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Study of Dried Vegetable Ingredients Effect on Chicken Mince Functional and Technological Properties

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Abstract

This report focuses on the feasibility of using chicken mince for chicken-vegetable ready-to-cook food manufacturing. The functional and technological chicken mince properties, kinds of vegetable additives and their technological properties have been studied. Chicken minces "Osobiy" and "Diyeticheskiy," produced by poultry farm "Mikhailovskiy broiler" (Artem town), were chosen as the target of this research. Rice flour and potato flakes were used as vegetable additives. The study was undertaken at the Food Products laboratory of the School of Biomedicine, Far Eastern Federal University. The studies were conducted according to standard procedures. The content of protein, fat and moisture were measured in chicken mince. Water-binding power (WBP), moisture-binding capacity (MBC), fat-binding capacity (FBC) and emulsion stability were determined in chicken-vegetable mince. The amount of vegetable additives in chicken mince varied from 5 to 20 %. The dependence of the amount of additives on ready-to-cook food properties was noticed. The system was stabilized by adding dried vegetable ingredients that increased chicken mince viscosity and reduced the losses. The optimum potato flakes content is 5 % in "Osobiy" chicken mince and 10 % in "Diyeticheskiy" chicken mince. The optimum rice flour content is 10 % in "Osobiy" chicken mince and 15 % in "Diyeticheskiy" chicken mince.

Keywords: chicken-vegetable ready-to-cook food, development of chicken mince ready-to-cook food, vegetable additives, functional and technological properties of chicken mince.

INTRODUCTION

The domestic production of poultry meat has been increasing recently. Large percent of produced poultry meat is delivered for manufacturing of various degree of processing ready-to-cook food. High-level poultry meat processing, poultry mincing and poultry mince ready-to-cook food manufacturing are promising trends in this sphere. [1]. Poultry meat is the main source of plastic material in a human diet, which is essential for a human body to build and regenerate cell structural parts and tissues and maintain homeostasis (relative dynamic stability properties of the internal environment and sustainability of physiological functions) [2]. Farce is a complicated system of various dispersion degrees which has particular functional and technological properties [3]. Functional and technological properties of farce are understood as a combination of factors such as water-binding power (WBP), moisture-binding capacity (MBC), fat-binding capacity (FBC) and emulsion stability. One of the most important farce quality indicators is its moisture-binding capacity (MBC). The main organoleptic properties of a finished food product such as juiciness, softness and losses while heating depend on that capacity.

LITERATURE REVIEW

Currently there are two ways of deboning poultry meat in poultry mince production: they are manual and mechanical ones [4, 5]. Mechanically deboned poultry mince has lower indices of MBC, WBP and FBC caused by grain of meat shear and high degree of its deformation while deboning. To improve functional and technological properties of mince, to enrich taste and increase nutrition value, it is necessary to add a number of ingredients into the recipe mixture. They provide free water binding and improve thixotropic properties of ready-to-cook food [6, 7]. These additives are protein products of vegetable origin (soy concentrates and isolates) [8, 9, 10, 11]; egg products; fresh vegetable additives (in the form of powder, puree and raw minced) [12, 13, 14, 15]; berries and fruit (in the form of powder, puree and homogenates) [16,17]; wheat or rice flour, sprouts [18, 19, 20, 21]; dietary fibers (vegetable fiber) [22]; cereals [23] and other additives [24, 25, 26, 27, 28, 29]. The amount of an added ingredient varies by its type and is from 5 to 60 % of mince mass inclusive. From 5 to 15 % of rice flour and potato flakes added to mince enrich it with ballast agents, minerals and vitamines. These vegetable additives bind water and fat by adsorbing whereby a ready-to-cook food form is maintained, losses while heating are reduced, food product juiciness is improved and yield is increased so they are essentially economically effective [30]. The amount of vegetable ingredients added is significantly higher and is up to 40 % for grated carrots and up to 60 % for potato puree and blanched carrots.

MATERIALS AND METHODS

Chicken mince procure

Chicken mince was thawed to the temperature -1°C in its mass. Salt, cracked black pepper and bread crumbs were sieved. Dry salt and pepper were added to the mince.

Vegetable ingredients procure

Rice flour was sieved. Potato flakes were crushed into powder and bolted. Potato flakes and rice flour were added in the amount of 5 - 20 % to the mince [31, 32].

Moisture test was run by means of a moisture analyzer "EVLAS-2M".

The method of fat test was based on its extraction from the tested product by an organic solvent followed by gravimetric estimation of fat amount.

The method of measuring moisture-binding capacity was based on the extraction of water from the sample by pressing.

The device "Fudon Rheo Meter", designed to determine rheological characteristic and consistency of studied samples, was used to measure viscosity and tack. The principle of the device is based on measuring and/or fixing viscous stress magnitude of a tested material by means of a strain gauge through a spherical head adapter at the sample-holder given velocities. Viscous stress arising between the adapter and tested sticky media, is transmitted through the adapter to the strain gauge and then to the similar device. An important property of raw meat is its viscosity and tack which are determined by the amount of protein found in a dissolved state in the aqueous phase. Viscosity and tack determine bond strength between dispersed particles.

RESULTS AND DISCUSSION

In our research we studied the feasibility of using chicken mince, produced in the Far East region, for chicken-vegetable ready-to-cook food manufacturing. Chicken mince composition varied in protein concentration, fat content and food energy value. Chicken mince "Osobiy" and "Diyeticheskiy" produced by poultry farm "Mikhailovskiy broiler" (Artem town) were chosen as the target of this research as they have high protein concentration. Chicken mince recipes were studied and their functional and technological properties were determined (Table 1).

