This paper reports the improved model of a tempering machine for heating the formulation mixture of marshmallow, characterized by heat supply to the working tank through the replacement of a steam jacket with heating by a film resistive electric heater of radiative type (FREhRT). The surface of the heat exchange of the device was increased by heating the stirrer with FREhRT secondary energy (30...85 °C) was used by converting it by Peltier elements for the autonomous operation of superchargers for cooling the engine compartment. The proposed solution will lead to an increase in the efficiency of the device, which is explained by a decrease in its specific metal consumption through the use of FREhRT.

A reduction in the duration of heating (75 °C) a marshmallow formulation mixture was experimentally established: in the examined model, 530 s, compared with the analog, 645 s. That confirmed the reduction in heating time to the set temperature by 21.7 % compared to the MT-250 basic design. The calculations have established a decrease, by 13 %, in the energy consumption of the device from 474 kg/m to 273 kg/m in the specific metal consumption of the device from 474 kg/m to 273 kg/m in the improved one.

The study results confirm the increase in the resource efficiency of the improved tempering machine, which is achieved by eliminating the steam jacket; increasing the heat exchange surface by heating the stirrer. The heat transfer by FREhRT simplifies the operational performance of the temperature stabilization system in a working tank. The reported results could prove useful when designing thermal devices with electric heat supply under the conditions of using secondary energy, which is relevant for ensuring resource efficiency.

Keywords: tempering machine, confectionery, specific energy consumption, secondary energy.

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This paper considers the process of squeezing oil from melon seeds in a screw oil press, using the method of planning a full-factor experiment. To study the interaction of various factors affecting the process of squeezing oil from melon seeds, mathematical methods of experiment planning were applied. Melon seeds were used as the object of the study. The results of studying the physical and mechanical indicators of melon seeds are reported; the rational modes of pressing melon seeds have been determined; the aerodynamic indicators of melon seeds have been defined in order to design a cold-pressed oil for melon seeds.

Ventilation modes have been substantiated; the soaking coefficient for melon seeds was derived. The coefficient of resistance for a melon seed is 1.54.

The highest critical velocity values for melon seeds were 6.4, for kernels 4.67, and for husks 3.94, respectively, with seed moisture content of 24.08 %.

The dependence of the oil yield on huskness has been determined. It is established that in the process of pressing there is a decrease in the oil content of the oil seed meal as it moves from the receiving chamber to the exit from the press, at the same time there is a compaction of the compressed product. Based on the study’s results, a plant for squeezing oil from melon seeds was designed. As a result of solving the problem with the vector optimization criterion, optimal intervals of input parameters were obtained: the initial humidity of the raw material is 9.15…10.27 %, the speed of rotation of the oil press screw is 0.843…0.895 s⁻¹, the clearance for the yield of cake is 0.750…0.800, the oil seed meal temperature at pressing = 87…89 °C, the huskness of the starting product is 7.13…7.23 %.

Keywords: vegetable oil, melon seeds, statistical analysis, oil press design, optimization criteria.

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IDENTIFYING PATTERNS IN THE FATTY-ACID COMPOSITION OF SAFFLOWER DEPENDING ON AGROCLIMATIC CONDITIONS (p. 23–28)

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The object of the study reported in this paper is to establish a dependence of the fatty acid composition of the fast-growing annual plant safflower on the agroclimatic cultivating conditions. The growth rate of safflower and the characteristics of the extracted oil are highly dependent on external temperature and moisture. At low temperatures, for example, the growth of safflower is significantly inhibited. With an increase in temperature and the length of daylight, the central stem begins to branch while growing faster.
Flowering is mainly affected by the length of daylight. The period from the end of flowering to maturity is typically 28–30 days. However, the total ripening period of the crop depends on the variety, location, sowing time, and agro-climatic cultivating conditions. The need for water increases significantly during the flowering period of safflower, which ultimately affects the indicators of the fatty acid composition and yield. At the same time, safflower is sensitive to moisture in terms of disease. In case of excess water, it is subject to root rot. In addition, frequent rains and high humidity after ripening can provoke the germination of seeds on the head. Hence, it follows that in order to obtain a high yield with the specified characteristics of the fatty acid composition of safflower oil, it is necessary to take into consideration the quantitative indicators of moisture and its seasonality, as well as the temperature regime during the growing season.

