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FACTORS AFFECTING THE QUALITY OF PREPACKED BACON - INTERIM REPORT

by H. B. Hawley

Introduction.

In view of the work of Bate-Smith (1948), Callow (1936-1949), Gibbons & Rose (1950), Madson (1943) and Wismer-Pedersen (1959), on the various effects of feeding sugar to bacon pigs prior to slaughter, it was decided to carry out a large scale factory trial to investigate the effect of such pre-treatment on the quality and shelf-life of prepacked sliced bacon.

It seemed reasonable to assume from the comprehensive data published that the appearance, palatability and shelf-life of prepacked sliced bacon might be improved if the pigs were fed and rested before slaughter.

Two preliminary trials made at a West Country bacon factory had amply confirmed the effect of sugar feeding on post-mortem pH and the present experiments were designed in collaboration with Dr. Ingram and Mr. Gatherum of the Low Temperature Research Station, Cambridge. These experiments were carried out at another bacon factory with facilities for the vacuum-packaging of sliced bacon. In this connection it must be emphasised that, apart from the pre-feeding of the experimental pigs, the slaughter and processing were carried out under normal bacon factory conditions and no special hygienic precautions were introduced for experimental purposes. The prepacked slices were held at atmospheric temperatures for storage tests and the shelf-life of all the experimental packs can be regarded as that existing under adverse conditions.

Each week for sixteen weeks, six pigs were weighed and provided with 2 lbs. of sugar and 1 lb. of meal in the late afternoon. Six control pigs were weighed but were given no food. All twelve pigs were supplied with adequate drinking water. The twelve pigs were slaughtered on the following morning and the hot carcases, livers and sides were weighed. The cold sides and livers were weighed after over-night cooling in the chill-room, and pH-measurements were made on selected muscles. The sides were trimmed, and weighed before and after pumping, and were then placed in the cover brine for 5 days. Fresh brine was made up for the experiment; the sugar-fed and control sides were kept in separate tanks and the two pickles were kept separate throughout this work. The sides were weighed when they were taken out of the pickle and were matured for 14 days; the two sets of sides were stacked separately during maturation and were weighed at the end of that time. The matured sides were smoked and weighed.

Every fifth week during the experiment, slices of bacon from all of the sides smoked during that week were vacuum-packed and despatched to Yeovil. The freshly-packed bacon from the sugar-fed and control pigs was compared for flavour and appearance by a tasting panel drawn from the office, factory and laboratory staffs. Additional packs were held at atmospheric temperature and were re-examined by the panel after storage for 1, 2 and 3 weeks in order to assess the shelf-life.

Chemical and bacteriological examinations were made of the brines at weekly intervals and of the freshly-packed bacon samples. The stored bacon samples were examined for bacteriological condition and pH at or about the end of their shelf-life.

EXPERIMENTAL METHODS.

FEEDING. Each week for seventeen weeks six pigs were weighed and provided with 2 lbs. of sugar and 1 lb. of meal in the late afternoon. Six control pigs were weighed but were given no food, and all twelve pigs were supplied with drinking water. The first week was used as a trial run, but the results obtained are included in this report.

SLAUGHTER. The twelve pigs were slaughtered the following morning after electrical stunning, and the hot carcases, sides and livers were weighed. The cold sides and livers were weighed after chilling over-night in the cold room, and pH measurements were made on the psoas and longissimus muscles of each side.

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CURING. The sides were trimmed and weighed before and after pumping, the bladebone pockets packed with salt and salt sprinkled over the sides, and placed in cover brine for 5 days.

BRINE. Sufficient brine was prepared for the whole experiment. The sugar-fed and control sides were cured in separate tanks and the brines were kept separate throughout the experiment. Samples were examined before the trial run was started and after the first batch of sides had been removed from the tank. The used pickle was then thoroughly mixed with the corresponding storage brine and this mixture used for the next batch of sides. This procedure was followed throughout the experiment, samples of brine being taken at the beginning and end of each batch.

MATURATION. The sides were weighed after removal from the pickle, stacked separately for 14 days and re-weighed.

SMOKING. The sides were smoked for 24 hours, allowed to cool, and weighed.

SLICING AND PACKING. One vacuum pack of short-back slices was prepared from each side of bacon from the trial run and four packs from each side from Batches 1, 5, 10, 13 and 16. The bacon from the trial run was submitted to a tasting panel on the day after packing. The sliced packed bacon from the other batches was examined by the panel on the day after packing, and after storage at room temperature for periods of one, two and three weeks.

METHODS OF EXAMINATION

MUSCLE - pH. 2 g. of muscle were macerated in 10 ml. of distilled water and the pH determined electrometrically with a glass electrode.

ORGANOLEPTIC EXAMINATION. Four tasting panels, each consisting of four members, were used for the organoleptic examination of the bacon on the day after it was packed. Each panel was presented with three pairs of samples of the grilled bacon, each pair consisting of one sugar-fed and one control rasher, and asked to indicate their preference for flavour. The panel then inspected the uncooked slices and indicated their preference for appearance of the bacon.

The shelf-life of the bacon packs was estimated in the following manner. Three unopened packs of each sample of sliced bacon were stored at room temperature. One complete set was examined by a sub-panel at weekly intervals and any samples which were obviously unacceptable, by reason of their odour or appearance, were regarded as being at the end of their shelf-life and were discarded. The remainder of the samples in the set were grilled and presented to the tasting panels to decide whether they were edible or were no longer acceptable.

CHEMICAL ANALYSIS OF BACON. The samples were prepared by removing the rind, mincing the bacon three times and thoroughly mixing.

