

## Energy and Nutrient Value of Selected Delicatessen Salads\*

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### Abstract

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Nutrient content of 11 kinds of mayonnaise salads (potato, Italian, delicate, camping, red cabbage, bean, Iceland, Camembert, Dutch, fish, egg), 6 non-mayonnaise salads (carrot, cabbage, maize, to-fu, spring, summer) and 2 kinds of rolls (plain, whole-meal) was evaluated. All samples were analysed for basic composition, content of selected vitamins ( $B_1$ ,  $B_2$ ,  $B_6$ , niacin, C, E, A, total carotenoids, carotenes) and minerals (Na, K, Ca, Mg, Fe, Cu, Zn, P, I). Finally, the contribution of consuming an average 100g serving of a salad and one roll to the fulfilment of the recommended daily allowances (RDA) of some observed nutrient factors for an adult person was estimated. A 100g serving of a salad mostly supplies the human organism with 10% or less of the recommended daily allowances of observed vitamins and minerals. With the exception of riboflavin and calcium, whole-meal rolls are a better source of vitamins and minerals than plain rolls.

**Key words:** fast food; salad; roll; basic composition; thiamin; riboflavin; vitamin  $B_6$ ; niacin; vitamin C; vitamin E; vitamin A; minerals

The fast food products, also including delicatessen salads, presently play an irreplaceable role in the nutrition of a number of people in this country, particularly of the younger generation. Fast foods are mainly produced by world-famous corporations like McDonald's, Kentucky Fried Chicken, Pizza Hut, or Dunkin's Donuts. These mammoth retail chains offer a long-established menu of foods only scarcely influenced by the country where the particular dining facility is located. Due to their rather long tradition world-wide, data on the nutrient composition of a number of their products are available (GREENFIELD *et al.* 1981, 1982; WILLS & GREENFIELD 1980, 1982; WILLS *et al.* 1985).

This is not the case of delicatessen salads, belonging to the fast foods most frequently consumed in the Czech Republic. Though this food habit has its long tradition in this country, and remains popular, comprehensive data on the nutrient value of these products are lacking both in the literature and in the Food Tables of the Society for Nutrition (PERLÍN *et al.* 1992, 1993).

In this study nutrient contents of 11 kinds of mayonnaise salads, 6 kinds of non-mayonnaise salads, and 2 kinds of rolls were evaluated. All samples were analysed for basic composition, content of selected vitamins ( $B_1$ ,  $B_2$ ,  $B_6$ , niacin, C, E, A, total carotenoids, carotenes) and minerals (Na, K, Ca, Mg, Fe, Cu, Zn, P, I). Subsequently,

the contribution of consuming an average 100g serving of a salad and one roll to the fulfilment of the recommended daily allowances (RDA) of some observed nutrient factors was estimated.

### MATERIAL AND METHODS

The respective samples of delicatessen salads and rolls were purchased in the network of delicatessen shops and supermarkets in various locations of the city of Prague. Those kinds of salads were selected that are traditional, offered under the same name in a number of shops, are frequently demanded, and supposedly have a stable recipe. The following samples were collected: mayonnaise salads (potato, Italian, delicate, camping, red cabbage, bean, Iceland, Camembert, Dutch, fish, egg), 6 non-mayonnaise salads (carrot, cabbage, maize, to-fu, spring, summer). Average weight of one piece of plain roll (43 g) and whole-meal roll (49 g) was found, to which the respective nutrient values were related. The samples of salads and rolls were homogenised in a blender and stored at  $-18^\circ\text{C}$  until analyzed. The samples were subjected to the following determinations:

basic composition: dry matter, ash, protein, fat, saccharide content and energy value of the sample  
thiamin ( $B_1$ ): thiochrome method ČSN 56 0052

