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DEVELOPMENT OF A TECHNOLOGY FOR PRODUCING A SMART BLENDED BEVERAGE WITH PULP BASED ON SEVEN VEGETABLES «JUS DE LONGÉVITÉ»

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ABSTRACT

The aim of this article is to develop a smart beverage with pulp based on seven vegetables named "Jus de longévité", which is translated from French as "Juice of longevity". This name has not been chosen randomly. A unique combination of the components of the functional beverage makes it possible to use it in therapeutic and dietary nutrition. There is an ancient wise proverb: "When the diet is wrong, medicine is useless. When the diet is right, medicine is not needed." Food can be medicine! [4].

This invention relates to the food and medical industry in the field of nutrition. The creation of the beverage is aimed at enhancing immunity, preventing cardiovascular diseases, diseases of the circulatory, digestive, and nervous systems, metabolic disorders, respiratory, and urogenital systems, and at reducing the risk of cancer. In addition, it is able to quickly purify the body from toxins and toxins. The smart beverage based on the juice of seven vegetables can be included in the diet of people suffering from obesity, depression, sleep disturbance, chronic fatigue, and also ensures the normal functioning of the reproductive system, stops the further development and formation of malignant tumors. The relevance of the innovative product is also due to the fact that "smart "products" are currently very popular, because their

production is of strategic importance; such products are significantly superior to traditional ones, but among many modifications of smart products, "Jus de longévité" is unique in combination and ratio of its constituent components.

INTRODUCTION

Smart food products have appeared on the market recently, but they have already been dubbed the "food of the future." This is a useful and functional product [2].

Unlike ordinary food products, smart food are not just a combination of nutrients, but also the "management information" that allows the body to quickly turn on the necessary self-regulation systems [2].

The aim of this work was to develop the technology and formulation of a smart blended beverage with pulp based on seven vegetables - "Jus de longévité".

This beverage has a selective immunomodulating effect, is aimed at preventing diseases of the circulatory, cardiovascular, digestive, and nervous systems, metabolic disorders, respiratory and genitourinary system, inhibits cancer cell apoptosis reducing the risk emergence and development of cancer. Due to the presence of biologically active compounds: dietary fiber (hemicellulose A and B, etc.), especially curcuminoid - curcumin (Fig. 1), "Jus de longévité" can be included in the diet of people suffering from obesity, depression, sleep disturbance, and chronic fatigue [3,4].

Seyed Mohammad Nabavia, Gian Luigi Russob, Idolo Tedescob, Maria Dagliac, Ilkay Erdogan Orhand, Seyed Fazel Nabavia, Anupam Bishayeee, Kalyan C. Nagulapalli Venkatae, Mohammad Abdollahif, and Zohreh Hajheydari in the article "Curcumin and Melanoma: From Chemistry to Medicine" examined the effects of curcumin-containing products on reducing the risk of melanoma [5]. According to statistics of the National Cancer Institute, (<http://www.cancer.gov/statfacts/> (accessed: June 30, 2013)), about 48 000 deaths per year are caused by melanoma [5].

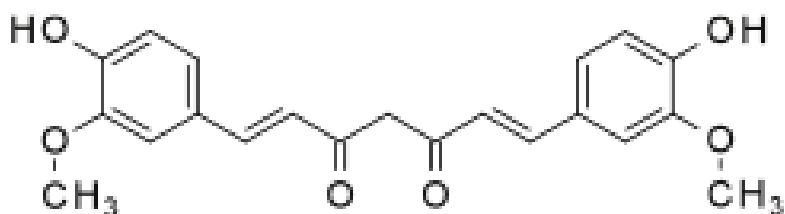


Fig.1. Curcumin structural formula

The use of bioactive compounds of natural origin in food products is an innovative and promising approach to the prevention and decreasing of the risk of cancer, including melanoma. The works of Russian researchers A.R. Chochiev, L.Z. Boliev, and F.K. Gioyev, on the basis of invivo experiments,

have proved the impact of curcumin on the occurrence in rats of mammary gland tumor caused by M-nitroso-N-methylurea (MNM) (Table 1) [5.8].

Table 1 Impact of curcumin on the occurrence in rats of mammary gland tumor caused by M-nitroso-N-methylurea (MNM) [8]

Indicator	Experiment [8]	
	MNM	MNM+Curcumin
Effective number of animals	22	22
Number of animals with mammary gland tumor, abs. / %	20 90.9%	8 40%
% of inhibition of carcinogenesis	-	55.6
Increase in the life expectancy of animals,%	-	51.2

Note: the differences with the control group are significant: – $p < 0.01$
 The results showed a decrease in the occurrence of neoplasms, inhibition of the terms of their occurrence and an increase in the life expectancy of experimental animals [8].

