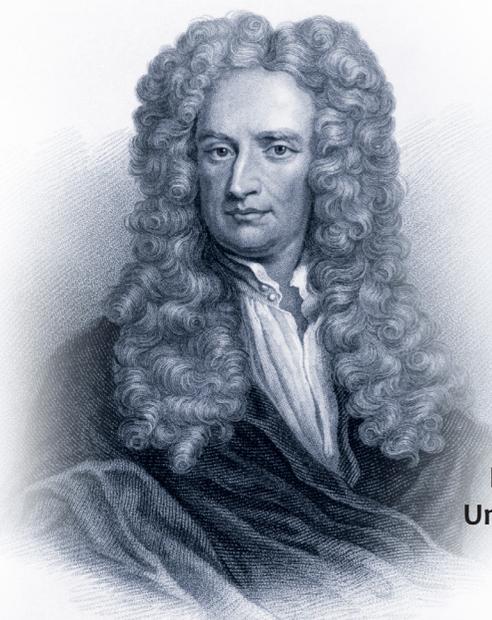




INTERNATIONAL CONFERENCE

**PROCESS  
MANAGEMENT AND  
SCIENTIFIC  
DEVELOPMENTS**



Birmingham  
United Kingdom



# **International Conference “Process Management and Scientific Developments”**

Birmingham, United Kingdom  
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## NORMALIZATION OF WORKING CONDITIONS OF WORKERS IN THE PRODUCTION PROCESSES OF THE ENTERPRISE\*

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**Abstract.** The article summarizes the methodological approach and the results of normalizing the working conditions of workers of one of the coal mining transport companies.

The growth rate of the single capacity of mining transportation equipment, its productivity and the intensity of mining determine the growth of technical risks, which are characterized by an increase in the direct or indirect influence of natural, mining, geological, technical, technological and organizational factors. As a result, the risk of equipment failure and personal injury increases significantly.

The author considers the normalization of working conditions of workers in production processes as one of the important tasks of ensuring the safety and efficiency of production at the site, in the service, at the enterprise and in the company. The article is open to question.

**Keywords:** working conditions, human factor, production process, normalization, dangerous production situation, safety, transport company, coal company.

Ensuring a high level of safety and efficiency of production processes is currently one of the primary tasks for a transport company as part of a coal mining enterprise [1]. The main principle of the successful functioning and development of a transport company in the market is the rational use of limited resources in the production of goods and services in accordance with the laws of supply and demand. In addition, a transport company is not only a production, but also a socio-economic system, which is designed to achieve goals and meet the needs of each entity [2].

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Human performance and the results of labor are determined by many interrelated factors, among which one of the first places is occupied by working conditions, which ultimately determine the costs and results of labor.

An analysis of the economic literature made it possible to establish that there is no universally recognized scientific concept of “working conditions” as applied to an enterprise as a subject of market relations. In most domestic publications, working conditions are understood as “the totality of factors of the working environment that affect the working capacity and human health” [3,4]. In the framework of the concept of enterprise management as a socio-economic system [5], the author uses the concept proposed by Professor G. Cherkasov. - “working conditions - is a set of factors determining the capabilities of the productive application of the forces of workers, i.e. the degree of socio-economic rationality of the expenditure of vitality to achieve production goals ”[4].

In publications on labor economics and management [6–9], classifications of working conditions are given, including industrial, sanitary-hygienic, psychophysiological, aesthetic and social (Fig. 1, a). All of these conditions are considered regarding the impact of the production environment of the enterprise on the human body, and the enterprise itself is considered as a production system.

This understanding of working conditions, their impact on the employee is mainly realized in the activities of organizations involved in solving the problem of improving working conditions at the international level (FAS), in the documents they develop [3]. Of course, the conditions shown in Figure 1 (a) are important and affect the employee and his condition. But, according to the author, the list lacks the main ones - the quality of labor organization and management. It is the organizational aspect of ensuring the safety of production that is missed: people are subjective, they can act as they are prescribed, and not so [11].

Ignoring the importance of the organizational aspect in ensuring labor safety is manifested in the system of activities and in industrial relations. For example, usually the work to eliminate violations of production safety requirements is carried out according to the scheme “revealed a violation - punished the guilty, often not understanding the reasons for such behavior or actions of the violator. Meanwhile, an analysis of workers' opinions on the causes of violations shows that almost 100% of violations of safety requirements are the result of the systems of organization of production, labor and industrial safety management that have been established at the enterprise and in the departments [11].

## Process Management and Scientific Developments

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In this regard, the author proposes a different view of working conditions and their impact on the employee (Fig. 1, b), which is based on the main provisions of the concept of reliable labor safety [12]:

- an enterprise (service, site, team) must be considered not only as a production system, but also as a socio-economic system [2];

- human factor<sup>1</sup> – is the main factor of safety and danger of production [13];

- the production safety management system is aimed at: creating safe working conditions that ensure the implementation of technology, personnel attitudes to safety as a condition of productive labor and efficient production; labor and process control;

- improving the quality of the labor process - a means of reaching a higher level of safety and production efficiency at the enterprise;

- an important component of improving the quality of the labor process is the organizational aspect of creating normal working conditions.

How to create normal working conditions for workers at the enterprise?

To begin with, let's determine the content of concepts.

"Normalization":

- from fr. normal – proper, correct; from normalization;

- streamlining; from lat. norma - ordered, correct, regulated;

- establishing standards, sample;

- bringing something in a normal state, in accordance with the accepted norm; adjustment.

Interestingly, the “normalization of working conditions” is the ninth of the twelve principles of production efficiency formulated by G. Emerson. He argued that “there are two ways to normalize conditions:

- normalize oneself to become higher than constant external conditions (water bug);

- normalize external factors so that our personality becomes the axis around which everything else moves (the firefly)” [14].

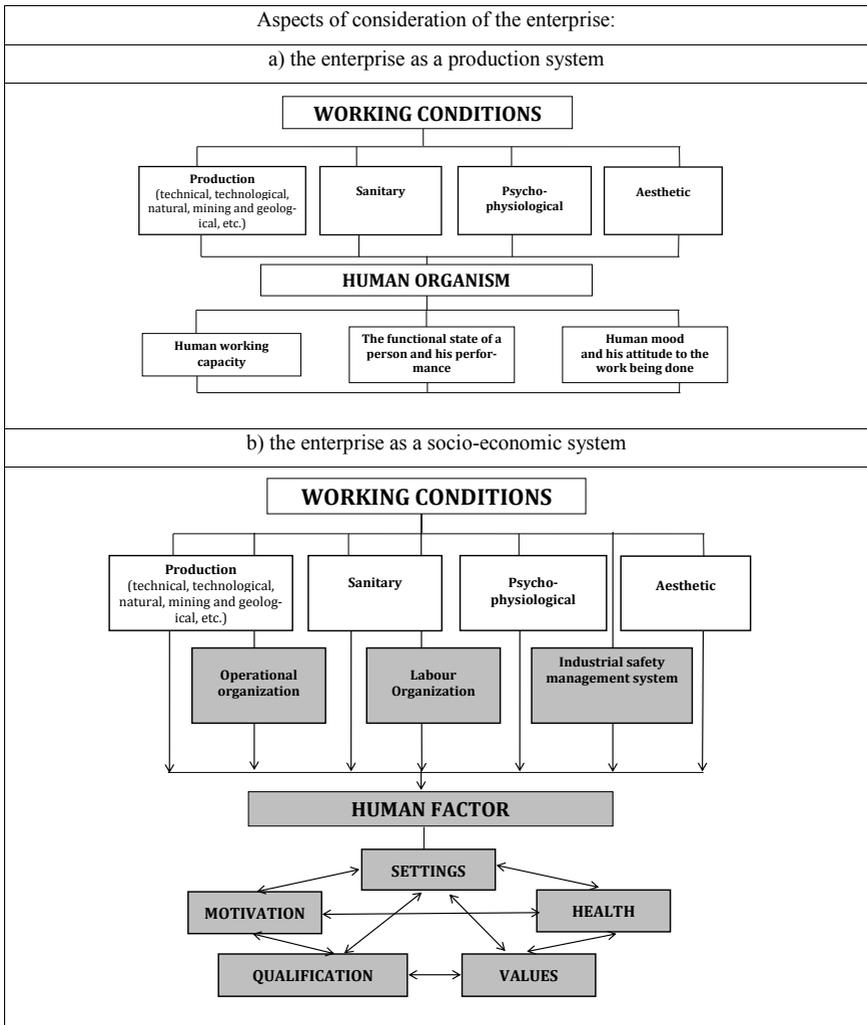
In other words, in order to live a full life, a person is given only two possible ways: to adapt himself to the environment or to adapt the environment to himself, to adapt it in accordance with his needs.

The question arises: are we normalizing the conditions in the production processes of the enterprise so that personnel are not injured, money is not thrown away in the wind, so that efforts are not wasted?

Rail traffic safety is a set of organizational and technical measures aimed at reducing the likelihood of occurrence of facts of a threat to human life and health, the safety of transported goods, the safety of infrastructure and rolling stock, and the ecological safety of the environment.

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<sup>1</sup>The human factor – is the energy of the impact of the employee and the personnel as a whole on the production process [13].



**Fig. 1. Classification of working conditions of employees of the enterprise depending on the aspect of its consideration [10]**

In general, the problem of ensuring labor safety at the transport enterprise is complex. It can be divided into several components:

- technological safety of the main technological processes of railway transport (train movement, shunting, loading wagons, etc.);
- industrial safety of hazardous industrial facilities of railway transport (the correct use of hoisting mechanisms, compliance with safety requirements during transportation and storage of hazardous substances, etc.);
- safety of railway workers;
- ecological safety of railway transport, which in the course of its activities has an ecological impact on the environment.

The railway transport company is one of the enterprises in which the specificity of labor and its increased danger are especially acute. Workplaces and work areas of many professions are located in close proximity to moving or ready-to-move rolling stock. To perform a number of technological operations, workers are forced to come into contact with rolling stock. Working conditions are complicated by the fact that workers work around the clock and at any time of the year, and in any weather.

The practice of enterprises indicates that almost all the dangers in production processes are known [15,16]. The procedure for performing work in compliance with safety requirements is provided for by the Technical Operation Rules (TOR) and other regulatory acts in the field of railway transport. It would seem that compliance with instructions, technological processes, norms and standards ensures technological safety by 95 - 98%, that is, the risk level is not higher than the background. However, the added risk due to the behavior of people and the organization of production increases this risk many times and tens of times.

Analysis of violations of safety requirements allows you to detect the frequency of these violations, the likelihood and possible severity of their consequences, as well as determine measures to prevent the recurrence of these violations and reduce the risks associated with them. Work on the detection and elimination of repeated violations of safety requirements allows you to focus on the conditions of their occurrence, to carry out the necessary work to eliminate these conditions and, thereby, improve the quality of the production process. Therefore, increase the safety and efficiency of production.

To improve the quality of the production process, an objective assessment of the effectiveness of the enterprise in providing safe working conditions, which is impossible without reliable criteria, is necessary and important. In terms of reducing the risk of injury due to a large number of repeated violations of safety requirements, it is advisable to use two main criteria - reducing the frequency of violations and the duration of their exist-

ence. Reducing the frequency of repetitions of violations of safety requirements is provided by eliminating the causes of violations. Reducing the duration of the violation is achieved by constantly monitoring the timeliness of eliminating violations of safety requirements [17-19].

In the process of working out the methods and tools for ensuring safe working conditions by the managers and specialists of the enterprise at the Center for Self-Training of Leading Personnel (Chelyabinsk), analyzing their effectiveness, it gradually comes to the understanding that it is impossible to effectively ensure labor safety in production processes by only supervisory functions.

The most effective and at the same time efficient way to reduce risk is to provide preventive measures to prevent the generation and development of hazardous production situations (HPS)<sup>2</sup> through the implementation of situational and advanced types of control (a rational combination of control and audit functions).

It is possible to implement this method at the planning and preparation stage of work at sites and in services. Work planning should include measures to eliminate existing HPS as well as measures to prevent new HPS.

Gradually, line managers of branch services develop an understanding that the preparation and issuance of work-orders for work is important in the system of ensuring labor safety, taking into account the assessment of the state of the working environment, organization and monitoring of its implementation. The task for the performance of work should contain a clear assessment of the real state of the workspace and workplaces in terms of safety, taking into account the main factors of danger, measures to bring working conditions into a safe state and ensure labor safety throughout the entire working period (shift, task, separate operation).

Inattention to the quality of the production process leads to the fact that personnel are forced to work in conditions of increased risk. According to the concept of improving the quality of labor processes, mastered at the enterprises of a coal mining company, the quality of the process is determined by the state of the main elements: the production environment, including personnel, equipment, processes and conditions, as well as the coordination of staff activities. The condition of each of the elements is evaluated according to certain criteria [15]. The quality levels of the production process determine its safety and effectiveness (high, medium, low, unacceptable).

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<sup>2</sup>Hazardous production situations are understood as a combination of circumstances and factors that occur when personnel perform production tasks, which leads to increased risks to critical values and, as a result, the occurrence of injuries, accidents and other negative events [20].

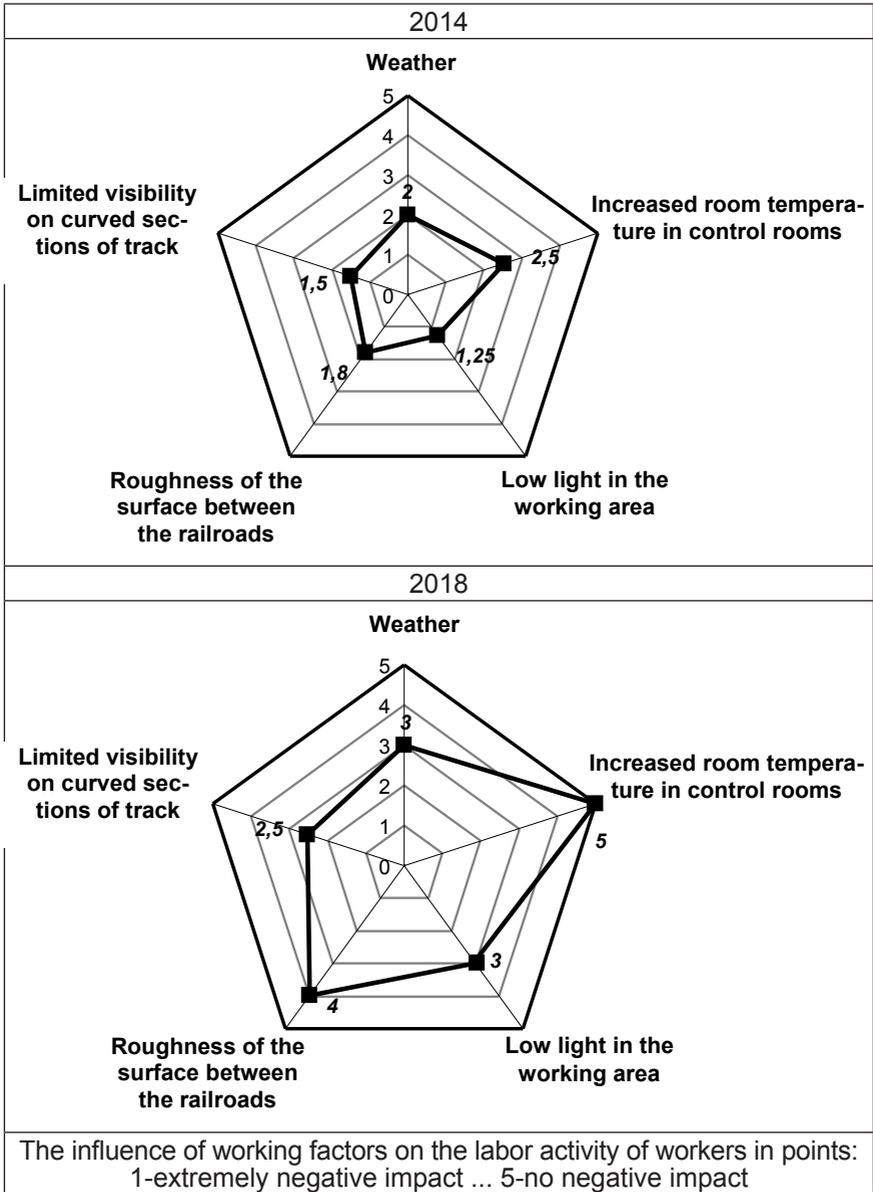
The practice of mastering the methodological tools of detection, reduction of the risk of implementation and elimination of HPS by the employees of the enterprise made it possible to understand that depending on the quality level of the production process as a whole and each criterion of its elements, a different level of attention to ensuring production safety is required. In the presence of at least one criterion with an unacceptable level (critical risk), work should not begin or should be stopped before a decision is made that ensures the safety of personnel. The decision made must be formalized by an admission order.

Work to normalize working conditions at the enterprise is ongoing, modern technical means are acquired, technological operations are improved, the HPS registry is compiled and constantly updated.

Using a point estimate, the results of normalizing the conditions of the production process of the production unit were analyzed (Fig. 2). In the presented diagrams it is clearly seen that the most significant decrease in the negative influence of factors was obtained by increasing the illumination of the working area - by 3, 2 times; decrease in unevenness of the earth's surface between the paths - by 2.2 times; normalization of temperature in the driver's cab - 2 times.

The methodology for assessing the results of normalizing technical and technological conditions in the practice of ensuring production safety at the enterprise has been tested. The next stage is the assessment of organizational and managerial measures to improve working conditions, we expect important, useful and interesting results from this work. Improving the quality of production processes in the branch affected the decrease in the number of negative events by half.

Summary. Reliable safety at work is possible if in each unit and at every workplace purposefully engaged in the normalization of working conditions. Each employee of the enterprise who values his reputation and the reputation of the enterprise at the present time and in the future needs to learn the role of "defender of himself, his subordinates, colleagues and managers from possible negative events in the zone of his responsibility or in the zone of his influence" [6].



**Fig. 2. The results of the normalization of working conditions in the enterprise [10]**

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## THE INFLUENCE OF THE RELATIONSHIP OF FINANCIAL AND NON-FINANCIAL INDICATORS ON ASSESSING THE EFFECTIVENESS OF THE COMPANY

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**Abstract.** This article reveals the importance of a balanced scorecard and the relationship of financial and non-financial indicators. The authors consider a balanced scorecard as an element of the accounting policy of the company, which makes it possible to have a systematic approach to accounting and analytical support of the business and making effective management decisions. Disclosure of non-financial information in financial statements plays an important role in ensuring business transparency.

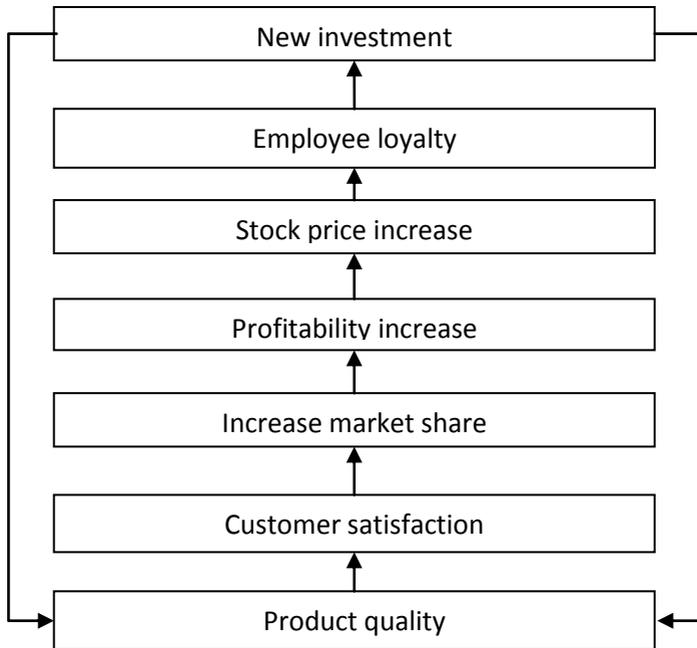
**Keywords:** accounting policies, financial and non-financial indicators, management system, performance indicators, business transparency.

Recently, many companies are faced with the problem of evaluating the effectiveness of their activities. Indeed, the analysis of only financial indicators does not provide its increase. In this regard, a new direction, called a balanced scorecard, is increasingly used by most managers as a tool to evaluate the effectiveness of the company.

A balanced scorecard allows the company to identify corporate and individual goals and bring them to employees at various levels, to track how strategic goals have been achieved [1]. This system is based on the relationship of financial and non-financial indicators of the company, which are shown in Figure 1:

The main components of a balanced scorecard are divided into four main blocks, which are shown in Figure 2:

The set of key indicators depends on the goal that this or that company sets itself. For example, the goal of any company can be to increase cash flow. In this case, the possible indicators in the context of each block may be the following:



**Fig. 1. The relationship of financial and non-financial indicators of the company**

## **Block 1. FINANCIAL INDICATORS**

### **1.1 Increase in sales**

- sales in physical and value terms
- dynamics of sales, change in absolute and relative terms

### **1.2. Liquidity improvement**

- turnover of receivables in days (at the same time, this indicator should be considered in the context of groups of debtors, for example, separately analyzing the turnover of buyers of each market segment, since, most often, customers of different segments have different loan conditions for the company);
- accounts payable turnover (by suppliers, grouped according to the supplied raw materials);
- inventory turnover - stocks in raw materials warehouses, stocks in production shops, stocks of finished products.

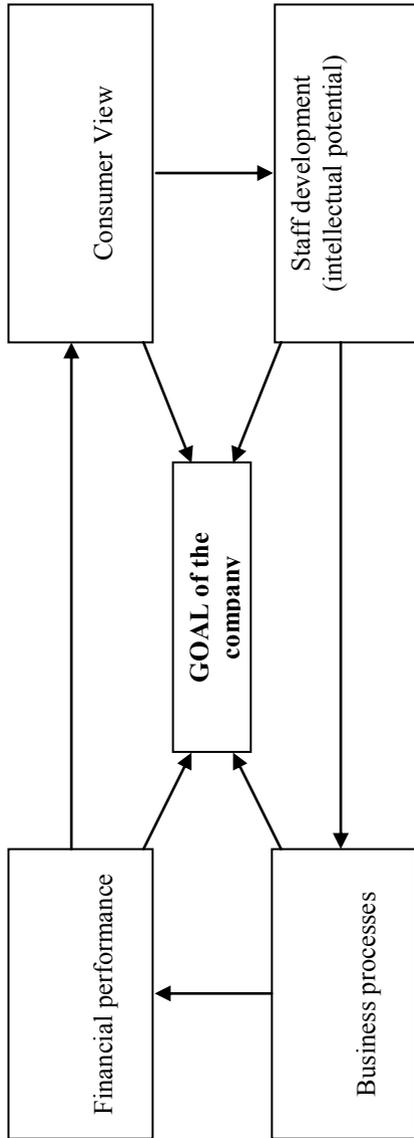


Fig. 2. The main components of a balanced scorecard

### 1.3. Profitability increase

- change in average product margins;
- margin in the context of the main groups of products (brands), a change in the sales structure, the share of sales in different price segments, a change in this indicator (for example, in the overall sales structure, the growth in the premium segment (segment of the expensive price category) is 3%);
- the amount of fixed costs, comparison with past periods, dynamics in relative, absolute terms;
- cost items, which may reduce costs;
- cost items for which an increase in costs is necessary (for example, marketing, PR).

## Block 2. CONSUMER VIEW

### 2.1. Marketing

- the total market for manufactured products, their growth dynamics;
  - the company's share in the total market volume (in rubles, in kind, in%), a share in each segment (cheap segment, "middle segment", "premium");
  - company portfolio: the number of brands (list of them) nationwide and local in the context of each market segment, brand price index in relation to competitors;
  - new brands introduced to the market (list, their price competitiveness, comparison with previous periods);
  - marketing expenses of the company: in value terms, in the context of the main areas of marketing (for example, market research (by type of research), trade marketing, advertising), the share of marketing expenses per ruble of sales;
  - PR - public opinion about the company, and about each brand.
- These criteria can be evaluated in the form of indices, for which a survey of a representative sample is carried out, for example, on a 10-point scale. Such criteria make sense when they can be represented both by your own company and by competitors.

### 2.2. Sales

- the total number of customers (wholesalers or distributors of the company with whom it directly works), the geography of customers;
- sales volume for each segment (in rubles, %, in kind), by major buyers;
- customer turnover: new customers, customers who have refused to work with the company. If large customers are present in the turnover, it is important to indicate the volumes by which they worked with the company (the share of their sales). Accordingly - the assessment of these indicators in dynamics;

- quality of customer service: the number of product returns, the number of claims made, the speed of customer service, for example, the time from the moment of order to the shipment of products to the buyer [2];
- the company's position in terms of the desire or willingness of distributors to work with it. This indicator is also a kind of conditional index, which can be derived using a survey of potential customers [3]. This indicator characterizes the tendency of a positive (negative) attitude of clients to work with the company. This is significant, because the stronger the company's position in the market, the more desire arises for distributors selling similar products to competitors to work with the company. If so, then the company can dictate its terms in terms of volumes, loan terms, prices. Even if you do not conduct a special survey, the assessment of this indicator is usually monitored by the company's sales team, for example, a positive attitude, unwillingness to work with the company, worsening of the situation compared to their competitors, etc.

