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Potential of *Datura Stramonium* for Phytoremediation of Soils Contaminated with Heavy Metals

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Abstract: *Comparative studies have been carried out to determine the amounts of toxic metals and nutrients in the vegetative and reproductive organs of Datura stramonium, the composition and quality of the oil, and to establish the possibilities for phytoremediation of heavy metal-contaminated soils. The field experiment was conducted on an agricultural field contaminated by the Non-Ferrous Metals Plant near Plovdiv, Bulgaria. The Datura is tolerant to heavy metals and can be grown on highly contaminated soils (2423.9 mg/kg Zn, 2509.1 mg/kg Pb, and 63.7 mg/kg Cd). Pb, Cd, Zn, Ni, Fe, Mn, Cu, K, and Mg accumulate in the leaves, Cr in the root system, and P accumulates in the seeds. The D. stramonium can be classified as a potential accumulator of Cd, an indicator for Pb, and an excluder of Zn. It can also be successfully used in phytoremediation of soils contaminated with heavy metals. The oil is a rich polyunsaturated linoleic fatty acid source with potential beneficial therapeutic activity.*

1. INTRODUCTION

Datura Stramonium is a poisonous flowering plant in the Daturae, family Solanaceae (Sayyed & Shah, 2014). It is known as thornapple, jimson weed, or devil's trumpet. In our country, it is known as horse chestnut. The most important species of *Datura* are *Datura innoxia, Datura metel, Datura discolor*, and *Datura stramonium* (Gupta, 2008). The plant was first described by the Swedish botanist Carl Linnaeus in 1753. It is distributed in various parts of the world, including the Americas, Africa, Asia, and Europe, and is considered to be native to Central America. *D. stromonium* is cultivated in Germany, France, Hungary, South America, and worldwide (Gaire & Subedi, 2013). *Datura* is also used for landscaping terraces and balconies.

Datura is an easy-to-cultivate species. It grows in open and sunny places. It develops best on limestone-rich soils or sandy loam soils. *D. stramonium* is an annual plant that reaches a height of up to 1 m (Soni et al., 2012). The stem is herbaceous, branched, and lightly covered with hairs. The leaves are large and covered with hairs. *Datura* blooms throughout the summer (from May to September). The flowers are funnel-shaped, white, or purple. The flowers emit a strong, sweet smell and open at night, attracting insects. *Datura* seeds are kidney-shaped and black (Gupta, 2008). The fruits are the size of walnuts and have spines (Soni et al., 2012). When the fruit ripens, it splits into four parts, each containing red seeds. When cut, these seeds emit an unpleasant odor. The seeds contain non-volatile oil with an unpleasant smell and taste.

The plant is harvested when the fruits are ripe but still green. To harvest, the entire plant is cut off, the leaves are stripped, and everything is left to dry. When the fruits begin to open, the seeds are collected.

The plant is highly narcotic but has specific effects on humans that make it very valuable as a medicine. The entire plant is poisonous, with the most toxic seeds (Oseni et al., 2011). Symptoms

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of acute *Datura* poisoning include dry mouth and intense thirst, dry skin, dilated pupils, blurred vision, urinary retention, rapid heart rate, confusion, anxiety, hallucinations, and loss of consciousness (Dugan et al., 1989).

Plants of the genus *Datura* exhibit antibacterial, anti-inflammatory, nematocidal, fungicidal, cytotoxic, antioxidant, and acaricidal activities (Singh & Singh, 2013). Members of the genus *Datura* are rich in biologically active substances and are used in traditional medicine. *Datura* is prescribed for whooping cough, Parkinson's disease, severe anxiety, and stomach pain. It is applied externally for rheumatism, radiculitis, and various edemas. In the past, *Datura* leaves were smoked against shortness of breath and tuberculosis. It has also been used as a hallucinogen, taken entheogenically to induce intense, sacred, or occult visions (Soni et al., 2012).