Curcumin is a yellow-colored bioactive substance found in the rhizome of *Curcuma longa* L.

The use of curcumin in pharmaceutical preparations is due to a wide range of biologically active properties: anti-inflammatory, antifungal, antiviral, anti-ischemic, anticancer, and neuro and hepatoprotective properties (due to blocking the bile ducts and reducing damage to hepatocytes, as well as scarring (fibrosis) by interacting with several chemical signaling pathways involved in inflammatory processes) [5, 6, 7]. Curcumin promotes weight loss, the daily consumption rate is 1 g. [9].

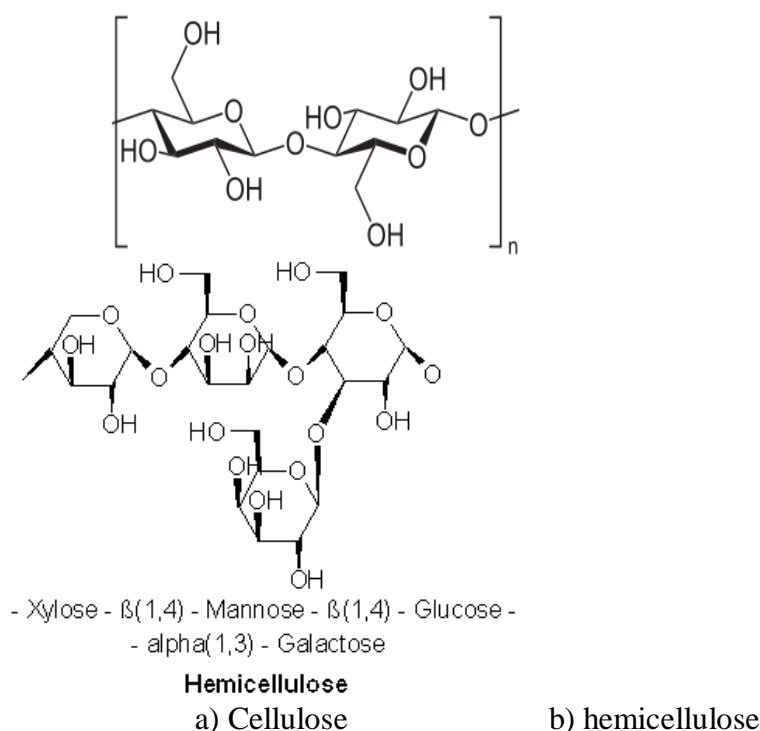


Fig 2. Structural formulas of soluble and insoluble dietary fiber

The presence of curcumin in the juice increases its biological value.

The increased content of pulp in the product increases its physiological activity. In addition to soluble dietary fiber (hemicellulose A and B), the contains cellulose (fiber) (Fig. 2) which slows down the absorption of carbohydrates and high density lipoproteins, which is valuable for dietary and therapeutic nutrition.

The content of pulp in the developed product makes it both food and drink. A beverage with pulp is not only physiologically, but also psychologically equivalent to eating, which is very important today with a constant lack of time.

An important feature of the innovative beverage is that it can be consumed by people who are allergic to β -carotenes, although its composition includes raw materials such as carrot and pumpkin, rich in vitamin A. Vitamin C and natural antioxidant routine are added to “Jus de longévité.” The juice contains raw materials rich in biologically active compounds: tomatoes, sweet pepper, apples, spinach, carrots, pumpkin), which may be destroyed during pasteurization. Vitamin C partially inactivates β -carotenes.

The name of the beverage with pulp described in the article "Jus de longévité" means "Longevity Juice" in French. The choice of the name is not accidental. Since ancient times, people have used vegetable juices as a medicine that

helps to fight against various ailments, preserving beauty and health for many years.

