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J21401-001

Posokhova M.A., Fateeva N.M.

THE USE OF BREATHING TECHNIQUES IN FORMING SPEECH BREATHING IN CHILDREN WITH SPEECH DISORDERS

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Abstract. This study presents special features of speech breathing development in preschool children with pseudobulbar dysarthria by means of breathing techniques. It was found that the development of external breathing positively effects on speech development and on the overall development of individuals.

Key words: external respiration, speech breathing, speech disorders, pre-school children.

Significance. There are not many studies related to the deviations of respiratory function in children with speech impairment. Yet nowadays speech disorders in pre-school children have a tendency to increase. Dysarthria, namely pseudobulbar dysarthria, is most the wide-spread speech alteration. All this makes it essential to find ways to change the current situation.

Main features of dysarthria are speech sound and voice disorders which are associated mainly to articulating and speech breathing disorders.

Breathing is a part of a complex functional speech system. The auditory periphery, respiration organs, voice and articulation systems are interconnected with each other on different levels under the control of CNS. Every speech organ has its function. In opinion of A.R.Luria, the disfunction of one organ will effect the functioning of others. That is why the role of breathing is so important as it is a “trigger” on early stages of speech sounds production, voicing, voice-leading in the speech-language therapy [5].

Speech breathing means the ability of a person to take in a short full breath and effectively use the air while talking. The nature of speech breathing is subordinated to internal speech programming, in other words to semantic, lexical, grammatical and intonation filling of the statement [1, 3, 4]. The correct speech breathing allows achieving maximum sonority at minimum energy consumption of articulators, sparingly using air.

Respiratory function almost always suffers in case of pseudobulbar dysarthria. Speech breathing is insufficient, the capacity of lungs is reduced, expiration is shorter than inspiration, and the expiration strength is insufficient [2].

Forming speech breathing and correction of pseudobulbar dysarthria are the integral components of successful development of children with speech pathology. Actually the speech breath development is included in all complex systems of correctional work of dysarthria and is one of the main directions during correction of a pseudobulbar dysarthria [3, 6].

Purpose: The purpose of this study was to investigate the features of speech breathing formation in preschool children with a pseudobulbar dysarthria using respiratory techniques.

Method. 97 children at the age of 5-6 years were studied in Tyumen preschool educational institutions representing 3 groups: test group – children with normal development of speech and two experimental groups of children with pseudobulbar dysarthria: group I for the children receiving logopedic therapy and additional classes on speech breathing; group II for the children receiving only logopedic therapy. The research was conducted twice: before speech correction (at the beginning of a year) and after speech correction (in the end of the year) in order to check the efficiency of the performed work.

The following methods of research were used: the frequency of respiratory movements (FRM), the respiratory volume (RV), the vital capacity of lungs (VCL), breath capacity per minute (BCM) with the use of " Microprocessor portable Spirograph SMP-21/01 - "R-D". Speech breathing investigation methods of E. F. Arkhipova, A I. Maksakov were used for determination of physiologic respiration type, the ability to differentiate oral and nasal breathing, focus and force of the air stream, duration of breathing-out, features of speech breathing. Point-level system of assessment was used for speech investigation. The technique of speech breathing development in children with pseudobulbar dysarthria included five stages. The first stage – the development of phrenic breathing type; the second stage – training to do respiratory gymnastics followed by further development of phrenic breathing type, development of a phrenic muscle motility, increasing inspiratory volume; the third stage of methodology – the development of the sounded expiration ; the fourth stage – the development of speech breathing. At first children are trained to pronounce syllables while expiration, and then separate words, phrases made of 2 and then 3-4 words and rhymed lines making the tasks more complicated gradually. The fifth stage – the development of speech breathing while performing complicated speech tasks. Children are trained to pronounce texts consisting of 3-4 short phrases using speech breathing correctly.

According to this methodology all respiratory movements are made simultaneously with exercises recommended in the method of paradoxical respiratory gymnastics of A. N. Strelnikova [7].

The statistical analysis of the obtained data was made by means of traditional methods of variance analysis. For the assessment of intergroup distinctions a paired Student test was applied. Reliable results were considered to be at $p<0,05$.

Results. The research showed that the condition of external and speech breathing of children age 5-6 years with a pseudobulbar dysarthria is lower, than of children with the speech development meeting the age standards. (Table 1)

The comparative analysis of the results showed that in the first experimental group after performed work related to speech breathing formation the indicators value of external breathing and speech considerably increased. Thus, the vital capacity of lungs (VCL) in children of the 1st experimental group increased by 12% (at the beginning of the year it was 80% in comparison with VCL at the year-end – 92%) whereas in children of the 2nd experimental group the indicators value of VCL increased only by 2% (Table 1).

The indicator of the breath volume per minute (BVM) by the end of the year in children of the 1st experimental group after the development of speech breathing has also increased in comparison with the 2nd experimental group (Table 1).

Table 1

RESULTS

Group	BVM (M ± m) л		VCL (M ± m) л	
	Beginning of the year	End of the year	Beginning of the year	End of the year
experimental group 1 (n=34)	2,8±0,02	3,3±0,04	1,05±0,03	1,27±0,02
experimental group 2 (n=33)	2,8±0,03	2,9±0,04	1,04±0,03	1,09±0,02
test group (n=30)	3,2±0,05	3,5±0,06	1,3±0,01	1,37±0,02

Note: $p<0,05$.

The increase of indicator values of external breathing in the 1st experimental group considerably influenced the speech breathing. The indicator of speech breathing in children of the 1st experimental group increased by 44% (40% at the beginning of a year and 84% at the end of the year), in the second group this indicator increased only by 9% (from 43 to 52%).

The obtained data prove that the vital capacity of lungs in children with a pseudobulbar dysarthria is much lower than in children with normal speech development, so lungs volume is insufficient for a speech expiration. Children should take additional breaths during speaking, breaths are convulsive, phonation and articulating are long and latent.

After additional correction by the end of the year in the 1st experimental group we can observe increase of indicator volumes of external breathing, which resulted in formation of long speech expiration enough for pronouncing the sintagma. The respiration became deeper and more rhythmical in comparison with indicators at the beginning of the year, when we observed shallow breath breath.

Besides, we can notice that prior the correction work, children with pseudobulbar dysarthria had расстройство of coordination between breathing and phonation, respiration was not regulated by the meaning content of the speech, children took in additional breaths.

After additional correction children in the 1st experimental group could differentiate nasal and oral respiration as a result of speech breathing buildup, the intensity and orientation of air stream increased which is important for children with pseudobulbar dysarthria.

One of the most important task in speech breathing formation is the development of diaphragmal breathing pattern.

It is known that when speech is developing, a specific breathing mechanism is being developed as well and also the “specific” movements of the diaphragm. While speaking the diaphragm repeatedly produces finely differentiated movements of inspiration and expiration. At every sound the diaphragm modulates certain amplitude and thereby duplicates speech articulation effects (lips, a tongue , pharynx, larynx). Central mechanisms clearly regulate and coordinate the movements of the diaphragm during speech expiration.

The breathing rhythm of preschool children is unstable - inspiration can be shorter than expiration or the same. Physical exertion or excitement can cause the increase of breathing frequency. Gradually with the age the child’s breathing becomes regular. Phrenic speech breathing is intensely developing in healthy children without speech pathology at the age of 4-6 years. Simple speech tasks are implemented based on a formed speech expiration.

The study showed that before correction work children with pseudobulbar dysarthria had clavicular type of breathing and after additional remedial work 70% of children of the 1st experimental group had diaphragmatic type of breathing as the most physiology and optimal for normal phonation.

While inspecting the condition of speech function at the beginning of the year it was established that the weakest side in children with pseudobulbar dysarthria was sensomotor: the phonemic perception, articulation, sounds pronunciation of the words. The study confirms that children with pseudobulbar dysarthria have phonetic and phonemic violations of the speech.

The analysis of results showed that in children of the first experimental group the indicator of the sound pronunciation increased by 21%. In the beginning of the year it was 50%, in the end of the year it increased up to 71%. In the second experimental group children had only logopedic therapy and the indicators of the sound pronunciation changed slightly (from 49% to 54%). The phonemic perception in the first experimental group also improved from 53% to 66%.

Inspecting phonemic perception and phonemic analysis children made less mistakes and could define a sound position in the word, the existence or absence of the sound. Inspection of articulation showed normalization of the tongue muscles, increase of accuracy. Indicators of sound-letter structure of the word improved: distortion of sounds, omission of consonants, replacement of sounds, confusion of sounds were less noted.

The comparative analysis showed that speech approbation in the first experimental group where logopedic therapy was followed by additional formation of speech breathing was more successful than the second experimental group where additional work on formation of speech breathing wasn't carried out.

Conclusion. The results obtained showed positive influence of additional correctional classes on the development of speech breathing in children with pseudobulbar dysarthria and on the whole respiratory system.

After correctional work we observed positive dynamics of indicators of speech breathing. Children learned how to differentiate nasal and oral breathing. The speech breathing became longer, the quantity of additional breaths considerably decreased during the speech. The number of the words said during a single expiration increased. The air stream became targeted which resulted in sounds pronunciation improvement.

Besides, we observed positive changes in speech motility: muscles tonus of articulators got back to normal, articulation moves became more accurate, exact, differentiated.

These results prove that additional correctional classes on the development of speech breathing together with logopedic treatment help to overcome pseudobulbar dysarthria.

Thus the study showed that formation of speech breathing with the use of respiratory techniques in children with a pseudobulbar dysarthria positively influences on the speech development of children, contributes to the efficiency of the correctional treatment of pseudobulbar dysarthria. Focused efforts on the development of speech breathing had positive impact on speech formation and the individuality of a child as a whole.

