

## THE VITAMIN CONTENT OF FRUITS

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**ABSTRACT:** Fresh fruits contain varying amounts of different vitamins, depending on the species, variety and agro-climatic conditions. Vitamins are complex natural organic compounds, which play an important role in metabolic processes and in the growth and development of the human body. The paper presents a theoretical aspect regarding the water-soluble and fat-soluble vitamins contained in fruits, the role and functions that they fulfill in the human body, the fruits in which they are found. Also presented are the structural chemical formulas of vitamins, as well as their content in different fruits.

**KEY WORDS:** fruits, vitamins, importance, formula, content

### 1. INTRODUCTION

Fresh fruits are produced with very high nutritional value, which can have significant amounts of antiquity, minerals and vitamins. Content regarding variable fruits according to species, conditions and agropedoclimatic conditions.

*Vitamins* = complex natural organic compounds, which participate in the anabolic and catabolic processes in fruits, forming numerous oxidative reducing systems, through which the cellular redox potential is regulated.

They are indispensable for the maintenance and development of the human body, which cannot fully synthesize them, so it must take them from the fruits, because their lack or insufficiency causes metabolic changes, such as avitaminosis.

*The role of vitamins in fruits* is as follows:

- enzymatic activators
- participates in the electron transport processes
- biocatalysts

- directly or indirectly constitute coenzymes of some enzymatic systems
- they do not release energy, but they are essential in generating it

*Vitamins contained in fruits are classified* as follows:

- *water soluble* = C and complex B; they are stored in very small quantities in the body, are used immediately, and the surplus is eliminated through the urine; requires a substantial intake of food or nutritional supplements.
- *fat-soluble* = A, D, E and K; are stored in adipose tissue and liver; they can be administered in cycles, by loading the deposits of vitamins, then following the consumption of reserves and the resumption of the cycle.

### 2. CHARACTERIZATION OF VITAMINS FROM FRUITS

There are 13 essential vitamins whose deficiencies affect the normal functioning of the body: A, C, D, E, K, thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid

(B5), pyridoxine (B6), biotin (B7), folic acid (B9), cobalamin (B12).

## 2.1. Water-soluble vitamins

**Vitamin C (L-ascorbic acid)** plays an essential role in the proper functioning of all organs and tissues, plays an antioxidant role and increases the body's immunity. The lack of vitamin C in the body causes scurvy. It is the main vitamin synthesized from fruits. Through oxidation it passes into dehydroascorbic acid (dicetonone). In fruits, it participates in the formation processes of unsaturated fatty acids, in the production of collagen, in the degradation of some amino acids, in carbohydrate and iron metabolism. It is found in the following fruits: blueberries, citrus fruits, currants, oranges, grapefruit, lemons, mango, strawberries, kiwi (fig. 1.)

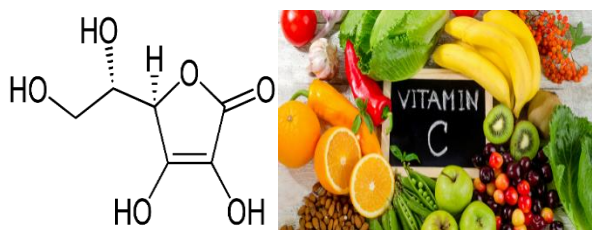


Fig. 1. Vitamin C in fruits

**Vitamin B1 (Thiamina)** plays an important role in carbohydrate metabolism and promotes glycogen deposition in the liver. Supports energy metabolism and nervous system. The lack of vitamin B1 in the diet results in BeriBeri disease. It is found in small quantities in apples, pears, plums, lemons, watermelons, varying within the limits of 0.02-0.9 mg / 100g, larger quantities in nuts and nuts (fig. 2.)