The importance of the production of a smart beverage with pulp based on the juice of seven vegetables is related to the following problems:

1) According to the Research Institute of Nutrition of RAMS (Russian Academy of Medical Sciences), today in Russia 60% of women and 50% of men over 30 are overweight, 30% are obese. This is due to an increase in the calorie content of food consumed by people throughout the day. Against the background of a decrease in the physical activity of Russians, this problem is especially acute. For various reasons (lack of time, addiction to flavouring agents), people are becoming hostages of fast food. “Tasty and fast!” is the motto of modern society. As a way to solve this problem, the authors of the article propose the inclusion of the blended functional beverage based on the juice of seven vegetables in the daily diet and in dietary and therapeutic nutrition. This product is useful in that it contains a minimum percentage of fat and is rich in vitamins, macro- and microelements, dietary fiber, antioxidants, phenolic compounds, and alkaloids necessary for human health. The juice is able to quickly purify the body of toxins that regularly accumulate in it.

2) It is no secret that the ecology of the Russian Federation and the Stavropol Territory in particular is deteriorating every year. This is due to the increase in the number of industrial enterprises, which do not always control the emissions of chemical pollutants into the biosphere, and to the accumulation of herbicides, pesticides, and agrochemicals in the soil during agricultural activity, and a number of other factors. Against the background of environmental problems, deterioration in the general well-being of citizens and the development of various chronic diseases is observed. Not only can the prevention of pollution of the atmosphere, soil, water, but also proper nutrition protect people from harmful effects. Provided that the minerals and vitamins, that the beverage is rich in, are fully supplied, the human body is able to defend and clean itself from radionuclides and heavy metals. Since 2017 was declared the year of ecology, this problem became especially relevant.

3) The problem of iodine deficiency. Iodine is necessary for the synthesis of thyroid hormones, namely thyroxine (T4) and triiodothyronine (T3). These two hormones are responsible for the growth, development, and balanced functioning of the digestive, cardiovascular, genitourinary and other systems. The physiometric parameters (height, weight, etc.) also directly depend on the thyroid gland. Lack or absence of this important element leads to hypothyroidism. The way to overcome this problem is the use in the diet of the blended beverage based on seven vegetables, which includes iodine-rich spinach juice.

The composition of the developed product includes tomatoes, red sweet pepper, pumpkin, spinach, ginger, apples, and carrots.

The scientific novelty of the development is due to the introduction into its composition of spinach and ginger root in the form of powder and scorzonera (black carrot) inulin.

Spinach contains vitamins C, A, B, B1, B2, B6, PP, P, E, D, and K. It also includes minerals, easily digestible iron, fiber, calcium, magnesium, and folic acid. The amount of protein in this herb, unlike other leaf crops, is very high. This amount is higher only in legumes. Spinach is also unique in that it contains iodine. This allows it to be used to prevent thyroid diseases and other endocrine disorders. It also lowers blood sugar and is therefore essential for diabetic patients [5,6,7,8,9].

Also, this plant is indispensable for the normal functioning of the intestines and pancreas; it promotes the rejuvenation of the body, reduces the risk of cancer, improves and restores men's health [5].

Ginger is similar to spinach in the richness of chemical composition and benefit for the human body. It contains:

- Vitamins C, B1, B2, B3, B4 and a small amount of vitamin A;
- Mineral elements: iron, phosphorus, potassium, magnesium, etc.;
- Essential amino acids;
- Essential oils;
- Linoleic, caprylic, and oleic acids;
- Capsaicin alkaloid, which gives an analgesic and anti-inflammatory effect;
- Curcumin, a natural dye with many useful properties;
- Gingerol, a compound that gives the ginger rhizomes a hot taste and determines many of the beneficial properties of ginger;
- Fiber [5].

Ginger is a treasury of useful vitamins and elements that make it possible to use it for medical purposes.

Useful properties:

- Relieves nausea and weakness in case of toxicosis or motion sickness;
- relieve pain during periods;
- stimulates the digestive system and thyroid gland;
- nourishes the whole body with useful substances;
- has a relaxing effect;
- helps to purify the body from toxins;
- lowers blood cholesterol;
- helps in case of allergic and skin diseases;
- boosts immunity;
- prevents the development of cancer of the rectum and colon;
- relieves spasms and serves as a carminative, i.e. helps the release of gases [5].

The smart beverage has a synergistic and additive effect, which is the basis of many of its healing properties.

The advantage is the fact that all the ingredients for the innovative beverage are grown in the Stavropol Territory.

Any vegetable juice contains macro - and micro - elements, organic acids, vitamins and other biologically active substances. The advantage of this beverage is that it has integrated all the benefits of vegetable juices, which together have a synergistic effect on the body, has functional effect due to additionally introduced components, and has a rich chemical composition, presented in Table 3 [6,7].

At the Department of Food Technology and Commodity Science, the smart beverage was tasted by a commission composed of qualified experts [8-11]. The results of organoleptic test are presented in Table 2.