Datura Stramonium is a raw material for isolating biologically active substances such as fatty acids, alkaloids (atropine, scopolamine, hyoscyamine), coumarins, etc. Oils from poisonous plants are not used as edible oils, but in the past, they were used in medicine to treat skin diseases caused by bacteria and fungi. Fatty acids obtained from the seeds of plants such as *Datura* are used as central components in some drugs and cosmetics. *Datura stramonium* oil is used as an analgesic in neurological practice and for hair removal in cosmetics (Yuldasheva et al., 2020). The oils of some Datura species are used to produce biodiesel as an alternative fuel source (Gupta, 2020; Koria & Nithya, 2012).

Phytoremediation is an inexpensive and environment-friendly method for cleaning up heavy metal-contaminated soils and waters (McGrath et al., 2002). This is a cost-effective approach to cleaning and remediation, in which the pollutant/toxic heavy metal is removed from the contaminated soil with various plants. According to the ability of plants to absorb heavy metals, they are classified as indicators, accumulators, hyperaccumulators, or excluders. The plants are planted in metal-contaminated soils and grown according to established agronomic practices. Being a plant-based technology, the success of phytoremediation will depend on the extent of uptake of metals by the root system, shrinkage, and accumulation in the shoots. Factors such as short growing cycles, rapid growth, large biomass production, disease resistance, and tolerance to heavy metals are also essential in plant selection (Baker et al., 1994). Plants used for phytoremediation must be tolerant of metals, translocate them from the roots to the aerial parts (Reeves & Baker, 2000), tolerate difficult soil conditions (i.e., soil pH, soil salinity, soil texture, water content), form a dense root system, and be easy to grow.

The search for suitable plants for phytoremediation is still the subject of much scientific research. Experiments have been conducted with plants of the genus *Datura* because they have shown the ability to accumulate various heavy metals with adequate capacities and the feasibility of cultured with high biomass production. *Datura metel* is a heavy metal tolerant plant and can grow well in polluted regions (Bhattacharjee et al., 2004). Previous studies have shown that *D. stramonium* can tolerate and accumulate Cd, with the potential for remediation of heavy metal-contaminated soils (Shirkhani et al., 2018). Eeshu et al. (2020) confirmed that *D. stramonium* could be a possible indicator of heavy metal-polluted soil since it tends to accumulate heavy metals from polluted soils rapidly. *Datura stramonium* was suitable for phytostabilization soils contaminated with Ni and Cu (Ibrahim et al., 2013).

The present study aimed to determine the amounts of heavy metals, macro, and microelements in the vegetative and reproductive organs of *Datura stramonium*, the composition and quality of the oil, and to establish the possibilities for phytoremediation of heavy metal-contaminated soils.

2. MATERIAL AND METHODS

The research was carried out during the period 2022 - 2024. The experiment was performed on an agricultural field contaminated by Zn, Pb, and Cd, located 0.5 km from the source of pollution, the Non-Ferrous-Metal Works (NFMW) near Plovdiv, Bulgaria. Characteristics of soils are shown in Tables 1 and 2. The soils were neutral to slightly calcareous, with moderate organic matter and essential nutrients (N, P, and K). The pseudo-total content of Zn, Pb, and Cd is high and exceeds the maximum permissible concentrations (MPC) in soil from 0.5 km from the NFMW (Table 2). The results presented in Table 2 show that in the soil samples (taken from the area situated at the distance of 0.5 km from NFMW), the reported values for Pb exceeded MPC approved for Bulgaria and reached 2509.1 mg/kg. Similar results were obtained for Cd and Zn. The results for the mobile forms of the metals extracted by DTPA show that the mobile forms of Cd in the contaminated soils are the most significant portion of its total content and reached 58.1%, followed by Pb with 33.8 % and Zn with 9.8%.

