

Oklahoma Agricultural Experiment Station,

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DIGESTION EXPERIMENTS AND FODDER ANALYSES.

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DIGESTION EXPERIMENTS WITH STEERS.

PRACTICAL RESULTS.

1. *Kafir stover* contained as much digestible matter as average corn stover.
2. *Kafir fodder* contained 10 per cent. less digestible matter than average corn fodder.
3. *Kafir heads* contained one-third as much digestible matter as average corn-and-cob-meal.
4. *Kafir corn* fed in the heads was neither more nor less digestible than when fed after thrashing.
5. *Kafir corn* fed after soaking in water for twelve hours was less digestible than when fed dry.
6. *Kafir corn* fed dry contained 40 per cent. less digestible matter than coarsely ground Kafir meal.
7. *Kafir meal*, coarsely ground, contained 20 per cent. less digestible matter than average corn meal.
8. *It paid to Grind Kafir Corn*—One hundred pounds of Kafir meal contained as much digestible matter as one hundred and sixty-seven pounds of Kafir corn
9. *A gain of thirteen per cent.* in the amount of digestible matter was secured when Kafir fodder was thrashed, the grain ground and fed to steers along with the shredded stover from the fodder.
10. *A gain of less than two per cent.* in the amount of digestible matter was secured when Kafir fodder was thrashed, and the resulting Kafir corn fed to steers along with the shredded stover from the fodder.

NOTE.—This Bulletin gives full discussion of work summarized in Bulletin No. 35. It was ready for publication June 1, 1898. A legal controversy concerning printing for the Station caused delay in printing this and other bulletins.

INTRODUCTION.

The general trend of results of feeding trials with Kafir products is that it requires more Kafir than it does of Indian corn to produce a pound of live-weight. In an experiment with pigs at the Kansas Station (Bul. 53.) it was found that 5.15 lbs. red Kafir meal were required to produce a pound of gain while 4.38 lbs. corn meal gave the same result. In each case, the pigs were given all they would eat and while those fed Kafir meal gained 1.37 lbs per day, those fed on corn meal gained 1.7 lbs.

Another trial at the same station (Bul. 61) gave even more marked results in favor of corn meal, 3.96 lbs. of which gave a pound of gain against 6.21 lbs. of Kafir meal. The pigs fed corn meal made an average daily gain of 1.44 lbs. while those fed Kafir meal gained but one-half pound per day. An experiment in fattening heifers is also reported in the same bulletin. It is concluded "that red Kafir corn meal is not quite equal to corn meal for fattening cattle, though the difference in favor of corn is less marked than in the case of the hogs."

In another trial at the Kansas Station (Bul. 67) three lots of steers were fed corn meal, red Kafir meal, and white Kafir meal, respectively, making daily gains of 1.86 lbs., 1.71 lbs., and 1.78 lbs. per head. To produce a pound of gain in weight, it required 9.97 lbs. of corn meal, 10.86 lbs. red Kafir meal, or 10.41 lbs. white Kafir meal. The profit from the five steers fed corn meal was \$47.60; from the five fed red Kafir meal, \$44.98; from the five fed white Kafir meal, \$42.02. Hogs followed the steers during the experiment and made gains which bring the profit from the feeding of corn meal up to \$54.70; red Kafir meal to \$55.10; and white Kafir meal to \$53.23, "which practically places Kafir corn on the same basis as corn in regard to feeding value."

Practical feeding experiments have been conducted at this Station, the results of which will be published in a separate bulletin.

It will be seen from a study of the results of the experiments here reported that they explain and in turn are explained by the results of feeding experiments. The slightly lower digestibility of the different parts of the Kafir crop as usually fed, as compared with the corresponding parts of Indian corn accounts for the fact that larger amounts of Kafir are required to produce a pound of live-weight.

After a crop has been grown successfully and proved adapted to conditions which exist and must be met, a correct estimate of its value is most desirable. Chemical analyses alone will not furnish a basis for this estimate, but in connection with trials of the digestibility of the feeding stuff in question, will determine to a great extent the relative value which should be attached to a crop. With this purpose in view, the investigations reported in this bulletin have been carried out.

In view of the increasing importance of Kafir in this and similar regions, it is necessary that a definite system of nomenclature be used when speaking and writing of the crop. The following, based principally on current usage among farmers, has been used in this bulletin.

Kafir, the crop in general.

Kafir corn, thrashed grain.

Kafir heads, portion bearing grain.

Kafir fodder, whole plant above ground.

Kafir stover, Kafir fodder minus the heads or grain.

Kafir meal, ground Kafir corn.

A brief explanation of the terms used in this bulletin is also inserted for the convenience of those who are not thoroughly conversant with the subject. It is taken, for the most part, from Farmer's Bulletin No. 73, of the U. S. Department of Agriculture.

Water is contained in all foods and feeding stuffs. The amount varies from 8 to 15 pounds per 100 pounds of such dry materials as hay, straw, or grain, to 80 pounds in silage and 90 pounds in some roots.

Dry matter is the portion remaining after removing or excluding the water.

Ash is what is left when the combustible part of the feeding stuff is burned away. It consists chiefly of lime, magnesia, potash, soda, iron, chlorine, and carbonic, sulphuric, and phosphoric acids, and is used largely in making bones. Part of the ash constituents of the food is stored up in the animal's body; the rest is voided in the urine and manure.

Protein (nitrogenous matter) is the name of a group of substances containing nitrogen. Protein furnishes the materials for the lean flesh, blood, skin, muscles, tendons, nerves, hair, horns, wool, casein of milk, albumen of egg, etc., and is one of the most important constituents of feeding stuffs.

Albuminoids is the name given to one of the most important groups of substances classed together under the general term protein. The albumen of eggs is a type of the albuminoids.

Carbohydrates.—The nitrogen-free extract and fiber are usually classed together under the name of carbohydrates. The carbohydrates form the largest part of all vegetable foods. They are either stored up as fat or burned in the body to produce heat and energy. The most common and important carbohydrates are sugar and starch.

Fiber, sometimes called crude cellulose, is the frame work of plants, and is, as a rule, the most indigestible constituent of feeding stuffs. The coarse fodders, such as hay and straw, contain a much larger proportion of fiber than the grains, oil cakes, etc.

Nitrogen-free extract includes starch, sugar, gums, and the like, and forms an important part of all feeding stuffs, but especially of most grains.

Fat, or the materials dissolved from a feeding stuff by ether, is a substance of mixed character, and may include, besides real fats, wax, the green coloring matter of plants, etc. The fat of food is either stored up in the body as fat or burned, to furnish heat and energy.

Nutritive ratio is a term used to express the relation existing between the digestible protein and the digestible carbohydrates and fat. More protein is required for animals that are growing or producing milk than for animals doing work or being fattened.

In a digestion experiment, weighed quantities of feed are given to animals (usually steers or sheep) and the dung is collected and weighed. Both the feed and dung are analyzed and from these data, the per cent. of the food digested is determined.

It is not anticipated that the busy stockman will find the tables presented in this bulletin full of enlivening interest. In order that an experiment of this sort may have its full value for those who study so as to feed to the best advantage, it is necessary that the essential details of the experiment be published and this has been done. The feeder who does not care for these details will find the practical results summarized at the beginning of the bulletin.

DIGESTION EXPERIMENTS.

