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ТЕМА:
« EVALUATION OF INDIVIDUAL MICRONUTRIENT INTAKES: VITAMIN, MINREAL AND FIBER FOOD INTAKES (part 1,2)»

Methodical recommendations to the lesson
for students in the specialty 31.05.01 "General Medicine"

г. Волгоград, 2020 г.

EVALUATION OF INDIVIDUAL MICRONUTRIENT INTAKES: VITAMIN, MINREAL AND FIBER FOOD INTAKES

Motivational description of the theme:

A balanced diet requires not only balanced intake of proteins, fats, and carbohydrates, but also balanced micronutrient intake. The results of studies on dietary intake of different groups showed significant prevalence of polyhypovitaminoses, lack of basic minerals and fiber foods. Micronutrient deficiencies cannot be prevented by simply increasing food consumption. Modern living and working conditions of the majority of the population lead to a relative reduction in energy consumption, which accounts for the need to reduce food intake and results in the inadequate intake of micronutrients contained in it. Awareness of the clinical manifestations of micronutrient deficiencies, sources of vitamins, minerals and fiber in the diet, and the ways and techniques of preserving the value of products (preventive fortification) enables the doctor to optimize the nutritional status of patients.

The objective: to familiarize with the biological role, rationing and nutritional sources of micronutrients and fiber foods, to calculate the chemical composition of diets based on the content of vitamins, minerals, dietary fibers (for example the menu production record of the daily dietary needs of a medical student), to learn the ways to store and cook products in order to preserve vitamins, to learn about preventive fortification.

Students' independent classroom activities

1. Determining the content of vitamins, minerals, fiber foods in the daily food consumption of a student.
2. Case problem (type 1. type 2).
3. Lab experiments to determine the content of vitamin C in vegetables.
4. Presentation and discussion of topics individually assigned by the teacher.

Self-study tasks

1. Biological role, rationing and sources of water-soluble vitamins in the diet.
2. Biological role, rationing and sources of dietary fat-soluble vitamins.
3. Types of vitamin A deficiency.
4. Causes of hypovitaminoses, their manifestation.
5. Ways to maintain and improve the vitamin value of a diet, prevention of hypovitaminoses.
6. Biological role, rationing and sources of minerals in the diet.
7. Biological role, rationing and sources of dietary fibers in the diet.

Plan of students' independent activities

1. Determining the content of vitamins, fiber foods and minerals in the daily nutritional ration of a student using the calculation method (the menu production record provided in theme 2.4.). Learning how to use the *Tables of the chemical composition and energy value of food*.

2.Case problem (type 1, type 2) The solution of case problems should be reported in writing.

3. Lab experiments: determine the content of vitamin C in vegetables, vitamin C loss in the process of food refining, processing and cooking.
3.1. Determination of vitamin C in raw and boiled potatoes, the calculation of % loss of vitamin C in the cooking process.
3.2. Determination of vitamin C in cabbage, calculation of % loss of vitamin C during storage.
3.3. Formulation of conclusions and recommendations for the preservation of vitamins in food.

Reference information

Term descriptions

AVITAMINOSIS is total depletion of all vitamins in the body (total vitamin deficiency). Avitaminosis is associated with certain clinical symptoms which are characteristic of all vitamin deficiencies. C-avitaminosis (scurvy, Barlow´s disease). B1-avitaminosis (alimentary polyneuritis, Beriberi). PP-avitaminosis (pellagra). B2-avitaminosis (ariboflavinosis). A-avitaminosis (hemeralopia, xerophthalmia). D-avitaminosis (rickets, osteoporosis).

ANTIVITAMINS are the compounds which lessen or negate the chemical action of vitamins in the body metabolism by breaking up, inactivating vitamins or preventing their assimilation. Antivitamins are divided into two groups:

a) structurally similar antivitamins (competitive inhibitors; they compete with vitamins or their derivatives in the corresponding biochemical metabolic processes). They include sulfanilamides, dicumarin, megafen, isoniaside, etc.
b) structure-modifying antivitamins (natural antivitamins; they destroy or decrease the effect of a vitamin by modifying the molecule itself or by forming complexes with the metabolite). They include thiaminase, ascorbic oxidase, avidin, etc.

VITAMINS are low molecular weight and highly biologically active organic compounds required for living. They are synthesized (or insufficiently synthesized) in the body and supplied through food. The biological role of *water-soluble vitamins* consists in the fact that they are involved in making coenzymes; the biological role of *fat-soluble vitamins* is to control the functional condition of cell membranes and subcellular structures.