Table 1. Soil characteristics of the study area

	pH	EC, dS/m	Organic C, %	N Kjeldal, %	P, mg/kg	Ca, mg/kg	Mg, mg/kg	K, mg/kg
0.5 km	7.5	0.15	1.54	0.12	607.2	24355.8	12573.9	8029.5

Source: Own research

Table 2. Total and DTPA-extractable heavy metals (mg/kg) in soil sampled from NFMW

	Pb	Cd	Zn	Cr	Ni
Total	2509.1	63.7	2423.9	126.7	136.5
DTPA -extractable	849.1	37.0	236.8	2.2	2.5
DTPA -extractable / total content	33.8	58.1	9.8	1.7	1.8

MPC (pH 6.0-7.4); Pb-100 mg/kg, Cd-2.0 mg/kg, Zn-320 mg/kg, Cr-200 mg/kg, Ni-110 mg/kg

Source: Own research

The study included *Datura stramonium*, which was grown using conventional technology. *Datura stramonium* seeds were sown in April at a depth of 3 cm, with the distances between rows and within rows being 70 and 20 cm, respectively. The plants were harvested in the technological maturity phase (end of September). Samples of plant material (roots, stems, leaves, and seeds) from *Datura stramonium* were analyzed. The roots stems, and leaves samples were dried at room temperature to obtain an air-dry mass, after which they were dried at 105ºC. The oil from *Datura stramonium* was derived under laboratory conditions through an extraction method with Socksle's apparatus, allowing the extraction of the oil from the ground seeds of *Datura stramonium* using petroleum ether and the subsequent liberation of the latter through distillation. Gas chromatography determined the oil's fatty acid composition (ISO, 1990). The concentrations of contents of heavy metals, micro, and macroelements in different parts of *Datura stramonium* (roots, stems, leaves, seeds), and oils were determined by microwave mineralization. The total content of heavy metals in soils was determined by ISO (2001). The mobilizable heavy metal contents in soils, considered a "potentially bioavailable metal fraction," were extracted by a solution of DTPA (ISO, 1955). The quantitative measurements were carried out with inductively coupled plasma emission spectrometry (ICP) (Jobin Yvon Emission - JY 38 S, France).

Statistical analyses were conducted with Statistica v. 7.0.

3. RESULTS AND DISCUSSION

The content of heavy metals in plants depends on the geochemistry of the soil where the plant grows and on the plant's ability to accumulate metals. Metal concentrations in plants vary with plant species (Kabata-Pendias, 2010). Plant uptake of heavy metals from soil occurs either passively with the mass flow of water into the roots, or through active transport crosses the plasma membrane of root epidermal cells. Under normal growing conditions, plants can accumulate metal ions in magnitude more significant than the surrounding medium (Kabata-Pendias, 2010).

Table 3 and Figure 1 present the results obtained for the content of heavy metals, micro and macro elements in the vegetative and reproductive organs of the *Datura stramonium*.

Table 3. Content of heavy metals, micro and macroelements in *Datura stramonium*

	Roots	Stems	Leaves	Seeds
Pb	150.2	44.1	2011.7	86.1
Cd	34.0	17.9	165.5	9.1
Zn	193.1	170.1	1381.2	117.1
Cr	2.7	0.1	2.4	0.3
Ni	2.6	0.1	3.7	0.5
Cu	18.0	3.8	169.3	17.2
Fe	700.3	32.1	704.6	162.2
Mn	22.8	5.9	129.0	18.1
P	463.0	191.4	2698.0	3887.3
Ca	8111.4	6406.9	22288.2	1303.4
Mg	1807.6	553.2	2261.2	2192.5
K	12131.0	9132.6	24889.0	3950.5

Source: Own research

Significant differences were found in the content of elements in the vegetative and reproductive organs of the *Datura stramonium*. The central part of Pb, Cd, Zn, Ni Fe, Mn, Cu, K, Ca, and Mg accumulates in the aboveground parts of the *Datura stramonium* (leaves), Cr in the root system, and P accumulates in the seeds. Probably via the conductive system, the heavy metals had been moved to the aboveground parts of these plants and were predominantly accumulated there. The *Datura stramonium* accumulates heavy metals through its root system. Still, the roots retain a small part of the heavy metals, and the main part moves and accumulates in the aboveground parts (leaves).

