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Usage Of Vegetable Stuff In Dry Sausage Production.

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ABSTRACT

The possibility of barberry fruits, goldenrod and dragonhead herbs usage as bioprotectors of oxidation and bacteriological damage of dry sausages is studied. It is shown that introduction of barberry fruits, goldenrod and dragonhead herbs in a receipt of uncooked smoked sausage leads to acceleration of aging and drying, reduction of fat oxidationrate and stabilizationof system frombacteriological damage. Results of the researches allow recommending application of studied plants in technology of uncooked smoked sausage production.

Keywords: drysausage, aging, dying, antioxidant,pH, moisture content,microflora.

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INTRODUCTION

Dry-cured and uncooked smoked production is delicious and has a great demand at consumers. Production of these types of meat products is closely identified with difficult biochemical and physical and chemical processes which promote formation of special color, taste and aroma. However the technology of production of raw cooked meat products is enough complicated and has a long cycle. Significant part of technological cycle occupies aging process (accumulation of lactic microflora and meat stuff self-fermentation). In this regard the meat industry has passed to technology of fermented sausages production by usage of starting cultures of lactic microflora and glucon-delta-lactone (GDL). It allows to accelerate biochemical processes of aging, to reduce duration of drying and to receive a product with high sensoric quality to 21st day of technological cycle.

However the expected decrease of mincemeat pH level can be reached not only by introduction of GDL and accumulation of the lactic acid produced by lactic microflora, but also by usage of plants as a source of natural organic acids, such as ascorbic, malic, paratartaric, etc.

It is known that many herbs have phytoncide and antioxidant properties that causes their wide application in the food industry

We have carried out the analysis of South Russian fauna, which presumably have phytoncide and antioxidant properties and could be perspective protectors for production of long shelf-life meat products[9].

The analysis showed that dried fruits of a barberry are very prospect in studying field because of significant content of ascorbic, malic, tartaric and citric acids. Fruits of a barberry also contain carotinoids (xanthophyll, lutein etc.), carbohydrates, tannins, pectinaceous substances, ashes, organic acids, macro- and microelements and vitamins: E, C and β -carotene. Fruits has strong bactericidal properties (especially concerning *Staphylococcus aureus*). Barberry is used in food industry for coloring because of high content of pigments (carotenes for example can change sausage color to need light-red color).

Earlier conducted researches [1,2,8,9,10] showed prospects of usage of goldenrod and a dragonheadherbs as bioprotectors in meat systems.

As dry-cured and uncooked smoked sausages belong to products with long shelf-life there are a lot of imposed requirements for lipid fraction stability and microbiological safety. In this regard, the authors carried out researches of possibility of usage of barberry fruits and goldenrod and a dragonhead herbs as bioprotectors in technology of uncooked smoked sausages production.

At the first stage there was studied the antioxidant activity (AOA) of barberry and chosen herbs water extracts [8-10]. Based on results of research it was decided to add to minced beef with pork fat 0,5% of dried barberry fruits and 0,5% of dry goldenrod and dragonhead. The receipt also included starting culture "BessaSTART" and GDL.

Sausage stuff was wrapped in collagen sausage casing "Belkozin". After wrapping there were ageing and drying processes in climatic cameras.

During ageing and drying there was carried out investigation of pH level, weight loss and microbial stability and antioxidant activity.

MATERIALS AND METHODS

The main research objects were barberry, goldenrod and dragon head water extracts, uncooked smoked sausages (were produced by intense technology with GDL and bacterial culture usage). Ageing and drying processes were stepwise produced in climatic cameras in 21 day.

There were used official methods of investigations: Russian State Standard 51478-99 (determination of antioxidant activity by concentration of antioxidants equivalent to quercetin), Russian State Standard 9793-74

(physical and chemical indexes (pH, water content etc), Russian State Standards 10444.15-94; 31746-2012;31747-201 (microbiological indexes)[3, 4, 5,6,7].

DISCUSSION

Antioxidant activity of barberry, goldenrod and dragon head was determined with the aim of study of inhibitory properties of chosen herbs.

Results of AOA investigation are showed in Table 1. .

Table 1: Antioxidant activity of herbs stuff, mg/dm³

Sample	AOA
Barberry water extract	9790,850
Goldenrod and dragonhead water extract	8098,660

According to showed data all samples had antioxidant activity, but the barberry extract antioxidant effect is higher.