The usual methods were followed in the experiments here reported. The animals used were grade shorthorn steers past two years old. A and B had been fed Kafir in some form throughout the fall while C and D had been fed a ration containing cottonseed.

Mr. J. T. Clark of the senior class in college performed the work of feeding and sampling in a most efficient and satisfactory manner.

The duration of the digestion period in each case was seven days preceded by a preliminary feeding of seven days except in the trial with Kafir stover when A and B were fed five days and C and D twelve days before the digestion period.

The following table shows the extreme variation in live-weights of steers during digestion periods. Weights were taken daily throughout the experiment, and are stated in pounds.

STEER	A	B	C	D
Period I.....	753-765	633-648	560-588	686-695
Period II.....	753-762	644-661	580-600	682-701
Period III.....	756-765	638-651	589-604	693-702
Period IV.....	765-771	642-649	572-605	667-700
Period V.....	764-786	644-660	610-618	698-710
Period VI.....	772-779	651-661		

In the calculations of digestibility, all weights are in grams. 453.6 grams weigh one pound avoirdupois.

I. DIGESTIBILITY OF SHREDDED KAFIR STOVER.

It is the practice of farmers to some extent to thrash Kafir fodder, thereby removing the grain and effectually shredding the stover. The feed used in this trial was prepared in this manner.

Analyses of material as sampled.

No.	DESCRIPTION.	Water	Ash	Protein	Fiber	N-free Extract	Ether Extract
908.....	Kafir stover.....	21.10	7.15	3.95	27.58	38.93	1.29
925.....	Kafir stover.....	21.83	7.57	5.06	25.80	38.18	1.56
917.....	Rejected by A.....	30.10	6.33	3.45	26.25	33.20	0.67
918.....	Rejected by B.....	25.61	7.11	3.88	27.89	34.67	0.84
936.....	Rejected by C.....	31.16	11.61	3.99	20.61	31.76	0.87
937.....	Rejected by D.....	26.02	6.76	3.56	27.48	34.96	1.22
932.....	Dung, A.....	81.84	3.04	1.75	4.63	8.59	0.15
933.....	Dung, B.....	82.67	3.00	1.56	4.62	8.01	0.14
956.....	Dung, C.....	83.12	2.82	1.50	4.35	8.05	0.16
957.....	Dung, D.....	81.60	3.32	1.69	4.54	8.68	0.17

Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N-free Ex'tct	Ether Ex'tct
STEER A.						
Offered	27489	2576	1579	9341	13493	500
Rejected	1068	97	53	401	507	10
Eaten	26421	2479	1526	8940	12986	490
Excreted	10970	1839	1057	2798	5185	91
Digested	15451	640	469	6142	7801	399
Per cent. digested	58.5	25.8	30.7	68.7	60.1	81.4
STEER B.						
Offered	27489	2576	1579	9341	13493	500
Rejected	1555	149	81	583	724	18
Eaten	25934	2427	1498	8758	12769	482
Excreted	11012	1908	990	2937	5088	89
Digested	14922	519	508	821	7681	393
Per cent. digested	57.5	21.4	33.9	66.5	60.1	81.5
STEER C.						
Offered	27489	2576	1579	9341	13493	500
Rejected	1152	194	67	345	531	15
Eaten	26337	2382	1512	8996	12962	485
Excreted	12069	2014	1073	3110	5761	111
Digested	14268	368	439	5886	7201	375
Per cent. digested	54.2	15.4	29.0	65.4	55.6	77.1
STEER D.						
Offered	25918	2429	1488	8801	12728	472
Rejected	1423	130	68	528	674	23
Eaten	24495	2299	1420	8273	12054	449
Excreted	11056	1996	1018	2725	5214	103
Digested	13439	303	402	5548	6840	346
Per cent. digested	54.9	13.2	28.3	67.1	56.7	77.1
Average per cent. digested	56.3	19.0	30.5	67.0	58.2	79.3

II. DIGESTIBILITY OF WHITE KAFIR CORN.

Kafir stover, the digestibility of which was determined, was fed in connection with white Kafir corn which consisted of 29 per cent. of cracked and imperfect grains and 71 per cent. of perfect grains. In the calculations which follow, the individual digestion coefficients as determined were used for each animal (The variety designated as "white Kafir corn" in this bulletin is commonly called "black-hulled white Kafir").

Analyses of material as sampled.

No.	Description	Water	Ash	Protein	Fiber	N-free ex'ct.	Ether ex'ct.
954	Kafir stover	19.63	7.65	5.18	25.95	39.99	1.60
955	Kafir corn	13.29	1.13	11.03	1.58	70.23	2.74
952	Rejected by A	22.76	10.24	3.98	26.02	35.82	1.18
953	Rejected by B	27.81	9.65	4.23	24.08	33.12	1.11
974	Rejected by C	20.72	10.85	5.34	27.11	34.66	1.32
975	Rejected by D	21.32	9.73	4.33	23.08	40.22	1.32
976	Dung, A	78.35	2.87	2.50	3.39	12.38	0.51
977	Dung, B	78.54	2.61	2.43	3.55	12.37	0.50
996	Dung, C	79.22	2.62	2.32	4.18	11.25	0.41
997	Dung, D	79.07	2.59	2.22	3.65	12.07	0.40

Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N-Free Ex'ct.	Ether Ext'ct.
STEER A.						
Stover offered.....	28129	2678	1813	9083	13995	560
Stover rejected.....	772	102	40	260	358	12
Stover eaten.....	27357	2576	1773	8823	13637	548
Grain eaten.....	9105	119	1158	166	7374	288
Total eaten.....	36462	2695	2931	8989	21011	836
Excreted.....	16446	2181	1900	2576	9401	388
Digested.....	20016	514	1031	6413	11610	448
Stover digested.....	16004	665	544	6061	8196	475
Grain digested.....	4012		487		3414	
Per cent. grain digested.....	44.1		42.1		46.3	
Per cent. ration digested.....	54.9	19.1	35.2	71.3	55.2	53.6
STEER B.						
Stover offered.....	28129	2678	1813	9083	13995	560
Stover rejected.....	1242	166	73	414	570	19
Stover eaten.....	26887	2512	1740	8669	13425	541
Grain eaten.....	9105	119	1158	166	7374	288
Total eaten.....	35992	2631	2898	8835	20799	829
Excreted.....	17772	2162	2013	2940	10243	414
Digested.....	18220	469	885	5895	10556	415
Stover digested.....	15594	593	562	5860	8068	441
Grain digested.....	2626		323	35	2488	
Per cent. grain digested.....	28.8		27.9	21.1	33.7	
Per cent. ration digested.....	50.6	17.4	30.5	66.7	50.7	50.0
STEER C.						
Stover offered.....	28129	2678	1813	9083	13995	560
Stover rejected.....	718	98	48	246	314	12
Stover eaten.....	27411	2580	1765	8837	13681	548
Grain eaten.....	9105	119	1158	166	7374	288
Total eaten.....	36516	2699	2923	9003	21055	836
Excreted.....	16370	2064	1828	3294	8861	323
Digested.....	20416	635	1095	5709	12194	513
Stover digested.....	14857	398	512	5779	7607	423
Grain Digested.....	5289		583		4587	90
Per cent. grain digested.....	58.1		50.3		62.2	31.2
Per cent. ration digested.....	55.2	23.6	37.5	63.4	57.4	61.4
STEER D.						
Stover offered.....	24915	2372	1606	8045	12396	496
Stover rejected.....	946	117	52	277	484	16
Stover eaten.....	23969	2255	1554	7768	11912	480
Grain eaten.....	9105	119	1158	166	7374	288
Total eaten.....	33074	2374	2712	7934	19286	768
Excreted.....	15521	1921	1646	2707	8950	297
Digested.....	17553	453	1066	5227	10336	471
Stover digested.....	12965	298	440	5212	6754	370
Grain digested.....	4588		626	15	3582	101
Per cent. grain digested.....	50.4		54.0	9.0	48.6	35.1
Per cent. ration digested.....	53.1	19.1	39.3	65.8	53.6	61.3
Grain—average per cent. digested.....	45.4		43.6		47.7	
Ration—average per cent. digested.....	53.5	1.98	35.6	66.8	51.7	56.6

III. DIGESTIBILITY OF MATURE WHITE KAFIR HEADS.

Kafir stover was fed with the heads and calculation of digestibility made as in II.

