fruits; and low in red and processed meat can fight cancer. This type of diet provides vitamins, minerals, and naturally occurring phytochemicals and defends the body against cancer and other diseases. Recently nutraceuticals have emerged as potential cancer preventive natural sources from food that may lead to reduced cell damage, reduced necrosis, cell proliferation. However, the reduced cancer incidence due to phytochemicals and nutraceuticals seems to be hype [3].

The specific role of dietary components, including supplements and chemoprevention, in cancer prevention/protection remains unclear. General recommendations include maintaining a healthy weight, eating fruits and vegetables, whole grains, and limiting consumption of refined carbohydrates and processes and red meats. Potential cancer preventive food-related components should be further researched in clinical trials on different models for their effectiveness and toxicological documentation. Furthermore, extensive research work should be carried out on these components to evaluate their possible applications, toxicological and particular genotoxic profile against a wide range of cancer in both either in-vitro or in-vivo.

References

1. Kravchenko Ju.S. Diet and Cancer. International Encyclopedia of Public Health (Second Edition). 2017, p. 294-304.
2. Canadian Cancer Statistics Advisory Committee. Canadian Cancer Statistics 2018. Toronto, ON: Canadian Cancer Society. 2018, 51 p.
3. Popovici C. Potential anticancer effects of food-related components. Book of Abstracts of the International Summer School “Food Safety and Healthy Living”. 2019, 1 p.
4. World Cancer Research Fund/American Institute of Cancer Research. Diet, Nutrition, Physical Activity and Cancer: A Global Perspective. Continuous Update Project Expert Report 2018. 112 p.

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MODELING OF THE PROCESS OF KNEADING THE YEAST DOUGH BY MODERN WORKING ELEMENT

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During the viscous flow, the deformation is proportional to the stress imposed by Newton's law, and after the removal of the load is not restored. Plastic deformation is created under stress that exceeds a certain limit value (the boundary of flowability), to which the material behaves as viscoelastic. During mixing flour with water, the components of the flour form a hydrated bonded mass - a dough. Hydrated medium, which is a dough, the presence in this mass of introduced fermentable microflora is triggered by a system of complex biochemical, microbiological, colloidal and other processes.

The cam working elements are becoming more widely used, but almost non-exploratory, requiring in-depth study and detailed analysis. By way of a critical analysis of literary sources on the subject of the process of mixing, the directions of development and improvement of this issue were identified, thus a deep and systematic study requires the problem of qualitative and intensive mixing of yeast dough in continuous-dough machines of continuous action.

To study the shear stress, four basic positions of the cam's working elements were selected, then these provisions are repeated on the shaft of the working element.

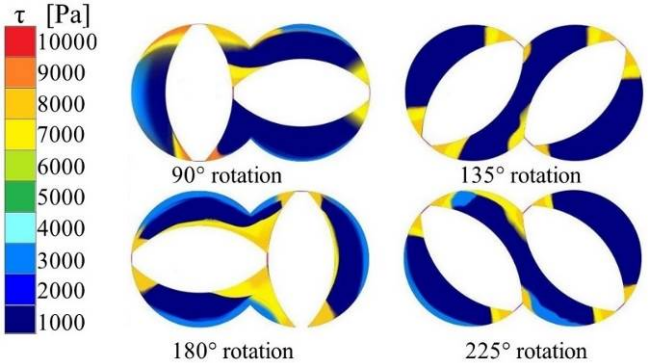

Figure 1 – Change in the shear stress [τ, Pa] in the mist chamber in the process of mixing the yeast dough by the cam operating elements

On the greater part of the working volume there are not large indicators of shear stress (Figure 1). The greatest indices of shear strain during modeling of the process of mixing the yeast dough are observed in the field of interaction of the working element with the wall of the case and in the zone of engagement of the working elements. In the area of the engagement of the working elements and at the contact with the walls of the chamber, the shear stress values reach from 7000 to 8000 Pa. For the rest of the chamber, the displacement strain reaches 1000-3000 Pa.

The dissociation is proportional to the displacement velocity squared. Due to dissipation, the conversion of the kinetic energy of the stream into the heat occurs due to internal friction of the yeast dough with the working elements and the case.

The yeast dough is mixed in 12 pairs of cams, which are shifted at an angle of 45°, for the dissipation process it was decided to consider the process of kneading in the example of 3-6-9-12 pair of cams, since at the beginning of mixing there were noticeable changes in dissipation. By means of simulation, distribution of dissipation in the microscope was considered in the process of mixing the yeast dough with the cam operating elements (Figure 2).

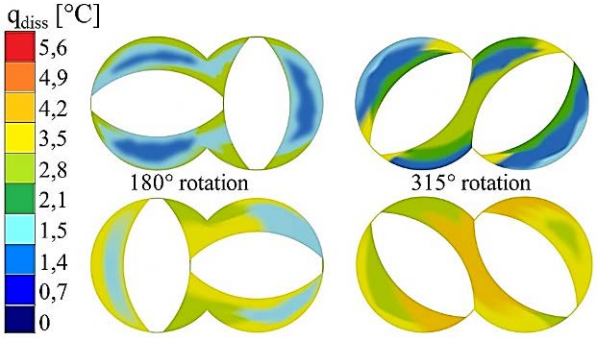

Figure 2 – Distribution of dissipation [q_{diss}, ° C] in the chamber in the process of mixing the yeast dough by the cam working elements

Distribution of dissipation clearly shows in which parts of the working chamber is the formation of heat in the flow area. In the area of kneading 3 pairs of cam (180° rotation), there is no significant heat release, then during the mixing due to internal friction of the yeast dough with the working elements and the case there is an increase in the conversion of the kinetic energy of the stream into the heat and the temperature of the yeast dough increases. At the stamping site 12 pairs of cams, the temperature of the yeast dough increases by almost 5° C, thus taking into account that before the start of the simulation, the initial temperature was set to t = 30° C, then at the end of mixing, this temperature in the yeast dough reaches almost 35° C. The greatest amount of heat is observed in the sphere of cam involvement of the working elements.

