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COMPARATIVE ANALYSIS OF ASSESSMENT PYROGENCITY SEMI - FINISHED PRODUCTS FIRST DOMESTIC INACTIVATED VACCINE «KAZFLUVAC®» AGAINST INFLUENZA A/H5N1

Annotation

The paper presents the results of studies on determination of pyrogenicity and content of bacterial endotoxins in a semi-finished experimental batch of the first domestic vaccine «Kazfluvac ®» prepared from kazakhstani strain A/AstanaRG/6: 2/2009 for the healthcare service. Pyrogens were determined by measuring the body temperature of rabbits injected intravenously with investigational product. It was analyzed the content of bacterial endotoxins using LAL - test for confirmation of the apyrogenicity of the semi-finished product under test.. As a result of these studies it had been established that the semi-finished vaccine has no pyrogenicity. As well as it had been revealed that the concentration of bacterial endotoxins in the semi-finished vaccine, which is less than the calculated content limit of bacterial endotoxins.

Key words: vaccine, vaccine, pyrogenicity, bacterial endotoxins.

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RESEARCH POLY-CEREAL ENERGY VALUE OF FOOD PRODUCTS BY EXTRUDING

Annotation

As a result of the conducted experimental studies on the extruding process of poly-cereal mixtures for the preparation of the high readiness products "Fitness" and "Zdorovie", there has been established the dependence of changes in their nutritive value on the variable values of the humidity of the poly-cereal mixture and the frequency of rotation of the extruder working body. The obtained dependences may adequately predict the change in the nutritive value $Э_{ц_1}$ and $Э_{ц_2}$ (kcal) in the range of the values of factors *W* (%) and *n* (min^{-1}) being under the study.

Keywords: poly-cereal mixtures, extrusion technology, extrusion, twin screw extruder, humidity, nutritive value, rotation rate.

Introduction

The modern methods for the formation of free running mass allow shortening the high readiness product manufacturing process. One of the promising areas of technological development as mentioned earlier is the extrusion of the poly-cereal mixture in order to obtain finished food [1, 2].

The meaning of the extrusion process is as follows. In the melting zone of the extruder under the action of the rotating extrusion screw with the increasing of the pressure *P* (hot extrusion up to 25 MPa), there are the destruction of the polymer structure of the main components of the starch-containing raw materials, the gelatinization and its subsequent gelification caused by the high temperature *t* (up to 120÷250 °C) occurring when mechanical energy (energy of the friction of the material on the extruder surface, and energy of the internal friction of the material while its moving between the working surfaces of the working body) converses to thermal energy. It results in an active thermomechanical disrupture. After that,

when the mass going out of the matrix, the product "expansion" and the loosening of its structure due to a sharp drop of pressure and temperature occur [1-4].

Such treatment leads to chemical changes in the poly-cereal mixture, with different depth. The result of the extrusion is the preservation of proteins along with the conversion of polysaccharides into more digestible oligosaccharides. Thus, it is observed the increase in the nutritive value of the products [5-8].

The results given in article are received during performance of research works on subjects: "Developing the technology of production of highly prepared products from domestic poly-cereal feedstock" (# the state registration 0112PK01528) on grant financing of scientific researches of Committee of science of the Ministry of Education and Science of RK.

Materials and methods

Definition of quality and safety of grain raw material selection and Kazakh flour prepared from poly-cereal raw materials is carried out in accordance with the next STST:

Selection and formation of grain raw materials of samples carried out in accordance with STST 13586.3-83 "Grain. Acceptance rules and sampling methods".

Determination of the organoleptic characteristics of the grain raw materials was carried out in accordance with STST 10967-90 "Grain. Methods for determination of odor and color".

Determination of moisture content of selected samples of grain raw materials was carried out in accordance with STST 13586.5-93 "Grain. Method for determination of moisture".

Determination of the chemical composition of the grain raw materials was carried out in accordance with STST R 50817-95 "Feed, compound feeds, feed raw materials. Method for determination of crude protein, crude fiber, crude fat and moisture using spectroscopy in the near infrared".

Determination of mineral content in the grain raw materials was carried out in accordance with STST R 50852-96 "Fodder, mixed fodder raw materials. Method for determination of crude ash, calcium and phosphorus from the application of spectroscopy in the near infrared".

Determination of heavy metal salts is carried out in accordance with STST R 51301-99 "Food products and food raw materials. Stripping-voltammetric methods for determining the content of toxic elements (cadmium, lead, zinc, copper)".

Determination of pathogenic microflora of grain and grain products was carried out in accordance with STST 10444.15-94 "Foodstuffs. Methods for determination of the number of mesophilic aerobic and facultative anaerobic microorganisms".