Analyses of material as sampled

No.	Description	Water	Ash	Protein	Fiber	N-free ext'ct.	Ether ext'ct.
986	Kafir stover	23.16	8.41	4.74	25.21	36.88	1.60
987	Kafir heads	21.63	2.38	8.40	6.92	58.26	2.41
998	Rejected by A.	22.04	7.28	4.07	27.53	37.66	1.42
999	Rejected by B.	26.80	6.49	3.57	29.44	33.13	0.57
1016	Rejected by B.	27.41	12.50	5.74	19.35	33.55	1.45
107	Rejected by D.	33.19	14.59	5.03	13.43	32.77	0.99
1018	Dung A.	78.94	2.56	2.45	4.06	11.58	0.41
1019	Dung B.	79.10	2.36	2.43	3.43	12.25	0.43
1035	Dung C.	79.61	2.67	2.22	3.80	11.23	0.47
1036	Dung D.	80.08	2.63	2.14	3.66	11.12	0.37

Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
STEER A.						
Stover offered	26894	2944	1659	8824	12907	560
Stover rejected	260	24	13	92	126	5
Stover eaten	26634	2920	1646	8732	12781	555
Heads eaten	10972	333	1176	969	8158	336
Total eaten	37606	3253	2822	9701	20939	891
Excreted	19192	2333	2233	3700	10552	374
Digested	18414	920	589	6001	10387	517
Stover digested	15581	753	505	5999	7681	452
Heads digested	2833	167	84	2	2706	65
Per cent. heads digested	25.8	50.1	7.1	0.2	33.1	19.3
Per cent. ration digested	48.9	28.3	20.9	61.8	49.6	58.0
STEER B.						
Stover offered	26894	2944	1659	8824	12907	560
Stover rejected	896	79	44	260	406	7
Stover eaten	25998	2865	1615	8464	12501	553
Heads eaten	10972	333	1176	969	8158	336
Total eaten	36970	3198	2791	9433	20659	889
Excreted	20429	2307	2375	3353	11974	420
Digested	16541	891	416	6080	8685	469
Stover digested	14949	613	547	5631	7513	451
Heads digested	1592	278	54	449	1172	18
Per cent. heads digested	14.5	83.4	14.9	46.3	14.3	5.3
Per cent. ration digested	44.8	27.9	14.9	64.4	42.0	52.7
STEER C.						
Stover offered	26894	2944	1659	8824	12907	560
Stover rejected	1031	178	82	275	475	21
Stover eaten	25863	2766	1577	8549	12432	539
Heads eaten	10972	333	1176	969	8158	336
Total eaten	36835	3099	273	9518	20590	875
Excreted	1965	2483	2065	3534	10446	437
Digested	17870	616	688	5984	10144	438
Stover digested	14018	426	457	5591	6912	416
Heads digested	3852	190	231	393	3232	22
Per cent. heads digested	35.1	57.1	19.7	40.6	39.6	65.5
Per cent. ration digested	48.5	19.9	25.0	62.9	49.3	50.0
STEER D.						
Stover offered	24205	2649	1493	7941	11618	504
Stover rejected	968	211	73	195	475	14
Stover eaten	23237	2438	1420	7746	11143	490
Heads eaten	10972	333	1176	969	8158	336
Total eaten	34209	2771	2596	8715	19301	826
Excreted	17948	2370	1928	3298	10019	333
Digested	16261	401	668	5417	9282	493
Stover digested	12757	322	402	5198	6318	378
Heads digested	3504	79	266	219	2964	115
Per cent. heads digested	31.9	23.7	22.6	22.6	36.3	34.2
Per cent. ration digested	47.5	14.5	25.7	62.1	48.1	59.6
Heads--Average per cent. digested	24.3	53.6	12.3	27.4	30.8	31.1
Ration--Average per cent. digested	47.4	22.7	21.6	62.8	47.3	55.1

IV. DIGESTIBILITY OF WHITE KAFIR MEAL.

Kafir stover, of the same lot as that previously fed, was fed in connection with coarsely ground white Kafir meal, the fineness of which is appended.

Sample No. 1057, White Kafir meal:—Coarser than 2 mm. 1 per cent.; 1 to 2 mm. 67 per cent.; $\frac{1}{2}$ to 1 mm. 30 per cent.; finer than $\frac{1}{2}$ mm. 2 per cent.

Analyses of material as sampled.

No.	Description	Water	Ash	Protein	Fiber	N-free ext'ct	Ether ext'ct
1030	Kafir stover	17.95	9.57	5.02	25.87	40.03	1.56
1057	Kafir meal	13.10	1.38	10.94	1.71	69.34	3.53
1039	Rejected by A	24.00	22.55	3.69	19.00	29.62	1.14
1040	Rejected by B	24.63	7.74	3.66	29.06	33.61	1.30
1053	Rejected by C	21.70	7.86	4.44	28.85	35.62	1.53
1054	Rejected by D	21.55	11.96	5.58	24.25	34.93	1.73
1058	Dung, A	82.02	3.03	1.93	4.12	8.61	0.29
1059	Dung, B	84.57	2.35	1.81	3.35	7.55	0.37
1076	Dung, C	81.96	2.76	2.01	4.22	8.71	0.34
1077	Dung, D	80.72	2.79	2.18	4.49	9.38	0.44