### **Block 3. BUSINESS PROCESSES**

#### **3.1. Production, quality control**

- the duration of the production cycle;
- presence (absence of quality control system ISO-9001 (ISO-9000);
- procedures (measures to improve the quality of products);
- costs of quality control;
- measures for the reconstruction of production are their costly component, and most importantly the ultimate goal of these measures.

#### **3.2. Logistics**

- the area of storage facilities per unit of manufactured products (for finished goods warehouses);
- the area of storage facilities per unit of raw materials purchased.

#### **3.3. Use of modern IT technologies in the company management system**

It is important here to disclose the company's plans (specific measures taken) for the implementation of information technologies that will accelerate the time from the decision-making process to its implementation. Especially when the company has several production sites located in different regions. For example, to reduce the time it takes to create and process accounting and analytical data and increase the efficiency of managerial decisions made, it is very important to introduce an electronic document management system. At the same time, the need to use high information technology becomes apparent.

### **Block 4. STAFF DEVELOPMENT (intellectual potential)**

In order to ensure a long-term presence on the market, a company must invest in the advanced training of its employees, information technology, systems and procedures. The effectiveness of the entire company depends on the knowledge accumulated by employees and improving their educational level.

In terms of advanced training, one can consider a range of measures to improve the skills of personnel.

- the number of employees in the context of the main units that underwent advanced training;
- the amount of expenses for continuing education, in general and in the context of individual units, respectively, the dynamics.

Analyzing the situation of personnel in the most general form, the motivation of company employees in terms of units is also important. Motivation can also be assessed by questioning. Then the indicator will be expressed in points or score. A situation with general motivation is needed because, as a rule, in Russian companies, employees are far from equally motivated to solve assigned tasks. So, for example, the motivation of management and the company and the sales department is usually quite high, while that of technical and production services is much lower (not to mention the workers themselves).

In conclusion, it should be noted that a balanced scorecard developed for a particular company should take into account the specifics of its activities and function systemically [4]. For this, it is necessary to regulate the requirements for its creation, implementation, application and subsequent monitoring. In this case, the important role of the accounting policy of the company as one of the main working documents of the company is obvious [5]. At the same time, one of the elements of accounting policy is a balanced scorecard. In our opinion, it is a systematic approach to accounting and analytical support of business in the form of disclosure of financial and non-financial indicators in the financial statements that can ensure the normal functioning of the organization and obtain high results.

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UDC 37

**SOCIO-PSYCHOLOGICAL ASPECTS OF SUCCESSFUL  
PROFESSIONAL ACTIVITY OF A TEACHER**

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**Annotation.** Educational process becomes digital and requires a modern teacher to be successful socially and psychologically. The article focuses on the issues connected with the prestige of teacher profession and status of a modern teacher. The author analyses the notion of teacher psychological success, defining its meaning and value to the effective educational activity. The article shows the results of the survey conducted in 2019 by the commission of the Civic Chamber of the Russian Federation concerning education and science development to obtain the social opinion about teacher status in the modern society. The article shows the results of the research conducted on the basis of pedagogical faculty of MSU n.a. M.V. Lomonosov. The authors distinguished and analysed the main parameters of socio-psychological teacher welfare: communicative, personal, cognitive, organizational, social perception. The results concern the request stated by the authorities to increase the status of a modern teacher. The conclusion states the main relevant ideas concerning socio-psychological teacher welfare.

**Keywords:** Digitalization of education, education, society, development, socio-pedagogical problems, indicators, success of the teacher, a teacher.

Socio-economical changes of the society bring new types of risks connected with security of personality cohesion, sustainability to the rapidly changing environment and realization of the need to express yourself in your professional activities. "The change of main professional roles makes the current situation uncertain and increases the professional risks" [2, p.44]. And "to reject the risk is to reject the art" - A. Makarenko says, we continue quoting him: "<...> Why do we study the resistance of materials in technical universities but do not study the resistance of personality in pedagogical ones, <...>?". Unfortunately, instrumentality and practicality of theoretical pedagogical and psychological knowledge that we obtain in the pedagogical universities are superficial. Although, the government has already proclaimed the necessity and importance of psychology and pedagogy. Recently Russian Minister Olga Vasileva declared that we should bring back five-year education, because "teacher should be educated according to 5-year programs of speciality" [11].

Obviously, the processes of modern epoch interfere all the spheres of social life. One of the priority features of the process is digitalization of education - the process of providing methodology and practise of elaboration, optimal use of modern IT that focus on psychological and pedagogical purposes of education and bringing up. Digitalization of the educational process transforms the aims, tasks and methods of education. It changes the main functions and roles of the teacher and his activity.

The teachers are learning to communicate with people of the other generation and another number of values, to understand and take into account the positions, interests, tastes and perspectives of the students in XXI. That is why educating the culture of labour, responsibility for the qualified fulfilment of job is the new and distinctive element of educational work. In other words, the product of teacher's activity is not only the number of general and professional pieces of knowledge, skills and faculties but also physical and spiritual health, social activity, civil and patriotic qualities of a person [7, p.147]. New requirements to the professional activities of a teacher art social and psychological problem of professional welfare of a teacher in modern conditions.

Socio-psychological welfare of a teacher is the main factor of successful realisation of his professional activity during the whole art way. It is mistily composed of the subjective feeling to be ready to produce pedagogical activity in the conditions of unstable managing system, methodological

requirements and enlarging functioning of work. The impossibility to express yourself, to develop creatively, lack of decent pay of labour leads to decrease of motivation, lose of interest and, hence, professional burnout. However, there is another factor that influences psychological welfare of a teacher. It is social attitude to the profession of teacher and perception of the profession by the population. That is why there are a lot of researches indicating emotional burnout in teachers [5, p.35; 6]

Modern researchers note that innovative processes in the educational institutions impose the requirements to the teachers professionalism on the one hand, and to their psychological stability and adaptivity, on the other hand that are too high [5, p. 37; 6]. The ability to foresee and take into consideration the negative consequences of innovations, preventive measures to decrease them will help to implement and promote them more effectively. Such indicators can be a result of relatively low status of the teacher profession among other professions. It is connected with the wrong opinion that teachers are those people who did not succeed in other professions.

Number of scientific publications analyze the problem of low social status of a modern teacher. In particular, V.A. Ilyin, A.A. Shabunova and G.V. Leonidova consider the influence of unsatisfactory economic condition of a teacher to his social feelings [3, p.43; 4]. G.Shafranov-Kutsev research focuses on the discrepancy between the material condition and social status of teachers. He believes that teachers - are th group of professionals who should be considered as a middle class according to the character of their labour, functions, level of education. Although they are at the lower layer of Russian society structure because of the salary [10, p. 39-41].

The Comission of the Civic Chamber of the Russian Federation of education and science development conducted the round-table about: "Summing up the results of a public opinion survey on the status of teachers in modern society." The survey was conducted on the site of the Civic Chamber RF from 14 to 25 January 2019. 1667 respondents participated it. I was a spontaneous selection carried out by the method of online-questionnaire. Approximately the half of the respondents were from countryside, villages and towns, the other half - from big regions. Были подведены две важные цифры итогов: 70% of respondents consider the status of teacher profession as low and 30% consider that the prestige of the profession is declining recently. But it should be noted that the respondents aged from 18 to 25 consider the prestige of the profession as medium.

Meanwhile, the survey participants believe that the reason for the negative professional behavior of teachers is due to excessive pedagogical load (1160 respondents) and a large number of paper reports (1089 respondents). It was noted that despite the fact that Russian teachers define the status of their profession as non-prestigious, it can not be argued that they definitely perceive themselves as a low-status professional group. *On the one hand*, despite the fact that Russian teachers estimate their salary as low and the majority of them believe that their labour payment is not competitive "in comparison to the average salary in the region", the salary is not the main motive for a teacher to choose the profession. Current crisis conditions make guaranteed and stable salary the most important factor. About a half of respondents chose it as one of the most. *On the other hand* comparing the degrees of different professions prestige, respondents noted that they do not consider pedagogical activity as less prestigious than economist, official, policemen, doctor and trade manager activity. Teachers community has two perspectives which are approximately equal. One perspective shows that teacher profession has low prestige and the other that it has medium and even high prestige. Thus, the main reasons determining the self-perception of the low status is the shortage of "free time", "insufficient salary" and lack of "social approval of the teacher profession". Factors connected with personality growth and choice of pedagogical activity have positive effect: "satisfaction with professional choice", "satisfaction of your work results" and "art self-expression, creativity, freedom from the patterns at work" [1, 9].

The decline in the social status of the teacher is associated with the existing unresolved contradictions characteristic of the modern information society. At a time when the social demand for the requirements and functions of the teacher's activity has changed, teachers themselves often perceive their professional identity in the former value coordinate system characteristic of the Soviet school. In this regard, the search for grounds aimed at self-identification of professional activity is necessary for the successful implementation of creative activity and professional well-being. In the framework of this study, it is interesting to analyze the main indicators of socio-psychological well-being of teachers.

The main indicators of social and psychological welfare of teachers include: *communicative indicator*, including readiness of a teacher to cooperate successfully with pedagogical collective, school administration; *personal* including the stress factor, activity motivation, appropriate abilities, match of pedagogical activities to personal qualities; analysis of *cognitive indicator* becomes especially important considering the perception processes loads such as attention, memory of a teacher; *organizational indicator* which includes the labour conditions, salary, school class and

teacher cabinets equipment, distribution of working hours and *indicator of social perception* including the ability to become approved and respected by society, certain status of the profession.

The selection was carried out by the teachers of Moscow schools who have the teaching experience from 1 to 10 years. The certain contingent was chosen to select the interested teachers who want to work and develop in pedagogical professional activity. That is why the survey was conducted among the students of additional education in pedagogical specialization. 96 teachers participated the surveys.

Analysis of data on the *communicative indicator* of socio-psychological well-being of teachers shows that more than half of the respondents (67%) actively interact with members of the teaching staff and the school administration. 43% of the respondents note the regularly cooperation with parents of pupils. The presence of communicative interaction between the subjects of the educational process is reflected in the feeling of well-being in the team, which is noted by 57% of teachers.

To analyze the *personal indicator*, the respondents' answers were used regarding motivation for pedagogical activity, stressful situations, opportunities for self-development in professional activity. Thus, 79% of respondents note a high motivation for pedagogical work, 94% are confident in the correspondence of their work with personal qualities and abilities. The obtained data are confirmation of the initially set task of the study of teachers interested in their professional activities.

Almost all respondents believe that the profession of a school teacher requires constant creativity and opens opportunities for self-development. At the same time, there is a fairly high rate of stress in professional activities, as well as the presence of regular emotional stress (66% of respondents), which is also reflected in the data obtained on the cognitive indicator. So, deterioration of memory, concentration and switching of attention in the course of activity is noted by 43,3% of the asked.

As part of the analysis of respondents' answers to questions related to the *organizational indicator*, data on information and technical equipment of schools, as well as the organization of work with information from their Internet sources, are of interest. Approximately 75% of respondents noted the presence of information technologies in schools, including distance learning. Of these, almost 90% of teachers independently monitor and select information from electronic sources, which indicates conscious work with the flow of information. Good organization of working conditions, decent wages, technical equipment of offices is noted by 64% of respondents. At the same time, a large percentage of teachers feel overload in their work. So, 72,4% note overwork in the course of activity.

The indicator of *social perception* in our study was formed from the respondents' own ideas about the importance of the profession for society and how their profession is perceived by others. 93% of respondents are convinced that the teaching profession is one of the most important, but only half of them believe that this profession will achieve social recognition and respect in society, which indicates the low social status of the profession.

The results reflect the concern of the authorities regarding the formation of a respectful attitude to the teaching profession in society. In accordance with the letter of the First Deputy Minister of education and science of the Russian Federation N. In. Tretiak from 20.01.2016, No. NT-62/15 within the framework of implementation of subprogram "Increase of prestige of the teaching profession" Integrated programme for professional development of pedagogical workers of educational institutions (from may 28, 2014 No. 3241n-P8) Ministry of education and science developed 3 social video on the following topics: "A teacher is more than a profession!", "Say thank you to teachers", "Teachers are the pride of Russia" [12].

Also, the law "About the education" made a number of amendments aimed at "increasing the prestige of pedagogical work." Legal protection, the ability to regularly improve the level of psychological and pedagogical competencies is, of course, an important factor affecting the social status of employees of the educational sphere. After all, according to the law, pedagogical workers receive "the right to additional professional education in the profile of pedagogical activity at least once in three years" (paragraph 2, 5 (subparagraph 2), article 47, No. 273-FL) [8].

The transition to a system of effective contracts, where the level of salary directly depends on the level of competence and efficiency of teaching, should have a positive impact on the welfare of teachers. Further, it is worth noting the outlined prospect for improving the welfare of teachers associated with the program "Zemsky Uchitel". About it Vladimir Putin said in instructions of the Message to the Federal Assembly, which outlined that "in 2020 will begin its implementation, according to which the teacher who moved to rural settlements, or worker towns or cities with a population up to 50 thousand lump sum compensation in the amount of one million rubles" [13]. Participants in the program can become a teacher, "qualified and willing to relocate to the settlement for a period of 5 years", – said the Director of Department of development of pedagogical shots and control the resources of the Ministry of education Maria Troublesome [14]. Also in October 2019, Russian Deputy Prime Minister Tatyana Golikova said that "Russian regions will receive 3.6 billion rubles from the Federal budget for the implementation" of this program [15].

Despite a number of positive state measures taken, and the emerging prospects for improving the social well-being of teachers, the need to create conditions and solve problems in the field of:

- reducing the stress factor and emotional stress in professional activities;
- development of motivation and opportunities for self-development in the profession by reducing the workload (eg., large amount of paper reporting);
  - analysis and rethinking of teachers ' experience in the field of communicative interaction with the subjects of the educational process;
  - the cultivation of pedagogical activity as a value, social recognition and respect in society, using the accumulated practical international experience.

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UDC 37

## MODERNITY OF PEDAGOGICAL IDEAS OF A. S. MAKARENKO

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**Annotation.** The article focuses on the modern side of A. Makarenko's pedagogical ideas. The mores of the prominent pedagogue about the education and development of minor students in natural unity with studies, work, public and leisure activities in a group are studied from another perspective. Makarenko's ideas about personality forming and development, his/her labour and academical education are presented.

**Keywords:** training, education, educational environment, A. Makarenko, teacher, educational process, students.

Among the other prominent teachers determined the way of world pedagogical thinking in XX, soviet teacher A. Makarenko was named an author of the educational system of personal individuality development based on the ideology of forming the united labour collective of teachers and students, by UNESCO in 1988.

A. S. Makarenko began his pedagogical activity in the 20s of the last century. It is world-widely know that he had to spend much time, power, enthusiasm and love to children to his educational work, because his activities was forming is special conditions beginning with the creation of labour colony for the younger children which were left legally free and had to undergo life ordeals.

Comparing education and upbringing he wrote: "It is impossible to teach a child to be happy, but it is possible to bring him up happy". The majority of his pupils had to undergo a long ordeal of homelessness by the mo-

ment they came to the colony. That is why Anton Semenovich believed that "the tomorrow happiness is one of the most important objects" of a teacher towards these children [4, 5, 6]. The vision of the future as we would call it "psychological and pedagogical prospective" which express optimism brought by making successful decisions is still a relevant psychological and pedagogical issue. The most precise characteristic of individual and group approach to bring up children and teenagers is presented in a famous book by A. Makarenko - "Pedagogical poem" [6]. The idea to create a colony with revolutionary spirit and build a new society, wit to re-educate the children who suffered from lack of tender and care in such a young are, was rather hard mission for A. Makarenko. Its important task was to creat a commune with climate of cooperation and mutual support, to teach children to adapt to the society, to socialize them and bring the "...social education" [2, p. 212-213].

*Social education* is a purposeful process of forming socially valuable personality features which are necessary to a child to socialize successfully. The process is not new, it had been integrated before. Each historical period "requires", "dictates", "claims" its attitudes and values. During the reigning of Catherine II it was common to bring up children without parents participation. They used to send their children to some special institutions of social education but, unfortunately, the experiment failed and then it was seized. In the first part of XX, i.e. during the revolutionary period scientific approach of socialization became popular.

It should be noted that socialization can not be static and each new historical period brings some changes and transformations to it. It also should be taken into account that a human develops slower and spontaneously but always in his own way: pace and environment, that makes a new require of society and culture. The main educational task to make "personal and collective prospective lines" harmonious, to form the attitude to the labour group as an enriched family where its members do socially valuable work and have human feelings. "To bring up a person means to bring him the prospective paths" [5, 6]. Here are the questions which were hard to answer even to A. Makarenko himself. Namely, how should we brake down the established norms of behaviour and teach to act differently, opening "light" side, higher spirituality, love to the close people of the pupils together with the nature potential, directing pupils personality development to the right way? He considered the teachers attitude to their pupils like to somebody that needs "taming" as the main "pedagogical vice". "He considered each child, even a "troubled one" as a wonderful and living life. Children should be considered to be friends and citizens, their rights should be respected including their right to be happy and duty to take responsibility".

Another difficult task of the period was to find the teachers for these purposes and teach the whole staff to work with deprived children. Each person has his own opportunities and aims. Each person as a part of the society is mutual subordinate of the society as his welfare depends on the social conditions. The experience shows that it is much harder to bring up teenagers than a younger child as he reacts to the world changes in more flexible way. "Even if social ideals change we should see the difference in the aims of educational work depending on the age of a pupil and level of his personality formation [7, p.253].

Researcher E. A. Bazaley in his article "Interpretation of the ideas of A. S. Makarenko in the modern educational space" notes: "The inner nature of the teacher was characterized by his psychological features which were humanistic. The leading factor of a teacher personality development is his interest to people and life" [1]. A lot of researchers believe now that a person is the main character of his life and the personal approach is still relevant and back in those times was the most relevant and needed by pupils and teachers.

Another aspect which should be brought to the discourse is the effective example of the teacher who can keep balance in the extreme circumstances, rethink and reorganise his usual life order for the small successful steps of his pupils. It is the necessity to be up-to-date, to find the decisions to handle the unforeseen issues of a person and the society urgently and produce professional intuition and sagacious mind.

The new ideas are usually violently opposed and are not accepted immediately, they often have to develop gradually following some rules. And, as a rule, at the first stages in complicated living conditions, a strategy of adaptation to new conditions and new people is put forward. Therefore, the next necessary complex pedagogical stage of personality formation, solved by him, was the construction of relationships in the team. And A. S. Makarenko made a special significant contribution to the development of the theory and practice of the team. "He proved that no method can be derived from the idea of a pair of < teacher+pupil>, and can be derived from the General idea of the organization of the school and the team. He was the first to comprehensively justify the harmonious concept of the educational team, permeated with humanistic ideas. The pedagogical principles underlying the organization of the children's collective provided a clear system of duties and rights that determine the social position of each member of the collective. The system of perspective lines, the technique of parallel action, the relationship of responsible depend-

ence, the principle of publicity, etc. were aimed at evoking the best in a person, providing him with a joyful state of health, security, self-confidence, forming a constant need to move forward" [7, p. 301]. "Today, the organization of the educational process is still based on the need to form a team, considering the important point of labor education, the principle of humanism and the formation of socially significant values – cultural and moral" [3].

The team, based on the analysis of their experience, as Makarenko defined as a group of children who are United by common goals that have a socially valuable meaning and joint activities organized to achieve them. The characteristic features of the team are significant goals and their sequence of moving forward; the inclusion of pupils in social joint activities, the systematic connection of the children's team with society. And no less significant are such signs as the atmosphere of mutual assistance, trust and demands, conscious self-discipline, criticism and self-criticism, the presence of positive traditions and exciting prospects. Of course, when forming a team there are conflicts and disagreements, for various reasons. It is: bringing up in family, value orientations, individual characteristics and society culture etc. And back in that time, the ideas of building a "bright future" and strengthening the social status of workers and peasants were breakthrough, which means that there was an opportunity to "raise" the status of children who had no other experience than to steal and Rob.

Makarenko believed that "the wider the collective, the prospects of which are personal, the more beautiful and higher a person is" [5, 6]. In this regard, it is surprising how A. S. Makarenko introduced elements of aesthetic design of the immediate environment and life into the everyday life of children's life. He considered it important to awaken in teenagers the desire to assert beauty wherever they spend their time, doing business or resting. "In the educational institutions led by him, eyewitnesses noted a lot of colors, sparkling parquet, mirrors, snow-white tablecloths in dining rooms, perfect cleanliness in the rooms" [7, p.292].

The role of the collective in the development of personality is that it opens the possibility of practical development of democratic forms of organization of life [7, p. 304]. In a democracy, people are considered free in their choice, but the need to find a "common language", "consensus" of cooperation, both with teachers and with members of this team remains relevant. The fundamental difference lies in the change of technological, economic and information equipment in society, which has rapidly burst into our lives and, in fact, expose their new requirements and tasks.

The democratic state aims to create such pedagogical conditions for the free search and development of moral values, in which there is an active search for the humanistic foundations of human existence. E. A. Bazaley believes that education has lost its main component—the development of human moral values. The society began to recognize the individual goals of the individual, including the uniqueness of each student, his right to personal development strategy. N.V. Kupryakov believes: "Currently, organizing the educational process, it is important to rely on the basic principle of A. S. Makarenko—the presentation of requirements to the person in combination with respect for his personality."

In modern systems of education there are similar problems, the solution of which directed his forces A. S. Makarenko. There is a serious choice: either we choose authoritarianism and, as a consequence, suppression of the personality, or excessive respect for it and excessive individualization, leading to a lack of control in the educational process, as well as to the leveled problem of social and social development.

And in conclusion, unfortunately, in the modern world community, the methods of A. S. Makarenko, oddly enough, have taken root not in pedagogy, but in the world of business. In such a fashionable direction as coaching, well-coordinated work of participants of the entire team of employees at enterprises is trained. In all major global corporations, rigid time frames and high responsibility for the commitments made for successful completion of work are proclaimed, and slogans of support for each other, and "a sense of elbow", and the education of new employees more experienced, and the dependence of the employee's salary on the total salary of the company, and corporate culture and self-governance are developed.

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## COMPETENCY-BASED APPROACH – INNOVATIVE MODEL FOR THE CREATION OF TEXTBOOKS

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**Abstract.** The article reveals the possibilities of a competency-based approach to creating textbooks.

**Key words:** approach, competence, competency-based approach, textbook, model, innovation.

The textbook is a carrier of educational content and a learning tool that promotes the development of educational material and develops basic skills and skills of students' independent creative activity. The textbook is a publication in which the content of the subject is consistently and systematically presented.

Traditional textbooks are focused mainly on the subject-knowledge paradigm of education and are reproductive. The students' perception of the educational content in them is complicated by the excessive use of long, complex, overly theorized texts, scientific terms without explanation, cumbersome definitions, an abundance of numbers, facts. Imperfect methodological apparatus, poor representation of motivating elements, uniformity in the presentation of materials in existing textbooks does not contribute to the successful learning activities of the student on them.

The creation of a new generation of textbooks is one of the key conditions for improving the quality of education and creating a modern and effective educational environment. It is necessary to create textbooks and teaching materials that perform not only an informative function, but more oriented to the organization of the activity-based learning process, independent work of students, and the use of active, interactive, and other modern forms of instruction.

The purpose of a modern school textbook is to disclose updated educational content in accordance with state compulsory education standards and standard curricula by presenting systematic, didactically and methodically processed teaching materials.

The textbook should comply with the didactic principles of the selection of content, ensure the implementation of the system of learning objectives, the motivated development of educational material. It performs the functions of forming a scientific worldview, moral qualities of a student's personality, teaches him to study, navigate the world of spiritual values, solve problems, and fulfill certain social roles. A modern school textbook implements the connection of learning with life and practice, actualizes knowledge in educational activities and life situations.

The priority in modern education is the transition to a competency-based approach. The essence of the competency-based approach is the transition from a knowledge-centric paradigm to activity, the transformation of learning goals into learning outcomes.

With the transition to a competency-based learning model, the main tasks of the school textbook change:

- the formation of a scientific worldview, the development of personal qualities necessary for a person to live in the 21st century;
- teaching students to use the tools of scientific knowledge, technologies of analytical and critical thinking;
- development of skills of independent educational, cognitive, educational and research activities of students.

