Extracting P - vitamin complex from green tea leaves

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Keywords:

Flavonoids
Catechin
Vitamin P
Extraction
Green tea

Article history:

Received 12.05.2014
Received in revised form 19.06.2014
Accepted 30.06.2014

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Abstract

Introduction. P - vitamin complex from green tea has high antioxidant action of catechins, so it can be used to prevent and treat the most common diseases in the pathogenesis of which activation of free radical oxidation plays an important role.

Materials and methods. Packed big leaves green tea was researched. For extraction of vitamin P methods of simple and repeated extraction were used. Determination of extractives was carried out by evaporation and weighing.

Results and discussion. For the selection of optimal conditions of vitamin P extraction from green tea technological parameters of the extraction with ethanol were studied .

The most complete removal of target compounds is achieved by 60 minute extraction, further increase time of extraction does not increase the amount of extractives.

The best proportion of vitamin P extraction from green tea is the ratio of raw material - extractant 1:40 so as further increase of solvent volume does not increase the number of flavonoids in the extract.

Maximum extraction of target compounds was observed in extraction of raw materials with particles size less than 1 mm. Research of multiplicity extraction showed that it is feasible to use a double extraction.

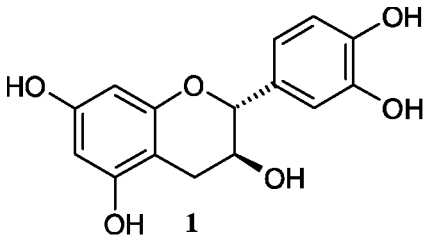
Conclusions. For vitamin P extraction from green tea leaves the following conditions of extraction are optimal: the process time - 60 min, the ratio of raw material - extractant 1: 40 during the grinding of raw materials to a particle size <1 mm, the double extraction of raw materials.

Introduction

For centuries, green tea *Camellia sinensis* and its extracts were used in medicine as a treatment for ailments [1]. The benefits of green tea was provened by modern research [1,2].

The healing properties of this drink due to its chemical composition - a high content of polyphenolic compounds that exhibit P - vitamin action. Catechins are bulk of all polyphenolic (flavan-3-ols). It is the most restored representatives of flavonoids. Green tea contains (+) - catechin 1, (-) - epicatechin 2, (+) - gallokatehin 3, (-) - epigallocatechin 4, (-) - epicatechin-3-gallate and 5 (-) - epigallocatechin -3-gallate (EGCG) 6 [1]. In addition, the composition of tea includes quercetin, kaempferol, and myricetin glycosides.

It is known that the antioxidant activity of plant extracts is caused mainly by the presence in them of natural phenolic compounds [1]. Interacting with free radicals, catechins, like other phenolic compounds neutralize them [1,3]. It should be noted that EGCG - the most powerful known antioxidants of plant origin [1].



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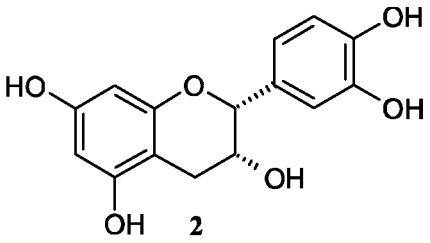

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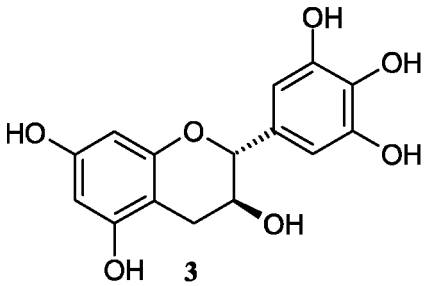

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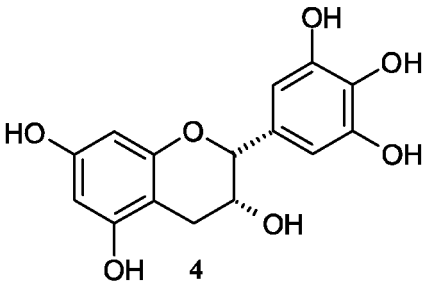