Determination of the number of yeasts and molds was carried out in accordance with STST 10444.12-88 "Food products. Method for determination of yeasts and molds".

Determination of the organoleptic characteristics of grain products was carried out in accordance with STST 27558-87 "Flour and bran. Methods for determination of color, smell, taste and crunch".

Determination of moisture content of flour from whole grain cereals was carried out in accordance with STST 9404-88 "Flour and bran. The method of determination of moisture".

Moisture poly-cereal high availability of food was carried out in accordance with STST 26312.7-88 "Groats. Method for determination of moisture".

Determination of particle size flour was carried out in accordance with STST 27560-87 "Flour. Method for determination of size." When choosing a sieve sizes are guided by STST ISO 2591-1-2002 "Sieve analysis. Part 1: Methods using test sieves of wire cloth and perforated metal sheets".

For the mathematical processing of the results of experimental studies with single and multivariate experiments we used the approximation of the experimental data of cubic functions by least squares, as a result, the optimal kinematic and technological parameters of technological processes.

Results and discussion

In order to study the changes in the nutritive value of the flour based on the poly-cereal mixtures of wholly milled cereal grain when manufacturing high readiness products depending on the humidity and the frequency of rotation of the working body, we also carried out experimental studies on the extrusion process at the food industrial twin-screw extruder.

The dependency diagrams of the calorific value of the flour poly-cereal mixture for the production of high-readiness products "Fitness" and "Zdorovie" are constructed on the basis of the experimental data depending on the variable values of the humidity and the frequency of rotation of the working body.

Figure 1 shows a three-dimensional model describing the dependence of the changes in the energy value of the flour-based poly-cereal mixture of wholly milled cereal grain for the production of the product "Fitness" on the variable values of the humidity of the flour poly-cereal mixture and the frequency of rotation of the extruder working body.

$$Э_{ц_1} = 631.0161 - 38.4253\ w - 0.3930\ n + 0wn + 1.2729\ w^2 + 0.0015\ n^2 \quad (1)$$

The analysis of the behavior of the three-dimensional surface shows that the increase in the frequency of rotation of the extruder working body (the screw) n from 80 to 250 min^{-1} leads to the increase in the energy value of the high readiness poly-cereal product ($Э_{ц_1}$, kcal). At that, the humidity of the flour poly-cereal mixture being processed has little effect on the change in the value $Э_{ц_1}$ in the process of extrusion.

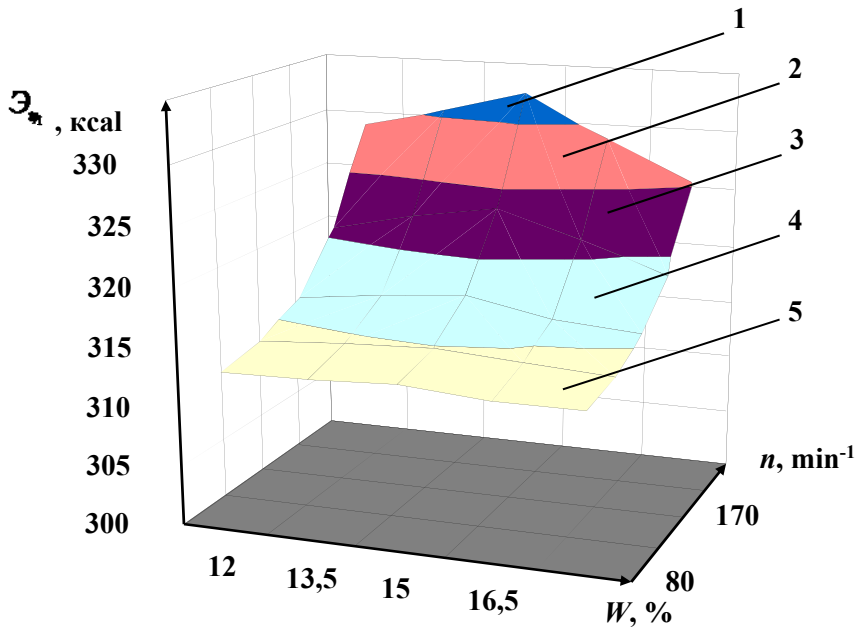

Figure 1 – The dependence of the energy value of the poly-cereal high readiness product "Fitness"

($Э_{ц_1}$, kcal) on the humidity (W, %) and the frequency of rotation of the working body (n, min^{-1}). The area characterized by the nutritive value (Эц, kcal):

1 – 330÷335; 2 – 325÷330; 3 – 320÷325; 4 – 315÷320; 5 – 310÷315

For example, when the humidity of the flour poly-cereal mixture is 12 %, and the frequency of rotation of the screw is 80 min^{-1}, the value $Э_{ц_1}$ corresponded to 313.38 kcal. When

W = 13.5 % and n = 80 min^{-1}, the value $Э_{ц_1}$ will be 313.47 kcal. The increase in the humidity to 15 % leads to an increase in the energy value to 313.85 kcal. A further increase in the humidity up to 18 % reduces the value of $Э_{ц_1}$ of the extrudate to 313.3 kcal.

