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RESEARCHES REGARDING THE NUTRITIONAL VALUES OF MUSHROOMS COMPARED WITH SEVERAL VEGETABLES

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Abstract

Cultivated mushrooms have gained more and more lately the percentage in human feeding. This is due to more factors like the exquisite sensorial quality of mushrooms and mushrooms dishes and their nutritional value. Mushrooms have the nutritional value comparable with several basic vegetables used for feeding, like potatoes, at the same time being diet foods due to a high content in proteins and a very low content in fats. Also mushrooms are economically worth and intensive cultures can be grown year-round.

***Keywords**: mushrooms, nutritional values*

Introduction

The most known specie of cultivated mushrooms is Agaricus (having as main representative Agaricus bisporus also known as Champignon) and Pleurotus mushrooms also called boletus out of which we point out Pleurotus Ostreatus (Beech's trout). Lately are widely cultivated the Lentinus edodes mushrooms (the chestnut's perfumed mushrooms) which is highly appreciated for its sensorial and nutritional outstanding qualities (Maier, 1963).

Mushrooms generally are characterized by a high content of water, around 90%, being from this point of view very similar to most of the vegetables (Mattila, 2004).

As for the dry content, mushrooms are characterized by a high content in proteins, sugars and a very low content in lipids. In table 1 is presented the general chemical composition of the main cultivated species of mushrooms as a percentage out of 100 g of dry content (dc) as well as the energetically value in kcal/100 g dc.

Table 1. Chemical composition of the main cultivated species of mushrooms (% of dc) and the energetically value in kcal/100 g dc

Mushroom specie	Proteins	Non fiber sugars	Lipids	Dietary fibers	Mineral salts	Energetically value
Agaricus bisporus	24-35	45-54	2-8	8-10	7-12	320-380
Pleurotus ostreatus	11-30	50-72	2-3	8-9	6-10	340-370
Pleurotus florida	9-37	46-50	2-6	9-14	6-9	265-335
Pleurotus sajor-caju	10-27	40-44	2-8	10-17	7-10	300-340
Lentinus edodes	13-18	60-71	5-8	7-8	3-8	380-395

Source: Glăman, (1997)

In order to be able to realize a comparison we also reported the figures regarding the general chemical composition of several fresh vegetables [6]. The data obtained is presented in table 2.

Table 2. Chemical composition of several vegetables frequently used in human diet (% of dc) and the energetically value in kcal/100 g dc.

Vegetable specie	Proteins	Non fiber sugars	Lipids	Dietary fibers	Mineral salts	Energetically value
Potatoes	15.38	74.4	0.59	14.96	9.63	347
Tomatoes	13.62	74.35	5.28	17.62	6.73	336
Cabbage	18.34	71.08	1.52	29.29	9.04	305
Cucumber	13.62	76.1	2.3	10.48	7.96	314
Green peas	25.63	68.4	1.89	24.12	4.11	383
Green beans	18.7	73.38	1.23	34.9	6.78	318

Source: USDA National Nutrient Database for Standard Reference, Release 17 (2004)

From the data presented in table 1 it is noted that various mushroom species have a similar general composition with some variations from one specie to another and even within the specie.

In table 3 is presented the content in the main dietary principles for mushrooms in general and for several species of vegetables frequently used in human feeding.

Table 3. Content in the main dietary principles for mushrooms in general and for several species of vegetables, expressed for 100 g of fresh product.

Dietary principle	m.u.	Mushrooms	Potatoes	Tomatoes	Cabbage	Cucumbers	Green peas	Green beans
Energy	kcal	22	58	21	24	15	81	31
Water	g	92.46	83.29	93.76	92.15	95.23	78.86	90.27
Proteins	g	3.11	2.57	0.85	1.44	0.65	5.42	1.82
Lipids	g	0.34	0.1	0.33	0.12	0.11	0.4	0.12
Glucides	g	3.24	12.44	4.64	5.58	3.63	14.46	7.14
Calcium	g	0.003	0.030	0.005	0.047	0.016	0.025	0.037
Phosphorous	g	0.085	0.038	0.024	0.023	0.024	0.108	0.038
Iron	mg	0.52	3.24	0.45	0.59	0.28	1.47	1.04
Vitam. A	mg	0	0	0.187	0.051	0.031	0.229	0.207
Vitam.B_1	mg	0.091	0.021	0.059	0.050	0.027	0.266	0.084
Vitam.B_2	mg	0.416	0.038	0.048	0.040	0.033	0.132	0.105
Vitam.C	mg	2.4	11.4	26	32.2	2.8	40	16.3

Source: USDA National Nutrient Database for Standard Reference, Release 17 (2004)

Experimental

Due to the high number of chemical compounds present in foods and the interactions between them it is quite difficult to apply a method in order to find the exact nutritional value of foods.