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EFFECT OF ACTIVATORS GROWTH ON THE PHYSIOLOGICAL AND BIOCHEMICAL PARAMETERS PLANT *TRITICUM AESTIVUM* L. CONDITIONS TOBOLSK DISTRICT

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Introduction

Growth and development of any vegetable organism is determined by a complex of environmental factors specific to a particular region [1]. Conditions of Siberia are characterized by a significant length of Siberia territory in the meridional direction, as well as difficult terrain with a wide variety of soil types, their different physicochemical properties, highly variable climatic conditions. Factors limiting the livelihoods of cultural Phytocenoses in northern latitudes are heterogeneity of weather and lack of mineral nutrients in the soil. In this aspect, there is actual the application of physiologically active compounds (FAC) on soft spring wheat plants for minimizing the action of stress factors and activation of biochemical processes in complex environmental conditions.

The study of the chemical elements Cu, Mn, Pb, Sr in the composition of the soil and plants is significant. According to chemical nomenclature these elements are particularly necessary for normal growth and development of the plant organism physiological processes. Furthermore , they can belong to the group of heavy metals if there is large content of them in the soil, and to the group of macro- and microelements if the concentrations are optimal [2, 3]. The availability of these elements to plants of spring wheat in the conditions of the northern territories, and the impact on their amount in vegetative organs during the action of FAC have been studied not enough.

Materials and methods

Field studies were carried out in 2009-2011 at the experimental plot of Small Zorkaltsev village, the Tobolsk district, Tyumen region, which is located in accordance with agro-climatic zoning in the sub-taiga zone – 58°25'00" N, 68°24'00" east longitude. Field studies packing was carried out according to the method developed by B.A. Dospehov [4]. Total area of the plots – 1 m^2, four-order repeatability, the number of seeds sown per plot – 650, row spacing – 15 cm, seed depth – 5-6 cm.

Data on meteorological conditions during the years of study and the average annual values were obtained from the "United hydro meteorological stations" of the Tobolsk region.

Type of the soil – cultivated residual-carbonate soddy small podzolic soil on ancient alluvial deposits with a wavy surface due to plowing furrows. No signs of erosion has been revealed, profile character – simple, unstrained. Textural and structural heterogeneity of the profile were evidenced by – interlayers of heavy (to the horizon B) and light (to the horizon C) granulometric composition. No signs of gleyzation, carbonate content – weak. Profile's power is of 110 cm. t Soil profile structure shall be as follows: Ap (0-38 cm), E (38-48 cm), U (48-76 cm), Bh, f, al (76-93 cm), C (93-110 cm).

Laboratory studies were carried out on the basis of an accredited laboratory "Ecotoxicology" of Tobolsk complex scientific station, Ural Branch of Russian Academy of Sciences. Selection of soil samples for physico-chemical studies, determination of chemical elements was carried out in accordance with GOST requirements, adopted in the Russian Federation.

In order to determine the moisture content and physical properties of soil, the samples were taken with the help of soil sampling tube in May (15.05.2009-2011), June (15.06.2009, 24.06.2010, 26.06.2011), July (17.07.2009-2011), August (15.08.2009-2011), September (12.09.2009, 19.09.2010, 17.09.2011), during a relatively dry period of the month – on the days without precipitation. Samples of soil for chemical analysis were selected twice each year during the growing season (June 15 and August 15 – combined sample). Sampling was carried out at 30 locations at the plow-depth of 30 cm; the experimental plot was divided lengthwise into three zones, 10 samples-each.

Determined: pH of the aqueous extract (18-channel instrument Anion-7050), the dry residue, the amount of anions, mg·eq – Cl^-, SO_4^{2-}, HCO_3^-, cations, mg·eq – Mg^{2+}, Ca^{2+}, Na^++K^+ (calculation method), nutrients, mg/kg – NH_4^+, NO_2^-, NO_3^-, $H_2PO_4^-$ and HPO_4, humus, % – according to methods developed by I.V. Tyurin and modified by V.N. Simakov. Soil density, solid phase density, porosity, aeration or air supply - were determined according to methods developed by Kaczynski.

Gross and fractional content of chemical elements in the soil was determined by atomic emission methods on inductively coupled plasma spectrometer OPTIMA-7000 DV (PerkinElmer) and repeated twice. Sequential fractionation of chemical elements was performed using the Sposito method.

We have studied the effect of pre-sowing treatment of spring wheat varieties, such as - Annette, Irene, Ricks, Icarus with physiologically active compounds (8 hours exposure) on the elemental composition of the vegetative mass and grain, biological absorption coefficients, pigment flag leaf complex. Experimental compounds concentration was as follows: zircon (a mixture of hydroxycinnamic acids in alcohol – 0.1 mg/cm^3) – 4.98×10^{-5} g/cm^3, and appin (24-epibrassinolide) – 1.25×10^{-5} g/cm^3.

Vegetable samples were ashed in a mixture of ultrapure concentrated HNO_3 (acid cleaning BSB-939-IR) and concentrated H_2O_2 in microwave decomposition pressure system Speedwave MWS-2 (made in Germany BERGHOF Products + Instruments Gmb H), using individually selected mode.

During assessing the content of chemical elements in the soil the maximum permissible concentration (PDK) [5] and normalization scale of elements concentrations in soils [6] were used. Conditional landmark World clarke soils [7] were taken as a background. Calculation and evaluation of chemical concentrations in soil (Kc) was made according to methods developed by Y.A. Ozersky [8], the coefficient of biological absorption of chemical elements from the soil (PCU) – was made according to A.I. Perelman [9].

Content of photosynthetic pigments in the flag leaves cells of spring wheat during the heading stage was determined with a spectrophotometer UNICO-1200, using the electronic program Hlorof. The results were processed statistically.

Results and Discussion

Meteorological conditions during the period of studies were characterized by high variability, both over years and during the growing season. In general, they reflected the main features of the cold climate zones of the sub-taiga area of the Tyumen region: lack or surplus of moisture, the frequency of high summer temperatures with sharp declines and fluctuations even during one day.

Average daily air temperature ranged from 10.8 to 17.2 ^{0}C in 2009, from 10.4 to 17.5 ^{0}C – in 2010, from 10.9 to 18.0 ^{0}C - in 2011. The maximum average daily temperature recorded in 2011 was 18.0 ^{0}C (June) and the minimum – 10.9 ^{0}C (May). May 2009, 2010 and 2011 was particularly hot and differed from normal at 1.1 ^{0}C. The average daily temperature in August and September 2009 and 2011 exceeded the average annual values at 0.7 and 2.5 ^{0}C respectively. The active temperatures amount was as follows: in 2009 – 1977.4 ^{0}C, in 2010 – 1855.4 ^{0}C, in 2011 – 1925.3 ^{0}C (the average excess over normal 219 ^{0}C).

The amount of precipitation during the growing season in 2009 (311.3 mm) and 2011 (358.2 mm) was close to normal. Vegetation period in 2010 can be characterized as arid, because the precipitation amount was 221.9 mm, which is below normal at 73.1 mm. Distribution of rainfall during the growing season was uneven, and dry periods observed during the ontogeny of plants were as follows: 2010 – July (19.9 mm), 2011 – May (8.5 mm).

May of 2009-2011 is characterized by low soil moisture. Critically low moisture content in the soil was noted in 2011 (3.4%). In June, the soil moisture content was as follows: 11.7% – in 2009, 13.6% – in 2010, 39.4% – in 2011. Accordingly, in 2011 the soil moisture content was most favorable for amicable and full germination, plant growth and development. June 2009 and 2010 was critical to the soil moisture content, which affected the germination and survival of plants.

Water consumption is especially important during the phase of leaf-tube formation and heading stage, i.e. through the period of reproductive organs formation (July). 2010 was the most difficult for wheat plants, with its dry season, low rainfall and high temperatures, the humidity level was – 6.8%. August of 2011 was also less favorable for the crop due to the soil moisture content at a level of 9.0%. This is called the milk phase of grains when wheat consumes 20-30% of the total moisture in the growing season. September is characterized by warm air temperatures, moderately favorable rainfall during the growing season and optimum soil moisture. All this facts are contributed to the full maturation of the grain in the ear.

Average data for the years of soil density research were as follows: 0.188±0.0001 cm^3 (May) – 0.899±0.055 g/cm^3 (June). Such substrate density is favorable for the growth and development of spring wheat within the area. Dense phase of the soil is on the following level: 1.018±0.000 g/cm^3 (August) – 1.117±0.000 g/cm^3 (July). The soil constitution is crumbly and loose, it is well–structure, but structural units are poorly cemented with each other. The data indicates that the soil contents mineral inclusions and organic substances in sufficient quantities.

Porosity and soil aeration were at a high level. Overall performance has been close to 100% of the total porosity and aeration. Maximum porosity value was fixed in May – 91.2% minimum value was fixed in July – 69.9%. The aeration ranged from 36.3% (July) to 88.4% (May). Obviously, these results are related to the amount of moisture in the soil and precipitation, which has occurred during this period.

The soil of slightly-alkaline type is determined by the following factors: residual carbonates, calcium and magnesium ions in the cations composition, low content of hydrocarbons, long organic fertilizers. Dry residue – an indicator of soil salinity – is 0.35 %. Nitrogen is excreted in three forms: ammonium (9.30±3.42 mg/kg), nitrate (8.87±1.79 mg/kg), nitrite (8.77±2.31 mg/kg) – the average content in the soil was fixed during 2009-2011. Phosphorus is found in large quantities and is available for plants mobile forms $H_2PO_4^-$ and HPO_4^- (268.7±98.65 mg/kg). Humus content in the soil is low: 1.9% – in 2009, 1.5% – in 2010 and 1.8% – in 2011.

Uptake and transport of chemicals in the soil-plant system and in plant bodies largely depends on a number of factors; environmental pH, calcium and phosphorus content are very important, as well as the ratio of some chemical elements in the soil solution. The elements shortfall in plants is mostly caused by the forms in which they are presented in the soil, i.e. the components solubility degree, and the way they are linked to solid and mineral phase of soil. There is often a deficiency of elements in soils with high pH values, soils containing carbonates and soils with low organic matter content [10].

According to the results of statistical data processing and annual dynamics analysis, it has been revealed that the number of related forms for Cu in the soil remains relatively constant and is within experimental error. There has been a slight increase in the number of Sr; the maximum was recorded in 2011. There has been a decrease of Mn related forms – 68.57-59.22 mg/kg and Pb – 8.77-5.63 mg/kg (Tab. 1).

