

3-1-1945

Kudzu in the ration of growing chicks

H. D. Polk

Marvin Geiger

Follow this and additional works at: <https://scholarsjunction.msstate.edu/mafes-bulletins>

Recommended Citation

Polk, H. D. and Geiger, Marvin, "Kudzu in the ration of growing chicks" (1945). *Bulletins*. 529.
<https://scholarsjunction.msstate.edu/mafes-bulletins/529>

This Article is brought to you for free and open access by the Mississippi Agricultural and Forestry Experiment Station (MAFES) at Scholars Junction. It has been accepted for inclusion in Bulletins by an authorized administrator of Scholars Junction. For more information, please contact scholcomm@msstate.libanswers.com.

Kudzu in the Ration of Growing Chicks

By H. D. POLK and MARVIN GIEGER

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLARENCE DORMAN, Director

KUDZU IN THE RATION OF GROWING CHICKS

By H. D. POLK and MARVIN GIEGER

There is an urgent need for a forage plant equivalent in feeding value to alfalfa and adapted to a wide variety of Mississippi soils, to be used in poultry rations.

Alfalfa meal is now widely used in commercial and home-mixed poultry feeds, in amounts ranging from 5 percent to 10 percent of the total. Properly cured alfalfa meal is considered a good source of provitamin A and riboflavin, and in addition carries liberal quantities of other food nutrients and is close to the feeding value of the succulent green plants.

However, during the war years alfalfa meal has been scarce, and the home mixing of poultry feeds has been made difficult because of inability to secure alfalfa meal or its equivalent on local markets.

It is highly desirable that poultry feed ingredients be produced whenever practicable on farms where used. Alfalfa is one of the lime-loving plants; it is produced without undue difficulty in the lime soils of the prairie and delta, but with considerable difficulty in the other sections of the State.

Kudzu, a legume and therefore high in feeding value, is being extensively planted primarily for erosion control on rough or eroded soils of Mississippi. To a lesser but increasing extent kudzu is being planted on the better soils, also, for hay production and summer grazing. It has made very good growth on all except poorly drained soils and soils with tight subsoils, and reported yields of kudzu hay have averaged about 2 tons per acre. Kudzu is similar to other plants in that it responds readily to fertilizer and makes heavier yields on the more fertile soils. It seems to be at its best on the sandy textured soils of southern, central, and northeast Mississippi, and on well drained silty soils of the Brown Loam area.

Thus, kudzu is available to most farmers who cannot produce alfalfa.

An experiment was started in 1942 by the Poultry Department of the Mississippi Agricultural Experiment Station to determine the value of kudzu when used instead of alfalfa in chick starting rations. Kudzu is relatively new as a hay plant, and information is limited as to its food constituents, as well as to the proper time of cutting and methods of curing so as to preserve in the resultant hay the food nutrients of the green material.

Cutting and Curing Kudzu

Kudzu for the first and second series of the feeding experiment was cut during the latter part of July 1943, using a mowing machine equipped with a home-made attachment to hold down the vines so the blade could clip them easily. In good weather kudzu is easily cured, due to the fact that the leaves curl up when drying, thus allowing air to pass readily through the leaves and vines. It is easily handled since the vines are cut up by means of the home-made attachment mentioned above. The kudzu for this experiment was given time to wilt after cutting and then was piled in small shocks before night to prevent dew from turning it dark. The following day the kudzu hay was placed in a large room to finish drying. The kudzu for the third series of the test was cut during the latter part of August 1944, and cured by the same method as given for the 1943 period.

The kudzu leaf meal, which contained only the leaves, was secured by hand-stripping the leaves from the green plants. The leaves were spread on a concrete surface exposed to the direct rays of the sun for approximately one-half day before moving to a room to finish drying. The leaves of kudzu do not shatter or crumble readily when dry. When cured by the above method the kudzu hay and

Table 2. Average chemical analyses of alfalfa meal, kudzu leaf meal, and kudzu meal and of rations including these products, used during 3 feeding periods, 1944 and 1945.

