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P. LANCEOLATA L. PLANT FOUND IN OUR REPUBLIC STUDY OF MECHANISMS OF BIOCHEMICAL CORRECTION IN EXPERIMENTAL DIABETES

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Abstract: Effects of polyphenols extracted from *P. lanceolata plant on peroxide oxidation process in rats were investigated* in experimental alloxan diabetes in laboratory conditions . Research results *Plantaginaceae* belonging to the family *P. lanceolata l.* when the amount of polyphenols extracted from plants was administered at both 50 mg/kg and 100 mg/kg doses, it was observed that the amount of lipid peroxidation products decreased compared to the control and the activity of antioxidant enzymes was better compared to the control group.

Key words : *Plantaginaceae,* polyphenol, diabetes. *P. lanceolata l.,* antioxidant , lipid, peroxide oxidation .

РАСТЕНИЯ P. LANCEOLATA L., ОБНАРУЖЕННОГО В НАШЕЙ РЕСПУБЛИКЕ ИЗУЧЕНИЕ МЕХАНИЗМОВ БИОХИМИЧЕСКОЙ КОРРЕКЦИИ ПРИ ЭКСПЕРИМЕНТАЛЬНОМ ДИАБЕТЕ

Резюме: *Изучено влияние полифенолов, выделенных из растения P. lanceolata, на процесс перекисного окисления у крыс при экспериментальном аллоксановом диабете в лабораторных условиях. Результаты исследований показывают, что P. lanceolata l. принадлежит к семейству Подорожниковые. При введении экстрагированного из растений количества полифенолов в дозе 50 мг/кг и 100 мг/кг наблюдалось снижение количества продуктов перекисного окисления липидов по сравнению с контролем, а активность антиоксидантных ферментов была лучше по сравнению с контролем. к показателям контрольной группы.*

Ключевые слова: *Plantaginaceae, полифенолы, сахарный диабет. P. lanceolata l., антиоксидант, липид, перекисное окисление.*

INTRODUCTION - Globally, the incidence of diabetes mellitus is increasing day by day, and as a result, it has a negative effect on the body due to metabolic disorders and weakened immunity. In particular, this disease leads to the development of other concomitant diseases. Accordingly , natural substances with prevention and treatment measures work exit important importance occupation is enough This research work above to information based on , i.e natural substances diabetes in pathogenesis to learn based on

LITERATURE ANALYSIS - The importance of the plant *P. lanceolata L.* in medicine and folk medicine : **according to the information of the European Medical Agency [1; 1 – 21 – p.] *P. lanceolata L.* leaves [2; 282 – 288 – p.] substances such as pectic polysaccharides, rhamnogalacturonan, arabino-galactan and α-Dglucan were isolated from its composition. Research has shown that the structure of polysaccharides mainly consists of arabinose, galactose, rhamnose and galacturonic acids, and immunomodulatory, antimicrobial and antioxidant activity due to the polysaccharides in them has been reported [1; 1 - 21** -p. **; 3; 52 – 348 – pp.].**

Figure 1.2. *Plantago lanceolata l.* plant **[4 ; 1-2 p.**] .

***Plantago lanceolata* was used by the people of North Africa as a medicinal plant that treats hemorrhoids and reduces fever against wounds, boils, burns and inflammations [** 5: 185-191-p. **]. In addition, it has been widely used in traditional medicine as a remedy for diarrhea, dysentery, anesthetic, quick repair of connective tissue, anti-inflammatory, anthelmintic, pain reliever, antihistamine, anti-rheumatic, anti-tumor [6;** 2-5-b; 7; 83–91–p. **].**

Shuma Fayera et al. investigated the antimicrobial activity of *Plantago lanceolata leaf extract by phytochemical analysis.* The identification of important phytochemical substances such as steroids, alkaloids, flavanoids, tannins, saponins, glycosides, phenols, terpenoids in the leaf extract during research is a sufficient scientific basis for using the plant as a medicinal plant. The pure compounds isolated from the crude extract of the leaves are from bacteria; *E. coli* , *S. thyphei* , *S. aureus* and *S. agalatiae* and fungi; When tested against *A. niger* , *F. solani, a strong antibiotic property was found* **[6; 2 - 5** -p. **; 7;** pp . **83-91 ;** 8; 7–8–p. **].**