In spite of this there were elaborated several relations to calculate it by taking into consideration several dietary principles which are the most important for the organism. In this paperwork we calculated the nutritional value of mushrooms and several vegetable with the help of an equation elaborated by F. Stimiska in which are taken into consideration 10 nutritional components considered to be essential (Segal, 1983). By this equation is calculated the "Nutritional value of 10 components" further on noted with VN_{10}.

$$VN_{10} = \frac{1}{10} \cdot \left(Pr \cdot F_{Pr} + L \cdot F_L + G \cdot F_G + Ca \cdot F_{Ca} + P \cdot F_P + Fe \cdot F_{Fe} + A \cdot F_A + B1 \cdot F_{B1} + B2 \cdot F_{B2} + C \cdot F_C \right)$$

Coefficients $F = \frac{b \cdot K \cdot 100}{d}$

Where: Pr, L, G, Ca, P – content in these nutrients expressed as g/100 g product (table 3)
Fe, A, B1, B2, C – content in these nutrients expressed as mg/100 g product (table 3)
b – biological value coefficient of the proteins (b = 0,6)
K – digestion usage coefficient of the nutrients
d – daily intake of the organism for each nutrient

The values for the F coefficients are presented in table 4.

Tabel 4. Values for the F coefficients of the vegetables for the 10 nutrients from the VN_{10} formula

Pr	L	G	Ca	P	Fe	A	B1	B2	C
0.69	0.55	0.1	54	60	6.1	17	53	42	0.5

Source: Segal, (1983)

Results and discussions

The nutritional value was calculated with the help of the presented formula, using the Excel package, the data obtained being presented in table 5.

Table 5. Calculus of the VN_{10} coefficients for the nutritional value of mushrooms and several vegetables

Nutrient factor	Mushrooms		Potatoes	Tomatoes	Cabbage	Cucumbers	Green peas	Green beans
	Fresh	Dried						
F· Pr	2.14	6.61	1.77	0.58	0.99	0.44	3.73	1.25
F· L	0.18	0.54	0.05	0.18	0.06	0.06	0.22	0.06
F· G	0.32	7.53	1.24	0.46	0.55	0.36	1.44	0.71
F· Ca	0.16	0.59	1.62	0.27	2.53	0.86	1.35	1.99
F· P	5.1	17.64	2.28	1.44	1.38	1.44	6.48	2.28
F· Fe	3.17	10.49	19.76	2.74	3.59	1.70	8.96	6.34
F· A	0	0	0	3.17	0.86	0.52	3.89	3.51
F· B1	4.82	15.9	1.11	3.12	2.65	1.43	14.09	4.45
F· B2	17.47	53.34	1.59	2.01	1.68	1.38	5.54	4.41
F· C	1.2	1.75	5.7	13	16.1	1.4	20	8.15
VN10	3.45	11.44	3.51	2.70	3.04	0.96	6.57	3.31

It can be easily seen in table 5 that the nutritional value of mushrooms is higher than that of some vegetables currently used as aliments being comparable with the nutritional value of potatoes. But compared with the potatoes, mushrooms have a higher content in proteins with a lesser content of sugars. This difference is fundamental and makes mushrooms a dietetic food.

Also must be taken into consideration the high quantity of water found in mushrooms. Thus, if we take into consideration the content in nutrients as part of the dry content it is noted from tables 1 and 2 that mushrooms (especially those of the Agaricus specie) have high quantities of proteins (up to 35%) that are higher than the content found in most vegetables and, compared with these, with a lower content in sugars.

Studies regarding the influence of the various technological processes over the nutritional value of mushrooms were also conducted. One of these studies shows that by preserving the Agaricus mushrooms the loss in proteins and lipids are insignificant while major changes undergo for the mineral slats composition (Vetter, 2003).

High losses in mineral salts take place due to the chopping of mushrooms in small pieces, thus increasing the contact area with the environment. Thus the content in potassium dropped by preservation from 38000-39000 ppm up to 1287 ppm or as low as 487 ppm, the content in phosphorus from 10430-11230 to 3789-4508 ppm dc while magnesium dropped from 1100 to 391-469 ppm dc.

But with the classical technologies was noted a major increase in sodium from 849-860 ppm to 16000-24000 ppm (USDA, 1986).

Thus, during the classical preservation of mushrooms the equilibrium between sodium and potassium is disturbed, with negative effects for the nutritional value.

Conclusions

Mushrooms are vegetal products which have the nutritional value, calculated for 10 basic nutrients for the organism, similar to several commonly used vegetables, for example potatoes and even higher than others like cabbage, tomatoes, green beans or cucumbers. In general, compared with the vegetables, mushrooms have the advantage of a higher content in proteins and a lower content in sugars, which makes

them a dietetic food and with a balanced content of nutrients. Also the technologies used for the conservation of mushrooms can have negative effects over the nutritional value, which imposes the finding of the most adequate conservation methods.

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