	Mois- ture	Crude fat	Crude fiber	Ash	Protein	Nitrogen free ext.	Calcium	Phos- phorus	Carotene micro- in 1 gm.	Riboflavin micrograms in 1 lb.
	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.		
Analyses of meals:										
Kudzu meal	5.00	2.23	30.06	7.09	13.75	41.88	2.97	0.22	81.58	3,413.21
Kudzu leaf meal	6.90	2.80	17.98	9.01	18.94	47.67	2.43	0.28	128.96	5,289.97
Alfalfa meal (dehydrated)	6.39	2.85	24.49	7.58	17.75	40.94	1.38	0.33	67.32	7,906.94
Analyses of rations:										
Ration 1; including alfalfa meal 9 pct., milk 3 pct.	8.83	3.36	9.24	6.88	21.83	49.81	1.60	0.79	6.42	3,280.83
Ration 2; including kudzu leaf meal 9 pct.	8.31	3.62	8.10	7.30	21.21	51.33	1.66	0.78	18.71	3,164.53
Ration 3; including kudzu meal 9 pct., milk 3 pct.	8.41	3.61	9.42	7.26	21.96	49.36	1.63	0.80	7.64	3,638.96
Ration 4; including kudzu meal 10 pct.	8.43	3.84	9.95	7.08	21.50	49.18	1.64	0.79	6.76	2,982.17

leaves are bright green in color and have a pleasant aroma. The kudzu meal is ground kudzu hay, and contains both leaves and stems as harvested.

The kudzu hay and leaves were ground on a hammer mill approximately 2 weeks after cutting, packed in used dried-milk sacks, and stored in a cellar until ready to feed.

It is realized that the hand-stripping method employed to secure kudzu leaves for leaf meal, is laborious and costly. It was desired that kudzu leaf meal of high quality be included in the experiment, however, and it was not obtainable otherwise. Kudzu hay is being marketed to a limited extent, but is of uncertain quality. Since only a small portion of the poultry ration is kudzu (or alfalfa) it is believed that the method followed in curing and preparing kudzu meal is practicable until better methods are made available.

The chemical analyses of the kudzu used in the experiment are given in table 2.

Rations Used in Experiment

Four rations were used in the experiment (table 1), one including alfalfa meal as the control or basis of comparison. The remaining three rations included kudzu instead of alfalfa. Two of

the rations contained dried milk at the rate of 3 percent as an additional source of riboflavin: lots 1 and 2. Thus, lot 1, the control ration, included alfalfa meal plus 3 percent dried milk; lot 2 included kudzu leaf meal, but no milk; lot 3 included kudzu meal plus 3 percent dried milk; and lot 4 included kudzu meal, but no milk. In addition, all rations included approximately equal amounts of yellow corn meal, wheat shorts, wheat bran, ground oats, shrimp meal, cottonseed meal, salt, and feeding oil. All chicks were fed granite grit bi-weekly throughout each experiment.

Ration 1 and ration 3 are directly comparable since both contain similar amounts of all ingredients, except that ration 1 contains 9 pounds alfalfa meal while ration 3 contains 9 pounds kudzu meal.

Kudzu leaf meal contains more of the essential feed ingredients than kudzu meal, and ration 2 (including kudzu leaf meal, no milk, but with 1 additional pound each of shrimp meal and yellow corn meal) was used to determine whether such a milk-less ration would be as satisfactory as rations containing dried milk.

Kudzu meal, though containing somewhat less of the essential feed ingredients, is much easier to produce on farms than kudzu leaf meal, and costs materially

Table 1. Rations used in comparisons of alfalfa and kudzu products for starting chicks.

Ingredients	Ration 1	Ration 2.	Ration 3	Ration 4
	Alfalfa meal plus milk	Kudzu leaf meal without milk	Kudzu meal with milk	Kudzu meal without milk
	pounds	pounds	pounds	pounds
Wheat shorts	10	10	10	10
Yellow corn meal	33	34	33	34
Wheat bran	10	10	10	10
Ground oats	10	10	10	10
Shrimp meal	14	15	14	15
Cottonseed meal	10	10	10	10
Kudzu	—	—	9	10
Kudzu leaf meal	—	9	—	—
Alfalfa meal	9	—	—	—
Dried milk	3	—	3	—
Salt	½	½	½	½
Feeding oil*	⅛	⅛	⅛	⅛

*3000 U.S.P. units of vitamin A and 400 U.S.P. units of vitamin D.

less when purchased. The kudzu meal ration (lot 4) was included to determine whether a satisfactory ration could be developed by the use of kudzu meal without milk. Ration 4 contained 1 pound more each of kudzu, yellow corn meal, and shrimp meal.

The rations given in table 1 were fed to carefully selected Barred Plymouth Rock males X White Leghorn female chicks during three feeding periods: November 27, 1943 to January 29, 1944; May 26 to July 20, 1944; and December 14, 1944 to February 15, 1945.