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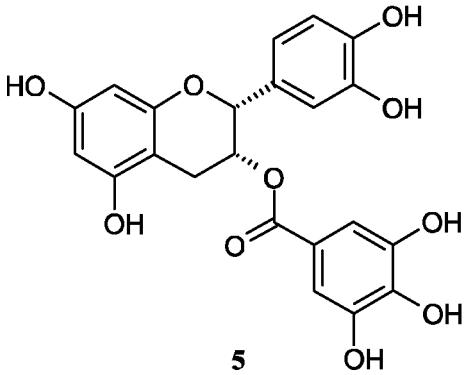

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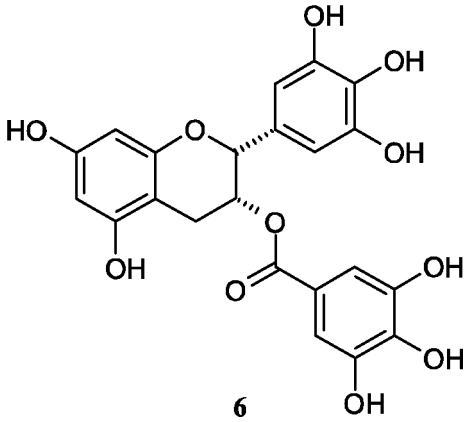

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Due to its antioxidant action, catechins prevent and slow down atherosclerosis, coronary heart disease, hypertension and its consequences, diabetes, the development of Parkinson's and of Alzheimer's diseases. In addition, EGCG effectively reduse the level of cholesterol and triglycerides in plasma and blood pressure [1,2,3].

Scientists's particular attention is attracted to study antimutagenic and antitumor action of tea catechins, especially EGCG. It was found anticarcinogenic effect of tea catechins. For example, antiproliferative effect EGCG, which also induces and enhances apoptosis of tumor cells [1,2,3,4]. Toxicity tea catechins is minimal, practically they do not cause side effects.

It should be noted that the human's antitumor effect of EGCG is reduced due to low digestibility and its intense metabolism with loss of activity. For getting an effective dose in relation to cancer cells it is necessary to drink 1.5 liters of green tea per day [1]. However, undesirable effects of caffeine, which is found in green tea 1.8 - 2.8%, inevitably occur.

Materials and methods

Green tea is a rich source of flavonoids, its leaves contain 51-84 mg of catechins per gram of dry weight, that several times is more than in black tea [1]. Taking into consideration this, we chose packed chinese green tea as the raw material to produce vitamin P .

Tea leaves except polyphenols contain alkaloids caffeine, theophylline, theobromine, saponins, essential oils, amino acids, carbohydrates, vitamins and minerals. Taking into consideration physical and chemical properties of natural compounds that are included to tea composition for polyphenolic compounds extraction we used consistent processing of raw materials by organic solvents.

Packed big leaves green tea was studied. For vitamin P extraction methods of simple and repeated extraction were used . Determination of extractive substances was carried out by evaporation with the following weighing.

Taken into consideration approaches to extracting natural compounds for the extraction of alkaloids, resins, essential oils and pigments as a non-polar solvent we used dichloromethane. After plant material drying catechins and flavonols glycosides that exhibit P-vitamin activity were bereaved by extraction with the help of ethanol. P - vitamin complex is obtained after evaporation of the resulting extract.

The process of extraction depends on many factors: the duration of the extraction, the ratio of raw material - the extractant, the degree of milling of raw material, temperature, and so on. To ensure a high content of vitamin P in the extract of green tea is recommended to study the optimal conditions for its extraction.

Extraction of alkaloids, resins, essential oils and pigments from green tea leaves. 10 g of green tea is placed in a round bottom flask volume to 250 ml, add 100 ml of dichloromethane and heated in a water bath under reflux with stirring for 2 h. Plant material was filtered under vacuum through a Buchner funnel and dried and used for further extraction of vitamin P.

Extracting vitamin P.

