

Research on Chemical Components of Goaty Odour

MENG XIANMIN, MALIZHEN, JIANG FUHU and LIU NAIYU.

Food Science Department of Shanxi Agricultural University, Shanxi, China.

SUMMARY: After analysing the content of  $C_6$ ,  $C_8$  and  $C_{10}$  of various meats, the results show that  $C_{10}$  is the determinant component causing goaty odour, its content is positively correlated with goaty odour intensity, and the  $C_{10}$ -content is different in various parts of the same goat, which are foreleg, hind quarter, chuck and belly in descending order of  $C_{10}$ -content. The return coupling experiment results show that the  $C_{10}$ -content of goaty odour removed sausages is 30%-34% lower than that in raw goat meat, our sense organ could not feel the presence of goaty odour and further prove  $C_{10}$  is one of the main components causing goaty odour.

INTRODUCTION: In order to reveal the component causing goaty odour in goat meat and its products, and establish theoretical base for producing goat meat products with goaty odour removed, we have consulted many reference materials from which we have learned a lot. Some reference materials say that goat fat contains large part of component causing goaty odour, the determinant compounds are saturated volatile fatty acids with short carbon chain (hexanoic acid, caprylic acid and capric acid). In many experiments, we repeatedly measured the  $C_{10}$ -content of these compounds in various meats (pork, beef, goat meat and horse meat), finding that capric acid ( $C_{10}H_{20}O_2$ ) is the determinant compound causing goaty odour, its content is related with goaty odour intensity.

MATERIALS and METHOD: 1, Meat samples and their sources

The goat meat sausages, with goaty odour removed and not removed, were made of local male goat meat. Fresh beef, horse meat and pork are from Beef and Goat Meat Combined Processing Factory of Beijing and local market.

2, Pretreatment of meat samples: Through strongly basic anion ion exchange resin 262, we pretreated the samples according to following process, the pretreated samples were stored in methyl alcohol for analysis.

Immersed in saturated sodium chloride for 18 hr. → Water washing until no chlorine ion with silver nitrate solution checking → Washing with 2%-5% hydrochloric acid solution → Water washing until PH is 7 → Washing with 2%-5% caustic soda solution → Water washing until PH is 7 → Stored in methyl alcohol for analysis.

3, Preparing meat samples: The meat samples were cut into pieces comminuted through mincing machine twice.

4, Extracting free fatty acids: 50g exactly weighed minced meat sample was put into 250ml triangular flask with stopper, add by drops diluted hydrochloric acid into the flask after adding ethyl ether, pour out ethyl ether after shaking for 30min., dry the top limpid ethyl ether with sodium sulfate after high speed centrifugalization, add the dried ether extract into pretreated dry resin to adsorb free fatty acids for two days, then pour out ethyl ether, admit nitrogen into the resin to dry it. Add 5ml methyl alcohol into the dried resin, adding by drops about 0.4ml concentrated sulphuric acid into it while shaking. Pour the methyl alcohol into 25ml test tube with stopper after shaking for 10min, then add 5ml water and 2ml hexane for extracting. pour the extract into 10ml test tube with stopper containing proper amount of sodium sulfate, taking out 2ul extract for gas chromatography analysis.

5. Qualitative analysis : Qualitative analysis was made through chromatographic retention method using A15840 standard sample produced in Japan.

6. Quantitative analysis: By the method of area normalization, the i-content is calculated according to following formula:

$$C_i = \frac{A_i}{\sum A_i} \cdot 100$$

- C<sub>i</sub>: Quantity percentage of component i
- A<sub>i</sub>: Peak area value of component i
- ∑A<sub>i</sub>: The sum of all the peak area values

RESULTS and DISCUSSION: We have found that C<sub>10</sub> (capric acid ) is the determinant component causing Goaty odour after repeatedly measuring the content of C<sub>6</sub> C<sub>8</sub> and C<sub>10</sub> in various meats, C<sub>10</sub>-content is related to goaty odour intensity. Table 1 shows the results.

Table1-the peak area values of C<sub>6</sub> C<sub>8</sub> and C<sub>10</sub> in various meats

Meat Kind	Number	C <sub>6</sub>	C <sub>8</sub>	C <sub>10</sub>
Pork	1	1175	2012	6381
	2	1052	2779	5927
	3	557	1164	5316
	4	634	1351	5817
	5	1288	2464	5474
	6	656	1237	5875
	7	1413	2044	6480
	8	1336	1928	5219
Goat Meat	1	1328	3679	17927
	2	523	827	12296
	3	785	936	17373
	4	643	897	15692
	5	671	893	16946
	6	1311	2577	14402
	7	1223	2018	13976
	8	842	1977	14018
	9	446		13392
	10	1061	1321	15441
Beef	1	1341	727	7374
	2	742	868	7528
	3	963	801	7211
	4	1094	1100	7371
Horsemeat	1	6357		3312
	2	5141		2715
	3	4529		2301

Data in table 1 shows no regular change pattern of C<sub>6</sub> and C<sub>8</sub> in various meats, but C<sub>10</sub> has a quantity range and a good reappearance, The peak area values of C<sub>10</sub> in goat meat are the highest , so we choose C<sub>10</sub> as characteristic peak indicating goaty odour, with C<sub>10</sub>-content indicating goaty odour intensity. We also measured the C<sub>10</sub>-content in various meats and different parts of the same goat. The results are showed in table 2 and table 3.