The pedagogical community is accelerating the process of determining competence and competence, which of them is considered to be basic (universal), their formation and identification of assessment methods, heated discussions continue to identify these concepts. A competency-based approach requires the student not only to acquire knowledge and skills separately, but also to master them in integrity. In conjunction with this requirement, in turn, the system of choice of teaching methods will undergo changes. The choice and practical application of teaching methods, in turn, requires improving competencies and functions that meet the requirements of the educational process.

As noted above, the competency-based approach is a new pedagogical phenomenon in terms of modernization of general secondary education. In the framework of this approach, consideration of practical experience, competence and competence as didactic units is required, as well as an analysis of the traditional three elements of education (triad): "Knowledge - Skills - Skill" in the form of six units (syxtet): "Knowledge - Skills - Skills - Practical experience - Competence - Competence. "

Based on the studies carried out before us, it is necessary to determine the significance of the concepts of “competence” and “competence”, which were originally used in many positions as synonyms.

In many studies conducted in conjunction with the requirements for the educational system of modern socio-economic development, a competent approach is seen as a new stage in changing the content and methods of education. From this point of view, in many studies, competence is interpreted as a set of interconnected personal qualities necessary for productive and creative activity, and competency as the development by a person of the necessary competencies that make it possible to solve a problem in a certain field [1].

Competence (from lat. Competere - correspond, approach) - the subject's preparedness for the ability to effectively and jointly organize external and internal reserves for setting goals and achieving it, in other words, it is the subject's personal ability to solve certain professional problems [2; p.41].

According to M.B.Urazova, the lexical meaning of the concept in English “competence” means “ability”, but the term competence serves to express knowledge, skills, mastery and talent [3; p.130].

N.V. Tarasova interprets the concept of "competency" as "general giftedness, based on knowledge, values, abilities, which make it possible to ensure the relationship between knowledge and situation, knowledge and action to solve the problem" [4; p.36]. Based on the opinion of the author, speaking of competence, relying on existing knowledge and life experiences, we can conclude that it is a person's ability to solve a particular problem.

It is important to emphasize separately that many of the definitions given to the concept of “competence” are set forth in conjunction with vocational education and professional activities. But, in conjunction with general secondary education, this concept has an innovative characteristic, in connection with this there is a separate need to identify its essence.

Competence is also ahead of social requirements (norms) for a predetermined educational preparation of a student, necessary for effective productive activity in a certain field.

In general secondary education, when it comes to introducing a competent approach, in contrast to vocational education, it is advisable to introduce the concept of "general educational competence" into educational practice. Because a student of a comprehensive school, although he cannot fully reflect a certain competence, he is able to realize some of its components.

General educational competence requires attitude to clearly established objects of reality, necessary for the implementation of the student's effective activity, acquiring personal and social significance, a semantic orientation (in essence and content), presented to educational preparedness, reflected in the complex of knowledge, abilities and experience .

According to A.V. Khutorsky, competence for a student is for him an image of the future, a specific reference point for learning. But during the period of school education, some elements of the "high" competencies of the student are formed, he assimilates these competencies from the general educational point of view, not only to prepare for further activities, but also for successful socialization at the current stage [5; p.60].

Based on the point of view of A.V. Khutorsky, it can be said that general educational competencies should be considered as an integral part of the activity aimed at mastering the subjects taught at the school, as well as to recognize the ability to ensure the full realization of its goals. It is important to note that during the period of school education, the student learns the most important thing - civic competence, and it is necessary that the leading role of this competence is preserved in the subsequent stages of education.

General educational competencies must perform the following tasks:

social order - a complete reflection in itself of a social demand for the formation of the student's personality with high spirituality, civic position;

axiological - achieving students awareness of the personal significance of education;

organizational - to reflect a single set of knowledge, skills, as well as methods of organizing activities, providing real environmental objects;

acmeological - within the framework of general educational subjects, the formation of the student's abilities to reflect his attitude to real objects of reality and practical orientation;

integrative - reflection in the content of various general subjects as key elements of the content of education;

focus on practice - ensuring the correspondence of theoretical knowledge with practice for solving problems aimed at a specific activity;

diagnostic - a reflection of the integral properties of means of monitoring the quality of student training, as well as personal and social significance.

The composite structure of competencies includes the following:

types of competence having a common sequence: (key, general, private competencies);

competencies as the area of real objects of reality, which are confirmed; socio-practical need and importance of competencies;

students' awareness of the essence and content, as well as personal significance in relation to the object;

assimilation of information related to a real object;

minimum experience of the student's necessary activities in a certain area of competence;

indicators - examples of tasks related to identifying a student's competence in teaching, monitoring and evaluation, taking into account the stages (classes) of education.

Competence serves to integrate actions in relation to the assimilation of a student's new personal experience, as well as self-development. For example, a student acquires competencies regarding the implementation of project activities.

Thus, we came to the conclusion that the introduction of a competent approach in the system of general secondary education, firstly, enables students to turn knowledge, skills and practical methods into personal experience, and secondly, it ensures integration between them thirdly, it guarantees an increase in self-development, independence, creative activity of the student.

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## AUTHORITARIAN RELIGIOSITY AND AGGRESSION

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**Abstract.** The paper presents an analysis of the grounds for aggression in the framework of the authoritarian type of individual religiosity. In the paradigm of E. Durkheim, religiosity is projected as a symbol of group and personal identity. Religious aggression manifests itself in relation to the non-identical, "heterodox".

**Keywords:** aggression, authoritarian religiosity, conflicts, extremism, individual religiosity, terrorism, fanaticism, identity, religious synthesis, sacred.

Recently, it has become increasingly apparent that in addition to the economic, geopolitical component of world conflicts, there is a religious dimension to them. Extremely devout people seek to shed maximum foreign blood. Almost saints. According to the forecasts of futurologists, the third world war may well be unleashed by people who tremendous with the Gospel and the Koran. Cruelty is increasingly identified with religion. How does religion contribute to the realization of not love, but hatred? Is aggression a manifestation of “non-genuine” religiosity, or are we dealing with its very common variants. Radical and fanatical forms of religiosity begin to threaten human existence. Religious fanatical extremism is among the global problems of mankind. Against this background, confessional ideologists unanimously proclaim love and mercy.

Within the framework of the phenomenon of neophytism, we tend, on the one hand, to claim exceptional forms of our own spirituality, and on the other, to identify all manifestations of religiosity only with good.

Everything significant turns into a subject of religion. “Ultimate” values are sacred. In the projection of faith, the realm of sacred and religious is a form of axiology: it is a symbolism of ultimate values. “Hopeful”, defining stable images, becomes reality [Heb. 11: 1]. Religious reality, notes P.

Tillich, is the state of being associated with the highest interest. "Faith is a state of utmost interest; the dynamics of faith is the dynamics of the ultimate interest of a person "[8, p. 133].

Higher values are ranked by levels in the pyramid of needs. And as ultimate values, life, food, political independence can be religious objects. Any problems - physiological survival, national liberation, financial, criminal, fraudulent, extremist - as their importance grows, they become sacred as ultimate values for the subject. Sacred values are both a manifestation of good and an unconditional manifestation of aggression.

"Faith," writes P. Tillich, "possesses truth to the extent that it reflects ultimate interest." The truth of faith is not connected with scientific truths [8, p. 194-195]. The truth of faith is not epistemological, but axiological and existential. Emotional cries, children's crying are the original form of prayer. Stable neurotic states of the psyche gravitate toward a religious form of manifestation. Religion is a symbolic form of phenomenology, psychology.

Religion is generated by an extreme sense of insufficiency that is extremely meaningful for the subject. Values, as interest in them grows, become sacred, becoming attributes of God. Realization of the most significant is an axiological proof of the existence of God and is perceived as a manifestation of divine mercy and miracle. For "religious extremists," successful terrorist acts are a form of manifestation of the greatness and mercy of God. The unfulfillment of the significant is assessed as the God-giveness of the world.

Conflicts of various traditions, ethnic, civilizational, projecting different value systems (in particular, authoritarianism and democracy), too often take a religious form.

As noted by Schleiermacher, James, Freud, Durkheim, Fromm, Jung, Maslow, Tillich, there is no separate specific "religious feeling (experience)", special religious motivation. There are no specific grounds for religious aggression and extremism. These grounds are natural, naturalistic, determined by the principles of determinism, devoid of mysticism. The search for the causes of sacred aggression involves the demythologization of both religion and religious extremism.

In addition to confessional religiosity - in the form of text, ritual, institutions - there is a "variety" (W. James) of types of individual religiosity, which are a projection of objectified confessional forms in the perception of an individual or group

In the paradigm of religiosynthesis, personality is a unity of types of individual religiosity, diverse religious subpersonalities [7]. Religious subpersonalities - mental dynamic substructures of the personality, character-

ized by the independence of needs, motivation, behavior. They have their own - life style, understanding of God, sin, "true religion", atheism, the paradigm of sacredness and salvation. Publicities act as separate individuals belonging to different faiths, "sects," which defines the "diversity of religious experience", the multidimensionality of individual religiosity, and the behavior of the subject in accordance with the "heretical imperative". "Spiritual" contradictions between subpersonalities are projected in inter-faith conflicts.

There is a process of personalization of religiosity, a departure from universal systems, when, according to V. Frankl, everyone can communicate with God in their own individual language [9, p. 337]. Consider the problem of aggression in the framework of the authoritarian type of individual religiosity.

Authoritarian religiosity is determined by a person's desire for self-abasement and submission to a higher power, force. E. Fromm notes that some people seek solutions to all problems in religion. They turn to her not because they are pious, but to avoid painful doubts and in search of some kind of protection. From a psychological point of view, such aspirations are symptoms of a nervous disease [11, p. 222]. The main virtue of such a religion, E. Fromm notes, is obedience, and sin is disobedience. Obeying God as the personification of power, a person avoids loneliness, stress, gains a sense of support in life, sacrificing his own personality [Ibid., P. 246]. The main attribute of God is power. And any political power is sacralized. "Authoritarian faith" is an indicator of an irrelevant personality. In an authoritarian group, the individual loses the ability to independently solve complex problems, he easily participates in the good and the criminal.

As the classic experiments of S. Milgram show, 63% of the subjects, ordinary people are subordinate to the authoritarian "boss" and tend to use cruel methods to treat "strangers" [5, p. 23-46]. Sometimes a terrorist act is committed as a result of the unquestioning execution of the order of the clergyman, imam. The authoritarian personality type - in the plane of the inferiority complex - is distinguished by "archetypal" aggressiveness towards "strangers" representing a different tradition. Maxim "yes love each other" applies only to "our own". Other faiths are seen as a threat to human salvation [6, p. 177].

As Richard Dawkins, son of Winston Churchill, describes in the book *The God Delusion*, when he was a young man, having first read the Bible, he could not do without profanity in determining the attributes of the Old Testament God. More mature and well-read Thomas Jefferson held

the same view: "The Christian god is a terribly unpleasant creature: cruel, vengeful, capricious and unjust." And, as R. Dawkins himself writes further: "The Old Testament god is perhaps the most unpleasant character in all fiction: a jealous proud of his jealousy; petty, unjust, vindictive despot; vengeful, bloodthirsty chauvinist killer; intolerant of homosexuals, woman-hater, racist, killer of children, peoples, brothers, cruel megalomaniac, sadomasochist, capricious, angry offender" [3, p. 49].

Authoritarian models of aggressive attitude towards representatives of other confessional traditions are fragmentarily constituted in the Scriptures. Religious doctrine, projecting sacred authority, dogmatizes the "will of God", can cause conflicts. Any form of Scripture - the Talmud, the Gospel, the Qur'an - representing a particular ethnic, civilizational community, symbolically reflects its aggressive archetypes regarding the "heterodox". Aggression towards "strangers", in particular, is constituted in the Gospel. "Such are the Names and Alexander whom I betrayed to Satan, so that they learn not to blaspheme" [1 Tmf. 1:20]. The Christian is compared with the "good warrior of Jesus Christ" [2 Tim. 2: 3]. At the same time, Christ carries "the spiritual sword, which is the word of God" [Eph.6: 17]. For Christ, the rights, fate and responsibility of "faithful" and "infidels" for the same actions (due to their inequality) are different [Lk. 12, 46]. Christ did not come to give peace, but separation, "for henceforth five in one house will be divided" [Lk.12: 51-52]. In Revelation of John, Christ threatens the Church of Ephesus, declares hatred of the Nicholas [2: 5, 6], threatens the Pergamon Church with a double-edged sword [2:12], the prophetess Jezebel of the Church of Thyatira threatens the death of her children [2:20, 23], - announces that those he loves, he punishes [3:19]. "For whoever does not love the Lord Jesus Christ, anathema" [1 Cor. 16:22]. The believer has eternal life, who does not believe in the Son - the wrath of God [John 3:36]. Whoever does not believe and be baptized will be condemned [Mark 16:16]. Whoever seduces a believer, "it would be better if they would hang a millstone on his neck and throw him into the sea" [Mark 9:42]. "I came to divide a man with his father and daughter with his mother ... He who loves a father or mother more than Me is not worthy of Me ... I have not come to bring peace, but a sword" [Matthew 10: 34-39]. Christ calls out: "He who is not with me is against me" [Matthew 12:30]. V. I. Ulyanov-Lenin was very fond of repeating this gospel phrase.

Despite the individual "sectarian-radical" appeals of the gospel Christ, one should not forget that the code of Christianity is love, not aggression. "God is love" [1 John 4: 8]. Love is not only "towards the neighbor", but love is "towards the distant". Love for his enemies [Matthew 5:43].

And the Surahs of the Quran also in the form of the will of Allah project the motivation of believers that is aggressive towards heterodoxy. "Verily, those who did not believe in Our knowledge, We will burn in the fire. Whenever their skin is prepared, We will replace it with another skin, so that they taste the torment (punishment)" [4.56]. "When you meet unbelievers on the battlefield, then chop heads ... If Allah wished, he would take revenge on himself, but he wished to test one of you through others. He never makes the deeds of those who were killed in the way of Allah vain" [47.4-5]. "They want you to become unbelievers like them, and to be equal. Therefore, do not take them as your helpers and friends until they move on the path of Allah. If they turn away, then grab them and kill them, wherever you find them" [4.89]. "Fight with them until the temptation disappears and until the religion (worship) is completely dedicated to Allah" [8.39]. The "right faith" in Islam - through manipulation, diplomacy or war - should spread to the whole world.

Beyond the "fierce" words of God in the Gospel and the Qur'an, we see the sacralization of stable mental states of people listening to them. What was "inspired" one and a half, two thousand years ago, now often loses its sacredness and is perceived as a manifestation of archaic, savagery, regression.

Religion, in addition to many other conceptual projections, in the paradigm of E. Durkheim, is a symbol of group identity - tribal, national, civilizational. Religious attributes act as factors in the recognition of "friend - foe."

The primary religious "pro-sociality" is manifested in the fact that it is directed almost exclusively to members of the reference group, to co-religionists. "Many experts believe that altruism and prosociality in human groups from the very beginning were inextricably linked with parochialism - hostility to strangers" [4]. Religious rites play the role of signals for identification and readiness for cooperation with specific "reference-faithful" groups and individuals.

The less actual a person is, the more her need for identification is and the easier it is for her to identify with a particular community. She sees a skeptical, ironic attitude toward religious symbols as a threat to her own identity. The war of denominations is a struggle of identity paradigms.

An immature neurotic person identifies himself with the clan, family, religious movement, faith and never - with Christianity, Islam, humanity as a whole. It is assumed that there is a "God of the Russians", Allah is "supervising" only Muslims. The struggle against non-Orthodoxy is a struggle for one's own identity, for "one's" individual paradigm, attitude to power, tradi-

tion, and denial of other paradigms. Develops a "fear of the non-identical" and hostility to it. Own national identity is acquired through denial, sometimes aggressive and cruel, of other cultural traditions. The self-identification of the subject through ethnic belonging to a particular denomination increases the degree of interethnic and inter-religious conflict.

One of the foundations of religious extremism is an identity crisis. Awareness of one's personality begins with identifying oneself with one or another community — professional, national, etc. In Europe, representatives of the second generation of emigrants, disadapted, unemployed, estranged from society, become involved in terrorist acts. They find their identity through identification with Islam.

In orthodox groups, disagreement with tradition - as a departure from timeless truth - is condemned and suppressed as heresy. Authoritarian communities are characterized by manipulateness, conformism, and totalitarianism.

Confessional religiosity too often - on the principle of "against whom are we friends?" - reflects the steady underlying desire of religious individuals to divide, confront, and aggression.

It is assumed that God forgives everything when you do something wrong with representatives of other religions or unbelievers. And God does not forgive when you sin against your fellow believers.

The division of the spheres of religious and ideological influence within the framework of the principle of "securing the canonical space" for traditional faiths, the elimination of other authoritarian sources lead to a group erasure of the individual by the uniform, which in religion is sometimes presented as collegiality. Which cannot but increase hostility to the "heterodox".

Within the framework of authoritarianism, the divine is demonized - God becomes a symbol of the values of nationalism, money-grubbing, suppressing dissent, and serving political power. The image of representatives of other faiths is belittled, endowed with negative, "dark" features of their own psyche.

In authoritarian personality, notes W. James, love of God "expels from it all human love, all human interests" [2, p. 127]. It is characterized, according to the formulations of G. Allport, immunity to the feelings of others. The excessive moralism of their behavior is a reactive formation that hides destructive impulses. The fear of "strangers" inherent in an authoritarian personality is a projection of one's own hostile motives. "Accusing other groups of immorality is a convenient substitute for their own feelings of guilt" [6, p. 127].

Without compassion and love, according to Z. Freud, are left individuals who do not belong to the community, "who do not love Christ and whom he does not love," therefore the "religion of love" should be "cruel and merciful to those who do not belong to it" [10, p. 148].

An authoritarian person is prone to manifest fanatical aggression against the "heterodox". A man obsessed with exposing heresies, writes N. A. Berdyaev, is a man condemned by Christ, although he does not notice this. "The sinful lust of power is always hidden behind the convictions of heretics" [1, p. 125].

Within the boundaries of authoritarianism, the individual renounces personal freedom of choice and responsibility in the matter of saving his own soul. The tendency to an authoritarian-passive type of relationship characterizes people with a weak type of nervous system, extroverts, with an external locus of control, reproductive thinking, trusting, anxious, not ambitious, prone to stereotypes. They seek everything from God, notes E. Fromm, and nothing from their own activity [12, p. 66]. A similar type of personality - in the projection of the inferiority complex - is characterized by "archetypal" aggressiveness.

Religion, emphasizes P. W. Pruyser, acts as a form of regression (as a psychological defense) and fixation of archaic forms of thinking and behavior [13, p. 123], it suggest, note W. Clebsch and C. Jaecle, an unjustified simplification of complex concepts and phenomena [14, p. 57]. One of the main forms of psychological defense within the framework of religiosity is regression - a return to children's behavior patterns. In his quest for ease of perception, the authoritarian personality, emphasizes G. Allport, is prone to totalitarian ideology and prejudice [6]. Authoritarian personalities can do something only with the help of supreme power, absolute omnipotence. God for them is "Lord," "Master." The life and ideas of an individual against the background of sacred goals of a community lose their value and meaning. The goals of community reduce the tasks and happiness of specific people. The expectation of "paradise after death" presupposes emptiness, "heroic" adversities and "sacred" suicidality in life. Abstract altruistic goals turn into the inhumanity of everyday life. Authoritarian religious institutes "realistically" proceed from disbelief in a person, in his ability to independently solve life-meaning problems, come from the psychology of "rams," directed by expert pastors. At the same time, there is an anomie of social feeling towards the "infidels."

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**A COMPREHENSIVE ANALYSIS OF POLITICAL RHETORIC  
(ON THE EXAMPLE OF D. TRUMP'S PRESIDENTIAL INAUGURAL ADDRESS)**

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**Abstract.** The paper deals with the inaugural address as one of the genres of political rhetoric. It is aimed at analyzing the structural, ideological and thematic model of Donald Trump's inaugural speech (2017). By means of content analysis we looked for linguistic means to determine the key concepts of Trump's narrative, which include «strong» America, restoring the country's prosperity, the welfare of the nation. The paper findings may be useful for researchers who deal with political and cognitive linguistics, political discourse and comprehensive analysis.

**Keywords:** political linguistics, political rhetoric, inaugural address, comprehensive analysis, Trump.

Currently political speech has been attracting the attention of linguists in terms of efficiency and manipulateness. Politicians use various methods of influencing the public. A politician's linguistic performance has become a tool for gaining popularity among the people. With the help of language means, politicians communicate their plans, intentions and beliefs to the audience. In this regard, among linguists the terms political discourse, political communication and political linguistics have appeared.

Political communication became the subject of linguistic research in the late 50s of the previous century. George Orwell, an English novelist, journalist and critic was the first who focused on political language as the language of manipulation and social power [1]. Later, such scholars as Teun van Dijk, Ruth Vodak, Harold Lasswell, K. Campbell, K. Jamison, Robert Meadow, A.G. Altunyan, E.I. Sheigal, A.P. Chudinov, B.P. Parshin, A.N. Baranova and others contributed a lot to the development of the political discourse studies.

We are interested in the linguistic approach where language is seen as a means of social control and restricting access to political institutions and politics. Proponents of this approach, for example, Robert G. Meadow, argue that public figures are authorized to make decisions, as well as representatives of the political elite, carry out their activities using a specific language, so the authorities listen to their opinions and requirements [3; 24]. Regarding the specific language, there are scholars who speak of the existence of a "language of politics." E. Sheigal suggests considering this concept as one of the professional sublanguages - variants of the national language. She claims that the language of politics includes specialized signs - both verbal (political terms, anthroponyms, etc.), and non-verbal (political symbols, etc.), as well as non-specialized signs that were initially not nominatively oriented to this sphere of communication, however, due to the stable functioning in it, acquiring its own specifics [4; 20]. Thus, we can argue that political discourse is an instrument of political power.

For our research, inaugural address as one of the genres of political communication is of great interest. The peculiarity of inaugural address is that the ceremony is of the essence rather than the content of the address. Therefore, Sheigal relates this speech to political performativity [4; 247].

Inaugural address as a genre is distinguished by its ritualism. It has a definite place and time. The inauguration is a marker of the end of the election campaign and the beginning of the reign of the new administration. Inaugural address, as a rule, has a clear structure, it outlines the intended state policy for the next four years. The head of the state promises to achieve goals for the good of the state and the prosperity of the nation. Thus, it can be claimed that the inaugural address is distinguished by its national specificity in accordance with the country's politics and mentality.

The given paper is aimed at the comprehensive analysis of Donald Trump's inaugural address. There are several reasons of focusing on Trump's speech rather than other political leaders of US. Firstly, Donald Trump is the first businessman and billionaire who has become the President of the United States; who has refused his presidential salary and accepted a purely symbolic \$1 reward due to him by law. Secondly, aged 70, he is the oldest first-term president of the United States, who broke the record of Ronald Reagan taking the post at 69. Moreover, he is the first one without prior military or government service. Thirdly, the personality of Trump is of great interest both to American people and the whole world. His political statements are characterized by ambition and authoritarianism. In addition, his campaign slogan was "Make America great again," where he boldly criticized current politics, religious groups, etc. It is this idea that permeates the inaugural speech of the 45<sup>th</sup> President of the United States.

So, the body of data comprises the transcript of the inaugural address of the US President D. Trump (2017). According to the results of the content analysis, Donald Trump's speech consists of 1,503 words. Dominant word forms are *we* (47), *our* (47), *America* (34), *you* (14), *all* (14), *people* (10), *country* (9), *president* (5). Words such as *dream*, *God*, *wealth*, *job*, *family* referring to American values are found 4 times.

As mentioned above, the inaugural address is clearly structured. The introduction starts with Donald Trump's address to the presidents present: "*Chief Justice Roberts, President Carter, President Clinton, President Bush, President Obama*", then to the Americans "*fellow Americans*" and to "*people of the world*". Saying "*fellow Americans*" the president points out the partnership and equality of everyone. The introduction ends with "*thank you*". This can be regarded as gratitude for the previous work, for voting, for coming to the ceremony.

The body of the address, as it is common for the genre, consists of the plans for the next 4 years. Here according to Campbell and Jamieson five substantive elements of inaugurals are performed: "The presidential inaugural unifies the people by reconstituting its members as "the people," who can ratify and witness the ceremony; rehearses communal values drawn from the past; sets forth the political principles that will guide the new administration; and demonstrates through enactment that the president appreciates the requirements and limitations of executive functions" [3]. The genres are established by similarities throughout substantive and stylistic forms.