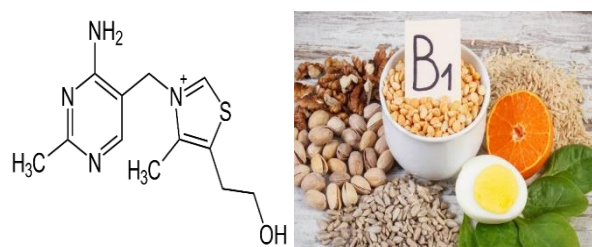


Fig. 2. Vitamin B1 in fruits

**Vitamin B2 (Riboflavin)** plays a decisive role in the process of growth and fat metabolism. Supports energy metabolism, eye

and skin health. It is found in the free state or in the form of coenzymes, in quantities of 0.02-0.62 mg / 100g, the richest fruits being almonds, pears, apples, strawberries, citrus fruits and lemons and hazelnuts (fig. 3.)

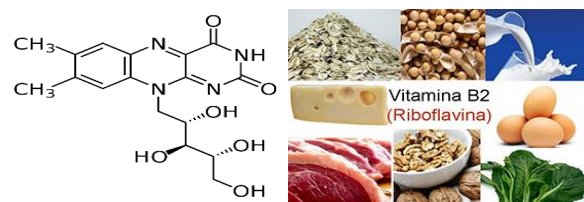


Fig. 3. Vitamin B2 in fruits

**Vitamin B3 or Vitamin PP (Nicotinamide)** has the same characteristics as nicotinic acid (niacin), whose content varies between 0.17-15.3 mg / 100g, higher in peanuts and almonds (fig. 4.)

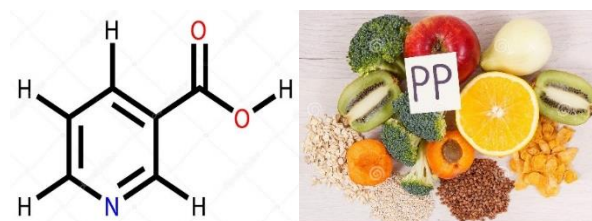


Fig. 4. Vitamin B3 in fruits

**Vitamin B4 (Choline)** is found as a component of lecithin (lecithin contains 13% choline). Choline was classified as an essential nutrient in 1998 and has multiple roles in the body. This complex substance that can also be considered a vitamin, is necessary for the synthesis of the neurotransmitter acetylcholine, plays an important role in lipid transport and synthesis, positively influences the development of the brain and memory and represents the starting material from which the substances that make up the cell membranes are synthesized. The biggest problem with ensuring the right amount of choline is that choline-rich foods contain significant amounts of cholesterol. Among the plant sources is found in nuts (fig. 5.)

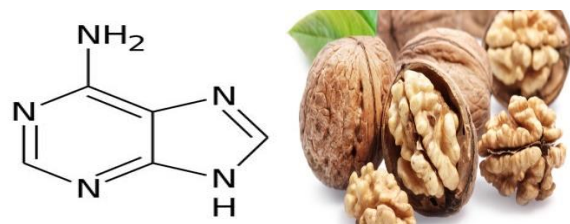


Fig. 5. Vitamin B4 in fruits

**Vitamin B5 (pantothenic acid)** supports the energy metabolism of amino acids and glycogen synthesis. It is freely or combined as coenzyme A, with a content ranging from 0.02-2.6 mg / 100g. The richest fruits are peanuts, hazelnuts, nuts and almonds (fig. 6.)

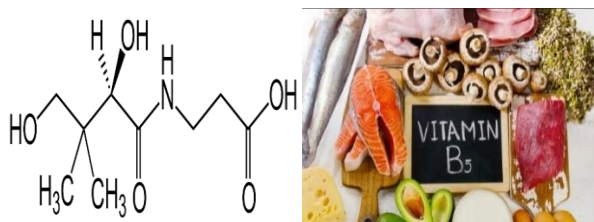


Fig. 6. Vitamin B5 in fruits

**Vitamin B6 (pyridoxine or adenine)** participates in the metabolism of amino acids and fatty acids, helps in the production of red blood cells and plays a role in the metabolism of amino acids and lipids. The content ranges from 0.01 to 1.19 mg / 100g, with higher values being nuts, peanuts, chestnuts, bananas, melons (fig. 7.).

