

THE RESEARCH AND PROCESSING OF CRISP FRIED GUT SEGMENT OF MEAT CHICKEN WITH RICH NATURAL SELENIUM

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INTRODUCTION

With the rising of living standards of people in China, the consumption amount of meat chicken is increasing day by day, so it is imperative to know how to make full use of the by-product. On Shanxi Meat Chicken Farm, the chicken gut often overstocks, which impedes seriously the production turnover and was unfavourable to the benefit. Entrusted by the farm, we studied the comprehensive utilization of meat chicken gut.

The mature period of the meat chicken 'Aivin' is about 54 to 56 days, the tenacity of collagen fibre and elastic fibre in the chicken gut is not strong, the gut consists of smooth muscle, which leads to its bad viscosity and plasticity. According to the feature of the raw material, referring to various popular kinds of snacks, on the basis of experiments over and over again, the crisp fried gut segment of meat chicken with rich natural selenium was produced in the best formula selected through orthogonal design optimum seeking method. The quality was appraised by the method of comprehensive fuzzy evaluation, which demonstrated that the product is 'very good'. We had probed into the methods to process a series of dietary snack rich in natural selenium, so the by-product on the farm was made full use, more important, the patients lacking selenium who are distributed over 72% region in China are provided a natural food with rich selenium. Therefore, the research is of great significance.

MATERIALS AND METHODS

Materials

Frozen meat chicken gut, refined plant oil, starch, eggs, breadcrumbs and flavouring (including something hot) were used.

Methods

Orthogonal design

Orthogonal design optimum seeking method was used to get the best formula. Four subsidiary material formulas of two kinds of flavour selected through repeated experiments were showed in Table 1. The method of hot work was boiling and frying.

Technological process

Unfreezing the frozen chicken gut; cleansing; putting in order; boiling (in solution containing 2% salt for 1 hour; cutting into section; adhering colloid of eggs; scrolling the gut in with the subsidiary materials; frying in plant oil (160-180°C; cooling; vacuumizing; product; storing or bringing to markets.

Key points of the technique

Preparing the materials: starch and flavouring were baked, grounded, sifted (through 0.18mm sieve) and mixed until homogeneous. Scrolling: scrolling the boiled gut sections with colloid of eggs, then with a layer of the prepared mixture (the thickness about 0.3-0.5mm). Frying: when the refined plant oil was heated to 160-180°C, put the scrolled gut into the pan quickly, get the gut out in about 30 seconds. Packing: cooling the fried gut to room temperature, then vacuumizing the gut quickly so that the feature crisp of the product could be maintained.

RESULTS AND DISCUSSION

Nutritive value analysis

The content of nutritive components contained in different domestic animals' or fowls' meat and the meat chicken gut were listed in Table 2.

The Table 2 demonstrated that chicken gut contained less protein than chicken meat or beef, more than pork, close to mutton, less fat than other meat in Table 2, more mineral than domestic animals' meat, less than domestic fowls' meat. The gut contained seven to 16 times calcium, 1.8 to 2.6 times iron and phosphorus, four to five times selenium as much as other meat. Therefore, the crisp fried gut segment of meat chicken with rich natural selenium and calcium may serve as meals during classes or assistant meals for young students or natural food with rich calcium for children or food resisting senescence for the old, more significant, the best natural food with rich selenium for the patients lacking selenium.

Sensory evaluation

Eight experienced experts or professors in food sensory evaluation were chosen to decide evaluation item, criterion and evaluate. Evaluation time: taste, texture, colour and no peculiar smell. Evaluation criterion: very good (91-100 marks), good (81-90), normal (71-80), not good (61-70). The results of the evaluation were analyzed with the method of fuzzy comprehensive evaluation and the final result was got.

The steps and results were showed as follow:

The consideration field of evaluation was assumed as U: U1 - taste, U2 - texture, U3 - colour, U4 - no peculiar smell.