Trump's entire speech is devoted to the idea of restoring the country's prosperity, namely, restoring the welfare of the nation. The elected president from the first lines of his address makes it clear that power now belongs to the people: "*Today's ceremony, however, has very special meaning, because today we are not merely transferring power from one administration to another, or from one party to another, but we are transferring power from Washington, D.C., and giving it back to you, the people.*" Trump frames "*the people*" in opposition to politicians and calls the audience "*you*", making it clear that the people does not include himself or politicians. The use of the pronoun "*you*" by the president creates a division between him and the people: "*the moment belongs to you, this is your day, this is your celebration, this is your country*". Here it is clear that he is not the part of "*the people*". Saying "*we*" Trump means his new administration and himself. As to the first person singular *I*, it is only used in his promise to serve the nation and do his best for the prosperity of the people: "*I will fight for you with every breath in my body and I will never ever let you down.*" Thus Trump constructs himself as the savior of the United States.

There are words which “unify” the people such as *together, all, nation, united, one*. Very poetic is the passage about equality of the people: “... *whether we are black or brown or white, we all bleed the same red blood of patriots. And whether a child is born in the urban sprawl of Detroit or the wind-swept plains of Nebraska, they look up at the same night sky, they fill their heart with the same dreams, and they are infused with the breath of life by the same almighty creator.*”

The current situation and the good future is opposed by the words with negative connotation: *decay, rust out, disrepair, dissipate*; to the words with a positive one: *great, safe, good*.

Tough criticism of the policies of the previous administration is achieved by such stylistic means as:

1) appeal to the historical past: “*For many decades, we’ve enriched foreign industry at the expense of American industry; subsidized the armies of other countries, while allowing for the very sad depletion of our military. We’ve defended other nations’ borders while refusing to defend our own. And spent trillions and trillions of dollars overseas while America’s infrastructure has fallen into disrepair and decay. We’ve made other countries rich, while the wealth, strength and confidence of our country has dissipated over the horizon*”;

2) antithesis: “*Washington flourished, but the people did not share in its wealth. Politicians prospered, but the jobs left and the factories closed. The establishment protected itself, but not the citizens of our country. Their victories have not been your victories. Their triumphs have not been your triumphs. And while they celebrated in our nation’s capital, there was little to celebrate for struggling families all across our land.*”;

3) metaphor: “*...mothers and children trapped in poverty in our inner cities; an education system flush with cash; the crime and the gangs and the drugs that have stolen too many lives and robbed our country of so much unrealized potential*”;

4) simile: “*rusted out factories scattered like tombstones across the landscape of our nation*”.

Trump is the first president who uses such words as *tombstones, trapped, robbed, or carnage* in an inaugural address.

Such communal values as freedom, love and loyalty to the motherland, pride, wealth, safety, democracy and greatness are advanced in Trump’s inaugural: “*together, we will make America strong again. We will wake America wealthy again. We will make America proud again. We will make America safe again. And, yes, together, we will make America great again. We must speak our minds openly, debate our disagreements honestly, but always pursue solidarity. When America is united, America is totally unstoppable.*”

While emphasizing shared communal values Trump appeals to God. The passage “*The bible tells us how good and pleasant it is when God’s people live together in unity*” establishes the idea that Americans are God’s People. The concept of safety is mentioned again when Trump says “*we will be protected by God.*”

As to the future goals of the administration, gradation used by the speaker makes it expressive and emotional: “*We will bring back our wealth, and we will bring back our dreams. We will build new roads and highways and bridges and airports and tunnels, and railways, all across our wonderful nation.*”

Mention should be made of the phrase “*Buy American and Hire American*” which sounds more a business policy rather than a governmental one. Here Trump reveals himself as a businessman who could strengthen businesses.

The climax of the speech might be considered the following paragraph: “*The time for empty talk is over. Now arrives the hour of action. Do not allow anyone to tell you that it cannot be done. No challenge can match the heart and fight and spirit of America.*” which emphasizes the greatness of Americans as the nation with bright future.

In conclusion the president believes in the prosperity of America and again he invokes God: “*And, Yes, Together, We Will Make America Great Again. Thank you, God Bless You, And God Bless America.*”

Speaking about the thematic model of Trump's address, two images are clearly shaped in it: “weak America” and “strong” America. Against the backdrop of all the events that weakened America, Trump points out the country's potential and its uniqueness, as if “transferring” power to the hands of the people. He sounds clear and concise – from now on, the Americans will make their own decisions and all actions will be performed first for the Americans, and after that assistance will be provided to other countries. Trump promises to wipe terrorism off the face of the earth and eradicate the injustice that Americans had before the day he was elected president of the country.

As to the phonostylistics, Trump's inaugural address is dominated by short rhythmic groups, consisting mainly of monosyllables, giving it a jerky and dynamic character. His speech is characterized by a slowed-down intonation pace and a high downward tone.

Thus, it can be argued that the goal of Trump's political rhetoric is simplicity. The desire to speak as “ordinary people” creates a linguistic image of a sincere and honest politician. Perhaps, this explains the success of Donald Trump as a political leader.

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## SPECIFICS OF YOUTH'S SOCIAL PERCEPTIONS OF BLOGGERS

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**Abstract.** This article presents the results of a comparative empirical study of the specifics of youth's social perceptions of a blogger's personality. Currently, blogosphere is showing growth in its popularity, and therefore we can say that the social perceptions (the image) of a blogger as a multi-level socio-psychological media phenomenon is one of the most significant ones in shaping a person's holistic view of mass media. The study involved students of the Chernyshevsky Saratov National Research State University. The empirical material was collected with the use of associative experiment methods. The data obtained via the survey were processed with the prototypical analysis proposed by P. Verges, and the analysis of individual conversations and online discussions which helped to control the outcome. The results showed that students evaluate the blogger's personality mainly in a positive emotional way. The representation of youth's ideas is characterized by concepts with a positive semantic connotation - the blogger is perceived by them as a young man who translates certain meanings and values providing real assistance and realizing various significant functions.

**Keywords:** blogger, blogosphere, blogger social perception, blogger's image, students' blogger perception, blogger personality, blogger personality analysis.

The blogosphere is an important part of today's media space, an interactive communication platform for promoting brands and products, a virtual platform for communication, self-presentation, self-realization, socialization and an integral part of a person's life.

Pointing to changes in the media landscape and, in particular, to the dynamic transformation of the blogosphere, researchers draw attention to the fact that today people devote the vast majority of their time both to consumption and production of their own media content. "You can see a peculiar turn to studying the meanings that users endow to 'the life in the

virtual space', and communication in the media environment becomes "a field for constructing new cultural rituals and meanings, a marker of social change" (Miller, 2016). Not only is the semantic and functional load of the blogosphere changing as a new type of social institution, but also are the very forms and strategies of a person's media behavior in the context of a changing media environment.

Some authors see the reason for the blogs' popularity in implementing one of the communication trends in the context of modern media culture, which is to blur the line between the private and public spheres of life. Gornyxh A. fairly observes that blogging as a postmodern historical form of a diary testifies to «emergence of a new subjectivity where the public-private topology finds itself turned inside out: publicity begins to sprout from the inside of the private life» (Gornyxh, 2009).

In other words, the role of the demonstrative component of various spheres of a person's life is growing. The person's constant positioning of themselves and their life has become an integral element of a media user's life. Media image tends to play an increasingly important role, it manifests itself not only in a person's images and video presentations in the media space, but also in the media status that is revealed in the number of reposts, views, subscribers and comments.

The attitude towards the privacy of an individual's life continues to change, the boundaries of the subjective reality of a person expand, and social ideas about the world change. This perspective focuses on the study of a number of psychological problems, including actualization of analyzing the blogosphere's value impact on the transformation of a person's media behavior, as well as on social ideas about mass media in general.

In general, the analysis of publications showed that for modern youth today, the blogosphere is viewed as leisure time, a good platform for self-realization, personal and professional advancement, a new socialization environment, and a tool for marketing and advertising for promoting a business or a person. Researchers pay special attention to studying blogs as new social media and their impact on political processes in the society.

Generally speaking, the above-mentioned list of studies points to the fact that currently, there is a certain interest in the blogosphere problems among researchers in various fields of science, which is due to the popularity of the blogosphere and its increasing influence on various spheres of life. Meanwhile, a theoretical analysis of the scientific works has also showed that to date, psychological science has done no comprehensive research into the study of the blogosphere, which is apparently due to the dynamics of the blogosphere development which precedes the pace of the scientific research.

This study involved students from the Saratov State University aged 17-23. The total sample size was 1,020 people. The empirical material was collected using the free associative experiment method. The data obtained were processed with the Verges' prototypical analysis.

The theoretical analysis of the vast field of scientific research has shown that up to now, there has been no psychological research aimed at studying empirically the young people's social perceptions of the blogosphere, and in particular, about the personality of a blogger.

Considering today's popularity and enthusiasm for the blogosphere, we can say that the social perceptions (image) of a blogger as a multi-level socio-psychological media phenomenon is one of the most significant phenomenon in shaping holistic views of mass media.

This study of the blogger identity perception has yielded 358 non-repeating characteristics among students. It should be noted that characteristics specified by over 3% of the respondents were statistically analyzed. The analysis of the research materials has made it possible to identify the core zone and the peripheral system of the blogger identity perception.

The core component of students' social blogger identity perception is positive. The substantive elements of the core zone are the following blogger's personality characteristics: «charismatic» (673; 3.01), "demonstrative" (581; 2.84), «positive» (581; 2.84), «with excellent self-presentation» (461; 3.53), «creative» (222; 2.59), «modern» (270; 2.48), «sociable» (157, 2.55), «popular» (202; 2.87), «funny» (164; 2.69), «active» (109; 3.06), «bold» (225; 2.80), «young» (163; 2.57), «fashionable» (99; 2.58), «communicative» (73; 2.18), «smart» (122; 2.51), «caring» (43; 2.79), «cheerful» (71; 2.18), «stress resistant» (122; 2.51), «energetic» (955; 3.22), «emotional» (48; 3.00), and «inspiring» (54; 2.61). In other words, representation of youth's blogger identity perceptions is characterized by unambiguity and concepts with a positive semantic connotation – we have obtained a peculiar portrait of the hero of our time.

The peripheral system which plays a secondary role in the structure of social perceptions is designed with characteristics such as: «open» (3; 3.67), «brisk» (8; 3.88), «beautiful» (12; 4.67), «confident» (17; 3.94), «advanced user» (16; 14.06), «proud» (14; 4.36), «narcissistic» (12; 4.58), «informed» (9; 4.00), «savvy» (5; 4.80), «independent» (7; 5.00), «public» (9; 4.00), «financially secure» (17; 3.94), «silver spoon» (1; 5.0), «ostentatious» (5; 4.20), «advertising» (12; 4,50), and «lazy» (3; 4,00).

Therefore, in the students' perceptions, the blogger personality holds mainly noticeable positive semantic meaning, both in the core and peripheral parts of the social perception. As the results of the study showed, the blogger is perceived by students as a creative and positive media person with charisma,

sociability, social courage and a well-developed ability of self-presentation. He or she is a modern, young, cheerful person who is really inspiring and helpful with presenting useful tips and tricks. Along with entertaining, social, cognitive, and motivating functions, some respondents pointed out the blogger's manipulative, propagandistic and advertising opportunities.

The blogger's personality in the respondents' social perceptions includes a system of knowledge, ratings and attitudes towards their media behavior based first of all on their individual experience from watching video blogs, as well as their experience in creating and promoting their own blog. Interestingly, only 6% of all study participants host their own blogs, 18% of respondents had a personal negative experience in creating a blog, 12% noted that in the future they would like to become a blog author, but so far they understand that it requires free time, interesting ideas, and quality content.

The study has once again confirmed the idea that blogosphere is especially popular among young people and it occupies a significant place in their free time. It is the youth audience that actively realizes itself not only as a spectator, but also as the blog author. Moreover, some students (as a dream) would like their future professional activities to be associated with blogosphere.

Social perceptions of the blogger's identity are based on personal media experience, as well as on ideas that exist in the society's social perceptions, above all, in perceptions of a social group that is significant for an individual. The phenomenon of the blogger's image in social students' perception includes the following components:

- information as summed knowledge about who the blogger is and what types of bloggers exist, which is determined by ideas and formed under the influence of macro environment factors (opinions of social groups and communities),
- a presentation field based on subjective assessments, which is formed under the influence of individual media experience in terms of viewing bloggers' content or maintaining their own blog,
- attitude as a result of categorizing the blogger's image in a media environment.

In our opinion, the multimillion number of bloggers cannot be reduced to a single portrait, and the blogosphere representations lie not only in its quantity and heterogeneity, but above all, in the particular person's social perceptions of the blogosphere, which are formed under the influence of a complex of factors - first of all, person's individual psychological characteristics, his media behavior, and specifically on the choice of his or her of favorite bloggers.

Each new media practice entering into the context of modern media culture actualizes new strategies and tactics of media behavior and on the whole changes in the person's media behavior, at the same time actualizing changes in the person's social perceptions of mass media. All in all, the problematization of the blogosphere expands the subject of media psychology as a science on personality included in the context of media culture, and it indicates an increasing trend in changes in the functioning of media behavior.

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### THREE SPACES OF GRAPHIC DESIGN

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**Annotation.** The article focuses on some properties of images depending on changes in the creating technology, location in the environment or inclusion to the text content.

**Keywords:** graphic design, art, space, habitat, graphic tablet.

All the practices of fine art and then graphic design developed as objects placed in different human habitats. They were certain images or the whole complexes which usually had sacred, aesthetic and informational content. The habitat is supposed to have physical parameters. Conventionally it is named space. As the society keeps developing, the habitat divided into two spaces in accordance with different human habitats. The interior of a house or a construction and all that was beyond the doorstep - facades and everything situated close and far outside was considered to be one large world image. It is believed that imaginary spatial ideas as a reflection of metaspaces could appear together with the images of mythological, poetical and realistic plots in different fields of knowledge [1]. Printing development created the second space where an image obtained its specific properties. Computer technologies discovered the third type of space for art. Virtual space has canceled or at least made all the physical parameters conditional. It took away all the borders and enlarged the range of art opportunities.

The images in the spaces can be similar to each other. They are often the same and do not have uniqueness, hence, can be replaced. For example, the most complex computer effect can be reproduced in a simple drawing by the well-known tools and materials and then expose in a book, magazine, as a graffiti on a facade or as a poster in an interior. However the aims and the functions of these types of space usage are fundamentally different. A brief historical analysis helps to understand the differences between them and to state new approaches to create and use a product find its purposes.

The fine art of the ancient world is closely connected with the ideas that the world had an order represented in oral form, i.e. in a myth. Oral phrases were fixed in the images which obtained then their own senses and values. The myth was visualized and the art canons were stated. Visual images developed formally and in their content. The experience and skills were accumulating. Obviously, all the images were close to each other and had visual differences in the beginning. It helped them to fill the small sacred spaces [2]. It can be presumed that in the beginning the borders between the notions of "interior" and "exterior" were not distinguished clearly and the general placed of image locations were at the same time the habitats [3] of cults. As the architecture developed, cult and housing building technology of images was replaced by that one which came from the previous borders to the facades. As the visual distances became larger, the new requirements to the sizes and craftsmanship emerged. The individual images or their small complexes were not sufficient to satisfy the requirements applied to the images from far and close view. The large ensembles started to form. They were build basing on the difficult compositional rules which had difficult meanings. The images came from the individual or group habitat, they created their own symbols for the whole society. Some of them integrated to the image of buildings and constructions and created the category of architecture decor [4]. Another part became the street and inter-housing space and took the functions of navigation and carriage of different types of information. However, all the images of both subspaces had the same important feature. They remained material and were placed on the material.

The medieval fine art can be presented through the practise of studying the environment space. The search for truth led to the opportunity to build realistic world image. In this time the highest art technical development was almost achieved, the art experience was almost perfect. Simultaneously, a new type of art was developing. It required to divide some functions between the image and the text. It is reflected in some scrolls, hand-written books etc. By the time of printing, the accumulated experience and skills helped to master the planes of the sheet, then newspapers and magazines rather quickly and elaborate an image language. The flow of images and experiences from fine arts, architectural decors and various information visual forms into the plane of a small, limited in size sheet, contributed to the formation of a new space. The printed sheet is accessible to the reader at a distance of only "arm's length", just as in the subspace of the living room and all its images could also remain the same as in the interior. However, the graphics in the book, and then later

appeared in all printed products is more illustrative nature, subordinate to the text. And with the advent of photographic technology, its uniqueness, symbolic symbolism, independence were largely lost-photocopy replaced manual graphics.

Graphic design, which emerged in the post-classical period of the search for new forms, is to a certain extent a continuation of the long development of visual practices. Two large intersecting in many places the channel of design and fine art have accumulated in the twentieth century, a huge joint experience in the development of figurative principles and visual techniques. CG (computer graphics) image technology has offered a new, this time virtual space for the realization of visual experience. The transition to a graphics tablet instead of traditional paper helped to replace the previously existing desire to study nature on the free reformatting and combinatorics of ready-made, widely available forms. This is due to both the functional purpose of the tablet itself as a desktop device for creative activity, and the entrenched postmodern ideas that everything has long been studied and depicted in all kinds and forms.

Graphic tablet saves a person from purchasing consumables, saves time on many operations, allows you to work with any virtual material. In addition, it provides a very wide range of tools, the possibility of unlimited experiment in color and image techniques, details and application of a limitless range of textures. If the draughtsman does not want to work with virtual analogues of the pencil and other tools, he is offered to draw Bezier curves or use pre-installed primitives (square, circle, line, point, etc.). In addition, the ability of a computer to generate an image in the form of, for example, fractals or cgi (computer-generated imagery), which is impossible for traditional practices, appeared.

However, the rejection of real materials and tools can destroy most of the techniques and techniques developed by artists over many centuries, and at the same time change the visual culture. Along with them will go the feeling of physical tension from working with the material, which inevitably arise in the viewer in the process of perception and deliver unconscious pleasure and aesthetic experiences.

A specific feature of the virtual space was the developing tendency to close all visual activities, its goals and objectives, as well as the creation and demonstration of products within itself. After all, to monitor the actions, and then to view the result, a screen device is enough. And storing the product on special media not only eliminates the waste of consumables, but also ensures accessibility from any device anywhere in the world.

### **Conclusion.**

The accumulated images created throughout the history and the types to create them can be divided into three groups according to their visual accessibility.

1. Hand-drawn products (pictography, petroglyphs, decors of things and buildings, paintings, ornaments, etc.)
2. Printed products of all kinds and sizes (illustration, various posters, including advertising, visual communications, signs, etc.)
3. Computer graphics of all kinds (sites, applications, games, etc.)

In this enumeration, there is a clear link with the development of image creation technologies. And the above analytical review of the development of visual practices showed that each new technology generated a new living space for its product. Simultaneously with the appearance of each new space, a significant part of the images went from direct visual perception first in the book-magazine-newspaper content, and then in cyberspace.

In the light of historical development, the groups listed above have passed through three major stages, each of which is characterized by the following features:

- visualization of ancient myths and poetics, which required the disclosure of the inner essence of the images of objects and their symbolism, the creation of a collective view of the world order;
- the study of the shape of an object and full improved it a realistic transfer in the image, development of personal views on the world order;
- using the accumulated practical visual experience to design individual unique virtual worlds.

The spaces considered are not a strict criterion for classifying all fine arts and graphic design practices. Their study can contribute to the understanding of the degree of human involvement in the visual activity, to understand and understand the degrees of necessity of the visual product, its role in our lives and ways of transferring technological and artistic experience.

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**ONCOPROTEIN NUCLEOPHOSMIN/B23 IN THE PRESENCE  
OF RENAL CLEAR CELL CARCINOMA: CLINICAL-ANATOMICAL  
FACTORS OF PROGNOSIS**

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**Annotation.** The study is devoted to the expression of Oncoprotein nucleophosmin / B23 in cells of kidney renal cell carcinoma depending on the clinical and morphological parameters and postoperative survival of patients. We studied 83 kidney cancer drugs. Nucleophosmin / 23 expression was detected by the immunohistochemical method, expression was assessed by calculating the integral optical density of the substrate in the nucleoli of the cells. It was revealed that the integral optical density of nucleophosmin / B23 in tumor cells was interconnected with a number of important prognostic factors: the stages of the disease according to TNM, the size of the tumor node, the degree of nuclear atypia according to Fuhrman, the presence of metastases, and 5-year postoperative survival of patients. The study of the integral optical density of nucleophosmin / B23 may serve as an additional prognosis factor for clear cell renal cancer.

**Key words:** renal cell carcinoma, nucleophosmin / B23, prognosis.

The search for new reliable markers of prognosis of kidney cancer is an urgent task of modern oncology.

Protein nucleophosmin (B23, NPM1, newmartin, NO38) according to modern data is the main argentophilic nucleolus protein [1]. By the chemical structure, nucleophosmin is a phosphoprotein. It was found in all mammalian cells studied to date, but most of all it is found in tumor cells, where

its amount increases by more than 20 times [2,3]. The nucleophosmin protein gene is located on chromosome 5 in locus 5q35 [4]. This gene consists of 12 functional domains and encodes several  $\gamma$ -formonprotein. In humans, B23 protein exists in the form of two isoforms, which are products of alternative splicing of a single gene [5]. The dominant is the isoform B23.1 (294 amino acid residues, electrophoretic mobility of 37-38 kDa), the minor isoform is B23.2 (257 amino acid residues, electrophoretic mobility of 35-36 kDa). The B23.1 isoform is localized mainly in the nucleolus, and the B23.2 isoform is contained mainly in the nucleoplasm [6]. Isoform B23.2 differs from B23.1 in the absence of the last 35 amino acids at the C-terminus of the molecule. Both isoforms function both in monomeric (N-terminal sequence) and in oligomeric (C-terminal sequence) form [7].

In tumor cells, over expression of nucleophosmin and the formation of specific forms of this protein are observed, some of which are monomers and some are oligomers, and the oligomeric state and distribution of monomeric and oligomeric forms between the nucleoli and nucleoplasm changes during carcinogenesis [8]. According to some authors, tumor cells contain 5–10 times more isoforms of B23.1, compared with B23.2 isoforms [9]. Over expression of the B23 protein in tumor cells is also accompanied by the appearance of its abnormal structural variants (shortened, mutant, and chimeric) [10]. For example, a mutant nucleophosmin is localized in the cytoplasm, and a chimeric nucleus, as a rule, has a nuclear cytoplasmic localization [11].

Nucleophosmin is a multifunctional protein that is included in a variety of intracellular processes. The main functions of this protein are: chaperone activity; stimulation of ribosome biogenesis; chromosome centromere duplication control; cell cycle regulation and apoptosis; activation of proliferation and participation in the processes of the cellular response to stressful effects and malignancy of cells [12].

In the literature there is a small number of works devoted to the study of nucleophosmin in malignant neoplasms [13–20]. It has been shown that with malignant neoplasms of the liver, prostate, colon, bladder, stomach, and salivary gland, the expression of nucleophosmin increases sharply. In the literature, we have found only one foreign work, where the expression of nucleophosmin in kidney cancer was studied. Thus, Sari A. (2012) [21] showed that the expression of nucleophosmin in tumor cells correlated with the degree of nuclear atypia. The authors note that the detection of nucleophosmin expression may be a useful immunohistochemical marker for the differential diagnosis between oncocytoma and chromophobic kidney cancer.

**The purpose of the study** was to study the relationship between the expression of nucleophosmin / B23 oncoprotein and the clinical and anatomical prognostic factors of renal cell cancer and the postoperative survival of patients.

**Materials and research methods.** The material for the study was 83 kidneys resected for cancer in the Altai branch of the National Medical Cancer Research Center named after N. N. Blokhin of the Ministry of Health of the Russian Federation, Barnaul. The average age of patients was  $57.6 \pm 1.1$  years. There were 38 men (45.8%), women - 45 (54.2%).

When grouping tumors by clinical stages (I – IV): I stages (T1N0M0) corresponded to 46 (55.4%) cases; II stage (T2N0M0) – 10 (12.05%) of observations; III stage (T1N1M0, T2N1M0, T3N0M0, T3N1M0) - 17 (20.5%) observations and IV stage (T4N0M0, T4N1M0, any N2M1, any M1) - 10 (12.05%) observations. The degree of malignancy of the tumors was evaluated by S. A. Fuhrman. The studied material included 35 (42.2%) tumors of the degree of anaplasia GI; 21 (25.3%) tumors of degree of anaplasia GII; 17 (20.5%) tumors of the degree of anaplasia GIII and 10 (12%) carcinomas of the degree of anaplasia GIV.

There were 15 metastatic carcinomas (18.1%), 68 - localized (81.9%). The average largest tumor node size was  $7.1 \pm 0.4$  cm. Before surgery, patients did not receive drug treatment.