The study was conducted using arid or semi-arid, sharply continental Central Asia with its hot summers and cold winters as an example. The dependence of the physicochemical parameters of plant-derived oils on agroclimatic indicators has been established. The reported results and conclusions will allow farmers to predict the yield of oilseeds with specified characteristics depending on the changing climatic parameters.

Keywords: safflower, processing technologies, fatty acid composition of oils, physicochemical properties, climate change, nutritional value.

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REVEALING THE INFLUENCE OF PLANT-BASED ADDITIVES ON QUALITATIVE INDICATORS OF A SEMI-FINISHED PRODUCT MADE FROM CAMEL MEAT (p. 29–35)

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This paper considers the influence exerted on the qualitative indicators of boiled camel sausage by plant-based additives. The study’s results were used to improve the technology and determine the levels of application of plant-derived additives.
extracts with antioxidant properties in the production of boiled sausages. The effect of plant extracts with antioxidant properties on oxidative processes in boiled sausages has been investigated. Camel meat contains phosphorus, magnesium, and potassium. This meat has a large content of vitamins A, B1, B2, C, and E. In terms of protein content (15.1 %), camel is inferior to beef; in terms of fat (11.5 %), it is inferior to other types of meat. However, camel meat is rich in vitamins and trace elements. In addition, the composition of camel meat contains phosphorus, 216–234 mg, which is higher than that of beef.

The disadvantage of boiled camel sausages is a short shelf life. Therefore, it was decided to add plant-based supplements with antioxidant properties. In addition, to ensure minimal lipolytic changes and changes in lipid oxidation in meat, the rational concentration of added antioxidants was determined. Using the response surface methodology, a three-level factor plan was constructed for two variables—the concentration of ginger root powder and sea buckthorn powder. The minimum acid number was manifested at the concentration of ginger root powder and sea buckthorn; the minimum TBARS was detected at 0.030 % of the powder of ginger root powder and 0.090 % of the powder of sea buckthorn. The concentration of ginger root powder with optimal resistance to oxidation and lipolysis is proposed. The shelf life was also determined in comparison with the control.

**Keywords:** camel meat, lipolysis, oxidative stability, ginger root powder, antioxidants, sea buckthorn powder.

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QUALITY FORMING PATTERNS IN THE CUPCAKE ENRICHED WITH PUMPKIN SLICES (p. 43–51)

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This paper reports a study into the effect of different quantities and shapes of fresh pumpkin slices on the technological properties of the cupcake. A comparative analysis of the technological properties of the cupcake with the addition of different quantities and shapes of pumpkin slices has been carried out. A change in the technological properties of the cupcake depending on the volume of pumpkin slices has been established. The use of fresh pumpkin slices reliably improves shrinkage during baking, humidity, and acidity of the cupcake. The volume of the cupcake is significantly reduced in this case. Porosity is significantly impaired when adding 30–50 % of slices. The slice shape does not significantly affect the technological parameters of the cupcake.

Social research was conducted; the main priorities for buyers of flour confectionery products were established. It is proved that the greatest importance when choosing food by consumers is given to the physical appearance of the finished product.

Based on the research, it was found that in the technology of cupcake production, it is optimal to add 5–25 % of fresh pumpkin slices of different shapes by weight of the dough. Applying this volume of slices makes it possible to bake a cupcake with a porosity of 9 points, a shrinkage at baking of 6.9–8.5 %, humidity of 6.9–12.8 %, a volume of 176–203 cm³, the acidity of 1.5–1.7 degrees. In addition, it is possible to use 30–35 % of pumpkin slices. The porosity of a cupcake with such a formulation is at the level of 6.5–8.0 points. The cupcake quality meets the requirements set out by DSTU 4505:2005 and ISO 22000:2018. The difference from the conventional technology of utilizing non-traditional raw materials is the use of different quantities and shapes of fresh pumpkin slices. The use of pumpkin slices makes it possible to reduce the volume of dough in the finished product.