MOISTURE. 5 g. were dried on sand to constant weight at 100°C.

pH. 2 g. were macerated with 10 ml. distilled water and the pH determined electrometrically with a glass electrode.

NITRATE. 10 g. were extracted with boiling water, made up to 200 ml. and filtered. Nitrate was determined on a 40 ml. aliquot of the extract by the xylenol method (British Food Manufacturing Industries Research Association (B.F.M.I.R.A.), Food Research Reports, Nos. 40 & 42, 1941).

SALT. A 20 ml. aliquot of the extract prepared for the nitrate determination was titrated with 0.1 N silver nitrate, using potassium chromate as indicator. 18

NITRITE. 5 g. were used for nitrite determination by the B.F.M.I.R.A. modification of the Griess-Ilosvay method.

CHEMICAL ANALYSIS OF BRINE.

NITRATE, NITRITE and SALT were determined as for bacon.

pH. Electrometric determination with a glass electrode.

ALLUMINOID NITROGEN. To 20 ml. of brine were added 20 ml. of 24% trichloracetic acid, and the precipitate was filtered off and washed with the reagent. The nitrogen content of the precipitate was determined by the Kjeldahl method.

BACTERIOLOGICAL EXAMINATION OF BACON. One slice was removed aseptically from each pack and transferred to a weighed sterile petri dish, which was then re-weighed to obtain the weight of the bacon. The slice was transferred aseptically to a blood transfusion bottle which contained 300 ml. of sterile 4.5% saline and 100 g. sterile acid-washed sand. The bottle was shaken vigorously for 3 minutes and allowed to settle for 30 seconds, when 1 ml. was removed and decimal dilutions prepared in 4.5% saline.

Colony counts were made by pipetting 0.1 ml. of a suitable dilution onto the surface of a 4.5% salt pork extract agar plate which had been dried over-night at 37°C. (Jespersen & Riemann. Proceedings of 2nd Intern. Symposium on Food Microbiology. April 1957. Page 177). The fluid was spread by means of a sterile glass spreader and the colonies counted after incubation at 26°C. for 15 days. Yeast and mould counts were made from suitable dilutions on wort agar after incubation at 22°C. for 5 days.

BACTERIOLOGICAL EXAMINATION OF BRINE.

1. Dilutions were made in 10% saline, plated on 10% salt nutrient agar and colonies counted after incubation at 26°C. for 5 days.
2. Dilutions were made in 20% saline, plated on 20% salt pork extract agar and colonies counted after incubation at 26°C. for 15 days.
3. A total microscopic count was made on the diluted brine in a standard counting chamber, using phase contrast illumination. The proportion of cocci to rods was noted during the course of the microscopic count.

RESULTS AND DISCUSSION.

EFFECT OF FEEDING ON YIELD OF BACON AND LIVER WEIGHT. A comparison of pig, bacon and liver weights at the various stages of production is given in Table 1, from which it will be noted that feeding has no definite effect other than to increase the liver weight by about 1 lb.

TABLE 1. COMPARISON OF WEIGHTS AT VARIOUS STAGES OF BACON PRODUCTION

Averages for 102 sugar-fed and 102 control pigs. All weights are expressed as pounds and decimals of pounds.

	SUGAR-FED	CONTROL
Live weight	199.9	200.8
Hot carcase weight	157.9	158.0
Calculated cold carcase	154.0	154.0
Hot sides	143.2	143.1
Cold sides	140.2	140.0
Hot liver	4.21	3.24
Cold liver	4.12	3.16
Sides before pumping	121.7	121.6
Sides after pumping	128.2	127.9
Sides out of pickle	127.4	127.4
Sides out of mature	124.5	124.6
Sides out of smoke	122.2	122.0
% yield $\frac{\text{Out of mature}}{\text{Cold carcase}}$ x100	80.8	80.9
% yield $\frac{\text{Out of smoke}}{\text{Hot sides}}$ x100	85.3	85.2

The weekly averages for yield and for liver weights are given in Table 2.

TABLE 2. WEEKLY AVERAGES FOR YIELD AND LIVER WEIGHT

BATCH NO.	% YIELD OUT OF MATURE COLD CARCASE x100		% YIELD OUT OF SMOKE HOT SIDES x100		% LIVER COLD LIVER COLD CARCASE x100	
	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL
TRIAL	82.0	81.0	86.5	86.1	2.50	1.84
1	80.9	81.3	85.6	85.8	2.60	2.01
2	79.1	81.0	84.1	84.9	2.64	1.83
3	80.0	79.8	85.9	85.8	2.74	2.10
4	81.2	81.3	85.7	85.4	2.56	1.87
5	81.8	81.7	86.4	86.4	2.76	1.88
6	82.6	81.3	86.8	86.0	2.65	1.89
7	80.0	81.7	85.8	86.0	2.13	1.74
8	80.7	79.8	85.2	84.2	-	-
9	81.1	81.1	85.0	85.2	2.58	2.23
10	79.9	80.4	84.2	83.6	2.74	2.16
11	80.9	80.8	86.1	85.8	2.67	2.21
12	81.0	81.6	85.3	85.6	2.78	2.14
13	79.8	80.9	83.6	84.9	2.99	2.28
14	80.9	80.6	85.3	84.9	2.68	2.16
15	81.0	81.0	85.0	84.5	3.14	2.30
16	81.1	79.7	84.1	84.3	2.75	2.38
AVERAGE	80.8	80.9	85.3	85.2	2.68	2.06

EFFECT OF FEEDING ON THE pH OF MEAT

The distribution of pH values for the meat is given in Table 3 for 204 sides from 102 sugar-fed and 204 sides from 102 control animals.

