

The Effect of Barley, Millet (*'n Yati- Pennisetum* sp.) and Lucerne Meal in Bacon Production.

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INTRODUCTION.

THE results of previous experiments (Romyn and others, 1930), have shown that from the producer's point of view a ration consisting of 90 per cent. maize and 10 per cent. meat meal proved most economical for bacon pigs. Baconers fed on this ration, however, tended to produce soft fat, and in some cases the back fat was too thick. The present trial was planned with the object of obtaining more information on the influence of a ration in which maize is partly substituted by a millet. Barley meal was again used to compare with work previously done (Schutte and Murray, 1931). Meat meal being an expensive protein ingredient, half the meat meal was substituted by 15 per cent. lucerne meal. Three rations was thus compared with the standard maize-meat meal ration. This trial was carried out at the School of Agriculture and Experiment Station, Potchefstroom.

MATERIALS AND METHODS.

On the 8th April, 1932, 40 pure bred Large White weaners were divided into four equal lots. The following rations were fed to the four lots, the proportions being by weight:—

Lot I.—Ground maize 90, meat meal 10.

Lot II.—Ground maize 80, meat meal 5, lucerne meal 15.

Lot III.—Ground maize 45, ground millet 45, meat meal 10.

Lot IV.—Ground maize 45, ground barley 45, meat meal 10.

To all the rations 5 per cent. of a mineral mixture consisting of 4 parts bone meal and 1 part salt was added. Equal quantities of green feed were given daily to each lot. The meal rations were fed twice daily in the form of a thick slop, the pigs receiving as much as they could clean up in about 30 minutes. The pigs were kept in dry $\frac{1}{4}$ -acre paddocks.

Individual weights were taken every week in the morning a few hours after the pigs had their food. When the proper weights had been reached the pigs were railed to the Farmers' Co-operative Bacon Factory, Estcourt, Natal, a distance of 415 miles, where they were killed a day after arrival and detailed data recorded on all carcasses.

The methods employed in the grading of the carcasses were described by Romyn and others (1930).

RESULTS.

In Table 1 the average weights, daily gains, and feed consumption of the pigs in the four lots are given:—

TABLE 1.

	Lot I.	Lot II.	Lot III.	Lot IV.
Number of pigs.....	10	10	10	10
Initial age—days.....	78·9	79·0	77·9	78·0
Final age—days.....	177·1	174·9	167·3	173·6
Days in experiment.....	98·2	95·9	89·4	95·6
Initial weight—lb.....	57·6	57·3	48·7	49·0
Final weight—lb.....	201·8	200·4	199·4	204·2
Total gain—lb.....	144·2	143·1	150·7	155·2
Average daily gain—lb.....	1·47	1·49	1·69	1·62
Total concentrates consumed—lb.....	4,570	4,700	4,679	5,086
Average daily food intake per pig—lb....	4·7	4·9	5·2	5·3
Food consumed per 100-lb. gain—lb....	316·9	328·4	310·5	327·7

The average weights and measurements and the grading of the carcasses are given in Table 2.

TABLE 2.

	Lot I.	Lot II.	Lot III.	Lot IV.
Farm live weight—lb.....	201.8	200.4	199.4	204.2
Factory live weight—lb.....	178.7	175.8	178.8	180.7
Percentage of farm weight.....	88.6	87.6	89.6	88.5
Dressed weight—lb.....	150.8	145.2	150.5	150.0
* Dressing percentage.....	74.7	72.4	75.4	73.5
Curing weight—lb.....	114.5	115.8	120.3	113.9
* Curing percentage.....	56.7	57.7	60.3	55.8
Thickness of back fat—				
Shoulder—cm.....	5.5	5.3	5.5	5.7
Flank—cm.....	2.7	2.6	3.1	2.8
Loin—cm.....	3.4	3.2	3.7	3.4
Average—cm.....	3.9	3.7	4.0	4.0
† Evenness—per cent.....	49.5	49.4	55.8	50.0
Thickness of belly—cm.....	2.9	2.8	3.2	3.3
Length of side—cm.....	76.8	76.2	75.0	75.1
Depth of side—cm.....	39.5	38.9	40.5	40.0
Circumference of ham—cm.....	59.0	58.6	59.6	58.7
Length of ham—cm.....	35.8	35.7	35.0	35.5
Ratio (C/L x 100)—per cent.....	164.9	164.3	170.5	165.6
Texture of back fat—				
Firm—per cent.....	90	90	100	100
Medium firm—per cent.....	10	10	—	—
Medium soft—per cent.....	—	—	—	—
Soft—per cent.....	—	—	—	—
Average refractive index at 40°C.....	1.4592	1.4593	1.4589	1.4588
Points awarded for—				
Length of side—per cent.....	82	78	75	79
Thickness of belly—per cent.....	70	60	82	80
Proportion of lean meat—per cent...	81	81	82	80
Proportion of fat—per cent.....	79	81	75	78
Uniformity of fat—per cent.....	84	82	81	82
Marbling of lean meat—per cent....	72	72	72	74
Plumpness of ham—per cent.....	79	73	82	80
Grading of sides—				
No. 1 lean sizeable—per cent.....	80	70	70	80
No. 2 lean sizeable—per cent.....	—	30	10	10
No. 1 medium—per cent.....	20	—	20	10