The devised recommendations could be used by low-productivity grain processing enterprises when making flour confectionery products.

Keywords: pumpkin slices, technological quality of cupcake, slice shape, volume of slices.

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As an additive to bread, it is proposed to use a powder made from derivatives of Sorbus aucuparia mountain ash processing. The powder production technology involves freezing fruits, preliminary dehydration by osmotic dehydration, drying in an infrared dryer and grinding. The technology of bread with an extended shelf life and increased biological value has been developed, and some of its physical and chemical properties have been studied. To determine the feasibility of using powders from Sorbus aucuparia processing derivatives, their amino acid spectrum was analyzed by the chromatographic method. 17 amino acids in the amount of 7.43 g/100 g were identified, 7 of which are essential (valine, leucine, isoleucine, lysine, methionine, threonine, phenylalanine) in the amount of 1.84 g/100 g. The highest concentration of the total number of amino acids is glutamic acid (1.57 g/100 g), which gives the powders the properties of natural preservatives, increases the storage capacity of bread. The experiment showed that adding 20 % powder from Sorbus aucuparia processing derivatives to wheat flour bread allows at least doubling its shelf life. However, such an amount of additive affects the porosity of the bread and its organoleptic properties. Therefore, a sample was made with the addition of 10 % powder, and no defects in taste, smell and shape of bread with the addition of mountain ash powder were found. When using the developed technology, the time for making bread is reduced by 30 minutes compared to the classic straight dough method and by 120–150 minutes compared to the sponge dough method. The shelf life of bread according to the proposed technology is 15 days.

**Keywords:** enriched bread, dehydration, Sorbus aucuparia processing derivatives, infrared drying, glutamic acid.

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INCREASING THE BIOLOGICAL VALUE OF BREAD THROUGH THE APPLICATION OF PUMPKIN PUREE (p. 58–68)

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Some vegetables are indispensable for the production of a wide range of bread products, because of their chemical composition. One of the factors hindering their widespread use in the bakery is the insufficient study of their functional properties in the mentioned technological areas. The main goal of the study was a complex analysis of the food value, mineral and vitamin compositions of raw materials and bread with additives, on the example of pumpkin variety «Perekhvatka 69». This is necessary to further substantiate the development of technology for the production of new types of bakery products, expanding the range of products and satisfying various consumer preferences. The nature of changes in nutrients, mineral and vitamin compositions in the technological process has been studied, which makes it possible to determine the proportion of reduction in their content. Based on this, it is possible to adjust the content of nutrients, mineral and vitamin compositions before and after the technological process of processing raw materials and making bread with additives. It has been found that the introduction of pumpkin puree has practically no effect on the amount of washed gluten. However, at a dosage of pumpkin puree from 5 to 25 %, the compression strain of raw gluten increases from 68.5 to 94.7 units. This makes it possible to adjust the content of nutrients, mineral and vitamin compositions in the technological process. Based on this, it is possible to adjust the content of nutrients, mineral and vitamin compositions before and after the technological process of processing raw materials and making bread with additives. It has been found that the introduction of pumpkin puree has practically no effect on the amount of washed gluten. However, at a dosage of pumpkin puree from 5 to 25 %, the compression strain of raw gluten increases from 68.5 to 94.7 units. This makes it possible to regulate the desired final properties of bread and the deformation of gluten in the dough.

Keywords: wheat flour, gluten, pumpkin, pumpkin purée, vitamins, minerals, dough, bread.

