Extraction products from kind Lonicera vegetative parts usage possibility

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Abstract. At present time the need of biologically active substances and preservatives as natural extract usage is increasing. Local recourses’ applying, in particular, honeysuckle common growing in the Krasnoyarsk territory is a justified decision. The results of vitamin С keeping dynamics in the separate vegetative parts of wild-growing blue honeysuckle depending on storage conditions are presented. It was shown that ascorbic acid is in 1.4 times higher in freshly picked berries in comparison with leaves. However acid content in berries subjected to deep freezing is decreasing over time and six month later it is only 68% from the original. At the same time vitamin C keeping in the leaves dried to air-dry condition is rather higher and to the end of storage period (6 months) is decreased only to 5.2%. Herewith the total amount of ascorbic acid in the leaves is higher than that in the frozen berries of the investigated plant. Besides that the spectrophotometric research showed the presence in the blue honeysuckle leaves (Lonicera caerulea L.) such classes of biological active compounds as chlorophyll containing derivatives, bioflavonoid complex, carbohydrate components, anthocyan, tanning agents, organic matters and so on. This circumstance suggests great perspectives for the vegetable raw material practical applying.

1. Introduction
Biological active substances (BAS) applying as natural vegetative extracts in food, pharmaceutical, perfume and cosmetics industry is of great interest for the whole world. There is a tendency of cosmetic products with natural ingredients providing wellness activity everywhere usage. The natural extracts have considerable advantage comparing with synthetic ones in connection to more sided influence on a human organism, a low range of contraindications and allergic reaction.

By the present, a lot of facts proving the synthetic biocide adverse effects for the organism were accumulated. For example, methyl- and propylparabens cause allergic contact dermatitis [1]. The same data were obtained for other ethers and n-oxybenzoic acid [2,3]. Benzyl alcohol and benziiparaben manifest allergic activities [4]. Benzoic acid and sodium salt of pyrrolidonecarboxylic acid give contact reactions. Contact dermatitis are caused by phenoxyethanol and mixture of biocide Euxyl K 400, containing phenoxyethanol [5].

The similar phenomena are observed also for kathon CG, urea imidazolidinyl, clotrimazolum, bronal, thimerosal, sorbic acid, propolis, quaternium etc.

It is impossible to produce high quality, competitive cosmetic products without corresponding raw base and using of natural, nutrient, preserving aromatizing dietary supplement. The import products and separate ingredients increased inflow to Russian market found out the native raw materials base for
food, cosmetic and other means production limitations. The most justified the problem solution is local recourses ‘applying for this purpose.

The natural vegetative supplements introduction into products is limited by the composition, extract properties and with other ingredients combinations’ poor investigation. In connection with it, the research in this field is topical. It is referred to the medicine from wild-growing vegetative organs especially of honeysuckle containing a wide scale of biological active substances taking into account its volume and availability to a considerable extent.

The honeysuckle kind (Lonicera L.) is referred to honeysuckle family (Caprifoliaceae Vant.) and includes more than 200 sorts. In the Russian territory there are 24 honeysuckle sorts but honeysuckle common dominates (L. xylosteum L.) and blue (L. cuerulea L.). In the Siberian territory the honeysuckle recourses are huge. The Siberian common and blue honeysuckle variety embraces the forest-tundra, the forest zone and the mountain forest regions of the prairie zone from the Urals to the Far East. The northern area border runs through the river Ob downstream and reaches Yakutia. The area southern part covers the mountain-forest regions of The Eastern and Western Sayans, Republic Tuva, Altai, Dzungarian and Zailiian Alatau [6].

The honeysuckle is a deciduous shrub of the honeysuckle family with peculiar large flowers, gathered into head-shaped inflorescences and simple, whole, sometimes lobed leaves. The leaves are lanceolate or oblong-elliptical, pointed at the top. The stipules are disc-shaped, fused with petioles. The flowers are yellowish, located in the lower three pairs of leaf axils and they appear in uncultivated leaves.

The honeysuckle propagates very early, in the beginning of summer. Juicy berries, from light to dark blue ones are located near to each other and very often grow together in pairs. Circle, bright orange honeysuckle berries (a wolfberry) must not be eaten. The natural plantings of the Krasnoyarsk region contain the honeysuckle with good and inedible berries.