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riboflavin (B<sub>2</sub>): lumiflavine method ČSN 56 0054  
 vitamin B<sub>6</sub>: microbiological assay with *Saccharomyces uvarum* ATCC 9080, ČSN 56 0056  
 niacin: microbiological assay with *Lactobacillus plantarum* ATCC 8014, ČSN 56 0051  
 vitamin C: titrimetric method ČSN 56 0050  
 vitamins E ( $\alpha$ -tocopherol) and A: HPLC method with fluorescence detection, after alkaline saponification and extraction of non-saponifiable matter  
 carotenoids: spectrophotometric determination, after alkaline saponification and extraction of non-saponifiable matter  
 carotenes: HPLC method with DAD detection, after alkaline saponification and extraction of non-saponifiable matter  
 minerals: dry ashing  
 Na, K, Ca, Mg, Fe, Cu, Zn – flame AAS  
 P – spectrophotometry  
 I – mineralisation by alkaline dry ashing, photometry

The results were obtained by duplicate determination of individual factors in single salad samples except potato and camping salads and plain roll, where two independent samples were used for analyses.

## RESULTS AND DISCUSSION

The results of the nutrient evaluation of delicatessen salads and rolls are given in Tables 1–3. Table 1 presents the basic composition and the calculated energy value of a 100g serving of salads and 1 piece of roll, Table 2 shows the content of some vitamins and Table 3 the content of selected minerals in observed samples.

The content of fat ranged from 0.2 to 31 g/100 g, being high in all mayonnaise salads, in other samples it always depended on the amount of plant oil added. With the exception of Dutch and Camembert salads with protein content approximately 10 g/100 g, other kinds were inferior to very poor sources of proteins. The content of saccharides in salads fluctuated between 1.4 and 15.8 g/100 g, higher values were found in products with a higher portion of potatoes, beans and maize. The energy values of 100g salad servings varied enormously. They were found low in vegetable salads, high in salads with higher content of mayonnaise.

The fat and protein content of rolls is very low, the content of saccharides approximately corresponds with the expected values (about 31 g in 1 roll).

Table 1. Basic composition and energy value of 100 g salad or 1 roll

Sample	Water [g]	Fats [g]	Saccharides [g]	Proteins [g]	Energy value	
					[kJ]	[kcal]
<b>Mayonnaise salads</b>						
Potato	73.2	10.8	13.2	1.8	679.3	162.4
Italian	67.0	17.8	10.5	3.1	923.4	220.7
Delicate	64.4	22.4	5.3	6.0	1066.7	254.9
Camping	69.8	17.4	5.0	5.7	859.2	205.4
Red cabbage	79.3	11.8	5.8	1.7	586.7	140.2
Bean	58.8	19.4	14.8	5.7	1107.8	264.8
Iceland	59.6	29.8	1.7	6.6	1301.4	311.0
Camembert	55.7	31.0	1.4	10.1	1401.3	334.9
Dutch	53.4	30.6	2.9	10.9	1425.8	340.8
Fish	59.9	27.0	5.1	6.0	1240.1	296.4
Egg	73.4	15.7	4.0	5.5	773.2	184.8
<b>Non-mayonnaise salads</b>						
Carrot	93.2	0.2	5.0	0.8	106.2	25.4
Cabbage	82.7	5.2	9.2	1.5	385.7	92.2
Maize	77.7	3.2	15.8	2.1	430.8	102.9
To-fu	79.4	2.0	9.6	6.6	356.0	85.1
Spring	79.6	9.6	5.5	2.9	518.6	123.9
Summer	89.6	1.4	3.2	4.9	194.1	46.4
<b>Rolls</b>						
Plain roll	5.2	0.6	31.5	4.9	648.4	154.9
Whole-meal roll	7.8	0.8	31.9	6.4	688.9	164.7