1. The influence of extraction time on the amount of extractives

Samples of 2 g of treated CH_2Cl_2 green tea are placed in round-bottom flasks of 100 ml and 40 ml of ethanol is added. The flasks are heated under reflux in a boiling water bath for 15, 30, 60, 90, 120 min respectively. The extracts were filtered under vacuum.

2. The influence of the ratio of raw material - the number of extractant extractives.

Samples of 2 g of green tea are placed in a round-bottom flasks of 100 ml and ethanol was added at a ratio of 1:10; 1:20; 1:40; 1:50; 1: 100. The flasks are heated under reflux in a boiling water bath for 60 min. The extracts were filtered under vacuum.

3. The influence of particle size on the amount of extractives

Samples of 2 g of crushed green tea leaves with particle sizes respectively <1 1..2, 2..2,5,> 2.5 mm are placed in a round-bottom flasks of 100 ml and 80 ml of ethanol is added. The flasks are heated under reflux in a boiling water bath for 60 min. The extracts were filtered under vacuum.

4. The influence of the multiplicity of extraction on the amount of extractives

Samples of 2 g of crushed green tea leaves with particle size <1 mm is placed in a round-bottom flasks of 100 ml and 80 ml of ethanol is added. The flask was heated to reflux in a boiling water bath for 60 min. The extract was filtered under vacuum. Plant material is retreated with ethanol under the same conditions. Extraction is repeated 3 times. The extracts were combined and used for determination of extractive amount.

Determining the amount of extractives. 20 ml of the resulting alcohol extract of green tea is taken by pipette and it is placed in a predried at a temperature of 100-105 C accurately weighed porcelain cup with a diameter of 7-9 cm. A solution is evaporated to dryness in a water bath. Cup of residue is dried in an oven at a temperature 100-105C to constant matter, then it is cooled for half an hour in a desiccator over calcium chloride and is weighed. The amount of extractives X is calculated by the formula:

$$X = \frac{m_1 \cdot V}{m \cdot V_1},$$

where m - mass of sample, m_1 - mass of dry residue, V - volume of extractant, V_1 - volume of aliquot.

The efficiency of extraction was evaluated by the number of extractives in different technological parameters. To determine the amount of extractives the extraction of raw material exact sample was performed . The extract was transferred into a predried at a temperature 100-105° C accurately weighed porcelain cup with a diameter of 7-9 cm. A solution was evaporated to dryness in a water bath. Cup of dried residue in an oven at a temperature 100-105° C to constant weight, then it is cooled for 30 min in a desiccator over calcium chloride and is weighed.

Results and discussion

It was studied the dependence of the number of substances on the duration of the process, the ratio of raw material - the extractant, the degree of milling of raw material extraction and multiplicity.

The most complete removal of target compounds is achieved with extraction for 60 min, as shown in Figure 1, a further increase in extraction time did not lead to an increase in the number of extractives.

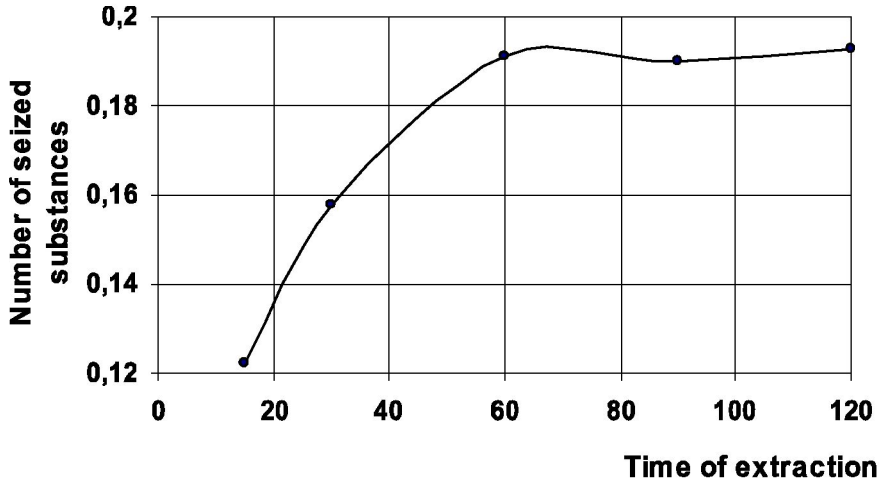

Fig. 1. Dependence of the number of seized substances on the duration of the process

It is established that the optimum ratio for the extraction of vitamin P from green tea (Figure 2) is raw - extractant 1: 40, so as to further increase the number of solvent does not increase the number of flavonoids in the extract.