Table 1

Contents of Cu, Mn, Pb, Sr in residual-carbonate soddy small podzolic soil of the Tobolsk region (2009-2011), mg/kg

Elements	Gross	Connected forms	Mobile forms	Clarke	PDK
Cu	0.99±0.19	0.57±0.0001	0.42±0.0001	20	60
Mn	96.65±1.97	64.98±2.90	31.67±2.70	850	1500
Pb	25.71±1.64	6.74±1.01	18.97±0.0001	10	100
Sr	1.86±0.12	1.04±0.000	0.85±0.0001	300	500

The mobile forms of elements (capable of migration and actively participating in biochemical processes in the soil-plant) have been defined and separated into fractions (exchangeable, organic, carbonate, oxide, residual, water-soluble) in order to identify the role of these chemicals in the plant organism.

Dominant factions of the lead are organic and exchangeable – 28.7% and 26.9%, respectively (of the total number of mobile forms). The content of water-soluble forms reaches 20.4%. Lead is associated with various soil components (mineral components, hydroxides and oxides, colloids) and organic substance in almost equal proportions and forms stable complexes with these substances. These factional compounds play major role in plant nutrition. Water-soluble forms are the most mobile and thus potentially more transportable, since they transfer surface and ground waters and can be easily involved in biogeochemical migration, available for plants and participate in their nutrition process. Exchangeable and water-soluble forms are direct nutrition reserve of plants. The highest strontium content in the soil revealed in organic (27.1%) and exchangeable (21.2%) fractions. The predominant manganese proportion is presented in form of stable complexes with organic matter (60.6%) and only 16.7% referrers to exchangeable form. The copper content in soil associated with carbonates and bicarbonates has been revealed in one faction – carbonate (100%).

It has been established that Mn, Pb, Sr elements can be found in varying amounts in all fractions under study in bound and movable forms, representing its gross structure. Most of the elements revealed are in organic, exchangeable and water-soluble forms, being a direct source of plants nutrition. Nature and form of the elements migration capacity are determined by the properties of the element itself, its reactivity, connections pattern and migration conditions – temperature, humidity, pH, anion-cation ratio, biogenic compounds and organic matter in the soil.

As measured by the chemicals concentration in soil, it has been revealed that compared to the conventional world Clarke, Pb can be characterized by high content in the soil, evidencing its accumulation, but not above the PDK level. Chemical concentration coefficient (K_c) has reached – 2.62. Element high concentration may respond to geochemical characteristics of parent rocks. There is a clark deficiency for Mn, Sr, Cu and their critically low content in the soil (K_s = 0.11, 0.006, 0.04, respectively) suggests the elements removal (this may be due to soil leaching regime).

Content of these elements in the soil is very important for plants, especially during the cultural phytocenosis. The chlorophyll content in the plant is increased under the influence of copper, enhancing the photosynthesis. Manganese, as well as copper, plays an important role in the redox reactions of the plant. It is a part of enzymes which take part in these processes. Element are involved in the photosynthesis reaction, respiration, carbohydrate and protein metabolism. Strontium is also very important for metabolic processes, formation and growth of chloroplasts and is a substitute for calcium. Lead, in very small quantities, is also important for the plant body as a trace element and its role is not fully understood (http://enc.sci-lib.com).

The ratio of elements content in the plants ash to their content in soil has been used to assess the plants extraction degree of chemical elements from soil and accumulation of the biomass. Preplanting zircon and appin treatment had a positive impact on the elements content in plants and in most cases helped to increase the biological absorption coefficients. Perhaps, this is due to an increase of the endogenous level of phytohormones in plant and biochemical processes strengthening, which contributed to extraction of elements from the soil solution.

The content of Mn in Annette variety has increased in plants vegetative mass and grains during zircon and appin treatment. In contrast to the controls - Pb has been detected. Cu content under the decreased by 19.5% influence of these specimens. Sr content has increased after appin treatment of seeds.

Icarus variety has demonstrated and increase in Cu and Mn content in experimental variants of plants compared to the controls. Strontium has been revealed in grains - in its minimum amount and in the vegetal mass – in its maximum amount.

The Iren variety turned to be the most responsive to zircon and appin treatment of seeds. Significant increase has been obtained in vegetative parts of the plant and grain Cu. The increase of Mn content in the grain has been observed during the appin treatments (difference with controls – 2.78 mg/kg). Conent of Sr has been increased to 0.13 mg/kg (zircon) and to 0.15 mg/kg (appin) under the control value – 0.12 mg/kg. Ricks variety reaction on growth regulators characterized by increase of Cu content in plants relative to controls in the experimental variants and Sr – in zircon options (0.10 and 3.14 mg/kg, respectively).

Chemical elements from the soil solution under the FAS influence have been absorbed with different selective ability. Copper, manganese and strontium, according to the CBI, are relatively easily absorbed by the plant organs, whereas lead is poorly absorbed by the plants. Biological absorption coefficient in the Sr soil-plant system refers to the strong accumulation elements in vegetative organs and secondary capture in grain, Cu – is an energetic accumulation element; Mn and Pb – are the weak grip elements.

Biochemical adaptations are reflected in the physiological processes of the plant organism [11]. Photosynthesis – is the process of formation of organic matter from inorganic compounds, which plays an important role in plants energy transformation and adaptive responses to rapidly changing environment.

Photosynthetic pigments (*a*, *b* chlorophylls and carotenoids) are main pigments of photosynthesis, which ensure absorption and storage of solar energy. Quantitative content, changing their ration within leaves – are important and sensitive indicators of physiological state of plants and photosynthetic apparatus, directional selectivity of adaptive responses when plants are exposed to stress conditions [12]. Decrease of leaves chlorophyll content leads to the proportion increase of b chlorophyll auxiliary pigments or carotenoids, which may be regarded as an adaptive response of the assimilation apparatus [13, 14].

In this aspect, the studies shall be focused on the pigment complex in flag plant leaves, as it is a long-functional complex, which occurs during the whole growing season and is the main donor that supplies assimilates to the ear and the final product – the seeds [15]. This is confirmed by a positive correlation between the total content of photosynthetic pigments in the flag leaf cells and content of chemical elements in the vegetative mass of plants: copper – r = 0.76; manganese – r = 0.63; strontium – r = 0.12.

The ratio of photosynthetic pigments in the flag leaf cells of the experimental is as follows: *a* chlorophyll (Chl. a) > carotenoids > *b* chlorophyll (Chl. b). It is represented in figure 1, as exemplified by controls, since under the FAS impact this feature has not been changed.

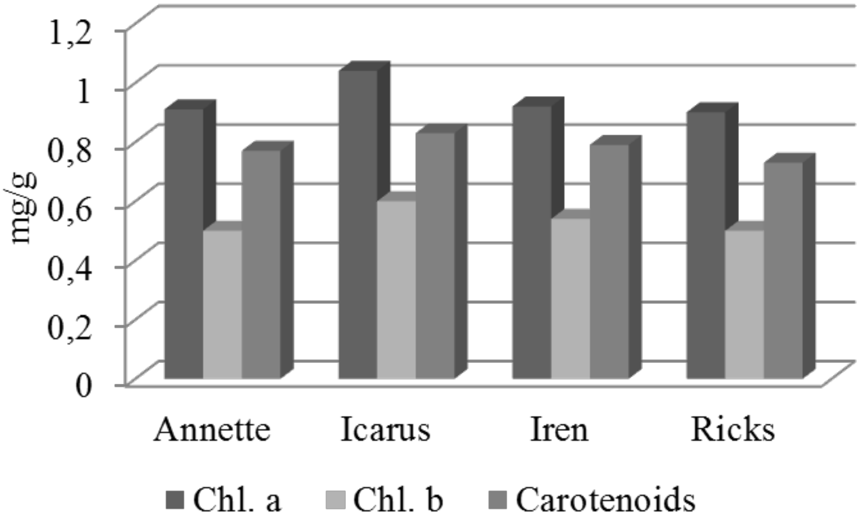

Fig. 1. The ratio of photosynthetic pigments in the flag leaves cells of spring wheat in controls

Significant increase obtained in the prototypes with respect to the pigments content under the influence of zircon, on average, reaches 49.1% and appin increase within the range of 22.1% compared to the controls. Data analysis revealed differentiation of content and ratios of photosynthetic pigments in flag plant leaves, depending on the used adjuster (Table 3).

Table 3

Content and the ratio of photosynthetic pigments in flag leaves of spring wheat during its heading stage under the FAS preliminary treatment (mg/g)

Grade	Experience option	A+B	C	A+B+C	(A+B) : C	(A : B)
Annette	Control	1,42	0,77	2,19	1,84	1,76
	Zircon	2,16	1,16	3,32	1,86	2,38
	Appin	1,78	0,93	2,71	1,91	1,97
Icarus	Control	1,65	0,83	2,48	1,99	1,73
	Zircon	2,18	1,16	3,34	1,88	2,39
	Appin	1,92	0,95	2,87	2,02	1,85
Iren	Control	1,46	0,79	2,25	1,85	1,70
	Zircon	2,19	1,25	3,44	1,75	2,13
	Appin	2,00	1,00	3,00	2,00	2,51
Ricks	Control	1,40	0,73	2,13	1,23	0,80
	Zircon	2,20	1,18	3,38	1,86	2,33
	Appin	1,61	0,84	2,45	1,92	1,56

Note: (A+B) – *a* chlorophyll + *b* chlorophyll; (C) – carotenoids, (A+B+C) – chlorophylls + carotenoids; (A+B) : C – the ratio «chlorophylls : carotenoids», (A : B) – the ratio of «*a* chlorophyll: *b* chlorophyll»; statistically significant results.