VITAMIN ANTAGONISTS: B1 and B2; A and D; nicotinic acid and choline; thiamine and choline (a long-term therapy with one vitamin results in the deficiency in another vitamin).

SYNERGY VITAMINS: C and R. R, C, K; B12 and folic acid; C, K, B2; A and E; E and inositol (they can increase the biological effect of each other when used together in multivitamin medications).

HYPOVITAMINOSIS is a sharp decline in vitamin supply. It is an initial stage of avitominosis. Hypovitaminosis is caused by insufficient consumption of vitamins that need to be included in the diet during a certain period of time.

LATENT FORM OF VITAMIN DEFICIENCY occurs when the body does not have a steady supply of vitamins in the diet. Latent forms of vitamin deficiency do not have any clinical manifestations. They are considered to be a preclinical stage of vitamin deficiency and are characterized only by biochemical disorders.

However, it has a negative effect on working capacity and resistance of the body to various unfavourable factors. It also makes recovery after a disease longer.

DIETARY FIBERS are macro molecular carbohydrates (cellulose, hemicelluloses, pectin, lignin, chitin, etc.), mainly, of plant origin that are indigestible and non-absorptive in the small intestine, but subject to full or partial fermentation in the large intestine.

MAJOR CAUSES OF HYPOVITAMINOSES AND AVITAMINOSES are as follows:

1. Inadequate intake of vitamins from food:

1.1. Low contents of vitamins in the diet

1.2. Reduced food intake due to low energy expenditures of a modern person.

1.3. Loss of vitamins during improper processing, storing, and cooking.

1.4. Imbalanced diet (a high carbohydrate diet requires more vitamins; inadequate intake of native vitamins C, PP, B 1 results in the situation when they are rapidly excreted with urine without being involved in metabolic processes. It also inhibits transformation of carotene into vitamin A).

1.5.Anorexia

1.6. Presence of vitamins in a form that cannot be utilized in some foods (inositol in the form of phytin in cereals).

1.7. Effects of antivitamin agents that are found in food.

2. Supression of intestinal flora producing a number of vitamins.

2.1.Diseases of the gastrointestinal tract.

2.2. Aftermaths of chemotherapy (dysbacterioses).

3. Malabsorption of vitamins.

3.1. Disorders related to malabsorption of vitamins in the gastrointestinal tract (diseases of the stomach, liver, gallbladder, intestinal diseases; old age disorders such as impaired bile secretion which is important for absorption of fat-soluble vitamins).

3.2. Most vitamins are utilized or broken down in the human body by intestinal parasites or pathogenic intestinal microflora (deficiency in B12 in case of broad tapeworm invasion).

3.3. Disorders of vitamin metabolism and formation of their biologically active forms (coenzymes) associated with various diseases, effects of toxic and infectious agents, chemotherapy, old age disorders.

4.Increased vitamin requirements.

4.1. Special physiological states (intensive growth, pregnancy, lactation).

4.2. Special climatic conditions (vitamin requirements increase by 30-60% due to higher energy expenditures at low temperatures in the northern climatic zone).

4.3. Intense physical activity.

4.4.Psychological and stress loads.
4.5. Effects of harmful occupational factors (People working in hot shops and exposed to high temperatures (32 degrees) require twice as much vitamins C, B1, B6, pantothenic acid as those doing the same job at 18 degrees).
4.6. Infectious diseases and intoxications (In severe sepsis daily requirements for vitamin C reach 300-500 mg).
4.7. Internal diseases and diseases of endocrine glands.
4.8. Increased excretion of vitamins.

5. Congenital genetic disorders of vitamin metabolism.

5.1. Congenital disorders of vitamin absorption.
5.2. Congenital disorders of vitamin transport in blood and across cell membranes.
5.3.Congenital disorders of vitamin biosynthesis (nicotinic acid from tryptophan).
5.4. Congenital disorders of conversion of vitamins into their coenzyme forms, prosthetic groups and active metabolites.
5.5. Disorders related to the failure to bind vitamins to the active site of an enzyme.
5.6. Impaired structure of an apoenzyme impeding its interaction with a coenzyme.
5.7. Impaired structure of an apoenzyme resulting in complete or partial enzymatic activity loss regardless of its interaction with a coenzyme.
5.8. Boosted vitamin catabolism.
5.9. Congenital disorders of renal reabsorption of vitamins.

