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STUDIES OF THE COMPOSITION OF PORK MEAT

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It is in the nature of scientific research that in answering some questions new problems are brought to light requiring further research. This is certainly the case with the investigation reported in the enclosed paper by my colleague Mr. M.G. John. It started as an extension of the work reported last year on the variation in the nitrogen content of lean pork meat, when different nitrogen contents were found in different parts of the carcass. It was then our opinion that this spread was due to differences in the moisture content of the tissues but this further investigation revealed a much more complicated picture.

Carcasses were divided into two equal parts - the left side was completely dissected and all the usable meat, as defined in the paper, was comminuted and analysed. The right half was dissected according to a standard butchering technique and divided into lean and semi-lean meat and fatty tissue. Each of these lots was then comminuted and analysed for fat, moisture and nitrogen content of meat.

If, as is usual, the lean content is taken as 100 - fat, then again the mean values for the nitrogen content of lean in the three types of tissue were found to vary from 3.42 to 3.50%. If however, the calculations are carried out for 'true lean' defined as 100 - fatty tissue then all such 'true lean' was found to have a mean nitrogen content of 3.42% from whichever type of tissue it was obtained.

The live weights of the analysed animals were obviously correlated with the analytical results, and, to simplify the picture, the total weight range was evenly divided into eight weight groups and the various relations and correlations examined for each weight group.

In dissected lean meat the nitrogen content was found to be correlated to the live weight as given in Table 6 and Fig. 2, and this increase in the nitrogen content appears to be connected with a decrease in the water content of the meat as the live weight increases. This is shown in Table 7.

The chemical fat content of dissected lean appears to be little affected by the live weights (Table 8) but, when all the usable meat is examined there is of course an increase in the fat content from 42.9% for the lightest group to 51.3% in the heaviest animals. These results are shown in Table 9 and Fig. 4.

As expected, both the nitrogen and the water contents of the average usable meat are influenced by the fat content and the paper gives equations to define these relations.

The paper examines next the average nitrogen and water contents of the usable meat and from the figures thus obtained computes the affect of live weight on the nitrogen factor, i.e. the nitrogen content of fat free meat. Fig. 10 indicates the increase in the average nitrogen factor as the live weight increases.

From the results of the determinations of the fat content in total usable meat and in the fatty tissue it is possible to calculate the fatty tissue content of the average usable meat. The results of this exercise are rather surprising as can be seen from Table 11 and Fig. 13.

It will be noted that while the fat content of the fatty tissue increases and the corresponding water content decreases with the live weight the actual percentages of fatty tissue in the carcass remains substantially unaffected by the live weight up to 300 lbs. when an increase occurs. We don't feel competent to comment on this certainly unexpected result; the physiologist rather than the biochemist or analyst may be able to provide an explanation. We also appreciate that this result may be true only for this particular group of pigs. Although our test animals were taken at random, the majority were certainly from the same race (large white) and probably fed ad libitum. It is conceivable that a similar series of analyses carried out on, say, Landrace bacon pigs would yield very different results.

The increase in the fat content of the fatty tissue is accompanied by a decrease in connective tissue content and hence by a reduction in the nitrogen content (see Table 11 and Fig. 14 and 15).

Further calculations deal with the water, nitrogen and fat contents of fatty tissue and their relation to each other.

The last section of the paper deals with the properties of 'true lean' as defined earlier in the paper. The mean nitrogen content was found to be 3.42 but varying with the increasing live weights from 3.28 to 3.57 as shown in Fig. 22. Fig. 23 illustrates the corresponding changes in the water content.

By using the combined analytical results calculated from 'true lean' and fatty tissue a postulated composition of carcass meat can be arrived at which can be compared with the figures obtained by actual analysis. This is done in Table 14 and 15 showing a very good agreement between nitrogen factors obtained from both sources. In a similar way Tables 16 and 17 indicate the excellent agreement between the calculated and experimentally found water contents of the meat in each weight group.

The results of the investigation are summarised as follows:-

1. Carcass meat may be regarded as a system comprising 2 components - true lean and fatty tissue. This concept provides a consistent explanation of the analytical findings.

2. The ratio of True Lean to Fatty Tissue is practically constant being independent of the live weight of the animal over a wide range of live weights.

3. The fat content of the fatty tissue (and therefore of the carcass) increases as the live weight increases and, consequently, the proportion of non fatty matter (connective tissue) and therefore nitrogen and water decreases as live weight increases.

   The contribution of the fatty tissue therefore, to the overall nitrogen and water content of the carcass decreases with increasing live weight.

4. The nitrogen and water content of True Lean are constant up to about 180 lbs. live weight, after which the nitrogen content increases and the water content decreases i.e. the flesh becomes drier.

5. The falling contribution of the Fatty Tissue to the overall nitrogen content is almost exactly counter-balanced by the increasing nitrogen content of the True Lean with live weight.

6. The falling contribution of Fatty Tissue to the overall water content goes hand in hand with a falling water content in the True Lean. Accordingly, the net result is a decrease in water content of the carcass as the live weight increases.

7. An increasing fat content with increasing live weight results in the observation that when the factor $\frac{100}{100-F}$ is used as a multiplier to convert nitrogen and water contents to a fat-free basis a positive linear correlation between nitrogen and live weight is obtained, whilst the water content of fat free meat appears to become independent of the live weight.