Antioxidants are among the mandatory components of the complex treatment of diabetes, and it is important to study the effect of natural antioxidants extracted from plants on the process of lipid peroxide oxidation and the course of microangiopathy in patients with diabetes. Flavanoids and their derivatives are considered heterocyclic compounds, which exhibit the properties of reducing the permeability of blood vessels and the fragility of their walls due to their antioxidant and membrane stabilization properties. Polyphenolic compounds interact with free radicals and cause inactive phenol radicals to slow down lipid oxidation in the body [9 ; 727 - 747 - p.; 1 0; 586 – 621 – p.].

Research during of polyphenols correction mechanisms based on *P. lanceolata* from the plant synthesized polyphenols amount experimental in diabetes in rats to the peroxide oxidation process effects research done

MATERIALS AND METHODS: The intensity of lipid peroxidation processes was evaluated by the amounts of their products - malondialdehyde (MDA) and diene conjugates (DK) in blood serum. The amount of MDA LI Andreeva et al. (1988) was determined using the method [11; 41 – 43 – p.]. This method is based on the interaction of MDA with thiobarbituric acid, which is formed during the peroxidation of unsaturated fatty acids containing 2-3 diene bonds. Extinction of the solution was measured relative to the control on a METTLER TOLEDO UV 5 (Switzerland) spectrophotometer at a wavelength of 532 nm. The amount of products reacting with thiobarbituric acid was calculated using the molar extinction coefficient of MDA equal to 1.56·105 mol·cm–1. The amount of MDA was expressed in mmol/l.

The amount of diene conjugates (DK) in blood serum was determined by the method of VB Gavrilov and MI Mishkorudnaya (1983) [12; pp. 33–36]. The method is based on the determination of the optical density at a wavelength of 233 nm of DK extracted using a mixture of heptane-isopropanol in an acidic medium. Optical density was measured relative to control on a METTLER TOLEDO UV 5 (Switzerland) spectrophotometer. The amount of DK was calculated in mmol/l.

Determination of antioxidant system enzyme activity : Antioxidant system activity was evaluated by the activity of superoxide dismutase (SOD) and catalase (KAT) enzymes. SOD activity VG Mkhitaryan and GE Badalian's (1978) method through was determined [13; 7 – 11 – pp.]. Method the enzyme alkaline in the environment nitrotetrazolium your blue return reaction braking ability based on Accounts nitrotetrazolium your blue return braking by percentage (T%). take went to :

$$T\% = \frac{E_к - E_о}{E_л} \cdot 100\%$$

SOD activity while based on the following formula calculated :

A = T % / 100 % – T % · 0.2 · N,

this where : A – enzyme activity (sh.b./ml),

0.2 – received serum quantity ,

N - solubility level

Catalase activity (K A T) M. A . Korolyuk and too (1988) method according to was determined [14; 16 – 18 – pp.]. Method hydrogen peroxide molybdenum salts with strong produce a yellow color to do based on Color intensity is 410 nm wave in METTLER TOLEDO UV 5 (Switzerland) spectrophotometer was measured . Enzyme activity based on the following formula calculated :

$E = (A_x – A_o) y \cdot t \cdot K$

Here : E – K A T activity , E/ml ;

A_x and A_o - control and experience samples extinction ;

y is included example volume (0.1 ml);

t – incubation time (600 s);

K is hydrogen of peroxide 22.2 103 mM –1 cm –1 ha equal to was millimolar extinction coefficient of .

ANALYSIS AND RESULTS: On the 7th, 14th, and 21st days of type 2 diabetes, the amount of lipid peroxidation products - MDA increased by 152.9, 159.3, and 43.7%, respectively, compared to the intact index, and the amount of DK - 194.2, 116.3, and 19 increased by 2%. SOD activity in blood decreased by 35.6, 29.6, and 14.8%, respectively, on the 7th, 14th, and 21st days of the disease compared to the intact level. KAT activity was 81.7 and 32.2% higher than the intact index on the 7th and 14th days of the disease , and on the 21st day - 40.3% lower. *P. lanceolata l.* The amount of MDA on the 7th, 14th, and 21st days of the disease was 32.5, 43.7, compared to the control and decreased by 15.1 %. At the same time, the amount of MDA was reliably higher by 70.7, 46.0 and 22.1 % compared to the intact indicator on the same days.

