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For Period
January 1, 1967 to June 30, 1967

Prepared by
R. C. Pickett

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INHERITANCE AND IMPROVEMENT OF PROTEIN QUALITY
AND CONTENT IN SORGHUM VULGARE PERS.

Report for Period January 1, 1967 to June 30, 1967.

Over 1000 sorghum lines from the world collection have been completed for protein and lysine (by short column chromatography) analyses.

The range of crude protein content in the whole seeds was 7.4 to 26.0% (Table 1) with 53 lines from the collection and sudangrass breeding nursery with 18 to 26% protein.

The range of lysine was .23 to 3.88% of protein. The highest lysine percents were noted in the fertility trial. Table 2 has the highest lysines under comparable fertility (2.63-2.84%).

Good combinations of high protein and high lysine were found in spite of the well known general negative relationship of the two. Table 3 shows the several with % Protein x % Lysine with 35 to 43 compared to the common level of 20± and the low of 3 to 4. Shrivelled seeds of several lines gave unusually high protein and lysine.

Over 100 select lines from this group were analyzed for complete amino acid composition. The 120 C Beckman is being operated on the 2 hour accelerated system.

Amino acid analyses of Hyderabad line 5356, whole grain, endosperm, and embryo are shown in comparison to 4 most used varietal parents (Table 4). A high protein of 21.75% in the embryo is combined with the highest percent lysine analyzed to date (4.11%) and by far the highest combination protein x lysine of 89.44. The protein and lysine in the endosperm was low but not as low as some whole seeds.

The threonine in the endosperm was lower than any seed (2.79) and almost as high as any in the embryo 3.44. The whole seed threonine range was 2.93-3.47.

The methionine range in all samples was 0.88-1.65 and was 1.53 in the embryo. The half cystine range was .57-1.35 and the total methionine-half cystine range was 1.57 to 2.75.

The isoleucine range was 3.73-4.49 for whole seeds though the embryo had 3.54 (in combination with 9.50 leucine) in favorable ratio with leucine.

The leucine in whole grains varied from 10.22-14.96 while the endosperm had 15.55 (with 4.32 isoleucine).

An interesting combination of extremes was found in line 2109 (Hyd.) which had 3.73 isoleucine, 10.22 leucine, along with the high lysine 3.36 and ordinary protein of 10.22%.

Table 5 has the complete amino acid analyses of the high protein lines tested to date. Several good combinations of high lysine, threonine, and methionine-cystine were found.

Some high lysine lines (Table 6) also had favorable content of threonine and sulfur bearing amino acids.

The high protein x lysine lines (Table 7) had the highest threonine and methionine-cystine contents.

A major part of the analytical effort went into the analysis of 19 genotypes tested in 3 reps with 3 samples per rep. and 3 levels of N fertilization plus a very high fertility plot. The mean data are presented in tables 8-12 and will be presented in M.S. thesis and paper for publication by Arden Campbell.

The correlation of % Protein with Lysine as a % of Protein was a surprisingly low - .1218**. Lysine was more closely related to protein x lysine (+.7690**) than was protein (+.5254**).

The nitrogen levels (residual, +100#/A, +200#/A) were significantly different for protein, but had a low order of magnitude relative to the large genotypic differences. Genotypes were highly significantly different for yield, lysine and protein x lysine in addition to protein at all N levels. Genotype x N levels and the interaction of these levels with high fertility were all nonsignificant. The high fertility field (Table 10) had significantly higher protein (range 12.1-17.1) than the means of the N treatments (range 11.7-16.3 Table 8).

This considerable effort would indicate the genotypic control of protein and lysine is great and that it holds up over a considerable range of fertilities. Lower fertilities that reduce yield greatly as well as other environmental effects will be studied by cooperators in other countries.

Fifty-five single crosses were tested in 3, 2, and 1 reps of short rows according to seed supplies (Table 13). Several of the best hybrids were better than either parent in % Protein but not as much in lysine relative to the parents. Some very excellent yields were noted which may mean increases in amount of protein, lysine and other constituents when more adequate yield tests are made in 1967.