In the manufacture of histological preparations, the tissue matrix method was used. In each case, from paraffin blocks (donor blocks), after previewing the histological specimen with a puncher needle with an inner diameter of 2.0 mm, the columns of tumor tissue were taken. Further, the columns (10-15 pcs.) were placed in paraffin blocks-recipients with a size of 20x20 mm. Using recipient paraffin blocks using a semi-automatic rotary microtome, serial histological sections 4  $\mu$ m thick were made and transferred to glass (from two paraffin blocks to one glass).

Immunohistochemical detection of the nucleolar nucleophosmin / B23 protein was performed using monoclonal antibodies - nucleophosmin / B23, clone mouseAb23 (Labvision company). The integrated optical density (IOP) of nucleophosmin / B23 in the nucleoli was estimated using a computer image analysis system consisting of a Leica DME microscope, a Leica EC3 digital camera (Leica Microsystems AG, Germany), a personal computer, and VideoTest-Morphology 5.2 software. The values of the NIP of nucleophosmin / B23 were expressed in relative units (rel. Units). Not less than 25-30 tumor cells were evaluated.

Statistical processing of the material was carried out using the statistical package Statistica 10.0. If the obtained data corresponded to the normal distribution, then the statistical hypotheses were tested using parametric statistics methods (Student's t-test), and if the data did not meet the normal distribution criteria (Shapiro-Wilk test  $W = 0.89$ ,  $p < 0.01$ ), then used the Kolmogorov-Smirnov test or the Mann – Whitney U-test. Survival curves were constructed using the Kaplan-Meier method, the significance of differences in survival curves was evaluated using a log-rank test, and correlative relationships were evaluated using the Pearson test. Data were considered reliable at  $p < 0.05$ .

**Results of the study:** In the study of the expression of oncoprotein nucleophosmin / B23 in tumor cells, the oncoprotein had a nucleolar localization in 100% of the cells, while the nucleoli were stained brown in color of various intensities. In general, regardless of the clinical anatomical parameters of carcinomas, quantitative analysis of nucleophosmin / B23 IOP showed that the median of IOP protein per core was  $1023.6 \pm 56.7$  rel. units, the range of fluctuations was from 118.9 rel. units up to 15778.3 rel. units.

A correlation analysis of the relationship between the nucleophosmin / B23 IOP and the patient gender was not found ( $r = 0.07$ ;  $p = 0.50$ ) (Table 1). In men, the integral IOP of the nucleophosmin / B23 protein per core was  $1305.8 \pm 57.9$  rel. units. In women, IOP protein did not significantly differ from that in men and amounted to  $1523.4 \pm 94.4$  rel. units ( $p = 0.06$ ) (table. 2).

**Table 1. Correlation relationships of IOP nucleophosmin / B23 with prognostic clinical morphological parameters**

Clinical and morphological parameter	Correlation coefficient (r)	Reliability (p)
patient gender	0,07	0,5
Patient age	0,005	0,96
Clinical stage	0,57	0,0001
Tumor size	0,58	0,0001
Degree of anaplasia according to Fuhrman	0,70	0,0001
The presence of metastases	0,40	0,0001

**Table 2. The integrated optical density of nucleophosmin / B23, depending on the clinical and anatomical parameters**

Clinical and morphological parameter	IOP of nucleophosmin B/23 (rel. Units)	Reliability (p)
Gender: Male Female	1305,8±57,9 1523,4±94,4	p = 0,06
Age: 30 – 39 years (1) 40 – 49 years old (2) 50 – 59 years old(3) 60 – 69 years old (4) 70 – 79 years old (5)	658,2±56,5 2007,7±197,9 1227,6±59,3 1176,8±82,5 2025,5±273,5	$P_{5-1} = 0,005$ $P_{5-2} = 0,6$ $P_{5-3} = 0,00002$ $P_{5-4} = 0,00009$
TNM Stage: stage I stage II stage III stage IV	956,1±31,4 2034,6±134,3 2525,9±197,5 3825,9±521,7	$p = 0,000001$ $p = 0,09$ $p = 0,009$
Fuhrman nuclear atypia degree: GI GIIIGIIIGIV	728,1±19,2 862,2±24,6 2166,9±63,2 4711,7±364,7	$p = 0,00002$ $p = 0,001$ $p = 0,0000001$
Tumor node size: < 7,0 cm ≥ 7,0 cm	904,2±24,7 2555,5±149,2	p = 0,001
Metastases: N0 N+	1197,3±43,4 3098,3±301,0	p = 0,0000001

There was also no correlation between the nucleophosmin / B23 protein IOP and the age of the patients ( $r = 0.005$ ;  $p = 0.96$ ) (Table 1). In the study of protein, depending on the gender of patients, the lowest IOP value of nucleophosmin / B23 was noted in the age group from 30 to 39 (658.2 ± 56.5 rel. Units) years, and the highest at the age of 70 to 79 years ( 2025.5 ± 273.5 rel. units) (Table 2).

IOP of nucleophosmin / B23 correlated with the clinical stage of the disease ( $r = 0.57$ ;  $p = 0.0001$ ) (Table 1). In tumors with stage I of the pathological process, the average IOP of the nucleophosmin / B23 protein per core was 956.1 ± 31.4 rel. units, at stage II - 2034.6 ± 134.3 rel. units ( $p = 0.0000001$ ), with stage III - 2525.9 ± 197.5 rel. units ( $p = 0.09$ ) and at stage IV - 3825.9 ± 521.7 rel. units ( $p = 0.009$ ) (Table 2). Thus, the IOP of the nucleophosmin / B23 protein was interrelated with the clinical stage of the pathological process. With an increase in the stage of the process, the content of the protein nucleophosmin / B23 in the nucleoli of the tumor cells significantly increased.

The nucleophosmin / B23 IOP was correlated with the size of the tumor site ( $r = 0.58$ ;  $p = 0.0001$ ) (Table 1). In tumor cells  $< 7\text{cm}$  in size IOP was  $904.2 \pm 24.7$  rel. units, in tumor nodes  $\geq 7$  cm IOP protein significantly increased to  $2555.5 \pm 149.2$  rel. units per 1 nucleus ( $p = 0.001$ ) (Table 2). Thus, the IOP of the nucleophosmin / B23 protein was correlated with the size of the tumor node. As the tumor size increased, the IOP of the nucleophosmin / B23 protein per nucleus also increased.

IOP of nucleophosmin / B23 correlated with the degree of tumor anaplasia according to Fuhrman ( $r = 0.70$ ;  $p = 0.0001$ ) (Table 1). In tumors of the degree of anaplasia G I according to Fuhrman, the average IOP of the oncoprotein nucleophosmin / B23 per nucleus was  $728.1 \pm 19.2$  rel. units, with the degree of anaplasia G II -  $862.2 \pm 24.6$  rel. units ( $p = 0.00002$ ), with the degree of anaplasia G III -  $2166.9 \pm 63.2$  rel. units ( $p = 0.001$ ) and with the degree of anaplasia GIV average -  $4711.7 \pm 364.7$  rel. units ( $p = 0.0000001$ ) (table 2). Thus, in clear cell renal cancer, IOP of the nucleophosmin / B23 protein was correlated with the degree of tumor cell anaplasia. A significant increase in the content of the protein nucleophosmin / B23 in the nucleoli of the cells with an increase in the degree of tumor anaplasia were revealed.

NIP of nucleophosmin / B23 was associated with metastasis of clear cell renal cancer ( $r = 0.40$ ;  $p = 0.0001$ ) (Table 1). In the cells of localized tumors of the IOP of the oncoprotein nucleophosmin / B23 per 1 nucleus, it amounted to  $1197.3 \pm 43.4$  rel. units, and in metastatic tumors, the IOP of the protein significantly increased to  $3098.3 \pm 301.9$  rel. units per 1 core ( $p = 0.0000001$ ) (table. 2). Thus, in the nuclei of cells of metastatic tumors of clear cell carcinoma of the kidney, a significantly higher IOP of the nucleophosmin / B23 protein was noted compared with localized tumors.

We carried out a study of 5-year postoperative survival of patients depending on the IOP of nucleophosmin / B23 in tumor cells. When analyzing survival by the Kaplan-Meyer graphical analysis of the analysis showed that when the IOP of nucleophosmin / B23 in the tumor cells was  $< 1000$  rel. units, then by 1800 days after the operation, the cumulative share of survivors was 0.98 (98%), and when the IOP of nucleophosmin / B23 in the tumor cells was  $> 1000$  rel. units, then the cumulative share of survivors was 0.60 (60%). A comparative analysis of the data using the logarithmic rank criterion revealed that the differences between the survival curves in the study groups were significant (log-rank;  $p = 0.01$ ).

**Conclusion.** Thus, summarizing the above, we can conclude that the expression of nucleolar-oncoprotein nucleophosmin / B23 in clear cell renal cancer was correlated with clinical and morphological prognostic parameters of carcinomas and 5-year postoperative survival of patients. With an increase in the clinical stage, the size of the tumor node, the degree of anaplasia, and the presence of metastases of the IOP of the nucleophosmin / B23 protein per nucleus, it significantly increased. An increase in the IOP of nucleophosmin / B23, in our opinion, significantly increases the ability of tumor cells to invasively grow and metastasize. Therefore, the finding of tumor cell populations with a high nucleophosmin / B23 IOP per nucleus in clear cell renal cancer may indicate a risk of metastases and an unfavorable prognosis of the course of the disease. The determination of the IOP of the nucleophosmin / B23 protein in tumor cells of primary carcinoma can be used in assessing the risk of metastases in the preoperative stage, predicting the course of RCC and in planning the scope of surgical treatment. Evaluation of the IOP of nucleophosmin / B23 protein in clear cell renal cancer can serve as an additional marker in determining the prognosis of the disease in combination with traditional classical prognostic factors.

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**THE PREVALENCE OF ANTIBIOTIC-RESISTANT GRAM-NEGATIVE  
PATHOGENS OF NOSOCOMIAL PNEUMONIA  
IN ST. PETERSBURG, RUSSIA**

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**Abstract.** Gram-negative bacteria are the most common causative agents of nosocomial pneumonia. This article presents the results of a study of antimicrobial sensitivity of 494 isolates of nosocomial pneumonia pathogens isolated from patients from a multidisciplinary hospital in St. Petersburg in 2018-2019. In the etiological structure of pathogens that cause pneumonia under hospital conditions, 66.0% (326 strains) were occupied by bacteria from the Enterobacteriaceae family (258 strains of *Klebsiella pneumoniae* and 68 strains of *Escherichia coli*), 34% (168 strains) were non-fermenting gram-negative bacteria (93 strains of *Pseudomonas aeruginosa*, 71 strain of *Acinetobacter* spp., 2 strains of *Burkholderia cepacia* complex and 2 strains of *Stenotrophomonas maltophilia*). The extreme resistance phenotype (XDR) was possessed by 20.2% of *K. pneumoniae* isolates, 65.6% of *P. aeruginosa* isolates, and 66.2% of *Acinetobacter* spp isolates.

**Keywords:** nosocomial pneumonia, antibiotic resistance, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Acinetobacter* spp.

### **Introduction**

Enterobacteria remain the leading pathogens isolated from patients with nosocomial infections in the Russian Federation, an increase in the prevalence of nosocomial infections caused by representatives of *Enterobacteriaceae* is noted: 30.1% in 2002-2004, 34.5% in 2006-2007, 33.7% in 2011- 2012 and 43.1% in 2013-2014 [1-6].

The most clinically significant is the problem of resistance of nosocomial enterobacterial strains to cephalosporins I-III generations and carbapenems. According to previous studies, resistance to cephalosporins among hospital strains of enterobacteria in Russia has reached more than 80%, mainly due to the epidemic spread of strains producing extended-spectrum  $\beta$ -lactamases (ESBL) [2,5,11]. The drugs of choice for the treatment of nosocomial infections caused by insensitive to cephalosporins are carbapenems. However, according to the results of the MARAFON study, in 2013-2014, resistance to carbapenems (meropenem, imipenem and erapenem) showed 4.8%, 5.2% and 14.5% of all isolates of enterobacteria, respectively; moreover, in 7.8% of isolates, resistance to carbapenems was mediated by the production of carbapenemases [6].

According to published data, *P. aeruginosa* is the second most common causative agent of nosocomial pneumonia. The proportion of *P. aeruginosa* isolates in the Russian Federation was and remains high: 23.0% in 2002-2004, 26.3% in 2006-2007, 20.2% in 2011-12 and 19.0% in 2013-2014 [1,3, 4, 7-9].

Currently, one of the most significant problems of chemotherapy for infections caused by *P. aeruginosa* is the global increase in carbapenem resistance, including the spread of metall- $\beta$ -lactamase (MBL) producing strains, enzymes that break down all  $\beta$ -lactam antibiotics, except aztreonam [10,11]. In addition to resistance to  $\beta$ -lactams, MBL-producing strains of *P. aeruginosa* often exhibit associated resistance to most non- $\beta$ -lactam antimicrobials, including aminoglycosides and fluoroquinolones, by linking the genetic determinants of resistance, which greatly complicates the choice of drugs for the treatment of infections caused by them.

Bacteria of the genus *Acinetobacter* - are the third most frequent pathogen after *K. pneumoniae* and *P. aeruginosa* in nosocomial infections. Over the years, *Acinetobacter spp* has remained one of the leading causative agents of nosocomial infections in Russia [14,15]. *A. baumannii* and related species have significantly lower natural sensitivity to most  $\beta$ -lactam antibiotics, including penicillins and cephalosporins, compared to members of the *Enterobacteriaceae* family. In this regard, carbapenems (meropenem and imipenem) are usually used to treat infections caused by these pathogens [13].

The emergence and spread of resistance to carbapenems in gram-negative bacteria, including mediated production of carbapenemases, is currently a real threat that determines the need for regular epidemiological and microbiological monitoring of the sensitivity of pathogens of nosocomial infections [16].

### Materials and methods

Bacteriological examination was performed on the primary material from the lower respiratory tract: sputum, bronchoalveolar lavage and bronchial lavage. 326 samples of bacteria of the *Enterobacteriaceae* family (258 strains of *K. pneumoniae* and 68 strains of *E. coli.*), as well as 168 strains of non-fermenting gram-negative bacteria, among which are 93 strains of *P. aeruginosa*, 71 strain of *Acinetobacter spp.*, 2 strains of both *B. cepacia complex* and *S. maltophilia* were isolated and identified from biomaterial samples. Sensitivity to antibiotics was determined by the disk diffusion method. The sensitivity categories of isolates to all drugs were determined in accordance with the Russian clinical guidelines "Determination of the sensitivity of microorganisms to antimicrobial agents" (Ver. 2015-02) and Methodological documents (EUCAST, 2018). For quality control, *E. coli* ATCC 25922 and *P. aeruginosa* ATCC 27853 strains were used.

All isolates included in the study were regarded as nosocomial, taking into account the following data: the probable etiological significance in the development of pneumonia and compliance with the recommended criteria for nosocomial infections, namely: according to the approved definitions for nosocomial pneumonia: nosocomial (nosocomial) pneumonia (NP) - pneumonia that develops through 48 hours or more after hospitalization; nosocomial pneumonia associated with mechanical ventilation (NP MV) - pneumonia that developed no earlier than 48 hours from the moment of tracheal intubation and the start of mechanical ventilation, in the absence of signs of pulmonary infection at the time of intubation.

### Results

326 bacterial strains of the *Enterobacteriaceae* family (258 strains of *K. pneumoniae* and 68 strains of *E. coli*), 168 strains of non-fermenting gram-negative bacteria, including 93 strains of *P. aeruginosa*, 71 strains of *Acinetobacter spp.*, and 2 strains from both *B. cepacia complex* and *S. maltophilia* were isolated and identified from biomaterial samples.

The proportion of *Enterobacteriaceae* isolates among all gram-negative bacterial pathogens of nosocomial pneumonia isolated in the study was 66%. 86% of *K. pneumoniae* strains were resistant to amoxicillin/clavulanate. 85% of *K. pneumoniae* strains are resistant to III generation cephalosporins, 37% to cefoperazone/sulbactam, 55% to amikacin, and up to 40% of carbapenems. Moreover, all isolated isolates are sensitive to polymyxin.

A similar trend is observed when studying the resistance of *E. coli* strains, 81% of which are resistant to ampicillin, 32% to amoxicillin/clavulanate, cefotaxime, ceftazidime, 9% to amikacin, 28% to ciprofloxacin, 7% to meropenem and imipenem, 3% - to cefoperazone/sulbactam. All isolated isolates are sensitive to polymyxin.

The proportion of *P. aeruginosa* isolates among all bacterial pathogens of nosocomial infections isolated in the study was 19.0%. Strains of *P. aeruginosa* are resistant to ciprofloxacin (66%), ceftazidime (63%), amikacin (43%), cefepime (47%), meropenem (57%), imipenem (52%), cefoperazone/sulbactam (33%). All isolated isolates are sensitive to polymyxin.

Representatives of the genus *Acinetobacter* among all bacterial pathogens of nosocomial pneumonia isolated in the study amounted to 14.4%. *Acinetobacter spp* strains. in 89% of cases were resistant to ciprofloxacin, in 92% to ceftazidime, in 83% to amikacin, in 86% to gentamicin, in 16% to doxycycline, in 80% of cases to meropenem, in 70% to imipenem, in 6% of cases - to cefoperazone/sulbactam. All isolated isolates are sensitive to polymyxin.

### **Discussion of the results**

As a result of the study, nosocomial strains of *Enterobacteriaceae* representatives were highly resistant to most antibacterial drugs. So, the isolated *K. pneumoniae* strains in 86% of cases are resistant to amoxicillin/clavulanate, which is typical for many intensive care units in large hospitals in St. Petersburg and Russia as a whole. More than 20% of the studied nosocomial *K. pneumoniae* isolates were classified as extremely resistant (XDR) in accordance with accepted international criteria. This fact excludes the possibility of the empirical use of antibiotics for the treatment of nosocomial infections caused by *K. pneumoniae*. At the same time, *K. pneumoniae* strains represented in foreign collections are resistant to protected amoxicillin only in 16% of cases. The resistance of the *K. pneumoniae* and *E. coli* strains to cephalosporins, including protected ones, aminoglycosides, and carbapenems is an order of magnitude higher than that of foreign strains.

The results of the study indicate a continuing increase in the resistance of *A. baumannii* isolates to most antibacterial drugs in the Russian Federation. Particular attention is drawn to the fact of the extremely high prevalence of resistance to carbapenems, which are traditionally considered the drugs of choice for the treatment of severe infections in hospitalized patients. The increase in resistance to drugs of this group is due, first of all, to the rapid spread of carbapenemase-producing *A. baumannii* strains in various regions of Russia, the share of which have increased by more than 20 times: from <3% in 2006-2007 to >64% in 2013-2014. The presence of many different types of carbapenemases and epidemiologically successful clones involved in their dissemination creates an unfavorable prognosis regarding the possibilities of inhibiting

the growth of resistance to carbapenem. At the same time, the choice of antibacterial drugs for the treatment of infections caused by carbapenem-resistant strains is extremely limited due to the high frequency of associated resistance to antibiotics of other groups. The phenotype of extreme resistance (XDR) was possessed by 66% of *A. baumannii* isolates and more than 29% - showed resistance to all available antibacterial drugs except colistin.

*P. aeruginosa*, along with *A. baumannii*, is the most “problematic” causative agent of nosocomial pneumonia in terms of the choice of antibiotic therapy. An increase in the resistance level of *P. aeruginosa* strains to antibiotics of the carbapenem group is noted. Moreover, the phenotype of extreme resistance (XDR) was possessed by more than 65% of *P. aeruginosa* isolates.

### **Conclusion**

A growing increase in resistance to carbapenems requires limiting their unjustified use and mandatory monitoring of the resistance of nosocomial pneumonia pathogens to them. The high frequency of combined resistance of *K. pneumoniae* strains to amikacin (55%) and ciprofloxacin (66%) allows us to recommend them only with confirmed sensitivity.

Polymyxins (colistin and polymyxin B) are currently the only group of drugs resistance to which in nosocomial *P. aeruginosa* strains does not exceed 5%.

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**THE DIAGNOSTIC VALUE OF ROUTINE RESEARCH METHODS  
ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY  
IN PATIENTS WITH CHRONIC HEART FAILURE ELDERLY**

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**Abstract.** Traditionally, CHF is associated with impaired LV contractile function. However, from the point of view of the pathophysiology of CHF syndrome, systolic dysfunction is considered only as one of the factors along with a change in wall tension and the structure of diastolic filling, i.e. with all that is included in the concept of "remodeling of the left ventricle."

It is assumed that the development of CHF in most cases is based on LV diastolic dysfunction, which can cause a decrease in systolic function of the myocardium due to structural changes in the valves and impaired excitability and conduction in the sinus node and conduction system of the heart. This is especially true of the elderly. The study of indicators of diastolic function in the dynamics of treatment can be used as criteria for the effectiveness of therapy in patients with CHF.

**Keywords:** chronic heart failure, ejection fraction of the left ventricle, electrocardiography, echocardiography, ventricular extrasystoles.

**Relevance.** Physiological changes in the body during aging can predispose to the development of CHF [2,5,6]. With age, there is a progressive increase in myocardial stiffness, the appearance of moderate physiological hypertrophy with the formation of diastolic dysfunction of the ventricles, as well as structural changes in the valves and disturbances of excitability and conduction in the sinus node and conduction system of the heart, which can cause a decrease in systolic myocardial function [3,4, 8.9]. The complexity of the diagnosis and treatment of CHF in the elderly is caused by a multi-organ disorder, frequent complications, and polymorbidity (combination with arterial hypertension, type II diabetes mellitus, neurological pathology, COPD).

**Material and research methods.** The study included 82 patients with CHF of ischemic origin (men 52–63.41%) aged 65-89 years (average age  $76.17 \pm 3.29$  years) with preserved systolic function of the left ventricle (PV LV  $\geq 50\%$ ), II and FC III according to NYHA 36 (44%) and 46 (56%) people, respectively. All patients with CHF and 20 healthy volunteers of the appropriate age (without signs of damage to the cardiovascular system) underwent 12-lead ECG and echocardiography according to standard protocols and with calculation of all indicators (PV, CSR, EDV, mitral regurgitation degree). Data processing and assessment of intergroup differences were carried out using Student's criterion. Correlation analysis was carried out using the Pearson correlation coefficient and assessing the degree of its reliability.

**Research results.** Among CHF patients, cardiac arrhythmias such as ventricular extrasystoles (VE) of I-II class according to Laun 10%, atrial fibrillation (AF) (8%), signs of LVH (80.1%), as well as borderline prolongation of QT and PQ were determined -intervals. In patients with CHF, in spite of the preserved LV systolic function, the LV EF value was significantly lower than in the control group. EDV LV was significantly increased in patients with CHF compared with the control group. The presence of CHF, and not age, was associated with an increase in the length of the left atrium (LP) and sphericity index. LV myocardial mass index was increased in elderly patients with CHF. Elderly age was associated with a decrease in the ratio (CG), while in patients with ischemic genesis CHF, the elderly showed a significantly reduced ratio of the rates of the early and late phases of diastolic displacement of the lateral segment of the mitral valve. In the group of elderly with CHF, there was a greater pancreatic hypertrophy of the pancreas, and a high frequency of tricuspid regurgitation - 68 patients (82.93%) in the CHF group versus 9 in the CG group - 45% ( $p < 0.001$ ). The estimated pulmonary systolic pressure in healthy volunteers was not dependent on age, while in patients with CHF it was significantly higher, although it remained within normal values.

**Conclusions.** All studies confirm that echocardiography and ECG are among the primary diagnostic studies in patients with suspected heart failure, helping to determine treatment tactics, monitor its effectiveness, evaluate prognosis and quality of life.

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**EFFECTIVENESS OF I-PRF AND RECOMBINANT BONE MORPHOGENETIC PROTEIN AT THE EXTRACTION OF IMPACTED MANDIBULAR THIRD MOLAR**

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**Abstract.** Objective – improving the effectiveness of treatment of patients with retention of the third molars of the lower jaw by using osteogenic factors (autoplasma enriched with i-PRF and recombinant morphogenetic protein (rhBMP-2). 82 patients were included in research.

The developed surgical method for treating retention and dystopia of the lower third molars using biomaterial based on demineralized bone matrix saturated with recombinant morphogenetic protein of bone rhBMP-2 can reduce the occurrence of postoperative inflammatory complications by 35, 4%, and also reduce the time for their elimination.

**Keywords:** retention, third molars, recombinant morphogenetic protein, i-PRF.

Despite the progress in treatment modes of mandibular third molar impaction and dystopia, the incidence of postoperative complications connected with complex abnormal extraction remains sufficiently high [1]. Extent of operation increase leads to major bone losses, to repair which special conditions are required [2, 3].