Table 1

Vitamin losses during processing and cooking

Foods	A	B1	B2	C	PP
Flour,cereals, beans	-	40	30	-	30
Butter	20	-	-	-	15
Sour cream, cottage cheese	20	20	15	-	15
Eggs	30	20	15	-	15
Meat	30	40	30	-	30
Fish	-	30	25	-	25
Fruits & berries	30	20	15	60-70	15
Vegetables (on average)	40-50	30	20	60-75	20
Milk	20	20	15	50	15
Flour, cereals, beans					

Table 2

Vitamin C losses in potatoes in food storage

Time	Content of vitamin C compared with initial value

After harvesting	100% (20 mg/100 g)
Storage of food for 6-8 months	50-40%

Table 3

Vitamin C losses during processing and cooking

Raw & cooked food	Vitamin C losses
Cabbage soup (shchi) with sauerkraut (boiled for 1 h)	50
Cabbage soup (shchi) that was kept on the heated stove for 6 hours	90
Potato soup (after cooking)	50
Potato soup that was kept on the heated stove for 6 hours	100
Stewed cabbage	85
Sauerkraut removed from the pickle juice in 12 hours	50
Sauerkraut removed from the pickle juice in 24 hours	70
Sauerkraut washed with cold water	60
Sauerkraut washed with hot water	80
Sauerkraut frozen	20-40
Mashed potatoes	80
Fried hashed potatoes	65
Boiled potatoes (peeled)	40
Boiled potatoes (in jackets)	25
Raw potatoes (peeled, potato tubers kept for some time in water at room temperature)	20
Raw potatoes (peeled, cut to pieces, kept in water for 30 minutes)	40
Boiled carrots (scraped)	60

Table 4

Vitamin C losses in potatoes during storage

Harvesting time	Content of vitamin C compared with the initial value
Immediately after harvesting	100% (20 mg/100 g)
9 days	90%
3 months	70%
Storage of food for 6-8 months	50-40%

Main preventive measures against vitamin deficiency

1. Increasing the production of foods which are rich in vitamins. Higher consumption of these foods per capita.
2. Making foods rich in vitamins available in the grocery throughout the year (greenhouses, etc.).
3. Proper storing and processing foods in public catering units, food industries and at home.
4. Developing new methods and facilities which will promote the preservation and increase of vitamins in foods.

5. Producing new foods by adding some food additives rich in natural vitamins.
6. Increasing the amount of vitamins we eat through the selection of crops and proper fattening of the farm livestock.
7. Increasing the production of vitamin and multivitamin supplements.
8. Educating the population about nutrition hygiene and practical vitaminology.
9. Controlling the amount of vitamins in the diet. Taking vitamin supplements or vitaminized foods (e.g. flour, sugar, milk or juices) in case of developing vitamin deficiencies.

There are two main ways of additional vitaminization

1. One of the ways of food vitaminization consists in adding some vitamin supplements to the foods (e.g. margarine is usually enriched with vitamin A, lump sugar and milk are often enriched with vitamin C; flour is supplemented with vitamins B410, B 420, PP; chocolate, marmalade and caramel are usually enriched with a B-complex multivitamin supplement as well as with vitamins C, A, D; tinned goods are often supplemented with vitamin C and carotene).
2. Another way of food vitaminization consists in adding vitamin supplements to cooked food in public catering units. Thus, vitamin C vitaminization is usually done in pre-school educational establishments, children´s homes and hospitals throughout the year, while in some other establishments – only in spring and winter.
The recommended daily intake of ascorbic acid is 30 to 70 mg for children, 100 mg for adults. Acorbic acid is usually added to the first and third courses. The dietary supplements of vitamin C may be taken as special tinctures, fruit and vegetable juices which are rich in natural vitamin C sources.

Recipe of a vitamin-rich dogrose tincture

100 g of dried dogrose fruits contain 1200-1500 mg of ascorbic acid. For the preparation of a vitamin-rich dogrose tincture one should take 15 g of dried fruits (per person), wash them in cold water, crush them thoroughly, pour in a glass of boiled water and boil the mixture for 10 minutes in the enamel sauce-pan with a lid on. The tincture should be left for 3-4 hours. Then it should be filtered. One should take one or two glasses of hot or cold tincture daily (sugar can be added). The content of vitamin C in a glass is about 100 mg. The tincture should be kept for no more than 2 days.