The 1967 field nursery is almost 12 acres and includes almost 3500 collection items grown in Puerto Rico. Many yield tests and inheritance studies were included that will be documented in subsequent reports.

Tables 14 and 15 list the relatively large seed increases made of contrasting genotypes made in 1966 and 1967. Seed is, or will be, available of these to interested research workers. Seed of these will be used for further biological tests, as they can be arranged. Small packets of several additional lines are being distributed to research workers in the U.S., South America, Africa, and Asia. Considerable variation of composition exists in many lines. Active distribution of seed and chemical analytical data are being rapidly developed with all interested cooperators. These reports are also available upon request and will be regularly mailed to all requesting it.

The biological tests to date consist of rat feeding trials by Dr. D. M. Hegsted, Harvard University. Table 16 shows preliminary, unpublished data. Table 17 shows rat feeding data from M.S. thesis by Isis Nawar and Dr. Helen Clark, Purdue University. Both trials show significant differences in feeding value of the relatively few sorghum lines with protein of 9 to 14%. Great differences in digestibility suggest that such trials are needed along with chemical evaluations and as a possible prelude to more intensive biological tests.

Table 1. SELECTED SORGHUM PROTEIN AND LYSINE ANALYSES - SHUMAN LABORATORY
1966-67
HIGH PROTEIN
(53 including 29 previously reported)
Jan., 1967

S-No.	Nursery or Hyd. No.	Prot.	Lys.	P x L
2094	P.S.N. 65120[1]	26.0	1.24	32.24
281	4503	25.9	0.69	17.87
148	5185	25.7	0.89	22.87
266	2429	24.9	0.91	22.66
2082	P.S.N. 65108	23.6	1.19	28.08
2096	P.S.N. 65122	23.5	0.55	12.92
2066	P.S.N. 65090	23.1	0.59	13.63
211	1888	22.6	1.91	43.17
269	5121	22.3	0.84	18.73
2070	P.S.N. 65094	21.6	0.46	9.94
280	5239	21.4	1.17	25.04
291	1718	21.0	0.93	19.53
75	5456	20.6	1.67	33.17
2047	P.S.N. 65071	20.4	1.07	21.83
192	0793	20.0	1.11	22.20
1967	0973	19.94		
279	2154	19.[illegible]	0.76	15.12
295	0973	19.6	0.83	16.43
132	0026	19.7	1.44	28.37
1196	5223	19.6	1.29	25.28
2009	P.S.N. 65032	19.6	0.93	18.23
2048	P.S.N. 65072	19.5	1.08	21.06
1475	5383	19.4	0.88	17.07
286	3736	19.4	0.97	18.82
34	0361	19.3	1.53	29.53
124	2197	19.3	1.10	21.23
274	6372	19.3	1.18	22.77
2072	P.S.N. 65096	19.3	0.43	8.30
311	0984	19.2	1.10	21.12
2076	P.S.N. 65100	19.1	1.43	27.31
319	1669	19.0	0.79	15.01
121	2111	18.9	1.11	20.98
2059	P.S.N. 65083	18.9	0.51	9.64
2071	P.S.N. 65095	18.9	0.36	6.80
2081	P.S.N. 65107	18.9	1.92	36.29
338	1488	18.8	0.91	17.11

[1] Purdue sudangrass selection number.

Table 1 (continued)

S-No.	Nursery or Hyd. No.	Prot.	Lys.	P x L
176	3237	18.7	1.23	23.00
87	2190	18.6	1.44	26.78
111	0355	18.5	1.17	21.64
284	5317	18.5	1.22	22.57
304	2949	18.5	1.13	20.90
1072	0973	18.4	1.76	32.38
345	0355	18.3	1.61	29.46
1478	1829	18.2	0.78	14.20
170	1821	18.0	0.86	15.48
227	1828	18.0	0.96	17.28
244	0974	18.0	0.80	14.40
1464	1206	18.0	0.49	8.82
1998	P.S.N. 65021	18.0	0.83	14.94
2039	P.S.N. 65062	18.0	1.17	21.06
2051	P.S.N. 65075	18.0	1.18	21.24
2053	P.S.N. 65077	18.0	1.01	18.18
2075	P.S.N. 65099	18.0	1.67	30.06
LOW PROTEIN				
53	1884	9.6	2.70	25.92
89	1121	9.63	1.62	15.60
201	5287	9.70	1.65	16.00
297	1440	8.5	1.06	9.01
320	5342	7.4	1.50	11.10
1368	1076	8.8	1.72	15.14
1355	1808	8.8	1.26	11.09
1246	4487	9.7	2.08	20.18

1/ Purdue sudangrass selection number.