Table 2-Relative percentage of C<sub>10</sub>in various meats

Meat kind	C <sub>10</sub> Average	Relative percentage
Goat meat	13354	100%
Beef	7371	55%
Pork	5811	44%
Horsemeat	2776	21%

Table 3 - C - content in different part meat of the same goat

Part	Hind Quarter	Foreleg	Chuck	Belly
Average	13392	16564	12638	11403

Note:Average is from two parallel experiments.

From table 2, we know that  $C_{10}$ - content in goat meat is 1.82, 2.27 and 4.76 times as much as in beef, pork and horsemeat respectively. So we can preliminarily conclude that there is internal relation between goaty odour and  $C_{10}$  - content, this is consistent with our sense feeling results.

From table 3 , we know that there is difference in  $C_{10}$  - content in different parts of the same goat.  $C_{10}$ -peak area value of foreleg is the highest, then is that of hind quarter, chuck and belly successively. Some reports say that sexual maturity male goat can secrete some compound with peculiar smell and goaty odour from horn base and mid-tail, this has close relation with our experiment material (from male goat ). We infer that the peculiar smell can cause stronger goaty odour when mixed with  $C_{10}$ . It is necessary to further prove whether the higher  $C_{10}$ - content of foreleg and hind quarter has relation with the peculiar smell.

In order further to prove  $C_{10}$ is the determinant component causing goaty odour, we have done the research on producing goaty odour removed sausages using biological starter.Table 4 shows the results.

According to table 4, supposing  $C_{10}$ -content of raw goat meat is 100%, that of group 3 and group 4 is 30% and 34% lower.  $C_{10}$ -content of control( with goaty odour not removed sausages ) is only 1.5% lower than that of raw goat meat. This means that enzymes from microbe metabolism in the starter have decomposed the compounds causing goaty odour or changed its presence form.

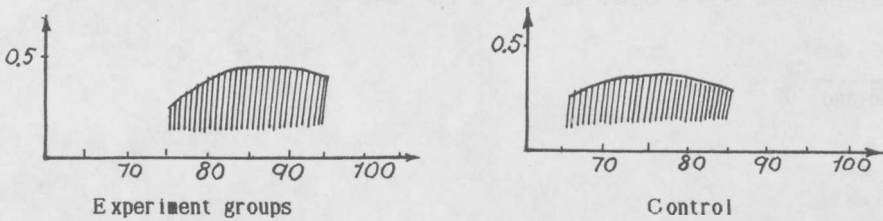
Table 4 -  $C_{10}$ -content of raw goat meat and sausages with goaty odour removed.

Item	1	2	3	Average	Relative percentage
Group					
Group3	10300	10991	12780	11357	70.00%
Group4	9657	11523	11001	10727	60.00%
Control	16162	15385	16243	15930	98.50%
Raw goat meat	15983	15298	17256	16179	100.00%

Note: Group 3 and group 4 belong to goaty odour removed sausages

By sense feeling, 10 appraisers appraised the texture, colour, flavour and goaty odour without rare delicacy of goaty odour removed sausages. Through blurred mathematics composition operation, the peak area values in group3 and group4 are all above 0.45, Integrals are between 81 and 90, meaning these products are " Welcome Products ".If their peak value centre moves toward the higher peak, the products may become " Very Welcome Products ". the peak area values of control are below 0.37, the products are: " Unwelcome Products " .(see Figure 1 ).

Figure 1 - The Blurred Mathematics Relation Curve



This result agrees with that measured with precision instrument, proving  $C_{10}$  is one of the determinant components causing goatly odour and it is feasible to remove goatly odour from goat meat products by the method of biological ferment.

**CONCLUSION:** Capric acid ( $C_{10}H_{20}O_2$ ) is one of the main components causing goatly odour, its content has positive correlation to goatly odour intensity; A theoretical basis has been established for goatly odour removed products; The method of appraising goat meat products has been improved, from sense appraisal to measurement with precision instrument.

#### **REFERENCES:**

- (1) LU HONG JUN etc.(1990). The Analysis Method for Fatty Acids ( $C_4$ ,  $C_6$  and  $C_{10}$ ) in Goat Meat and Its Products. Meat Research 1990.3.29-30
- (2) ZHOU LIANG YAN etc. (1987). Research on Producing Cyclo-ethers Ewe milk Odour Removal Reagent and Its Odour Removing Mechanism. Food Science 1986.1. 1-8
- (3) MENG XIAN MIN etc.(1990). The Summary of Research on Components Causing Goatly Odour and Measurement Methods.
- (4) ZHANG SUQUAN et al. (1989): Research on Goat Meat Sausages Fermented with Lactic Acid Bacteria. Meat Research.1989,4. 31-35