AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

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Batch #24

1. SUBJECT CLASSIFICATION

A. PRIMARY: Serials — Y-AF30-0170-0000

B. SECONDARY: Agriculture--Plant breeding--Cereals--Sorghum

2. TITLE AND SUBTITLE

Inheritance and improvement of protein quality and content in Sorghum vulgare Pers.; semi-annual report,July-Dec.1967

3. AUTHOR(S)

(101) Purdue Univ. Dept.of Agronomy

4. DOCUMENT DATE: 1968

5. NUMBER OF PAGES: 23p.

6. ARC NUMBER: ARC 633.174.P985

7. REFERENCE ORGANIZATION NAME AND ADDRESS

Purdue

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

(Research summary)

9. ABSTRACT

10. CONTROL NUMBER

PN-RAB-394

11. PRICE OF DOCUMENT

12. DESCRIPTORS

Proteins
Sorghum

13. PROJECT NUMBER

14. CONTRACT NUMBER

CSD-1175 Res.

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

Inheritance and Improvement of Protein Quality and Content in *Sorghum vulgare* Pers.

Semi-Annual Report No. 3
For Period
July 1, 1967 to December 31, 1967

Prepared by
R. C. Pickett

Contract No. 1175
U.S. Agency for International Development
Department of State
with
Purdue Research Foundation
Lafayette, Indiana

January 15, 1968

Not For Publication

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

Report for Period July 1, 1967 to December 31, 1967

High protein lines will be quickly accepted and used if they are also superior in yield. Thus much of the 1967 Purdue Sorghum nursery was devoted to yield trials on high protein selections and their hybrids. Also, trials were set up with known high yielding hybrids to study protein content and quality.

On the basis of height of the male parents 337 single crosses were separated into four groups (Tables 1, 2, 3, 4). RS 610 was the check (control) hybrid. The driest June and July on record contributed to the low yield of RS 610 which produced 64-76 bu./A. In normal years this yield has been around 140 bu./A. Under the same adverse conditions 51 single crosses doubled or more the RS 610 yield with best crosses producing 169, 221, 209 and 189 bu./A. Protein and lysine determinations are in progress on these crosses.

Another trial, which tested the effects of pollinating bags and flag leaf removal involved 2 inbreds, 2 hybrids from them, and RS 610 as a check. The bagging and flag leaf removal are normal controlled pollination procedures and the effects of each are significant in their reduction of yield though they had little effect on protein percent (Table 5). The drastic yield reduction of the combination of bagging and flag leaf removal on the highest yielding cross suggests that some genotypes may be reduced much more than others. Bagging had a greater effect than flag leaf removal. The protein per acre was 107% on Redlan x C819 compared to 59% for check RS 610. Yields could be doubled for certain crosses in good years and the protein percentage could be increased 50% or more which poses an immediate, and seemingly achievable, objective of well over 3000 lbs. protein per acre (in the grain only).

A third trial, involving 30 parents crossed onto 4 male-steriles, was studied by A. O. Abifarin for protein content of the F_1 seed. (Table 6). The material effect is most striking with Martin crosses having the highest protein in the F_1 seed itself. Seed from the F_1 plants will be grown and tested in 1968.

Protein analyses of sorghum parents and reciprocal F_1 seed in F. C. Collins' thesis crosses are shown in Table 7. The maternal effect is also suggested in this data though many striking exceptions occur and increases can take place over either parent. Rarely does the F_1 seed fall very far below the high parent.

Yield and protein tests were made at three locations in 1967 on 10 parents being used by Collins for a diallel cross as part of a thesis problem (Table 8 and 9). The combined analysis of variance for yield showed there were significant differences among the 10 parents. Some of the inbred parents yielded more than the check hybrid RS 610 at the two best locations but not on the lowest yielding site. There was a significant variety x location interaction. Protein was significantly different among varieties at each location but did not change as much as yield among locations. Further studies will be made on the effect of location on the quality of the protein.

Variations of protein content among selections of line C819 were studied (Table 10). Selections made in 1966 had protein varying from 12.47% to 16.75%. Open pollinated seed progeny grown in 1967 varied only 13.34 to 14.01. This indicates that open pollinated seed samples have less variation and that adequate sampling of this seed will give a less variable, repeatable reading.

Yields of several high yielding single crosses grown in 1966, together with the performance data of the male parents in 1967, are shown in Table 11. The yields of the inbred lines themselves were very good with four of them producing up to 7591 #/A. and the check hybrid RS 610 which had 6306 #/A. The best four inbreds had top F_1 - 1966 yields of 16,038, 10,769, 14,273, and 13,794 #/A. respectively. Another lower yielding parent had even better F_1 yields of 17,606 #/A. Critical yield and protein trials on the hybrids, in comparison with the parents, will be done in 1968. The head size data show that the highest yielding parents have the largest heads.