The Pb content in the *Datura stramonium* roots reaches 150.2 mg/kg, Zn – 193.1 mg/kg, Cd – 34.0 mg/kg, Cr – 2.7 mg/kg, and Ni – 2.6 mg/kg. The obtained values for heavy metals (Cd, Pb, and Zn) in roots are much higher than the values considered by Kabata-Pendias (2010) to be toxic to plants (0.1 mg/kg Cd, 30 mg/kg Pb, 100 mg/kg Zn). The roots also accumulate fewer microelements and macroelements compared to other organs. The content of Cu reaches 18.0 mg/kg, Fe – up to 700.3 mg/kg, Mn – up to 22.8 mg/kg, P -463.0 mg/kg, Ca - 8111.4 mg/kg, Mg – 1807.6 mg/kg and K – 12131.0 mg/kg.

The anatomical and morphological features of the *Datura stramonium* can explain the obtained results. The root system consists of a thick yellowish spindle-shaped root with several lateral branches that reach a depth of up to 100 cm. The primary root mass is located at a depth of about

50 cm. Previous studies by Angelova (2012) show that in *Datura stramonium*, only a small part of the heavy metals are absorbed by the roots, and a great part of them is accumulated in the aboveground parts (stems and leaves). Similar results were obtained by Ibrahim et al. (2013), who found higher values of Cd and Pb in the aboveground mass than in the roots. However, Olowoyo et al. (2012) found the highest content of heavy metals in the roots of the *Datura stramonium*.

The movement of heavy metals and their accumulation in the vegetative organs of the *Datura stramonium* is specific. The content of heavy metals and macro and microelements in the aboveground mass is higher compared to the root system. Regarding Fe and Cr, the values obtained are comparable between the roots and leaves.

A significant accumulation of Pb has been established in the leaves of the *Datura stramonium*. The content of this element reaches 2011.7 mg/kg in the leaves. Numerous studies have shown that only a small part of the available Pb from the soil is absorbed by most plants. It is also known that most of the accumulated Pb accumulates in the roots and does not move to the aboveground parts of the plants. However, obtained results show the *Datura stramonium*'s significant ability to accumulate Pb in the leaves. Accumulation in the leaves was likely due to the uptake of heavy metals (from the contaminated soil) by roots and the movement of the heavy metals through the conductive system, as well as due to airborne heavy metals that fall onto the leaves as a result of their dispersion into the air by aerosols. Their more substantial accumulation in *Datura stramonium* was probably because the leaves of *Datura Stramonium* had hairs, which contributed to the fixing of the aerosol pollutants and their accumulation there.

The Cd content in the leaves of *D. stramonium* reaches 165.5 mg/kg, values considered toxic to plants. According to Kabata-Pendias (2010), 5.0 mg/kg is considered toxic for plants. The obtained results show the ability of *D. stramonium* to accumulate Cd in its aboveground mass. Similar results were obtained by Shirkhani et al. (2018), who found that Concentrations of Cd in the shoots of *D. stramonium* were higher than those in the roots.

The Zn content in the leaves of *D. stramonium* reaches 1381.2 mg/kg, which are also higher than the critical values for plants - 100 - 400 mg/kg. Zn toxicity in plants is manifested as a restriction of the growth of both the roots and the aboveground mass and purple-red wilting of the leaves. These symptoms of Zn toxicity were not observed in the plants of this study. The Cu content in the stems and leaves of the *Datura stramonium* reached 3.8 and 169.3 mg/kg, respectively, which are higher than the critical values for plants - 20 - 100 mg/kg.

The content of Cr in the stems and leaves of the *Datura Stramonium* a varies from 0.12 to 2.4 mg/kg, Ni - from 0.14 to 3.77 mg/kg, Fe - from 32.1 to 704.6 mg/kg, Mn - from 5.9 to 129.0 mg/kg, K - from 9132.6 to 24889.0 mg/kg, P - from 191.4 mg/kg to 2698.0 mg/kg, Mg - from 553.2 to 2261.7 mg/kg and Ca - from 6406.9 mg/kg to 22288.2 mg/kg.