The average ratio of *a* and *b* chlorophylls increased as follows: 60.3% zircon impact and 34.6% – appin impact respectively, compared to the controls. Quantity content of carotenoids in the plant leaves has grown during the experiment from 19.2

to 52.6%. No significant differences in intervarietal reaction was observed. We have reordered the accumulation of photosynthetic pigments in the flag leaf during zircon processing within the range from 0.86 mg/g (Icarus) to 1.25 mg/g (Ricks), appin – 0.32 mg/g (Ricks) to 0.75 mg/g (Iren). Taking into account this fact, we can conclude that there is a specific response within the variety of physiologically active compounds influence. As was previously noted, the Ricks varieties had the most responsive effect on zircon, which was evidenced by the maximum total accumulation of pigments in the flag leaves cells of the varieties under study. Presowing impact of appin has contributed to a minimum increase of the chlorophylls and carotenoids concentration compared to the controls in this variety class. It is clearly that, in this case a drug concentration its physiological effects on plants shall be important. The specificity of impact caused by FAS of different chemical compounds classes shall be considered during the experiments.

During assessing the ratio «chlorophylls : carotenoids» it was noted that the appin impact manifested itself in greater extent (6.5% – the difference under zircon treatment experience), 13.3% – the difference under the controls. The maximum values of the varieties against «*a* chlorophyll : *b* chlorophyll» ratio has also been received under zircon treatment options. The exception was noted in Iren varieties, similar values within the range of – 2.13 and 2.51 mg/g (zircon and appin) have been obtain during the experiments.

The impact of physiologically active compounds on varieties did not alter the «ratio of pigments» in the flag leafs compared to controls, however it has only increased their concentration in the leaves.

In general, the concentration of zircon within the range of 4.98×10^{-5} g/cm^3 helped to maximize the carotenoids and *a*, *b* chlorophylls content and in the soft spring wheat. It can be concluded that daily impact of FAS on plants is capable of minimizing the impact of critical soil and climatic conditions, causing adaptive reactions, which are expressed by increase of carotenoids and *a*, *b* chlorophylls content.

It is known that the main function of chlorophyll is to absorb and transmit the energy. The study shows that the average content of a chlorophyll in the control and experimental variants of wheat reaches 67.0% and is a part of the light-harvesting complexes (SSC), acting as an antenna, which transmits the energy to the photosystem reaction center. The most active energy transmission flows from long wave *a* chlorophyll, which is the main component of the reaction centers; *b* chlorophyll – is an auxiliary pigment, with an absorption maximum at a short wavelength. Carotenoids absorb the light at those wavelengths, that are least absorbed by chlorophyll, on average, 36.0% of such pigments are included in the light harvesting complexes.

The effect of physiologically active compounds used in the experiment, has contributed to the *a* chlorophyll preservation during the vegetation period by increasing and maintaining the certain level of carotenoids. The treatment method used allows to keep the pool carotenoids in line with the growth of the *a* chlorophyll pool, thereby increasing its protective function and the *b* chlorophyll pool growth compared to the control variant, due to the lack of photo-oxidation of green pigment.

Therefore, the carotenoids have performed the light-shielding function along with the light-harvesting function; the light-shielding function protects the chlorophylls from photo-oxidation by reactive oxygen species. This is confirmed by the links between photosynthetic pigments with normally distributed traits. Differences in responses between the varieties have been observed. Mostly, it is strong positive significant correlation (Fig. 2).

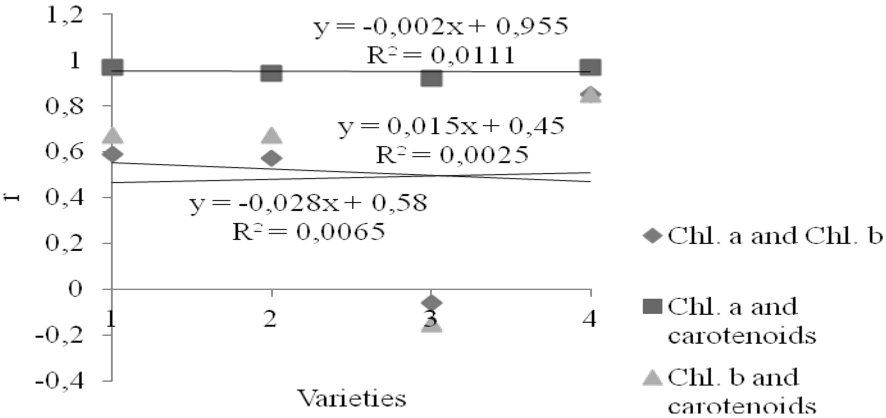

Fig. 2. Spearman correlation between photosynthetic pigments in the flag leaf cells during the heading stage of soft spring wheat. Varieties: 1 – Annette; 2 – Icarus; 3 – Iren; 4 –Ricks. Chl. *a* – *a* chlorophyll, Chl. *b* – *b* chlorophyll.

Analysis of variance revealed the exposure of influence factors to the variability of the pigment amount in plant leaves. It has been revealed that the percentage impact on the variability of cells chlorophyll content is 3.8%, the share of FAS – 96.2%. The varieties affect the variability of carotenoids amount within the variation share of 5.6%, FAS – 94.4%. Accumulation of flag-leaf pigments occurs mainly due to the effect of compounds (96.9%). The increase in pigments accumulation is determined by the profiled reaction within a given cultural variety, only by 3.1%.

Thus, the use of growth regulators can influence the chemical composition of soft spring wheat and the final product – grain, by enhancing and strengthening the internal regulation mechanisms of selective absorption of chemical elements from the soil solution depending of the environment, as well as morphological and physiological processes of the plant organism.

Conclusions

1. There is determined that cultivated residual-carbonate soddy small podzolic soil on ancient alluvial deposits of the sub-taiga area of the Tyumen region refers to basic-type soils and its cationic and anionic composition, dry residues, density and porosity creates conditions for spring wheat growth on a favorable level.

2. During some plants phenological phases the soil moisture content reaches its critical level: germination and tillering in 2009 and 2010 (11.7 and 13.6%, respectively), stem elongation and earing in 2010 (6.8%), milky ripeness of grains in 2011 (9.0%).

3. Pigment composition of spring-wheat flag leaves cells, the chemical composition of the vegetative organs and grain varies significantly under the

influence of physiologically active substances, taking into account their concentration, methods of application and variety-specific reaction to their impact.

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INFLUENCE OF ANTHROPOGENIC FACTORS AT THE MORPHO-BIOLOGICAL VARIABILITY SOME PLANT SPECIES

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Abstract. Defined accumulating capacity P. major L. and P. media L. for heavy metals (Cu, Zn, Pb). Studied plasticity leading morphometric parameters of the autonomic sphere age stages of Plantago major L. and Plantago media L. depending on anthropogenic pressures and raznogodichnye fluctuations of these parameters. Set, the correlation coefficient between the main morphological features as P. major L., and P. media L.

Keywords: Plantago major L., Plantago media L., heavy metals, morphometric parameters, ontogenesis, correlation coefficient.

Introduction. The analysis of the background of the environment shows a tendency of accumulation in it a number of chemical compounds that negatively affect biological systems. Anthropogenic pollution in the city of Tobolsk district and from year to year increases, there is a degradation of natural ecosystems and reduced species diversity of plants [1].

Based on the foregoing, in the region of oil refining and petrochemistry studies changes occurring in plant populations exposed to of various pollution in the system: soil - plant, are perspective theoretical and applied aspects.

Of plant objects convenient to use the coenopopulations plantain (*Plantago major* L.) and plantain medium (*Plantago media* L.) as anthropotolerance species with a wide geographic distribution and mainly in seed reproduction [2].

On the basis of the practical relevance of plantains and their adaptability to the strong anthropogenic stress conditions in urban and industrial environment and an understanding of their biology, ontogenesis and morphogenesis is important for bioindicative research. *Plantago major* L. and *Plantago media* L. may be sensitive markers to assess the quality of the human environment. [3]

At step field research were originally identified model landscaping sections with different anthropogenic pressure, which are investigated the parameters of priority pollutants. Identified the content (Cu, Zn, Pb) in the soil and in plants, and P. major L. P. media L [4].

Model station number 1 - the eastern part of the city, adjacent to an industrial area TPCP (Tobolsk Petrochemical Plant); model section number 2 - side of the road, adjacent to an industrial area TCDP (Tobolsk City Dairy Plant) model section number 3 - fringe mixed forest near the village Vinokourovo (control); model section number 4 - the northern part of the city, vacant lot adjacent to an industrial area TCPP (Tobolsk concrete products plant); model section number 5 - side of the road, the southern part of town near the Nikolsky´s elevation; model section number 6 - estate №9, with a modern, dense high-rise buildings urban development.

In the soil was analyzed the content of heavy metals (Zn, Cu, Pb), and mineral oil. In soil, the observed sample areas prone anthropogenic effects, heavy metals ranged zinc from 3,09 to 80,10 mg / kg (control 2,06) Copper 0,28 to 1,50 (0,3 control) , lead from 1,20 to 7,10 (control 1,02). Oil content ranged from 84,21 to 410,60 mg / kg (control 33,40).

Heavy metals accumulate not only soil, but also in plants. Through the chemical analysis of the ash of plant and *P. major* L. *P. media* L. detected degree of accumulation of analyzed chemical elements (Fig. 1).

