Study Iodine Amount in Content of Some Medicinal Plants by Ion Chromatography

N.T.FAZLIEVA, N.Q.MUHAMADIEV, SH.M.SAYITKULOV

Chair of Physical Chemistry, Division of Chemistry, Department of Natural Sciences, Samarkand State University, Samarkand, Uzbekistan, 140104, E-mail: m_nurali@mail.ru

Abstract

In the work iodine amount in vegetative and generative organs of medicinal plants Berberis Vulgaris L. and Xanthium Strumarium L. has been studied by ion chromatography. It was found that iodine amount in stalk of Berberis Vulgaris L. by 3 times and in leaf by 23 times less than that in root, and in fruit it makes 6,2±0,5 mg. It was revealed that in root, stalk and leaf of Xanthium Strumarium L. iodine amount is almost the same (677,8±39,4), and in fruit – 80 % (540,4±28,4) of vegetative organs.

Keywords: Berberis Vulgaris L., Xanthium Strumarium L., iodine, ion chromatography, vegetative, generative, amount.

Introduction

It is known that lately an interest to the method of ion chromatography is being increased. Because, ion chromatography has shown a number of its advantages as a no replaceable method in electrolyte substances analysis[1,7,9]. Therefore in the standards of a number of developed countries including the Russian Federation ion chromatography has been having its place. Especially, ion chromatography has been used as the main analysis method in the standards concerning to the determination of ions in water and different samples[8-10]. Iodine is the element that is responsible for temperate growing and development of all mammals organism including a man. Lack of iodine amount in organism is the reason for resulting a lot of diseases including goiter[3,4,6].

Today lack of iodine is observed in 65% of the population. Lack of iodine has spread more among school children, the lack may result in negative changes of generation that is to say the changes in chromosomes and the inclination for oncological diseases. Therefore to have information about iodine amount in them is actual from the point of view studying iodine amount in medicinal plants growing in the Republic of Uzbekistan, systematizing them and enriching information about medicinal plants widely used in commonwealth states of International Organization of Health Protection[2,5].

Material and Methods

Berberis Vulgaris. L. is found in mountain boundary of Crimea, Caucasia, Central Asia, European part of Ukraine, Russia and North America. Berberine, palmitin and other alkaloids up to 3% like those are found in all vegetative organs of Berberis Vulgaris L. In its root besides berberine and palmitin oxyacanthine alkaloid was found. In fruit of Berberis Vulgaris L. sugar, carotene, K, C vitamins (172 mg/%), acids of

lemon, apple, grape, alkaloids (berberine and etc.), tanning, pectine, pigment substances, mineral salts have been determined.

Berberine $C_{20}H_{19}O_5N$ (up to 1,5 %) alkaloid has been separated from the bark of root and leaf. Oxyacanthine $C_{19}H_{21}O_3$, palmitin $C_{21}H_{21}O_4N$ and columbamine $C_{20}H_{19}O_4N$ alkaloids were separated from the bark of root. It was determined that it has ether oils and tanning substances. In leaf berbamine, leontedine alkaloids, ascorbic acid (up to 120 mg/%), vitamin E (up to 49 mg/%) have been determined. It was noted that its fruit has ascorbic acid and organic acids like apple, lemon, grape. Energetic value of 100 g Berberis Vulgaris L. fruit is 29.6 kkal in average.

Xanthium Strumarium L. plant is found in all continents beside Antarctica. It grows in great number in Ukraine mainly in Crimea, in Kazakistan, in all zones of Russia. It can be met in rubbish heaps, in neglected lands, in sands and drain trenches, in plowed and garbage lands.

The plant leaf has some alkaloids, in great number iodine and ascorbic acid. Pitches, fatty acids, iodine, xanthostrumarin and other active chemical compounds have been determined from its seed. The plant has ether oils and phenol, tymol and its isomers, carvacrol and tricyclic sesquiterpenes, tanning substances, pigments, ascorbic acid are a part of it. According to Pakistani researchers Xanthium Strumarium L. has 3,6-14,8 % alkaloids, 3,8-6,2 % saponines, 6,0-9,4 % flavanoids and 2,585-4,157 mg/kg Zn, 0,132-0,150 mg/kg Cd, 1,462-1,807 mg/kg Pb, 1,587-3,117 mg/kg Fe, 0,939-2,129 mg/kg Cu [ ]. The oil, which was extracted from its seed with the help of solvent makes 30-35 % and it has the taste like that of oils of sunflower and other plants.