The seeds of the *Datura Stramonium* can be a good source of minerals due to their high Ca, K, Mg, and P content. In the seeds, macroelements (K, P, Mg, and Ca) prevail, followed by Fe and Zn (Table 3). The content of Cu and Mn is significantly lower. The seeds also contain the heavy metals Pb, Cd, Cr, and Ni, and their content in the seeds is considerably lower compared to the aboveground mass of the plants.

The P and Mg content in the *Datura Stramonium* seeds is the highest compared to the other parts of the plant, while the content of K is lower compared to the stems and leaves.

The distribution of heavy metals, micro and macro elements in the organs of the *Datura stramonium* are selective and specific for the elements. Pb, Cd, Zn, Ni Fe, Mn, Cu, K, and Mg accumulate in the aboveground parts of the *Datura stramonium* (leaves), Cr in the root system, and P accumulates in the seeds (Fig. 1).

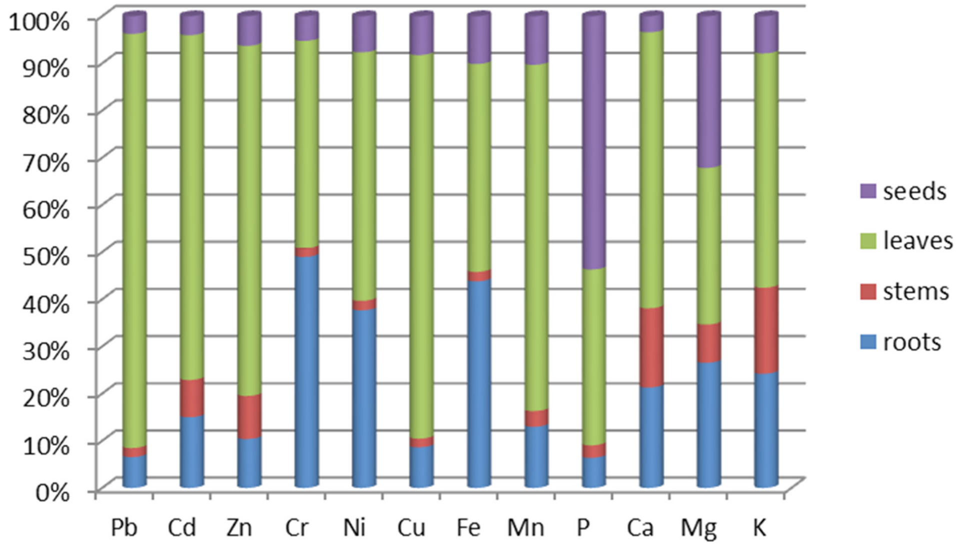

Figure 1. Distribution of heavy metals, micro and macroelements in *Datura stramonium*

Source: Own research

Oil was obtained from the seeds of *Datura stramonium* in laboratory conditions by extraction method with the Soxhlet apparatus, allowing extraction of the fat from the pre-ground seeds with petroleum ether and subsequent distillation of the latter.

The results showed that a significant part of the heavy metals contained in the seeds of *Datura stramonium* were not transferred into the oil during processing, which caused their content in the oil to be considerably lower.

The Pb content in the *Datura* oil reaches 0.08 mg/kg, Cd - up to 0.04, and Zn - up to 4.8. The content of Ni and Cr is very low and near the detection limits of the techniques used (ICP-OES). The ML for Pb in oil of vegetable origin is 0.1 mg/kg, Zn - 10 mg/kg, and Cd should not exceed 0.05 mg/kg. The results show that the Pb, Zn, and Cd quantities in *Datura* oil are lower than the accepted Maximum Permissible Values and meet the requirements for ecologically clean products.

Bioaccumulation factor (BCF) and translocation factor (TF) are often used to characterize the phytoremediation efficiency of plants, which is mainly dependent on soil conditions, the type of selected plant, and the bioavailability of heavy metals The bioconcentration factor (BCF) is the ratio of the metal content of each plant organ to the concentration of metal in the soil. TF is the ratio of the concentration of metal in the aboveground parts to the concentration of metal in the root. The coefficients The BCF and TF, which were used to evaluate the ability of plants to absorb and translocate metals, were calculated according to the following equations:

$$TF = Cshoots / Croots$$

where Cshoots represent the element contents (in mg/kg) in the plant shoots, and Croots shows the element concentration in the roots (in mg/kg),

$$BCF = Cplant\ parts / Csoil$$

where Cplant parts represent the element contents (in mg/kg) in the plant organs (roots, stems, leaves, seeds), and Csoil (in mg/kg) shows the element concentration in the corresponding soils.