The chicks were brooded in a five-sec-

tion battery brooder for a period of 5 weeks. At this period they were placed in a finishing battery until the end of the ninth week. Each week the chicks were shifted in the batteries to equalize temperature and volume of fresh air which could have influenced their growth if they had remained at a constant height from the floor level.

The chicks were weighed weekly, their feed consumption determined weekly, and they were watched for signs of nutritional deficiencies. Mortality was recorded as it occurred.

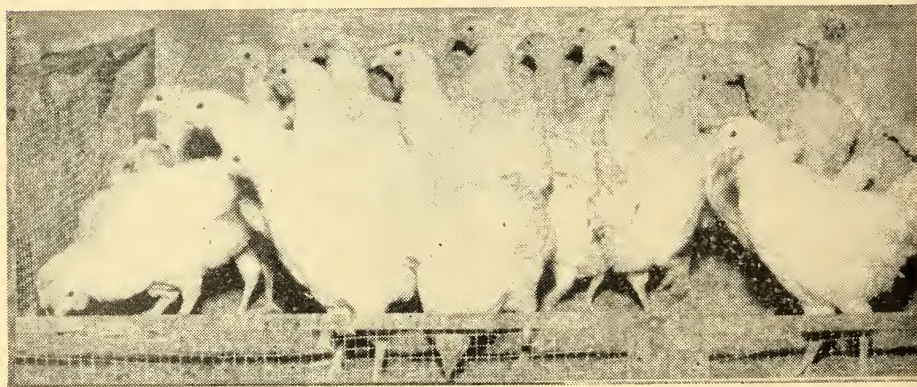


Figure 1A. Lot 1, Early Winter, 1944 Series; ration including alfalfa meal and dried milk.

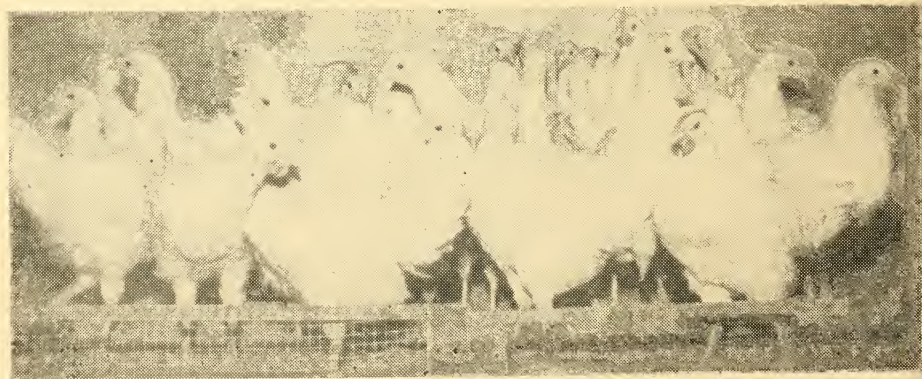


Figure 1B. Lot 2, Early Winter, 1944 Series; ration including kudzu leaf meal, no milk.



Figure 1C. Lot 3, Early Winter, 1944 Series; ration including kudzu meal and dried milk.



Figure 1D. Lot 4, Early Winter, 1944 Series; ration including kudzu meal, no milk.

Figure 1. Approximately one-half of the birds at the close of the November 27-December 29, 1944, feeding test. Little differences between lots is apparent, indicating that the rations containing kudzu were approximately as good as the ration containing alfalfa.

Series 1: Early Winter Feeding Period, November 27, 1943 to January 29, 1944

Table 3 gives the results secured for the first series of the experiment. Mortality during the first series of this experiment did not exceed 10 percent. The mortality was due to weak chicks and in most cases occurred during the first 2 weeks of the experiment. The chicks that died later were weak and did not gain at a normal rate of growth up to the time of their death. The chicks did not

exhibit definite symptoms of vitamin A or vitamin B₂ deficiencies, even though the chicks in lot 2 depended on the kudzu leaf meal and chicks in lot 4 depended on the kudzu meal to bring the ration up to the minimum requirements for normal growth. Both of these rations were void of milk.