Preparation of sample for analysis.

Berberis Vulgaris L. (from Vakhshivor village boundaries of Oltinsoy district in Surkhandarya region) and Xanthium Strumarium L. (from Urgut and Pastdargom districts in Samarkand region) were picked in May-September months of 2012 and in May-November months of 2013 and dried in shady place. Samples of the plants gathered on vegetative organs and dried were grinded in mill and weighed by 10 grams.

Using 5 % solution of tertiary amine was recommended to swallow the products formed in mineralizing process of the sample in oxygen atmosphere. The advantage of burning in oxygen atmosphere is a rapid preparation of sample for analysis. But this method is used for the products, which have an iodine in amount of less than 0,01 % and the mass of the sample taken must not be more than 0,05 % g. If iodine amount in sample is less than 0,01 % then applying the sample “wet” and “dry” is used. In a “dry” method, when the sample is processed iodine will be in the form of iodide (or iodates) of potassium or sodium in the content of volatile salts. According to iodine amount the sample is concentrated or diluted.

Chromatographic system.

Determinations were carried out in "Tsvet-3000" chromatograph. Elements of chromatographic system: sampling ring with the volume of 30 and 300 mkl; 6x200 mm initial column filled with AB 17 anion-exchanger in OH form that cleans the eluent from anion additions including carbonates; separation column with size of 4x150 mm filled with Amberlit sorbent that ion-exchange capacity is 0,0013 m-ekv/ml and particle size is 14 mkm; reductive column with size of 6x200 mm filled with UCE – 2x8 sorbent that ion exchange capacity is 2 m-ekv/ml and particle size is 150 mkm; conductivity detector. The eluent that has 3 M NaOH, 1 M Na_2CO_3, 0,05 M KSCN has been injected to column with the rate 1,8 ml/min by high pressure pump.

Ion power of the eluent was changed by adding NaCl solution to the eluent, medium was changed by changing buffer mixture content. Ions separated through chromatographic column have been recorded by conductivity detector. To determine iodine amount in the sample an absolute calibration was used. Iodine amount was determined on vegetative organs (root, stalk, leaf) and generative organs (fruit) of Berberis Vulgaris L.

Results and Discussion

Findings have been presented in the form of histogram in the figure (in mg as compared with 1 kg sample).

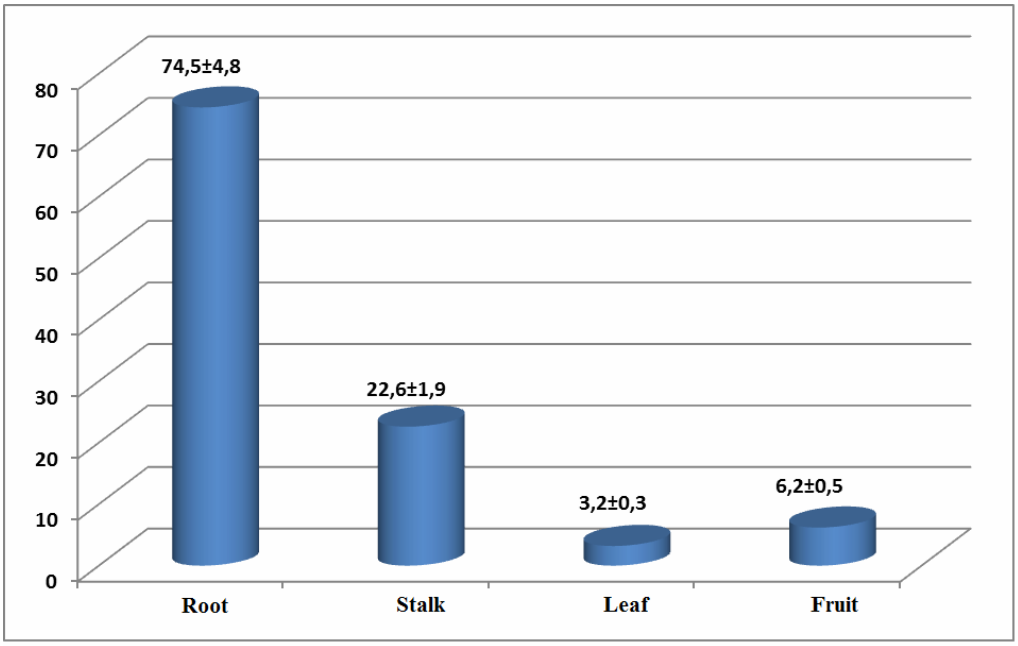

Figure 1 Iodine amount in vegetative and generative organs of Berberis Vulgaris L.