Table 4. Bioaccumulation (BCF) and translocation (TF) factor

	TF	BCFoos	BCFstems	BCFleaves	BCFseeds
Pb	13.39	0.06	0.02	0.80	0.03
Cd	4.87	0.53	0.28	2.60	0.14
Zn	7.15	0.08	0.07	0.57	0.05

Source: Own research

Generally, a plant species can be considered a good candidate for phytoextraction purposes when, for a given metal, the TF > 1; otherwise, it is considered suitable for phytostabilisation. The results show that for Pb, the translocation factor *for Datura stramonium* reaches 13.4, Cd up to 4.87, and Zn up to 7.15.

The results for BCFroots show that this ratio reaches 0.06 for Pb, 0.53 for Cd, and 0.08 for Zn. Lower values than 1 were obtained for BCF stems and seeds (Table 4).

BCF leaf indicates the plant's ability to absorb and move metals to the leaves, which can be easily collected. A plant is an excluder if BCF < 1, an indicator if BCF=1, an accumulator if 1 < BCF < 10, and if BCF > 10, the plant is a hyperaccumulator. Plants with a BCF value > 1 are suitable for phytoextraction.

The results show that for Pb, the bioconcentration coefficient for the leaves reaches 0.80; for Cd, it is up to 2.60; and for Zn, it is up to 0.57. The study results show that *Datura stramonium* can be classified as a potential accumulator of Cd, a potential indicator for Pb, and an excluder for Zn when grown on contaminated soils.

Similar results were obtained by Shirkhani et al. (2018), who concluded that *D. stramonium* is a Cd-accumulator plant with phytoremediation potency.

Fatty acid composition of Datura oil. The fatty acid composition of the oil is the main factor that determines the quality of the oil and its use for industrial purposes and culinary use, with the variety, climate, and region of production having a significant influence.

Table 5 and Figure 2 present the results for the fatty acid composition of *Datura stramonium* seeds.

Table 5. Fatty acid composition of *Datura* oil (expressed as % of total fatty acid composition)

Saturated fatty acids (SFA)

Caproic acid (C 6:0)	Myristic acid (C 14:0)	Palmitic acid (C 16:0)	Stearic acd (C 18:0)	Arachidic acid (C 20:0)	Total
Trace	Trace	11.55	2.39	0.51	14.45

Usaturated fatty acids (UFA)

Palmioletic acid (C16:1)	Oleic acid (C18:1)	Linoleic acid (C 18:2)	Linolenic acid (C 18:3)	Gadoleic acid (C20:1)	Arachidonic acid (C 20:4)	Total
Trace	23.00	62.54	Trace	trace	trace	95.54

Source: Own research

The percentage of oil content varies from 10.3 to 23.2% in the seeds of different types of *Datura* (Zhang et al., 2008), which is by obtained results (22.0%).

Datura stramonium oil is a rich source of unsaturated fatty acids such as linoleic and oleic. In contrast, the content of saturated fatty acids (palmitic and stearic acids) is much lower (Sheveleva et al., 2021), which is confirmed by the results obtained. In the fatty acid composition of the oil studied, unsaturated fatty acids predominate, with their amount reaching 85.54 % respectively. Similar results were obtained by Valieva et al. (2022) (83.1%. unsaturated fatty acids).

Linoleic acid (C18:2, 62.54 %), followed by oleic acid (C18:1, 23.0 %), dominates the oil composition. Traces of palmitic (C16:1), C20:0 linolenic (C18:3), gadoleic (C20:1), and arachidonic acid (C20:4) acids were detected.