Amino acid analyses from July 1 to December 31, 1967 showed several new introductions have good protein - lysine combinations (Table 12). The other critical amino acids often seem to be favorably associated with higher lysine.

Miss Olivia A. Veron, Post-doctoral Research Associate in Biochemistry has been working with Prof. E. T. Mertz on factionation and the nature of the endosperm proteins in sorghum. In preliminary tests, three selections were studied, Hyderbad Nos. C819, 1884 and RS 610 (Table 13). The endosperms were separated by manual dissection after soaking the whole seeds in water. The endosperms were ground and defatted with petroleum ether. The defatted samples were ground to very fine powders in a small ball mill.

The endosperm powders were fractionated using the Osborne method as modified by Mosse (Federation Proc. 25-1663-1669 (1966), and the copper fractionation method of Mertz, Lloyd and Bressani (Cereal Chem. 35 1460155 (1958) as modified by Bates (Bates, L. S., M. S. Thesis, Purdue University, 1966)

Table 13 summarizes the per cent of total nitrogen extracted and the per cent of extracted nitrogen found in various protein fractions. The Osborne method extracts only 1/2 to 2/3 of the nitrogen extracted by the Copper method, with a very poor recovery of the alkali-soluble (glutelin) fraction. The soluble protein fractions recovered from the endosperm of Hyd. RS 610 were analyzed for lysine, threonine and other amino acids on the Spinco amino acid analyzer. The fractions resemble those from corn endosperm except the lysine level in the alkali-soluble fraction was only about 1/3 of that found in normal corn and the threonine in the alcohol-soluble fraction was about 2/3 of that found in corn. Copper fractions from a wide range of endosperms will now be examined for protein and amino acid composition.

Table 1

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group I-

Purdue Selections (short male parents)

Mean of 3 replications - Bushel = 56 lbs.

Parents		F_1 yield
Female	Male	Bu/acre
Redlan MS	x 640351	90.8
Redlan MS	x 640216	100.1
CK60 MS	x 0317	96.9
Wheatland MS	x 0317	132.7
Martin MS	x 0317	148.3
Redlan MS	x 0317	115.0
Redlan MS	x 640386	138.8
Wheatland MS	x 640240	164.1
Wheatland MS	x 640583	158.6
Redlan MS	x 640352	71.5
Wheatland MS	x 640352	88.3
Redlan MS	x 640357	75.5
Redlan MS	x 640579	113.5
Martin MS	x 640231	118.7
Wheatland MS	x 640329	81.0
Redlan MS	x 640322	98.9
Redlan MS	x 640331	103.4
Redlan MS	x 640323	155.1
Redlan MS	x 66042	63.5
Martin MS	x 640221	116.4
Redlan MS	x 640221	92.7
Redlan MS	x 640327	168.5
Wheatland MS	x 640462	137.1
Redlan MS	x 640417	98.0
Martin MS	x 640235	66.4
Martin MS	x 640218	117.4
Redlan MS	x 640356	99.5
Martin MS	x 640240	104.7
Martin MS	x 640248	83.7
Wheatland MS	x 640488	51.8
Redlan MS	x 640234	127.6
Redlan MS	x 640240	163.1
RS610 (hybrid check)		76.0
Martin MS	x 66038	74.3
Wheatland MS	x 66042	109.8
MS	x 66015	116.1
MS	x 66014 Mixed	139.3
Redlan MS	x 640355	91.2
Redlan MS	x 640601	46.8
Wheatland MS	x 66045	98.7

Table 1 (continued)

1967 LAFAYETTE, INDIANA
Sorghum Single Cross Performance - Group I -
Purdue Selections (short male parents)
Mean of 3 replications - Bushel = 56 lbs.

Parents		F_1 yield
Female	Male	Bu/acre
Redlan MS	x 64045	150.8
Martin MS	x 66045	102.4
Redlan MS	x 66045	127.8
CK60 MS	x 66045	93.7
Redlan MS	x 66033	138.3
Redlan MS	x 640453	94.2
Redlan MS	x 640452	79.0
Martin MS	x 640322	99.2
Wheatland MS	x 640424	79.1
Martin MS	x 640237	140.4

Table 2

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group II

Purdue Selections (intermediate-shorter males)

Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 yield
Female	Male	Bu/acre
CK60 MS x	1727	115.3
Redlan MS x	66047	108.8
Redlan MS x	1727	119.7
Martin MS x	1727	161.1
MS x	66037 Mixed	107.7
Martin MS x	66030	90.0
CK60 MS x	66045	107.7
Redlan MS x	66042	96.6
Wheatland MS x	66038	68.9
CK60 MS x	66038	65.5
MS x	66029	96.3
Redlan MS x	66030	111.7
CK60 MS x	66030	116.0
Wheatland MS x	66030	132.2
Wheatland MS x	66042	88.8
Wheatland MS x	66033	107.0
Wheatland MS x	66021	148.7
Redlan MS x	66021	142.7
Redlan MS x	640241-F	134.9
Martin MS x	66038	57.5
Martin MS x	640219	70.0
Redlan MS x	640212	209.0
Martin MS x	640212	151.9
Redlan MS x	640599	125.7
Redlan MS x	640559	159.0
Wheatland MS x	640211	121.2
Redlan MS x	640227	180.5
Wheatland MS x	640456	126.4
Wheatland MS x	640444	132.8
Martin MS x	640241	181.3
Martin MS x	640211	125.4
Martin MS x	640242	140.5
Redlan MS x	640224	142.7
RS610 (hybrid check)		79.70
Redlan MS x	640438	141.0
Wheatland MS x	640441	146.5
Redlan MS x	640561	201.0
Wheatland MS x	640222	76.6
Redlan MS x	640496	113.0
Redlan MS x	640550	188.5

Table 2 (continued)

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group II

Purdue Selections (imtermediate-shorter males)

Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 yield
Female	Male	Bu/acre
Wheatland MS x	640389	113.7
Redlan MS x	640523	220.8
Redlan MS x	66011	168.4
Wheatland MS x	66004	112.6
Wheatland MS x	640220	113.5
Redlan MS x	640244	141.0
Wheatland MS x	640305	153.0
Redlan MS x	640370	124.2
Redlan MS x	640361	114.3
Redlan MS x	66004	127.0
Martin MS x	66004	106.2
CK60 MS x	66004	96.4
Redlan MS x	66018	136.5
Redlan MS x	640466	118.8
Redlan MS x	640383	157.2
RS 610		57.8
Martin MS x	640247	142.9
Redlan MS x	640243	160.4
CK60 MS x	66033	97.8
Redlan MS x	640334	92.5
Redlan MS x	640291	97.1
Redlan MS x	640366	99.8
Redlan MS x	640382	132.7
Redlan MS x	640250	119.3
Redlan MS x	640581	112.3
Wheatland MS x	640600	106.8
Wheatland MS x	640599	155.9
Redlan MS x	640586	102.9
CK60 MS x	66047	84.9
Redlan MS x	640529	107.1
Redlan MS x	640371	85.0
Redlan MS x	640457	59.3
Redlan MS x	640407	129.0
Redlan MS x	640435	55.7
Wheatland MS x	640301	49.9
Wheatland MS x	640361	125.2
Redlan MS x	640600	173.6
Redlan MS x	640220	102.7
Redlan MS x	640460	95.9
Redlan MS x	640527	112.5
Redlan MS x	640525	183.3
Martin MS x	640277	55.3
Redlan MS x	640277	67.9
Redlan MS x	640247	128.6
Redlan MS x	640222	[illegible]

Table 3

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group III

Purdue Selections (intermediate-taller males)

Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 Yield
Female	Male	Bu/acre
Martin MS x 66016		92.0
Redlan MS x 66031		162.2
Martin MS x 66031		89.0
Wheatland MS x 66031		114.1
CK60 MS x 66031		99.8
Redlan MS x 66040		143.3
Wheatland MS x 66040		113.7
CK60 MS x 66040		86.0
Martin MS x 66040		157.8
CK60 MS x 66041		102.7
Redlan MS x 66041		102.0
Martin MS x 66041		86.9
Redlan MS x 0947		168.8
Wheatland MS x 0947		95.9
CK60 MS x 0947		134.0
Martin MS x 66034		115.1
Wheatland MS x 3041		127.7
Redlan MS x 3041		106.8
CK60 MS x 3041		150.8
Martin MS x 3041		111.9
Redlan MS x 5244		125.2
CK60 MS x 5244		149.9
Martin MS x 5244		281.4
Redlan MS x 5456		87.5
Redlan MS x 640411		101.2
Redlan MS x 640238		134.5
RS 610		85.7
Wheatland MS x 66002		178.3
Redlan MS x 66002		153.6
Redlan MS x 66007		113.4
Martin MS x 66003		120.3
CK60 MS x 66003		105.0
Redlan MS x 66003		132.8
Wheatland MS x 66003		154.6
Martin MS x 66007		96.7
CK60 MS x 66007		95.3
Wheatland MS x 66007		90.7
Wheatland MS x 66008		122.9
CK60 MS x 66008		124.0
Martin MS x 66008		88.19

Table 3 (continued)

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group III

Purdue Selections (intermediate-taller males)

Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 yield
Female	Male	Bu/acre
Redlan MS	x 66008	105.9
CK60 MS	x 66010	99.6
Wheatland MS	x 66010	116.1
Redlan MS	x 66010	119.2
Martin MS	x 66010	84.8
Redlan MS	x 66016	81.0
Wheatland MS	x 66016	119.4
CK60 MS	x 66016	28.7
Wheatland MS	x 640320	64.7
Wheatland MS	x 640317	30.2
Redlan MS	x 640359	57.6
Redlan MS	x 640547	140.1
Wheatland MS	x 640346	68.4
Redlan MS	x 640278	72.6
Redlan MS	x 640317	115.4
Martin MS	x 640278	85.5
Redlan MS	x 640583	147.4
RS 610		49.2
Redlan MS	x 640230	134.1
Redlan MS	x 640217	132.2
Redlan MS	x 640413	81.6
Redlan MS	x 640344	92.3
Redlan MS	x 640422	109.3
Redlan MS	x 640306	116.0
Wheatland MS	x 640372	96.1
Wheatland MS	x 640509	115.6
Redlan MS	x 640214	149.7
Redlan MS	x 640567	137.4
Redlan MS	x 640308	83.4
Redlan MS	x 640398	129.0
Redlan MS	x 640538	143.1
Redlan MS	x 640591	120.2
Redlan MS	x 640409	155.0
Redlan MS	x 640336	88.0
Redlan MS	x 640207	97.6
Redlan MS	x 640597	94.8
Redlan MS	x 640367	96.6
Wheatland MS	x 640643	91.7
Redlan MS	x 640349	80.7
Redlan MS	x 640358	103.0

Table 3 (continued)

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group III
Purdue Selections (intermediate-taller males)
Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 yield
Female	Male	Bu/acre
Redlan MS x 640534		105.5
Redlan MS x 640566		128.1
Redlan MS x 640416		115.1
Wheatland MS x 640566		115.1
CK60 MS x 66039		108.9
Redlan MS x 640518		139.0
Redlan MS x 640375		164.1
RS 610		86.0
Redlan MS x 640279		102.8
Redlan MS x 640282		112.4
Wheatland MS x 640533		110.0
Wheatland MS x 640560		114.4
Redlan MS x 640464		77.2
Redlan MS x 640229		166.7
Redlan MS x 640374		99.2
Martin MS x 640016		110.7
Redlan MS x 640590		208.6
Redlan MS x 640232		135.3
Wheatland MS x 640584		114.6
Wheatland MS x 640495		159.7
Redlan MS x 640533		97.9
Redlan MS x 640245		118.8
Wheatland MS x 640522		145.7
Redlan MS x 640316		100.3
Redlan MS x 640575		181.8
Redlan MS x 640215		97.7
Redlan MS x 640524		110.5
Redlan MS x 640522		130.9
Redlan MS x 640535		102.3
Wheatland MS x 640584		204.9
Wheatland MS x 640524		136.8
Redlan MS x 640348		91.0
Redlan MS x 640531		124.7
Redlan MS x 640528		114.7
Redlan MS x 640350		83.7
Redlan MS x 640483		79.8
Redlan MS x 640643		108.0
RS 610		61.7
CK60 MS x 66002		149.6
Redlan MS x 640233		105.0
Redlan MS x 640328		93.6
Wheatland MS x 640304		77.5

Table 4

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group IV

Purdue Selections (Tallest male parents)

Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 yield
Female	Male	Bu/acre
Wheatland MS x	66006	96.1
CK60 MS x	66006	95.8
Redlan MS x	66020	78.4
Wheatland MS x	66020	74.2
Martin MS x	66020	74.7
Martin MS x	66009	97.2
CK60 MS x	66009	105.9
Redlan MS x	66009	136.6
Wheatlard MS x	66024	123.0
Redlan MS x	66024	126.1
CK60 MS x	66024	104.3
Redlan MS x	66025	91.0
Wheatland MS x	66025	123.0
CK60 MS x	66025	100.6
Martin MS x	66025	108.7
Martin MS x	66028	135.2
CK60 MS x	66028	127.6
Wheatland MS x	66028	117.5
Redlan MS x	66028	118.7
Martin MS x	0361	103.3
Redlan MS x	0361	69.1
Redlan MS x	66044	118.9
CK60 MS x	66044	100.6
Wheatland MS x	66044	77.2
Martin MS x	66044	92.4
Wheatland MS x	640483	89.5
Redlan MS x	640294	104.2
RS 610		64.5
Redlan MS x	640378	112.7
Redlan MS x	66018	81.8
Redlan MS x	640562	155.0
Redlan MS x	640364	120.6
Redlan MS x	640553	85.9
Redlan MS x	640595	131.5
Martin MS x	640039	102.6
Redlan MS x	640373	126.1
Martin MS x	640273	99.5
Redlan MS x	640542	107.0
Wheatland MS x	640254	51.1
Redlan MS x	640253	142.4

Table 4 (continued)

1967 LAFAYETTE, INDIANA

Sorghum Single Cross Performance - Group IV

Purdue Selections (tallest male parents)

Mean of 3 replications - Bushel = 56 lbs.