Experimental diabetic rats were treated *with P. lanceolata l.* when the sum of plant polyphenols was introduced at a dose of 50 mg/kg, the amount of DK on the 7th, 14th, and 21st days of the disease was statistically reliably lower by 27.7, 23.7 , and 12.2 % compared to the control. At the same time, the amount of DK was reliably higher by 112.8 and 65.1% compared to the intact indicator on the 7th and 14th days of the disease. On the 21st day of the disease, the amount of DK was not reliably different from the intact indicator .

Table 1

***P. lanceolata* plant polyphenols (at a dose of 50 mg/kg) on the lipid peroxidation process and antioxidant system activity in the dynamics of experimental diabetes**

G groups		Statistical indicators	L PO products		AOT activity	
			MDA, mmol/l	DK, mmol/l	SOD, s.b./mg protein.	KAT, mKat/mg protein.
Intact		M ± m	2.63 ± 0.08	1.72 ± 0.03	1.35 ± 0.02	37.68 ± 1.14
		Max ÷ Min	2.88 ÷ 2.42	1.85 ÷ 1.65	1.41 ÷ 1.25	41.41 ÷ 34.12
QD	7 milk	M ± m	6.65 ± 0.43	5.06 ± 0.28	0.87 ± 0.05	68.47 ± 4.02
		Max ÷ Min	8.25 ÷ 5.48	5.69 ÷ 3.87	1.08 ÷ 0.75	81.31 ÷ 55.2
		R	0.001	0.001	0.001	0.001
QD + PF	7 milk	M ± m	4.49 ± 0.27	3.66 ± 0.18	0.93 ± 0.06	51.22 ± 2.45
		Max ÷ Min	5.22 ÷ 3.58	4.5 ÷ 3.22	1.12 ÷ 0.76	57.43 ÷ 40.84
		R	0.001	0.001	0.001	0.001

		R_1	0.001	0.001	Yes	0.001
QD	14 milk	M ± m	6.82 ± 0.52	3.72 ± 0.31	0.95 ± 0.04	49.80 ± 3.79
		Max ÷ Min	8.54 ÷ 5.45	4.56 ÷ 2.78	1.05 ÷ 0.8	65.31 ÷ 40.93
		R	0.001	0.001	0.001	0.01
QD + PF	14 milk	M ± m	3.84 ± 0.15	2.84 ± 0.15	1.02 ± 0.04	39.66 ± 1.41
		Max ÷ Min	4.3 ÷ 3.45	3.32 ÷ 2.45	1.13 ÷ 0.85	44.36 ÷ 35.12
		R	0.001	0.001	0.001	Yes
		R_1	0.001	0.001	Yes	0.05
QD	21 milk	M ± m	3.78 ± 0.22	2.05 ± 0.06	1.15 ± 0.03	22.49 ± 1.62
		Max ÷ Min	4.6 ÷ 2.95	2.22 ÷ 1.83	1.28 ÷ 1.08	27.85 ÷ 17.11
		R	0.001	0.001	0.001	0.001
QD + PF	21 milk	M ± m	3.21 ± 0.08	1.80 ± 0.04	1.20 ± 0.03	29.44 ± 1.52
		Max ÷ Min	3.5 ÷ 3	1.97 ÷ 1.68	1.31 ÷ 1.11	34.32 ÷ 25.93
		R	0.001	i.e	0.001	0.05
		R_1	0.05	0.05	Yes	0.05

Note : P is intact to the indicator relatively reliability level , P_1 – control to the indicators relatively reliability level , QD – sugary diabetes , PF – polyphenols , ie – reliable it's not . (n = 7-8).

P. lanceolata L. plant polyphenols were administered to experimental diabetic rats at a dose of 50 mg/kg, SOD activity was 6.9, 7 , 4, and 4.4, respectively, compared to the control on the 7th, 14th, and 21st days of the disease . % higher was not statistically significant (P > 0.05). At the same time, the increase of SOD activity by 31.1, 24.4 and 11.1 % compared to the intact indicator on the 7th, 14th and 21st days of the experiment was statistically reliable.