Similar dependences were obtained by changing the values of the frequency of rotation of the working body from 120 to 250 min^{-1}. For example, when n = 120 min^{-1} and W = 12 %, the value of $Э_{ц_1}$ will be 314.0 kcal. The increase in the value of n to 170 min^{-1} leads to the increase in $Э_{ц_1}$ to 316.01 kcal. The increase in the value of n to 210 min^{-1} also leads to the increase in $Э_{ц_1}$ to 320.75 kcal. When the frequency of rotation of the working body will further be increasing up to 250 min^{-1}, the energy value of the high readiness product "Fitness" will be 328.75 kcal. In the course of experimental studies there have been established the maximum value of $Э_{ц_1}$ = 332.34 kcal, which is achieved at the frequency of rotation of the working body n = 250 min^{-1} and W = 15 %.

Figure 2 shows a three-dimensional model describing the dependence of the changes in the energy value of the flour-based poly-cereal mixture of wholly milled cereal grain for the production of the product "Zdorovie" on the variable values of the humidity of the flour poly-cereal mixture and the frequency of rotation of the extruder working body.

The analysis of the behavior of the three-dimensional surface shows that the increase in the frequency of rotation of the extruder working body (the screw) n from 80 to 250 min^{-1} also leads to the increase in the energy value of the high readiness poly-cereal product ($Э_{ц_2}$, kcal). At that, the humidity of the flour poly-cereal mixture being processed also has little effect on the change in the value $Э_{ц_2}$ in the process of extrusion.

For example, when the humidity of the flour poly-cereal mixture is 12 %, and the frequency of rotation of the screw is 80 min^{-1}, the value $Э_{ц_2}$ corresponded to 315.72 kcal. When W = 13.5 % and n = 80 min^{-1}, the value $Э_{ц_2}$ will be 315.33 kcal. The increase in the humidity to 15 % leads to an increase in the energy value to 315.6 kcal.

$$Э_{ц_2} = 589.0392 - 29.1706\, w - 0.5388\, n + 0.0037\, wn + 0.9436\, w^2 + 0.0001\, n^2, \qquad (2)$$

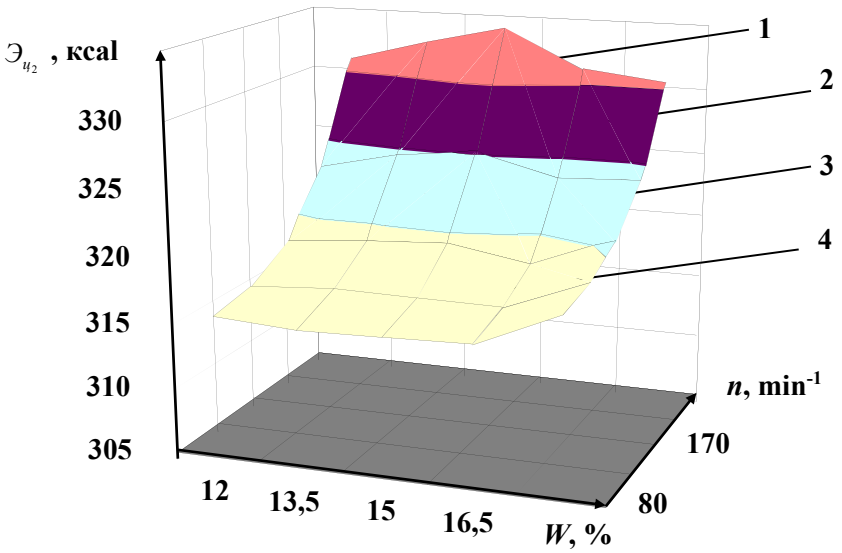

Figure 2 – The dependence of the energy value of the poly-cereal high readiness product "Zdorovie"

($Э_{ц_2}$, kcal) on the humidity (W, %) and the frequency of rotation of the working body (n, min^{-1}).