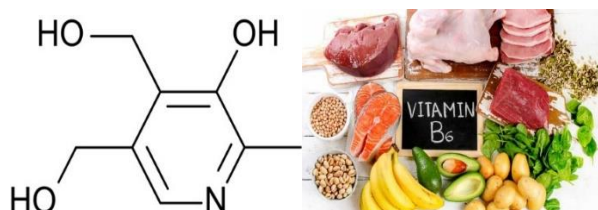


Fig. 7. Vitamin B6 in fruits

**Vitamin B7 or Vitamin H (Biotin)** supports energy metabolism, fat synthesis, amino acid metabolism, glycogen synthesis. It participates as a coenzyme in decarboxylation of ketone acids, in the dissemination of amino acids and in the synthesis of asparagic acid. It plays an important role in the process of growth and resistance to infectious diseases. It is an indispensable food factor, with a reduced spread of 0.001-1.9 mg / 100g, with higher amounts being in peanuts, nuts, raspberries and bananas (fig. 8).

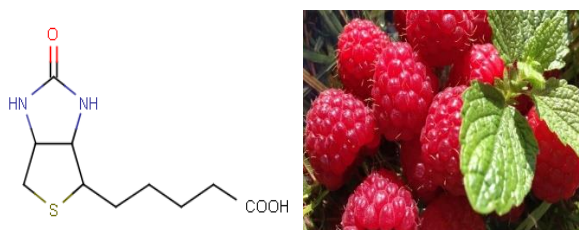


Fig. 8. Vitamin B7 in fruits

**Vitamin B9 (Folic Acid)** supports DNA synthesis and new cell creation and participates in riboflavin metabolism. It is found in very small quantities, in free form or in conjunction with a large number of glutamic acid residues. Content ranges from 0.01-0.13 mg / 100g, the highest being in peanuts, nuts, peanuts, almonds (fig. 9).

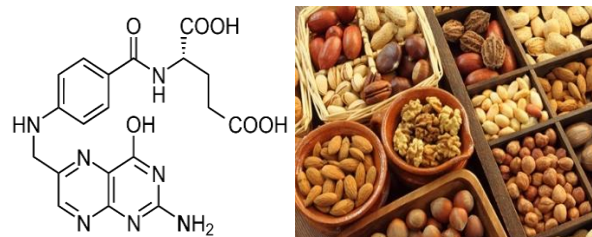


Fig. 9. Vitamin B9 in fruits

**Vitamin P (Rutin)** acts on the permeability of blood capillaries. It is necessary for proper absorption and use of vitamin C. It is also called capillary permeability factor (P = permeability). The basic role of bioflavonoids is to increase the resistance of capillaries and regulate absorption. It acts synergistically with vitamin C and contributes to maintaining the health of the connective tissue. For each 500 mg of vitamin C, a minimum of 100 mg of bioflavonoids is required. It is found in lemons and mulberries (fig. 10.)

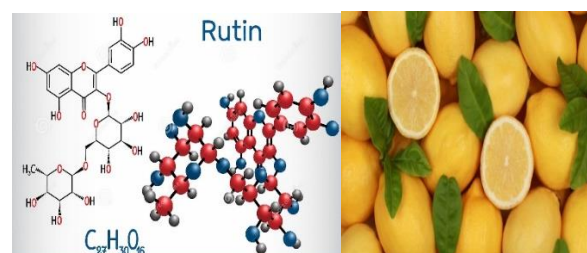


Fig. 10. Vitamin P in fruits

## 2.2. Fat-soluble vitamins

**Vitamin A (Retinol)** supports vision, skin, bones and teeth. It has antioxidant role, increases the immunity of the body, protects the body against drying of epidermal cells. It is found in apricots, blueberries, currants, mango (fig. 11.).