25.2 and 20.4 % lower than the control values on the 7th and 14th days of the experiment, respectively . On the 21st day, on the contrary, this indicator was 30.9% higher than the control. When experimental diabetes is treated with polyphenols at a dose of 50 mg/kg, CAT activity is 35.9 % higher than the intact index on the 7th day of the experiment, at the level of the intact index on the 14th day, and above the intact index on the 21st day. decreased by 21.9%.

Table 2

***P. lanceolata L.* plant polyphenols (at a dose of 100 mg/kg) on the lipid peroxidation process and antioxidant system activity in the dynamics of experimental diabetes**

Groups	Statistical	L PO products	AOT activity

		indicators	MDA, mmol/l	DK, mmol/l	SOD, s.b./mg protein.	KAT, mKat/mg protein.
Intact		M ± m	2.63 ± 0.08	1.72 ± 0.03	1.35 ± 0.02	37.68 ± 1.14
		Max ÷ Min	2.88 ÷ 2.42	1.85 ÷ 1.65	1.41 ÷ 1.25	41.41 ÷ 34.12
QD	7 milk	M ± m	6.65 ± 0.43	5.06 ± 0.28	0.87 ± 0.05	68.47 ± 4.02
		Max ÷ Min	8.25 ÷ 5.48	5.69 ÷ 3.87	1.08 ÷ 0.75	81.31 ÷ 55.2
		R	0.001	0.001	0.001	0.001
QD + PF	7 milk	M ± m	3.99 ± 0.16	2.65 ± 0.09	0.94 ± 0.06	42.94 ± 2.03
		Max ÷ Min	4.63 ÷ 3.58	2.95 ÷ 2.27	1.12 ÷ 0.8	50.8 ÷ 37.42
		R	0.001	0.001	0.001	0.05
		R_1	0.001	0.001	Yes	0.001
QD	14 milk	M ± m	6.82 ± 0.52	3.72 ± 0.31	0.95 ± 0.04	49.80 ± 3.79
		Max ÷ Min	8.54 ÷ 5.45	4.56 ÷ 2.78	1.05 ÷ 0.8	65.31 ÷ 40.93
		R	0.001	0.001	0.001	0.01
QD + PF	14 milk	M ± m	3.50 ± 0.07	1.95 ± 0.15	1.04 ± 0.05	37.35 ± 1.84
		Max ÷ Min	3.72 ÷ 3.28	2.33 ÷ 1.45	1.17 ÷ 0.9	41.33 ÷ 31.12
		R	0.001	i.e	0.001	Yes
		R_1	0.001	0.001	i.e	0.001
QD	21 milk	M ± m	3.78 ± 0.22	2.05 ± 0.06	1.15 ± 0.03	22.49 ± 1.62
		Max ÷ Min	4.6 ÷ 2.95	2.22 ÷ 1.83	1.28 ÷ 1.08	27.85 ÷ 17.11
		R	0.001	0.001	0.001	0.001
QD + PF	21 milk	M ± m	3.04 ± 0.07	1.75 ± 0.05	1.17 ± 0.03	31.96 ± 1.43
		Max ÷ Min	3.21 ÷ 2.75	1.88 ÷ 1.6	1.26 ÷ 1.06	37.11 ÷ 29.02
		R	0.001	i.e	0.001	0.01
		R_1	0.001	0.001	i.e	0.01

Note : P is intact to the indicator relatively reliability level , P_1 – control to the indicators relatively reliability level , QD – sugary diabetes , PF – polyphenols , ie – reliable it's not . (n = 7-8).

P. lanceolata L. plant polyphenols were administered to experimental diabetic rats at a dose of 100 mg/kg, the MDA content on the 7th, 14th, and 21st days of the disease was 40.0, 48.7, and 19.6 compared to the control. % decreased (Table 2). At the same time,

the amount of MDA was reliably higher by 51.7, 33.1 and 15.6 % compared to the intact indicator on the same days. When *P. lanceolata L. plant polyphenols were administered* to experimental diabetic rats at a dose of 100 mg/kg, the amount of DK on the 7th, 14th, and 21st days of the disease was statistically significantly lower by 47.6, 47.6 , and 14.6 % compared to the control. . At the same time, the amount of DK increased by 54.1% compared to the intact index on the 7th day of experimental diabetes treatment .