Table 2 shows results of sausages pH investigation during ageing and drying.

Table 2: pH investigation during ageing and drying

Sample	Duration, days				
	0	0.3	7	14	21
Control sample	5.9±0,1	5,1±0,1	5,0±0,1	4,9±0,1	4,8±0,1
Experimental sample	5,7±0,1	4,8±0,1	4,7±0,1	4,7±0,1	4,7±0,1

At zero time uncooked smoked sausages pH was 5,7-5,9, but after 8 h. of ageing in climatic camera (20-22°C)pH started fall. Table 2 shows that pH falling process was more intense in experimental samples with barberry and goldenrod and dragonhead. Last step of ageing and whole drying process promote further pH reduction till 4.7 (for experimental samples) at 7th day. That level of pH was constant for two weeks. The lowest pH level of control sausages was received at 21st day and it still was higher than pH of experimental samples – 4.8.

Ageing and drying process has a great effect on physical and chemical properties of sausages. That is why it is necessary to control water content during whole technological cycle. Results of studying a usages water content investigation are showed in Table 3.

Table 3: Water content investigation, %

Sample	Duration, days			
	0	7	14	21
Control sample	56,6±2,5	44,2±2,0	40,3±2,3	30,9±2,1
Experimental sample	56,5±2,1	40,3±1,9	37,4±2,1	28,3±2,2

As shown by the research data, the experimental samples lost moisture much more intensively than the control samples, which is consistent with the above results of the pH value changing.

Research of control and experimental a usages AOA confirmed finding that chosen herbs have high antioxidant activity (Table 4).

Table 4: AOA changing of control and experimental samples of uncooked smoke sausages, mg/dm³

Sample	Duration, days		
	10	20	30
Control sample	1732	1161	588
Experimental sample	3803	2755	1486

30-days dynamics of AOA changing shows its decrease in all samples, but absolute value of experimental samples AOA is higher than control samples AOA at every equal period. Thus after thirty days of age in dried control samples have lost 66% of origin AOA, but experimental samples have kept 45% of initial antioxidant activity.

Described results indicate high-level antioxidant properties of barberry, goldenrod and snakehead, which can be used to stabilize the fat fraction in meat systems in order to extend the shelf life of the product

Shelf life also linked with microbiological activity. To measure microbiological effect on developed sausages storage capacity, it was conducted a microbiological research of barberry water extract influence on the growth and activity of putrid microflora, Escherichia coli, Staphylococcus and yeast according to EAC (Technical Regulation of Custom Union 034/2011)

After selection and seeding of studied control and experimental samples in MPA, Kessler, Endo, ACI, Saburo, beveled agar there were determined QMAFAnM, coliforms, mold, Staphylococcus and Proteus vulgaris indexes. The results of the study is formed in table 5.

Table 5: Microbiological indexes of control and experimental samples

Index	Duration, days	Control sample	Experimental sample
Coliform organism	0	--	--
	21 days	--	--
QMAFAnM, CFU/g	0	9,0*10 ³	8,4*10 ³
	21 days	3,0*10 ⁴	4,4*10 ³
Yeast, CFU/g	over the whole period	–	–
Proteus, in 1 g	over the whole period	–	–
Staphylococcus in 0,1 g.	over the whole period	–	–

Note: "+" - detected, "-" - non detected

The data obtained indicate that originally minced stuff of control and experimental samples had almost the same number of microflora-limits 8,4-9,6*10³CFU/g, but at 21th day of the technological process QMAFAnM of control samples has grown 10 times to initial index. while QMAFAnM of experimental samples stayed stable at level 4,4*10³ CFU.

During the whole period of the ageing and drying process we have not found microorganisms of the genus Proteus vulgaris, Staphylococcus, E. coli, yeast and mold, both in control and in experimental samples.

CONCLUSION

The results of research showed that antioxidant and antimicrobial properties of barberry dried fruits and goldenrod and drag on head herbs change physical and chemical parameters of sausages. Optimal introduction is 0.5% of dry barberry and 0.5% dried herbs goldenrod and dragonhead. This research becomes a base of next researches of dried fruit of barberry, Canada goldenrod and Moldavian dragonhead in the formulation of smoked sausages.

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