Calculation of Digestibility

	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
STEER A.						
Stover offered	28717	3350	1757	9055	14009	541
Stover rejected	746	221	36	186	292	11
Stover eaten	27971	3129	1721	8869	13717	535
Meal eaten	9125	145	1149	180	7280	371
Total eaten	37096	3274	2870	9049	20997	906
Excreted	14842	2501	1593	3401	7108	239
Digested	22254	773	1277	5648	13889	667
Stover digested	16363	807	528	6093	8244	435
Meal digested	5891		749		5645	232
Per cent. meal digested	64.5		65.2		77.5	62.5
Per cent. ration digested	60.0	23.6	44.9	62.4	66.1	73.6
STEER B.						
Stover offered	28717	3350	1757	9055	14009	546
Stover rejected	1820	187	88	702	812	31
Stover eaten	26897	3163	1669	8353	13197	515
Meal eaten	9125	145	1149	180	7280	371
Total eaten	36022	3308	2818	8533	20477	886
Excreted	15615	2378	1832	3390	7641	374
Digested	20407	930	986	5143	12836	512
Stover digested	15466	677	567	5555	7931	420
Meal digested	4941		419		4905	92
Per cent. meal digested	54.1		36.5		67.4	24.8
Per cent. ration digested	56.6	28.1	35.0	60.3	62.7	57.8
STEER C.						
Stover offered	28717	3350	1757	9055	14009	546
Stover rejected	1475	148	84	544	670	29
Stover eaten	27242	3202	1673	8511	13339	517
Meal eaten	9125	145	1149	180	7280	371
Total eaten	36367	3347	2822	8691	20619	888
Excreted	14619	2237	1629	3420	7057	276
Digested	21748	1110	1193	5271	13552	612
Stover digested	14765	493	485	5566	7416	399
Meal digested	6983		708		6136	213
Per cent. meal digested	76.5		61.6		84.3	57.4
Per cent. ration digested	59.8	33.2	42.3	60.6	65.7	68.9
STEER D.						
Stover offered	25846	3015	1581	8149	12610	491
Stover rejected	1511	230	107	467	674	33
Stover eaten	24335	2785	1474	7682	11936	458
Meal eaten	9125	145	1149	180	7280	371
Total eaten	33460	2930	2623	7862	19216	829

Calculation of Digestibility—Continued.

Excreted	14462	2093	1635	3368	7036	330
Digested	18998	837	988	4494	12180	499
Stover digested	13360	368	417	5155	6768	353
Meal digested	5638		571		5412	146
Per cent. meal digested	61.8		49.7		74.3	39.4
Per cent. ration digested	56.8	28.2	37.7	57.2	63.4	54.1
Meal—Average per cent. digested	64.2		53.3		75.9	46.1
Ration—Average per cent. digested	58.3	28.3	40.0	60.1	64.5	63.6

V. DIGESTIBILITY OF FIELD-CURED KAFIR FODDER.

Mature Kafir fodder, as usually cut and shocked, was fed without any preparation other than cutting the stalks in two so that they would go into the feed troughs.

Analyses of material as sampled.

No.	Description	Water	Ash	Protein	Fiber	N-free Ext'ct.	Ether Ext'ct.
1096.....	Kafir fodder.....	11.78	4.05	5.73	20.78	55.24	2.42
1074.....	Rejected by A.....	12.79	5.95	3.42	31.50	44.70	1.64
1072.....	Rejected by B.....	17.60	7.06	3.59	27.73	42.52	1.50
1094.....	Rejected by C.....	14.21	5.37	4.04	29.37	44.92	2.09
1095.....	Rejected by D.....	11.12	5.37	4.29	30.77	46.40	2.05
1097.....	Dung A.....	77.29	2.09	2.56	4.36	13.01	0.69
1098.....	Dung B.....	82.18	1.67	1.99	3.79	9.84	0.53
1121.....	Dung C.....	81.64	1.90	1.94	4.09	9.97	0.46
1122.....	Dung D.....	80.79	1.97	1.92	4.56	10.23	0.53

Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N. free Ext'ct.	Ether Ext'ct.
STEER A						
Offered	46316	2126	3008	10910	23001	1271
Rejected	6998	477	274	2528	3587	132
Eaten	39318	1649	2734	8382	25414	1139
Excreted	16015	1474	1805	3075	9174	487
Digested	23303	175	929	5307	16240	652
Per cent. digested	59.5	10.6	34.0	63.3	63.9	57.2
STEER B						
Offered	46316	2126	3008	10910	29001	1271
Rejected	5780	495	252	1945	2983	105
Eaten	40536	1631	2756	8965	26018	1166
Excreted	16073	1506	1795	3418	8876	478
Digested	24463	125	961	5547	17142	688
Per cent. digested	60.3	7.6	34.9	61.8	65.9	59.0
STEER C.						
Offered	46316	2126	3008	10910	29001	1271
Rejected	8100	507	381	2773	4242	197
Eaten	38216	1619	2627	8137	24759	1074
Excreted	14336	1483	1515	3194	7784	359
Digested	23880	176	1112	4943	16975	715
Per cent. digested	62.2	7.7	41.9	60.7	68.5	66.6
STEER D.						
Offered	46316	2126	3008	10910	29001	1271
Rejected	7560	457	365	2617	3947	174
Eaten	38756	1669	2613	8293	25054	1097
Excreted	15388	1578	1544	3653	8188	425
Digested	23368	91	1099	4640	16866	672
Per cent. digested	60.3	5.4	41.6	55.9	67.3	61.3
Average per cent. digested	60.6	7.8	38.1	60.4	66.4	61.0

VI. DIGESTIBILITY OF SOAKED WHITE KAFIR CORN.

Kafir corn, consisting of 66 per cent. of perfect grains and 34 per cent. of cracked and imperfect grains, was soaked in sufficient water to cover, for twelve hours and then fed along with shredded Kafir stover as used in previous trials.

Analyses of material as sampled

No.	Description.	Water	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
1119.....	Kafir corn	13.30	1.19	11.37	1.63	69.47	3.04
1118.....	Kafir stover.....	11.42	7.77	5.14	30.26	43.58	1.83
1116.....	Rejected by A.....	12.48	19.46	6.03	20.14	40.42	1.47
1117.....	Rejected by B.....	14.44	8.97	4.29	32.02	39.17	1.11
1125.....	Dung, A.....	77.44	2.86	2.40	3.47	13.24	0.59
1126.....	Dung, B.....	80.50	2.49	2.13	3.28	11.10	0.50

Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
STEER A.						
Stover offered.....	31003	2720	1799	10591	15252	641
Stover rejected.....	602	134	41	139	278	10
Stover eaten.....	30401	2586	1758	10452	14974	631
Grain eaten.....	9104	125	1194	171	7295	319
Total eaten.....	39505	2711	2952	10623	22269	950
Excreted.....	18046	2288	1920	2776	10590	472
Digested.....	21459	423	1032	7847	11679	478
Stover digested.....	17785	667	540	7181	8999	514
Grain digested.....	3674	.....	492	.....	2680	.....
Per cent. grain digested.....	40.3	.....	41.2	.....	36.8	.....
Per cent. ration digested.....	54.3	15.9	35.0	73.9	52.4	50.3
STEER B.						
Stover offered.....	31003	2720	1799	10591	15252	641
Stover rejected.....	2563	269	129	959	1173	33
Stover eaten.....	28440	2451	1670	9632	14079	608
Grain eaten.....	9104	125	1194	171	7295	319
Total eaten.....	37544	2576	2864	9803	21374	927
Excreted.....	17647	2253	1925	2968	10046	452
Digested.....	19897	323	936	6835	11328	475
Stover digested.....	16353	525	566	6405	8461	496
Grain digested.....	3544	.....	370	.....	2837	.....
Per cent. grain digested.....	38.9	.....	31.0	.....	39.3	.....
Per cent. ration digested.....	53.0	12.5	32.7	69.7	53.4	51.2
Grain, fed soaked—Av. per ct. digested.....	39.6	.....	36.1	.....	38.1	.....
Ration—Average per cent. digested.....	53.7	14.2	33.9	71.8	52.9	50.8

A CHECK METHOD OF DETERMINING THE DIGESTIBILITY OF KAFIR CORN.

