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Concentration of heavy metals in pharmaceutical plants, Economic value in Kosovo

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Abstract

Pharmaceutical plants are a powerful therapeutic source to cure various diseases in the world and an economic value for Kosovo. The amount of heavy metals in the plant was analyzed to show the potential threat of their effects on animals and humans consuming their products. The nutrient content is current to pharmaceutical plants in terms of identifying the elements in the pathway. The concentration levels (mg / l), of heavy metals in pharmaceuticals (Ni, Cu, Cr, Zn, Mn, Pb), were evaluated in some of the important plant plants in the "Drini i Bardhë" basin. The atomic absorption spectrophotometer is used for the estimation of heavy metals of three species of different plants collected from different countries within the Dukagjin region. Determination of the metal content in the samples was found in pharmaceuticals: Lat: (Rubus fructicosa), (Sambucus ebulus), (Saambucus nigra). It has the level of metal in the range of Cu> Cr> Mn> Zn, (Sambucus ebulus), Cu> Cr> Zn> Mn, (Saambucus Nigra) Cu> Zn> Cr> Mn. Nickel and lead were found fully in all three investigated plants.

Keywords: *Pharmaceutical plants, health, economy.*

INTRODUCTION

Pharmaceuticals exports last year amounted to $ 20 million of pharmaceutical products that Kosovo exports to the world. Established around 24 medical plant exporting companies today have marked a success story.

Fig 1: Kosovo Pharmaceutical Plants

Initially, sporadically, people from mountainous areas collected and sold for livelihoods, wildlife growing plants in mountainous terrain, and today, this industry counts about 15,000 people scattered throughout the country [1]. The export of medicinal herbs has multiplied in recent years as a result of increased demand in foreign markets, with the formalization of the domestic market. There is growing demand for processed pharmaceutical plants, their cleansing from large heavy metal companies, and the possibility that this crop grows in a natural state without requiring major economic investment [8].

Challenges of Kosovo industry on pharmaceuticals

Kosovo offers many opportunities to make investments in medicinal herbs, which grow in the fields and elevations of Kosovo. According to officials of the Ministry of Agriculture, Forestry and Rural Development (MAFRD), medicinal plants that are collected in Kosovo are only exported and not professionally processed by any licensed operator (Due to lack of industrial capacity)[12]. The Ministry of MAFRD has announced that the Organic Agriculture sector in Kosovo, including pharmaceutical plants, is at the initial stage of development. Currently, few farmers have focused on organic production[2] . The climatic and terrestrial conditions, which reign in Kosovo, enable the growth of many types of medicinal herbs. Because of their specifics and lack of elementary knowledge, very little is consumed and several types are processed in a simple and traditional manner[11]. Adding that these plants grow in themselves in different areas, but their collection is not done much in an organized way and by professional persons. Removal of the population from rural areas and abandonment of mountainous areas is a problem for exporters as the population directly involved in the collection of medicinal plants. Foreign companies have turned this much more organized business into open competition for domestic companies. Despite these challenges, medical plants have turned against poverty. Parallel to the collection of aromatic herbs, companies also develop the cultivation of these herbs. Currently 25 species of medicinal aromatic plants are cultivated in Kosovo[3].

The role of heavy elements in the body - Copper is one of the essential metals required for the normal growth and development of plants. Copper is a co-factor for the metal proteins and plays a major role in some metabolic pathways. Though essential, excessive copper levels will hinder growth and change some cellular processes[9]. Anthropogenic release of heavy metals into the environment through extraction, melting, production, agriculture and waste disposal technologies is a major cause for excessive accumulation of copper in nature as well as in plants. Since the higher concentration of Cu becomes toxic due to redox, it should be kept at lower levels in the body[7].

Chromium is widely used in industry and is considered as a serious environmental pollutant. In plants the chromium toxicity is based on the state of valence, Cr (III) is less toxic when compared to Cr (VI). Chromium is not directly absorbed by the plants, but is accumulated by carrier ions such as sulfate or iron. Chromic toxicity varies plant germination, its full growth by affecting photosynthesis, other metabolic processes and the total production of dry matter[4].

Zinc is an essential micronutrient that is involved in many biochemical reactions in plants. It is necessary for the optimal growth of the crop and it is taken in the form divalent from the plants. Manganese is also a substantial metal composition that plays a vital role in photosynthesis, nitrogen metabolism and in the formation of other constituents required for plant metabolism[10].