Parent		F_1 yield
Female	Male	Bu/acre
Redlan MS x 640556		78.5
Martin MS x 640233		107.4
Martin MS x 640263		95.2
Wheatland MS x 640432		106.4
Redlan MS x 640540		142.4
Martin MS x 66006		80.1
Redlan MS x 66006		111.9
Redlan MS x 640626		141.5
Redlan MS x 640616		39.2
Redlan MS x 640603		125.1
Redlan MS x 640609		112.0
Redlan MS x 640640		53.1
Redlan MS x 640635		102.1
Martin MS x 66005		189.2
Wheatland MS x 66005		154.7
Redlan MS x 66005		125.5
CK60 MS x 66005		108.7
RS 610		62.6
Wheatland MS x 640255		122.7
Wheatland MS x 66041		54.4
Redlan MS x 640260		54.7
Martin MS x 640236		45.5
Redlan MS x 640261		88.6
Martin MS x 66041		62.4
Redlan MS x 66041		95.3
CK60 MS x 66018		139.0
Redlan MS x 640549		127.2
Wheatland MS x 640499		102.0
Martin MS x 640311		94.6
Wheatland MS x 66035		97.1
CK60 MS x 66035		81.1
Redlan MS x 640270		129.4
Wheatland MS x 66009		157.8
Martin MS x 66018		37.8

Table 5

1967 LAFAYETTE, INDIANA

Effects of Pollinating Bags and Flag Leaf Removal
(Normal Pollinating Procedure) on Yield and Protein of
Selected Sorghum Inbreds and Hybrids
Means of Four Replications

Genotype	Treat-ment	% Protein	Yield * #/A	Protein #/A
RS610	1	11.88	4990	592.8
	2	11.96	4284	512.4
	3	12.93	3651	472.1
	4	13.19	3926	517.8
1884	1	10.55	5785	610.3
	2	10.13	6031	610.9
	3	10.57	4760	503.1
	4	9.91	4558	451.7
Redlan x 1884	1	9.99	8238	823.0
	2	9.85	7063	784.4
	3	10.57	6283	664.1
	4	11.23	5359	601.8
0819	1	14.42	5897	850.4
	2	14.07	4710	662.7
	3	14.90	4250	633.3
	4	14.58	4021	586.3
Redlan x 0819	1	12.14	8887	1078.9
	2	12.24	7918	969.2
	3	12.28	8266	1015.1
	4	12.47	4710	587.3

Treatment		Treatment Means		
Check-no treatment	1	11.80	6759	797.6
Flag leaf removed	2	11.65	6182	720.2
Head Bagged	3	12.25	5438	666.2
Head Bagged and Flag leaf removed	4	12.28	4514	554.3

* Genotypic and treatment differences are highly significant for both protein and yield.

Table 6

1967 LAFAYETTE, INDIANA

Protein and Lysin Content of Single Cross Seed of 30 Sorghum Parents Crossed to 4 Male-Steriles - Abifarin Thesis