The consideration field of evaluation criterion was assumed as V: V1 - very good (91-100 marks), V2 - good (81-90), V3 - normal (71-80) and V4 - not good (61-70).

The weight set of evaluation item X was suggested by the experts or professors: $X=(U1-0.4, U2-0.2, U3-0.3, U4-0.1)$.

Such conclusion could be obtained from the analyses above. In Group 1, the maximum was 0.372, which got comprehensive evaluation marks 91-100, showed that the product was 'very good'. Group 2 was also 'very good'. In Group 3 and 4, the maximum were 0.357 and 0.75 respectively, the comprehensive evaluation were 'good' or 'normal'. The results became clearer when showed in the way of fuzzy relationship curve (Figure 1).

The curve showed that the gravity centre of the curves in Group 1 and 2 moved upwards, which demonstrated that there was the probability for the quality of the product getting better. While in Group 3 and 4, the centre moved downwards, which indicated that the quality of the product was normal and there was a trend to being 'not good'. So the formulas of Group 1 and 2 should be applied in the processing factory of meat chicken gut. The comprehensive evaluation of Group 3 and 4 was not satisfying, their cost was high, and the technological process was difficult, so their formulas should not be used.

Benefit Analysis

The rate of finished product

There were a little mucous membrane, fat and connective tissue in or out the chicken gut, sometimes there was a little impurity in frozen gut. The rate of finished product was only 27.6% after unfreezing, cleansing and boiling, 30.2% after scrolling.

Cost accounting

Frozen chicken gut sold for 0.8 yuan per 0.5kg, there was 2kg primary - processed gut in a pack, which could be used to produce 600g 'crisp fried gut'. If the crisp fried gut sold in small packs, the gut was supposed to sell for 1.30 yuan per pack, so 600g would be 20 packs, about 26 yuan, while the cost was 14.75 yuan, the net income was 11.25 yuan. If the gut was produced in greater scale, the cost would be lowered. In the farm providing the frozen gut, 600kg chicken gut was produced in every 8 hours, if all was used to produce 'crisp fried gut segment' there would be 6000 packs of gut, net income would be 3375 yuan, the benefit was considerable, meanwhile, the processing would help to solve the problem of overstock of frozen gut.

Preservation Period

The experiment showed that: the quality hardly changed in a week if the gut segments were preserved in not sealed packs under normal temperature, but the crispness, lowered. The quality did not change in half a month if the preserved in not sealed packs under 30 to 35°C, if preserved after vacuumizing, the quality would not change in six months or longer. The AW (activity of

water) value of the product was below 0.90, which belong to no-freezing and easy preserved foods. But if the preservation period was prolonged, the crispness would be impaired.

CONCLUSION

The content of selenium in chicken gut is more than in any other meat of domestic animals and fowls. Selenium is the component of glutathione peroxidase, also takes part in the biosynthesis of CoQ and CoA, so the 'crisp fried chicken gut segment' can replenish selenium, promote the basic metabolism of human body, which will be helpful to health.

It needs simple equipment, little investment, short product cycle to produce the 'crisp fried gut segment' and there is rich source to the raw material, so considerable benefit can be got whether the product scale is large or small. The processing not only helps to solve the problem of the gut overstock in chicken farm, but also increase the income.

Only by changing the component of the subsidiary material the product can be changed into other types in order to meet the different taste of consumers.

The processing technique is also suitable for the processing of different kinds of domestic animals' or fowls' gut.

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Table 1. Formulas of the crisp fried gut (Unit:g).

	Group 1/hot	Group2/com.	Group3/hot	Group4/com.
Starch	100	100	-	-
Bread crumb	-	-	100	100
Chili powder	3	-	3	-
Chinese prickly ash	3	-	3	-
White sugar	7.6	-	7.6	-
Ginger powder	6.6	-	6.6	-
Gourmet powder	4.6	4.6	4.6	4.6
Compound flavouring	2.5	5	2.5	5
Table salt	6.6	6	6.6	6
Pepper powder	2.6	-	2.6	-

Table 2. Content comparison of nutritive component between meat chicken gut and other domestic animals' or fowls' meat (/100g).