Ways of increasing vitamin value in vegetables

1. Storage of vegetables.
One should store fresh vegetables in well ventilated rooms at a temperature of +1-3 Cº and relative air humidity of 85-90%. It is necessary to protect them from sunlight. Fermented vegetables should be pickled and kept at a temperature of +3 Cº; sauerkraut should be pickled and stored in a compressed state (see table).
One should avoid freezing and defrosting vegetables repeatedly. Leafy vegetables (e.g. lettuce/salad, green onions, etc.) should be eaten no later than 4 hours after picking.
2. Primary processing of vegetables.

It is necessary to minimize the period of processing vegetables. The skin of vegetables and fruits which contains a great deal of vitamins is to be preserved. One should use the utensils made of stainless steel. One should not wash sauerkraut (see table 1.2).

3. Storage of convenience foods.

One should minimize the time of keeping raw potatoes in water. It is necessary to avoid keeping vegetables cut to pieces in water. Root plants and vegetables should be kept one piece under a moist cloth, while cabbage and onions – under a dry one. Convenience leafy vegetables should be cooked immediately before thermal processing or adding to cooked dishes. Sauerkraut and pickled cucumbers should be taken out of the pickle before using.

4. Thermal processing.

Vegetables should be cooked in stainless ware or ware made of aluminium alloy or tin. The sauce-pans should be completely filled with their lids on. Vegetables should be cooked in water, oil or broth. Vegetables should be put into boiling water. Frozen vegetables should be put into the broth without defrosting. The order of putting vegetables into a sauce-pan depends on the time they take to be cooked. It is not allowed to add baking soda to the broth with vegetables. Carrots and onions for the first and second courses should be fried in oil for 15-18 min. One should avoid stewing vegetables.

5. Storage of cooked food.

Food should be cooked before serving. One should avoid re-heating the food. Dill, parsley and other greens one should put into boiling broth. Cold vegetable dishes (salad, Russian salad) should be stored for no more than 4 hours at a temperature of +8 Cº.

Appendix

Table5

Content of mineral substances in common food products (in mg per 100g of edible portion)

Food Products	Sodium	Potassium	Calcium	Magnesium	Phosphorus	Iron
1	*2*	*3*	*4*	*5*	*6*	*7*
Rye bread	383	67	21	19	87	2
White bread	488	127	26	35	83	1.6
Porridge oat	45	292	64	116	361	3.9
Wheat farina	22	120	20	30	84	2.3
Rice	26	54	24	21	97	1.8
Buckwheat	-	167	70	98	298	8
Millet	39	201	27	101	233	7
Macaroni	10	124	18	16	87	1.2
Beef	60	315	9	21	198	2.6
Pork	51	242	7	21	164	1.6
Beef liver	63	240	5	18	339	9
Sausage	900	211	7	17	146	1.7
Chicken	110	194	16	27	228	3

Chicken eggs	71	153	55	54	185	2.7
Codfish	78	338	39	23	222	0.6
Sturgeon caviar	-	-	-	-	-	-
Pasteurized milk	50	146	121	14	91	0.1
Kefir	50	146	120	14	95	0.1
Sour cream	50	124	90	10	62	0.1
Cottage cheese	41	112	164	23	220	0.4
Hard cheese	950	-	760	-	424	-
Butter	74	23	22	3	19	0.2
Refined sunflower oil	-	-	-	-	-	-
Peas	-	731	89	88	226	7
Potatoes	28	568	10	23	58	0.9
White cabbage	13	185	48	16	31	1
Green onions	57	259	121	18	26	1
Tomatoes	40	290	14	20	26	1.4
Cucumbers	8	141	23	14	42	0.9
Beet	86	288	37	43	43	1.4
Carrots	21	200	51	38	55	1.2
Mushrooms	-	-	27	-	89	5.2
Apples	26	248	16	9	11	2.2
Apricots	30	305	28	19	26	2.1
Cherries	20	256	37	26	30	1.4
1	*2*	*3*	*4*	*5*	*6*	*7*
Raspberries	19	224	40	22	37	1.6
Wild strawberries	18	161	40	18	23	1.2
Currants	32	372	36	35	33	1.3
Dogrose	13	58	66	20	20	28
Grapes	26	255	45	17	22	0.6
Lemons	11	163	40	12	22	0.6
Oranges	13	197	34	13	23	0.3
Pies. cakes	23	64	30	16	68	1

Table 6

Content of iodine in food products, mkg

Product	Portion (g)	Iodine deficient province	Non-endemic conditions

Cod	100	-	75-139
Haddock	100	-	122-169
Oysters	100	-	100-200
Shrimps	100	-	29-43
Sea cabbage	50	-	Up to 900
Fish sticks	40 (2 units)	-	35
Cheese	30	1.4	9
Pork	100	4.4	30
Eggs	100	3.4	22
Potatoes	100	2.3	5
Onion	100	1.6	4.8
Apples	100	1.6	3.9
Milk	100	-	13.9
Bread, cereals	100	-	10.5