TABLE 3 DISTRIBUTION OF pH VALUES OF MEAT

pH	PSOAS		LONGISSIMUS	
	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL
6.6	0	1	0	0
6.5	0	1	0	2
6.4	2	3	0	0
6.3	0	6	2	3
6.2	0	10	1	4
6.1	0	12	0	15
6.0	3	20	3	15
5.9	6	18	1	12
5.8	10	17	4	12
5.7	20	27	12	21
5.6	27	36	30	34
5.5	57	25	53	43
5.4	46	20	67	32
5.3	22	8	26	8
5.2	10	0	4	2
5.1	1	0	1	1
Mean pH	5.50	5.75	5.47	5.66

Comparison of mean values shows that sugar-feeding caused a fall in pH of about 0.2 unit. Very few of the sugar-fed samples had pH values in excess of 6.0, but an appreciable proportion of the control samples had values above this level.

FIGURES I & II. illustrates the data from Table 3 in the form of a histogram. Since this showed some evidence of a dual peak or inflection in the pH of the controls, the data was re-analysed on the basis of sex in Table 4 and illustrated as histograms in Figures 3 and 4. Although there are sex differences which are no doubt accounted for by the greater activity of hogs this obviously does not explain the inflections.

The weekly averages given in Table 5 show appreciable variations from week to week both in the sugar-fed pigs and controls. As mentioned by previous workers these variations are no doubt related to fluctuations in ambient temperature.

FIGURE I

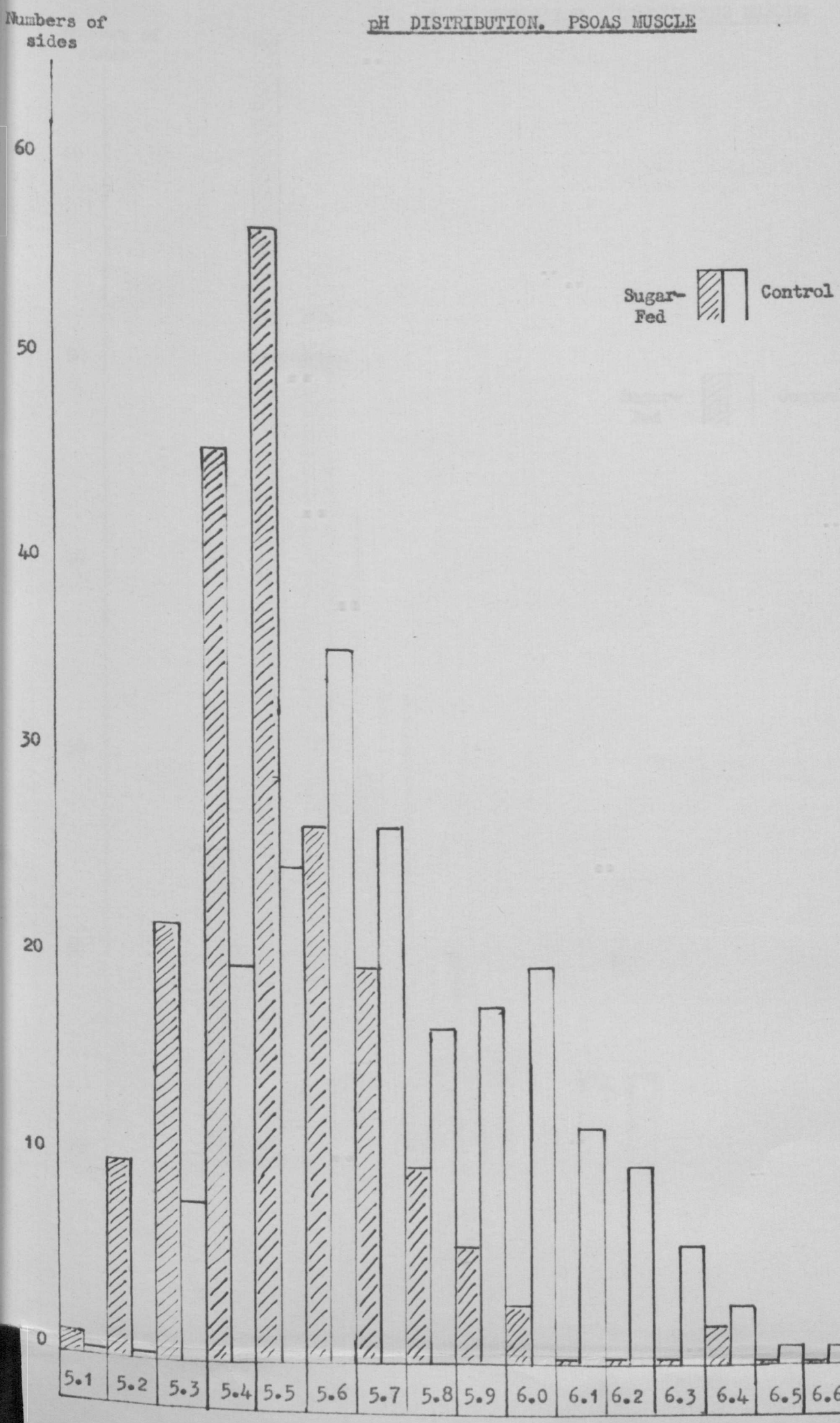
pH DISTRIBUTION. PSOAS MUSCLE
Numbers of sides
Sugar-Fed
Control
60
50
40
30
20
10
0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0
6.1
6.2
6.3
6.4
6.5
6.6
pH