The area characterized by the nutritive value ($Э_{ц_2}$, kcal):

1 – 330÷335 kcal; 2 – 325÷330 kcal; 3 – 320÷325 kcal; 4 – 315÷320 kcal

A further increase in the humidity up to 18 % reduces the $Э_{ц_2}$ value of the extrudate obtained to 318.45 kcal.

Similar dependences were obtained by changing the values of the frequency of rotation of the working body from 120 to 250 min^{-1}. For example, when n = 120 min^{-1} and W = 12 %, the value of $Э_{ц_2}$ will be 316.36 kcal. The increase in the value of n to 170 min^{-1} leads to the increase in $Э_{ц_2}$ to 318.3 kcal. The increase in the value of n to 210 min^{-1} also leads to the increase in $Э_{ц_2}$ to 323.05 kcal.

When the frequency of rotation of the working body will further be increasing up to 250 min^{-1}, the energy value of the high readiness product "Zdorovie" will be 331.05 kcal. In the course of experimental studies there have been established the maximum value of $Э_{ц_2}$ = 334.9 kcal, which is achieved at the frequency of rotation of the working body = 250 min^{-1} and W = 15 %.

Conclusions

The analysis of the three-dimensional surfaces obtained allows for concluding that the frequency of rotation of the extruder working body has the predominant influence on the change in the energy value of the poly-cereal mixtures for the preparation of the high readiness products "Fitness" and "Zdorovie". The humidity of the poly-cereal mixture has little effect on the change in the nutritive value of the poly-cereal mixtures for the preparation of the high readiness products "Fitness" and "Zdorovie".

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ЭКСТРУДИРЛЕНГЕН КӨП ДӘНДІ ТАҒАМ ӨНІМДЕРІНІҢ ЭНЕРГЕТИКАЛЫҚ ҚҰНДЫЛЫҒЫН ЗЕРТТЕУ

Андатпа

"Фитнес" және "Здоровье" атты дайындық дәрежесі жоғары өнім алу үшін көп дәнді қоспаны экструзиялау үрдісін зерттеу үшін жүргізілген тәжірибелік зерттеулер нәтижесінде, көп дәнді қоспа ылғалдылығы, W (%) және экструдердің жұмыс органының айналу жылдамдығы, n (мин$^{-1}$) ауыспалы мәндерінің олардың тағамдық құндылығына тәуелділігі анықталды Алынған тәуелділіктер, зерттеу шеңберінде, тағамдық құндылықтардың $Э_{ц_1}$ және $Э_{ц_2}$ (ккал) келесі W (%) және n (мин$^{-1}$) өлшемдерінің мәніне тәуелділігін дәлме-дәл көрсетеді.

Кілт сөздер: көп дәнді қоспалар, экструзионды технология, экструзиялау, екі шнекті экструдер, ылғалдылық, дәмдік құндылық, айналу жылдамдығы.

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ИССЛЕДОВАНИЕ ЭНЕРГЕТИЧЕСКОЙ ЦЕННОСТИ ЭКСТРУДИРОВАННЫХ ПОЛИЗЛАКОВЫХ ПИЩЕВЫХ ПРОДУКТОВ

Аннотация

В результате проведенных экспериментальных исследований процесса экструзии полизлаковых смесей для получения продуктов высокой степени готовности "Фитнес" и "Здоровье", нами была установлена зависимость изменений переменных значений влажности полизлаковой смеси W (%) и частоты вращения рабочего органа экструдера n (мин$^{-1}$) на их питательную ценность. Полученные зависимости адекватно отражают в диапазоне исследования, изменения питательной ценности $Э_{ц_1}$ и $Э_{ц_2}$ (ккал) от значений параметров W (%) и n (мин$^{-1}$).

Ключевые слова: полизлаковые смеси, экструзионная технология, экструзия, двухшнековый экструдер, влажность, питательная ценность, скорость вращения.

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ШҰБАТТАН БӨЛІНІП АЛЫНҒАН СҮТ ҚЫШҚЫЛДЫ БАКТЕРИЯЛАРДЫҢ АНТАГОНИСТІК ҚАСИЕТТЕРІН IN VIVO ЖАҒДАЙЫНДА ЗЕРТТЕУ

Аңдатпа

Мақалада микроорганизмдер мұражайында («Антиген «ҒӨК» ЖШС) сақталған шұбаттан бөлініп алынған сүт қышқылды бактериялардың антагонистік қасиетін in vivo жағдайында зерттеу нәтижелері көрсетілген. Олардың барлығы зерттеу нәтижесінде антагонистік қасиет көрсетіп, пробиотикалық препараттар өндірісінде қолдануға тиімді деп танылды.