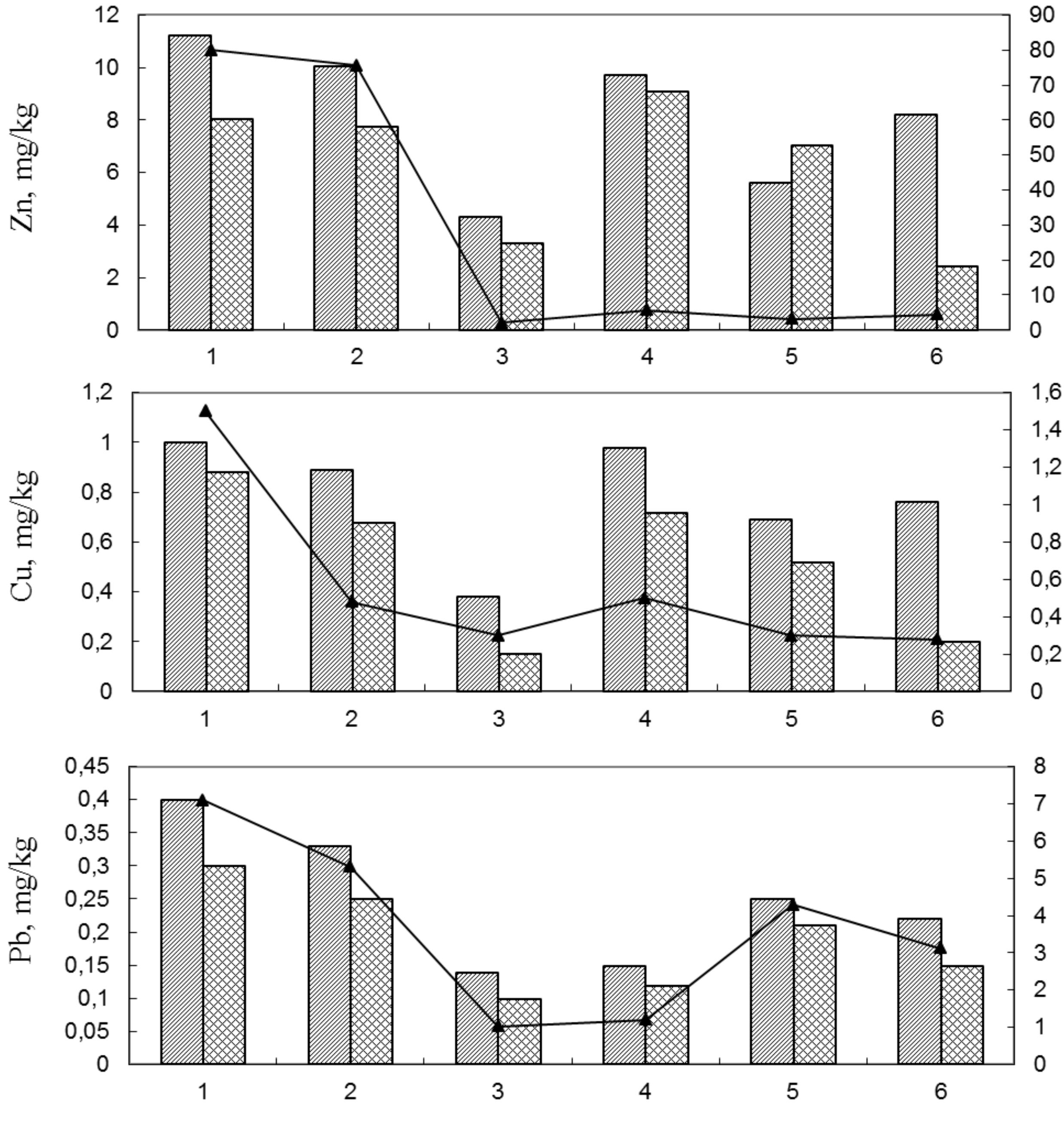

Fig. 1 Removal of heavy metals by plants plantains two types, depending on their content in soils in different areas. Legend: – *P. major* L.; – *P. media* L.; - soil

The zinc content in the plants of the most contaminated areas varied from 5,60 to 11,20 mg / kg (*P. major* L.) and from 2,04 to 9,05 mg / kg (*P. media* L.). Accumulation of Cu ranged from *P. major* L. 0,69 to 1,00 mg / kg, while P. media L. 0,20 to 0,88 mg / kg. The lead content in P. major L. also significantly higher than *P. media* L.

According to the analysis of the soil studied sections are arranged in the following order with the increasing anthropogenic pressures, including the content of heavy metals in plants: Section №3 (control) → section №6 → section №5 → section №4 → section №2 → section №1.

Thus, the examined plants differ in their ability to accumulate heavy metals. In all cases, *Plantago major* L. accumulate considerably more heavy metals in comparison with *Plantago media* L., but the storage capacity of the plant species examined appears to maximize copper (three studied metals) and minimum - with respect to the lead.

There was a high positive correlation between the content of heavy metals in soil and plants (P. major L. r = 0,58-0,99; P. media L. r = 0,48-0,98).

Variability of morphological characters is unidirectional in both species. In juvenile (j), immature (im) and virginal (v) conditions morphological traits P. major L. and P. media L. at all six sites not significantly different, which is clearly can be represented graphically. As an example, in P. major L. Fig. 2 shows the results of morphometric measurements of the most labile, ie important aspect at bioindication, morphometric parameters.

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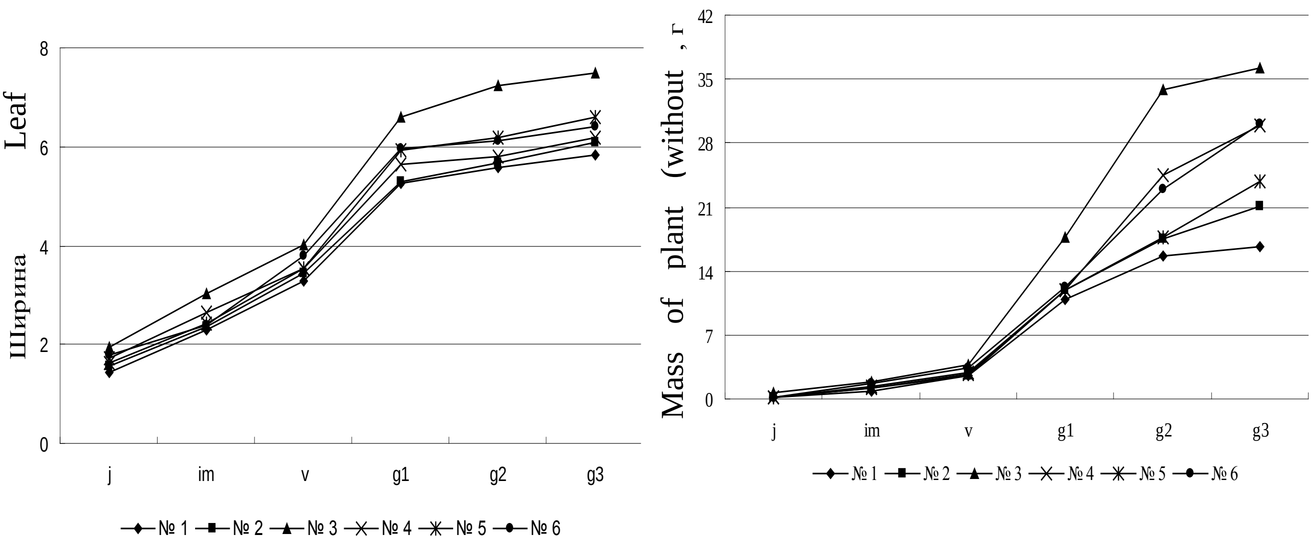

Morphometric parameters cenopopulations *P. major* L. and *P. media* L. differ high enough variation. Intensive anthropogenic impact results in substantial decrease medium-sized of instances *P. major* L. and *P. media* L., which is reflected in all the morphometric parameters.

Establishing the correlation coefficient between the basic morphological characters as *P. major* L., and *P. media* L. suggests that the dependence between the features is much weaker with increasing anthropogenic pressures. Thus, the mass of the aerial parts of plants *P. major* L. and several other features in the most contaminated sites following values: mass leaves (r = 0,30-0,90), the control (r =

0,52-0,95) ; the weight of one sheet (r = 0,54-0,98), the control (r = 0,65-0,99); leaf width (r = 0,01-0,28), the control (r = 0,02-0,51); number of generative shoots (r = 0,01-0,09), control (r = 0,10-0,79), in *P. media* L.accordingly: r = 0,24-0,89, control (r = 0,29-0,90); r = 0,20-0,86, control (r = 0,29-0,91); r = 0,02-0,19, control (r = 0,02-0,38); r = 0,01-0,08, control (r = 0,02-0,19) and others.

From these results we can conclude that industrial pollution sample areas has significant influence on the morphological parameters of the observed species. Greatest plasticity exhibit such characteristics as length, width, and aboveground plant mass and the mass of the root system, and morphometric parameters more variable on ontogeny g1, g2, g3. Thus, these parameters may morphometrical greatest diagnostic value when evaluating the quality of the environment.

The magnitude of the correlation coefficients, which determines the relationship of the analyzed characteristics, is also depending on the changing environmental factors, significantly weakening the amplification stressful situation.

Conclusion. There was a high positive correlation between the content of heavy metals in soil and plants (P. major L. r = 0,58-0,99; P. media L. r = 0,48-0,98). Consistent with this, a number of the named sites regularly increases the concentration of heavy metals (Cu, Zn, Pb) in plants *P. major* L. and *P. media* L.

Morphometric parameters cenopopulations *P. major* L. and *P. media* L. differ high enough variation. Intensive anthropogenic impact results in substantial decrease medium-sized of instances *P. major* L. and *P. media* L., which is reflected in all the morphometric parameters.

Analysis of the correlation between the basic morphometric features *P. major* L. and *P. media* L. suggests that the relationship between them is much weaker with increasing anthropogenic pressures. Thus, the mass of the aerial parts of plants *P. major* L. and several other features in the most contaminated sites following values: mass leaves (r = 0,30-0,90), the control (r = 0,52-0,95) ; the weight of one sheet (r = 0,54-0,98), the control (r = 0,65-0,99); leaf width (r = 0,01-0,28), the control (r = 0,02-0,51); by the generative shoots (r = 0,01-0,09), the control (r = 0,10-0,79) et al. from P. media L.accordingly: r = 0,24-0,89, control (r = 0,29-0,90); r = 0,20-0,86, control (r = 0,29-0,91); r = 0,02-0,19, control (r = 0,02-0,38); r = 0,01-0,08, control (r = 0,02-0,19) and others.

The most promising for bioindicative research should recognize morphometric parameters of *P. major* L. and *P. media L.* on ontogeny g1, g2, g3. For all morphometric parameters bioindicatelly value exceeds the P. major L. P. media L. As for *P. major* L., and *P. media* L. identified patterns hold, and in the aspect of by years.