Male Parents	1966 row no.	Female Parents							
		Protin	Lysine	Prot.	Lys.	Prot.	Lys.	Prot.	Lys.
SA 6126-4-1-1-2-1 DD	640330	18.1	1.55	17.1	1.06	14.0	1.08	16.6	1.25
Red Swagi Local	640214	13.6	1.44	15.3	1.25	14.9	1.09	16.0	1.32
Lyungu Cholam	640327	16.7	1.46	14.4	1.15	15.1	1.16	18.5	1.34
SA 1797 Gurno	640334	12.7	1.65	15.1	1.15	15.4	1.08	18.0	1.34
CJ 623 Spur feterita	640589	17.6	1.44	16.3	1.06	16.5	1.10	16.6	1.50
SH 79 Bonita	640223	12.5	1.61	13.6	1.27	14.7	1.12	17.2	1.50
Hegari 6645-11-1-1-2	640231	15.1	1.25	16.5	1.20	14.4	1.07	16.7	1.50
DD Wh. Heg. SA6645-4	640221	15.5	1.34	17.0	1.16	16.1	1.02	17.6	1.43
280 Geterita Gondaly	640219	14.9	1.32	15.8	1.00	16.7	0.87	17.0	1.44
Matindi Grey 99	640581	15.0	1.33	17.4	0.83	15.9	0.63	17.6	1.45
137 Bargawi	640573	16.1	1.34	13.9	1.06	14.2	1.51	16.6	1.33
(Hybrid)!	640746	13.0	1.37	16.6	1.14	13.4	1.72	16.5	1.26
178 Abu Kudar	640586	15.3	1.34	15.5	1.16	15.1	1.60	21.6	1.14
EC 21496 Z8	640227	13.6	1.51	16.4	1.22	16.0	1.82	16.5	1.43
132 Wad Yabis	640600	15.9	1.51	15.6	1.15	15.8	1.58	15.6	1.37
SA 9 602-1 short DDSS Yek	640337	13.8	1.30	16.3	1.12	15.7	2.10	17.2	1.56
Unkonwn (ped.)	441428	13.9	1.05	16.6	1.00	16.1	1.55	16.5	1.49
SA 8026-2-5-2	640346	13.8	1.32	16.7	1.98	16.9	1.73	17.5	1.35
6351 (541641)	640485	14.6	1.30	14.8	0.88	14.8	1.64	16.1	1.31
SA 8026-1-24-M-2	640345	13.0	1.01	16.0	0.67	13.6	1.56	14.8	1.32
FC6606 Darso	44946	14.2	1.30	15.1	0.89	14.0	0.97	18.1	0.99
MSCK60 x 7871 (NEBR) F_7	61005	14.6	1.23	16.6	0.98	16.0	1.35	16.5	1.22
MSCK60 x Plainsman F_7	61006	14.7	1.48	14.6	1.27	17.0	1.36	16.2	1.06
MSCK60 x H7910 F_7	61021	13.5	1.34	14.7	1.04	14.9	1.56	17.4	1.20
20212 x H7922 F_7	61028	14.9	1.37	17.2	0.96	15.0	1.46	16.5	1.13
7763-3/55H x 1308 F_7	61059	13.5	1.23	14.6	0.98	15.0	1.57	15.1	1.22
710550P(Ind. Expt. 3) F_7	61061	15.5	1.21	16.8	0.83	15.7	1.57	15.8	1.35
Man I 2 S F_7	61064	16.5	1.18	15.6	0.76	15.7	1.42	16.2	1.11
77230P (CE6042) F_7	61071	16.1	1.05	14.1	0.74	13.7	1.40	16.3	1.21
SA 7078 S_2	61067	13.4	0.92	15.4	0.60	15.0	1.46	17.2	0.77

Table 7

1967 LAFAYETTE, INDIANA

Protein Analysis of Sorghum Parents and F_1 seed in Collins Thesis

(Seed from F_1's to be obtained in 1968)

Male Parents	% Crude Protein (N x 6.25) Female Parents								
	0355	0793	0819	1884	5187	MRT	CK60	Wht	Rdl
0355	17.25	14.25	19.47	13.97	16.13	17.19	16.41	15.53	16.78
0793	17.59	13.66	17.44	13.50	14.84	14.69	12.47	11.50	13.59
0819	17.66	15.19	13.81	14.34	13.28	17.09	14.69	15.22	14.03
1884	16.63	13.50	16.53	9.38	14.50	15.44	12.84	14.25	13.72
5187	16.50	14.88	16.13	13.47	12.06	14.56	11.88	13.28	13.34
Martin	17.00	13.59	18.19	13.13	14.72	12.97	12.06	14.66	12.91
CK60	16.59	14.78	20.16	13.16	13.63	14.56	11.00	14.91	13.16
Wheatland	16.34	14.09	17.34	13.53	16.09	15.31	12.78	13.34	13.06
Redlan	16.88	14.75	15.38	13.00	13.81	15.63	11.94	16.66	10.31

Table 8

1967 LAFAYETTE, INDIANA

Protein Diallel - Parents

Means From All Locations - 4 Replications

Yield

Entry	Bushel per acre		
	Location		
	Lafayette Nursery	High Fertility 1/	Sand Farm
0026	105.2	96.6	43.6
0355	59.0	47.9	17.3
0793	110.5	107.6	48.6
0819	107.5	72.9	44.3
1884	100.7	69.0	45.7
5187	71.5	52.6	55.0
MRTB	75.4	75.8	62.5
CK60 B	84.9	68.9	67.6
Wht B	94.5	85.2	65.1
Rdl B	100.2	98.7	75.6
RS 610	102.3	93.3	84.9
C. V.	9.7%	13.7%	12.8%

1/ Late planted and droughty.