FIGURE II

pH DISTRIBUTION. LONGISSIMUS MUSCLE

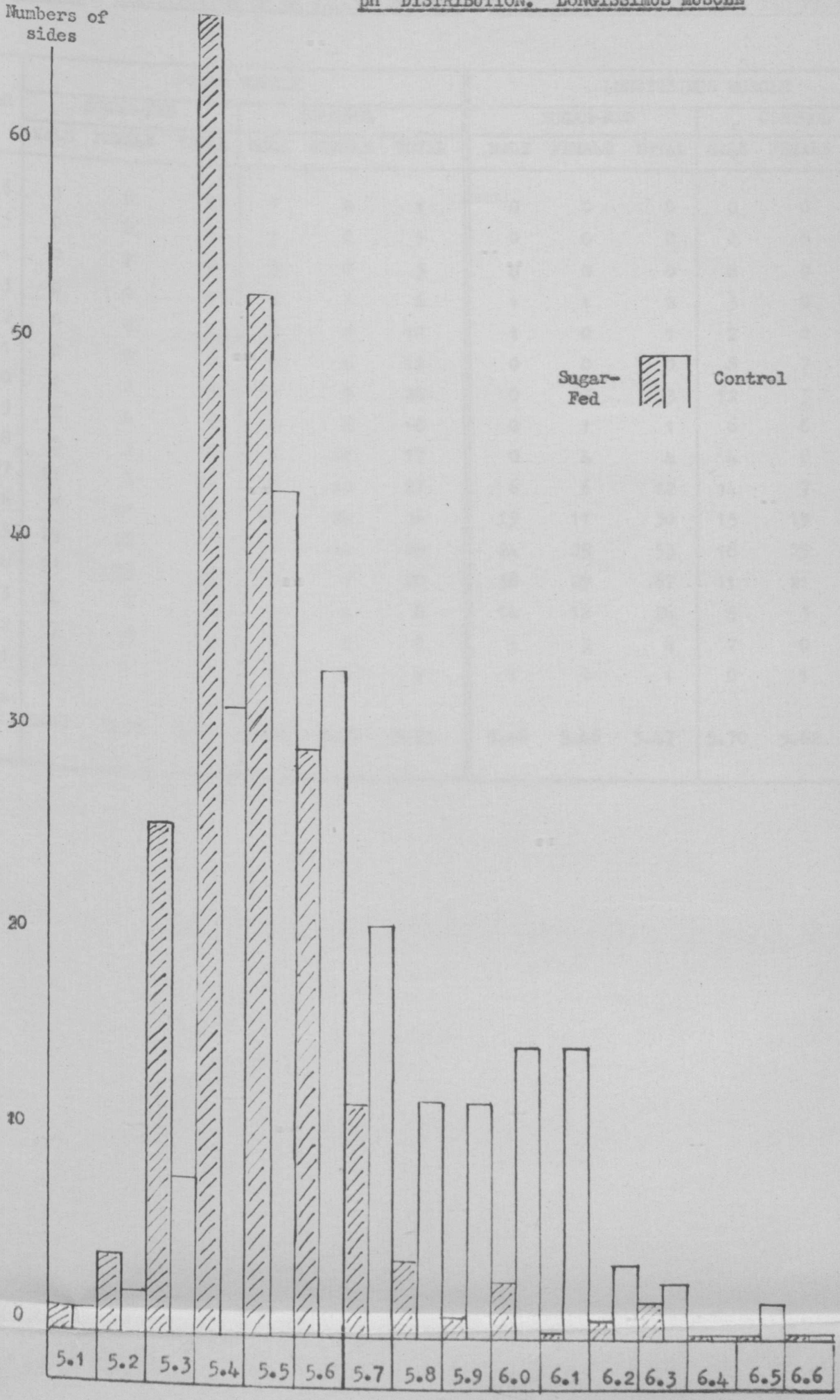

TABLE 4 DISTRIBUTION OF pH VALUES OF MEAT DIFFERENTIATION INTO MALE AND FEMALE PIGS

pH	PSOAS MUSCLE						LONGISSIMUS MUSCLE					
	SUGAR-FED			CONTROL			SUGAR-FED			CONTROL		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
6.6	0	0	0	1	0	1	0	0	0	0	0	0
6.5	0	0	0	1	0	1	0	0	0	2	0	2
6.4	0	2	2	3	0	3	0	0	0	0	0	0
6.3	0	0	0	3	3	6	1	1	2	3	0	3
6.2	0	0	0	8	2	10	1	0	1	2	2	4
6.1	0	0	0	6	6	12	0	0	0	8	7	15
6.0	1	2	3	11	9	20	0	3	3	12	3	15
5.9	2	4	6	10	8	18	0	1	1	6	6	12
5.8	5	5	10	6	11	17	0	4	4	4	8	12
5.7	11	9	20	12	15	27	6	6	12	14	7	21
5.6	8	19	27	12	24	36	19	11	30	15	19	34
5.5	29	28	57	11	14	25	24	29	53	18	25	43
5.4	23	23	46	13	7	20	38	29	67	11	21	32
5.3	14	8	22	4	4	8	14	12	26	5	3	8
5.2	7	3	10	0	0	0	1	3	4	2	0	2
5.1	0	1	1	0	0	0	1	0	1	0	1	1
Mean pH	5.47	5.55	5.51	5.78	5.72	5.75	5.48	5.46	5.47	5.70	5.62	5.66