There is not an outstanding difference existing in weight between lot 1 and lot 3 chicks for either males or females. Lot 2 and lot 4 are very close in weight of males and females. It should be noted that lot 2 has an unequal distribution of

Table 3. Results of early winter feeding test of kudzu products used in starting rations for chicks, November 27, 1943 to January 29, 1944

	Lot 1	Lot 2	Lot 3	Lot 4
	Alfalfa meal with milk	Kudzu leaf meal without milk	Kudzu meal with milk	Kudzu meal without milk
Number chicks started	40	40	40	40
Percent mortality	2.5	5.0	10.0	2.5
Number males	18	10	18	26
Number females	21	28	18	13
Average weight males, ozs.....	33.65	30.63	33.23	30.17
Average weight females, ozs.....	28.20	27.79	27.40	27.27
Average weight all sexes, ozs.....	30.77	28.54	30.32	29.21
Feed consumed per bird, lbs.....	6.13	5.63	6.02	6.05
Feed per pound of gain, lbs.....	3.19	3.10	3.12	3.64
Grades of birds at end of test:				
A	0	2	1	1
B	18	20	19	17
C	21	16	16	21
Rejects	0	0	0	0

sexes, in that there are 18 more females than males. This difference in sex ratio has influenced the final average in weight for this lot. The chicks in lot 4 were low for all lots even though the ratio of males to females was high.

Chicks fed the control ration were heavier by an average of 2.23 ounces than chicks on the kudzu leaf meal ration, 0.45 ounce heavier than chicks fed the kudzu meal and dried milk ration, and 1.56 ounces heavier than chicks fed the kudzu meal without milk ration, when averages for all sexes are considered.

There is very little difference in feed

consumed per bird or in feed required to produce a pound of gain. Lot 2 was low in total feed eaten by each bird, and lot 1 was high; however, the difference was only 0.50 pound. Feed required to produce one pound of gain was low for kudzu leaf meal ration, being 3.10 pounds, and high for the kudzu meal and no milk ration, being 3.64 pounds.

All of the birds in each of the lots of this series of the test were well pigmented. Only a small percentage of the chicks graded A, and the remaining grades were well divided between grade B and grade C.

Table 4. Results of summer feeding test of kudzu products used in starting rations for chicks, May 26 to July 20, 1944.

	Lot 1	Lot 2	Lot 3	Lot 4
	Alfalfa meal with milk	Kudzu leaf meal without milk	Kudzu meal with milk	Kudzu meal without milk
Number of chicks started	40	40	40	40
Percent mortality	2.5	0	2.5	5.0
Number males	21	20	17	20
Number females	18	20	22	18
Average weight males, ozs.....	28.39	26.86	27.40	27.65
Average weight females, ozs.....	23.03	22.41	22.80	21.99
Average weight all sexes, ozs.....	25.92	24.64	24.80	24.97
Feed consumed per bird, lbs.....	4.83	4.87	4.88	4.93
Feed per pound of gain, lbs.....	2.98	3.16	3.08	3.16
Grades of birds at end of test:				
A	1	0	0	1
B	8	12	10	20
C	30	28	29	16
Rejects	0	0	0	1

Series 2: Summer Feeding Period, May 26 To July 20, 1944

Mortality in the second series of this test, did not go above 5 percent, and then only in lot 4 where kudzu meal without milk was fed. As in the case of the first series of the experiment, mortality was due to weak chicks.

The ratio of males to females in the summer series of tests was well equalized. As to be expected, the weights for all lots were significantly lower than the first series fed the same rations during the

winter months. This was due to hot weather, which is unfavorable to chick growth. The males and females were slightly heavier in the control ration lot than in the kudzu lots. There is no significant difference existing in weights of males or females for the kudzu meal ration plus 3 percent milk, the kudzu leaf meal ration without milk, and the kudzu meal ration without milk.

During the summer test, there was little difference between lots in total feed consumed per bird and in the feed required to produce a pound of gain.

It should be noted that the birds during the summer test ate less feed than

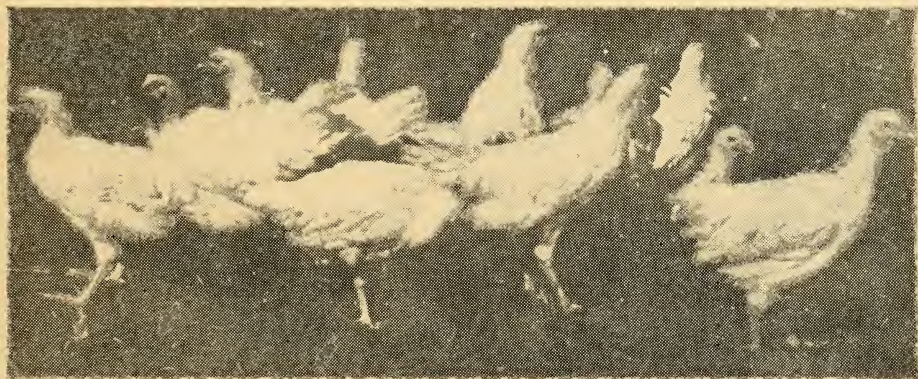


Figure 2A. Lot 1, Summer, 1944 Series; ration including alfalfa meal and dried milk.