The management of reparative osteogenesis optimization requires further development and in-depth study. It lets achieve early recovery of three-dimensional bone defects, formed after the impacted mandibular third molar extraction. In recent decade it is administered the calcium binding bone morphogenetic protein (BMP-2) to solve the given problem [4]. This is one of the most important directions in the implementation of the specific materials in medical practice. The study results have shown

that the pattern of rhBMP-2 topically applied with the collagenous agent leads to the tridimensional osteogenesis in single-step in vivo procedure [5]. Authors concluded that in case of big defects compounds including recombinant BMP (rhBMP-2), allograft bone and PRP (plasma-rich platelet) can be used as osseous tissue substitutes [6]. Another study shows that platelet-rich fibrin (PRF) administration in the extraction defects is high-value management which provides quick soft tissues postoperative recovery with marginal complications [7, 8].

### **Study object**

The object of the study is improving the effectiveness of treatment of patients with retention of the third molars of the lower jaw by using osteogenic factors (autoplasma enriched with i-PRF and recombinant morphogenetic protein (rhBMP-2)).

### **Study methods and materials**

In this study 82 patients with difficult mandibular third molar eruption take part at the age from 19 to 37. There were 40 (48,8%) male subjects and 42 (51,2%) female subjects among them. All patients had invariable indications for impacted mandibular third molar extraction like difficult wisdom tooth eruption (pericoronitis, phlegmon, lymphadenitis), dystopia, space shortage.

Difficult eruption of the cohort was followed by inflammatory complications the most common of which was acute pericoronitis among 61 patients (74,4%) and rarely it was long-term one among 21 patients (25,6%).

Treatment was provided in two stages. During the first stage sanitation was done to eliminate or stabilize an acute infection which is inflammatory process in the area of impacted third molar. The second stage provides abscessed tooth extraction, wound sanitation, formed defect filling with osteo-inductive medications under the collagen membrane and complete closure.

To diagnose the anatomic features of impacted mandibular third molars orthopantomography data was used. It was done on the apparatus PlanmecaProOne (firm «Planmeca», Finland) under conditions stated above 60-75 kW, 7 mA with timing at 10 seconds. Further condition robust picture of alveolar bone, dentition, reparative regeneration dynamics was studied with the help of computerized tomography on the tomograph PlanmecaProFace (firm «Planmeca», Finland). Following picture processing was carried out with the use of Planmeca Romexis Viewer 4.4.1.R program package («Planmeca», Finland) that enables to calculate mean value in units of Hounsfield (units H or Hounsfield Units or HU) being representative of the bone density.

All patients were administrated with preoperative assessment which was infection and inflammation sanitation of retromolar area. To achieve these goals HELBO therapy (HELBO Photodynamic system) was used. Hygienic measures were professionally conducted under the application Lidocaine liquor 10,0% (inveterate pericoronitis) or block anesthesia Sol. Ultracaini 4%-1,7 ml (acute pericoronitis), after which damage are was filled with photosynthetase following by laser irradiation with exposure dose up to 3 min. The procedure was repeated during 3-5 days till discernible, evident reversal or marked decline of inflammatory indications and soft tissues oedema abolition or involution in difficult mandibular third molar eruption area. Since that period surgical treatment stage starts.

Surgical aggression management was administrated due to the united act for all patients. Osteotomy was conducted with the use of ball-shaped dental cutter following by continuous cooling with the saline solution. After the third molar degloving, extraction is being done with a straight elevator. During this procedure all patients had formation of great bone losses with partial damage of inter-alveolar septum.

Post-operative wound curettage was administrated as well as photodynamic effect with HELBO system. Further, depending on osteal wound care, referral to osteogenesis pacing was held in 3 groups with the usage of different methods.

20 patients were enrolled into the first group; they were administrated with the nominal technique for the given abnormality. After the third molar extraction bone loss was filled with blood clot and the wound is sutured tightly.

Patients of the second group (31 people) had their osseous tissue defect replaced with the osteoplastic material BioOss or Osteoplast-M, mixed with i-PRF in the ratio 2:1.

The third group consisted of 31 patients. After impacted mandibular third molar extraction bone loss was filled with biomaterial based on the demineralized bone matrix (BCP), imbued with recombinant bone morphogenetic protein rhBMP-2 in the ratio 3:1. On the second, third and fourth day after the operation all patients were administrated with HELBO therapy according to the technology, which is described above, to provide preventive measures from the closest infectious inflammatory complications.

Statistical analysis of material was conducted with the use of program for statistical processing Statistica 6.0 StatInc USA on the personal computer in Windows. It was conducted average mean calculation (M), standard mean square errors of arithmetic middling (m), Student coefficient. Differences were considered accurate at  $p < 0,05$ .

### Results

Having done preoperative preparation, it was detected earlier reversal of infectious inflammatory process clinical features in retromolar area at inveterate pericoronitis than at acute course. Full regress of chronic inflammation clinical symptoms was already detected among 78 patients (98,0%) after 2-3 HELBO therapy manipulations. Mucosa round impacted/misplaced mandibular third molar gains on pale pink color, palpation is anodynous. 4 treated patients (5 %) with intact mandibular evident subacute inflammation of soft tissues had inflammatory process eliminated only to the end of five manipulations.

Preoperative preparation duration of patients with acute pericoronitis continued no less than 5-6 days and not all trial subjects were followed with full sanitation of inflammatory process in retromolar area. Despite performed treatment, 49 (80,3%) patients had acute pericoronitis eliminated but the rest 12 (18,7%) patients had disease clinical features retained although they were critically retracted. It is worth noting that HELBO therapy usage at the preoperative preparation stage upregulated abolition of gingival tissue edema as well as pyorrhea subsidence from inflammation focus.

It should be noted that microbiocenosis recovery in retromolar area as well as further rate and gingival tissue obligate bacteria content rising (Bifid bacteria, Lactic acid bacillus, Str. Veridans) happened on the 3<sup>rd</sup>-4<sup>th</sup> day after HELBO therapy manipulations. Impacted mandibular third molar extraction was being conducted this timing.

Clinical research in the earliest time limits after the usage of different modes of surgical management and remedial treatment in conditions of «pure» working zone (with impacted/misplaced mandibular third molars) detected better results for representatives of the second and third groups. During 2-3 days after the operation acute spontaneous pain was registered more often among the patients from the 1<sup>st</sup> group (4 patients (20,0%) but critical edema and tissue hyperemia around the wound was detected among 13 patients (65,0%) of the 1<sup>st</sup> group, 9 patients (29,0%) of the 2<sup>nd</sup> group and 5 patients (16,1%) of the 3<sup>rd</sup> one. An inflammatory contracture, refactoring during the first three days, was defined among 11 patients (55,0%) of the 1<sup>st</sup> group, 12 patients (38,7%) of the 2<sup>nd</sup> group and 9 patients (29,0%) of the 3<sup>rd</sup> one. Risen, algescic regional lymphatic nodes were detected among 20,0% of the first group patients, 12,5% of the second group patients and 6% of the third group patients who were operated due to our processed method. Postoperative period of the rest patients proceeded laudably as intensive painfulness, edema, hyperemia, lymphatic nodes reactions were not detected. Only hyperemia of soft tissue flap around the wound and fibroid accretion in the raphe area were defined.

Postoperative period medical data final research showed that the long-term inflammatory complications among 45,0% of the patients administrated with conventional treatments (I group) and 25,8% of patients who had their bone loss replaced with autoblood osteoplastic material rich of i-PRF (II group) were observed quite frequently, though 9,6% of patients who treated with the use of the cocktail based on recombinant morphogenetic protein (rhBMP-2) had given above complications very rarely. It is characteristic that complications, appeared after the mandibular third molar extraction, were resolved in different terms: III group patients by 2-3 days of treatment (on average  $6,2 \pm 0,3$ ), this process was a bit longer for II group patients up to 3-4 days (on average  $8,6 \pm 0,2$ ) and up to 5-6 days for the patients administrated with conventional treatments (on average  $11,4 \pm 0,3$ ).

**Table 1**  
**Osseous tissue changing dynamic in impacted mandibular third molar among the study group patients according to Hounsfield scale**

Study groups	Mineral density indicants of osseous tissue according to Hounsfield scale		
	3 months	6 months	12 months
I (21 patients)	$341,6 \pm 13,5$	$359,3 \pm 13,2$ $p_3 < 0,05$	$374,4 \pm 12,6$ $p_3 < 0,05$
II (31 patients)	$350,8 \pm 15,2$ $p_1 < 0,05$	$361,5 \pm 13,2$ $p_1 < 0,05$ $p_3 < 0,05$	$384,3 \pm 14,8$ $p_1 < 0,05$ $p_3 < 0,05$
III (31 patients)	$373,4 \pm 16,5$ $p_2 < 0,05$	$383,9 \pm 12,8$ $p_2 < 0,05$ $p_3 < 0,05$	$402,9 \pm 13,4$ $p_2 < 0,05$ $p_3 < 0,05$

Remarks:  $p_1$  – statistical significance towards the I group data;  
 $p_2$  – statistical significance towards the II group data;  
 $p_3$  – statistical significance towards the previous stage.

Computer densitometric examination data evaluation of patients from all groups that was done in long date (in 3, 6 and 12 months) after the mandibular third molar extraction showed that osseous tissue regenerative process strength of patients treated due to the conventional treatments and by the processed methods was dissimilar. It is detected that osseous tissue reversibility in the extracted tooth zone was being proceeded in the heaviest and fullest way among the patients whose bone loss was replaced with osteoplastic material in combination with recombinant mor-

phogenetic protein (rhBMP-2). It is proved with the dynamics of its rise according to Hounsfield scale (table 3). At the end 3, 6 and 12 months osseous tissue reversibility of the first group patients, that had their mandibular third molars extracted and further conventionally treated, was in 1,02; 1,01 and 1,03 times less than II group patients and in 1,06; 1,06 and 1,05 times less comparing with the III group data properly (table 1).

### **Consideration**

Thus, comparative study of the received medical, radiological and microbiologic data detected essential advantages of the offered surgical management method of impaction and dystopia of mandibular third molars with pericoronitis in preoperative period. This method involves photodynamic effect and postoperative bone loss replacement with osteoplastic material in combination with recombinant morphogenetic protein (rhBMP-2) in contrast to the conventional treatments. It is identified that laudable results were caused by the multifactorial manipulations of the processed treatment complex that was aimed at the infectious inflammatory process sanitation in retromolar area, any kinds of complications prophylaxis as well as reduction of the osteo-regeneration period as the result we have full reversibility of the damaged tissue. Everything given above allows us to recommend this surgical management method of impaction and dystopia of mandibular third molars with pericoronitis for the widespread use in surgical dental practice treatment.

### **Conclusion**

1. An administration of photodynamic effect among patients with impaction and dystopia of mandibular third molars with pericoronitis in preoperative period conduces infectious inflammatory process in retromolar area quick elimination which makes conditions for the further operative therapy of the given abnormality.
2. Processed surgical treatment management of mandibular third molar impaction and dystopia with the use of biomaterial based on the demineralized bone matrix (BCP), imbued with recombinant bone morphogenetic protein rhBMP-2 in the ratio 3:1 lets decrease postoperative inflammatory complications up to 35.4%, retract its elimination period (on average up to 5.2 days). Also it improves graft quality in the postoperative defects area according to CT scan densitometry in 1.07 times in 3 months; in 1.08 times in 6 months and in 1.09 times in 12 months.
3. Computer radiological densitometry method gives an opportunity to conduct postoperative monitoring of reparative osseogenesis dynamics in the area of extracted impacted/ misplaced mandibular third molar.

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## HISTORICAL EXPERIENCE AND PROSPECTS FOR THE USE OF VIBURNUM IN MEDICINE

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**Abstract.** In the course of a study of scientific literature, the historical experience of using viburnum in different territories over a very long period of time was studied. Analysis of the prospects for use was carried out by us, based on knowledge and work on the content of a number of biologically active substances, among which anthocyanins, flavonoids, tannins, as well as a diverse composition of vitamins and trace elements, a complex of biologically active substances: vitamins (C, P, B2, E, carotenoids), phenolic compounds (flavonoids, phenolic acids, anthocyanins), glycosides, polysaccharides, sugars, organic and triterpenic acids, fatty oils, macro and micronutrients (1)

**Keywords:** common viburnum, fruits of viburnum, historical experience of using viburnum, leaves of viburnum, viburnum wood.

As you know, many berries have healing properties, however, in our opinion, common viburnum (*Viburnum opulus* L.) often bypasses all others due to a large complex of biologically active substances: vitamins (C, P, B2, E, carotenoids), phenolic compounds (flavonoids, phenolic acids, anthocyanins), glycosides, polysaccharides, sugars, organic and triterpenic acids, fatty oils, macro and micronutrients [1]. The above components determine such beneficial properties that are exerted on the human body, such as immunoprophylaxis, toning, lowering blood pressure, and getting rid of insomnia.

The purpose of the work is to study the historical experience of using common viburnum (*Viburnum opulus* L.), analysis and the subsequent conclusion about the prospects of using this raw material in medicine.

Materials and research methods. The object of the research was articles, scientific papers and patents on the use of viburnum as a healing plant. By the method of their study, as well as analysis based on the data indicated in them, the prospects of using common viburnum (*Viburnum opulus* L.) in medical practice were revealed.

Historical experience.

The year of publication of the first data on the study of the chemical composition of viburnum is 1844: H. Kremer announced the release of a voluminous bitter substance from the bark of viburnum. Later, in 1880, H. van Allen and in 1897, T. Shenmann also reported the release from the bark of a viburnum of a voluminous similar glycoside, which had both anti-spastic effects and stopped uterine bleeding.

The events in which E. Cowmann Donijov isolated a similar glycoside from the leaves of *Viburnum tinus* and the bark of *Viburnum rufidulum* Raf, *Viburnum alnifolium* Marsh belong to 1902. and *Viburnum trilobum* L. Despite the fact that its activity was not related to the species *Viburnum opulus* L, these actions continued the study of the composition of viburnum.

In 1972, J. A. Nicholson et al. a specific substance was isolated from the aqueous extract of viburnum bark *Viburnum opulus* L., which was later called viopudial, which is an ester of isovaleric acid and sexwerpene alcohol having two aldehyde groups and two double bonds.

So, the first studies regarding the fruits of the species *Viburnum opulus* L. belong to Vigrova et al. In 1976, they reported the presence of viburnin in the fruits of *Viburnum opulus* L. The viburnin glycoside was isolated as a yellow-orange amorphous powder with a melting point of 65 to 72°C. In addition, this glycoside had a bitter taste and had a specific smell, reminiscent of the smell of valerianic acid. During the hydrolysis of the isolated glycoside, glucose and mannose, valerianic and isovalerianic, formic acid, acetic, valerianic and isovaleric acid were formed. The aglycon-non-carbohydrate portion of the glycoside molecule of the above glycoside was obtained as a brownish oily liquid.

In 1972, J. A. Nicholson et al. a specific substance was isolated from the aqueous extract of viburnum bark *Viburnum opulus* L., which was later called viopudial.

R. P. Godeau et al. In 1978, from the leaves of *Viburnum tinus*, by chromatography of thin layers of a sorbent, they were able to identify a substance that gives a positive reaction to esters with hydroxylamine and dinitrophenylhydrazine. After acid hydrolysis of the isolated substance, an individual compound was obtained. This substance is called viburtinal. It should be noted that a similar substance having a similar structure shortly before was isolated from the rhizomes of *Valeriana wallachii*.

Prilepa V.L. and Gentselova T.M. studied how heat treatment affects the preservation of carotene and vitamin C in the fruits of viburnum and the inlet of work found that ascorbic acid is less resistant to temperature conditions than carotene. So when drying fruits at a temperature of 65 ° C, vitamin C was preserved only by 50%. When processing fruits at a temperature of 75 ° C of this vitamin, only 12.7% was obtained.

All of the above data relate directly to the history of the study of the chemical composition of different parts of this plant. The results obtained in the above studies confirm the fact of the value of not only the fruits of the viburnum *Viburnum opulus* L., but also its leaves, wood.

*Viburnum* was used in national and traditional medicine for many years and is used to this day.

Its fruits have been used since the Middle Ages. The first mention of its healing properties appeared in the herbalists of Hildegard and Albert the Great in the XIV century. The mean lines of herbalists Loniceri (1528-1580), Jerome Bosque (1498-1554) and Mattioli (1504-1577) describe the use of viburnum fruits for nausea and diarrhea.

Then, in the herbalists of the XVII - XVIII centuries, data were presented on the use of the fruits of viburnum for diseases of the heart, kidneys and stomach. But only from the beginning of the first half of the 20th century, viburnum began to be used as a medicine.

Traditional medicine indicated the use of a warm decoction of fruits with honey of chronic bronchitis. Fresh harvest, rubbed with sugar, were recommended for nervous excitement, manifestations of hypertension and atherosclerosis. Decoctions and infusions of dried fruits were used ascites, asthma, pulmonary tuberculosis, colitis, cholecystitis, hepatitis, diarrhea.

A decoction of viburnum bark was used for colds, but it also had an antispasmodic, anticonvulsant and sedative effect [2].

Also known is the use of viburnum juice in folk medicine in the dermatological field: for acne in young men.

Infusion of viburnum flowers was used as an astringent for diarrhea, to improve the functioning of the gastrointestinal tract, with cough and hoarseness, with cholelithiasis and kidney stones, atherosclerosis, pulmonary tuberculosis, cardiovascular diseases, hypertension. Infusion of viburnum flowers with scrofula and skin rashes.

As can be seen from this information, the use of viburnum in folk medicine was really extensive and multidirectional.

As an official medicine, *Viburnum vulgare* first entered the USSR Pharmacopoeia of the 7th edition in 1925, together with the bark of *Viburnum vulgare*, as a substitute for imported raw materials. Further, it was ex-

cluded from subsequent pharmacopeias of the former USSR. Instead, the viburnum bark *Viburnum opulus* L. independently entered the Pharmacopoeia of the USSR VIII, IX, X and XI editions.

It is customary to use medicinal plant raw materials for the manufacture of herbal medicines, however, we want to note that over the past few years there has been a tendency to increasingly include plant extracts as a source of valuable biologically active substances, as a component of newly developed food products, which significantly increases their preventive value and allows us to consider such products as elements of a healthy diet.

At the moment, there are a number of patents received on the topic of food production with the presence of viburnum in their composition.

Among them, a patent on a method for the production of jelly marmalade (RF patent № 2 627 49 from 2016.11.25, IPC A23L 21/10)

The product prepared according to this recipe belongs to the confectionery industry, namely to the preparation of fruit and jelly marmalade based on natural gelling substances and sweeteners. This marmalade has a therapeutic and prophylactic focus.

The product is characterized by a fairly low energy and high nutritional value in comparison with other confectionery products. Due to the content of pectin, it is able to remove toxins, elements of heavy metals, harmful substances formed during the metabolism, such as urea and cholesterol from the body.

The described method is intended for the production of fruit and jelly marmalade based on natural sweeteners and gelling substances, which has a therapeutic and preventive focus, intended for people with diseases of the cardiovascular system, gastrointestinal tract, as well as for working in environmentally harmful environmental conditions, everyone save, strengthen your health.

RF Patent № 2493720 describes a method for producing fruit bars intended for functional nutrition, for the preparation of which they use sea buckthorn, viburnum, mountain ash, rhubarb, apples, nightshade, Jerusalem artichoke, kernels of sunflower seeds, sesame, pumpkin, peanuts and nuts.

RF patent №2014101850 describes a method for producing fruit syrup from viburnum fruits with a high content of biologically active substances, which includes drying and grinding of whole viburnum fruits, heat treatment, filtering and differs in that the viburnum fruits are dried to a moisture content of 13% at a temperature of  $75\pm 2^{\circ}\text{C}$  for 72 hours with a purge of 30% air volume over the last hour, crushed to 0.01 mm particles, mixed with sugar and water and boiled syrup with a solids content of 50%.

Thus, on the basis of all the above data, we can conclude that the use of viburnum in medicine is promising. Especially, its berries is as a raw material for the production of healthy food additives and components of a healthy diet.

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## INFLUENCE OF ENVIRONMENTAL FACTORS ON BIOCHEMICAL INDICATORS CHARACTERIZING THE QUALITY OF WHEAT GRAIN

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**Abstract.** The article presents data characterizing the climatic and weather features in the conditions of the experiment, as well as the protein and starch content in the grain of the studied varieties and lines of wheat. It was revealed that the content of protein and starch in wheat grain differs depending on the growing conditions and fertilizer application. These results can be used in breeding as a test system characterizing the quality of grain.

**Keywords:** wheat, adaptability, protein, starch, productivity, stability.

The strategy of modern breeding is aimed at creating varieties and hybrids of crops that combine high productivity and crop quality with increased adaptability to adverse environmental conditions. The success of breeding work largely depends on the availability of source material for breeding, as well as on effective methods for their assessment and knowledge of physiological and biochemical mechanisms that determine crop quality and resistance to various stress factors [1].

Assessing the stability and plasticity of plants allows us to establish the reliability of differences and obtain additional information for the selection of valuable source material for adaptability. The creation of varieties and hybrids with high adaptability involves the use of special selection methods depending on environmental conditions and the phase of plant ontogenesis [2].

One of the important conditions affecting the quality of wheat grain is the soil and climatic conditions in which crops are grown.

In this regard, it seemed important to study the influence of environmental factors on biochemical parameters characterizing the quality of wheat grain. The protein and starch content of four varieties and lines of wheat were investigated.

### **Material and research methods**

The studies were carried out at three experimental sites of the Center for Innovative Biology and Medicine of the Academy of Sciences of the Republic of Tajikistan, which are located at an altitude of 800, 920 and 2500 m above sea level. As the object of research, zoned soft wheat varieties Orien, Somoni and isogenic lines ANK 17B and ANK15 were used.

Sowing crops was carried out on plots, the area of which was 1 m<sup>2</sup>, the seed sowing rate of 5 million/ha. All experiments were carried out in 3 replicas.

The experimental options were as follows: control (without fertilizer) and with the introduction of mineral and organic fertilizers with the calculation of N<sub>100</sub>P<sub>60</sub>K<sub>60</sub>, biocompost and ram manure at 4 tons/ha. The experimental results were processed statistically. Data are presented as mean values. The obtained experimental material was processed according to Dospekhov (1985).

Biochemical analysis of grain (protein, starch and grain moisture content) was determined by a universal multifunctional IR analyzer with a diode array DA 7200 from Perten Instruments (Sweden).

A mass of 1000 grains was determined according to GOST 12042 - 80 by the standard method.

Our previous studies showed that the environmental conditions of cultivation, as well as the use of mineral and organic fertilizers, have a significant impact on growth and development, as well as on the productivity of various varieties and lines of wheat [3].

In this article, we present the characteristics of climatic conditions and soil analysis of the regions of the studies, as important factors determining the environmental conditions and their impact on the biochemical parameters of grain.

According to the Agency for Hydrometeorology of Tajikistan, the average annual air temperature in the highlands (Anzob Pass) was  $-1.4^{\circ}\text{C}$ . The average temperature in January was  $-13.6^{\circ}\text{C}$ , in July  $+10.8^{\circ}\text{C}$ . (Fig. 1). The absolute minimum air temperature in this zone is  $-13.6^{\circ}\text{C}$ , the absolute maximum  $+10.8^{\circ}\text{C}$ . The average annual rainfall in this zone over the years of research was 446 - 456 mm, and their main amount (up to 90%) falls on the winter-spring period. (Fig. 2). The average annual relative humidity was 64%. (Fig. 3).

In the Gissar Valley, the average long-term annual air temperature is  $+14^{\circ}\text{C}$ . The average temperature in January over the years of the study was  $+4.60^{\circ}\text{C}$ , in July  $+28.60^{\circ}\text{C}$ . Absolute minimum of air temperature  $+20^{\circ}\text{C}$ , absolute maximum  $+35^{\circ}\text{C}$ . (Fig. 4). The average annual precipitation over the years of research was 509 mm, but in especially dry years (2017-2018) about 387 mm. Of the total amount of precipitation, about 90% falls on the period from December to April, and their greatest amount falls in March - about 90 mm. (Fig. 5). The average annual relative humidity was 62.5%. (Fig. 6).

From the data presented, it can be concluded that climatic conditions (t-air, rainfall and air humidity) in the studied areas are very different and can have a significant impact on the morphological and physiological-biochemical parameters of the studied objects.

As is known, agrochemical parameters of the soil are also an important component influencing the physiological and biochemical parameters of the plant. In this regard, soil analysis was carried out at the experimental sites.

The results of soil analysis of the experimental plots showed that in the highlands (Siya-Kuh) humus content is 4.67%; total nitrogen -  $60.82 \mu\text{g}/\text{kg}$ , mobile forms of phosphorus ( $\text{P}_2\text{O}_5$ ) -  $3.2 \text{ mg}/100 \text{ g}$  of soil; potassium ( $\text{K}_2\text{O}$ ) -  $37.3 \text{ mg}/100 \text{ g}$  of soil. The soil composition of the other experimental plots was about the same. Table 1.