Combined Analysis of Variance

Source	df	MS
Locations	3	33,303,695.0**
Reps. within Locat.	12	498.940.6**
Variety	10	3,711,734.3**
Var. X Locat.	30	754,050.1**
Error	120	109,733.5

Table 9

1967 LAFAYETTE, INDIANA

Protein Diallel Parents (Inbreds)

Protein Percent Analyses

Means From 4 Replications

Entry	Lafayette Nursery	High Fertility	Sand Farm
0026	15.70	14.45	14.27
0355	18.60	18.83	16.42
0793	15.33	14.98	14.01
0819	14.63	15.15	13.40
1884	11.25	11.13	11.39
5187	12.10	11.98	10.17
Martin B	15.13	14.48	12.07
CK60 B	11.73	11.73	9.56
Wheatland B	13.15	12.38	11.12
Redlan B	12.75	12.10	10.21
RS610 (Hybrid Check)	12.58	11.98	10.51
LSD .01	0.77	0.78	1.64
C. V.	2.83	2.97	6.96

Analysis of Variance over 3 Locations

Protein Analysis

Source	df	MS
Total	131	-
Locations	2	40.1850**
Replication within	9	0.6156 h.s.
Variety	10	56.2300**
V X L	20	1.1435**
Error	90	0.3399

Table 10

1967 LAFAYETTE, INDIANA

Protein Variability in a Sorghum Line

Performance of 7 selections of line 0819

Line	% Protein of parent-self	% Protein of Open-Pollinated Seed			
		I	II	III	IV
0819-1	16.75	14.03	13.94	14.28	13.78
0819-2	16.09	14.03	13.25	13.38	13.28
0819-3	13.53	13.81	14.06	13.06	13.72
0819-4	14.88	13.94	13.84	13.41	13.34
0819-5	15.94	13.97	13.88	13.91	13.47
0819-6	14.22	13.91	-	13.63	13.53
0819-7	12.47	13.50	13.53	13.00	13.34

Table 11a

Co[illegible] Trials - Lafayette, Indiana

Populations - Thinned to 120,000 Plants per acre

Abifarin Thesis - Inbred Selection

1967 Performance Characteristics

Entries	Seedling vigor score 1/	Leaf shading score	WA/Hd	Days to 50% blooming	Height in cms.	Head 3/ Size	Head 3/ Type	Yields lbs/ Acre.	% Protein	Lysine as % of Prot.
RS 610(Hybrid check)	1	2	72.4	82	108	M	L	6,306	12.8	1.35
Red Swazi local	3	2	51.7	92	133	M	L	6,834	11.0	1.49
Lyungu Chalan	4	2	80.1	96	135	M	L	7,591	11.5	0.80
SA1797 Gurno	3	3	39.2	94	147	M	L	4,311	13.8	1.16
CJ 623 Spur Feterita	3	2	39.9	93	167	L	C	5,527	15.0	1.00
SH 79 Bonita	3	2	42.2	88	120	S	C	6,100	12.2	0.78
Hegari 6645-11-1-1-2	3	2	43.9	82	88	S	L	4,678	13.4	1.23
DD WhHeg.SA6645-4	4	3	41.8	86	84	M	L	3,623	12.0	1.21
Mavindi Grey 99	4	2	35.5	120	151	L	L	2,110	11.8	2.0
137 Bargawi	3	1	57.6	110	165	M	L	5,848	12.6	1.47
178 Abu Kudar	3	2	88.6	108	157	M	L	6,994	12.8	1.27
EC 21496 Z8	2	3	53.8	99	140	M	C	6,926	13.1	1.36
SA 9602-1 Short DDSSYek	2	2	38.7	93	120	L	V.L	5,343	11.6	1.60
SA 8026-2-5-2	4	3	36.6	86	123	V.L	V.L	4,197	13.5	1.19
CK60 x 7871 (Nebr.) F_7	2	3	42.9	87	100	M	L	4,472	14.1	1.06
CK60 x Plainsman F_7	3	2	41.3	87	98	M	L	4,472	14.7	1.15
CK60 x H7910 F_7	2	3	56.7	90	110	M	L	5,527	13.7	1.20
Man I 2S F_7	3	3	52.5	90	95	M	L	4,839	12.6	1.20
7723 OPCE6042 F_7	2	2	58.8	88	92	M	L	5,395	13.8	1.28
SA 7078 S_2	2	2	50.2	61	85	M	L	4,587	13.8	1.28
SA 6126-4-1-1-2-1DD	5	3	77.2	109	108	L	C	3,578	11.8	1.58