Whenever in a digestion trial, it is necessary to feed a coarse fodder with a concentrated feed and assume that the fodder has the same digestibility as when fed alone in making the calculations of digestibility of the concentrated feed, the results are to some extent a matter of conjecture. This subject has been discussed frequently and no review of the discussion is necessary here.

The kernel of Kafir corn is covered with a tough coat and is so small that when fed without grinding it is imperfectly masticated by cattle. A casual inspection shows that much of

the grain appears in the dung. In the digestion trials here reported, the amount and composition of grain excreted was determined. The grain was removed from the dung by the following method: An aliquot part of the dung excreted each day was placed in a sieve having circular holes 2mm. in diameter fitted with a cover having a tube so arranged that a stream of water was directed a little above the junction between the side and bottom of the sieve. This was attached to a water pipe and all the finer particles of the dung washed out. The residue was dried, and the grain separated from other materials and weighed. These aliquots were combined for each steer for each period and analyzed.

It is possible from these data to calculate the per cent. of grain which certainly was not digested and compare the results with those obtained by the usual method. The only trials in which direct comparisons can be made are those in which the thrashed grain was fed. (See II and VI.)

Composition of Air-dry Grain.

No.	Description.	Water	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
962.....	From dung, A, II.....	6.75	0.77	10.94	1.54	76.78	3.22
963.....	From dung, B, II.....	6.13	0.76	12.77	1.65	75.83	2.86
982.....	From dung, C, II.....	5.82	0.80	11.81	1.59	77.23	2.75
983.....	From dung, D, II.....	5.71	0.70	10.41	1.64	79.15	2.39
1123.....	From dung, A, VI.....	6.00	0.73	12.08	2.11	75.88	3.20
1124.....	From dung, B, VI.....	5.48	0.73	11.81	1.61	77.03	3.34

KAFIR CORN FED DRY.

Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
STEER A. (II)						
Grain eaten ..	9105	119	1158	166	7374	288
Grain excreted.....	5029	42	590	83	4140	174
Per cent. not digested.....	55.2	35.3	50.9	50.0	56.2	60.4
Per cent. possibly digested.....	44.8	64.7	49.1	50.0	43.8	39.6
STEER B. (II)						
Grain eaten ..	9105	119	1158	166	7374	288
Grain excreted.....	6095	49	829	107	4924	186
Per cent. not digested.....	66.9	41.1	71.6	64.4	66.8	64.5
Per cent. possibly digested.....	33.1	58.9	28.4	35.6	33.2	35.5
STEER C. (II)						
Grain eaten ..	9105	119	1158	166	7374	288
Grain excreted.....	5032	43	631	85	4126	147
Per cent. not digested.....	55.3	36.1	54.5	51.2	55.9	51.0
Per cent. possibly digested.....	44.7	63.9	45.5	48.8	44.1	49.0
STEER D. (II)						
Grain eaten ..	9105	119	1158	166	7374	288
Grain excreted.....	5086	38	562	88	4269	129
Per cent. not digested.....	55.7	31.9	48.5	53.0	57.9	44.8
Per cent. possibly digested.....	44.3	68.1	51.5	47.0	42.1	55.2
Av. of four; per cent. possibly digested	41.7	63.9	43.6	45.4	40.8	44.8
Av. per cent. digested by usual method	45.4	.....	43.6	.....	47.7	.....

Although the assumption that all of the grain not recovered was digested is not valid, it is clear from a comparison of the results obtained by the two methods and of the methods themselves, that the results obtained by the check method more closely approximate the truth. From the results above, the highest possible digestibility of Kafir corn fed dry under the conditions of the experiment is that given in the table as 'per cent. possibly digested'.

SOAKED KAFIR CORN.
Calculation of Digestibility.

	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
STEER A. (VI)						
Grain eaten	9104	125	1194	171	7295	319
Grain excreted	5717	44	735	128	4615	195
Per cent. not digested	62.8	35.2	61.5	74.8	63.2	61.1
Per cent. possibly digested	37.2	64.8	38.5	25.2	36.8	38.9
STEER B. (VI)						
Grain eaten	9104	125	1194	171	7295	319
Grain excreted	5544	43	693	94	4518	196
Per cent. not digested	60.9	34.4	58.0	54.9	60.9	61.4
Per cent. possibly digested	39.1	65.6	42.0	45.1	39.1	38.6
Av. of two; per cent. possibly digested	38.0	65.7	40.2	35.2	38.0	38.8
Av. per cent. digested by usual method	39.6	.....	36.1	.....	38.1	.....

As was the case when the grain was fed dry, results by the check method, except for protein, are lower than those by the usual method and seem to justify the conclusion that the check method has given results more nearly correct.

Summarizing, we have the following for the digestion coefficients of Kafir corn.

DESCRIPTION.	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
Fed dry	41.7	63.9	43.6	45.4	40.8	44.8
Soaked 12 hours	38.0	65.7	40.2	35.2	38.0	38.8

These results may seem somewhat anomalous to those who have fed Kafir corn. It is possible, however, that the soaking serves to toughen the grains so that they are really more difficult of mastication than the dry grains, which although hard, are easily cracked.

SUMMARY OF RESULTS.

The results reported in the preceding pages are summarized in the following tables.

Per Cent. Digestible.

DESCRIPTION	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct.	Ether Ext'ct.
Shredded Kafir Stover.....	56.3	19.0	30.5	67.0	58.2	79.3
White Kafir corn fed dry.....	41.7	63.9	43.6	45.4	40.8	44.8
Soaked white Kafir corn.....	38.0	65.7	40.2	35.2	38.0	38.8
Mature white Kafir heads.....	24.3	53.6	12.3	27.4	30.8	31.1
Coarsely-ground white Kafir meal.....	64.2	.....	53.3	.....	75.9	46.1
Field-cured white Kafir fodder.....	60.6	7.8	38.1	60.4	66.4	61.0

Average of analyses of Kafir products made at this Station are given in the following table. Results are stated on the basis of the material as sampled in each case.

Percentage Composition.

DESCRIPTION	Number of Analyses	Water	Ash	Protein	Fiber	N-free Ext'ct.	Ether Ext'ct.
Kafir stover field-cured.....	6	19.18	8.02	4.85	26.78	39.60	1.57
Kafir fodder field-cured.....	2	9.65	4.74	5.64	21.78	55.79	2.40
Kafir heads, white.....	1	21.63	2.38	8.40	6.92	58.26	2.41
Kafir corn.....	6	12.52	1.26	10.86	1.94	70.48	2.94

Combining the above tables, the per cent. of digestible matter is given. Carbohydrates and fat includes the sum of the digestible fiber, nitrogen-free extract, and two and one-fourth times the fat.

Per cent. of Digestible Matter.

DESCRIPTION	Dry Matter	Protein	Carbo- hydrates and fat	Total	Nutritive Ratio
Shredded Kafir stover.....	80.82	1.48	43.78	45.26	1 : 29.5
Kafir fodder, field-cured.....	90.35	2.15	53.49	55.64	1 : 24.9
Mature white Kafir heads.....	78.37	1.03	21.53	22.56	1 : 20.9
Kafir corn.....	87.48	.....	.....	.....	.....
Whole, fed dry.....	.....	4.73	32.60	37.33	1 : 6.9
Whole, soaked.....	.....	4.37	30.03	34.40	1 : 6.9
Coarsely ground.....	.....	5.79	56.54	62.33	1 : 9.8

For sake of comparison, the following average results for Indian corn are here inserted. The data for corn are, in each case, calculated to the same content of moisture as the average Oklahoma analyses, on the assumption (partially borne out by actual results) that Kafir products have the same content of moisture as the corresponding parts of Indian corn under like conditions.