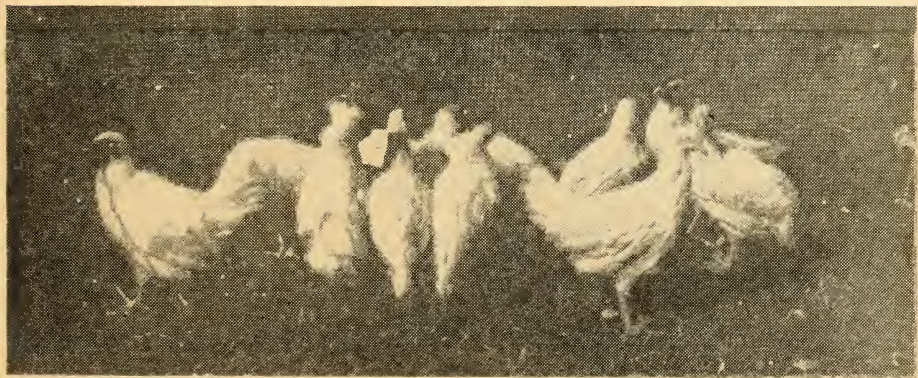


Figure 2B. Lot 2, Summer, 1944 Series; ration including kudzu leaf meal, no milk.

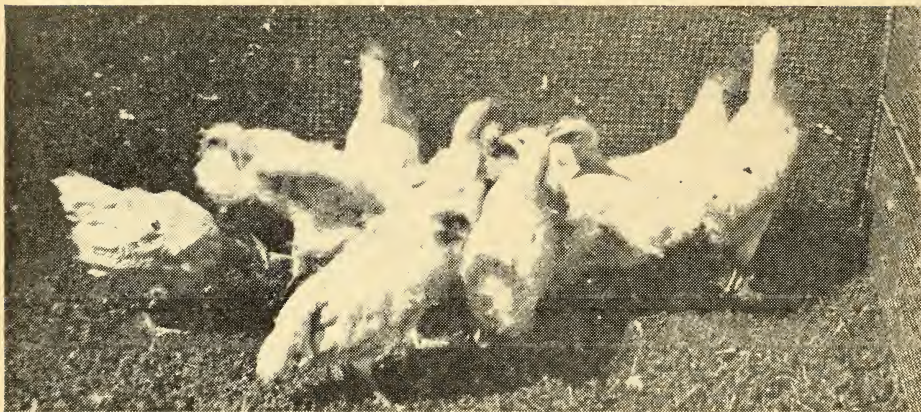


Figure 2C. Lot 3, Summer, 1944 Series; ration including kudzu meal and dried milk.

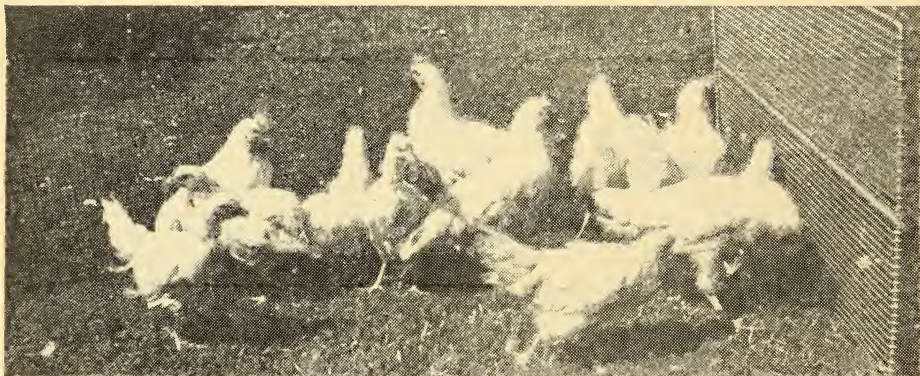


Figure 2D. Lot 4, Summer, 1944 Series; ration including kudzu meal, no milk.

Figure 2. Average males and females at the close of the May 26-July 20, 1944, feeding test. Although birds in all of the four lots of the summer series were inferior to birds produced in the early winter and late winter series, differences between the alfalfa ration and the kudzu ration chicks were small.

those during the winter months, though the cost per pound of gain is higher than series 1 or series 3. See table 4.