Table 1. Physical, chemical and rheological characteristic of chicken mince.

Chicken mince	Protein, %	Fat , %	Water, %	Moisture-binding capacity,%	Viscosity, Pa·s	Tack, Pa
“Osobiy”	17,5	8,8	74,24	12,34	596,4	873,88
“Diyeticheskiy”	17,5	6,9	75,49	10,7	344,08	632,25

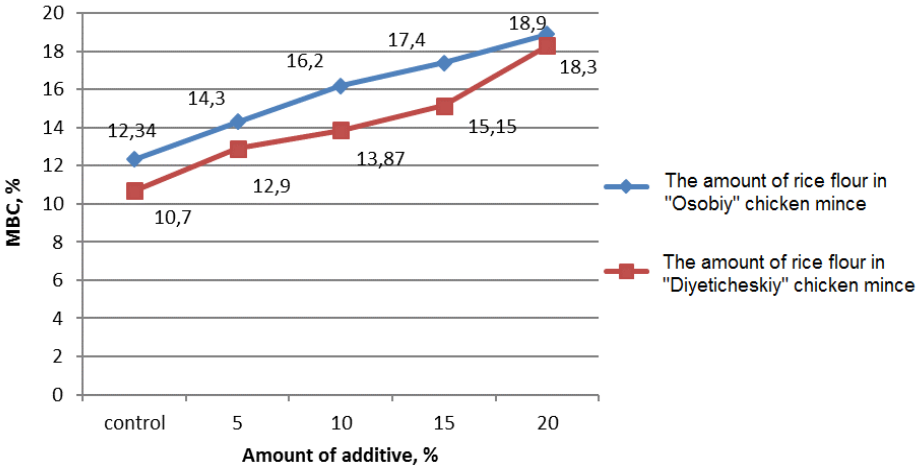

Fig. 1. The dependance of chicken mince moisture-binding capacity on the amount of rice flour.

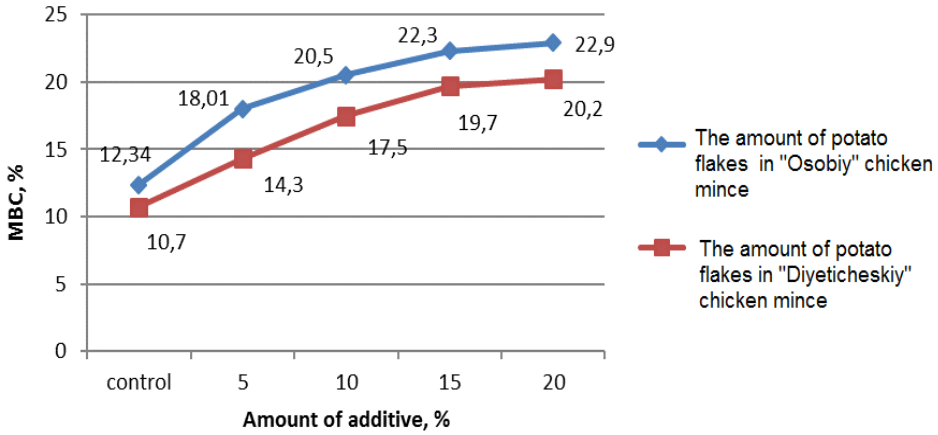

Fig. 2. The dependance of chicken mince moisture-binding capacity on the amount of potato flakes.

Chicken mince study samples have high moisture and low moisture-binding capacity. For this reason while choosing a vegetable additive, it is necessary to use such additives that enable to enrich chicken mince with minerals and vitamins as well as help to reduce losses while heating by binding free water and fat. On the assumption of these criteria the task was set to develop a range of chicken-vegetable mince ready-to-cook food and determine the balance of ingredients in its recipes. Rice flour and potato flakes were used as vegetable additives. Rice flour moisture-binding capacity is 100% and its fat-binding capacity is 180% in the production of mince ready-to-cook food. Rice flour has almost no fat that allows chicken mince food to retain its gustatory quality after heating. Potato flake additives used in sausage products positively affect seepage coefficient of water that appears in the process of meat mincing. As a result, fat does not flow out of sausage products during their storage period.

These kinds of chicken mince vary in their recipes and have different functional properties caused by various amount of additives. It was found that losses while heating are decreased by adding large amount of vegetable ingredients.

Potato flakes and rice flour were added to chicken mince in the amount of 5 to 20 %.

The effect of the amount of added additives on chicken mince moisture-binding capacity is presented in figures 1, 2.

The use of dried vegetable ingredients stabilized the system, increased chicken mince viscosity, tack and reduced the losses. The optimum content of potato flakes is 5 % in “Osobiy” chicken mince and 10 % in “Diyeticheskiy” chicken mince. The optimum rice flour content is 10 % in “Osobiy” chicken mince and 15 % in “Diyeticheskiy” chicken mince.

Chicken mince functional and technological properties were improved by adding the above-mentioned amount of additives. They reduced losses while heating and increased organoleptic characteristics of finished products. The most important property of potato flakes and rice flour is the ability to bind moisture and fat. It makes the product stable, increases the output of ready-to-cook food and improves production process. Furthermore, chicken mince functional and technological properties improve. The use of this quantity of ingredients improved functional and technological properties of chicken mince, reduced losses while heating and increased organoleptic indexes of finished product [33].

CONCLUSIONS

It was proved that dried vegetable additives help to improve functional and technological properties of chicken mince more than vegetable puree. The relationship between the amount of additives and finished product quality was noticed. It was found that provided the amount of additives is increased more than recommended, organoleptic indexes of ready-to-eat meat products reduce. Ready-to-eat meat products become dry and tough [34, 35].

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