This plant’s vegetative parts comprise a wide spectrum of biological active substances [7]. The goods from honeysuckle biomass organization is very topical because they include phenolic, reducing, tanning substances, vitamins and ether oils which are used as preservatives and aromatizer in cosmetic products and also as a supplement in food [8]. To solve this task it is necessary to investigate the processes of raw extraction by different extractive agents forming corresponding technological lines [9, 10].

The shrub biomass chemical composition is perspective for natural supplements production this will allow considerably the raw materials base of cosmetic products. Thanks to high enough flavonoid connections with P-vitamin activity content the drugs from the blue honeysuckle leaves possess the antioxidant, anti-inflammatory and capillary strengthening.

Such connections as calcium, potassium, magnesium, vitamin C, ruthin, quercetin which can be found in the honeysuckle leaves and berries in high concentration. In addition to this, the plant contains a range of antioxidants (flavonoids, tannings and triterpene saponin) and acids which are necessary for skin to reduce a free radical impact like anti-age ingredient in «aged» cosmetics.

The extract from the honeysuckle different parts has anti-inflammatory properties and prevents skin infections that can soften irritated skin and together with other active substances (tanning) is effective in acne curing. Besides the honeysuckle leaves extract enables detoxification, cleans skin and also lymph and blood from metabolism harmful products, heavy metals and other toxins remnants.

The newest developments show the possibility of the honeysuckle vegetative parts extracts usage in sunscreen creams because they are able to prevent ultra-violet radiation to skin. At the same time the extract keeps its healthy properties after lasting influence of direct sun beams.

The purpose of the work is to investigate the vitamin C content dynamics changing in the separate vegetative parts and to research the blue honeysuckle leaves extractive substances’ chemical composition.

2. The experimental part
The leaves and berries of the investigated plant which grows wildly in the Krasnoyarsk region southern taiga territory were taken as original raw material. According to V. M. Leontjev et al. [11] the most ability to accumulate ascorbic acid belongs to the honeysuckle berries of the taiga population (The
southern taiga of The Krasnoyarsk region). There is vitamin C in 3.5 times higher than in the area of the village Minino ones (forest-steppe) and in 8.5 times higher than in the honeysuckle berries of population Birusinsk (mountain taiga). This circumstance explains the choice of analyzed biomass place of harvesting.

The blue honeysuckle leaf sheet and berries harvesting голубой was being carried out simultaneously during the last ten days of July 2019. The time choice of samples to be analyzed was conditioned by the final stage of the investigated plant vegetation that is by full berries ripening. This fact allows supposing that by the time period the vegetative biomass had accumulated the maximum amount of biological active substances. After the blue honeysuckle leaf sheets samples had been gathered they were dried in the drying cabinet at the temperature of 40-50 °C. The gathered berries were washed by the running water, dried and packed into vacuum containers for fast products freezing and storage at the temperature of -18°C.

The analytical sample was taken with the quartering from the raw materials method corresponding to the state standard NKVT 14143-69, GF-IX, article 231 [12]. The moisture, the analyzed vegetable raw materials ash content, lignin and polysaccharide content were undertaken by standard techniques [13], and heavy metals ions quantitative determination was perfumed by an atom-absorption analyses method. The ascorbic acid quantitative determination in the investigated plant leaves and berries was done by S.M. Procoshev’s technique. The dried material fractional extraction method was used for investigation if researched biomass extractive substances chemical composition. The dried material was extracted by organic solvents of increasing polarity: diethyl ether, ethyl acetate, isopropanol, water. The extractive substances content was determined by the sample mass loss after full extraction in the Soxlet’ machine. It was being done during 20 and more hours with further sample drying at 105°C. The various chemical connections of different classes’ availability were specified by the extracts absorption of electromagnetic radiation in электромагнитного излучения in UV- and in visible area [14].