* The dressed and curing weights are expressed as percentages of the farm live weight.

† The thickness of the back fat at the flank (thinnest measurement) is expressed as a percentage of the thickness at the shoulder (thickest measurement).

DISCUSSION OF RESULTS.

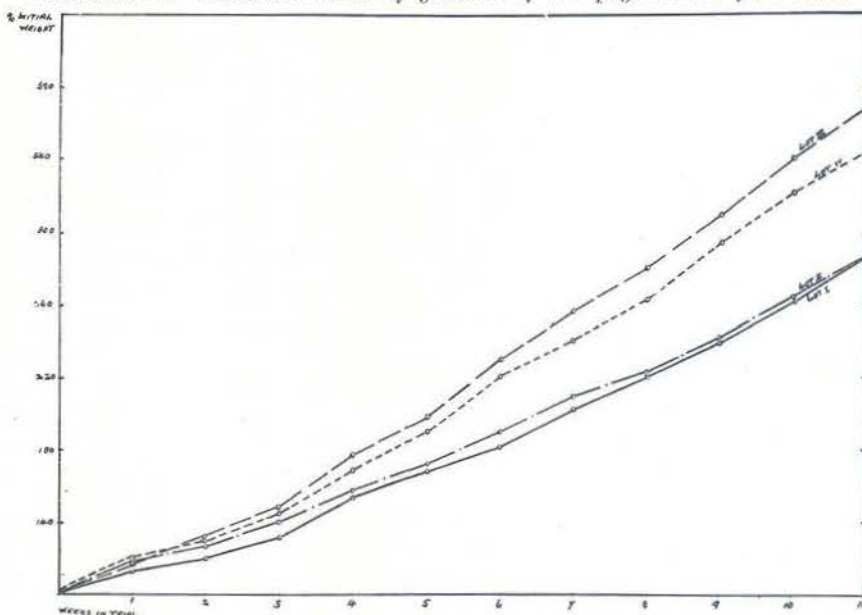
The pigs in the four lots made very good gains, those in Lots III and IV being somewhat better than those in the first two lots, which are practically the same. The pigs in the two lots that made the best gains, however, also consumed the largest amounts of food per day. Since the average initial weights of Lots III and IV were below that of the first two lots, the initial weights were taken as 100, and the subsequent weekly weights expressed as percentages thereof and the result is shown in diagram I. Lot I (maize-meat meal) remained behind from the start, whereas Lot II (maize, lucerne-meat meal) kept

fairly close to Lots III and IV for about three weeks and then remained about the same as Lot I for the rest of the trial. From the seventh week the difference between Lots III and IV did not change much.

Throughout the trial the pigs were healthy and had excellent appetites, which is also indicated by the average daily feed consumed per pig during the experimental period. There is not much difference between the four lots as regards the food consumed per unit gain.

The carcass weights and measurements do not show large differences and in most cases these are small and insignificant. The lucerne meal lot (II) has the lowest dressing percentage, but also the thinnest back fat. The pigs in this lot also have the thinnest bellies with those in Lot I only slightly thicker. The standard errors have been calculated for the average lengths of Lots I, III and IV to see whether the differences which were obtained are significant. The

DIAGRAM I.—*Relative rates of growth of the pigs in the four lots.*



results are: Lot I, 76.8 ± 0.95 cm.; Lot III, 75 ± 0.67 cm.; Lot IV, 75.1 ± 0.69 cm.; and the difference between Lots I and III is 1.8 ± 1.2 cm. and between Lots I and IV 1.7 ± 1.2 cm., both differences, therefore, being insignificant, so that the food had no direct or indirect effect on the length of the pigs. Schutte and Murray (1931), however, maintained "that barley exercises a favourable influence on length of side", but no standard errors were given and at the same time the barley fed lots were 9.3 and 10.4 lb. heavier than the maize-meal lot. The following are the standard errors of the mean lengths which they obtained: Lot I (maize-meal meal), 28.9 ± 0.29 in.; Lot II (45 maize, 45 barley, 10 meat meal), 29.6 ± 0.23 in.; Lot III (70 barley, 20 maize, 10 meat meal), 29.5 ± 0.25 in.; and the difference between Lots I and II is 0.7 ± 0.36