Table 2. Vitamin content in 100 g of salad or 1 roll

Sample	B <sub>1</sub> [mg]	B <sub>2</sub> [mg]	B <sub>6</sub> [mg]	Niacin [mg]	C [mg]	E [mg]	A [µg]	Carotenoids [mg]	Carotenes [mg]
<b>Mayonnaise salads</b>									
Potato	0.06	0.02	0.12	0.6	traces	2.8	0	0.53	0.38
Italian	0.04	0.06	0.22	1.0	0.2	7.2	13	0.66	0.37
Delicate	0.08	0.06	0.07	1.1	0.0	2.8	6	0.39	0.08
Camping	0.06	0.05	0.10	1.0	0.0	4.0	6	0.62	0.12
Red cabbage	0.03	0.02	0.06	0.2	0.0	2.9	0	0.20	0.05
Bean	0.08	0.06	0.06	0.3	0.0	4.9	0	0.07	0.02
Iceland	0.04	0.05	0.06	0.3	0.0	7.4	27	0.21	0.15
Camembert	0.06	0.21	0.05	0.7	0.0	10.9	65	0.13	0.05
Dutch	0.05	0.22	0.07	0.5	0.0	7.1	59	2.19	0.56
Fish	0.04	0.08	0.07	0.5	0.0	11.6	12	0.56	0.50
Egg	0.05	0.13	0.09	0.4	0.0	3.6	28	0.24	0.04
<b>Non-mayonnaise salads</b>									
Carrot	0.02	0.05	0.17	1.0	0.0	0.3	0	5.79	5.67
Cabbage	0.03	0.02	0.13	0.3	0.2	2.8	0	0.47	0.43
Maize	0.06	0.05	0.12	1.1	0.0	1.4	3	2.40	0.29
To-fu	0.06	0.05	0.13	0.7	0.0	0.8	0	1.95	0.70
Spring	0.09	0.04	0.17	0.8	3.1	0.7	0	1.12	0.22
Summer	0.04	0.04	0.14	0.4	<0.2	1.4	0	2.14	1.09
<b>Rolls</b>									
Plain roll	0.04	0.04	0.03	0.7	0.0	0.5	0	0.05	0.02
Whole-meal roll	0.08	0.03	0.06	0.8	0.0	0.7	0	0.05	0.01

As can be read from Table 2, the content of observed hydrophilic vitamins (B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, niacin, C) was very low both in salads and rolls. The values of thiamin ranged from 0.02 to 0.09 mg/100 g. The content of riboflavin was dependent on the presence of milk-derived products, specifically cheese, in the sample. This is why it reached its maximum in Camembert and Dutch salads (up to 0.22 mg per 100 g). The values of vitamin B<sub>6</sub> in salads fluctuated in the range of 0.05 to 0.22 mg/100 g, the highest content being determined in Italian salad and some vegetable salads. The levels of niacin ranged from 0.2 to 1.1 mg/100 g. Due to vitamin C instability, this factor was only found in traces, or was absent, in all samples studied. Vitamin C is oxidized to the high extent already during the raw material chopping. Very similar data on the content of some hydrophilic vitamins were also found by WILLS and GREENFIELD (1982) in potato and bean salads offered by Kentucky Fried Chicken, by DONG *et al.* (1980) in salads served to U. S. Armed forces, and by MŇUKOVÁ (1980) in the carrot salad supplied to canteen feeding. The values of all hydrophilic vitamins in rolls were very low. Thiamin and vitamin B<sub>6</sub> showed higher contents in whole-meal roll, confirming the data by ERBERSDOBLER (1997).

The content of observed lipophilic vitamins in salads fluctuated substantially. The levels of total carotenoids and carotenes very much depend on the presence of their very rich sources, particularly of carrot and paprika. High levels of these factors were therefore found in carrot salad (about 5 mg/100 g) and other, predominantly vegetable items. The share of carotenes in total carotenoids ranged from 12 to 98%, reaching its maximum in carrot salad. Carrot, with most abundant  $\alpha$ - and  $\beta$ -carotenes (HEINONEN 1989), is the dominant source of carotenoids in this salad. On the other hand, the levels of vitamin A found in the samples were very close to null. Only the salads containing cheese, eggs, or fish are the sources of vitamin A. Very low values of vitamin A were also found by WILLS and GREENFIELD (1982) in potato and bean salads by Kentucky Fried Chicken. The content of vitamin E was well correlated with fat content and ranged from 0.3 to 11.6 mg/100 g. High levels were found in mayonnaise salads. The levels of observed lipophilic vitamins in rolls were very low or null.