Table 2 Assessment of the smart beverage using a 20 point scale

Indicators	Expert 1	Expert 2	Expert 3
Appearance (color and consistency, 5)	4	5	4
Taste (10)	10	9	9
Flavor (5)	5	5	5
Total:	19 (excellent)	19 (excellent)	18 (excellent)

As a result of organoleptic analysis, it was confirmed that the blended smart beverage meets the requirements of GOST 32100-2013 for all quality indicators. Tasting results presented in Table 2 show that the studied product scored high points [1].

Figure 3 shows the results of a social survey in which 100 respondents took part. They gave replies to questions of a specially developed questionnaire. Along with this, a tasting of the blended smart beverage was held. Then the participants were offered to compare the beverage with analogous products.

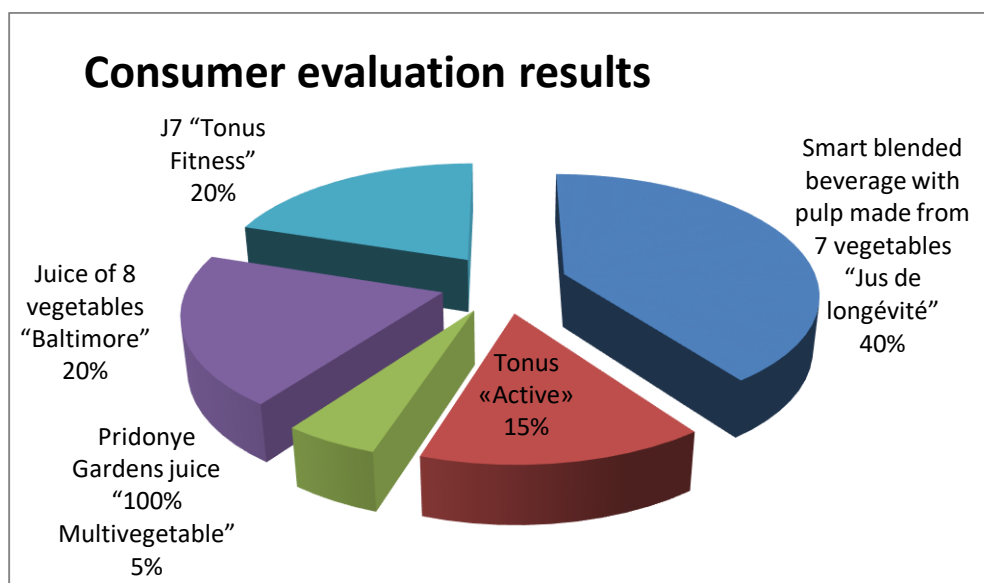


Fig. 3. Consumer evaluation results

During the social survey, the developed beverage gained the largest number of votes. 40% of respondents preferred "Jus de longévité".

The analogues of the developed product are the juices of seven vegetables of various manufacturers: J7 "Tonus Fitness", juice of the vegetable mix "Tonus Active", Pyridine Gardens juice "100% Multivegetable" and the juice of 8 vegetables "Baltimore". But all of the above analogues are significantly inferior to the developed blended functional drink based on 7 vegetables, since they do not contain spinach and ginger juice. None of the analog products has such a combination of ingredients as "Jus de longévité". It should be noted that the introduction of these components into the beverage not only determines its functionality, but also significantly improves its organoleptic properties. It gives the juice delicacy and lightness.

The product meets the requirements of GOST 32100-2013. Preserves Juice products. Vegetable and vegetable-fruit juices, nectars and juice-containing beverages. General specifications for organoleptic and physico-chemical quality indicators.

According to a marketing research results, it was found that the smart beverage with pulp based on seven vegetables "Jus de longévité" is in demand on the Russian market. 40 out of 100 respondents preferred the developed beverage. An indicator of competitiveness was determined, which is 1.25, i.e. exceeds one, which means that this product is competitive. The cost characteristics of analog products are significantly inferior to those of "Jus de longévité" [8]. The total score of marketing competitiveness indicators is presented in Figure 4.