It is interesting to note that the majority of the birds completing the summer series of this experiment were graded C, with the exception of lot 4 which was equally divided between B and C. These chicks were well colored, but lacked finish and covering of the breast bone.

Series 3: Late Winter Feeding Period, December 12, 1944 To February 15, 1945

Table 5 presents a summary of the results for the third series of this test. Mortality in lots 3 and 4 was high with 5 percent each; one chick in lot 4, reported as mortality, disappeared between the second and third week of the test. The

Table 5. Results of late winter test of kudzu products used in starting rations for chicks, December 14, 1944 to February 15, 1945.

	Lot 1	Lot 2	Lot 3	Lot 4
	Alfalfa meal with milk	Kudzu leaf meal without milk	Kudzu meal with milk	Kudzu meal without milk
Number chicks started	40	40	40	40
Percent mortality	2.5	0	5.0	5.0
Number males	16	15	21	25
Number females	23	25	17	13
Average weight males, ozs.....	35.56	33.97	34.58	31.90
Average weight females, ozs.....	29.35	29.93	29.09	28.56
Average weight all sexes, ozs.....	31.89	31.44	32.15	30.76
Feed consumed per bird, lbs.....	6.38	6.43	6.77	6.24
Feed per pound of gain, lbs.....	3.06	3.26	3.31	3.25
Grades of birds at end of test:				
A	3	8	1	0
B	18	25	20	24
C	18	7	17	14
Rejects	0	0	0	0

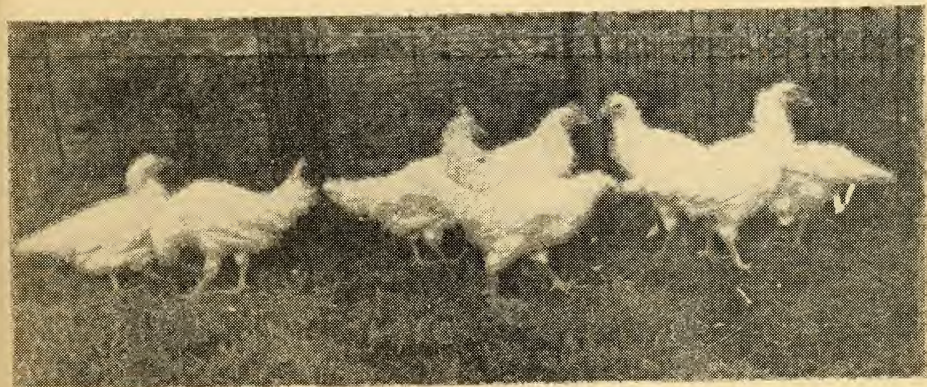


Figure 3A. Lot 1, Late Winter, 1945 Series; ration including alfalfa meal and dried milk.

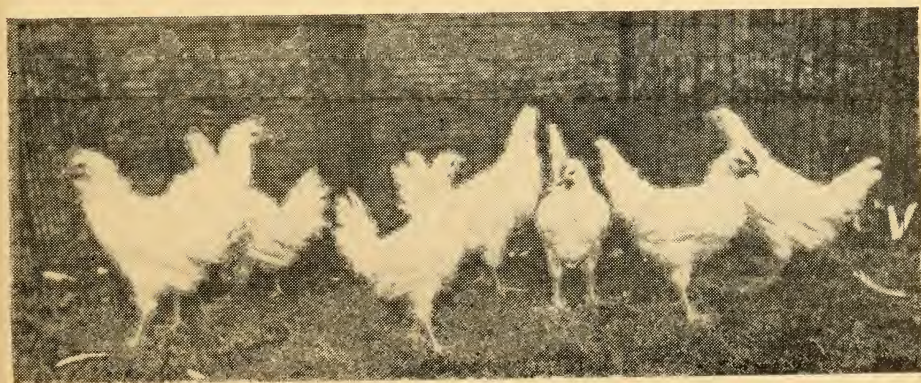


Figure 3B. Lot 2, Late Winter, 1945 Series; ration including kudzu leaf meal, no milk.

