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12-1939

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COLLEGE OF AGRICULTURE UNIVERSITY OF NEBRASKA
AGRICULTURAL EXPERIMENT STATION
RESEARCH BULLETIN 116

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by Growing Chicks**

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Artificially Dried Sudan Grass Meal
In Rations for Growing Chicks**

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LINCOLN, NEBRASKA
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SUMMARY

1. The effect of replacing the ten parts of alfalfa meal in a ration with artificially dried Sudan-grass meal on an equivalent protein basis was studied in a growth and body-analysis experiment with two lots of day-old chicks.
2. The chicks of both lots consumed equal amounts of dry matter during the feeding trial.
3. There were no significant differences in the growth rate or composition of the chicks at the end of a six weeks' feeding trial.

The Utilization of Food Elements by Growing Chicks

VIII. A Comparison of Alfalfa Meal and Artificially Dried Sudan Grass Meal In a Ration for Growing Chicks

C. W. ACKERSON, M. J. BLISH, AND F. E. MUSSEHL

The past few years have seen a decrease of about 50 per cent in the alfalfa acreage in Nebraska with a like drop in tonnage of hay produced. Sorghums, grown for grain or forage, and Sudan grass have replaced a considerable portion of the lost acreage. With adverse moisture conditions it is necessary to use Sudan grass as an emergency crop for pasture and forage. Digestion coefficients for cattle, sheep, and swine for Sudan grass cut at various stages of maturity and dried under field conditions may be found in the literature. The advent of artificial and quick drying of hays to conserve the carotene present in the green plant led Newlander (1, 2) to investigate the digestibility of artificially dried Sudan grass. He used young Sudan grass by making four cuttings during the season and dried it artificially. By this method he obtained hay of higher protein and lower fiber content than is the rule in matured hay.

PREPARATION OF THE RATIONS

At this Station Sudan-grass meals have been prepared from young grass 12 to 18 inches tall. By varying the conditions of cutting and drying, Sudan-grass meals ranging from 12 to 25 per cent protein and from 2 to 68 mg. per cent of carotene on the dry-matter basis have been obtained. With meals of this type available for feeding trials it was felt desirable to gain some information on their value as substitutes for alfalfa meal in a ration for growing chicks. A previous paper of this series (3) showed that the substitution of ground kalo for the 31 per cent of ground yellow corn in a ration has no significant effect on the growth of chicks up to six weeks of age.

Ingredients	Alfalfa-meal	Sudan-grass
	ration	meal ration
	<i>Lbs.</i>	<i>Lbs.</i>
Ground yellow corn	31	31
Shorts	20	20
Bran	10	10
Pulverized oats ..	10	10
Alfalfa meal....	10	0
Sudan grass meal	0	8.3
Corn starch.....	0	1.7
Meat meal.....	5	5
Fish meal.....	5	5
Corn gluten meal	5	5
Calcium carbonate	2	2
Sodium chloride.	1	1

The purpose of this experiment was to compare the utilization of food elements by growing chicks on two rations differing only by the substitution of Sudan-grass meal for alfalfa meal. The Sudan-grass meal was prepared from locally grown grass cut on August 3 when 12 inches tall. It was dried in a room in subdued light but no heat was used to hasten the process. After it had become air dry it was ground into

a fine meal, which contained 23.0 per cent protein and 15.4 mg. per cent of carotene. It was thus a very good product from the standpoint of protein content, and better than average hay in carotene. The ration used for the basis of comparison differed from those reported in previous papers of this series by the replacement of soybean meal by corn gluten meal. In preparing the rations the protein levels were kept the same by standardizing

TABLE 1.—*Analyses of the rations.*

Ration	Water	Ash	Nitrogen	Calcium	Phosphorus
	<i>P.ct.</i>	<i>P.ct.</i>	<i>P.ct.</i>	<i>P.ct.</i>	<i>P.ct.</i>
Alfalfa meal	8.4	8.1	3.35	1.56	0.83
Sudan-grass meal	8.4	9.2	3.37	1.43	0.85