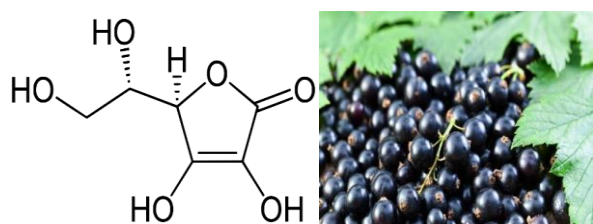


Fig. 11. Vitamin A in fruits

**Vitamin D (Rickets)** plays a role in the metabolism of calcium in the body. It is fixed in the body under the action of the sun. It is found in peanuts, almonds, mango, grapes (fig. 12.).

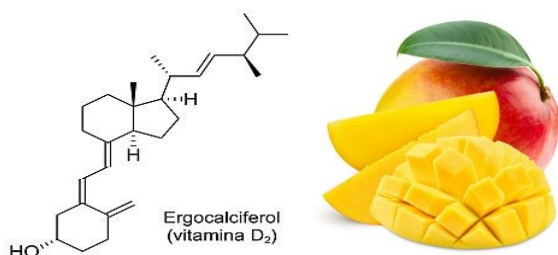


Fig. 12. Vitamin D in fruits

**Vitamin E (Tocopherol)** represents a group of related substances, methylated derivatives of stubble; it has antioxidant role, regulates oxidation reactions, supports cell membrane stabilization and skin health and plays an important role in growth and fecundity. It is found in hazelnuts, bananas, oranges, avocados (fig. 13.).

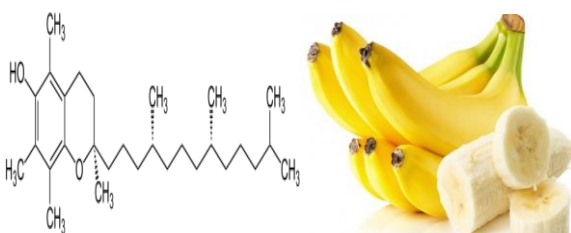


Fig. 13. Vitamin E in fruits

**Vitamin F** is essential for fat metabolism, favoring the synthesis of human lecithins that enter the composition of the brain. It is found in grapes (fig. 14.).



**Vitamin K1 (Filochinone)** has anti-hemorrhagic action, maintains blood coagulation, regulates blood calcium level, plays a role in oxidative phosphorylation as an electron transporter between two coenzymes and catalyzes the generation of energy-rich phosphate bonds. The content ranges from 0.01-1.5 mg / 100 g and is found in apples, blueberries and strawberries (fig. 15.)

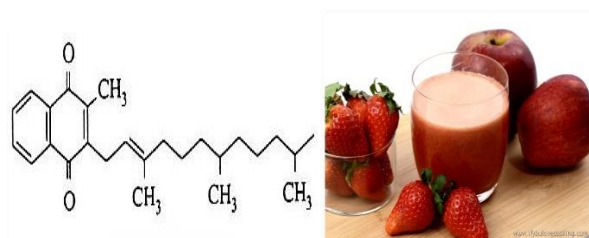


Fig. 15. Vitamin K1 in fruits

### 3.VITAMIN CONTENT OF FRUITS

Tables 1, 2 and 3 shows the content of vitamins B1, B2, B6, B9, B5, B7, PP, C and E, in different fruits from Romania, but also from other areas, with different climatic and relief conditions. The content of vitamins is presented in mg / 100 g fresh fruit.

Table 1. Contents of vitamins B1, B2 and B6 in fresh fruits (mg / 100 g fresh fruits)

Fruit	Vitamin B1	Vitamin B2	Vitamin B6
peanuts	0,9	0,15	0,3
melon	0,05	0,06	0,11
blueberries	0,02	0,02	0,06
barberries	0,02	0,02	0,02
hazel	0,39	0,21	0,45
bananas	0,05	0,06	0,37
apricot	0,04	0,05	0,07
chesnut	0,2	0,21	0,35
strawberries	0,03	0,05	0,06
cherries	0,04	0,04	0,05
black currant	0,05	0,04	0,08
grefruit	0,05	0,03	0,01
quince	0,03	0,03	-
lemons	0,05	0,02	0,06
tangeres	0,07	0,02	0,07
apples	0,04	0,03	0,05
almonds	0,22	0,62	0,06
blackberries	0,03	0,04	0,05
nuts	0,34	0,12	0,87
pears	0,03	0,04	0,02

peaches	0,03	0,05	0,03
grapes	0,05	0,03	0,07
oranges	0,08	0,04	0,05
plums	0,07	0,04	0,04
sour cherries	0,05	0,06	-
raspberries	0,02	0,05	0,08