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INFLUENCE OF AGRARIAN SYSTEMS ON THE MICROBIOLOGICAL TRANSFORMATION OF ORGANIC MATTER IN TYPICAL CHERNOZEM UNDER SUGAR BEET GROWING

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Was investigated influence of agrarian systems and methods of soil tillage on the number of basic physiological groups of microorganisms which participate in the transformation of organic matter of typical chernozem under sugar beet growing. Was defined the direction of microbiological processes in soil under different agricultural applications.

Keywords: microorganisms, agrarian systems, soil tillage, sugar beet, typical chernozem.

Introduction. Ukraine – one of the states that has a huge reserve of fertile soil, which is one of the most valuable treasures of the world. Soil fertility is forming by a complex system of environmental factors. It is including the leading role of biochemical activity of microorganisms, which provides circulation and transformation of matter and energy of soil. Soil microbial communities involved in the formation of important soil properties that determine its taxonomic characteristics: direction, intensity and type of soil formation processes, are caused organic properties – ensures its functioning as a biochemical filter, assist with biodynamic balance of synthesis and destruction of organic matter and nutrient availability to plants [1-5].

Growing human pressure affects the properties of the soil, impairing their agrochemical and biological indexes. Thus, under the influence of anthropogenic factors (doses, forms and norms of fertilizers, soil types, the permanent cultivation of crops and the use of crop rotation, the use of plant protection products, plant growth regulators, pesticides, etc.) is changing complex of microbiological indicators, it is occur the qualitative and quantitative changes in the structure and biodiversity of various physiological groups of microorganisms, which are not always positive for soil [2, 4].

Therefore, the study of patterns of microbial function and direction of microbiological processes in the soil will allow to forecast the possible ways to change the soil under the influence of agrosystems, to get the necessary information for adjusting used farming systems, which in turn can ensure the preservation and restoration of soil fertility and high productivity of agro-ecosystems in general [6].

The purpose of research – to determine the effect of agrarian systems and soil tillage on the number of basic physiological groups of microorganisms involved in the transformation of organic matters and to identify common patterns of directional microbial transformation processes of organic matter in the soil.

Materials and methods of research. The study of soil microbial communities was carried out on the stationary field experiment of Agriculture and Herbology Department of Agronomy Research Station of NUBiP of Ukraine in the forest-steppe in grain and beet rotation. Soil is chernozem typical medium loamy, humus content in the plow layer is 4%, nitrogen – 4.5 mg per 100 g of soil, mobile phosphorus – 4.5-5.5 mg per 100 g of soil, exchangeable potassium – 10 mg 100 g of soil. Selection of soil samples was carried out from the top of the arable horizon (0-25 cm) before sugar beet *(Beta vulgaris)* harvesting.

The scheme of experiment is provided to study two factors: agrarian systems and measures of soil tillage: 1) industrial agrarian system – (control) – (applying $N_{92}P_{100}K_{108}$ fertilizer, 12 tons of manure per hectare of crop rotation) + surface tillage (cultivation of disk tools to a depth of 8-10 cm for all crops rotation), 2) industrial system + differentiated tillage – (hold 6 times plowing on different depth, 2 times the surface tillage under winter wheat after peas and corn silage and 1 again – tillage under barley for crop rotation), 3) ecological agrarian system (application of $N_{46}P_{49}K_{55}$ fertilizer, 24 tons of organic fertilizer (12 tons of manure, 6 tons of non-commercial harvest (straw), 6 tons of green manure crop mass (radish)) per hectare of crop rotation + surface tillage, 4) ecological agrarian system + differentiated tillage, 5) biological agrarian system (24 tons of organic fertilizer) + surface tillage, 6) biological agrarian system + differentiated tillage [7].

The number of basic physiological groups of microorganisms was determined by inoculation of soil suspensions on solid nutrient medium [8]. In meat-pepton agar into account the number of bacteria that metabolize nitrogen of organic compounds, on starch-ammonia agar – the number of bacteria and streptomycetes that assimilate mineral forms of nitrogen, in the Zvyagintsev – the total number of bacteria, on Czapek – micromycetes, on Ashby – olihonitrofilnic microorganisms, on Menkina – phosphorus mobilization bacteria, on Hetchynson – tselyulozolitic bacteria, on soil agar – pedotrophic, on starvation agar – olihotrophic microorganisms. The direction of microbiological processes in the soil was determined by methods of K. Andreyuk. H.Iutynska et al [5]. The moisture of soil was determined by thermostatic-weight method [9].

Results. The number of the microorganisms, even for short periods of phenophase may vary change under influence of dynamics of soil moisture, temperature, composition of vegetation [10].

Microbiological studies of soil under crops of sugar beet, showed that the correlation and number of different physiological groups of soil microorganisms depends on the dose, type of fertilizer and soil tillage.

The largest group of microorganisms was representative’s bacterial microflora, pedotrophes, olihotrophes and microorganisms that absorb mineral nitrogen (Fig. 1). Thus, the number of bacteria in the investigated soil samples ranged from 6.35 to 8.93 million CFU / 1 g a.d.s (absolutely dry soil). Increase the quantity of bacterial microflora on the 16-41% observed in the application of surface tillage compared with the differentiated tillage, because plant residues and fertilizer are localized in the upper soil layer. Number pedotrophes that intensive developing on depleted soils, due to their trophic specificity and lack of competition, the highest was in the application of ecological agrarian system in conjunction with surface tillage (10.53 million), the lowest is ecological system and differentiated tillage (6, 44 million). Application of industrial agrarian system and surface tillage are contributed to the increase of oligotrophic microorganisms to 8.35 million, compared with other agrosystems (6,27-7,14 m), which had less influence on the formation of groups oligotrophes. The number of microorganisms that metabolize nitrogen of mineral compounds was lower (2,84-8,19 million). The number of the microorganisms that absorb nitrogen of organic compounds ranged from 1.96 to 6.08 million. Number of nitrification microorganisms prevailed number ammonification microorganisms by 42-65% (in the version of the experiment biological agrarian system + surface tillage – 10%), that indicate on active mineralization processes in the surface layer of soil. The highest number of the bacteria that use nitrogen of organic compounds was in the variant of the experiment biological agrarian system + surface tillage (5.38 million), due to the higher content of organic matter of plant origin compared with other variants of the experiment. Investigated samples of typical chernozem are also characterized by low proteolytic activity of microbiota because the number of microorganisms that mineralize nitrogen-containing organic compounds generally dominated the number of ammonification microorganisms by 33.5%.

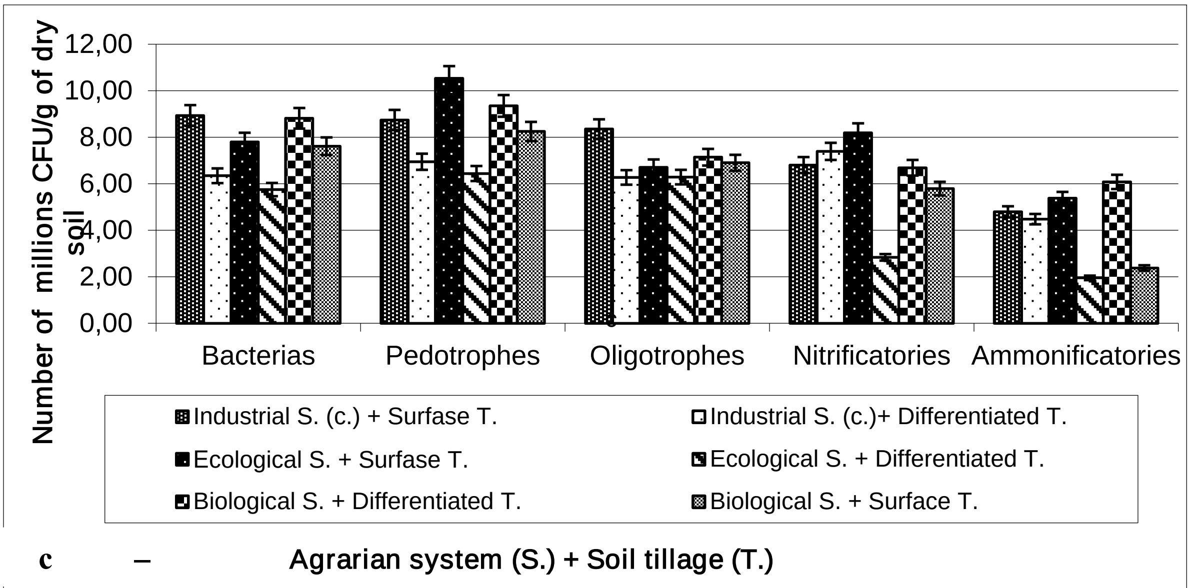

Fig. 1 The number of physiological groups of microorganisms in typical chernozem at the sugar beet growing under different agrosystems

The number of streptomyces's, spore-forming, olihonitrophiles and phosphorus mobilization microorganisms was much smaller – 0,61-2,57 million CFU / 1 g a.d.s. (Fig. 2). Streptomycetes are important part of soil microbiological communities. They participate in the decomposition of plant and animal residues in soil, in the formation of humus and its mineralization [10]. The largest number of streptomycetes (1.6 million) is formed at the industrial agrarian system. The number of group of these microorganisms is also increasing on average 23.9% on surface tillage at all variants of the experiment compared with differentiated tillage. So, at this conditions the number of easily accessible organic compounds for streptomyces's are greater.