Rubus fructicosa - Description: Shrubs up to 2 m high, arched or stretched branches. Thumb at, wide open, 3-5 leaves, over green .

Fig 2: ***Rubus fructicosa***

Frequently leafy leaves with leaves on the base. Wrinkles, wrinkled or oval, white or pink. The sweet black fruit next to the floral bed.
Spreading in Kosovo: Grows in shady bushes of fields or at the foot of exposed sunsets.
Usable Parts: Fry and Leaves.
Harvest: Harvest harvests at the end of summer and autumn after ripe, leaves harvested during bloom.
Drying: The leaves should be dried in the oven or under shade at 50 ° C. Report: 4: 1.
Therapeutic category: Adstrigjent.
Use: The leaves are used as tea in the treatment of inflammation of the mouth and throat mucosa.
Preparation and dose: Tea prepared from 1.5 grams of dried leaves should be used 3 times a day.

Sambucus ebulus - Description: herbaceous perennial plants up to 2 m high straight stem, usually plain. Bouquet with a diameter of 5-16 cm, looks like a umbrella. White wreath, rarely rosy on the outside. Black glittery fruit, 4-6 mm. Spreading in Kosovo: Grows in uninhabited lands and edge of roads.

Fig 3: **Sambucus ebulus**

Usable parts: Fruit (Sambuci fructus), and flowers (Sambuci flos).
Harvest: Flowers harvested during the months of May. The fruits are harvested during July-August after they are picked up in black.
Drying: The fruits are dried in the oven at temp. 50 ° C. Report: 6: 1.
Therapeutic category: diuretic, laxative, traditionally diaphoretic.
Use: Medical and coloring plants. The flowers used to be difficult to sweat and urinate, while the fruits for breathing and diuretic help.
Preparation: Both Flower and Fruit are prepared as tea. For floral tea should be taken 0.20 gr of dried flowers to settle in boiling water to stand for about 15 min. As for the fruit tea, take 0.50 grams of dried, fried crushed and squeezed for 10 minutes.

Saambucus nigra - Description: Rare tree bushes up to 6 m high. The juniper and the branches have grace, the wood in the middle has white marrow. Leaves composed of 7 leaflets.

Fig 4: **Saambucus nigra**

Flowers in the umbrella blossoms up to 30 cm. Fruits when they are ripened are almost black in color with three seeds and with a reddish liquid. Spreading in Kosovo: Grows in rich soils near the streams and the forests. Usable parts: Flowers (Sambuci flos), and fruit (Sambuci fructus). Harvest: Flowers harvested during the months of May. Drying: Before placing in the oven, it takes at least 2-3 hours to stay in the sun. The flowers are soaked at 45 ° C. Report: 6: 1. Therapeutic category: Antiseptic, astringent, carminative. Use: It is used as a tea against sweating, urinary tract cleansing, cough relief,etc. Preparation and dose: 10 gr. fruit in 100 ml of boiling water prepared to drink during the day.

Heavy metals in pharmaceutical plants

The absorption of heavy metals from pharmaceutical plants is a major way of transferring metals from sediment and water to the food network. The absorption of metal from the plant is determined by metal mobility and bio availability. Most approved procedures include dry disposal or wet digestion using only nitric acid, or in combination with per choric acid or hydrogen peroxide. This study approves the procedure of nitric acid overnight treatment with nitric acid only for the determination of heavy metals[5]. Plants can collect metal in their parts and transfer it from lands to the food chain. This accumulation is one of the most serious environmental concerns due to the potential adverse effects that toxic metals may have on animals and human health. Some metals such as zinc, iron, copper, chrome and cobalt are toxic only at higher concentrations, while others such as lead, mercury and cadmium are exclusively toxic. Many pharmaceutical plants are used for treatment of different diseases by thinking that they have positive effects without thinking that they are often due to environmental pollution and are toxic. Where health effects are more harmful than being pharmaceuticals [6].

