.9	11.3	1.0	29.7
Quing Qun Wang	496	38	6	21.5	61.3	35.1	4.3	17.0	1.1	32.8
Cal pearl	512	39	6	17.9	57.3	34.5	3.5	14.0	1.1	30.9
Sadri	708	49	6	16.9	59.5	36.9	3.5	12.9	1.3	38.0
Sadri Rice 1	771	52	6	17.8	59.7	39.3	4.5	12.0	1.2	34.8
		AVG[1]		18.4	61.0	37.9	4.0	14.0	1.1	33.8
		MIN		15.3	55.1	34.0	2.7	10.5	0.9	28.1
		MAX		23.4	66.9	41.5	4.8	18.8	1.5	38.0
		STDS		1.6	2.6	1.8	0.4	1.5	0.1	2.4

[1,2] See Table 1.

Table 4. Mineral composition of 54 varieties of rice straw treated with anhydrous ammonia.[1]

Variety	ROWS	SAMPLE	ID	Ca	Mg	K	P
				-------------% dry matter			------------
C111048	76-80	1	1	0.16	0.38	1.88	0.09
C111049	81-85	2	1	0.18	0.39	2.14	0.13
C111050	86-90	3	1	0.18	0.44	2.14	0.17
LABELLE	256-260	8	1	0.14	0.42	2.03	0.13
M-9	539	44	1	0.15	0.35	2.03	0.10
M-302	550,588,851	45	1	0.14	0.37	1.77	0.08
M-5	847	53	1	0.13	0.45	1.62	0.09
Calmochi:202	861	54	1	0.14	0.34	1.86	0.08
M-204	291-300	11	2	0.14	0.39	1.61	0.07
M-201	3185-88	22	2	0.16	0.35	1.48	0.06
M-202	3189-92	23	2	0.15	0.37	1.36	0.12
M-203	3193-96	24	2	0.20	0.38	1.59	0.11
M-204	3197-3200	25	2	0.21	0.35	1.34	0.09
M-401	3261-64	26	2	0.16	0.38	1.58	0.09
DD2	176-180	6	3	0.16	0.33	1.68	0.09
CALROSE 76	281-285	9	3	0.15	0.33	1.39	0.09
M-101	286-290	10	3	0.18	0.42	1.52	0.08
DOONGARA	1311-20	13	3	0.14	0.46	1.51	0.12
BOGAN	1381-90	14	3	0.16	0.34	1.74	0.08
CHUNGSTUN	1401-10	15	3	0.19	0.38	1.86	0.08
C11403	3011-15	16	3	0.18	0.36	1.45	0.09
S-101	3172-76	19	3	0.17	0.36	1.49	0.09
S-201	3177-80	20	3	0.17	0.36	1.67	0.07
S-301	3181-84	21	3	0.19	0.33	1.51	0.08
AKITAKOMACHI	3273-76	29	3	0.18	0.30	1.39	0.11
KOSHIHIKARI	3277-80	30	3	0.18	0.37	1.72	0.11
M-101 WAXY	131-135	31	3	0.23	0.46	1.90	0.08
Maratelli	425	32	3	0.20	0.34	2.18	0.08
CS-M3	459	34	3	0.17	0.35	1.99	0.08
Amaroo	463	35	3	0.16	0.37	2.12	0.07
Colusa	480	36	3	0.17	0.38	1.77	0.09
Ricol	514	40	3	0.14	0.33	1.59	0.08
Echuca	515	41	3	0.18	0.44	1.93	0.06
Calrose	532,872,873	42	3	0.15	0.32	1.58	0.08
Italica Livorno	534,902+++	43	3	0.16	0.39	2.05	0.06
Calmochi: 101	625,860	47	3	0.15	0.37	1.84	0.08
M-103	Border	55	3	0.21	0.41	1.83	0.08
IR50 R	286-90	12	4	0.20	0.40	1.43	0.09
Rasi	449	33	4	0.15	0.42	2.06	0.14
Hunan E. Dwarf4	483	37	4	0.14	0.44	1.86	0.09
Basmati: 370	728	50	4	0.17	0.45	1.80	0.14
Dular	763	51	4	0.15	0.33	1.64	0.07
L-202	3265-68	27	5	0.15	0.41	1.30	0.15
L-203	3269-72	28	5	0.15	0.38	1.59	0.16
Lemont	626,868	48	5	0.16	0.45	2.07	0.13
C111054	106-110	4	6	0.15	0.33	2.11	0.09
P1506230	166-170	5	6	0.17	0.31	1.53	0.08
API	206-210	7	6	0.17	0.49	2.42	0.09
924594	3016-25	17	6	0.15	0.37	1.22	0.10
924596	3021-25	18	6	0.14	0.32	1.25	0.09
Quing Qun Wang	496	38	6	0.14	0.44	2.23	0.10
Cal pearl	512	39	6	0.15	0.35	1.83	0.10
Sadri	708	49	6	0.16	0.43	1.72	0.12
Sadri Rice 1	771	52	6	0.14	0.43	2.14	0.13
		AVG[2]		0.16	0.38	1.75	0.10
		MIN		0.13	0.30	1.22	0.06
		MAX		0.23	0.49	2.42	0.17
		STDS		0.02	0.05	0.28	0.03

1,2 See Table 2.

Table 5. P-values for different components when contrasting non-treated straw with ammonia treated straw[1].

	Non-treated vs Treated
ASH	.36
NDF	.0004
ADF	.56
HEMI	.0001
LIG	.51
CELL	.42
SIL	.04
N	.0001
NFDIG	.0001

[1] NDF=neutral detergent fiber; ADF = acid detergent fiber; HEMI = hemicellulose (NDF-ADF); LIG = lignin; CELL = cellulose (ADF-LIG); N = nitrogen; NFDIG=NDF digested in 48 hrs.

PUBLICATIONS OR REPORTS:

We will be publishing the results of this research in the near future.

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

The composition and fermentation index of fifty-four rice varieties were measured. The results show that variability in chemical composition and fermentation of rice straw exists among varieties. Ash ranged from a low of 15.5% (L-203) to a high of 23.8% (C111050), silica ranged from a low of 10.3% (924596) to a high of 17.7% (C111050), fiber ranged from a low of 56.6% (Basmati, 370) to a high of 68.6% (M-204), and nitrogen ranged from a low of .45% (M-201) to a high of .86% (Basmati, 370). The rice straw with the lowest energy content was C111050 (3.27 kcal/g) and the rice straw with the highest energy content was L-203 (3.61 kcal/g). If a market existed to utilize rice straw for energy production, the choice of which variety to choose for this market would be clear under the conditions of this experiment. The fermentation of fiber ranged from 21.2% (Akitakomachi) to 31.1% (Calrose, 76; M-204). These fermentations were determined by measuring fiber remaining in a bag after 48 hours of fermentation. We are now determining fermentation by measuring gas production. This method should be more accurate in determining the fermentation index of each rice straw. This information may be valuable in determining the incorporation success of different varieties of rice straw.

The establishment of variability is necessary if rice breeders and growers are going to use this information in their programs. The information from this study may provide a bases for future management decisions based on straw composition and fermentation.