

Cottage cheese with wheat malt flour from germinated wheat grain

Abstract

Germination time and conditions for wheat grain were studied to determine optimum conditions that would maximize the production of carotene and minimize nitrate amount. The study of the germinating wheat mode is described in the article. Wheat's germinating duration and drying temperature are recommended. The wheat malt is intended for use in the dairy. Also cottage cheese product basic recipe is described.

Keywords: wheat, germination, nitrate, carotene, mode, cottage cheese

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Introduction

Dairy products are one of the most delicious and useful human ration components. Though milk or dairy mineral nutrients list is not wide, some vitamins contents is not enough, the dietary fiber lack is apparent. The best way of enrichment dairy products by these components is the combination of milk raw with some grains components.¹ Furthermore, the germinated grain becomes more valuable, the content of vitamins, minerals and dietary fibers grows. Scientists have studied germination of seven selected commercially important grains to establish its effects on the nutritional and chemical composition. The changes in the concentration of the nutrients and bioactive compounds were investigated. This study indicates the potential of germinated grains for the development of physiologically bioactive compounds for the reduction of the risk of diabetic agents and colon cancer.² Vitamins (C, E, beta-carotene) are barely detectable in the dry wheat grains. Upon germination the concentrations of these antioxidant vitamins steadily increased with increasing germination time, reaching their peaks after 7days.³ Although wheat may contain different contaminants – nitrates for instance.⁴

The problem set

The finding ways to reduce nitrates amount and along to increase nutrient and biological value of germinated grain is the purpose of our research. The germinated grains are intended for use in the dairy industry. The physical-chemical, biochemical and microbiologic methods of researches have been used. The object of research was the spring soft wheat. The pilot experiments and the technological literature review proved the fact that fermented milk drinks with fillers unable to content grain-flour more than 0,5-3,0% because of organoleptic properties. That is why our research was turned on creation a *non-fluid* dairy product with grain filler. Cottage cheese with wheat malt flour was selected as such one. Grains were germinated within 10days for nutrient and biological value increase. Wheat grains were first steeped, followed by incubation in the dark for 10days at 98% RH and 18degrees C. Wheat has been watered by: distilled water (control sample), acidic fraction of the electrochemical activated water (EAW), alkalescent fraction of the EAW, suspension of chlorella (it is a source of protein, vitamins, minerals). The

electrochemical activation of water is based on the electrolysis. The changes in the concentration of nitrates and carotene were monitored over the germination period. In the experiments was used cottage cheese with a mass fraction of fat 4%.

Results

The best biomass growth as result watering seeds by suspension of algae chlorella or alkaline fraction of the EAW is established. Sprouting wheat in acid fraction is not effective. The germinated wheat was dried at 40 or 60 or 80 or 100°C up to constant weight and then wheat malt including sprouts and roots was milled. As a result wheat malt flour was obtained. The fact that nitrates amount in germinated grain have been decreasing within all sprouting period is established by that experience. More remarkably this process goes up to 2-4day of sprouting. The chlorella wetted sprouts are an exception because a medium for cultivating chlorella contains some nitrates. Chlorella wetted sprouts contain a little bit more nitrates in comparison with the control sample. The ones wetted by an acidic or alkalescent fraction of the EAW are contain nitrates less than the control sample. The drying temperature rising reduces nitrate amount in sprouts. This phenomenon is not dependent on the liquid's type.

The aspects of the carotene (provitamin A) biosynthesis during sprouting are important to know. Non-germinated grain carotene content is negligible, by the way. It is established that carotene amount rises up to 6-8 day of sprouting. Most actively this process is expressed on 4-6days of sprouting. Further, up to 10days, the carotene amount drops. The carotene amount decrease is dependent on the relative reduction its part at green biomass sprouts within germinating. The liquid's types favoring to wheat germinating are favors accumulation of carotene too. The sprouts wetted by a suspension of chlorella contain maximum carotene amount. The algae contain some carotene quantity as well. Also significant carotene amount contains sprouts wetted by an alkalescent fraction of the EAW. The least carotene quantity contains sprouts wetted by an acidic fraction of EAW. The carotene amount correlates with drying temperature. The drying temperature rising reduces carotene quantity in wheat malt.

After data interpretation the mathematical relation between the nitrates amount, carotene amount, duration of sprouting and drying

temperature are obtained. The system of equations solution gave optimum technological mode the wheat malt obtaining. These are the following factors values: germination time is 8day with watering grains by alkaline faction of the EAW, drying temperature is 91°C.

The analysis of the composition of the wheat malt flour has shown that its caloricity decreases in comparison with the initial grain because of active amylolytic processes. The protein and fat amount are insignificantly changing. The relative quantity of dietary fibers during grain's sprouting increase as result of the polysaccharides destruction.

The experiments have shown that as a result of the direct introduction of wheat malt flour in the cottage cheese quickly occurs limitation in color and taste of the cottage cheese product. So there is a limit of malt flour dose in the cottage cheese product. The usage apricot or other bright fruit-berry or a vegetable component in the cottage cheese product recipe allows increasing the malt dose. We recommend the stated below cottage cheese product recipe. Cottage cheese product contains following components, wt%: dried pitted and halved apricot 5-7; sugar 3-5; wheat grain germinated during 8days and ground in conjunction with all anatomical parts to particle size below 200micron 6-7; cottage cheese - the balance.

By organoleptic properties cottage cheese product is almost does not differ from the similar one with dried apricots and without the addition of the wheat malt flour. Cottage cheese product obtained by that recipe completely meets the sanitary requirements. In the issue microbiological and physico-chemical researches we established cottage cheese product shelf life. Cottage cheese product with wheat malt flour storage mode is within 48hours at 4 degrees Celsius.

Conclusion

Germination time and conditions for wheat grain were studied to determine optimum conditions that would maximize the production

of carotene and minimize nitrate amount. The study results have shown that wheat grains steeped by alkaline faction of the EAW (or suspension of chlorella), germinated for 8 d and dried at 91°C would produce the most desirable sprouts. Effects of the research: the way to increase biological value and dietary properties of wheat and method of producing cottage cheese product with wheat malt flour are suggested. Our method of obtaining cottage cheese product with wheat malt flour has been patented.⁵ The wheat malt can be used as part of other dairy products as well.

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Conflict of interest

Author declares that there is no conflict of interest.

References

1. Song W, Chun O, Kerver J, et al. Ready-to-eat breakfast cereal consumption enhances milk and calcium intake in the US population. *J Am Diet Assoc.* 2006;106(11):1783–1789.
2. Donkora ON, Stojanovska L, Ginnb P, et al. Germinated grains-Sources of bioactive compounds. *Food Chem.* 2012;135(3):950–959.
3. Yang F, Basu TK, Ooraikul B. Studies on germination conditions and antioxidant contents of wheat grain. *Int J Food Sci Nutr.* 2001;52(4):319–330.
4. Lawlor DW, Boyle FA, Kendall AC, et al. Nitrate nutrition and temperature effects on wheat: Enzyme composition, nitrate and total amino acid content of leaves. *Journal of Experimental Botany.* 1978;38(3):378–392.
5. Patent RU №. Curd-cereal product. *Int Cl.* 1997.