FIGURE III pH DISTRIBUTION PSOAS MUSCLE COMPARISON OF MALE AND FEMALE PIGS

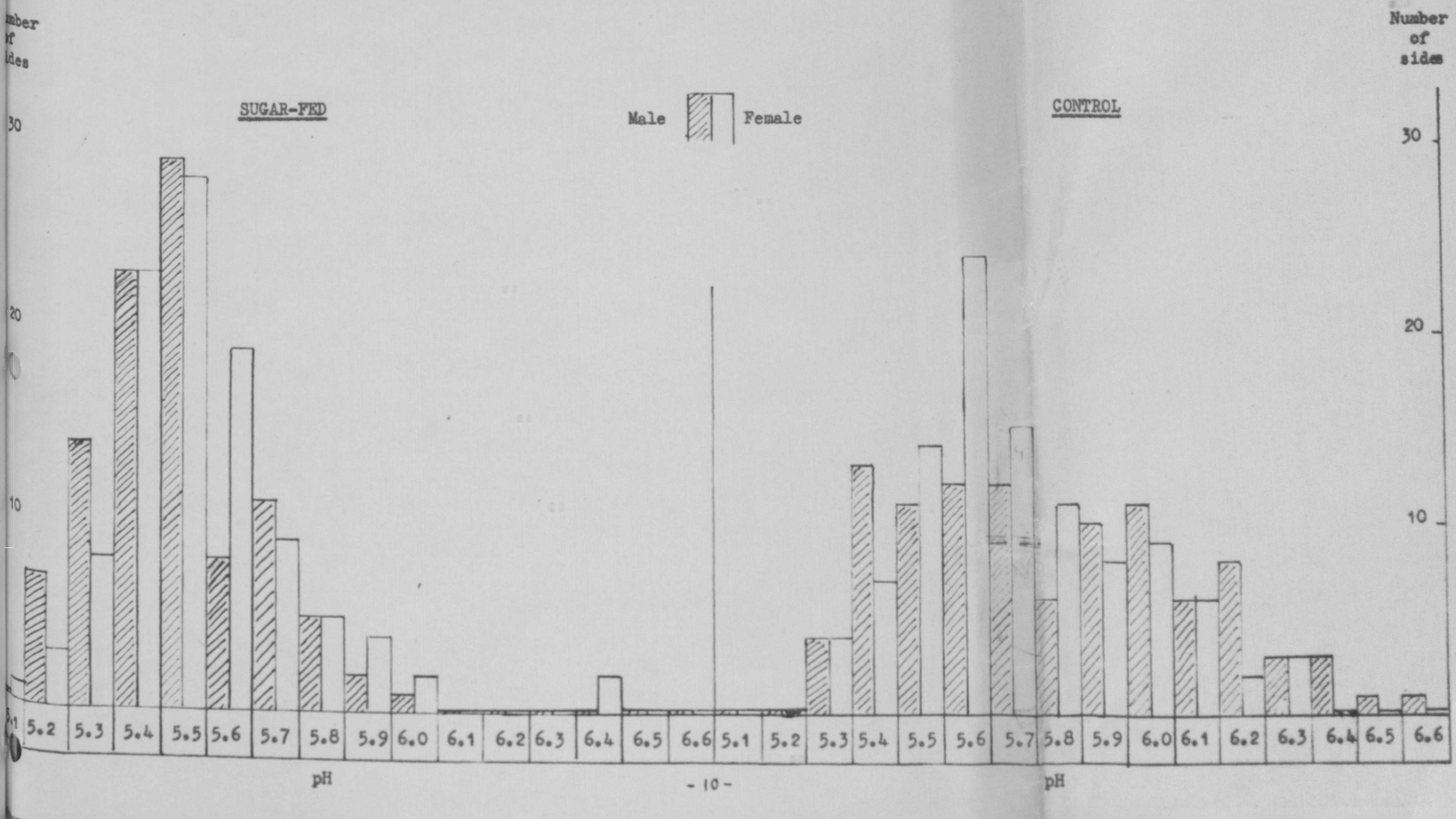

FIGURE IV pH DISTRIBUTION LONGISSIMUS MUSCLE COMPARISON OF MALE AND FEMALE PIGS

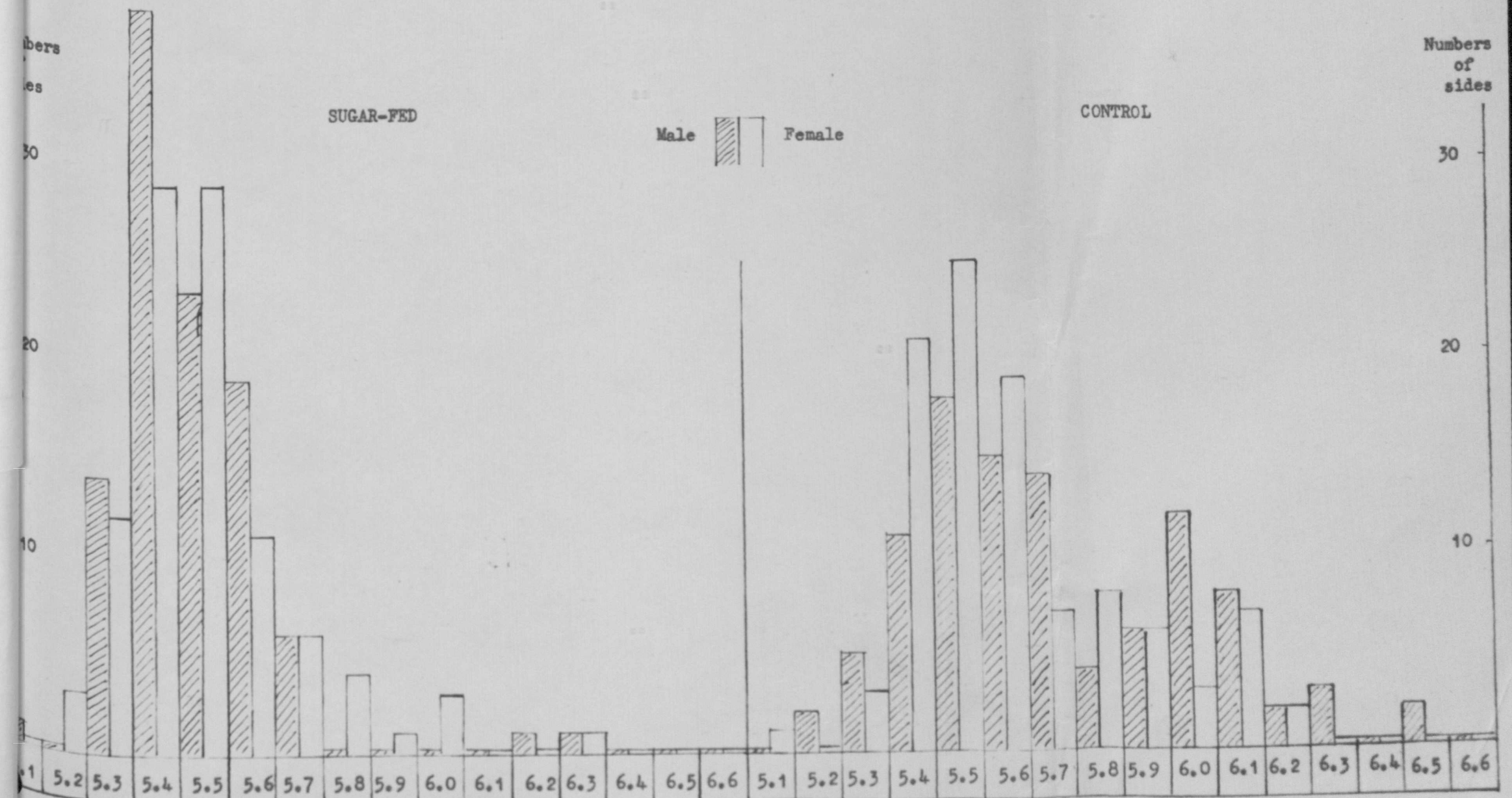

TABLE 5 WEEKLY AVERAGES FOR THE pH OF MEAT

BATCH NO.	PSOAS		LONGISSIMUS	
	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL
TRIAL	5.60	5.83	5.61	5.86
1	5.64	5.83	5.55	5.88
2	5.32	5.91	5.33	5.75
3	5.43	5.50	5.30	5.34
4	5.46	5.94	5.44	5.86
5	5.48	5.96	5.50	5.88
6	5.50	5.63	5.45	5.64
7	5.45	5.99	5.38	5.79
8	5.60	5.79	5.58	5.62
9	5.44	5.61	5.45	5.50
10	5.56	5.66	5.57	5.62
11	5.41	5.67	5.42	5.55
12	5.64	5.64	5.64	5.58
13	5.42	5.95	5.40	5.84
14	5.38	5.61	5.48	5.57
15	5.58	5.56	5.43	5.44
16	5.57	5.73	5.45	5.49
AVERAGE	5.50	5.75	5.47	5.66

EFFECT OF FEEDING ON THE QUALITY OF BACON

The samples were grilled and submitted to the tasting panels. The results are expressed in Table 6 as the percentage preferences for each batch.

TABLE 6 RESULTS OF TASTING TESTS ON BACON

BATCH NO.	SUGAR-FED	CONTROL	NO PREFERENCE
TRIAL	56.2	27.1	16.7
1	48.0	45.8	6.2
5	33.3	50.0	16.7
10	41.7	50.0	8.3
13	43.7	31.3	25.0
16	50.0	31.3	18.7
AVERAGE	45.5	39.2	15.3

A slight preference for the sugar-fed bacon appeared to exist, but the general opinion of the panels was that there was no marked difference between the two sets of samples.

TABLE 7 PERCENTAGE PREFERENCES FOR APPEARANCE OF BACON

BATCH NO.	SUGAR-FED	CONTROL	NO PREFERENCE
TRIAL	60.4	37.5	2.1
1	35.4	47.9	16.7
5	47.9	45.9	6.2
10	54.1	41.7	4.2
13	64.6	35.4	0
16	47.9	47.9	4.2
AVERAGE	51.7	42.7	5.6

There was a general preference for the appearance of the sugar-fed bacon on the score of better colour, although this preference was reversed in the case of Batch 1. In the earlier batches the hams from the control animals were of glassy appearance while those from the sugar-fed pigs were of good colour and appearance. When the concentration of nitrite in the control brine had attained a level in excess of 1,000 p.p.m. the appearance of the corresponding hams improved and was equal to that of the sugar-fed hams.

The samples were stored at room temperature and examined at weekly intervals until they were no longer edible.

TABLE 8 STORAGE TESTS ON PRE-PACKED SLICED BACON

Numbers of samples which were edible for the following storage periods.