It is shown that iodine is formed in plant root the most. Iodine amount in stalk is less by 3 times than that in root, in leaf less by 23 times. Iodine is formed in its mostly used fruit and its amount is 6,2±0,5 mg.

Iodine amount that was determined from vegetative and generative organs of Xanthium Strumarium L. plant is presented in table.

Table 1 Iodine amount that was determined from vegetative and generative organs of Xanthium Strumarium L. plant

Vegetative and generative organs	Amount, mkg %		P <
	Ion Chromatography	Spectrophotometric	
Root	678,5 ± 42,7	659,1 ± 39,2	0,1
Stalk	677,8 ± 39,4	662,2 ± 37,4	0,1
Leaf	678,8 ± 41,4	667,2 ± 36,4	0,1
Fruit	540,4 ± 28,4	536,5 ± 26,5	0,1

It is shown from the data presented in table 1 that iodine amount determined by ion chromatography from the plant content does not differ reliably from that determined by spectrophotometric method (P<0,1). It is evidence that taken results are reliable.

Iodine is formed in Xanthium Strumarium L. plant's root the most, formed almost the same in stalk and leaf. Iodine amount in its fruit makes 80 % as compared with that in vegetative organs. Therefore all vegetative and generative organs of the plant can be used as a source of iodine.

Conclusions

i) Iodine amount in vegetative and generative organs of plants Berberis Vulgaris L. and Xanthium Strumarium L. has been studied by ion chromatography.

ii) It was studied that formation of iodine in stalk of Berberis Vulgaris L. is less 3 times than that in the root, less 23 times in leaf and it makes 6,2±0,5 mg in its fruit.

iii) It was studied that formation of iodine in root, stalk and leaf of Xanthium Strumarium L. is almost the same, its amount in its fruit is 80 % as compared with that in vegetative organs.

References

[1] G.A. Guliyeva, E.M.Babaeva. The use of ion chromatography for the microbiological monitoring of polluted waters. *Successes of modern science*, 9, 2012, 19-24.

[2] World Health Organization (2010) *WHO monograph on medicinal plants commonly used in the Newly Independent States (NIS)*, 2010, 464.

[3] E.P.Kasatkina. Iodine deficiency disorders in children and adolescents. *Problems of Endocrinology*, 3, 1997, 3-7.

[4] I.I.Dedov, G.A.Melnichenko, E.A.Troshina and others. Iodine deficiency - a threat to the health and development of children in Russia. Solutions to the problem. *National report*, M: 2006, 36.

[5] A.N.Kvachenyuk, E.L.Kvachenyuk. The use of herbal medicine in the treatment of thyroid diseases. *Doctoring*, 3-4, 2012, 1-4.

[6] S.A.Savchik, G.F.Zhukova, S.A.Khotimchenko. Iodine deficiency disorders and their prevalence. *Microelements in medicine*, 2, 2004, 1-9.

[7] N.Q.Mukhamadiev, Sh.M.Sayitkulov, I.M.Ergashev, Kh.F.Khafizov, N.I.Fayzullaev. Optimization of Separation on the Basis of Unifac Parameters and Evaluation of the Composition of the Stationary Phase in Gas-Liquid Chromatography. *Chromatographia*, 57(7), 2003, 831-33.

[8] Fazlieva NT, Ubaydullaev JN, Muhamadiev NQ, Ergashev IM, Sulaymonov ES. Study iodine amount in the content of medicinal plants by Ion Chromatography. Materials of the Republican scientific-applied conference *"Actual problems of Chemistry"*, 2009 November 6-7, Samarkand, Uzbekistan, 86-b.

[9] Fazlieva NT, Muhamadiev NQ, Khalilov KF. Evaluation of separation process in Ion Chromatography based on the parameters of LIQUAC. *International Youth Conference "Nano- and supramolecular chemistry in the sorption and ion exchange processes"*; 2012 September 13-14; Kazan, Russia: P. 88-91.

[10] Fazlieva NT, Muhamadiev AN, Muhamadiev NQ. Algorithm of optimization of separation process in ion chromatography. *XIII International Conference "Computer Science: problems, methodology, technology"*; 2013 February 7- 8; Voronezh, Russia: P. 124-126.