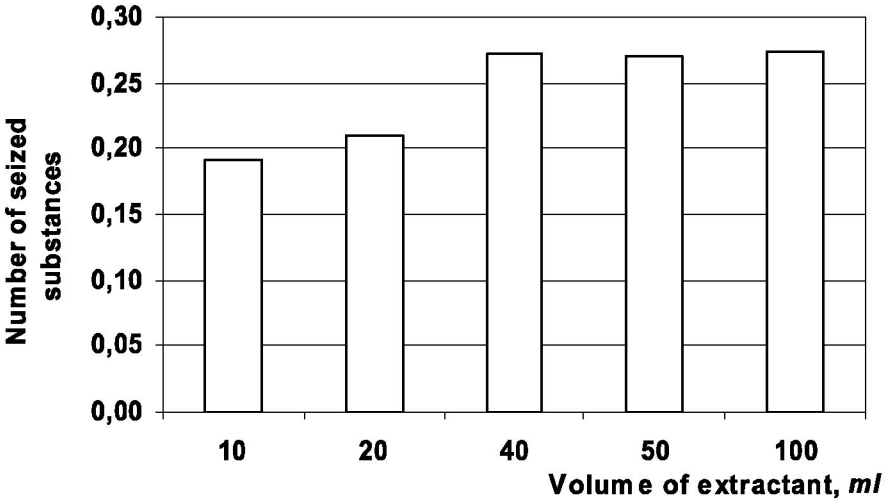

Fig.2. Raw-extractant ratio

On the basis of the calculations it was shown that the maximum extraction of target compounds is observed during the extraction of raw materials with particle size <1 mm (Figure 3).

Research of extraction multiplicity has shown (Table 1), that green tea leaves double extraction should be used.

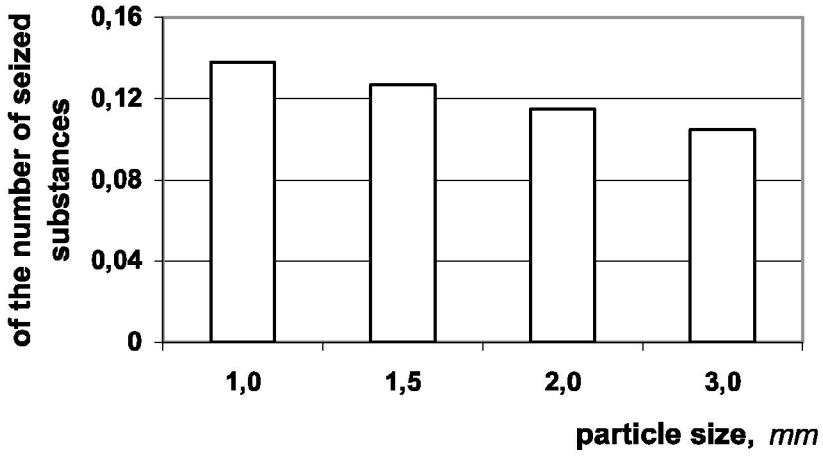

Fig.3. The degree of grinding material

Table 1

Extraction of flavonoids from green tea leaves according to multiplicity

Multiplicity extraction, number of times	**Number of extractives from 1 g of raw material, g**
1	0,272
2	0,052
3	0,019

Conclusions

For vitamin P extraction from green tea leaves the following conditions of extraction are optimal: the process time - 60 min, the ratio of raw material - extractant 1: 40 during the grinding of raw materials to a particle size <1 mm, the double extraction of raw materials.

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