Table 11a

Single Crosses

1966 Yields - Mean of 3 Reps. in lbs./acre

Entries	Female Parents			
	MS 399	MS 378	Martin	CK60
RS 610(Hybrid check)	13,794	-	-	-
Red Swazi local	16,038	-	-	-
Lyungu Chalan	9,841	-	-	-
SA1797 Curno	17,606	15,246	10,245	10,406
CJ 623 Spur Feterita	15,730	-	-	-
SH 79 Bonita	11,616	12,947	-	-
Hegari 6645-11-1-1-2	13,133	13,552	11,858	10,138
DD WhHeg. SA 6645-4	8,107	7,744	9,559	-
Matindi Grey 99	12,463	-	10,164	-
137 Bargawi	10,769	-	10,043	-
178 Abu Kudar	12,705	-	14,273	-
EC 21496 Z8	5,547	15,306	-	11,616
SA 9602-1 Short DDSS yek	7,623	-	6,534	-
SA 8026-2-5-2	-	-	13,673	-
CK60 x 7871(Nebr.) F_7	-	-	-	10,204
CK60 x Plainsman F_7	10,083	-	-	-
CK60 x H7910 F_7	9,599	9,519	-	-
Man I 28 F_7	9,196	-	-	11,568
7723 OPCE 6042 F_7	-	-	5,485	-
SA 7078 S_2	10,529	-	10,567	8,930
SA 6126-4-1-1-2-1 DD				

Table 1

PURDUE UNIVERSITY SORGHUM

Sample of Amino Acid Analyses Run from July 1 to Dec. 31, 1967

Including Extremes of Protein and Lysine

Sample No.	Source no. Is.	Source no. Hyd.	% Prot.	Amino Acids as % of Protein: Lys.	Threo.	Half Cys.	Meth.	Total A-A's	Isol.	Leu.	Isol. Leu. Ratio
199	2213	2048	10.84	2.84	3.40	.66	.81	1.47	4.00	11.98	.334
149	2446	0095	14.66	3.19	3.44	.83	1.20	2.03	3.64	9.95	.366
150	3569	0195	11.84	2.25	3.38	1.21	1.44	2.65	4.44	14.27	.311
151	8263	0268	12.75	3.00	3.14	.72	.90	1.62	3.71	10.56	.351
154	2685	0381	10.44	2.26	3.04	.99	1.17	2.16	3.90	12.59	.310
156	8093	0782	10.91	2.23	3.11	.87	1.30	2.17	3.98	12.70	.313
158	3573	2406	9.84	2.24	3.25	1.30	1.43	2.73	4.16	13.56	.307
166	3933	2486	12.50	2.27	3.27	1.26	1.75	3.01	4.41	14.04	.314
180	3485	5470	14.91	2.17	3.29	1.28	1.26	2.54	4.10	13.54	.303
188	3568	5270	10.84	2.22	3.26	1.50	1.04	2.54	4.55	14.07	.323
191	2486	0910	10.75	2.21	3.36	-	1.26	1.26	4.56	14.93	.305
196	8330	5155	9.81	2.28	3.35	1.25	.72	1.97	4.38	13.49	.325
High Protein - Intermediate Lysine											
192	0075	0793	19.50	1.90	3.16	-	.52	.52	4.47	14.93	.299
189	6911	5260	14.09	1.99	3.10	1.47	1.36	2.83	4.31	13.77	.313
145	8353	5177	17.47	1.73	2.91	.87	.69	1.56	3.87	13.03	.297
Low Lysine											
134	3762	1161	13.91	1.58	3.15	.97	1.04	2.01	4.25	15.19	.280
129	0916	1113	13.25	1.62	2.90	.99	.95	1.94	3.76	12.86	.292
161	6922	5279	13.84	1.59	3.11	1.12	1.21	2.33	4.27	15.02	.284
170	0339	1821	16.16	1.58	3.05	1.29	1.15	2.44	4.18	14.26	.293
174	1084	0464	16.66	1.46	3.13	1.41	1.58	2.99	4.12	14.68	.281
176	4748	3237	18.03	1.67	3.11	.83	1.35	2.18	4.43	15.28	.290
177	8336	5160	13.97	1.59	3.07	.68	1.23	1.91	4.31	14.99	.288
179	8298	5123	15.09	1.71	3.10	1.45	1.23	2.68	4.24	14.40	.294

Table 13

Protein Fractionation of Sorghum Endosperms

Method	Nitrogen Extracted (%)	Salt solution soluble (%)	70% Alcohol soluble (%)	Alkali soluble (%)
		Hyderabad 0819*		
Osborne	40	10	82	8
Copper	66	14	31	55
		Hyderabad 1884*		
Osborne	41	16	70	14
Copper	81	18	32	50
		Hyderabad RS 610* (Check)		
Osborne	49	10	75	15
Copper	92	12[a]	50[b]	38[c]

Hyd. 0819, Whole seed: 15.3% protein; 2.5% lysine (based on 16 gm. N)
Hyd. 1884, Whole seed: 10.84% protein: 2.7% lysine (based on 16 gm. N)
Hyd. RS 610, Whole seed: 12.1% protein; 1.9% lysine (based on 16 gm. N)

[a] Lysine content: 20% (based on 16 gm. N)

[b] Lysine content: 0.0% (based on 16 gm. N)

[c] Lysine content: 0.7% (based on 16 gm. N)