On the 14th day of treatment, the 13.4% increase in the amount of DK compared to the intact indicator was not statistically significant (P > 0.05). On the 21st day of treatment, the amount of DK in the treated group was not significantly different from the intact indicator.

P. lanceolata L. plant polyphenols were administered to experimental diabetic rats at a dose of 100 mg/kg, the SOD activity was 8.1 and 9.5% higher, respectively, compared to controls on the 7th and 14th days of the disease, but it was not statistically significant (P > 0, 05). On the 21st day of the experiment, SOD activity did not differ from the control group. Although the SOD activity in the treated group was more favorable than in the untreated group, the SOD activity on the 7th, 14th, and 21st days of the experiment was statistically significantly lower than the intact value by 30.4, 23.0, and 13.3%.

In rats treated with the sum of polyphenols at a dose of 100 mg/kg, CAT activity was 37.3 and 25.0% lower than the control values on the 7th and 14th days of the experiment, respectively. The activity of KAT in the blood of experimental diabetic rats was 42.1% higher on the 21st day of the experiment, compared to the control. When experimental diabetes was treated with the sum of polyphenols at a dose of 100 mg/kg, CAT activity was 14.0% higher than the intact value on the 7th day of the experiment, almost no different from the intact value on the 14th day, and 14.0% higher than the intact value on the 21st day. decreased by 15.2%.

CONCLUSIONS AND SUGGESTIONS: Thus, the results of the study showed that lipid peroxidation processes are accelerated and antioxidant system enzymes activity changes in experimental alloxan diabetes. *Plantaginaceae* to rats induced experimental alloxan diabetes to the family *P. lanceolata l.* when the amount of polyphenols extracted from the plants was administered at a dose of 50 mg/kg and 100 mg/kg, it was observed that the amount of lipid peroxidation products decreased compared to the control and the activity of antioxidant enzymes was better compared to the control group. It can be concluded that these substances have antioxidant properties.

REFERENCES:

1. Samuelsen A.B The traditional uses, chemical constituents and biological activities of Plantago major L. A review // J. Ethnophar. – 2000. V.71, № 1. - P.1-21.

2. Lukova P.K., Karcheva-Bahchevanska D.P., Nikolova M.M., Iliev I.N., Mladenov R.D. Comparison of structure and antioxidant activity of polysaccharides extracted from the leaves of *Plantago major L., P. media L.* and *P. lanceolata L.* // Bulgar. Chem. Com. -2017. V.49, № 2 P.282– 288.

3. Hetland G., Samuelsen A.B., Løvik M., Paulsen B.S., Aaeberge I.S., Groeng E.C., Michaelsen T.E. Protective Effect of *Plantago major* L. Pectin Polysaccharide against Systemic *Streptococcus pneumoniae* Infection in Mice // J. Immunol. - 2000. - P.52-348.

4. https://en.wikipedia.org/wiki/File:Ribwort_600.jpg#file. - P.1-2.

5. Veale D., Furman K., Oliver D. South African traditional herbal medicines used during pregnancy and childbirth // J. Ethnophar. – 1992. - P.185-191.

6. Basri D.F., Tan L.S., Zin N.M. In vitro antibacterial activity of galls of Quercus infectoria Olivier against oral pathogens // Evid. Bas. Comp. Alter. Med. – 2012. - P.2-5.

7. Kobeasy I., Abdel-Fatah M., El-Salam SM., Mohamed Z.E. Biochemical studies on *Plantago major L.* and *Cyamopsis tetragonoloba L.* // J. Intern. Biodiver Conserv. – 2011. V.38, № 3. - P.83-91.

8. Shuma F., Neelaiah B.G., Aman D., Yiheyis B. Phytochemical Investigation and Antimicrobial Study of Leaf Extract of *Plantago lanceolate* // J. Nat. Produc. Chem. Res. - 2018. - P.7-8.

