



FEASIBILITY OF USING DRY EXTRACTS OF TEA IN THE FOOD INDUSTRY

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The article is devoted for the use of tea extracts as a source of biologically active substances in food products balanced on vitamins and minerals. Quantitative changes of the content of water-soluble vitamins and minerals of green and black tea in the production of dry tea extracts have been ascertained.

The problem of consumption of products that are not balanced on the content of the biologically active substances (vitamins, phenolic substances, organic acids, trace elements, macronutrients, etc.) is quite acute nowadays. At the same time it is necessary to note the problem of the full use of raw material resources, as the plants are the primary source of biologically active substances. The great importance in the solution of this problem is the organization of rational processing of plant materials in the extracts for use in food production [1, 2]. This gives an opportunity to balance food products according to their chemical composition. Thus the enrichment of food products with natural biologically active substances is relevant for today.

The review of the literature showed that tea is one of the greatest sources of biologically active substances. It includes about 300 different chemical compounds. Most of them are present in the concentrations that are close to the physiological needs of the body.

Tea contains both water-insoluble substances (52%) (fiber, proteins, chlorophylls, pigments, Pectin, Starch) and water-soluble substances (simple phenols, oxidized and unoxidized poly phenols, carbohydrates, amino acids, vitamins, minerals), and also caffeine. There are about 17 amino acids, more than 20 macro - and microelements, about 100 aromatic compounds (essential oils, poly terpenes, monoterpenes, sesquiterpenes, and others), about 30 polyphenols (catechins, Gallic acid, tannins and others), pigments (chlorophyll. carotene, xanthophyll, tioflavin, thearubigine and others), alkaloids purine type (caffeine, theobromine, theophylline, diuretic), resins, organic acids (oxalic acid, lemon, apple and others), vitamins (vitamin C, rutin, vitamin PP, vitamin b), and more than 10 enzymes (polyphenoloxidase, catalase, peroxidase, invertase and others) in tea [3,4].

The use of tea extract as vitamin-mineral additives allows to regulate the chemical composition of food and can meet the modern requirements of nutrition science [5].

The aim of this paper is the study of mineral and vitamin content of green and black tea and dry extracts obtained on their basis; to prove the feasibility of using extracts of tea in the production of products of fast preparation.

The objects of study were green and black tea and dry extracts obtained on its basis. Dry extracts were obtained in accordance with the technologies that have been developed at the National University of Food Technology at the Department of technology of bakery and confectionery products. Tea was extracted using hot water with periodic stirring within a certain period of time and was dried in vacuum at a temperature of 60 degrees Celsius to the moisture content of 4,5 % in it.

The mineral composition and content of vitamins were determined by standard methods in the samples. So the mineral composition of the substances has been determined using x-ray fluorescent analyzer "Elva X-med" in accordance with the methodology for determining the composition of chemical elements in hair (method №12-4502), which was developed in the scientific and technical center "Vyrya" and was approved in the Ministry of health of Ukraine (the decree №8 from 05.10.2000). Vitamin content was determined in accordance with the methodology specified in GOST 7047-55 Vitamins A, C, D, B1, B2, and PP. Sampling, methods of the determination of vitamins and the quality tests of vitamin preparations.



In the literature there are no data about the content of the elements of mineral substances in dry extracts of green and black tea. This fact contributes to their study. The result of these studies is presented in table 1.

Minerals are found in food products in the form of organic and inorganic compounds. They are part of the organic substances of different classes - proteins, fats, glycosides, enzymes and others. Such elements as Fe, Cu, Mn accelerate the processes of oxidation of vegetable oils, and also assume a catalytic effect of trace elements in the formation of the products of thermal oxidation [6]. Different substances are washed out of broken cells during the extraction of raw materials and it is possible the transition of mineral substances in the extract, and a decrease of moisture content in the extract during the drying process leads to a concentration of the majority of biologically active substances. Table 3.5 shows that technological processing (extraction, drying) increases the content of K to 30%, Na to 25%, Ca to 26%, Mn to 32%, Mg to 37%, Fe to 32%, Cu to 80%, and also contains many other elements.

Table 1 - The mineral content of tea in raw materials and finished products, mg/100g

Element	Green tea		Black tea	
	Raw materials	Dry extract	Raw materials	Dry extract
S	180	482	195	358
K	1385	2006	1464	2070
Na	45	51	38	51
Ca	140	187	156	212
Mn	18	23	17	25
Mg	222	257	180	285
Fe	2,8	3,5	2,3	3,4
Ni	-	0,6	-	0,8
Cu	0,5	1,4	0,3	1,5
Zn	3,0	5,8	3,9	6,7
Br	0,4	0,8	0,7	10,1
Rb	10	14	9	16
Sr	0,5	0,8	0,8	1,5
Zr	-	0,2	-	-

*Explanatory note 1 - the results are outside the sensitivity of the method. (0,1mg/100g)

The content and the change of water-soluble vitamins were studied during the production of extracts for full characterization of the obtained extracts. Research results are presented in table 2.

Table 2 – The content of vitamins in raw materials and ready product.

Title		Ascorbic acid, mg/100g	Citrin, mg/100g	Riboflavin, mg/100g	Pyridoxine, mg/100g
Green tea	Raw materials	174,0	25,8	0,53	0,03
	Dry extract	60,3	31,6	1,26	0,05
Black tea	Raw materials	13,4	15,8	0,49	0,04
	Dry extract	11,3	21,9	1,21	0,11

The results of the researches, connected with the determination of changes of content of water-soluble vitamins during production of dry extracts, testify not only about the rest of vitamins, but also about their quantitative increase. So carboxylic enzyme inactivation, not a long process of extraction and low temperature of drying helps preserve some of vitamin C, and dehydration of the extract leads to the concentration of this element: its remainder is 65% for green tea and 12% for black one. Rutin is a bioflavonoid that is resistant to boiling component. Moreover, high temperature promotes better dissolution in water. Therefore, a quantitative increase of vitamins during technological processing of raw materials reaches 28%. During the research of changes in the content of Riboflavin, it was found that



vitamin B₂ is increased to 60%, while vitamin B₆ is increased to 63%.

It is necessary to emphasize the increase of water-soluble vitamins, micro and macro elements. Most of them cover the daily needs of the organism in these components. Thanks to the developed technology (not a long process of extraction, low conditions of evaporation and drying) extracts of tea retain most of biologically active substances, and dehydration to a specified number of dry substances leads to the concentration of these substances. The obtained dry extracts are soluble in cold and hot water. They are easily dosed, contain a large number of biologically active substances and can be used as natural dyes and flavor enhancer adding these extracts in food. It should be noted that developed extracts can be used in the form of drinks when they are diluted in water with sugar or without it.

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ЦЕЛЕСООБРАЗНОСТЬ ИСПОЛЬЗОВАНИЕ СУХИХ ЭКСТРАКТОВ ЧАЯ В ПИЩЕВОЙ ПРОМЫШЛЕННОСТИ

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Резюме

Статья посвящена вопросу использования экстрактов чая, как источника биологически активных веществ, в пищевых продуктах, сбалансированных по содержанию витаминов и минеральных веществ. Установлены количественные изменения содержания водорастворимых витаминов и минеральных веществ чая зеленого и черного при производстве сухих экстрактов чая.