The analyses are taken from "The Computation of Rations for Farm Animals" by Armsby. Digestion coefficients for corn stover, corn fodder, corn meal, and corn and cob meal, are averages compiled by Lindsey and published in Massachusetts Hatch Station Report for 1897. Coefficients for corn fed whole are Jordan's averages published in Experiment Station Record, Volume 6.

Percentage Composition.

Description	Number of Analyses	*Water	Ash	Protein	Fiber	N-free Extract	Ether Extract
Corn stover, field-cured.....	60	19.18	4.58	5.12	26.58	43.06	1.48
Corn fodder, field-cured.....	35	9.65	4.22	7.03	22.35	54.25	2.50
Corn ears, (ground).....	7	21.63	1.39	7.84	6.09	59.82	3.23
Corn.....	154	12.52	1.47	10.22	1.86	69.01	4.92

* Calculated to Oklahoma moisture-content.

The next table has been calculated from the above analyses and the digestion coefficients indicated.

Per cent. of Digestible Matter

Description	Dry Matter	Protein	Carbo-hydrates and fat	Total	Nutritive Ratio
Corn stover, field-cured.....	80.82	2.05	43.89	45.94	1 : 21.4
Corn fodder, field-cured.....	90.35	3.87	58.27	62.14	1 : 15
Corn and cob meal.....	78.37	4.08	61.49	65.57	1 : 15.1
Corn fed whole to hogs.....	87.48	8.07	68.27	76.34	1 : 8.5
Corn meal.....	87.48	6.13	74.36	80.49	1 : 12

Practical lessons taught by the results of these digestion trials will be found elsewhere in this bulletin.

DIGESTIBILITY OF KAFIR CORN WHEN FED IN THE HEADS.

It has been stated that Kafir corn is better digested by animals when fed in the heads than when fed thrashed without grinding. It is argued that the grains are held together in the heads so that they may be better masticated than the loose grains.

In connection with the digestion trial of Kafir heads reported in another place, data were secured which have a direct bearing on this question. The undigested Kafir corn was washed from the dung as previously described, and analyzed.

Composition of Air-dry Grain.

No.	Description.	Water	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
1004	From dung, A, III	4.90	0.79	11.42	1.69	78.68	2.52
1005	From dung, B, III	4.70	0.79	12.12	1.58	78.30	2.51
1024	From dung, C, III	5.24	0.83	11.24	1.74	78.25	2.70
1025	From dung, D, III	4.78	0.76	11.73	1.75	78.08	2.90

A number of determinations made by the agricultural department shows that Kafir heads contain from 71 to 75 per cent. of thrashed grain. Assuming the latter figure to be correct for the heads fed, and that the grain fed in the heads was of the same composition as that fed in II, the following tables show the calculations of the greatest possible digestion of the grain in the heads.

KAFIR CORN FED IN THE HEADS.

Calculation of Digestibility

	Dry Matter	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
STEER A, (III)						
Grain eaten	9105	119	1158	166	7374	288
Grain excreted	5538	46	665	98	4582	147
Per cent. not digested	60.8	38.6	57.4	59.0	62.1	51.0
Per cent. possibly digested	39.2	61.4	42.6	41.0	37.9	49.0
STEER B, (III)						
Grain eaten	9105	119	1158	166	7374	288
Grain excreted	62.0	51	789	103	5094	163
Per cent. not digested	68.1	42.9	68.1	62.0	69.1	56.6
Per cent. possibly digested	31.9	57.1	31.9	38.0	30.9	43.4
STEER C, (III)						
Grain eaten	9105	119	1158	166	7374	288
Grain excreted	4881	43	579	90	4030	139
Per cent. not digested	53.6	36.1	50.0	54.2	54.6	48.2
Per cent. possibly digested	46.4	63.9	50.0	45.8	45.4	51.8
STEER D, (III)						
Grain eaten	9105	119	1158	166	7374	288
Grain excreted	7443	38	584	87	3890	144
Per cent. not digested	52.1	31.9	50.4	52.4	52.8	50.0
Per cent. possibly digested	47.9	68.1	49.6	47.6	47.2	50.0
Av. of four; per cent. possibly digested	41.3	62.6	43.5	43.1	40.3	48.5
Per cent. possibly digested, fed thrashed	41.7	63.9	43.6	45.4	40.8	41.8

These average results, if the assumptions made are correct, show that there was no difference in this trial whether the grain was fed in the heads or thrashed and then fed.

FODDER ANALYSES.

The following fodder analyses have been made in connection with studies of forage crops which are not yet completed. It is believed, however, that the analyses, especially of Kafir may be of some value in this form.

The customary methods of fodder analysis were followed with the exception that no condenser was used in the determination of fiber, that moisture was determined by drying in flat-bottomed platinum dishes in the air at the temperature of boiling water, and that ether extract was calculated from the loss in weight of extraction tube. A number of trials showed that this method for ether extract was more easily carried out and gave more concordant results than when the fat was weighed after extraction. The extracted fat is apparently partially oxidized by drying in air making it difficult to dry to constant weight.

ANALYSES OF KAFIR FODDER—WHITE VARIETY.

Per cent. in Material as Sampled.

Sample Number	Date of Sampling, 1896	Height of Plants	Water	Ash	Protein	Fiber	Nitrogen free ext'ct	Ether Extract
558	May 12	7.6 inches	82.93	2.09	3.91	3.65	6.29	1.13
562	May 18	8.9 "	84.67	2.10	3.78	3.55	4.94	0.96
564	May 25	16.3 "	83.13	2.08	2.95	3.97	6.86	1.01
567	June 1	25.0 "	87.60	1.50	3.02	3.20	3.98	0.70
571	June 8	31.7 "	86.52	1.72	2.82	3.34	5.07	0.53
574	June 15	37.5 "	83.58	1.76	3.07	4.01	6.93	0.65
580	June 22	44.5 "	85.61	1.54	2.24	4.16	5.74	0.71
583	June 29	56.2 "	85.64	1.53	2.04	4.37	5.86	0.56
591	July 6	66.9 "	83.97	1.64	1.91	5.61	6.45	0.42
599	July 13	68.2 "	78.87	1.93	2.12	6.25	10.10	0.73
604	July 21	68.2 "	76.30	1.93	2.26	6.11	12.84	0.56
610	July 27	68.9 "	73.62	1.97	2.24	6.56	14.86	0.75
616	August 3		69.18	2.40	2.43	7.79	17.45	0.75
624	August 10		66.59	2.73	2.57	7.80	19.49	0.82
629	August 17		72.86	2.38	1.85	6.43	15.89	0.59

ANALYSES OF KAFIR FODDER—RED VARIETY.

Per cent. in Material as Sampled.