9. Manach C., Scalbert A., Morand C. Polyphenols: food sources and bioavailability // Am. J. Clin. Nutr. – 2004. – V.79, № 5. – P.727–747.

10. Quideau S., Deffieux D., Douat-Casassus C., Pouysegu L. Plant Polyphenols: Chemical Properties, Biological Activities, and Synthesis // Angew. Chem. Int. Ed. – 2011. – V.50, 3 – P.586–621.

11. Андреева Л.И., Кожемякин А.А., Кишкун А.А. Модификация метода определения перекисей липидов в тесте с тиобарбиталовой кислотой // Лаб. дело. – 1988. – № 11. – С.41-43.

12. Гаврилов В.Б., Мишкорудная М.И. Спектрофотометрическое определение содержания гидроперекисей липидов в плазме крови // Лабораторное дело. - 1983. - № 3. - С.33-36.

13. Мхитарян В.Г., Бадалян Г.Е. Определение активности супероксиддисмутазы // Журнал экспер. и клин. медицины. – 1978. – №6. – С.7-11.

14. Королюк М.А., Иванова Л.И., Майорова И.Г., Токарев В.Е. Методы определения активности каталазы // Москва., Медицина. - 1988. - С.16-18.

15. Tukhtayeva F.Sh. Experimental Sugary In Diabetes of the Liver Structure to the Situation P. Major L. From the Plant Separate Received Polyphenols of Substance Effect // Miasto Przyszłości (ISSN: 2544-980X) PublisherKielce: Laboratorium Wiedzy Artur Borcuch ISSN-L2544-980X E-ISSN2544-980X IF(Impact Factor)11.43 / 2024

Websitehttps://miastoprzyszlosci.com.pl/index.p… Vol. 53 (2024): Miasto Przyszłości 234-238 p.

16. Tukhtaeva F.Sh., R. R. Makhmudov, N. M. Yuldashev Study of the Anti-Diabetes Activity of Polyphenols Contained in Plantago Major L. Plant // International Journal of Virology and Molecular Biology 2022, 11(4): 50-54 DOI: 10.5923/j.ijvmb.20221104.02

17. **Tukhtaeva F.Sh., N. M. Yuldashev, R. R. Makhmudov Dorivor moychechak o‘simligi tarkibidagi flavonoid va kumarinlarni miqdorini aniqlash // EVRASIAN JOURNAL OF AKADEMIK RESEARCH/ Volume2 N;2 ISSN: 2181-2020/February 2022.p. 663-667**

18. Tukhtaeva F.Sh., N. M. Yuldashev, R. R. Makhmudov The effectiveness of amount of the polyphenols separated from plantago major and plantago lanceolata plants in correction of experimental diabetes mellitus // Фундаментальные и прикладные научные исследования: актуальные вопросы, достижения и инновации: сборник статей LXVIII Международной научно практической конференции. – Пенза: МЦНС «Наука и Просвещение». – 15 дек. 2023. – 8-10 с.

19. Tukhtaeva F.Sh., N. M. Yuldashev, R. R. Makhmudov The study of the biochemical activity of polyphenols in the composition of plants of plantago major l. and plantago lanceolata l. against experimental diabetes mellitus // АКТУАЛЬНЫЕ ВОПРОСЫ СОВРЕМЕННОЙ НАУКИ И ОБРАЗОВАНИЯ сборник статей XXXIV Международной научно-практической конференции, Состоявшейся 20 декабря 2023 г. В г. Пенза 32-35 с.

20. To‘xtayeva F.Sh. Tajribaviy qandli diabetda jigarning struktur holatiga P. major l. o‘simligidan ajratib olingan polifenollar substansiyasining ta’siri // Xalq tabobati va zamonaviy tibbiyot, yangi yondashuvlar va dolzarb tadqiqotlar xalq tabobati va zamonaviy tibbiyot, yangi yondashuvlar va dolzarb tadqiqotlar ilmiy amaliy onlayn konferensiya Toshken-sentyabr 2024 14-18 b.

21. Fer, Tukhtaeva. "Experimental Sugary In Diabetes of the Liver Structure to the Situation P. Major L. From the Plant Separate Received Polyphenols of Substance Effect." *Miasto Przyszłości* 53 (2024): 234-238.