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УДОСКОНАЛЕННЯ ТЕМПЕРАЮЧОЇ МАШИНИ ДЛЯ КОНДИТЕРСЬКИХ МАС (с. 6–11)

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Розглянуто процес віджиму олії з насіння дині в шнековому маслопресі, із застосуванням методу планування повнофакторного експерименту. Для дослідження взаємодії різних факторів, що впливають на процес віджиму олії з насіння дині, було застосовано математичні методи планування експерименту. Як об'єкт дослідження використовували насіння дині. Наведено результати досліджень, які дозволяють розглядати процес відкосування насіння дині. Обґрунтовано режими вентилювання, знайдено коефіцієнт витання для насіння дині. Коефіцієнт опору для насіння дині становить 1,54. Найбільші значення критичної швидкості для насіння дині становили 6,4, ядер 4,67 і для лушпиння 3,94, відповідно, при вологості насіння 24,08 %. Визначено залежність выходу олії від лузжистості. Встановлено, що в процесі віджиму відбувається зменшення олійності м'ятки в міру її просування від приймальної камери до виходу з апарату, однаково відбувається ущільнення продукту, що пресується. За результатами дослідження спрощена установка для віджиму олії з насіння дині. В результаті вирішення задачі з векторним критерієм оптимізації були отримані оптимальні інтервали вхідних параметрів: початкова вологість сировини 9,15...10,27 %, частота обертання шнека маслопресу 0,843...0,895 с⁻¹, величина зазору для виходу макухи 0,750...0,800, температура м'ятки при віджимі 87...89 °С, лузжистість вихідного продукту 7,13...7,23 %.
Дослідження проводилися на прикладі посушливої або напівзасушливої, різко континентальної, зі спекотним літом та холодною зимию. Центральної Азії. Встановлено залежності фізико-хімічних показників рослинних олій від агрокліматичних показників. Отримані результати та висновки дозволяють аграріям прогнозувати отримання продукції олійних культур із заданими характеристиками залежно від параметрів клімату, що змінюються.

Ключові слова: сафлор, технології переробки, жирно-кислотний склад олій, фізико-хімічні властивості, зміна клімату, харчова цінність.

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ВИЯВЛЕННЯ ВПЛИВУ РОСЛИНИХ ДОБАВОК НА ЯКІСНІ ПОКАЗНИКИ НАПІВФАБРИКАТУ З ВЕРБЛЮЖАТИНИ (с. 29–35)
Zhanar Medeubaeva, Aigul Tayeva, Gulnara Shambulova, Laila Syzdykova, Mikhail Astakhov

Розглядається вплив на якісні показники вареної ковбаси з верблюжатини рослинних добавок. Результати дослідження використані при вдосконаленні технології та визначені рівні внесення рослинних екстрактів з антиоксидантними властивостями при виробництві вареної ковбаси. Дослідження вплив рослинних екстрактів з антиоксидантними властивостями на окисні процеси в вареної ковбасі. У місці відкладається розумову концентрацію доданих антиоксидантів. Використовуючи методологію поверхневих відсіків, встановлений факторний план будувалося для двох змінних – концентрації розчину кореня краншу та порошку обліпихи. Мінімальна кислотна сила виявлялася при 0,018 % розчину кореня краншу та 0,035 % порошку обліпихи. Мінімальне кислотне число отримано при розчині кореня краншу та 0,005 % порошку обліпихи.

Ключові слова: технології переробки, жирно-кислотний склад олій, фізико-хімічні властивості, зміна клімату, харчова цінність.

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СТВОРЕННЯ ПЕЧИВА З ГАРБУЗОВОГО БОРОШНА (с. 36–42)
Dan Gao, Anna Helikh, Zhenhua Duan, Yan Liu, Feifei Shang

Печиво є поширене закускою з великим вибором смаків. З підвищенням сучасної цінності здоров'я вчена печиво з високим вмістом цукру, олії, жиру та низьким вмістом білка не забезпечує пиття покупців. Підходи необхідно більше корисних яловичин. Наступні дослідження з метою оцінки розумову концентрацію доданих антиоксидантів. Використовуючи методологію поверхневих відсіків, встановлений факторний план будувалося для двох змінних – концентрації розчину кореня краншу та порошку обліпихи. Мінімальна кислотна сила виявлялася при 0,018 % розчину кореня краншу та 0,035 % порошку обліпихи.