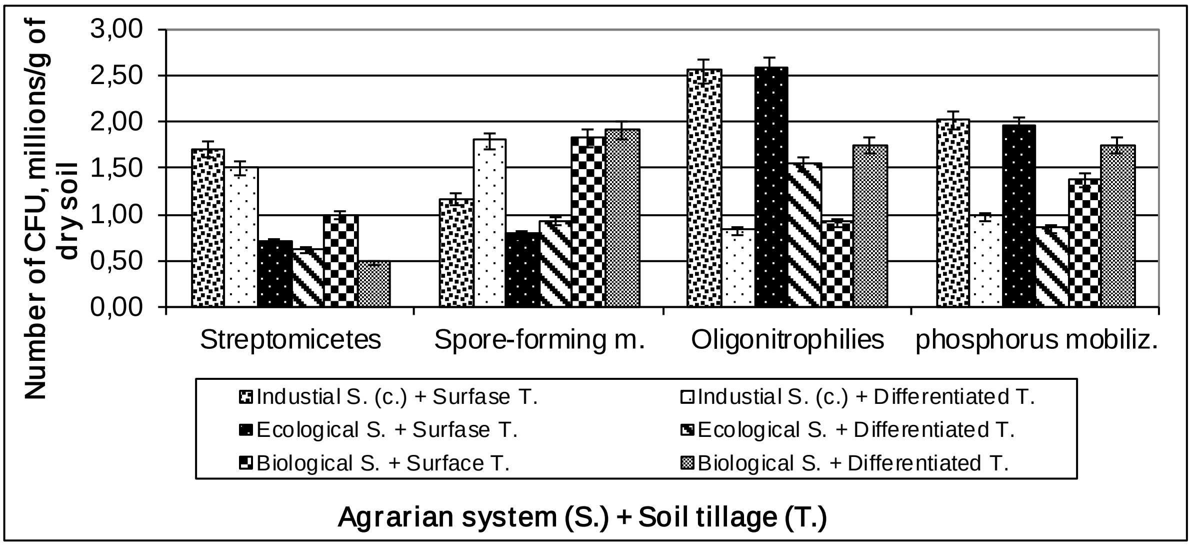

Fig. 2 The number of physiological groups of microorganisms in typical chernozem at the sugar beet growing under different agrosystems

The number of spore-forming bacteria (0,78-1,9 million), in contrast, increase at the differentiated tillage and the highest (1.9 million) was at the biological agrarian system. The number of olygonitrophilies (0,82-2,57 m) is increased with the introduction of mineral and organic fertilizers at the minimizing tillage. Thus, the most microorganisms (2.57 and 2.55 million) were at the application of ecological and industrial agrarian systems in combination with surface tillage. This indicates the possibility of higher nitrogen fixation in these variant of experiment.

It was studied soils which are characterized by a large number of micromycetes (7,54-18,67 thousand CFU / 1 g a.d.s.), due to localization in the upper soil layer plant residues with high fiber content, that stimulates the development of fungal microflora (Figs. 3). Minimum number of tselyulozolitic bacteria (3,9-11,3 thousand) is conditioned low rainfall and slightly thick litter. Due to energy matter localization in the upper part of the arable soil layer in the application of industrial agrarian system in conjunction with surface tillage and biological system with differential tillage are increase the number of microorganisms and intensity of tissue degradation.

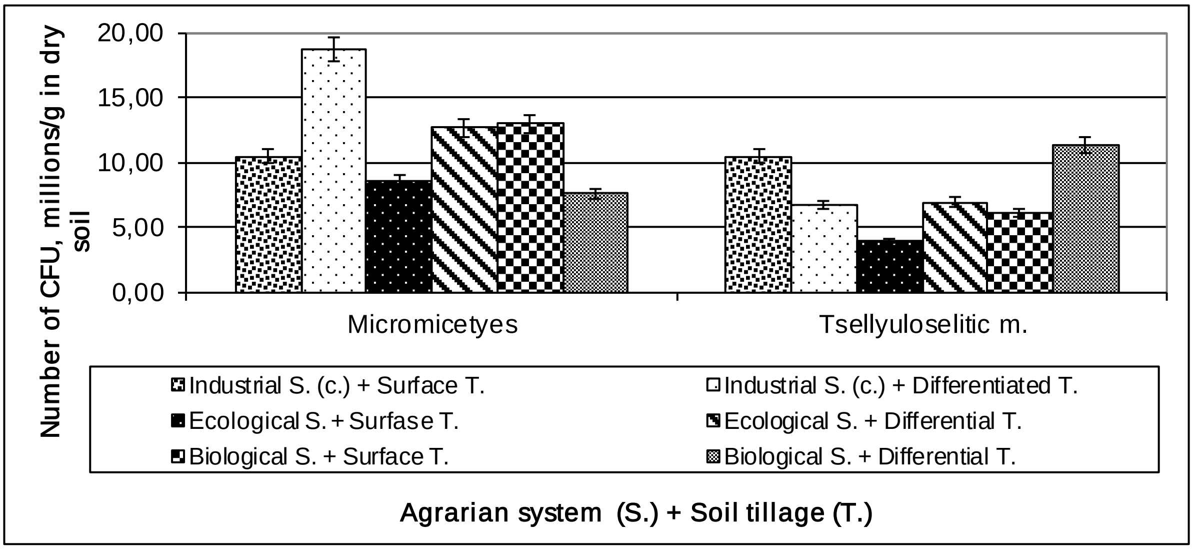

Fig. 3 The number of micromycetes and tselyulozolitic microorganisms in typical chernozem at the sugar beet growing under different agrosystems

The highest biogenic of soil (total number of microorganisms) in the layer 0-25 cm have three options of experiments where were conducted a surface tillage (industrial – 45.1, ecological – 44.6 and biological systems – 43.2 million CFU/1g. a.d.s.) (Fig. 4). Slight biogenic index have biological and industrial agrarian systems and differentiated tillage (36.8 and 36.5 million, respectively), the lowest biogenic level has the variant of ecological system + differentiated tillage (27, 2 million). This reduction of the total number of microorganisms in this version of the experiment due to lower revenues organic residues because of the exclusion of biomass.

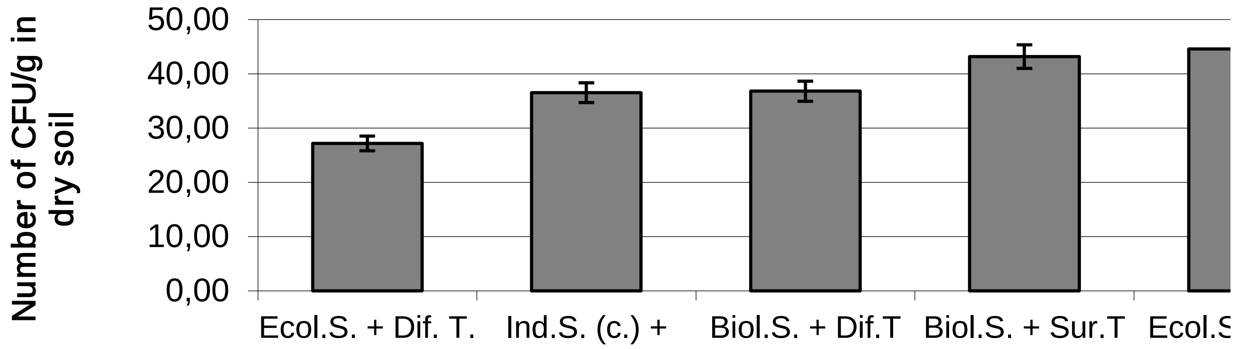

Fig. 4 Biogennic of typical chernozem at the sugar beet growing under different agrosystems

Based on the obtained data it was determined the orientation of microbiological processes in the soil by using the coefficients of mineralization, immobilization, oligotrophnic, pedotrophnic and microbial transformation of organic matter (Fig. 5).

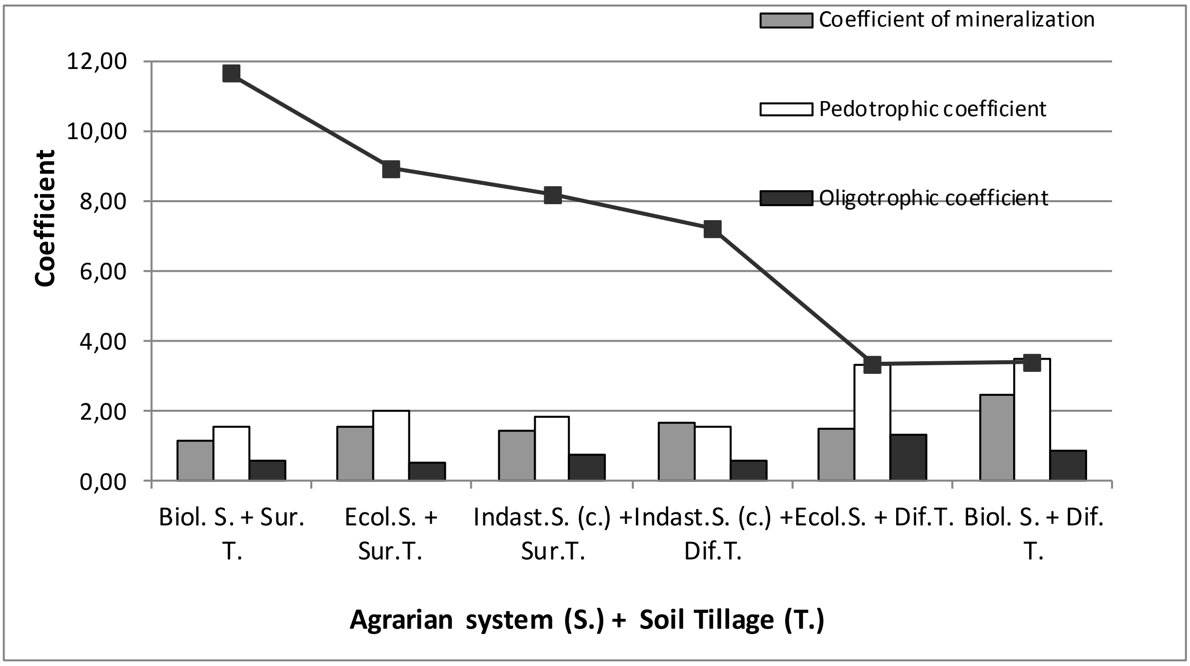

Fig.5 The direction of microbiological processes in the soil at the sugar beet growing under different agrosystems

Coefficient of mineralization ($k._m$. = 1,1-2,43) indicates the predominance of degradation processes of organic matter above the synthesis of all variants of the experiment. In the variant of biological agrarian system + surface tillage indicator value was the lowest ($k._m$. = 1.1). It indicated on the direction to the balancing between the processes of mineralization and immobilization. The values of the pedotrophic coefficient were the lowest in the biological system in combination with surface tillage ($k._{ped.}$ = 1.54) and the industrial system with differentiated tillage ($k._{ped}$. = 1.55). The highest coefficient was in the biological and ecological systems, and differentiated tillage ($k._{ped.}$ = 3.47 and 3.29, respectively). Increasing the pedotrophic index shows an increase of intensity of decomposition of soil organic matter, such as humic compounds. The oligitrophic coefficient of indicates on the lower content in soil nutrients at the ecological agrarian systems and differentiated tillage ($k._{ol.}$ = 1.31). Other variants of the experiment was characterized by a high supply of soil micronutrients ($k._{ol.}$ = 0,49-0 , 84). Transformation of organic matter in the soil is the most intensive at the variant of biological agrarian system + surface tillage ($k._{trans.}$ = 11.61).