Table 2.

HIGH LYSINE

S-No.	Hyd. No.	Prot.	Lys.	P x L
53	1884	9.6	2.70	25.92
76	6283	11.4	2.70	30.78
67	5217	12.3	2.84	34.93
1395	5410	11.2	2.79	31.25
16	2016	14.6	2.63	38.40
21	3041	10.9	2.66	28.99
33	0305	13.9	2.69	37.39
37	0819	14.6	2.71	39.57
38	0923	12.9	2.64	34.06
64	4487	12.3	2.66	32.72
126	1458	10.7	2.67	28.57
1134	0765	10.4	2.68	27.87
1208	1699	13.5	2.64	35.64
LOW LYSINE				
1466	1738	11.4	.31	3.53
1468	0793	13.6	.34	4.62
1987	P.S.N. 65010	17.3	.23	3.98
1988	P.S.N. 65011	11.6	.32	3.71
1989	P.S.N. 65012	12.3	.29	3.57
1991	P.S.N. 65014	12.5	.24	3.00
2022	P.S.N. 65045	15.4	.30	4.62
1992	P.S.N. 65015	12.7	.30	3.81

Table 3.

S-No.	Hyd. No.	Prot.	Lys.	P x L
		HIGH P X L		
16	2016	14.6	2.63	38.40
37	0819	14.6	2.71	39.57
65	5075	17.1	2.28	38.99
211	1888	22.6	1.91	43.17
1208	1699	13.5	2.64	35.64
1241	1665	17.9	2.16	38.66
1349	2941	14.4	2.45	35.28
1398	1705	15.1	2.47	37.30
		LOW P X L		
1462	5273	10.7	.36	3.85
1466	1738	11.4	.31	3.53
1988	P.S.N. 65011	11.6	.32	3.71
1989	P.S.N. 65012	12.3	.29	3.57
1991	P.S.N. 65014	12.5	.24	3.00
1992	P.S.N. 65015	12.7	.30	3.81

Table 4. SELECTED 1966-67 COMPLETE AMINO ACID ANALYSES

Department of Agronomy, Purdue University

Sample No.	Hyd. No.	% Prot.	% Lys.	% P x % L	% Threo-	% Meth	% Cyst
Whole Grain	5356	14.63	1.66	24.36	3.06	1.23	0.96
Endosperm	5356	13.69	1.07	14.70	2.79	1.00	0.82
Embryo	5356	21.75	4.11	89.44	3.44	1.53	0.96
Redlan		13.81	1.70	23.42	3.26	1.64	0.96
Martin		16.31	1.85	30.16	3.13	1.29	1.08
Wheatland		12.38	1.89	23.36	3.17	1.11	0.99
Ck 60		13.03	1.80	23.47	3.06	1.70	0.82

Table 5. COMPLETE AMINO ACID ANALYSES

S-No.	Hyd. No.	% Prot.	% Lys.	P x L	% Threo	% Meth	% Cyst
High Protein							
124	2197	18.72	1.857	34.76	3.029	0.380	0.691
345	0355	18.44	1.747	32.21	3.018	1.106	0.868
990	0361	18.09	2.26	40.88	3.15	1.15	1.14
121	2111	17.81	1.897	33.79	3.261	1.112	0.893
111	0355	17.41	1.539	26.79	2.950	1.354	0.833
34	0361	16.65	1.61	26.81	2.95	1.40	0.72
991	0819	16.25	2.31	37.54	3.29	1.40	1.35
Low Protein							
125	2191	10.06	2.030	20.40	3.264	1.323	0.909
115	2109	10.22	3.357	34.31	2.992	1.079	0.782
	3041-OP	10.28	2.481	25.50	3.312	1.120	0.567
103	1099	10.53	1.968	20.72	3.045	1.118	1.149
597	1457	10.88	1.87	20.35	3.24	1.19	1.24
761	1884	10.44	2.208	23.05	3.312	1.174	1.315

Table 6.