MATERIAL AND METHOD

The samples gathered at the ravine of Dukagjini near the motorways and sample compare in high mountainous areas. Sampling: the leaves of the herb (Rubus fructicosa, Sambucus ebulus, Saambucus nigra), and transferred to a sterile bag and transferred to the laboratory. Samples were collected from nine points defined as A1 to A9 The collected samples were taken to the laboratory and purified at 4 oC before analysis The collected samples were quenched using HNO3, the volume was adjusted to 100 cm3 with distilled water Defining metals Fe, Zn, Cu, Co, Mn, Cd, As, Ni and Pb were made using sophisticated apparatus in the Ontario Ontario laboratory: "Perkin-Elmer Analyst 300 Atomic Absorption Spectroscopy (AAS).

RESULTS DISCUSSIONS

A total of 6 elements (Cu, Cr, Mn, Ni, Zn and Pb), were determined on specimens of plant leaves of medicinal plants using atomic absorption spectrophotometer (AAS). Tab 1. shows different metal concentrations in plant-analyzed plants. The study found that all metals had been collected in larger or smaller sizes from 3 types of plants studied, with the exception of nickel and lead.
Vegetable Seedlings (rubus fructicosa), has been investigated for the presence of some heavy metals and their concentration is found to be zinc 15.7, copper 1.12, iron 188, manganese 46.5, sodium 138, lead 0.49, potassium 19220, magnesium 5630 , calcium 3543 phosphate levels 900 ppm (sambucus ebulus). In the current study (Saambucus nigra), showed the presence of heavy metals in the concentration of copper 1,655, chromium 0.145, zinc 0.294, manganese 0.348 ppm where the concentration of copper was found to be at the maximum level followed by manganese, zinc and chrome. The content of heavy metals in the above plant was not found in large quantities. Therefore, this work would support the application to the above plants due to the accumulation of heavy metals. The plants were analyzed at the Ontario laboratory to detect the presence of heavy metals and the report obtained would be useful as only a few research activities. Copper was found to be very concentrated in the above plant followed by manganese, zinc and chrome.

Table 1: Concentration of heavy metals in plants: (Lat: Rubus fructicosa,sambucus ebulus, Saambucus nigra) (mg)

Plants	Nr	Fe	Zn	Cu	Co	Mn	Cd	Ni	Pb
Rubus fructicosa	A1	9.20	2.25	0.15	0.09	1.23	0.06	0.20	0.09
	A2	7.59	0.34	0.11	0.08	1.14	0.01	0.16	0.05
	A3	6.70	0.21	0.04	0.09	1.09	0.01	0.12	0.01
Sambucus ebulus	A4	3.93	0.12	0.04	0.06	0.64	0.01	0.07	0.01
	A5	2.48	0.05	0.02	0.08	0.46	0.01	0.02	0.03
	A6	1.72	0.18	0.37	0.07	0.89	0.02	0.13	0.07
Saambucus nigra	A7	1.72	0.16	0.03	0.07	0.79	0.04	0.08	0.01
	A8	1.08	0.16	0.02	0.08	0.57	0.03	0.06	0.05
	A9	1.62	0.15	0.03	0.07	0.68	0.02	0.07	0.01

Figure 1 : Graphic presentation of metal at site, regression analysis and concentration of heavy metals.