	Pork	Beef	Mutton	Chicken	Chicken liver	Chicken gut
Protein(g)	9.5	17.5	13.3	19.7	15.4	12.4
Fat (g)	59.8	20.3	34.5	18.7	4.1	14.2
Ca (mg)	6	5	11	8	16	81.6
P (mg)	101	179	129	225	264	125
Fe (mg)	1.4	2.1	2.0	5.1	13.0	3.6
Se (mg)	6.2	4.7	6.4	17.4	-	25.2
Va (IU)	0	0	0	-	900	-

Table 3. Evaluation results of Group 1.

	V1	V2	V3	V4
U1	4	3	1	0
U2	2	4	2	0
U3	3	2	3	0
U4	6	2	0	0

Based on the synthesis of fuzzy relationships:

$$\begin{aligned}
 Y1 &= X * R1 && \begin{matrix} 0.500 & 0.375 & 0.125 & 0.000 \\ 0.250 & 0.500 & 0.250 & 0.000 \\ 0.375 & 0.250 & 0.375 & 0.000 \\ 0.750 & 0.250 & 0.000 & 0.000 \end{matrix} \\
 &= (0.4, 0.2, 0.3, 0.1) * \\
 &= (0.400, 0.375, 0.300, 0.000)
 \end{aligned}$$

Let it equal 1: $Y1 = (0.372, 0.349, 0.279, 0.000)$

Table 4. Evaluation results of Group 2.

	V1	V2	V3	V4
U1	6	1	1	0
U2	3	5	0	0
U3	2	4	2	0
U4	4	4	0	0

Based on the synthesis of fuzzy relationships:

$$\begin{aligned}
 Y2 &= X * R2 && \begin{matrix} 0.750 & 0.125 & 0.125 & 0.000 \\ 0.375 & 0.625 & 0.000 & 0.000 \\ 0.250 & 0.500 & 0.250 & 0.000 \\ 0.500 & 0.500 & 0.000 & 0.000 \end{matrix} \\
 &= (0.4, 0.3, 0.25, 0.0) * \\
 &= (0.4, 0.3, 0.25, 0.0)
 \end{aligned}$$

Let it equal: $Y2 = (0.421, 0.316, 0.263, 0.000)$

Table 5. Evaluation of Group 3.

	V1	V2	V3	V4
U1	2	3	2	1
U2	1	3	4	0
U3	1	1	6	0
U4	4	2	2	0

$$\begin{aligned}
 Y3 &= X * R3 && 0.250 \ 0.375 \ 0.250 \ 0.000 \\
 &= (0.4, 0.2, 0.3, 0.1) * && 0.125 \ 0.375 \ 0.500 \ 0.000 \\
 &&& 0.125 \ 0.125 \ 0.750 \ 0.000 \\
 &&& 0.500 \ 0.250 \ 0.250 \ 0.000 \\
 &= (0.250, 0.375, 0.300, 0.125) \\
 \text{Let it equal: } Y3 &= (0.238, 0.357, 0.286, 0.119)
 \end{aligned}$$

Table 6. Evaluation results of Group 4.

	V1	V2	V3	V4
U1	1	3	3	1
U2	0	2	5	1
U3	1	5	2	0
U4	4	2	2	0

$$\begin{aligned}
 Y4 &= X * R4 && 0.125 \ 0.375 \ 0.375 \ 0.125 \\
 &= (0.4, 0.2, 0.3, 0.1) * && 0.000 \ 0.250 \ 0.625 \ 0.125 \\
 &&& 0.125 \ 0.625 \ 0.250 \ 0.000 \\
 &&& 0.500 \ 0.250 \ 0.250 \ 0.000 \\
 &= (0.125, 0.375, 0.375, 0.125)
 \end{aligned}$$