in., and between Lots I and III is 0.6 ± 0.38 in. In spite, therefore, that Lots II and III were heavier than Lot I, the differences were insignificant. The depth of the sides are in the same order as the thickness of the back fat, the fattest group also having the deepest sides, which agrees with Murray's results (1933). To get a measure of the plumpness of the ham the circumference has been expressed as a percentage of the length. The points awarded for the plumpness of the ham according to sight, follow the same sequence as regards the four lots, although the differences are not quite the same.

The firmness of the back fat, as determined by the refractive index, of all the lots is very good, that of Lots III and IV being firmer than that of Lots I and II. The average refractive index of Lot I (1.4592) is lower than the average (1.4595-1.4603) of all previous trials where the same ration was used. The same is the case with the barley lot (1.4588), since the averages of previous trials ranged from 1.4591-1.4595. In the previous trials the pigs that were used were the crosses of Large White, Large Black and Tamworth breeds. As reported by Kelly (1932) there is a difference in the firmness of the fat between different breeds and this may also be the case between types of the same breed. This aspect is very important for a country like South Africa, where the staple pig food consists of maize.

In spite of the rapid gains, the grading of the carcasses was very good. The carcasses were also very uniform. No lot has less than 70 per cent. No. 1 lean sizeable carcasses. Lot II has the largest percentage of inferior carcasses and this was caused by the thin bellies of these carcasses. The analysis made by Murray (1933) showed a positive correlation between rate of gain and thickness of back fat and that when pigs made very rapid gains the grading depreciated. The work was done with cross-bred pigs of the three breeds mentioned above. In the present trial the rapid gains did not have the adverse effect on the grading which one would have expected. In the mentioned analysis the optimum rate of gain for baconers appeared to be from 1.2 to 1.49 lb. per pig per day after the age of 10 weeks. It would therefore appear that for different types of pigs the optimum rate of gain, to get the best grading, is different.

Since there were only differences in the gains made by the pigs and no difference in carcase quality caused by the food, it will, therefore, depend on the prices whether one can use such ingredients as lucerne, millet or barley. As in previous trials the maize-meat meal ration was again the cheapest, being 2.37 pence per pound gain. The ration of Lot II was 2.41, Lot III 2.94 and Lot IV 2.66 pence per pound gain in live weight when the contract prices are taken which ruled when the trial was started. The contract prices per 100 lb. food were: maize 5s. 4d., millet 9s., barley 6s. 6d., meat meal 11s., lucerne meal 6s. 6d. When prices as given above are ruling for the foodstuffs then the best return in bacon production is realised by using the cheap maize-meat meal ration.

SUMMARY.

Three rations were compared with the standard maize-meat meal ration when fed to baconers. Excellent gains were made on all the rations, the pigs on the millet and barley rations, however, making

the best gains, but these lots also consumed the largest amounts of food daily. The difference in rate of growth slightly influenced the degree of fatness of the pigs, otherwise there were no significant differences in the carcass measurements of the pigs in the four lots. The fat appeared to be firmer than that of pigs of previous trials which had similar rations. Type of pig may have caused this difference. The grading was good and the rate of gain had no adverse influence, so that it appears that different types of pigs have different optimum growth rates for the production of first grade bacon. The standard maize-meat meal ration again proved to be the most economical in bacon production.

ACKNOWLEDGMENT.

Grateful acknowledgment is due to Mr. D. J. R. van Wyk, M.Sc., of the Division of Chemistry, for his technical assistance in connection with the refractive index determinations, and to the management of the Farmers' Co-operative Bacon Factory, Estcourt, for placing the facilities which their factory affords to the disposal of this Division for experimental purposes.

REFERENCES.

- KELLY, R. B. (1932). The Pig Industry. *Commonwealth of Australia, Pamphlet No. 28*, pp. 43.
- MURRAY, G. N. (1933). A statistical analysis of growth and carcass measurements of baconers. Typed Mss.
- ROMYN, A. E., BONSMAN, F. N., MURRAY, C. A. AND MURRAY, G. N. (1930). Investigations into the production of bacon. *16th Report of the Dir. Vety. Serv. and Anim. Indust., Union of S.A.*, pp. 503-522.
- SCHUTTE, D. J. AND MURRAY, C. A. (1931). The effect of barley in the ration on the quality of bacon. *17th Rept. Dir. Vety. Serv. and Anim. Indust., U. of S.A.*, pp. 813-818.