S-No.	Hyd. No.	% Prot.	% Lys.	P x L	% Thre	% Meth	% Cyst
High Lysine							
115	2109	10.22	3.357	34.31	3.312	1.120	0.567
989	5456	14.78	2.89	42.71	3.43	0.93	0.99
593	1358	13.88	2.61	36.23	3.47	1.09	1.19
	3041-OP	10.28	2.481	25.50	3.312	1.120	0.567
Low Lysine							
S-77	0819 end os	13.66	1.29	17.62	3.01	1.32	0.80
S-111	0355	17.41	1.539	26.79	2.950	1.354	0.833
S-34	0361	16.65	1.61	26.81	2.95	1.40	0.72
	1102	12.47	1.662	20.73	2.928	1.374	0.915

Table 7.

S-No.	Hyd. No.	% Prot.	% Lys.	P x L	% Threo	% Meth	% Cyst
High P x L							
S-990 1/	0361	18.09	2.26	40.88	3.15	1.15	1.14
991 1/	0819	16.25	2.31	37.54	3.29	1.40	1.35
989 2/	5456	14.78	2.89	42.71	3.43	0.93	0.99
593 2/	1358	13.88	2.61	36.23	3.47	1.09	1.19
124 1/	2197	18.72	1.857	34.76	3.029	0.880	0.691
121 1/	2111	17.81	1.897	33.79	3.261	1.112	0.893
Low P x L							
597	1457	10.88	1.87	20.35	3.24	1.19	1.24
125	2191	10.06	2.030	20.42	3.264	1.323	0.909
103	1099	10.53	1.968	20.72	3.045	1.118	1.149
	1102	12.47	1.662	20.73	2.928	1.374	0.915

1/ also high protein

2/ also high lysine

Table 8. 1966 LAFAYETTE, INDIANA

Ave. Of All N Levels (residual, 100 #/A, 200 #/A.)

Rank On Protein

Entry (Hyderabad No.)	Rel. Yield Gm./Hd.	Lysine as % Protein	Protein	Duncans Multiple Range	Prot. x Lys.
2190	30.4	1.71	16.3		27.87
6269	6.1 (late, shrivelled)	2.52	16.3		41.08
1897	51.1	1.64	15.5		25.42
1177	25.6	1.66	15.3		25.40
2833	23.2	2.09	15.3		31.98
0819	69.9	2.10	14.7		30.87
5228	11.8	2.33	14.4		33.55
0692	23.7	2.11	14.3		30.17
5075	18.4	2.12	14.2		30.10
1054	53.9	1.98	14.1		27.92
5217	37.9	1.97	14.0		27.58
5383	59.8	1.77	14.0		24.78
2016	46.0	1.98	13.6		26.93
1102	57.8	1.72	12.9		22.19
0305	32.7	2.16	12.6		27.22
1499	11.5	2.14	12.3		26.32
RS610	75.1	1.95	12.1		23.60
5206	51.1	1.75	11.9		20.83
1121	49.3	2.03	11.7		23.75

Table 9

1966 Lafayette, Indiana

0 # (residual) Nitrogen/Acre

Rank On Prot.

Ave. 3 reps. - 3 plant samples per rep.