Table 7

Content of fiber in certain food products (g)

Product	Portion (g)	Quantity of fiber (g)
Oat shorts	50	7.7
Beans	100	6.8
Raspberries	100	6.8
Blueberries	100	5.3
Apples	140 (1 unit)	3.7
Mangoes	240 (1 unit.)	3.7
Buckwhat	100	3.4
Almonds	30 (23 units)	3.3
Oranges	130 (1 units)	3.1
Dried apricots	100	3.2
Pistachios	30 (47 units)	2.9
Pumpkins	100	2.9
Bananas	120 (1 units)	2.8
Kiwi	75 (1unit)	2.6
Potatoes	135 (1 unit)	2.4
Sweet pepper (red)	120 (1 unit)	2.4
Peanuts	30 (33 units)	2.4
Nectarine	135 (1 unit)	2.2
Carrots	70 (1 unit)	2.2
Sweet pepper (green)	120 (1 unit)	2.1
White cabbage	100	1.9
Sweet cherries	70 (10 units)	1.6
Tomatoes	120 (1 unit)	1.4
Bread (wholemeal)	30 (1 slice)	1.1

Physiological effects of dietary fiber:

- Ensuring normal intestinal motility, stimulation of peristalsis;
- The maintenance of normal intestinal microflora (microbiocenosis);
- Sorption properties;
- Protection of the epithelium of the large intestine from various pathological processes, including neoplastic ones.

Table 8

Physiological daily requirement in vitamins for adults (Russia)

Group	Age	C mg	A mic	E mg	D mic	B1 mg	B2 mg	B6 mg
1	2	3	4	5	6	7	8	9
Male								
I	18-59	70.0	1000.0	10.0	2.5	1.2	1.5	2.0
II	18-59	70.0	1000.0	10.0	2.5	1.4	1.7	2.0
III	18-59	80.0	1000.0	10.0	2.5	1.6	2.0	2.0
IV	18-59	80.0	1000.0	10.0	2.5	1.9	2.2	2.0
V	18-59	100.0	1000.0	10.0	2.5	2.4	2.4	2.0
Male over 59								
60-74		80.0	1000.0	15.0	2.5	1.4	1.6	2.2
Over 75		80.0	1000.0	15.5	2.5	1.2	1.4	2.2
Female								
I	18-59	70.0	800.0	8.0	2.5	1.1	1.3	1.8
II	18-59	70.0	800.0	8.0	2.5	1.1	1.3	1.8
III	18-59	80.0	1000.0	8.0	2.5	1.3	1.5	1.8
IV	18-59	80.0	1000.0	8.0	2.5	1.5	1.8	1.8
Female over 59								
60-74		80.0	800.0	12.0	2.5	1.3	1.5	2.0
Over 75		80.0	800.0	12.0	2.5	1.1	1.3	2.0
In addition to standard (pregnancy)								
		+20.0	+200.0	+2.0	+10.0	+0.4	+0.3	+0.3
1	2	3	4	5	6	7	8	9
Infant								
0-3		30.0	400.0	3.0	10.0	0.3	0.4	0.4
4-6		35.0	400.0	3.0	10.0	0.4	0.5	0.58
7-12		40.0	400.0	4.0	10.0	0.5	0.6	0.6
1-3 year		45.0	450.0	5.0	10.0	0.8	0.9	0.9
Children								
4-5 year		50.0	500.0	7.0	2.5	0.9	1.0	1.3
Pupil								
6 year old		60.0	500.0	10.0	2.5	1.0	1.2	1.3
7-10		60.0	700.0	10.0	2.5	1.2	1.4	1.6
11-13 male		70.0	1000.0	12.0	2.5	1.4	1.7	1.8

11-13 female	70.0	800.0	10.0	2.5	1.3	1.5	1.6
14-17 male	70.0	1000.0	15.0	2.5	1.5	1.8	2.0
14-17 female	70.0	800.0	12.0	2.5	1.3	1.5	1.6

Table 9

The content of vitamins in food (100g)