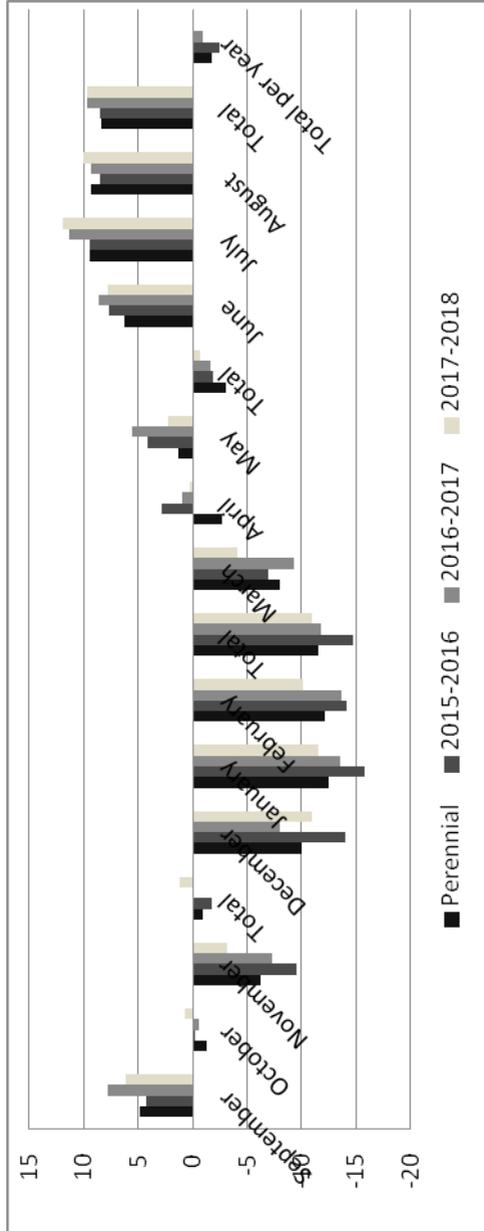


Fig. 1. Air temperature (OC) for the period of research

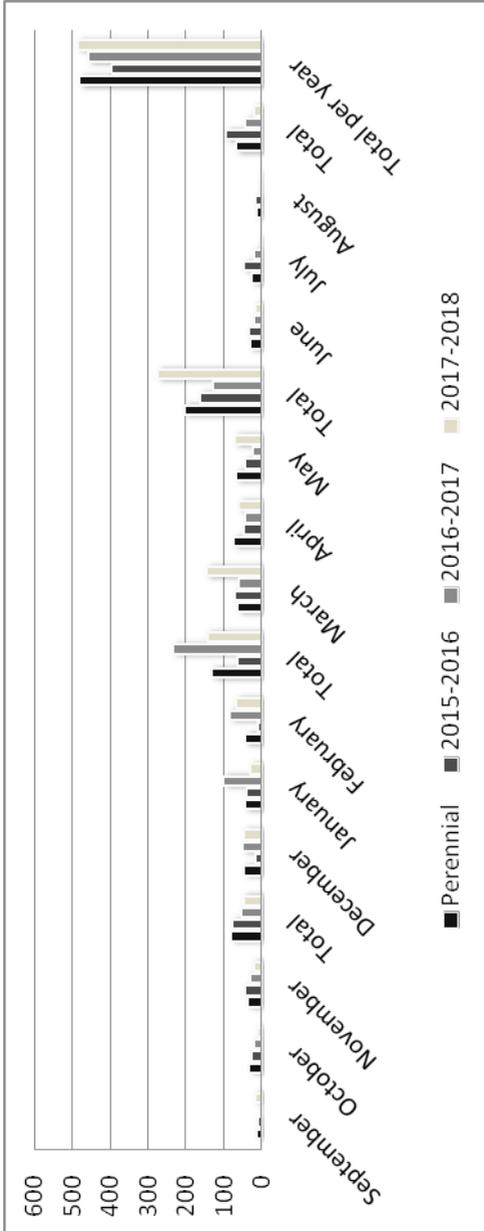


Fig. 2. The amount of precipitation (mm) for the period of the study

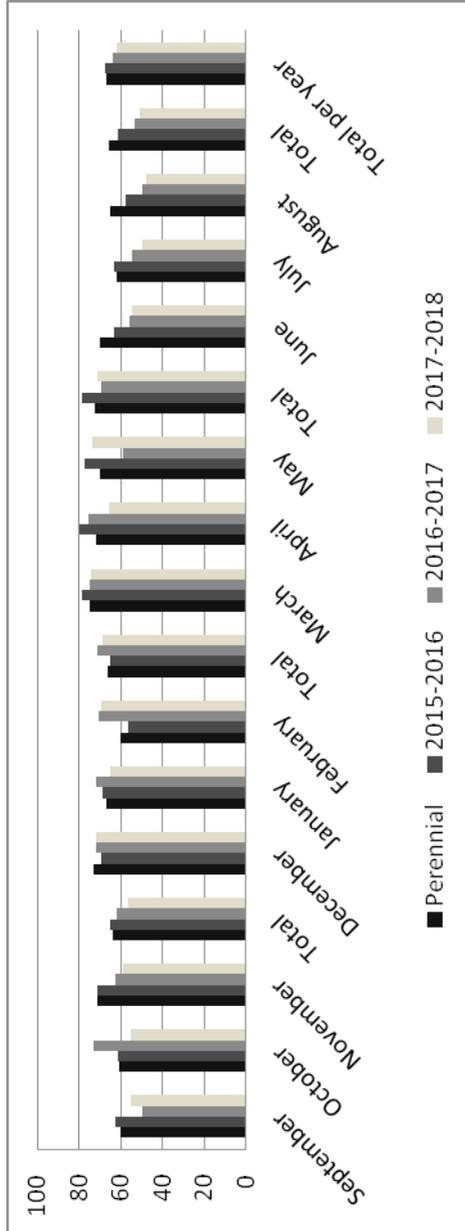


Fig. 3. Humidity (%) for the period of the study

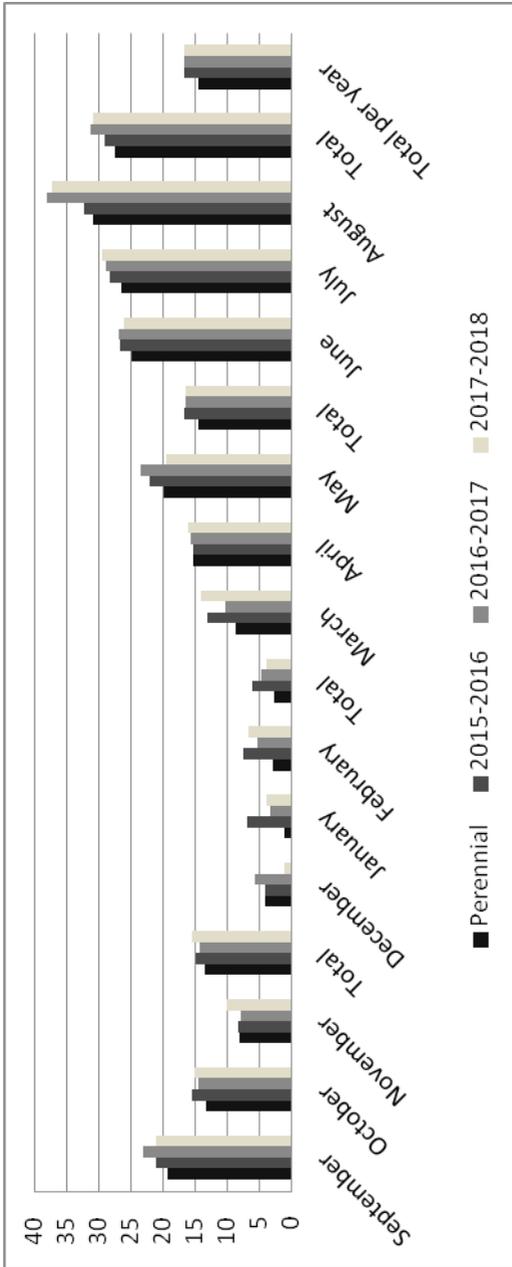


Fig. 4. Air temperature (0C) for the period of research

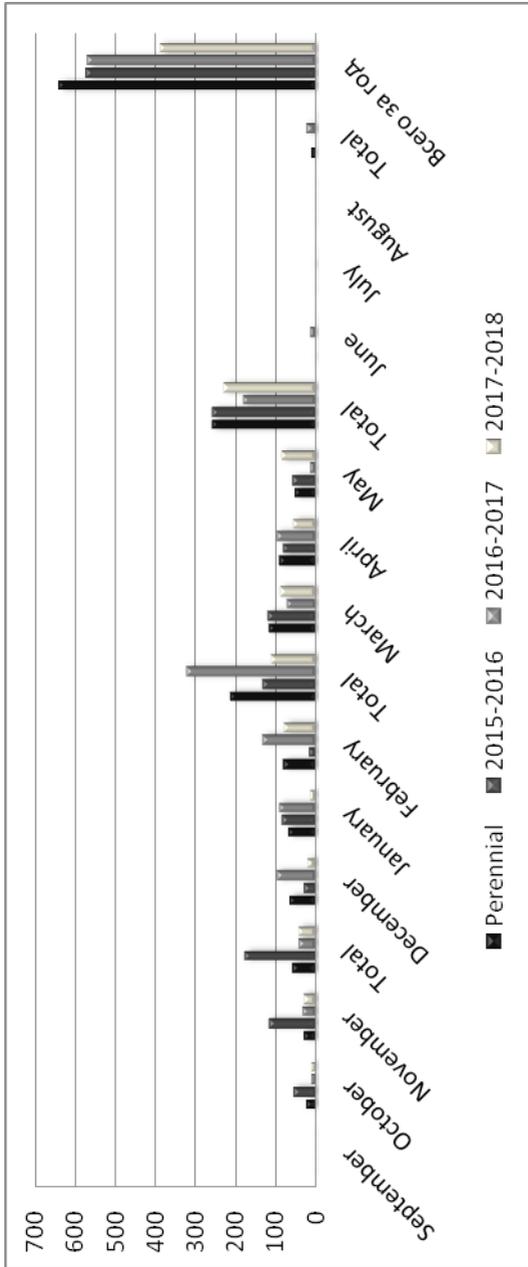


Fig. 5. The amount of precipitation (mm) for the period of the study

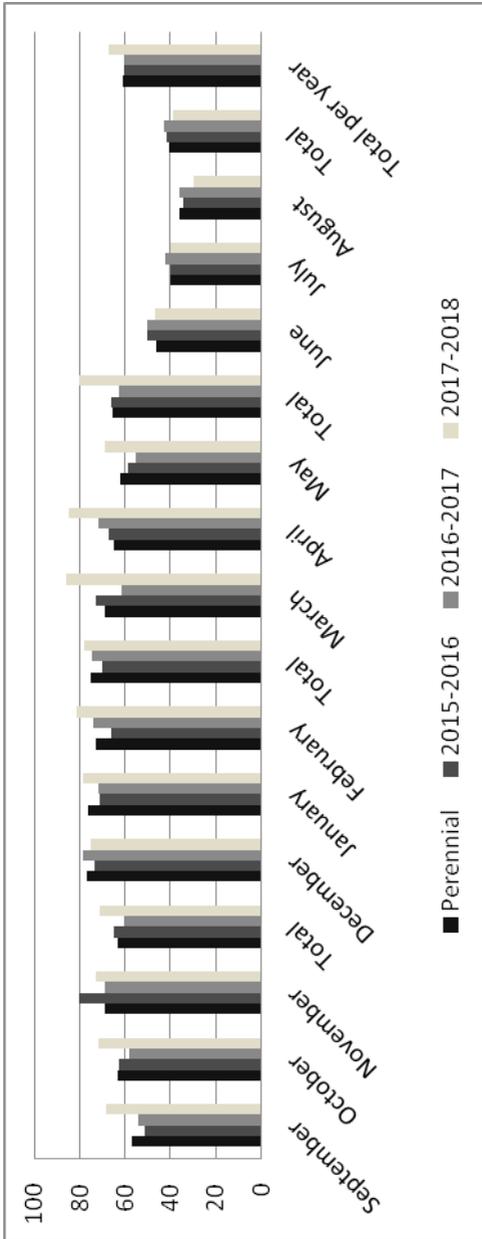


Fig. 6. Humidity (%) for the period of the study

**Table 1**

**The main agrochemical indicators of the soil of the experimental plots**

Plots	Depth of sampling, cm.	Humus, %	Mineral nitrogen mc/kg		Mobile phosphorus, mg/100g	Substitutable potassium, mg/kg
			N-NH <sub>4</sub>	N-NO <sub>3</sub>		
Sia - Kuh ( <i>alpine meadow</i> )	30	4.67	18.48	42.41	3.2	37.30
Center ( <i>typical gray earth</i> )	30	1.03	10.62	19.87	15.56	16.6
Bogara ( <i>dark gray earth</i> )	30	1.14	11.53	20.19	18.29	16.7

It is known that in wheat grain the main nutrients that determine its value are protein and starch, and the quality of wheat grain depends on their balance.

As noted in the works of A.N. Pavlov (1984), depending on the growing conditions, the protein content in wheat grain can vary within very wide limits, in the range from 8 to 25% [4].

The results regarding the protein content in wheat grains grown under dry conditions showed that this indicator was higher in the Somoni variety (10.0±1.37) in the version with biocompost. The lowest protein content was observed in the Oriyon variety in variants without fertilizer and NPK (6.1±0.58). It should be noted that under dry conditions, compared with other regions, all varieties of wheat contained less protein and starch in the grain.

The starch content in wheat grain on average over the years of research under the same conditions was 60.4-67.6%. A slight increase in starch content was observed in Orient wheat in the variant without fertilizer (67.6±0.98), while in other varieties this indicator decreased. (Table 2).

According to V.P. Pleshkov, the average starch content in the grain, depending on varietal characteristics or crop growing conditions, can vary significantly: in wheat grain from 49 to 73%, rye from 55 to 73, barley from 45 to 68. As a rule, the higher the protein content in grain, the less starch is in it, and, conversely, at low protein concentrations, the amount of starch increases [5].

**Table 2**  
**Biochemical quality indicators of wheat grains grown**  
**in dry conditions (Gissar)**

Varieties and lines	Variations	Protein, %	Starch, %	Humidity, %	Weight of 1000 grains, g.
Oriyon	<i>No fertilizer</i>	6.1±0.58	67.6±0.98	13.5	31.6
	<i>Biocompost</i>	9.2±0.87	63.2±1.20	13.5	33.2
	<i>NPK</i>	6.1±0.50	67.5±0.81	13.5	34.8
	<i>Ram manure</i>	6.2±0.60	67.5±0.71	13.3	32.7
Somoni	<i>No fertilizer</i>	9.4±0.83	62.8±0.72	13.1	31.5
	<i>Biocompost</i>	10.0±1,37	63.6±0.68	11.5	33.0
	<i>NPK</i>	9.6±0.65	63.8±0.70	11.5	34.8
	<i>Ram manure</i>	9.0±0.56	64.8±0.75	11.4	33.9
ANK-17V	<i>No fertilizer</i>	7.3±0.50	66.0±1.13	13.1	26.5
	<i>Biocompost</i>	6.8±0.90	67.3±0.90	12.2	28.3
	<i>NPK</i>	7.0±0.60	65.7±0.62	13.0	28.4
	<i>Ram manure</i>	7.7±0.75	64.4±0.73	13.2	28.5
ANK-15	<i>No fertilizer</i>	8.4±0.65	60.4±0.94	13.6	23.4
	<i>Biocompost</i>	8.2±0.88	62.2±1.13	13.3	26.4
	<i>NPK</i>	8.1±0.74	62.1±0.74	13.3	25.4
	<i>Ram manure</i>	7.0±0.48	65.2±0.70	13.5	25.9

It should be noted that in wheat varieties grown in high altitude indicators of protein and starch in all studied objects were relatively high. The increase in protein and starch content, apparently, had an effect on the weight of 1000 grains of the studied wheat samples. It should be noted that the highest content of these indicators was found in the Oriyon and Somoni varieties. In particular, in the Oriyon variety, the amount of protein in the variants of NPK and ram manure was 15.6±0.81-15.0±0.67, which is 1.2-1.8% more than in the control. This indicator in the Somoni variety in the indicated variants varied from 14.9±0.50 to 15.2±0.76, which is 1.2-1.5% more relative to the control. The maximum starch content was found in the Oriyon variety in the NPK variant (76.7±0.61), which is 6.1% higher than the control. (Table 3).

**Table 3**  
**Biochemical quality indicators of wheat grain grown in highlands (Siya-Kuh)**

Varieties and lines	Variations	Protein, %	Starch, %	Humidity, %	Weight of 1000 grains, g.
Oriyon	<i>No fertilizer</i>	13.8±0.84	70.6±0.88	14.5	39.7
	<i>Biocompost</i>	14.2±0.67	72.3±0.95	14.0	43.5
	<i>NPK</i>	15.6±0.81	76.7±0.61	15.0	44.6
	<i>Ram manure</i>	15.0±0.67	74.4±0.55	13.5	50.0
Somoni	<i>No fertilizer</i>	13.7±0.87	69.6±1.41	15.0	40.5
	<i>Biocompost</i>	14.1±0.62	71.0±0.80	14.5	48.1
	<i>NPK</i>	14.9±0.50	73.9±0.50	13.0	48.9
	<i>Ram manure</i>	15.2±0.76	72.8±0.70	14.0	48.0
ANK-17V	<i>No fertilizer</i>	13.2±0.69	68.0±0.87	14.5	30.1
	<i>Biocompost</i>	13.2±0.44	71.2±0.70	14.0	32.6
	<i>NPK</i>	14.2±0.90	73.1±0.81	14.0	33.3
	<i>Ram manure</i>	14.0±0.64	72.0±1.00	14.0	34.7
ANK-15	<i>No fertilizer</i>	11.6±0.60	69.0±1.12	14.4	34.8
	<i>Biocompost</i>	11.3±0.40	72.8±0.60	14.2	38.8
	<i>NPK</i>	14.3±0.64	73.9±1.57	14.0	48.6
	<i>Ram manure</i>	13.0±0.76	72.6±0.72	13.9	39.8

Under Dushanbe conditions, the protein content in ANK-17B and ANK-15 wheat grain was much higher compared to other varieties. In particular, in the ANK-17B line, in all experimental variants, this indicator was 13.1%. In this region, the maximum protein content was observed in the ANK-15 line in the variant without fertilizer (13.8±0.64). As for the starch content, its highest content (64.9±0.67) was found in the Oriyen variety in the ram manure variation.

Thus, it can be concluded that under dry conditions, the highest protein content was detected in the Somoni variety (10.0±1.37) in the variant with biocompost, and its minimum content was observed in the Oriyon variety in the variants without fertilizer and NPK (6.1±0.58). In high altitude conditions, a high protein content in wheat grain was observed in the Oriyon variety in the NPK (15.6 ± 0.81) and mutton manure (15.0±0.67) variants. Under the conditions of Dushanbe, a high protein content (13.1±0.60-13.8±0.64) was found in the ANK-17V and ANK-15 lines. A study of the comparative starch content in wheat grain depending on the cultivation location showed that it varies over a wide range from 58.1±0.45 to 76.7±0.61.

Table 4

**Biochemical quality indicators of wheat grain grown in Dushanbe**

Varieties and lines	Variations	Protein, %	Starch, %	Humidity, %	Weight of 1000 grains, g.
Oriyon	<i>No fertilizer</i>	10.1±0.98	64.0±0.52	13.3	30.7
	<i>Biocompost</i>	9.0±1.01	64.5±0.99	13.2	33.1
	<i>NPK</i>	9.7±0.63	63.2±1.00	13.3	35.5
	<i>Ram manure</i>	9.5±0.85	64.9±0.67	12.9	35.9
Somoni	<i>No fertilizer</i>	10.4±1.00	62.3±1.08	12.8	31.9
	<i>Biocompost</i>	12.3±0.80	60.8±1.39	12.2	35.3
	<i>NPK</i>	10.3±1.01	62.9±0.87	11.7	35.6
	<i>Ram manure</i>	11.4±0.92	62.6±1.06	12.0	36.4
ANK-17V	<i>No fertilizer</i>	13.1±0.60	60.3±0.53	12.2	27.3
	<i>Biocompost</i>	13.0±0.75	60.0±1.64	12.4	29.9
	<i>NPK</i>	13.1±0.41	60.0±1.07	12.1	29.9
	<i>Ram manure</i>	13.1±0.90	60.0±1.00	12.3	30.4
ANK-15	<i>No fertilizer</i>	13.8±0.64	58.4±0.70	12.4	27.1
	<i>Biocompost</i>	13.0±0.61	58.9±0.95	12.3	29.9
	<i>NPK</i>	12.7±0.70	58.4±1.02	12.3	31.0
	<i>Ram manure</i>	12.2±1.19	58.1±0.45	13.9	30.3

Therefore, the ratio of the main biochemical parameters (protein and starch) depends on the application of various types of fertilizers and conditions of growing. The results obtained allow us to recommend Oriyon soft wheat variety in terms of productivity and grain quality to cultivate it in highlands (Siya-Kuh, 2500 m above sea level).

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**SOME RESULTS OF MONITORING THE TEMPERATURE REGIME IN  
THE ALTITUDE ZONE OF THE BARGUZIN RIDGE  
(NORTHERN BAIKAL REGION)**

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**Abstract.** The monitoring of temperature in the territory of the Barguzinsky reserve was organized. On a high-altitude transect of a key section of the Barguzinsky ridge, information is collected on the temperatures of the air column and on the surface of the earth. Research is carried out using thermochrons of the DS1921G type and the M-03 automatic metecomplexes. The temperature regime of the Barguzinsky ridge was specified taking into account altitudinal zonation. The vertical gradient of the ground and minimal and middle air temperatures was calculated. The estimation of mountain temperature inversions is given. Peculiarities of changing the thermal regime of altitudinal zoning by the seasons of the year are noted.

**Keywords:** Barguzinsky ridge, altitudinal zonation, temperature, thermochrons, temperature inversion.

**Introduction**

Monitoring the temperature regime of local territories is a necessary condition for their characterization and forecast of future climatic changes. The studies were conducted on the territory of the Barguzinsky State Natural Biosphere Reserve, located in the middle part of the western macro slope of the ridge of the same name. The study of the temperature regime of high-altitude vegetation zones of the Barguzinsky ridge has so far been limited to brief information from the work of the scientific staff of the reserve N.P. Ladokhin (1948), N.P. Ladokhin and A.M. Turcan (1948) for the period 1934-1945, V.K. Timofeev (1948) from observations at the weather station "Sosnovka" in 1933-1937, T.L. Ananina (2008) on a high-altitude profile in the Davsha River Valley in the period 1989-1990.

Regular observations of changes in meteorological parameters on the coast of Lake Baikal have been carried out since 1955 at the 8-time meteorological station of the second category of the Barguzinsky Reserve UGMS. The following are recorded: air thickness (middle, minimum, maximum), soil temperature, soil temperature at depths of 5, 10, 15, 20 cm, etc. The results of the analysis of long-term climate observations were published in (Ananin, Ananina, 2002, 2018; Ananina, Ananin, 2013, 2017). The data obtained do not cover the mountainous part of the Barguzinsky ridge and do not reflect the climatic features of the entire territory of the reserve. Poor knowledge of the problem initiated us to organize monitoring of the thermal regime of high-altitude vegetation zones of the Barguzinsky ridge.

The climate of the study area is sharply continental with marine features. Its formation is greatly influenced by the huge volume of water (about 23 thousand km<sup>3</sup>) concentrated in the Baikal depression and the mountainous landshaft (Ladokhin, Turcan, 1948). Accumulating heat in the summer, Baikal gives its surrounding area in the autumn. On the contrary, in the spring, absorbing heat during the period of ice melting, the lake cools the surrounding air. The Barguzinsky ridge, located on the path of air currents, retains moisture evaporated from the surface of Lake Baikal, which falls here on the territory of the reserve in the form of various precipitation, while its eastern slope remains in the rain shadow (Timofeev, 1948).

### **Material and methods**

Since 2011, at various points on the territory of the Barguzinsky Reserve, air temperature is recorded by automatic DS1921G thermochrons programmed to record the temperature after 4 hours. Thermochrons allow you to record the air temperature in hard-to-reach places throughout the calendar year, including under a layer of snow. At present, 31 thermochrons are operating: in the valleys of the Davsha river - 19 and the Bolshaya river - 6, in the vicinity of the Davsha field base - 6. The thermochrones are installed in a weather box or fixed with tape on a tree trunk at a height of 2 m, and near the ground surface from the north side.