Batch No.	Storage Temp. °F	Less than 1 week		1-2 weeks		> 2-3 weeks		Greater than 3	
		Sugar-Fed	Control	Sugar-Fed	Control	Sugar-Fed	Control	Sugar-Fed	Control
1	56-66	2	0	6	3	3	8	1	1
5	61-68	0	0	7	3	5	9	0	0
10	64-71	0	0	10	8	2	4	0	0
13	65-76	2	0	8	6	2	6	0	0
16	66-75	2	6	7	3	3	3	0	0
	TOTAL	6	6	38	23	15	30	1	1

TABLE 9 STORAGE TESTS ON PRE-PACKED SLICED BACON

Percentage of samples which were edible for the following storage periods.

	SUGAR-FED	CONTROL
Greater than 1 week.	90.0	90.0
Greater than 2 weeks.	26.7	51.7
Greater than 3 weeks.	1.7	1.7

The keeping quality of the bacon prepared from the sugar-fed pigs was inferior to that prepared from the control animals in spite of the fact that a decrease in the pH of the sides had been achieved by pre-feeding. There was no obvious connection between the bacterial counts on the bacon and its keeping quality either immediately after packing or at the end of its shelf-life, and it is apparent that the types of organisms were more important than the grossnumbers which were capable of growth on the media employed. Most of the samples developed a sour flavour and in only a few cases were fishy odours or flavours present after storage. In some cases appreciable numbers of yeasts developed during storage but poor keeping quality was not invariably associated with such development.

TABLE 11 COMPARISON OF CHEMICAL COMPOSITION OF SLICED BACON FROM SUGAR-FED AND CONTROL PIGS. (BATCH AVERAGES)

BATCH	% MOISTURE		% SALT		NITRITE p.p.m.		% NITRATE		pH	
	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL
1	34.97	36.06	3.01	2.92	56	86	0.169	0.181	5.74	5.74
5	35.18	35.02	3.00	2.97	59	89	0.146	0.151	5.79	6.03
10	39.00	39.40	3.49	3.57	128	167	0.128	0.132	5.86	5.87
13	39.00	34.70	3.00	2.98	112	204	0.066	0.069	6.04	6.24
16	32.50	33.60	3.07	3.39	172	454	0.055	0.039	5.69	5.80
MEAN	36.13	35.76	3.11	3.17	105	200	0.113	0.114	5.82	5.94

TABLE 12 COMPARISON OF COLONY COUNT OF SLICED BACON FROM SUGAR-FED AND CONTROL PIGS. (BATCH AVERAGES)

BATCH	COLONY COUNT x 10^5 per g.	
	SUGAR-FED	CONTROL
1	19.7	21.7
5	1.3	52.1
10	49.5	49.9
13	145.4	155.2
16	15.5	86.7
MEAN	46.3	73.1

EFFECT OF FEEDING ON THE CHEMICAL COMPOSITION AND BACTERIOLOGICAL QUALITY OF THE COVER BRINE

The results are shown in Table 10. During the first eight weeks the production of nitrite was more rapid in the sugar-fed brine than in the control, but thereafter there was little difference. Apart from this there were no major differences between the two brines.

EFFECT OF FEEDING ON THE CHEMICAL COMPOSITION AND BACTERIOLOGICAL QUALITY OF THE PRE-PACKED SLICED BACON

The results are summarised in Table 11. There are very slight differences in moisture contents and pH between the bacon from the sugar-fed and control pigs but the significance of these, if any, is not yet known since the statistical analysis have to be completed. The same also applies to the differences in bacteriological counts, but it is perhaps noteworthy that they are in the expected direction. The only noteworthy differences are nitrite content of the bacon which from the sugar-fed pigs is about half that of the controls.

SUMMARY

Although the lower post-mortem pH of the muscles of sugar-fed pigs and the increase of liver-weight are in accord with previously recorded observations, the keeping quality of the pre-sliced packaged bacon contrary to expectation was inferior to that of the controls. The yields were unaffected as a result of sugar-feeding.

The tasting panels showed a slight preference for the appearance and flavour of the freshly manufactured bacon from the sugar-fed pigs, but during storage at room temperature the flavour preference was reversed and the controls outlasted the experimental bacon.

These differences do not appear to be related to the analytical composition of the cover-brine since the only differences were a more rapid development of nitrite in the cover-brines from the experimental sides. Rather unexpectedly the experimental bacon had on average only about half the nitrite content of the controls. Differences in the moisture, salt, nitrate contents, pH and bacteriological counts were slight and are of doubtful significance.

In conclusion, it must be emphasised that these comments must be accepted with some reserve since a detailed statistical analysis of all the data is not yet complete, nor has it been possible in the short time available since the conclusion of the experiment to present in detail all the data obtained. The full results will be published elsewhere in due course.

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25.8.60.

TABLE 10. COMPARISON OF COVER-BRINES USED FOR SUGAR-FED AND CONTROL PIGS.