Ration	Crude fat	Crude fiber	Protein	N-free extract	Ratio Ca:P
	<i>P.ct.</i>	<i>P.ct.</i>	<i>P.ct.</i>	<i>P.ct.</i>	
Alfalfa meal	4.1	7.0	20.9	51.5	1.88
Sudan-grass meal	4.1	6.1	21.0	51.2	1.67

the Sudan-grass meal with starch to the level of the alfalfa meal. These meals furnished 10 per cent of the ration while the balance of the formula was identical. The Sudan-grass and alfalfa meals were each mixed with 90 parts of the base which had been mixed in sufficient quantity for the two rations. After mixing, each ration was pelleted by means of a 5/32-inch die. The experimental variable thus lay in the substitution of Sudan-grass meal for alfalfa meal. The rations were mixed according to the formulas given, and their compositions are shown in Table 1.

EXPERIMENTAL FEEDING

The chicks used in this feeding trial were Single Comb White Leghorn chicks chosen in a weight range of 36 to 41 grams with an average initial weight of 39 in each lot. All chicks were fed the same amount of the pelleted rations daily in the manner described in an earlier paper (4). Three chicks of the lot on the Sudan-grass-meal ration did not take the feed at the required rate in the preliminary feeding and were discarded. One chick was lost by accident and another lost during analysis of the final digest. As a result data are available on 22 chicks in the alfalfa-meal and on 17 of the Sudan-grass-meal lot. The chicks carried through the trial were fed identical quantities of feed. They were kept in electrically heated brooders in a room maintained above 70°F. Cod-liver oil was fed individually by burette at a level of 0.5 per cent of the ration. The chicks developed normally, with no evidences of nutritional deficiencies. Wing and toe picking was not in evidence in either lot. Average rates of gain for each sex of both lots are given in Table 2. Incremental and period gains did not vary significantly in the two lots.

TABLE 2.—Rates of gain of chicks.

RATES OF GAIN ON SUCCESSIVE INCREMENTS OF DRY MATTER						
Age of chick (<i>days</i>).....	17	24	30	35	39	43
Dry matter increment (<i>g.</i>).....	143	127	146	136	134	137
LOT FED ALFALFA-MEAL RATION						
8 males, rate of gain (<i>p.ct.</i>).....	48	54	48	43	50	27
14 females, rate of gain (<i>p.ct.</i>).....	46	48	45	45	44	27
LOT FED SUDAN-GRASS-MEAL RATION						
7 males, rate of gain (<i>p.ct.</i>).....	47	52	45	41	51	34
11 females, rate of gain (<i>p.ct.</i>).....	47	48	42	48	41	34
RATES OF GAIN OF CHICKS, CALCULATED AT ATTAINED WEIGHT ON GAIN OVER INITIAL WEIGHT						
Total dry matter fed (<i>g.</i>).....	143	270	416	552	686	823
LOT FED ALFALFA-MEAL RATION						
8 males, rate of gain (<i>p.ct.</i>).....	48	51	50	48	49	45
14 females, rate of gain (<i>p.ct.</i>).....	46	47	46	46	45	42
LOT FED SUDAN-GRASS-MEAL RATION						
7 males, rate of gain (<i>p.ct.</i>).....	47	49	48	46	47	45
11 females, rate of gain (<i>p.ct.</i>).....	47	47	46	46	45	43

DISCUSSION

The experimental feeding was started February 15 and continued to March 30, at which time the chicks were killed by ether anesthesia. Individual live weights were taken and the contents of the digestive tract removed, after which the mean net weight of each chick was noted. The mean net weights of the males of both lots were identical and those of the females agreed within 1.5 per cent, while all values had a low standard error. These data are given in Table 3, while the analytical data are shown in Table 4. From the latter table it is evident that over the period

TABLE 3.—Mean net weights¹ and their standard errors.