Sample No.	Date of Sampling 1896	Height of plants	Water	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
559	May 12	5.2 inches	84.44	1.70	3.76	3.04	5.95	1.11
561	May 18	7.9 "	85.21	1.81	2.70	3.11	6.13	1.04
565	May 25	15.5 "	86.02	1.75	3.04	3.12	5.16	0.91
568	June 1	24.5 "	88.58	1.48	2.94	2.67	3.65	0.68
572	June 8	31.7 "	86.84	1.67	2.86	3.27	4.84	0.52
575	June 15	37.7 "	84.32	1.77	3.01	3.60	6.65	0.65
581	June 22	42.9 "	85.09	1.63	2.43	4.02	6.22	0.61
584	June 29	52.2 "	82.54	1.82	2.50	5.31	7.33	0.51
592	July 6	65.9 "	83.58	1.56	1.96	5.13	7.25	0.52
600	July 13	67.0 "	79.32	1.65	2.14	6.61	9.62	0.66
605	July 21	67.2 "	87.59	0.99	1.33	3.69	6.10	0.30
611	July 27	66.7 "	74.89	1.91	2.40	6.32	13.73	0.75
617	August 3		72.67	2.23	2.38	7.03	15.06	0.63
623	August 10		67.31	2.64	2.67	7.51	19.00	0.87
630	August 17		67.63	2.44	2.29	7.76	18.88	0.80

MISCELLANEOUS ANALYSES OF KAFIR—WHITE VARIETY.

Sample No.	Date of Sampling 1897	Remarks	Water	Ash	Protein	Fiber	Nitrogen-free Extract	Ether Extract
768	July 9th	Fodder	84.03	1.61	2.31	4.51	6.67	0.87
770	July 26th	Fodder-heading	82.59	1.50	2.12	5.08	8.11	0.60
773	August 6th	Fodder in bloom	78.70	1.60	2.11	6.24	10.54	0.81
774	August 6th	Leaves and heads	73.95	2.68	2.97	7.50	12.25	0.65
775	August 6th	Stalks	81.70	1.35	1.73	4.78	9.89	0.55
784	Sept. 18th	Fodder	64.47	2.69	3.80	6.15	21.36	1.53
785	Sept. 18th	Heads	39.80	2.63	6.99	6.63	41.86	2.09
786	Sept. 18th	Leaves	68.44	4.35	2.83	8.86	14.26	1.26
787	Sept. 18th	Stalks	78.71	1.58	1.16	6.44	11.37	0.74

ANALYSES OF CORN FODDER.

Per cent. in Material as Sampled.

Sample Number	Date of Sampling 1896	Height of Plants	Water	Ash	Protein	Fiber	Nitrogen-free Extract	Ether Extract
554	April 27	9 inches	86.26	1.59	3.04	2.51	5.83	0.77
556	May 4	10.6 "	85.99	1.77	3.16	2.68	5.78	0.62
557	May 12	14.2 "	84.73	1.87	3.55	3.46	5.73	0.66
560	May 18	19.2 "	86.37	1.97	2.65	3.15	5.22	0.64
563	May 25	31.6 "	85.76	1.50	2.66	3.45	5.89	0.74
566	June 1	43.4 "	89.69	1.34	2.53	2.97	3.96	0.51
570	June 8	58.0 "	87.77	1.34	2.21	3.29	4.93	0.46
573	June 15	67.3 "	86.82	1.17	1.76	3.25	6.62	0.38
579	June 22	73.2 "	85.19	1.26	1.86	4.65	6.30	0.74
582	June 29	91.7 "	84.34	1.28	1.67	4.70	7.49	0.52
590	July 6	102.8 "	81.31	1.36	2.06	5.79	8.97	0.51
598	July 13	"	83.53	1.04	1.64	4.86	8.26	0.67
601	July 21	"	83.02	1.11	1.66	4.79	8.81	0.61
606	July 27	"	79.04	1.14	2.00	6.13	11.20	0.49
613	August 3	"	67.95	1.38	2.60	5.91	21.29	0.87
621	August 10	"	53.80	2.05	4.23	8.91	29.84	1.17
626	August 17	"	42.84	2.76	4.82	10.95	37.14	1.49
717	September 29, 1897	"	13.07	7.32	7.64	19.03	51.24	1.70
738	May 22	"	90.97	0.91	2.04	1.84	3.82	0.42
767	July 9	In tassel	81.75	1.80	1.63	5.68	8.30	0.84
769	July 25	milks Stage	79.21	1.35	1.53	5.93	11.01	0.97
776	August 16	"	78.83	1.50	2.57	5.59	10.95	0.56

ANALYSES OF DIFFERENT PARTS OF CORN FODDER.

Per cent. in Material as Sampled.

Sample No.	Date of Sampling, 1896	Remarks	Water	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
585	June 29	Leaves and tops	83.57	1.31	2.13	4.90	7.62	0.47
595	July 10	"	84.71	1.11	1.66	3.92	7.94	0.66
602	July 21	" ears and tops	84.23	0.91	1.49	3.78	9.14	0.40
607	July 27	" " "	74.30	1.36	2.22	6.43	14.95	0.74
614	August 3	" " " "	61.84	1.66	3.13	7.85	24.51	1.01
622	August 10	" " " "	46.27	2.70	5.35	8.91	35.24	1.53
627	August 17	" " " "	29.24	3.27	5.98	11.61	48.10	1.80
716	September 29	" " " "	12.93	7.00	8.26	17.67	52.56	1.58
586	June 29	Stalks	84.45	0.84	1.17	5.31	7.45	0.78
596	July 10	"	82.13	0.88	0.88	6.62	8.86	0.63
603	July 21	"	86.08	0.52	0.71	4.56	7.78	0.35
608	July 27	"	82.87	0.76	0.89	6.58	8.51	0.49
615	August 3	"	79.22	0.87	1.05	8.44	10.11	0.31
623	August 10	"	72.51	1.26	1.58	10.90	13.57	0.18
628	August 17	"	58.76	2.20	2.24	18.85	17.77	0.18
715	September 29, 1897	"	13.63	3.71	5.01	40.16	37.20	0.29
777	August 16	Leaves and ears	75.07	1.65	2.23	5.97	14.40	0.68
778	August 16	Stalks and tassels	80.32	0.87	1.81	5.25	11.47	0.28

FODDER ANALYSES, 1898.

Per cent. in material as sampled.