WEEK	BATCH NO.		NITRITE, p.p.m.		SALT, %		NITRATE, %		ALBUMINOID N, p.p.m.		pH		COLONY COUNT (1) x10⁶		COLONY COUNT (2) x10⁶		TOTAL MICROSCOPIC COUNT x10⁶		RATIO COCCI TO RODS C/R	
			SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL	SUGAR-FED	CONTROL
0	Dummy run	Sides in	36	38	24.0	24.3	2.26	2.19	-	-	8.26	8.26	0.014	0.036	0.0064	0.023	-	-	-	-
1		Sides out	89	57	21.7	22.1	2.08	1.29	105	90	6.25	6.51	0.71	0.27	-	-	0.44	0.34	1.67	1.24
1	1	Sides in	64	49	24.2	24.0	2.37	1.87	46	58	6.98	7.14	0.28	0.38	1.75	1.32	0.22	0.26	1.18	1.75
2		Sides out	131	96	22.6	22.5	1.75	1.94	142	142	6.45	6.45	0.78	0.56	-	-	3.9	4.3	2.39	1.26
2	2	Sides in	96	79	24.7	24.1	1.68	2.01	68	71	6.71	6.71	0.90	0.45	2.09	1.23	3.55	2.95	2.55	1.18
3		Sides out	178	96	23.1	22.9	0.99	1.32	156	158	6.31	6.38	1.16	3.5	-	-	20.4	18.0	1.63	0.89
3	3	Sides in	118	81	24.3	24.0	1.42	1.75	94	106	6.52	6.62	0.93	0.88	2.5	2.6	14.5	14.0	0.48	0.70
4		Sides out	249	133	21.4	22.0	0.99	1.53	207	197	6.25	6.28	1.56	1.57	-	-	17.7	13.5	3.42	2.16
4	4	Sides in	133	91	24.5	24.6	1.21	1.47	104	120	6.43	6.50	1.03	1.19	2.72	2.55	17.7	16.5	2.40	3.46
5		Sides out	276	163	22.4	22.0	1.55	1.64	234	255	6.40	6.28	1.53	1.32	-	-	10.5	11.2	0.75	0.96
5	5	Sides in	182	113	25.0	24.3	1.62	1.82	157	165	6.51	6.53	1.33	1.88	2.72	2.55	11.0	13.7	0.91	0.57
6		Sides out	291	200	22.5	22.1	1.51	1.56	246	264	6.31	6.39	1.99	2.50	-	-	34.9	15.2	7.32	6.63
6	6	Sides in	229	163	24.7	24.1	1.57	1.62	218	183	6.50	6.55	1.96	1.57	3.70	2.79	11.7	36.7	8.40	7.74
7		Sides out	409	306	22.7	22.2	1.58	1.53	266	298	6.29	6.20	1.94	3.99	-	-	10.1	17.0	12.45	5.8
7	7	Sides in	326	256	24.1	23.8	1.79	1.79	217	231	6.39	6.41	1.99	2.45	1.40	1.37	21.5	12.5	10.6	5.73
8		Sides out	444	360	22.8	22.1	1.51	1.64	275	290	6.50	6.51	1.82	2.51	-	-	14.3	18.9	4.7	9.9
8	8	Sides in	395	326	24.1	23.8	1.57	1.68	240	226	6.57	6.58	1.80	1.54	6.2	14.7	17.2	20.2	7.6	4.8
9		Sides out	400	375	23.3	22.6	1.44	1.53	307	342	6.80	6.79	3.19	2.64	-	-	24.3	35.0	9.78	11.7
9	9	Sides in	385	355	24.1	23.8	1.55	1.70	258	272	6.82	6.82	2.67	2.22	26.5	24.4	20.5	28.0	5.3	8.5
10		Sides out	755	739	22.8	22.4	1.37	1.33	384	376	6.58	6.55	2.50	2.67	-	-	25.8	28.8	6.45	7.23
10	10	Sides in	715	685	24.3	24.0	1.56	1.60	324	317	6.72	6.70	2.32	2.69	35.1	24.7	31.5	39.0	16.9	8.8
11		Sides out	1046	1134	22.4	22.1	1.09	1.10	401	397	6.45	6.64	2.48	1.84	-	-	23.8	37.7	6.33	1.85
11	11	Sides in	1055	1055	24.4	24.4	1.38	1.31	327	352	6.52	6.58	1.56	1.74	19.9	25.8	30.8	42.3	4.1	3.8
12		Sides out	1302	1302	-	-	-	-	-	-	-	-	2.11	1.67	-	-	28.3	29.5	11.5	13.7
13	Static		1124	1182	24.5	24.4	1.19	1.07	377	395	6.47	6.48	2.30	1.79	-	-	24.8	33.5	8.91	11.2
13	12	Sides in	1568	1182	25.4	25.8	1.25	1.23	332	360	6.61	6.68	1.34	1.01	8.10	6.40	28.6	27.0	0.4	4.2
14		Sides out	1338	1420	23.7	24.1	1.08	0.61	392	406	6.15	6.05	1.38	1.01	-	-	28.1	22.3	13.0	13.8
14	13	Sides in	1389	1420	25.8	25.9	1.15	1.08	371	396	6.22	6.18	1.60	0.65	4.51	4.07	3.62	2.60	10.0	9.8
15		Sides out	1398	1380	24.4	24.7	1.04	1.08	430	437	6.48	6.45	2.61	2.68	-	-	24.6	30.5	8.9	5.1
15	14	Sides in	1518	1460	26.0	26.2	1.04	1.24	371	409	6.62	6.60	1.65	1.96	8.80	5.50	31.3	61.3	7.9	9.7
16		Sides out	1479	1508	24.5	25.3	1.01	0.99	421	498	6.20	6.30	2.45	2.10	-	-	28.6	30.5	9.4	11.4
16	15	Sides in	1380	1666	25.8	26.4	1.15	1.00	421	418	6.41	6.40	1.94	1.79	5.50	3.60	38.5	31.8	13.8	9.6
17		Sides out	1568	1638	25.3	25.8	0.86	0.88	403	420	6.26	6.20	1.67	2.14	-	-	26.0	31.4	9.3	8.7
17	16	Sides in	1439	1677	26.0	26.4	0.93	0.93	420	368	6.43	6.40	2.05	1.73	3.82	2.31	25.7	30.5	8.7	9.3
18		Sides out	1558	1567	25.1	24.7	0.86	0.87	497	493	6.31	6.40	2.50	2.24	-	-	24.8	29.4	8.5	7.9