Table 3 presents the content of observed minerals in salads and in rolls. Their levels mostly corresponded to the raw materials used. The values of sodium fluctuated

Table 3. Mineral content in 100 g of salad or 1 roll

Sample	Na [mg]	K [mg]	Ca [mg]	Mg [mg]	Fe [mg]	Cu [mg]	Zn [mg]	P [mg]	I [µg]
<b>Mayonnaise salads</b>									
Potato	202	160	17	10.0	0.64	0.102	0.21	36	5.6
Italian	312	266	16	15.0	0.52	0.057	0.49	57	5.6
Delicate	454	140	22	9.8	0.65	0.051	0.82	85	8.8
Camping	515	142	27	10.1	0.43	0.047	0.74	83	8.9
Red cabbage	320	131	30	7.5	0.29	0.028	0.14	25	4.2
Bean	220	155	44	19.0	1.24	0.066	0.56	80	6.0
Iceland	610	134	21	10.8	0.33	0.022	0.26	66	18.1
Camembert	461	121	114	8.7	0.69	0.032	1.04	153	8.6
Dutch	589	83	182	10.2	0.85	0.042	1.23	183	18.4
Fish	522	88	27	7.4	0.44	0.037	0.38	64	10.9
Egg	303	148	25	9.6	0.52	0.041	0.44	77	14.6
<b>Non-mayonnaise salads</b>									
Carrot	44	237	29	11.2	0.29	0.022	0.27	31	0.5
Cabbage	296	143	44	8.1	0.34	0.019	0.13	22	14.9
Maize	226	177	13	16.2	0.80	0.039	0.40	57	6.0
To-fu	561	212	48	30.9	1.33	0.123	0.70	104	13.2
Spring	448	204	40	15.9	0.49	0.038	0.29	56	1.5
Summer	103	196	25	8.4	0.27	0.055	0.15	31	6.6
<b>Rolls</b>									
Plain roll	259	55	21	9.2	0.39	0.047	0.28	53	1.2
Whole-meal roll	551	86	21	18.3	0.83	0.098	0.60	85	1.5

between 44 and 610 mg/100 g, being higher mainly in products containing fish and soy meat. The levels of potassium ranged from 83 to 266 mg/100 g. The content of calcium in salads usually was very low (about 20–50 mg per 100 g), only in salads containing cheese it exceeded 100 mg/100 g. Magnesium levels reached 19 mg/100 g or less, except for to-fu salad with 31 mg/100 g. The iron content of salads was not mostly significant (0.27 to 0.85 mg/100 g), with the maximum, approximately 1.3 mg per 100 g, in bean and to-fu salads. Copper values in salads were mostly low (0.02 to 0.12 mg/100 g), as well as those of zinc (up to 0.6 mg/100 g). The products containing cheese and smoked meats only showed zinc values of approximately 1 mg/100 g. The levels of phosphorus were found low (up to 100 mg/100 g), only the Camembert and Dutch salads reached higher values because of cheese content. Iodine content of salad samples ranged between 0.5 and 18.4 µg/100 g, being particularly low in vegetable salads because of the negligible content of this factor in vegetables. Higher values are the result of addition of ingredients of animal origin (cheese, egg, fish meat) and particularly of the use of iodized salt in their preparation.

The levels of all observed minerals in rolls were low and mostly corresponded with the raw materials used.

Doubled values of magnesium, iron, and zinc were found in whole-meal rolls as compared with plain rolls. These data are in keeping with the paper by ERBERSDOBLER (1997). Negligible amounts of iodine in rolls indicate that no iodized salt was used for their production.