3. Discussion of the results
In connection with the fact that the analyzed biomass was considered by us as a possible natural source of biological active substances for a human organism it was found out, first of all, by the atom-absorption method the heavy metals content in the raw materials. The obtained results are presented in the table 1.

| № of sample | The raw material sort          | Pb  | Cd  | As  | Hg  | Zn  |
|-------------|--------------------------------|-----|-----|-----|-----|-----|
| 1.          | The raw material sort          | 1.06±0.05 | 0.32±0.05 | 1.06±0.05 | 0.22±0.05 | 1.12±0.05 |
| 2.          | The blue honeysuckle berries   | 0.89±0.05 | 0.19±0.05 | 0.86±0.05 | 0.08±0.05 | 0.88±0.05 |

As it is followed by the given data both the blue honeysuckle berries and sheet leaf contain the ions of above mentioned pollutants in the amounts which are rather smaller than their extremely allowed concentration. Thus, the investigated vegetative raw is ecologically safely by this pollutant class and may be recommended as a source of natural origin micronutrients for their enrichment of food products.

The investigation results of ascorbic acid content dynamic changes in the frozen berries and in the dried to an air-dried condition of the honeysuckle leaf sheet are shown in the figure 1.
Figure 1. Vitamin C content dynamic changes in the frozen biomass.

As it is followed from the given data while keeping the investigated plant berries in condition of deep freezing, the analyzed micronutrient content is considerably decreasing during the time. So, in three month of storage in the mentioned conditions the vitamin C quantity is only 85.3 %, and in half a year – 68 % relating to original raw materials. To our mind this circumstance is explained by low thermal resistance of the analyzed micronutrient.

Thus, it is necessary to state that the above mentioned mean of the investigated vegetative raw storage cannot be considered to be preferable because during six month of observation loss of the controlled substance exceeded 30% from its original content in the freshly gathered berries of the blue honeysuckle.

Besides that from the data presented in the figure 1 it can be seen that ascorbic acid content dynamic changes in the dried leaves has a less expressed character in comparison with frozen the berries of the plant. So, in three months of storage under normal conditions the analyzed value was decreased by 4.8 %, in half a year – на 5.2 % relating to the same value determined in the blue honeysuckle freshly gathered leaves. Simultaneously with this, it is worth noting that the dried leaf sheets not only loose in the lass extent but in six months storage contain more amount of ascorbic acid (in a total value) than the frozen berries of the investigated plant.

Consequently it is necessary to declare that the blue honeysuckle dried leaves compared with its frozen berries are more preferable source of vitamin C from its quantitative content point of view. The results of the blue honeysuckle leaves chemical content obviously growing in the southern taiga of the Krasnoyarsk region are presented in [7].

As we have found out previously, the investigated vegetable biomass contains 5 mass% of lignin 7.7 вес.% carbohydrates and about 70 веc.% of extractive substances the ether oil is contained in the blue honeysuckle dried leaf sheets in trace amounts. Probably, it is connected with not only terpenoids flying fractures partly loss in the process of the vegetative mass drying but chemical processes working in the plant on the final stage of the vegetative cycle.

The essential content of the extractive substances in the analyzed biomass is (about 70 mass %). This circumstance made us address to the question of their qualitative and quantitative content.

In spite of the fact that the biological active substances being extracted from the leaf sheets of _Lonicera caerulea_ L. by diethyl ether is not high – 5.9 mass % the extract contains numerous classes of organic connections (table 2). As we have found out previously [7] chlorofill is presented more from them (the maximum of absorption by λ ~ 667 nm) and aurons (λ ~ 395 – 405 nm), less are - anthocyan (λ ~ 500-530 nm), catechins (λ ~ 365 nm), coumarin (λ ~ 310 nm), fatty acid, phenol-carboxylic acids (probably, п – oxybenzoic and protocatechuic acids (λ ~ 305 nm), and also simple phenols (265 nm) are
The presence of the pointed out classes provide antioxidant and biocide activity of medicine from the investigated vegetative activity.

Table 2. Chemical composition of the blue honeysuckle leaves.

| Extractive agent | Maximum absorption with wave length, nm | Probable classes of organic connections |
|------------------|---------------------------------------|---------------------------------------|
| Diethyl ether    | 667                                   | Chlorofill                            |
|                  | 395-405                               | Aurons                                |
|                  | 500-530                               | Anthocyan                             |
|                  | 365                                   | Catechins                             |
|                  | 310                                   | Coumarins                             |
|                  | 305                                   | Phenol-carboxylic acids               |
|                  | 265                                   | Simple phenols                        |
| Isopropanol      | 260-280                               | Lamentation, aglycones, flavonoids    |
|                  | 340                                   | Coumarins, oxiphenol carboxylic acids |
|                  | 405-410                               | Aurons                                |
| Water            | 230-250                               | Organic acids                         |
|                  | 265-270                               | Isoflavones, xanthones, flavones      |
|                  | 310-330                               | Flavanones                            |
|                  | 330                                   | Hydroxycinnamic acids                 |
|                  | 350-360                               | Tanning substanses                    |

Ethyl acetate extract of the blue honeysuckle does not contain the substances absorbing the UV and visible radiation [7].