Ключові слова: технології переробки, жирно-кислотний склад олій, фізико-хімічні властивості, зміна клімату, харчова цінність.

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ОСОБЛИВОСТІ ФОРМУВАННЯ ЯКОСТІ КЕКСУ, ЗБАГАЧЕНОГО СОЛОМОЮ ГАРБУЗА (с. 43–51)
В. В. Любич, В. В. Новіков, В. В. Желєзна, О. А. Балабак, М. Я. Кирина, М. О. Макарчук, О. А. Балабак, В. В. Москалець, Т. З. Москалець

Дослідження вплив різної кількості та форми свіжої соломки гарбуза на технологічні властивості кексу. Проведено порівняльний аналіз технологічних властивостей кексу з добавлянням різної кількості та форми соломки гарбуза. Встановлено зміну технологічних властивостей кексу залежно від кількості соломки гарбуза. Заостосування свіжої соломки гарбуза достовірно збільшує упікання, змінюється, кислотність кексу. Об’єм кексу при цьому достовірно збільшується. Дослідження проводилися на прикладі посушливої або напівзасушливої, різко континентальної, зі спекотним літом та холодною зимию. Центральної Азії. Встановлено залежності фізико-хімічних показників рослинних олій від агрокліматичних показників. Отримані результати та висновки дозволяють аграріям прогнозувати отримання продукції олійних культур із заданими характеристиками залежно від параметрів клімату, що змінюються.

Ключові слова: сафлор, технології переробки, жирно-кислотний склад олій, фізико-хімічні властивості, зміна клімату, харчова цінність.
Вологістю 6,9–12,8 %, об’ємом 176–203 см³, кислотністю 1,5–1,7 град. Крім цього, можливе застосування 30–35 % соломки гарбуза. Розроблені рекомендації можуть бути використані зернопереробними підприємствами низької продуктивності під час виробництва борошниплодових кондитерських виробів.

Застосування соломки гарбуза дозволяє зменшити кількість тіста в готовому виробі.

Застосування соломки гарбуза дозволяє зменшити кількість тіста в готовому виробі.

Ключові слова: соломка гарбуза, технологічна якість кексу, форма соломки, кількість соломки.

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РОЗРОБКА ТЕХНОЛОГІЇ ХЛІБА З ВИЩОЮ БІОЛОГІЧНОЮ ЦІННІСТЮ ТА ЗБІЛЬШЕНІМ ТЕРМІНОМ ЗБЕРІГАННЯ (с. 52–57)
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В якості добавки до хліба запропоновано використання порошку, виготовленого із похідних переробки горобини звичайної Sorbus aucuparia. Технологія отримання порошку передбачає заморожування плодів, попереднє зневоднення методом осмотичної дегідратації, висушування в інфрачервоній сушарці та подрібнення. Розроблено технологію хліба з подовженим терміном зберігання та підвищеною біологічною цінністю, досліджено її дії фізико-хімічні властивості. Для встановлення доцільності використання порошків в хлібопекарській промисловості проводився комплексний аналіз харчової цінності, мінерально-вітамінного складу порошку та хліба з добавками на прикладі гарбуза сорту «Перехватка 69».

Це необхідно для подальшого обґрунтування розробки технології виробництва нових видів хлібобулочних виробів, розширення асортименту продукції та задоволення різних споживчих вподобань. Вивчено характер зміни поживних речовин, мінерально-вітамінного складу протягом технологічного процесу, що дозволяє визначити час зниження їхнього вмісту. Виходячи з цього, можна регулювати вміст поживних речовин, мінерально-вітамінний склад до та після технологічного процесу переробки сировини. Установлено, що введення гарбузового пюре практично не впливає на кількість відмитої клейковини. Однак при вмісті гарбузового пюре від 5 до 25 % деформація стиснення сирої клейковини збільшується з 68,5 до 94,7 одиниць.

Ключові слова: пшеничне борошно, клейковина, гарбуз, гарбузове пюре, вітаміни, мінерали, тісто, хліб.