Thus, the simulation parametric model of the process of mixing the yeast dough allowed to study in details the processes occurring in the mixing chamber of the dough, the dependence of the flow pattern on the design and configuration of the cam operating elements and the frequency of rotation.

The simulated parametric model of the process of mixing by cam operating elements, which allows to carry out design calculations effectively when choosing rational structural and technological parameters, is developed. Using the presented scientific and methodological developments will significantly accelerate and economically save the process of creating reliable process equipment for mixing yeast dough.

It is possible to rationalize the process of mixing the dough and reduce the time required for fumigation and fermentation by intensive mechanical processing of the dough by the cam operating elements and as a result of obtaining qualitative characteristics of the baking products.

It is advisable to mix the yeast dough with the use of the cam's working organs.

References

1. Struck S., Straube D., Zahn S., Rohm H. (2018), Interaction of wheat macromolecules and berry pomace in model dough: Rheology and microstructure, Journal of Food Engineering, 223, pp. 109-115.
2. Nawrocka A., Krekora M., Niewiadomski Z., Miś A. (2018), Characteristics of the chemical processes induced by celluloses in the model and gluten dough studied with application of FTIR spectroscopy, Food Hydrocolloids, 85, pp. 176-184.
3. Brandner S., Becker T., Jekle M. (2018), Wheat dough imitating artificial dough system based on hydrocolloids and glass beads, Journal of Food Engineering, 223, pp. 144-151.

4. Zhang D., Mu T., Sun H. (2017), Comparative study of the effect of starches from five different sources on the rheological properties of gluten-free model doughs, Carbohydrate Polymers, 176, pp. 345-355.
5. Wang Y., Ye F., Liu J., Zhou Y., Zhao G. (2018), Rheological nature and dropping performance of sweet potato starch dough as influenced by the binder pastes, Food Hydrocolloids, 85, pp. 39-50.
6. Šćepanović P., Goudoulas Th. B., Germann N. (2018), Numerical investigation of microstructural damage during kneading of wheat dough, Food Structure, 16, pp. 8-16.
7. Vanin F. M., Lucas T., Trystram G., Michon C. (2018), Biaxial extensional viscosity in wheat flour dough during baking, Journal of Food Engineering, 236, pp. 29-35.
8. Jiang Z., Liu L., Yang W., Ding L., Zhou S. (2018), Improving the physicochemical properties of whole wheat model dough by modifying the water-unextractable solids, Food Chemistry, 259, pp. 18-24.

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ПЕРСПЕКТИВЫ ИННОВАЦИОННОЙ МОДЕРНИЗАЦИИ ПРОИЗВОДСТВА ПРОДУКЦИИ ЖИВОТНОВОДСТВА

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Вглядываясь в будущее, необходимо понять грозит ли человечеству – в близкой или отдаленной перспективе – массовый голод, если уже сейчас от него, по данным ООН, страдает один миллиард человек [1]. Хватит ли сельскому хозяйству земельных, водных и других природных ресурсов, чтобы удовлетворить продовольственные потребности каждого жителя планеты на уровне не менее 2700 ккал в сутки. Способны ли инновации в сельском хозяйстве противостоять опасным изменениям климата и капризам природы. Наконец, какую аграрную политику предстоит выработать мировому сообществу и каждой стране, чтобы обеспечить высокоэффективное, устойчивое сельское хозяйство.

Эффективность работы всех звеньев АПК развитых зарубежных стран определяется в конечном итоге степенью удовлетворения потребностей населения в высококачественных продуктах питания. С шестидесятых годов XX века, в результате увеличения потребления основных видов сельскохозяйственной продукции, питательность рациона человека превысило 3000 ккал и в настоящее время составляет 3100 – 3600 ккал. При этом, следует отметить, что в наиболее развитых, в экономическом отношении странах, калорийность рациона уже не возрастает, а снижается. Заметно тенденция снижения в нем доли хлебопродуктов и картофеля при повышении доли мяса, молока и яиц, овощей и фруктов. Отмечается стабилизация уровня потребления общего белка в пределах 100 г, с ростом в нем доли белка животного происхождения, которое в настоящее время достигло в рационе почти две трети общего потребления белка. Значительную роль в обеспечении человеческого организма белком животного происхождения принадлежит мясе и мясопродуктам [2].

На современном этапе развития в большинстве передовых странах аграрная политика направлена на сохранение и наращивание уровня производства мяса, расширения выработки ассортимента мясной продукции и улучшения их качества для удовлетворения меняющихся запросов потребителей.

По данным Службы зарубежных сельскохозяйственных исследований Министерства сельского хозяйства США (FAS USDA) объемы потребления говядины в Мире в последние годы увеличивается. Ускоренное развитие отрасли мясного скотоводства в ближайшие годы является одним из перспективных стратегических направлений по увеличению производства высококачественной говядины.

В соответствии с произведенными расчетами Организации экономического сотрудничества и развития (ОЭСР) и ФАО прогнозируется увеличение производства всех видов мяса в Казахстана. В то же время, по данным Службы зарубежных сельскохозяйственных исследований Министерства сельского хозяйства США мировое поголовье КРС в 2018 г. состави-