The largest content of biological active substances were obtained from the blue honeysuckle leaves by polar solvents – 58.9 mass % (table 2). The extractive substances got by isopropanol give maximum absorption by $\lambda \sim 260-280$ nm, that proves the considerable amount of lamentation, aglycones and flavonoids: rutin - quercetin-3-glycoside, kaempferol-3-sopforaside, kaempferol -7-diglycoside, apigenin-5-glycosidea, quercetin, kaempferol, saponaretin, naringenin, dihydrokaempferol, dihydroquercetin, isoquercetin, luteolin-7- glycoside that is conformed to the data X. Chen et al. [15]. Obviously, due to high enough content of different flavonoids complex connections with vitamin P activity in combination with the ascorbic acid the blue honeysuckle medicine have antioxidant, inflammable and capillary strengthening properties. Poorly expressed absorption maximum by $\lambda \sim 340$ nm is explained by coumarins andoxiphenol carboxylic extract low content. Absorption maximum by $\lambda \sim 405-410$ nm indicates rather low aurons content in the extract and by $\lambda \sim 265$ nm – simple phenols [16].

The blue honeysuckle leaves water extract contains organic water-soluble acids: apple, oxalic, lemon (absorption in the area $\lambda \sim 230-250$ nm), iso flavones, xanthone, flavones: apigenin, luteolin, genkwain (absorption by $\lambda \sim 265 - 270$ nm), hydroxycinnamic acids ($\lambda \sim 330$ nm), flavonones ($\lambda \sim 285$ nm and 310-330 nm), tanning substanses ($\lambda \sim 350-360$ nm). Most likely the presence of these classes’ organic connections provides antibacterial, antiviral and inflammable medicine activity from the investigated raw material and their astringent action [17].

4. Conclusions
The investigation of the Lonicera caerulea L blue honeysuckle leaves and berries chemical composition naturally growing in the Krasnoyarsk region southern taiga have been carried out. It was shown that ascorbic acid content in the freshly gathered berries is in 1.4 times higher than that in comparison with the investigated plant leaves.

During the storage process in deep freezing conditions the vitamin C content is decreasing and in 180 days constitutes only 68% from the original one. At the same time the vitamin C storability in the dried to air dry condition leaves is considerably higher and by the end of keeping period (6 months)
will have been decreased only by 5.2%. Meanwhile, the absolute content of the ascorbic acid in the leaves surpasses the same indicator in the investigated plant frozen berries. It was found out that the investigated plant leaves contain 5 mass% lignin, 7.7 mass% carbohydrates and about 70 vas.% extractive substances.

It was shown that the following organic connections classes: chlorophylls, aurons, anthocyan, catechins, coumarins, fatty acids, phenol-carboxylic acids and also simple phenols are extracted by nonpolar solvents from the blue honeysuckle leaves. The pointed out substances presence provide medicines from the investigated vegetative biomass antioxidant and biocide activity.

The extracted by polar solvents extractive substances are presented by lamentations, aglycones and flavonoids. The presence of P vitamin connections in the blue honeysuckle leaves in combination with the ascorbic acid determines antioxidant inflammable and capillary strengthening properties of the latter.

The blue honeysuckle leaves water extract contains organic water-soluble acids: apple, oxalic, lemon isoflavones, xantheme, flavones: apigenin, luteolin, genkwanin, hydroxycinnamic acids, flavanones, tanning substanses.

Their presence provides antibacterial, antiviral and inflammable medicine made of the investigated raw materials activity and the astringent action. Thus, the carried out investigation showed the presence of different biological active connections providing a wide range of pharmaceutical plant activity in the blue honeysuckle leaves and berries (Lonicera caerulea L.) growing in the Krasnoyarsk region southern taiga. This circumstance opens wide perspectives for practical usage of the investigated biomass in food additives, pharmaceutical and perfume and cosmetics medicine production.

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