Entry	Grain/Panicle	Lys.	Prot.	Prot. x Lys.
6269	5.3	2.70	16.3	44.01
2190	38.3	1.74	16.2	28.19
2833	14.9	2.27	15.7	35.64
5228	7.9	2.21	14.8	32.71
5075	10.6	2.06	14.8	30.49
1897	62.3	1.78	14.4	25.63
0819	68.0	2.13	14.3	30.46
1054	52.5	1.88	14.3	26.88
2016	35.9	2.10	14.2	29.82
5217	29.8	2.15	13.9	29.89
1177	26.3	1.85	13.9	25.72
0692	29.9	2.15	13.6	29.24
5383	59.7	1.75	13.2	23.10
1499	7.4	2.08	12.6	26.21
0305	32.6	2.16	12.5	27.00
5206	45.0	1.83	11.9	21.78
1121	49.4	2.04	11.6	23.66
RS610	75.1	2.03	11.6	23.55
1102	65.9	1.83	11.6	21.23

Table 10

+100 # N/Acre

Rank on Prot.

Entry	Grain/Pan.	Lys.	Prot.	P x L
2190	27.5	1.59	16.9	26.87
6269	9.8	2.31	16.6	38.35
1897	36.2	1.50	16.6	24.90
1177	23.2	1.61	15.9	25.60
0692	21.6	2.18	15.0	32.70
2833	29.9	2.14	14.9	31.89
5075	23.0	2.05	14.7	30.14
0819	82.4	2.13	14.4	30.67
5383	49.5	1.67	14.3	23.88
5228	12.1	2.52	14.1	35.53
5217	42.9	1.89	13.9	26.27
2016	44.2	2.06	13.7	28.22
1054	64.0	1.98	13.7	27.13
1102	47.7	1.68	13.3	22.34
0305	26.3	2.16	12.7	27.43
RS610	67.8	1.93	12.5	24.13
1499	12.3	2.12	12.2	25.86
5206	54.7	1.59	12.0	19.08
1121	41.2	2.19	11.7	25.62

Table 11

+200 # N./A.

Rank On Prot.

Entry	Rel. Yield Grain/Pan.	Lys.	Prot.	Duncan's Multiple Range Test			P. x L.
2190	37.3	1.82	16.7				30.39
1177	27.1	1.53	16.1				24.63
6269	3.2	2.57	16.0				41.12
0819	31.7	2.03	15.4				31.26
1897	54.7	1.63	15.3				24.94
2833	24.8	1.87	15.2				28.42
5228	15.2	2.26	14.4				32.54
0692	19.5	2.01	14.4				28.94
5383	70.3	1.90	14.3				27.17
5217	40.9	1.88	14.0				26.32
2016	58.0	1.83	14.0				25.62
1054	45.2	2.07	13.8				28.57
5075	21.6	2.26	13.0				29.38
1102	59.9	1.60	12.7				20.32
1499	14.6	2.21	12.2				26.96
0305	39.0	2.14	12.1				25.89
RS610	82.4	1.95	12.1				23.60
5206	53.7	1.82	12.0				21.84
1121	57.3	1.86	11.9				22.13

Table 12. 1966 - Sorghum - Lafayette

High Fertility - Field 56

3 Replications

Variety (Hyderabad No.)	Rel. Yield Gm./Head	Lysine as % of Prot.	% Prot.	Duncan's Multiple Range Test	Prot. x Lys.
2190	24.5	1.35	17.1		22.85
1897	10.7	1.20	16.8		19.38
2833	24.4	1.43	16.0		22.58
6269	9.6	1.71	16.0		27.59
5228	5.7	2.61	15.6		40.45
1177	25.4	0.98	15.3		15.07
0819	31.0	1.71	15.3		25.63
5217	25.1	1.11	14.8		16.69
1054	41.2	1.86	14.7		27.32
2016	36.3	1.56	14.4		22.02
1102	41.4	1.47	14.3		20.25
5075	19.8	1.41	14.2		19.62
5383	45.9	1.65	13.7		22.52
0305	21.1	2.11	13.4		28.13
0692	31.5	1.50	13.3		19.81
5206	40.6	1.25	12.9		15.75
1121	49.6	1.54	12.2		18.85
1499	20.2	0.93	12.1		11.04