Lot	Males	Females	Males and females (unweighted mean)
	g.		
Alfalfa-meal ration	396.50±3.67	374.50±2.78	385.50±2.22
Sudan-grass-meal ration	396.71±3.93	380.18±3.16	388.45±2.45
Unweighted mean.....	396.61±2.69	377.34±2.08	386.98±1.64

¹ The net weight is the weight of the chick after removal of the contents of the digestive tract.

covered by the feeding trial the rate of gain and the gain in weight per gram of nitrogen fed were not influenced by the rations. Furthermore the differences in the percentages of nitrogen, calcium, and phosphorus in the gain and the retention of these elements do not vary significantly between the two rations. The slight difference observed in the retention of calcium can be accounted for by the higher intake of calcium in the lot fed the alfalfa-meal ration. It is to be noted that the amounts retained in the

TABLE 4.—*Summary of growth and analytical data on chicks.*

Item	Alfalfa-meal ration		Sudan-grass-meal ration	
	Male	Female	Male	Female
Number of chicks.....	8	14	6	11
Net weight (g.).....	397	374	397	380
Gain in weight (g.).....	357	335	357	341
Dry matter fed (g.).....	823	823	823	823
Rate of gain (p.ct.).....	43.4	40.8	43.4	41.4
Gain per gram nitrogen fed (g.).....	11.9	11.2	11.8	11.2
Nitrogen in chick (p.ct.).....	3.53	3.57	3.46	3.48
Calcium in chick (p.ct.).....	0.95	0.96	0.96	0.94
Phosphorus in chick (p.ct.).....	0.64	0.66	0.66	0.66
Ratio, Ca:P in chick.....	1.49	1.46	1.45	1.43
Nitrogen in gain (p.ct.).....	3.66	3.70	3.59	3.60
Calcium in gain (p.ct.).....	1.02	1.02	1.02	1.00
Phosphorus in gain (p.ct.).....	0.68	0.70	0.70	0.70
Ratio, Ca:P in gain.....	1.50	1.46	1.46	1.43
Ether extract (p.ct.).....	3.9	3.1	3.9	3.6
Nitrogen intake (g.).....	30.05	30.05	30.33	30.33
Nitrogen in gain (g.).....	13.05	12.39	12.80	12.29
Nitrogen retained (p.ct.).....	43.4	41.2	42.2	40.5
Calcium intake (g.).....	14.34	14.34	13.14	13.14
Calcium in gain (g.).....	3.63	3.43	3.64	3.42
Calcium retained (p.ct.).....	25.3	23.9	27.7	26.0
Phosphorus intake (g.).....	7.63	7.63	7.87	7.87
Phosphorus in gain (g.).....	2.42	2.35	2.50	2.39
Phosphorus retained (p.ct.).....	31.7	30.8	31.8	30.4

gain are identical for the two sexes in the two lots. Thus the lot receiving the larger quantity retained a smaller percentage of ingested calcium.

It thus appears practical to make use of an emergency forage crop in rations for growing chicks. The protein content of the meal as prepared may appear unusually high but Sudan grass cut at a height of 12 inches is still a very young plant, and it is well established that immature plants have a higher content of protein than older plants when considered on the dry-matter basis. In this connection Prince, Phillips, Blood, and Percival (5) show that while the dry-matter yield increased, the percentage of protein and the yield of protein per acre decreased as the date of cutting of grass hay was advanced from June 10 to July 30. This indicates that if protein feed is required it is advantageous to cut grass hay at an early stage of growth.

CONCLUSIONS

1. The substitution of an artificially dried Sudan-grass meal for alfalfa meal in a complete ration for growing chicks had no significant effect on the growth rate of White Leghorn chicks up to six weeks of age.

2. The retention of nitrogen, calcium, and phosphorus was not significantly altered by the substitution of Sudan-grass meal for alfalfa meal.

3. Sudan-grass meal, prepared from grass cut at a height of 12 inches and artificially dried can be used to replace the alfalfa meal in a ration for growing chicks.

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