Conclusion. Thus, the use of agrarian systems and soil tillage is influenced to the formation of different microbial communities on unequal value microorganisms of major physiological groups. It leads to the change of intensity of the flow of microbial processes. So, the use of industrial system helps the most enhance of soil biota (excluding bacteria, spore-forming and pedotrophic microorganisms', whose number was greater at the biological systems). Application of the surface tillage contributes the increase of the number of microorganisms, involved in the transformation of soil organic matter (except micromycetes, tselyulozolitic and spore-forming bacteria, most of which were found in the application of differentiated tillage). Coefficient of microbial transformation of organic matter also indicates the beneficial effects of this tillage on the state of the soil biota. Thus, microbial processes of transformation of soil organic matter were more intensivity at the using of industrial agrarian system and surface tillage.

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STAGES OF BIOPLAST FORMATION WAVE EXPLANATION OF ONCOLOGICAL DISEASES

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Article of debatable character. It sets forth the new wave model of bioplast formation which has given the theoretical basis for developing the wave method of curing oncological diseases.

Key words: ferromagnetics, diamagnetics, cell, genome

The article describes new wave hypothesis of formation of bioplast, RNA, DNA and genome which gave a theoretic basis for development of the effective wave method of curing oncological diseases at the cellular level applying electronics.

Material and methods of researches. Material for research were the experiments with bioplasts of James Watson and Francis Crick(1,8) who were the Nobel prize winners in 1962 as well as experiments of other scientists [2,6,7,8,9]. Methods of research are the comparison of those materials with laws of physics.

Research results. In the result of researches we created the new wave model of formation of bioplast, RNA, DNA and genome complying with the laws of physics.

Bioplast formation takes place in the result of interaction of three classes of the magnetic substances: ferromagnetics, paramagnetics and diamagnetics [3,4,5]. In the living tissues the microscopic natural magnet – ferromagnetic matrix (FM) is formed. It becomes the basis of the new cell, the source of its magnetic energy and the diskette that the magnetic record of the gene memory is recorded on and is reproduced from. Paramagnetics get pulled in to the magnetic field of FM and diamagnetics get pushed out of it. As a result the cell nutriment and isolation organ, the Goldgi complex is formed.

None of the works of Nobel prize winners mentions these key words: ferromagnetics, paramagnetics and diamagnetics.

Now comes the question: where does the energy for this FM formation come from? Solar energy is the guarantee of life on Earth. Solar wind moves to the Earth with the speed of 300-2000 km/sec [8]. It carries electrons, protons and other cosmic energetic particles /CEP/. With the speed of 2000 km/sec CEP can magnetize iron in the intercellular matrix, go through the electronic lattices and nucleus of the atoms, easily destruct them and thus cause the microscopic nuclear blast of the nucleus of one atom. Nobel prize winners name this phenomenon as “Release of the heat energy in the form of blast” [1]. Ferromagnetics, paramagnetics and myriads of particles of the thinnest dark matter (TDM) get involved into this process. As a result a new FM is formed.

All the cells possessing nucleus contain ferromagnetics: iron, nickel and cobalt. Their participation in FM formation makes it to be non-corrosive. All paramagnetics have crystal structure. Paramagnetic oxygen in the liquid form forms liquid crystals. Getting pulled in to the magnetic field of the FM paramagnetics form multisurface paramagnetic single crystal around it. It becomes a nucleus of the new cell.

In the end of XX century the molecular electronics as a new branch of electronics appeared. It is based on creation in the single crystal by raising it of the sections having different qualities the combination of which gives many knots of electronic circuits and even entire electronic circuits. Atomic amplifiers and microwave radiation generators are created. The main part of these devices which acquired the name of quantum amplifiers and generators is the single crystal. This is the role of the paramagnetic single crystal of the nucleus in the cell.

Inside the ferromagnetic its magnetic field can thousand times exceed the outer magnetic field. The transformers work is based on this fact. In addition to that the magnetic field of FM is increased manifold by paramagnetic singe crystal of the cell nucleus. That is how the microscopic FM becomes the powerful source of magnetic energy of the cell. Electromagnetic induction starts (EMI).

EMI is waves and at the same time it is flows of electrons, protons and other matters. They flow down from the edges of the single crystal of the cell nucleus. Along them the paramagnetic monomolecular chains of polynucleotides are formed, which means RNA are formed. Beginning of the RNA chain has a minus charge and the second end has a plus charge. Many of these similarly polarized chains coming from all the edges of the single crystal of the cell nucleus create the unusual cell polarity: minus in the center and plus on the cover. But the FM itself is polarized, as usually. This fact explains why the cells do not get together and do not move apart. Their similarly polarized covers get pushed away from each other (plus from plus) and their FM pull the cells plus to minus. That is why the linear formations appear: muscular and nerve fibers.

Hydrophobic formations cannot give such linear formations.

All the cell mass turns around in the magnetic field of FM. That is why the RNA get twisted, their plus end joins with the minus beginning of the chain and the POWER PAIRS of the oppositely directed paramagnetic chains of DNA are formed. Power pairs do not get separated.

This is why DNA can be eternal and get found in mummies.

Under the impact of EMI flows going down the edges of the single crystal the DNA chain going from the single crystal edge is constantly growing. And the second oppositely directed chain has nothing to grow from. So the single-strand tails are formed on the ends of DNA. Their similarly charged ends (plus and plus) get pushed away from each other forming the fork [1,8]. Nevertheless this is not DNA replication but normal phenomenon of electrodynamics.

Number of DNA corresponds to the number of single crystal edges. The book [1] contains the number of micro photos clearly showing that the source of magnetic energy of the cell is in the center.

FM operates uninterruptedly. Cell mass is growing. But the magnetic field of the FM of basic cell cannot hold the unbounded cell mass next to it. So when under the impact of CEP next to the basic cell or inside it the new FM is formed, the new cell gets quickly formed from the ready cell matter.

Energetic base of the cell being its polarized FM is indivisible. That is why the polarized cell cannot be divided.

Magnetic waves do not absorb each other but get laid one over another. Each particle of the living body is polarized, radiates its wave, sings its song which gets immediately recorded to the magnetic memory of the new FM like to the computer diskette forming the genome record on it. Paramagnetic crystal of the nucleus amplifies it and DNA duplicate it.

Supposedly the long memory is recorded by the wave method on the hard tissues of skulls, concha and other hard parts of the body having crystal structure. Nerve cells, axons and others are the signals transmitters. The proof of it is that from our childhood we remember only events which happened after the embryo gristle was changed to the real bone as well as the fact that in case of skull injury we lose a part of memory, and in case of spinal column injury people lose the ability to walk.

The soft-bodied animals (medusas) do not have the long memory.

Magnetization of FM in the cell liquid longs about 40 days [6]. But if CEP get there and magnetize it repeatedly such cell can live for even more days. When cell FM becomes demagnetized the cell having no source of the magnetic energy gets decomposed. Apoptosis takes place. But power pair of the DNA have their own power field. That is why they do not get decomposed but form in groups. Around the groups of DNA of the decomposed cells in their magnetic field the mitochondrium radiating the magnetic energy are formed.

WAVE EXPLANATION OF ONCOLOGICAL DISEASES

By multiple researches of the scientists no special matters were found in cancer tissues. Thus it is not about the chemical content but about the direction of magnetic fields of the cancer cells.

Cellular protein of four-footed animals consists of 20 amino acids and all 20 of them are left-rotating. Thus the magnetic field of the bioplast is also left-rotating. The summary magnetic field of all left-rotating cells of the body creates the general left-rotating magnetic field of the body, its aura. It makes the blood containing non-magnetic iron move along the left-rotating circle and makes the heart work. When heart stops the blood continues flowing, it gets accumulated in auricle. The summary left-rotating magnetic field of the body makes the bowel peristalsis also move along the left-rotating circle. When surgeons do not consider this fact after the surgeries the adhesions appear on the bowels and the peritoneal commissures appear.

Cancer tissues contain cells with left-rotating as well as with right-rotating magnetic field. The effect of any drug has a wave nature as it is again a work of ferromagnetics, paramagnetics and diamagnetics (10). That is why the same drug of FM of the left-polarized cells demagnetizes which is destructs the very cells and quite the contrary feeds the right-polarized cells with the additional energy.

Supposedly this is the mysterious incurability of cancer.

Cancer cells differ by small size and morphologic simplicity. And this gives the opportunity to apply the electronics and diamagnetics to selectively demagnetize and thus destruct the cancer cells with left-rotating as well as with right-rotating magnetic field not damaging the surrounding healthy cells and organs.

Theory of diamagnetism logically explains the nature of toxicity of multi legged blue-blooded animals. Their blood contains not the hemoglobin but haemocyanin containing diamagnetics which getting into the blood flow of four-legged animals demagnetize the FM of the surrounding cells and thus destruct the cells and paralyze nerve fibers.

While irradiation the ionization and FM cells demagnetization also takes place which causes mass decomposition of the cells

Conclusion. New wave model of bioplasts and genome formation gives the logical explanation of the origin of all living things in the Universe and opens wide perspectives for new explanation of diseases and curing people and animals.

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