Table 13. 1966 Lafayette, Indiana

26 Single Crosses

3 Reps - 120,000 plants/Acre

Cross (Hyderabad No.'s)	% Prot. - % Lys. of Parents Respectively	Relative Yield Gm./Hd.	% Prot.	Lys. as % of Prot.	Prot. X Lys.
M.S. Redlan x 1177	14.7-1.47 x 14.1-1.94	19.1	18.2	1.01	18.38
M.S. Redlan x 1829	14.7-1.47 x 12.7-2.20	60.0	15.8	0.85	13.43
4608 x 0692	12.6-1.74 x 15.1-1.96	35.9	15.4	1.47	22.64
4608 x 6269	12.6-1.74 x 14.2-1.31	28.7	15.0	1.55	23.25
M.S. Redlan x 1897	14.7-1.47 x 12.6-2.21	72.4	15.0	1.39	20.85
M.S. Redlan x 5456	14.7-1.47 x 20.6-1.61	33.9	14.7	1.56	22.93
M.S. Redlan x 0802	14.7-1.47 x 14.5-1.75	80.8	14.5	1.03	14.94
0692 x 3041	15.1-1.96 x 10.9-2.66	23.2	14.2	1.80	25.56
2451 x 5206	12.3-2.57 x 12.6-1.42	29.2	14.2	1.60	22.72
4608 x 1406	12.6-1.74 x 13.5-1.36	45.7	14.0	1.13	15.82
1406 x 2066	13.5-1.36 x 12.5-2.48	63.4	13.8	1.29	17.80
1420 x 4608	10.9-1.89 x 12.6-1.74	39.8	13.8	1.18	16.28
M.S. Redlan x 5217	14.7-1.47 x 12.3-2.84	39.3	13.4	1.27	17.02
1406 x 1102	13.5-1.36 x 13.9-1.42	77.5	13.0	1.15	14.95
4608 x 2016	12.6-1.74 x 14.6-2.63	72.5	12.9	1.09	14.06
4608 x 2066	12.6-1.74 x 12.5-2.48	46.4	12.9	0.89	11.48
M.S. Redlan x 5312	14.7-1.47 x 12.5-2.49	49.1	12.8	1.40	17.92
1406 x 3041	13.5-1.36 x 10.9-2.66	106.2	12.8	1.25	16.00
4608 x 5206	12.6-1.74 x 12.6-1.42	46.7	12.6	1.47	18.52
2451 x 3041	12.3-2.57 x 10.9-2.66	80.4	12.5	1.63	20.38
4608 x 3041	12.6-1.74 x 10.9-2.66	68.9	12.5	1.01	12.63
M.S. Redlan x 0374	14.7-1.47 x 14.5-1.72	80.8	12.3	1.22	15.01
M.S. Redlan x 0923	14.7-1.47 x 12.9-2.64	66.4	12.3	1.07	13.16
M.S. Redlan x 1360	14.7-1.47 x 15.0-1.79	66.9	11.8	0.95	11.21
1406 x 2451	13.5-1.36 x 12.3-2.57	86.2	11.5	1.38	15.87
1406 x 2016	13.5-1.36 x 14.6-2.63	81.7	10.6	1.52	16.11

Prot. Range = 10.6 - 18.2
Lys. Range = 0.85 - 1.80

Table 13 (continued) 1966 Lafayette, Indiana

8 Single Crosses

2 Reps

Cross Hyderabad No.'s)	% Prot. - % Lys. of Parents Respectively	Relative Yield Gm./Hd.	% Prot.	Lys. as % of Prot.	Prot. X Lys.
M.S. Redlan x 2343	14.7-1.47 x 13.2-2.14	62.3	14.2	1.05	14.91
0692 x 2016	15.1-1.96 x 14.6-2.63	33.7	13.9	1.07	14.87
2451 x 2066	12.3-2.57 x 12.5-2.48	57.9	13.4	1.35	18.09
4608 x 1102	12.6-1.74 x 13.9-1.42	77.0	13.2	0.77	10.16
2016 x 3041	14.6-2.63 x 10.9-2.66	92.7	12.8	0.96	12.29
M.S. Redlan x 5228	14.7-1.47 x 14.2-2.00	67.1	12.7	1.43	18.16
1406 x 1420	13.5-1.36 x 10.9-1.89	54.1	12.6	1.03	12.98
M.S. Redlan x 1884	14.7-1.47 x 9.6-2.70	81.9	10.2	1.57	16.01