Food	B1	B2	PP	B6	C	A	ß-carotene	E
	Mg/100g							
1	2	3	4	5	6	7	8	9
Rye bread	0.18	0.11	0.67	0.17	-	-	-	2.2
White bread	0.21	0.12	2.81	0.3	-	-	-	3.8
Semolina	0.14	0.07	1.0	0.17	-	-	-	2.5
Buckwheat	0.53	0.2	4.19	0.4	-	-	-	6.6
Rice	0.08	0.04	1.6	0.18	-	-	-	0.4
Millet	0.62	0.04	1.55	0.52	-	-	0.15	2.6
Macaroni	0.17	0.08	1.21	0.16	-	-	-	2.1
Beef	0.07	0.18	3.0	0.39	-	-	-	-
Pork	0.52	0.14	2.4	0.33	-	-	-	-
Beef liver	0.3	2.19	6.8	0.7	33.0	3.8	1.0	1.3
Sausage	0.25	0.18	2.47	0.19	-	-	-	-
Chicken	0.07	0.15	3.6	0.61	-	0.1	-	-
Eggs	0.07	0.44	0.2	0.14	-	0.3	-	2.0
Crash	0.09	0.16	2.3	0.17	-	-	-	0.9
Sturgeon caviar	0.3	0.36	1.5	0.29	7.8	0.2	-	-
Milk	0.03	0.13	0.1	-	1.0	-	0.01	-
Kefir	0.03	0.17	0.14	0.06	0.7	-	0.01	0.1
Sour cream	0.02	0.1	0.07	0.07	0.2	0.2	0.1	0.5
1	2	3	4	5	6	7	8	9
Cheese	0.02	0.3	0.3	0.1	1.6	0.2	0.1	0.5
Butter		0.01	0.1	-	-	0.5	0.34	
Sunflower oil	-	-	-	-	-	-	-	67.0
Peas	0.81	0.15	2.2	0.27	-	-	0.07	9.1
Potato	0.12	0.05	0.9	0.3	20.0	-	0.02	0.1
Cabbage	0.06	0.05	0.4	0.14	50.0	-	0.02	0.1
Onions	0.02	0.1	0.3	0.15	30.0	-	2.0	1.0
Tomato	0.06	0.04	0.53	0.1	25.0	-	1.2	0.4
Cucumbers	0.03	0.04	0.2	0.04	10.0	-	0.06	0.1
Beet	0.02	0.04	0.2	0.07	10.0	-	0.01	0.1
Carrots	0.06	0.07	1.0	0.13	5.0	-	9.0	0.6
Mushrooms	0.02	0.3	4.60	0.07	30.0	-	-	0.6

Apples	0.01	0.03	0.3	0.08	13.0	-	0.03	0.6
Apricots	0.03	0.06	0.7	0.05	10.0	-	1.6	0.9
Cherries	0.03	0.03	0.4	0.05	15.0	-	0.1	0.3
Raspberry	0.02	0.05	0.6	0.07	25.0	-	0.2	0.6
Wild strawberry	0.03	0.05	0.3	0.06	60.0	-	0.03	0.5
Currant	0.02	0.02	0.3	0.13	200.0	-	0.1	0.7
Dogrose	0.15	0.84	1.5	-	1200	-	6.7	-
Grapes	0.05	0.02	0.3	0.09	6.0	-	-	-
Lemon	0.04	0.02	0.1	0.06	40.0	-	0.01	-
Orange	0.04	0.03	0.2	0.06	60.0	-	0.05	0.2
Pie	0.75	0.1	0.7	-	-	0.1	0.14	-

Appendix

METHODS FOR CALCULATING VITAMIN C IN VEGETABLES

One should take 5 g of the food, crush it in a bowl and pour in 15 ml of a 2% hydrochloric acid solution. Then it should be infused for 10 min. The given mixture is to be filtered. 1 ml of the filtrate is to be placed into a flask. One should add 6. 5 ml of distilled water, 0. 5 ml of 1% iodic potassium solution and 2 ml of 0. 5% starch solution. The mixture is to be titrated with 0. 001% potassium iodate solution until a steady blue colouring appears.

The equation used for calculating vitamin C:

$$X = \frac{П \cdot К \cdot В \cdot 0.088 \cdot 100}{С \cdot Д}$$

Where,

X – content of vitamin C in 100 g of the foods;

0. 088 – constant coefficient (1 ml of 0. 001% potassium iodate solution is converted to 0. 088 mg of vitamin C);

П – the amount of 0. 001% potassium iodate used for titrating the probe (in ml);

В – the volume of the foods after adding extraction liquid (in ml) (20);

С – the volume of the filtrate used for titrating (in ml) (1);

Д – weight of the foods (in g) (5);

100 – coefficient used for calculating vitamin C in 100 g of the foods.