No.	DESCRIPTION	Water	Ash	Protein	Fiber	N-f. ex.	E. ex.
ALFALFA							
1127	Plat 1, Field F.	76.49	2.04	4.08	7.47	9.51	0.40
1133	Plat 1, Field F.	69.17	2.36	5.48	9.94	12.35	0.71
B'K H'D WHITE KAFIR							
1149	First heads showing	80.43	1.37	1.51	6.43	9.78	0.48
1110	First heads showing	82.42	1.24	1.61	6.28	8.08	0.37
1155	First heads showing	83.13	1.12	1.46	5.89	8.12	0.28
1152	First heads showing	80.08	1.43	2.01	6.10	10.00	0.38
1179	Milk stage	74.17	1.50	1.25	7.89	14.57	0.82
1180	Milk stage	74.87	1.74	1.51	7.76	13.53	0.59
1181	Milk stage	72.71	2.23	1.64	9.47	13.38	0.57
1182	Milk stage	69.56	2.03	2.70	7.54	17.44	0.73
1221	Mature fodder	61.81	2.13	2.87	8.36	24.22	0.61
1222	Mature fodder	60.78	2.24	3.60	7.16	25.43	0.79
1224	Mature fodder	43.15	3.16	2.59	15.92	34.26	0.92
1239	Mature fodder	60.49	2.13	2.52	8.16	25.85	0.85
1268	Stalks	72.10	1.25	0.63	7.41	18.16	0.45
1269	Leaves	55.43	4.52	3.51	13.74	21.40	1.40
1270	Heads	29.82	2.60	8.21	4.86	52.44	2.07
WHITE DENT CORN							
1130	Beginning to tassel	88.23	0.95	1.28	3.78	5.52	0.24
1131	Beginning to tassel	88.10	1.01	1.26	4.07	5.36	0.20
1132	Beginning to tassel	87.33	1.09	1.79	3.44	6.10	0.25
1134	In full tassel	84.63	0.95	1.23	4.76	8.13	0.30
1135	In full tassel	85.56	0.94	1.64	4.21	7.37	0.28
1136	In full tassel	81.21	1.20	1.50	5.13	10.58	0.38
1140	Roasting ear stage	81.86	0.97	1.46	5.71	9.71	0.29
1141	Roasting ear stage	79.83	1.05	1.07	6.21	11.49	0.35
1142	Roasting ear stage	79.05	1.18	1.48	6.01	11.88	0.40
1153	Glazed	76.42	1.14	2.25	4.69	14.9	0.54
1154	Glazed	75.72	1.36	1.42	6.53	14.60	0.37
1155	Glazed	75.41	1.16	1.15	7.00	14.95	0.33
1162	Mature fodder	68.66	1.51	1.68	8.44	19.16	0.55
1163	Mature fodder	65.55	1.72	2.56	8.78	20.62	0.77
1164	Mature fodder	65.25	1.44	2.98	7.48	21.8	1.07
1265	Ears	51.92	0.91	4.83	3.87	36.36	2.11
1266	Leaves	69.86	2.60	1.93	8.74	17.23	0.54
1267	Stalks	79.55	0.63	0.97	5.79	12.73	0.33
SMALL SORGHUM							
1138	First cutting	85.15	1.28	1.89	4.63	6.54	0.51
1146	First heads showing	85.56	0.78	1.23	4.44	7.53	0.46
1147	First heads showing	85.97	0.82	1.31	4.31	7.14	0.45
1148	First heads showing	80.26	1.03	1.36	5.65	11.11	0.59
1158	Milk stage	73.50	1.24	1.59	6.34	16.72	0.61
1160	Milk stage	77.58	1.10	1.19	5.34	14.24	0.55
1223	Mature fodder	52.75	2.28	1.49	13.65	28.62	1.21
1240	Mature fodder	63.31	1.43	2.40	6.71	25.23	0.92
1254	Stalks	72.94	0.76	0.63	5.55	19.08	1.04
1255	Leaves	50.27	4.69	4.12	13.49	25.66	1.77
1256	Heads	17.03	2.66	8.41	5.39	64.15	2.36
LARGE SORGHUM							
1137	First cutting	84.24	1.49	2.03	4.41	7.31	0.51
1143	First heads showing	88.11	1.18	1.14	4.11	5.20	0.26
1145	First heads showing	85.60	0.92	1.49	4.84	6.81	0.34
1206	Milk stage	75.85	1.25	0.80	7.87	13.75	0.48
1207	Milk stage	77.85	1.14	1.08	6.75	12.61	0.57
1241	Mature fodder	68.99	1.44	1.83	6.55	20.55	0.64
1264	Mature fodder	64.53	1.48	1.65	8.74	22.20	1.40
1271	Stalks	73.35	1.03	0.70	6.94	16.68	1.30
1272	Leaves	50.63	4.35	3.57	15.34	24.45	1.66
1273	Heads	25.43	2.87	7.67	7.63	53.95	2.45
BLACK RICE CORN							
1144	First heads showing	81.41	1.11	1.28	6.43	9.38	0.39
1159	Milk stage	75.61	1.32	1.33	6.05	15.28	0.41
1238	Mature fodder	63.08	2.06	2.28	7.55	24.34	0.69
1248	Stalks	76.02	1.19	0.79	6.57	15.18	0.25
1249	Leaves	71.34	3.18	2.50	8.45	13.76	0.77
1250	Heads	16.29	3.04	8.62	7.05	62.79	2.21
MILO MAIZE							
1157	First heads showing	77.60	1.15	1.22	7.68	12.02	0.33
1205	Milk stage	74.79	1.37	1.13	8.92	13.24	0.55
1260	Stalks	74.35	1.91	0.79	10.75	11.98	0.22
1261	Leaves	47.80	5.63	2.98	17.02	25.22	1.32
1262	Heads	18.01	3.01	9.20	5.23	62.10	2.45
1263	Mature fodder	65.79	2.10	2.27	10.08	19.02	0.74

MISCELLANEOUS ANALYSES.

Per cent. in Material as Sampled.

Sample No.	Date of Sampling	Material	Water	Ash	Protein	Fiber	N-free Ext'ct	Ether Ext'ct
142.	Oct. 2, '93....	Teosinte.....	62.75	3.68	5.02	11.20	15.60	1.75
497.	Sept. 21, '95..	Teosinte.....	64.02	3.53	2.33	12.52	17.10	0.50
154.	Mar. 19, '94..	Chufas.....	2.23	2.02	3.52	10.52	50.15	31.56
576.	June 13, '96..	Kafir f'dr from stack ...	.53	5.42	5.54	22.78	56.35	2.38
597.	July 10, '96..	Kafir corn.....	6.21	0.80	12.43	3.09	75.29	2.18
553.	April 20 '96 ..	Alfalfa, com'ng into bl'm	73.95	2.96	5.33	5.91	10.81	1.04
555.	May 1, '96....	Alfalfa, cut for hay.....	57.23	4.93	8.31	9.41	18.13	1.99
569.	June 5, '96....	Alfalfa, 2d cut'ng, f'l bl'm	70.58	2.93	5.65	8.35	11.36	1.13
587.	July 1, '96....	Alfalfa, 3d c't, c'm'g bl'm	81.25	2.02	4.14	4.99	6.82	0.78
737.	May 19, '97...	Alfalfa, nearly full bl'm	74.81	2.52	4.62	7.20	9.57	1.28
765.	June 25, '97...	Alfalfa, full bloom.....	74.29	2.62	4.24	9.22	8.76	0.89
772.	July 29, '97...	Alfalfa, full bloom.....	68.71	2.58	5.84	7.87	13.60	1.40
730.	Oct. 31, '96...	Kafir, white, from shock	14.02	1.55	9.89	2.02	69.44	3.68
731.	Oct. 31, '96...	Kafir, red, from shock...	15.18	1.51	9.48	1.64	69.13	3.06

FERTILIZER ANALYSES.

Per cent. in Material as Sampled.

Sample No.	Date of Sampling	Material	Water	Nitrogen	Potash	Phos-phoric Acid
*576....	June 13, '96....	Kafir fodder from stack.....	7.53	0.76	2.22	0.91
718....	Oct. 1, '96....	Ashes from stable manure.....	17.46	.....	2.72	1.58
593....	July 6, '96....	Soil from roots of castor bean pl'ts	.....	.....	0.315	0.096
594....	July 6, '96....	Soil from bet'n rows of castor 'b'ns	.....	.....	0.355	0.133

* Calculated to water-free substance.