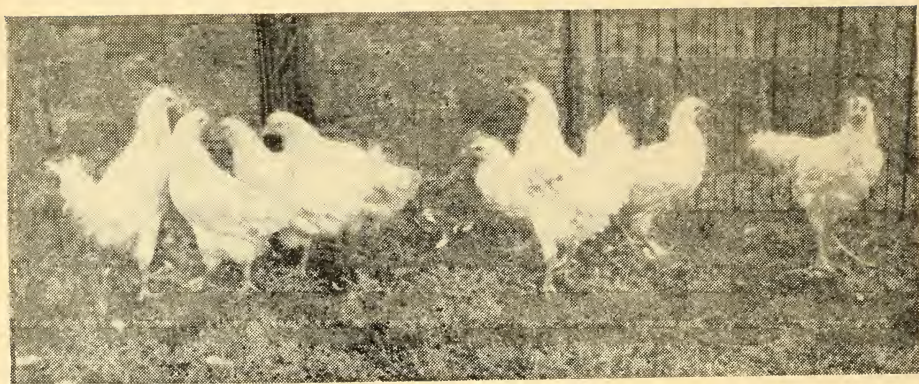


Figure 3C. Lot 3, Late Winter, 1945 Series; ration including kudzu meal and dried milk.

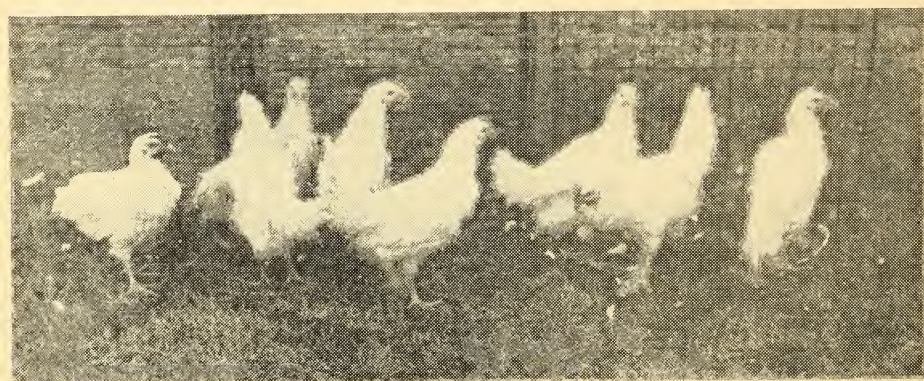


Figure 3D. Lot 4, Late Winter, 1945 Series; ration including kudzu meal, no milk.

Figure 3. Average males and females at the close of the December 12, 1944-February 11, 1945, feeding test. These were the best birds produced in the three feeding series, but, as in the case of the early winter and summer series, one ration appeared to be about as good as another.

mortality was due to weak chicks which died prior to the fourth week of the test.

The ratio of males and females was unequal in the kudzu leaf meal ration, there being 10 more females than males; and there were 12 more males than females in the kudzu meal ration without dried milk. Considering that males are usually heavier than females, an equalization of the sexes should increase the average weight of lot 2 and decrease the average weight of lot 4.

All weights of birds by rations were slightly heavier in this series of the test

than for the first series conducted under similar climatic conditions. The chicks on the kudzu meal and 3 percent milk ration led all other lots with an average weight at 9 weeks of 32.15 ounces. Relatively slight differences between chicks on alfalfa meal, kudzu leaf meal, and kudzu meal with milk are apparent in average weights. The chicks on the kudzu meal ration without dried milk were low in weight, with an average weight of 30.76 ounces.

From the standpoint of feed required to produce 1 pound of gain, the alfalfa

meal ration was low for this series with 3.06 pounds of feed required to produce 1 pound of gain. The greatest difference occurred when the alfalfa meal ration with milk and the kudzu meal ration with milk was used, this difference being 0.25 pound. The difference in the amounts of feed consumed per pound of gain in rations 2, 3, and 4 is not significant. These results indicate that alfalfa is slightly superior to kudzu in feed required to produce one pound of gain.

The kudzu leaf meal ration produced a higher percentage of grade A and grade B chicks than the other rations. There was not enough difference in grades between the alfalfa plus dried milk, kudzu meal plus dried milk, and kudzu meal without milk, to be significant. All rations produced chicks that were well pigmented, as was the case in series one and two.

Discussion

A summary of all series of this experiment is presented in table 6. The mortality did not exceed 5.83 percent for all rations used in this experiment. The principal cause of mortality was weak chicks, and such weak chicks in most cases died prior to the fourth week of the test.