Figs 1 and 2 offer a comparison of the content of selected nutrients in 100g serving of salads and in one roll, as related to the recommended daily allowances (RDA) for an adult person. Not all the observed nutrient factors are included because the Food and Tobacco Product Law No. 110/1997 Sb. does not determine their recommended daily allowances. Fig. 1 shows the contribution of 100 g of a salad to the supply of recommended daily allowances. It was compiled from minimum, average, and maximum values of the content of respective nutrient factors obtained by the analysis of all 17 salads. The data make it obvious that a 100g serving of a salad will not bring more than 15% of the recommended daily allowances of all observed vitamins, except for vitamin E. In fact, most values were close to 5% of the recommended daily allowances. The content of vitamin E is very dependent on the type and quantity of the plant oil used, the values therefore ranged between 3–116% of the recommended daily allowances. One 100g salad serving does not contribu-

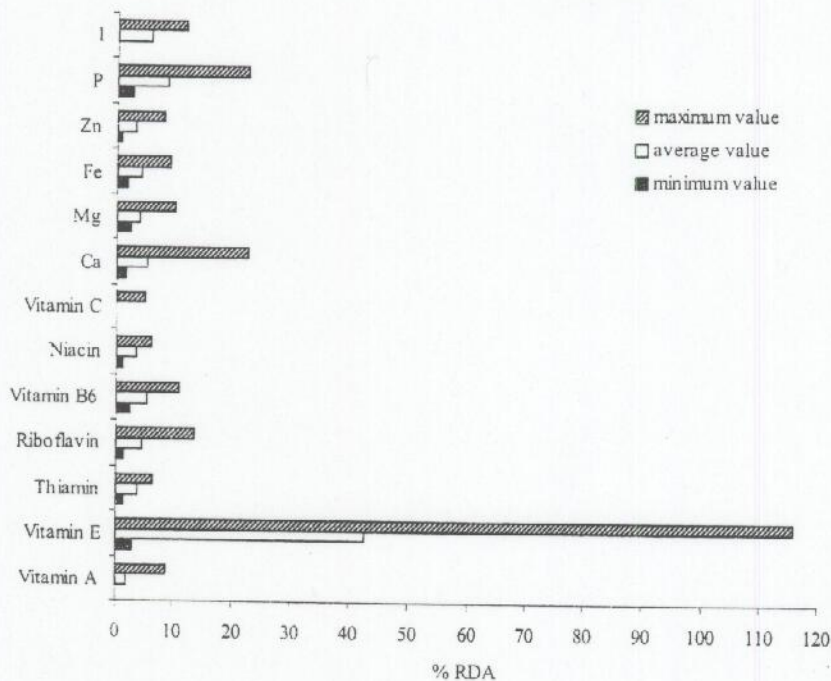


Fig. 1. Content of selected nutrients in 100 g of salad related to RDA

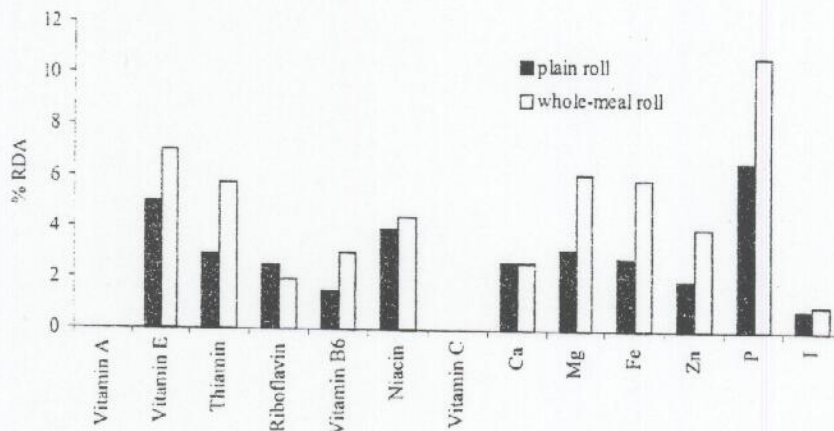


Fig. 2. Content of selected nutrients in 1 roll related to RDA

te more than 10% of the recommended daily allowances of selected minerals to the organism, except for Camembert and Dutch salad contributing some 23% of calcium and phosphorus.