Table 1 Chemical composition of the ingredients of the beverage recipe

Index	Product	Net weight	Dry solids, g	Proteins, g	Fats, g	Carbohydrates			Organic acids, mg	Fiber, g	Ash, g	Minerals, mg					Vitamins, mg				Energy value, kcal
						Mono- and disaccharides, g	Pectins, g	Starch and dextrins, g				Ca	Na	Mg	I	P	β-carotene	B ₁	PP	C	
1	Tomatoes	35	2.8	0.39	0.07	1.2	0.1	0.1	0.28	0.49	0.25	4.9	1.05	7	1.75	9.1	280	0.021	0.18	8.75	7.8
2	Carrots	10	1.2	0.13	0.01	0.67	0.08	0.14	0.03	0.24	0.1	2.7	2.1	3.8	0.4	5.5	1200	0.006	0.1	0.5	4.2
3	Pumpkin puree	7	1.16	0.12	0.007	0.25	0.05	0.04	0.007	0.084	0.08	4.3	13.7	1.0	0.07	3.9	58.1	0.003	0.02	0.18	1.9
4	Apple puree	7	21.8	0.04	0.02	0.7	0.07	0.003	0.04	0.08	0.02	0.84	0.07	0.49	0.14	1.2	0	0	0.03	0.11	3.5
5	Sweet pepper puree	10	1	0.14	0.03	0.52	0	0.01	0.01	0.15	0.05	0.8	0.2	0.7	0.2	2.5	0.2	0.01	0.12	2.5	3
6	Ground ginger and scorzonera inulin	1	0.9	0.09	0.04	0.034	0	0.7	1.3	0.06	0.05	1.14	0.27	2.14	0	1.7	0	0.005	0.1	0.007	3.35
7	Ground spinach	2.5	0.25	0.07	0.009	0.05	0.03	0.002	14.2	0.05	0.04	1.34	0.2	0.44	0	0.73	40.25	0.002	0.02	0.45	0.7

8	Antioxidant (ascorutin)	4.5	0.8	0.03	0.014	0.9	0.3	0.13	0.05	0.22	0.04	0.56	0.1	0.16	0	0.16	52	0.001	0.012	13	5.5
9	Sodium chloride	1	0.99	0	0	0	0	0	0	0	0	0.24	387.5	0.1	0	0	0	0	0	0	0
10	Water	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL:	100	30.9	32	0.2	4.3	0.63	1.13	16	1.4	0.63	18	405	16	2.6	25	1630	0.04	0.582	25.5	30

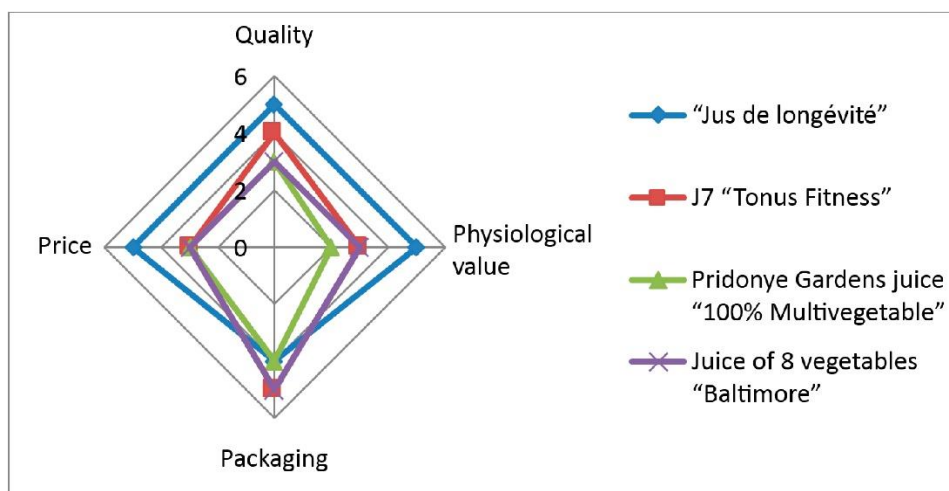


Fig.4 Total score for the marketing indicators of competitiveness

The scope of application of the innovative product will be:

- sanatoriums of the Stavropol Territory with the following specialties: treatment of the cardiovascular system, circulatory system, digestive organs, nervous system, metabolic disorders, respiratory and genitourinary systems;
- grocery chains and health food stores.

The cost of a smart drink is reduced due to the use of vegetables and root crops grown in the Stavropol Territory. It also contributes to the support of the Russian manufacturers in the conditions of import substitution.

Due to its medicinal properties, the product can be recommended for inclusion in the diet of sanatoriums of general specialty, and in particular, for the treatment of the cardiovascular system, digestive organs, nervous system, metabolic disorders, respiratory and genitourinary systems, as well as for the mass consumer through a network of groceries and health food stores.

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