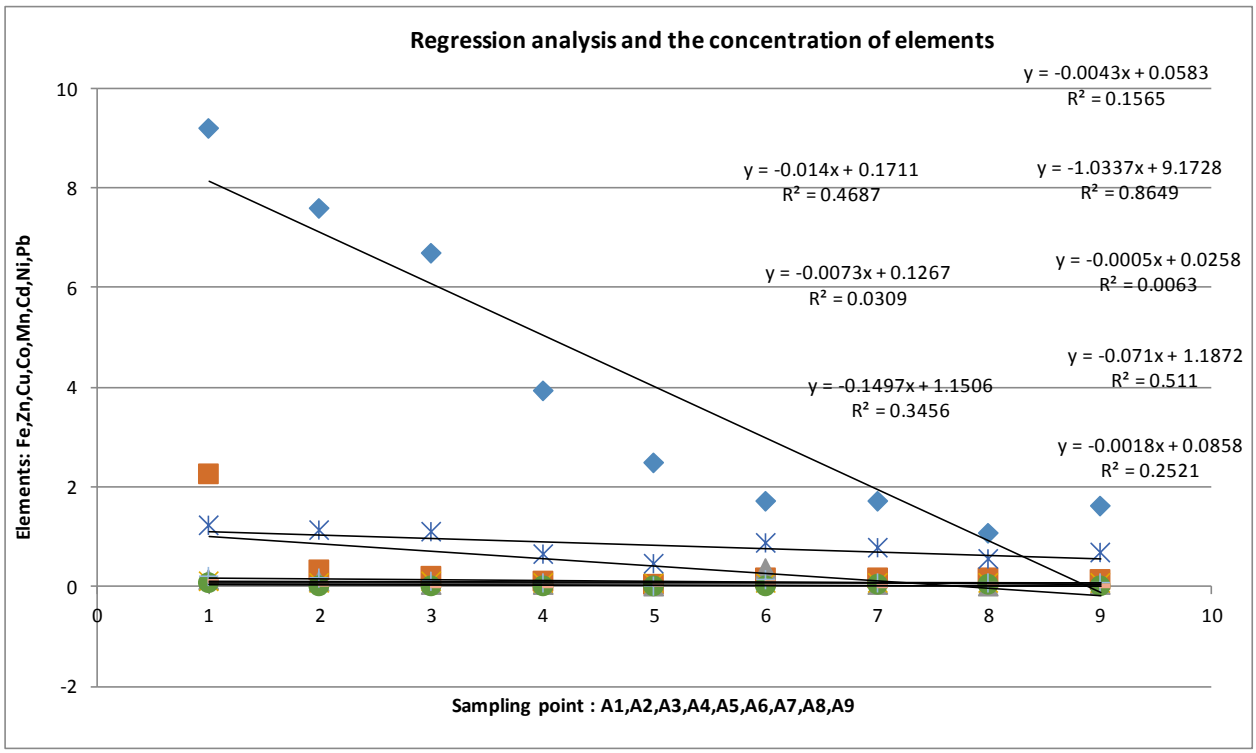

Table 2: International parameters of heavy metals in pharmaceutical plants

Standards	Fe	Zn	Cu	Co	Mn	Cd	Ni	Pb
WHO	1.0	<1	0.05	0.02	0.05	0.03	0.02	0.05
FEPA	5.0	<1	0.01	0.02	0.05	0.05	0.05	0.02
NSDËQ	0.3	<1	1.0	0.02	0.2	0.03	0.02	0.01

These measures help us to be free from all the investigated plants showing the highest level of copper in the sheet parts. The content of heavy metals in the plant causes stress in the plant and causes various diseases, other stress related concerns, etc. Thus, the need to maintain quality control of medicinal products obtained has been of great interest, particularly in the field of pharmaceutical industries. Medicinal plants were given standard values for the presence of metal content metal contaminated plant products.

The source of metal content on the ground is mainly due to over-utilization of artificial fertilizers, the removal of industrial waters into agricultural land areas and other man-made activities. Thus, from heavy metal soil, the content was transferred to parts of plants that had been consumed by human and animal species. Therefore, the bioaccumulation of heavy metal content would achieve greater deposition in different areas of plants, animals and humans. The standard levels obtained for four metals such as copper were found to be 4-15ppm, zinc in the wide range of 15-200ppm, followed by manganese concentrations as 2-685ppm. The level of chromium detection has a limit of about 0.12ppm per gram.

By comparing the values obtained with the standard limit values, we can conclude that the copper concentration was found to be smaller than the detection limit and thus do not have any damage to the products obtained from them. Similarly, the zinc and manganese concentrations of the above plants were also found to be less than the standard limits. But the concentration of

chromium was found to be higher than that of the standard level in all three plants. Stress of heavy metals in the plant affects the entire life cycle due to their accumulation in further biological species at the highest levels of order, thus accumulating more stressful metals in the environment. Heavy metals cause stress on cells in the body and thus affect the oxidation process called oxidative damage. The heavy metal content at the plant was useful only at a certain limit. Determination of heavy metal content in the plant depends on factors such as collection area, sampling procedures.

CONCLUSIONS

The results of this study revealed a high presence of heavy metals above the standard limits established by WHO, FEPA and NSDWQ for sewage discharged into surface water. Release of gases from vehicles which is over 450,000 in the streets of Kosovo, which 90% do not meet international standards. Power point points have been observed to be more contaminated than the upper point (control). This indicates that there is unregulated discharge of the contaminated streams in the natural receptor - the White Drin River without proper treatment of sewage from the industries. This can have negative consequences for the health risk and damage to the entire environment in general. It is therefore indispensable for the government to implement the law on flow management in all pharmaceutical industries to reduce the environment and human health.

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