Fig. 2 shows that neither plain roll nor whole-meal roll contributes significantly to the fulfilment of the recommended daily allowances of selected nutrients. The content of all observed nutrients in rolls did not exceed 10% of their recommended daily allowances. However, it should be stressed that, except for calcium and riboflavin, consuming whole-meal rolls rather than plain rolls covers their recommended daily allowances more fully.

It can be concluded that the analysed delicatessen salads, with some exceptions, have low saccharide content and all the non-mayonnaise samples also have low fat content. On the other hand, it is necessary to warn against high fat content and consequently high energy value of mayonnaise salads.

In most cases, delicatessen salads in 100g servings supply the human organism with no more than 10% of the recommended daily allowances of selected vitamins and minerals. The exceptions are vitamins A, C, B<sub>1</sub> and niacin, their content in salads being even lower. On the other hand, the majority of mayonnaise salads are a sufficient source of vitamin E considering its recommended daily allowances. As for the content of calcium and phosphorus, out of the observed salad samples, Camembert and Dutch salads were rather good sources of these factors. Whole-meal roll is a better source of vitamins and minerals than the plain roll, except for riboflavin and calcium.

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#### Souhrn

MAŠKOVÁ E., FIEDLEROVÁ V., HOLASOVÁ M., RYSOVÁ J. (1999): Nutriční hodnota vybraných lahůdkových salátů. Czech J. Food Sci., **17**: 176–181.

Lahůdkové saláty se řadí k výrobkům rychlého občerstvení konzumovaných převážně v České republice, ale doposud nejsou známy údaje o jejich nutriční hodnotě. Bylo provedeno nutriční hodnocení 11 druhů majonézových salátů (bramborový, vlašský, pochoutkový, kempink, hanácký, fazolový, islandský, hermelínový, holandský, rybí, vajíčkový), 6 salátů bez majonézy (mrkvo-vý, zelný, kukuřičný, tofu, jarní, letní) a 2 různých druhů pečiva (běžné a celozrnné typu kornšpic). Ve výrobcích bylo experimentálně zjištěno základní složení, obsah některých vitaminů (B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, niacin, C, E, A, karotenoidy, karoteny) a minerálních látek (Na, K, Ca, Mg, Fe, Cu, Zn, P, I). V konečné fázi byl odhadnut přínos konzumace průměrné 100g porce salátu a 1 kusu pečiva k naplnění denní doporučené dávky některých sledovaných výživových faktorů. Výsledky nutričního hodnocení lahůdkových salátů a pečiva jsou uvedeny v tab. 1–3. Obsah vybraných živin ve 100g porci salátu a 1 kusu pečiva vzhledem k jejich doporučené denní dávce pro dospělého člověka je uveden na obr. 1 a 2. Analyzované lahůdkové saláty mají, až na výjimky, nízký obsah sacharidů a všechny nemajonézové vzorky i nízký obsah tuků. Naopak všechny majonézové saláty vykazaly vysoký obsah tuků a energetickou hodnotu. Saláty ve 100g porci dodají lidskému organismu ve většině případů maximálně do 10 % doporučené denní dávky vybraných vitaminů a minerálních látek. Výjimkou jsou vitaminy A, C, B<sub>1</sub> a niacin, jejichž obsah v salátech byl ještě nižší. Naopak většina majonézových salátů je dostatečným zdrojem vitaminu E vzhledem k jeho doporučené denní dávce. Hermelínový a holandský salát obsahují ve 100g porci přibližně 23 % denní doporučené dávky vápníku a fosforu. S výjimkou riboflavinu a vápníku je pečivo typu kornšpic lepším zdrojem vitaminů a minerálních látek než běžné pečivo.

**Klíčová slova:** salát; pečivo; základní složení; thiamin; riboflavin; vitamin B<sub>6</sub>; niacin; vitamin C; vitamin E; vitamin A; minerální látky

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