Of the saturated fatty acids, palmitic acid (C16:0) predominates in the amount of 11.5%, followed by stearic (C18:0, 2.39%) and arachidic acid (C20:0, 0.51%) acids. The oil also contains margaric (C16:0) and myristic (C16:0) acids. The content of saturated fatty acids in *Datura Stramonium* oil reaches 14.45% (Table 5).

Similar results were obtained by Valieva et al. (2022) for oil from Azerbaijan, where linoleic (64.52%), oleic (18.38%), palmitic (12.42%), and stearic (2.29%) acids predominate, and constitute 97% of the total fatty acids.

According to Yuldasheva et al. (2020), the main compounds found in *Datura* seed oils are polyunsaturated cis-linoleic acid (C18:2), monounsaturated oleic acid (C18:1) and saturated palmitic (C16:0) and stearic acids (C18:0).

The distribution of fatty acids is presented in Figure 2. The ratio of unsaturated: saturated fatty acids in *Datura stramonium* oil is 85.54:14.45.

The total content of saturated fatty acids (SFA) in *Datura stramonium* oil reaches 14.45% of the total amount of fatty acids. The monounsaturated fatty acids (MUFA) content reaches 23.0%, and polyunsaturated – up to 62.54%. Similar results do not correspond to the findings of Yuldasheva et al. (2020) and Koria and Nithya (2012), who found that the content of polyunsaturated fatty acids is lower than monounsaturated fatty acids. Koria and Nithya (2012) identified 83.3% unsaturated fatty acids, of which 65.59% are monounsaturated and 17.72% are polyunsaturated. It is known that the physiological activity of polyunsaturated fatty acids increases with increasing their unsaturation. The presence of these compounds in *Datura stramonium* and the possibility of growing this plant on contaminated soils make *Datura* seeds a valuable source of fatty oils. The results of this study may be helpful for future studies on the application of these oils in the pharmaceutical, cosmetic, fuel, and other industries.

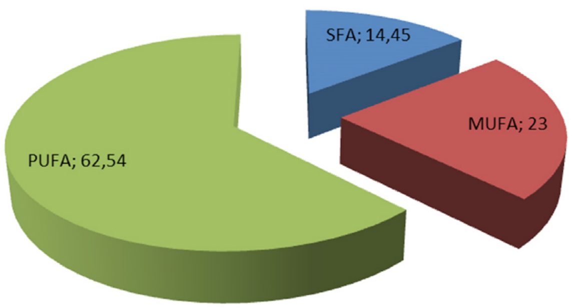

Figure 2. Distribution of fatty acids in *Datura stramonium* oil

Source: Own research

4. CONCLUSION

Based on the results obtained, the following important conclusions can be drawn:

1. The *Datura stramonium* is a crop that is tolerant to heavy metals, can be grown on highly contaminated soils (2423.9 mg/kg Zn, 2509.1 mg/kg Pb, and 63.7 mg/kg Cd) and is successfully used in phytoremediation of soils contaminated with heavy metals.
2. The *Datura stramonium* can be classified as a potential accumulator of Cd, indicator for Pb and excluder for Zn when grown on contaminated soils.
3. There is a clearly outlined peculiarity in the absorption of heavy metals, micro and macro elements in the vegetative and reproductive organs of the *Datura stramonium*. Their distribution in the organs of *Datura stramonium* has a selective nature, specific for individual elements: Pb, Cd, Zn, Ni Fe, Mn, Cu, K, and Mg accumulate in the above-ground parts of *Datura stramonium* (leaves), Cr in the root system, and P accumulates in the seeds.
4. The quantities of Pb, Cd and Zn in the oil of *Datura stramonium* cultivated 0.5 km from the NFMW, were lower than the accepted Maximum permissible concentrations, and the resulting oil could be used in the pharmaceutical, cosmetic, and other industries..
5. Polyunsaturated fatty acids (PUFA-62.54%) predominate in *Datura stramonium* oil, followed by monounsaturated fatty acids (MUFA-23.0%) and saturated (SFA-14.45%) fatty acids.
6. *Datura stramonium* oil is a rich source of polyunsaturated linoleic fatty acid with potential beneficial therapeutic activity.

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