Alfalfa meal and kudzu meal rations,

both with the addition of 3 percent dried milk, produced chicks which varied in final average weight by one-half ounce. There was a difference of only one-tenth of an ounce between the kudzu leaf meal ration and the kudzu meal ration void of dried milk. Statistically, there is no significant difference existing in weight between chicks fed on rations containing alfalfa meal 9 percent plus milk, kudzu leaf meal 9 percent less dried milk, kudzu meal 9 percent plus dried milk, and kudzu meal 10 percent less dried milk. The kudzu leaf meal ration was at a disadvantage since there were more females than males which averaged lighter. This was reversed in the kudzu meal ration without dried milk, where there were more males than females.

Feed required to produce 1 pound of gain was low in the ration carrying 9 percent alfalfa meal plus dried milk, being 3.10 pounds; and high in the ration carrying 10 percent kudzu meal without dried milk, the feed requirement being 3.30 pounds. The difference existing between rations 2, 3, and 4 is very close. These results indicate that alfalfa dehydrated is slightly more efficient than the kudzu leaf meal or kudzu meal with or without dried milk.

From the standpoint of pigment, health, feathering, and grades, the kudzu leaf

Table 6. Average results of three series of tests of kudzu products used in starting rations for chicks, 1944-1945.

	Lot 1	Lot 2	Lot 3	Lot 4
	Alfalfa meal with milk	Kudzu leaf meal without milk	Kudzu meal with milk	Kudzu meal without milk
Number chicks started	120	120	120	120
Average percent mortality	2.5	1.7	5.8	4.2
Number males	55	45	56	71
Number females	62	73	57	44
Average weight males, ozs.....	32.20	30.07	31.97	30.07
Average weight females, ozs.	27.16	27.05	26.13	25.49
Average weight all sexes, ozs.	29.53	28.20	29.02	28.31
Feed consumed per bird, lbs.....	5.78	5.64	5.89	5.74
Feed per pound of gain, lbs.....	3.10	3.20	3.25	3.30
Grades of birds at end of test;				
A	4	10	2	2
B	44	57	49	61
C	69	51	52	51
Rejects	0	0	0	1

meal, kudzu meal with dried milk, and kudzu meal without dried milk rations showed no apparent difference.

Throughout all series of this test no trouble was encountered from feather picking or cannibalism.

Conclusions

To supply an existing need for an ingredient in chick starter rations equivalent to alfalfa, which may be produced on or near most poultry farms in areas of Mississippi not adapted to alfalfa, the Poultry Department of the Mississippi Station conducted a series of tests with kudzu. Included in the study were chemical analyses, methods of harvesting and curing, and the feeding of three lots of chicks in early winter, late winter and summer series.

It was found that kudzu harvested by conventional farm methods yields hay and feeds of desired quality if exposure to the sun is short after cutting and the drying completed under shade. The method of drying is thought practicable for poultry producers; the hand-stripping method of securing leaves for kudzu leaf meal was for experimental purposes only.

Kudzu meal (ground kudzu hay) and kudzu leaf meal (ground air-dried kudzu leaves) compare favorably in chemical analyses with alfalfa meal and alfalfa leaf meal of good grade; these alfalfa products are accepted as standards of quality in the poultry feed industry.

Kudzu leaf meal dried by the process described in this experiment averaged 5,289.97 micrograms of riboflavin in 1 pound of feed and 128.96 micrograms of carotene in 1 gram of feed. Kudzu meal

averaged 3,413.21 micrograms of riboflavin in 1 pound and 81.58 micrograms of carotene in 1 gram.

Ration 1, including alfalfa at the rate of 9 percent plus 3 percent dried milk, produced chicks which averaged 29.53 ounces; ration 2, including kudzu leaf meal without dried milk, produced chicks which averaged 28.20 ounces; ration 3, including kudzu meal with 3 percent dried milk, produced chicks which averaged 29.02 ounces; and ration 4, including kudzu meal without milk, produced chicks which averaged 28.31 ounces.

Statistically, there is no significant difference in the final average weights of chicks grown in batteries up to 9 weeks of age when fed alfalfa meal, kudzu meal, or kudzu leaf meal at the rate of 9 percent.

Under the conditions of this experiment, kudzu products compared favorably to alfalfa meal from the standpoint of average chick weights, mortality, grade, and feed required to produce one pound of gain.

There was no apparent difference in health, pigment, feathering, and grades of chicks produced by the four rations tested.

Acknowledgment

Acknowledgments are made to Miss Laverne McWhirter, Home Economics Department, Mississippi Experiment Station, and to Walter J. Peterson, head of Nutrition Section, North Carolina State College, Raleigh, for making determinations of riboflavin; and to Dr. C. D. Smith, Mathematics Department, Mississippi State College, for statistical work.