Prot. Range = 10.2 - 14.2
Lys. Range = 0.77 - 1.57

21 Single Crosses

1 Rep

2016 x 5206	14.6-2.63 x 12.6-1.42	23.0	16.9	1.52	25.69
1406 x 0692	13.5-1.36 x 15.1-1.96	10.6	14.9	1.79	26.67
1102 x 0692	13.9-1.42 x 15.1-1.96	38.7	14.8	2.01	29.75
M.S. Redlan x 2481	14.7-1.47 x 14.2-2.42	124.7	14.3	1.75	25.03
2066 x 5206	12.5-2.48 x 12.6-1.42	35.6	13.9	1.53	21.27
1420 x 6269	10.9-1.89 x 14.2-1.31	38.6	13.9	1.05	14.60
2016 x 6269	14.6-2.63 x 14.2-1.31	30.4	13.8	2.09	28.84
6269 x 0692	14.2-1.31 x 15.1-1.96	34.7	13.8	0.82	11.32
2451 x 0692	12.3-2.57 x 15.1-1.96	35.2	13.7	1.36	18.63
2016 x 2451	14.6-2.63 x 12.3-2.57	54.7	13.2	0.83	10.96
1102 x 2016	13.9-1.42 x 14.6-2.63	79.7	12.8	1.78	22.78
1420 x 5206	10.9-1.89 x 12.6-1.42	39.7	12.8	0.53	6.78
1102 x 6269	13.9-1.42 x 14.2-1.31	53.8	12.7	1.75	22.23
6269 x 1406	14.2-1.31 x 13.5-1.36	40.0	12.6	0.98	12.35
1420 x 2451	10.9-1.89 x 12.3-2.57	54.5	12.4	1.23	15.25

Table 13 (continued) 1966 Lafayette, Indiana

21 Single Crosses

1 Rep (Cont.)

Cross (Hyderabad No.'s)	% Prot. - % Lys. of Parents Respectively	Relative Yield Gm./Hd.	% Prot.	Lys. as % of Prot.	Prot. X Lys.
2451 x 6269	12.3-2.57 x 14.2-1.31	37.0	12.4	0.73	9.05
1420 x 1102	10.9-1.89 x 13.9-1.42	64.4	12.2	1.23	15.01
2066 x 1420	12.5-2.48 x 10.9-1.89	36.7	12.1	1.59	19.24
1420 x 2016	10.9-1.89 x 14.6-2.63	75.5	11.8	1.72	20.30
4608 x 2451	12.6-1.74 x 12.3-2.57	62.7	11.8	0.97	11.45
2451 x 1102	12.3-2.57 x 13.9-1.42	67.5	11.3	1.46	16.50

Prot. Range = 11.3 - 16.9
Lys. Range = 0.53 - 2.09

Range Over All Single Crosses:

M.S. Redlan x 1884 M.S. Redlan x 1177

Prot. = 10.2 - 18.2
Lys. = 0.53 - 2.09

1420 x 5206 2016 x 6269

Table 14. 1966 SORGHUM INCREASES - PURDUE UNIVERSITY

Hyderabad Number	% Protein	Plot (10' long) Yield (gms)	Amount (X) seed (lbs)	Amount OP seed (lbs)	Heading Date	Number of leaves	Lodging	Seed Color	Glume Color	Height	Head Type
0031	13.25	964	5.6	5	9-2	16	1	white	tan	8'	V Tight
0305-1	13.03	415	1.4	43	8-28	16	1	white 10% Red 90%	red	4'	Med
0317	12.44	957	5.6	96	8-28	18	1	Red	red	5'	Med
0361	18.09	265	0.8	11	9-4	16	1	Red	red	9'	loose
0786	14.41	1479	9.2	91	7-22	10	6	white	Black	6'	loose
0819	16.25	1537	5.4	200	8-21	14	7	white	red	7'	tight
0923	12.38	2247	11.4	61	7-31	12	1	white	red	5'	med
0947	13.22	1823	9.0	92	8-30	16	3	yellow	-	7.5'	med
1150	10.75	2575	13.4	206	8-1	12	5	white	red	7'	med
1358	13.88	449	2.2	6	9-3	16	3	V white		7'	loose
1385	14.53	508	4.0	71	7-17	8	3	white	L purple	7'	loose
1406	11.94	1570	7.6	219	8-04	10	9	brown	red	7'	loose
1457	10.88	1899	8.4	125	8-17	14	1	lt brown	red	7.5'	med
1727	14.50	1472	3.8	56	8-1	10	1	yellow	red	6'	L. open
1814 (Grassy)	13.38	720	0.6	21	7-12	10	1	drk brown	drk brown	5'	V open
1884	10.84	1887	8.4	305	8-10	14	1	yellow	red	6'	L open
2310	12.41	713	3.2	88	8-6	8	4	white	purple	8'	L open
2481	13.34	2374	8.2	234	7-30	9	8	yellow	red	6'	loose
2486	14.84	1521 (low pop)	6.0	66	7-29	8	1	V large yellow	-	3'	compact
5075	13.31	748	1.8	75	8-28	12	9	red shiney	red shiney	9'	L open
5126	15.53	1176	4.8	36	8-1	10	1	yellow	tan	4'	loose
5217	13.16	1188	3.8	35	7-29	10	1	white red	drk red	6'	med
5244	14.28	1019	10.8	76	8-25	14	2	tan	tan	8'	med
5342	11.00	1471	6.6	69	8-24	12	5	very mixed		5-8'	med
5356	-	-	4.8	7	8-28	16	broken at top node	white	tan	8'	med
5456	14.78	-	0	0	9-6	18	1	white	red	8'	med

Table 15. 1967 SORGHUM INCREASES

AT PURDUE UNIVERSITY

Line No.	% Protein		% Lysine	Source of Seed	
5126	15.53			1966 Increase	(1 Acre)
0361	18.09	19.3	1.53	1966 Increase	
0819	16.25		1.45	1966 Increase	(1 Acre)
2486	14.84			1966 Increase	(1 Acre)
2190	16.0		1.80	640362	
0355	18.3		1.61	640503	
5187	14.6		1.34	640369	
2478	14.7		1.99	640343	
2197	16.6		1.87	640345	
0026	15.3		2.22	640403	
0464	17.3		1.88	640259	
3237	16.2		1.15	640275	
0793	14.8		1.62	640589	
2489	15.7		1.83	640451	
1888	16.5		2.00	640462	
2941	16.19		1.01	640249	
3071	15.41	16.5	0.80	640277	
2949	16.69	18.80	1.13	640289	
3403	16.72	16.5	1.03	640297	
5147	15.44	16.2	0.88	640301	
1840	15.19	17.3	0.96	640448	
0974	14.91	18.0	0.80	640477	

Table 16.

1966 SORGHUM FEEDING TRIAL - RATS
Department of Nutrition, Harvard University
Dr. D. M. Hegsted

	Hyd. No.	% Protein	BASED ON WEIGHT GAIN Potency %	Error	Limits	BASED ON BODY NITROGEN Potency %	Error	Limits	Net Available Protein %
Lactalbumin			100.0			100.0			
540589	1150	9.80	33.3	± 2.8	27.7-38.8	15.2	± 2.8	9.8-20.7	1.49
540720	0051	9.30	33.2	± 3.2	26.9-39.6	23.4	± 3.2	17.2-29.5	2.18
540630	2451	10.37	37.8	± 5.0	28.0-47.5	30.8	± 4.8	21.4-40.2	3.19
540813	0786	12.80	27.3	± 2.0	23.5-31.2	19.9	± 1.9	16.2-23.7	2.55
540885	0947	12.37	31.7	± 2.1	27.6-35.8	24.4	± 2.0	20.4-28.4	3.02
540710	5206				Estimated Potency - 45%				
540600	1457				Estimated Potency - 17%				
541005	2833								
541014	1314				Estimated Potency - 30%				
540728	5244								