Table 2. Contents of vitamins B9, B5 and B7 in fresh fruits (mg / 100 g fresh fruits)

Fruit	Vitamin B9	Vitamin B5	Vitamin B7
peanuts	0,05	2,6	0,034
melon	0,04	0,4	-
blueberries	0,01	0,16	0,001
barberries	-	0,2	-
hazel	0,07	1,15	-
bananas	0,02	0,23	0,005
apricot	-	0,29	-
chesnut	-	0,5	0,002
strawberries	0,02	0,3	0,004
cherries	0,01	0,19	-
black currant	-	0,4	0,002
grefruit	0,01	0,21	-
quince	-	-	-
lemons	0,01	0,27	-
tangernes	0,02	-	-
apples	-	0,1	0,004
almonds	0,05	0,58	-
blackberries	-	0,22	-
nuts	0,08	0,82	0,02
pears	0,01	0,06	-
peaches	-	0,14	0,002
grapes	0,01	0,06	0,002
oranges	0,02	0,24	0,002
plums	-	0,18	-
sour cherries	-	-	-
raspberries	-	0,3	-

Table 3. Contents of vitamins PP, C and E in fresh fruits (mg / 100 g fresh fruits)

Fruit	Vitamin PP	Vitamin C	Vitamin E
peanuts	15,3	0	20,2
melon	0,05	9	0,1
blueberries	0,4	22	-
barberries	0,25	35	1
hazel	1,35	3	28
bananas	0,65	12	0,45
apricot	0,77	9	0,5
chesnut	0,87	27	7,5
strawberries	0,51	64	0,22
cherries	0,27	15	0,27
black currant	0,28	177	1
grefruit	0,2	45	0,25
quince	0,2	13	-
lemons	0,17	53	0,8
tangernes	0,2	31	-

apples	0,3	12	0,57
almonds	4,18	3	26,1
blackberries	0,4	17	9,7
nuts	1	3	24,7
pears	0,22	5	0,43
peaches	0,85	10	0,6
grapes	0,23	4	-
oranges	0,3	50	0,24
plums	0,44	5	0,8
sour cherries	0,4	12	-
raspberries	0,3	15	1,4

Analyzing the information in the tables, regarding the vitamin content of some fruits, it is observed that the highest content of vitamins in complex B (B1, B2, B5, B6, B7 and B9), vitamin E and vitamin P PP they have peanuts, hazel, chesnut, nuts, almonds (fig. 15).



Fig. 15. Fruits with the highest levels of vitamins B, PP and E (peanuts, hazel, chesnut, nuts, almonds)

As for vitamin C, a very high content is found in black currants, but also in lemons, grapes, berries and melons (fig. 16.).



Fig. 16. Fruits with the highest levels of vitamin C (balck currants, berries and citrus)

#### 4. CONCLUSION

1. Fresh fruits contain varying amounts of different vitamins, depending on

- the species, variety and agro-climatic conditions.
2. Vitamins are complex natural organic compounds, which play an important role in metabolic processes and in the growth and development of the human body.
  3. The role of vitamins in fruits is enzymatic activators, biocatalysts, directly or indirectly constitute coenzymes of some enzymatic systems.
  4. Vitamins contained in fruits are classified as follows water soluble, who are vitamin C and complex B and fat-soluble, who are vitamins A, D, E and K.
  5. Are presents the structural chemical formulas of vitamins, as well as their content in different fruits.
  6. Peanuts, hazel, chesnut, nuts, almonds, lemons, grapes, berries and melons are fruits with the highest vitamin content.

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