Replacement of thermochrons is done twice a year, as a rule, before the establishment and after the snow cover has melted. Information is read to a computer and entered into the database. In 2015, automatic weather complexes M-03 (AM-M-03) were acquired in the reserve (developed by the Institute for Monitoring of Climate and Ecological Systems SB RAS, Tomsk, manufactured by Inflay LLC, Tomsk, author of the development S. A. Kurakov). These automatic weather stations are designed to measure the amount of liquid precipitation (rain), measure the temperature and humidity of air on the soil surface and a height of 2 m,

atmospheric pressure, deep soil temperature, wind speed and direction, snow depth. Information is recorded every 20 minutes, removed once a year on a flash card. In 2018, the automatic weather complex in Davsha was configured to transmit measurements from the drive, automatically, via the Internet to the website of the Institute for Monitoring of Climatic and Ecological Systems of the SB RAS with a limited access mode. The information base was the data of middle daily temperatures of the air column and minimum temperatures on the surface of the earth for the period of 2011-2016. Thermochrones are established in 12 characteristic biotopes of a high-altitude transect of a key section of the Barguzinsky ridge in the Davsha valley. Here for a long time the population of birds, large and small mammals, insects, forest pathological and phenological observations have been monitored. A 30 km long transect crosses all high-altitude vegetation zones from the shore of Lake Baikal to high mountains (Fig. 1).

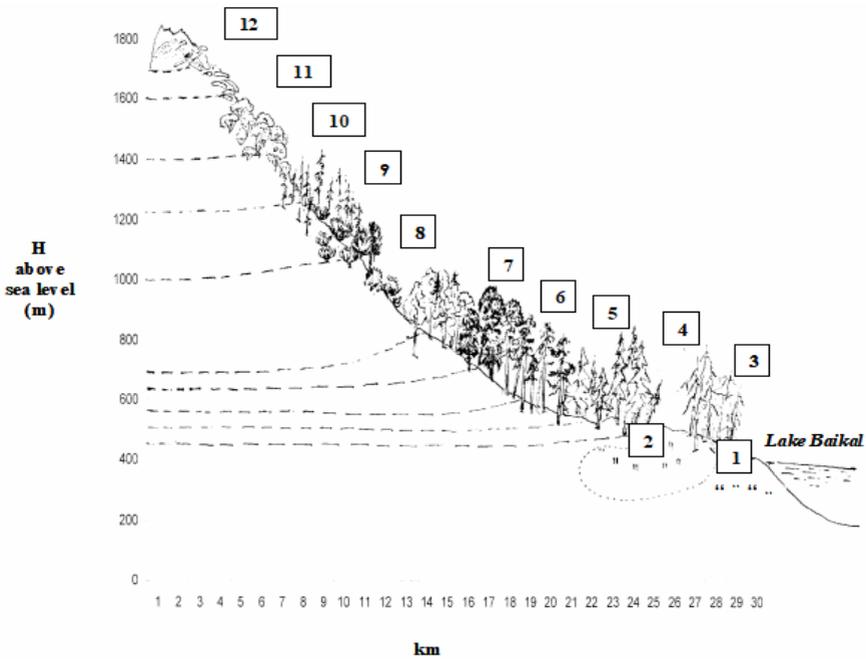
The terrain is characterized by a relatively gentle rise in the low-mountain part of the transect (at 535–721 m), steeper to the upper border of the forest (1407 m), and by a sharp rise to the watershed ridge of the Barguzinsky ridge (1667 m).

Automatic weather stations were installed in 2015 on the coast of Lake Baikal in Davsha settlement (468 m above sea level) and 30 km from the coast on a mountain pass - the watershed of the Davsha and Praviy Tarkulik rivers (1667 m above sea level).

To assess the intra-annual changes in the temperature regime, according to the climatic features of the north-eastern Baikal region, the phenological seasons of the year are indicated: *winter* (cold period, 13 decades) - **X-3 - III-3**, *summer* (warm period, lasts 9 decades) - **VI-1 - VIII-3**, *spring* (9 decades) - **IV-1 - V-3**, and *autumn* (5 decades) - **IX-1 - X-2** (transitional periods of the year). The timing of the onset of the seasons of the year is determined according to climatic criteria proposed by K.P. Filonov (1978). The beginning of *winter* is determined by the date of snow cover establishment, *spring* - by the date of the final transition of maximum air temperatures above 10°C, *summer* - by the date of steady transition of minimum air temperatures above 5°C, and *autumn* - by the date of transition of minimum air temperatures below 0°C.

For the convenience of analysis, high-altitude sections are indicated: *the coast* - 458-517 m above sea level BS, *the lower part of the mountain belt* - 518-721 m, *the upper part of the mountain belt* - 722-1004 m, *the subalpine belt of vegetation* - 1005-1667 m.

### Results and discussion



**Fig. 1. Location of thermochrons on a key section of the Barguzinsky ridge in the Davsha river valleys**

Designation of biotopes:

- 1 - shrubby meadow (468 m above sea level),
- 2 - grass meadow (517 m),
- 3 - blueberry larch (518 m),
- 4 - sedge spruce (517 m),
- 5 - lingonberry pine (535 m)
- 6 - badan pine cedar (635 m),
- 7 - badan aspen (721 m),
- 8 - cedar elfin (1004 m),
- 9 - bilberry fir (1278 m),
- 10 - park birch (1407 m),
- 11 - bilberry tundra ( 1637 m),
- 12 - lichen tundra (1667 m)

In the Northern Baikal region, the winter season lasts 13 decades, unlike the summer - only 9 decades. Spring, as a rule, is long - 9 decades, unlike the short autumn season - 5 decades. The cold winter and spring seasons have a greater influence on the formation of the temperature regime of the Barguzinsky ridge than the summer and autumn seasons. The temperature characteristics of the seasons of the Barguzinsky ridge, obtained according to thermochrons, are presented by the following indicators (Table 1). The results of observations of the temperature regime of the Barguzinsky ridge for the seasons of the year are shown in Fig. 2 and Fig. 3.

The temperature gradient of the altitude transect does not remain constant. Due to the topography of the Barguzinsky ridge, microclimatic inversions of air temperature are observed. In winter, the cold air flowing from the highlands stagnates in depressions - in the park birch forest and cedar dwarf forest, where low temperatures of the air column remain. The warmest remain elevated sections of the transect with good conditions for the flow of cold air - bilberry tundra, bilberry fir and aspen. In the summer season, under the influence of the influx of solar radiation, the air warms up better in well-lit biotopes - lichen tundra, grassy meadow, aspen badan (Fig. 2 A). Ground temperatures in summer are higher in the mountain belt (Fig. 2 B).

**Table 1.**  
**Temperature characteristics of the seasons of the high-altitude transect of the Barguzinsky ridge for the period 2011-2016.**

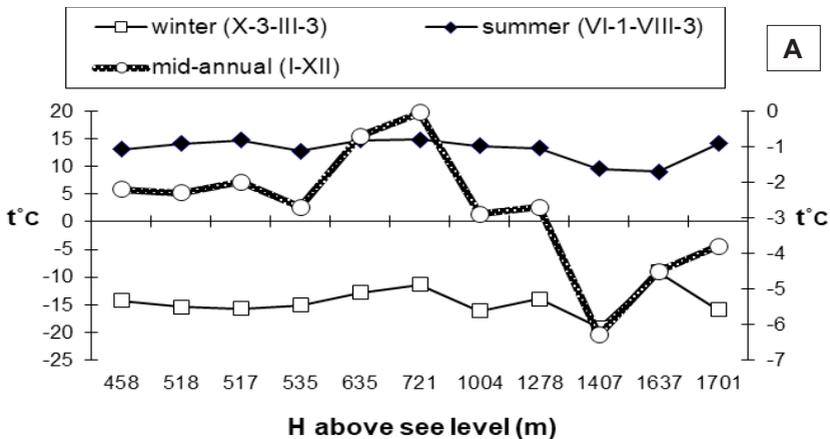
Seasons	Winter	Spring	Summer	Autumn	Average annual
Average t° C	-14,4	+1,7	+14,4	+3,1	-2,7
Ground minimal t° C	-7,1	-1,6	+7,4	-0,8	-1,6

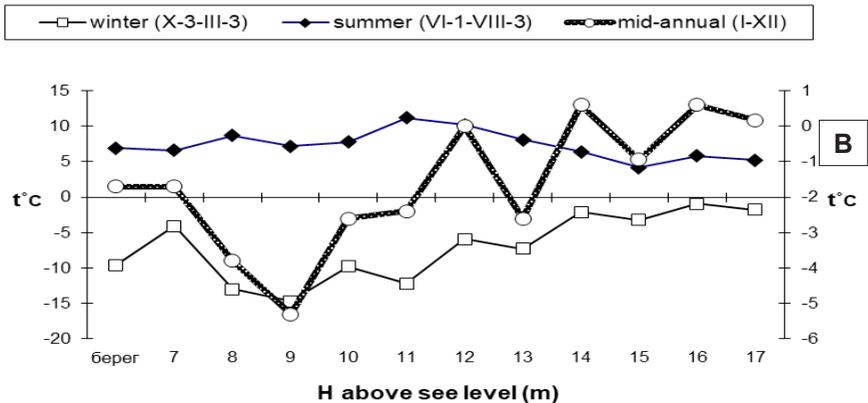
In the transitional seasons of the year, a normal vertical distribution of the average temperature of the air column is observed - it decreases with increasing height. The average air temperatures during the off-season are minimum in the subalpine belt, and maximum in the low-mountain zone (Fig. 3 A). Soil temperatures in the transitional seasons of the year depend on the timing of the establishment of snow cover in the autumn and its destruction in the spring. The establishment of snow cover on the Barguzinsky ridge begins with a loach belt, and its destruction - from the coast of Lake Baikal. The first snow in the highlands can fall and melt already in the second half of August. In September and October, up to 20.6% of the total

amount of solid precipitation already arrives there, at which time the snow cover has not yet been established on the coast. In November and December, intense soaring of Lake Baikal continues, northwestern winds carry moisture to the east coast, causing frequent and heavy snowfalls (26.8% and 25.4%). In the upper and especially in the middle heights, snow still covers the melt. The soil does not freeze to low values, and sometimes the temperature has plus values (Fig. 3 B). This creates favorable conditions for wintering of small animals and plants (Filonov, 1978).

Calculations of the vertical gradient of air temperature on a high-altitude transect in the valley of the Davsha River revealed that the average annual air temperatures decrease with distance from Baikal and with increasing height: in the warm season - by  $0.33^{\circ}\text{C}/100\text{ m}$ , in the cold - by  $-0.26^{\circ}\text{C}/100\text{ m}$ . On the contrary, average annual ground temperatures increase with climb: winter - by  $-1.26^{\circ}\text{C}$ , summer - by  $0.13^{\circ}\text{C}$ . There is an explanation for this

- the large contrast between the temperatures of the air mass and on the surface of the earth in winter is due to the thickness of the snow cover, the period of snow accumulation, the periods of its establishment and destruction at different altitude levels (Ananina, Kozulin, 2018). The duration of snow cover is always longer in the upper parts of the macorelief, since its establishment always starts from the loach belt, and its destruction from the coast. In the cold season, the ground temperatures on the transect are always higher in the alpine zone, and in the warm season, in the low altitude zone (Fig. 2 B, Fig. 3 B).



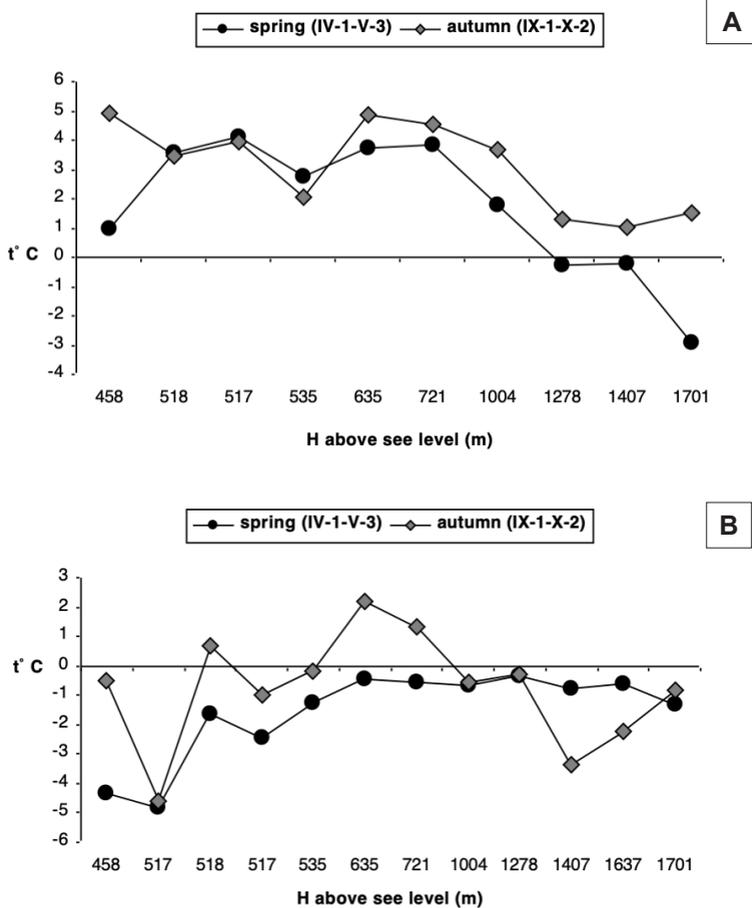


**Fig. 2. Temperature characteristics of the air column and on the surface of the earth in the winter and summer seasons of the year on the high-altitude transect of the Barguzinsky ridge (2011-2016)**

A – average annual, average winter and average summer temperatures of the air column;

B – average annual, average winter and average summer minimum air temperature on the soil surface.

Thus, the temperature regime of the Barguzinsky ridge is influenced by a complex of factors: altitude, Lake Baikal, mountain landscape, plant associations, slope angle and exposure, and duration of the seasons. With an increase above sea level and a distance from Baikal, the thermal regime of the Barguzinsky ridge changes significantly. However, phenological events do not fit into the diagram with the ordinates of "distance from Baikal" and "altitude above the lake." Thus, the highest average annual temperatures of the air column and on the surface of the earth are observed in the lower part of the mountain belt, where the zone of climatic optimum passes. Temperatures decrease when moving up from the low mountains to the alpine belt and down to the coast of Lake Baikal.



**Fig. 3. Characterization of air temperature during the transition periods of the year (spring, autumn) on the high-altitude transect of the Barguzinsky ridge (the Davsha River valley) in 2011-2016**  
 A, B - designations see fig. 2.

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## GROWING JUVENILE CARP IN CAGES UNDER SEMI-INTENSIVE CONDITIONS OF THE REPUBLIC OF UZBEKISTAN

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**Abstract.** Cages (0.5 m<sup>3</sup>) were installed in a fish pond with a polyculture of cyprinids. 148-150 pieces of fry were planted in cages with a total biomass of 300 g. The young were grown for 20 days. We chose a feeding dose of 10% of biomass per day. Feed was introduced 1 time per day - in the morning from 8-00 to 9-00.

The analysis showed that both feeds used had approximately the same value for fish growth. Feed coefficient of feed № 1 was 10-16 (average 13.0), feed № 2 was 12-16 (14).

Hydrochemical analysis showed that at the used fish densities, the amount of dissolved oxygen in the water and the temperature of the water did not differ from those in the pond in which these cages were installed.

**Keywords:** Uzbekistan, semi-intensive, cage, biomass, azolla (30%), wheat bran (30%), soy flour (30%), minced fresh weed fish,

In semi-intensive conditions, a fish farmer can vary in fish density and fish feeding ration. We conducted an experiment according to the scheme "different planting densities - the same feeding" of carp in cages.

*Growing fish stock in cages. Test № 1* was carried out on July 5-24. The same number of carp fry was planted in cages (0.5 m<sup>3</sup>), fed with different recipes of our own cooking with the same diet (10% of the fish biomass in the cage), i.e. a changing factor was the feed mix recipe. When preparing feed recipes (estimated protein content is 20-24%), we proceeded from the fact that we will grow fry in semi-intensive conditions, i.e. in a well-fertilized pond (Collection ..., 1986). Feed № 1 had the following composition: dried azolla (30%), wheat bran (30%), soy flour (30%), minced meat from fresh weed fish, frogs (10%). Feed № 2 had the following composition: soy flour (50%), wheat bran chopped into flour (50%). Food was prepared in a meat grinder and food processor and immediately brought to the fish.

148-150 pieces of fry were planted in cages with a total biomass of 300 g (Table 1). The juveniles were reared for 20 days. We chose a feeding dose of 10% of biomass per day. Feed was introduced 1 time per day - in the morning from 8-00 to 9-00.

Hydrochemical analysis showed that at the used fish densities, the amount of dissolved oxygen in the water and the temperature of the water did not differ from those in the pond in which these cages were installed.

In all cages, fish grew by 15-20% in 20 days, this is a fairly good growth. The analysis showed that both feeds used had approximately the same value for fish growth. Feed coefficient of feed № 1 was 10-16 (average 13.0), feed № 2 was 12-16 (14).

**Table 1**  
**The growth of juvenile carp in experiment № 1**  
**with semi-intensive cultivation in cages**

Cage	n, pcs	Feed №	Biomass of fish in the cage, g			The amount of feed introduced, g	Feed coefficient
			Initial	terminal	growth		
1	150	1	300	346	46	600	13
2	150	1	300	360	60	600	10
3	143	1	300	338	38	600	16
4	143	2	300	350	50	600	12
5	150	2	300	343	43	600	14
6	145	2	300	338	38	600	16

In our experiment, the fish density was 1 kg/m<sup>3</sup>.

**Table 2**  
**The growth of juvenile carp in experiment № 2**  
**with semi-intensive cultivation in cages**

Cage	n, pcs	Biomass of fish in the cage, g			The amount of feed, g	Feed coefficient
		Initial	terminal	growth		
1	30	60	70,5	10,5	126	12
2	30	58	68	7	121,8	17
3	120	242	293	51	508,2	10
4	120	239	289	50	501,9	10
5	200	405	476	71	850,5	12
6	200	403	463	60	846,3	14

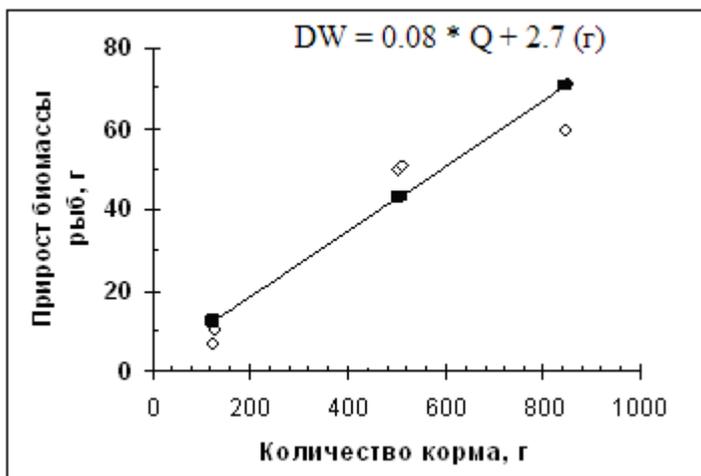
*Test № 2.* In the experiment (August 1–21, 2005), the fish planting density was changed, the feed recipe and diet (10% of the fish biomass in the cage) were constant factors (Table 2). Fish fry were planted in cages with a density of 30, 120, 200 fish/m<sup>3</sup>. They were fed with a feed mixture including raw azolla (70%) and wheat bran (30%).

*Dependence of the growth of biomass of fry and the amount of feed introduced.* The biomass of fish increased in all cages, but to varying degrees. Analysis of variance showed the influence of such a factor as the amount of feed introduced on the growth rate.

Correlation analysis showed that the relationship between the indicators is quite strong ( $r_{DW-Q}=0.96$ ) (Fig. 1) is well described by the formula:

$$DW = 0,08 * Q + 2,7$$

(where DW – increment of biomass of carps in the cage, g;  
Q – the amount of feed introduced, g).



**Fig. 1: Dependence of the growth of fish biomass in cages on the amount of feed introduced into the cage in the experiment**

*The feed coefficient* in the experiment ranged from 10 to 17 (average 13). The value of the coefficient did not depend on the biomass of fish and the amount of feed introduced. The dependence of the feed coefficient and the individual weight of the fish was interesting. It was strong and negative, i.e. the more individual fish grew, the lower the feed coefficient were ( $r_{R-w2} = -0,96$ ).

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## GROWING TWO-YEAR CARP IN CAGES IN EXTENSIVE CONDITIONS OF THE REPUBLIC OF UZBEKISTAN

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**Abstract.** Fish tanks (1 m) were installed in a fish pond with a polyculture of cyprinid fish, filled by two-year-old carp (150 346 g) with a density of 3. 8. 13 fish/m<sup>2</sup> and then simple feed mixture pellets were introduced

(wheat bran - 60%, azolla 15%, green parts of Jerusalem artichoke 15%, minced weed fish - 10%). For 15 days in cages, where the growth of individuals was faster, there was a greater increase in fish biomass ( $r_{DW-d} = 0,76$ ). In cages with a lower planting density, fish grew more individually and in total biomass (row w -0.33), i.e. In densely populated cages, a large number of fish ate the natural food supply faster (and starved) than in sparsely populated ones. The carp density in cages was 1-4.5 kg/m<sup>2</sup>, i.e. 5-2.5 times higher pond productivity. Higher results showed densities up to 1 kg/m<sup>2</sup> under extensive cultivation.

**Keywords:** Uzbekistan, extensive, cage, biomass, fish survival, one-way analysis of variance, feed ratio

During extensive cultivation, the fish farmer can vary only by one parameter - the density of fish landing, since the food supply in the cage (for fish) is determined by its development in the pond. As a result of this, we built the experiment according to the scheme "one feeding - different planting densities".

Cages with a volume of 1 m<sup>3</sup> each were installed in the pond of the Tashrybopodomnik with fertilizer application according to the technology (Collection ..., 1986). Throughout the experiment, the average daily water temperature ranged from 27.9-29.1°C. Additionally, simple feeds from local raw materials were added to the cages: wheat bran - 60%, azolla - 15%, green parts of Jerusalem artichoke - 15%, minced weed fish - 10%. Azolla, growing in abundance in ponds and canals, was collected in the morning in the canals of a fishery, shaken from water and grinded into pasta after 10-30 minutes. The green parts of Jerusalem artichoke were cut off

in the morning, ground to a pasty state. Wheat bran was crushed to the grains. Weed fish were caught in the ponds and completely ground. All ingredients were mixed in proportion to a homogeneous paste and granules were made in a meat grinder, the necessary amount was weighed out and introduced into cages. The experiment was carried out on July 10 - 25. Two-year-old carp with a planting density of 3, 8, 13 fish/m<sup>3</sup> in double repetition were planted in cages. Fish in all cages were fed with the indicated feed mixture at the rate of 10% of fish biomass. Feed was introduced in the morning at 9-00, once a day.

*Fish survival.* There was no fish waste in any of the cages.

*Fish growth.* Over 15 days in different cages, the total biomass of fish increased in all cages (Table 1). The average individual body weight of fish during the experiment increased from 200-346 g to 208-352 g.

*Dependence of the growth of fish biomass on the density of fish.*

The initial biomass of fish (planting density) was 600-700, 1200-1500, 4100-4500 g/m<sup>3</sup> in different cages. Univariate analysis of variance showed a significant effect of such factors as planting density on biomass growth. The dependence of the indicators was negative ( $r_{DW-W1} = -0.33$ ) (Fig.1).

*Dependence of the growth of fish samples and the growth of fish biomass in cages.* In those cages where the growth of individuals was faster, the growth of fish biomass was greater. The dependence of the indicators is strong ( $r_{DW-dw} = 0,76$ ) (Fig. 1). The dependence of the indicators are reliably described by the regression equation:

$$DW = 2,93*dw+33,97$$

(where DW – increase in total biomass of fish, g;  
dw – the growth of individual fish, g).

**Table 1.**  
**Dependence of the growth of carp biomass in cages on the density of carp during extensive cultivation**

Initial biomass of fish, g	Final biomass, g	The gain in biomass, g
600	760	160
700	780	80
1200	1250	50
1500	1550	50
1700	1730	30
1800	2110	310
4100	4160	60
4500	4580	80

It turns out that in conditions of extensive fish keeping and the use of simple feeds (low production), in cages with a lower planting density, fish grew more individually and in total biomass. We attribute this to the influence of the natural food supply: in densely populated cages, a large number of fish ate the natural food supply faster (and starved) than in sparsely populated ones.

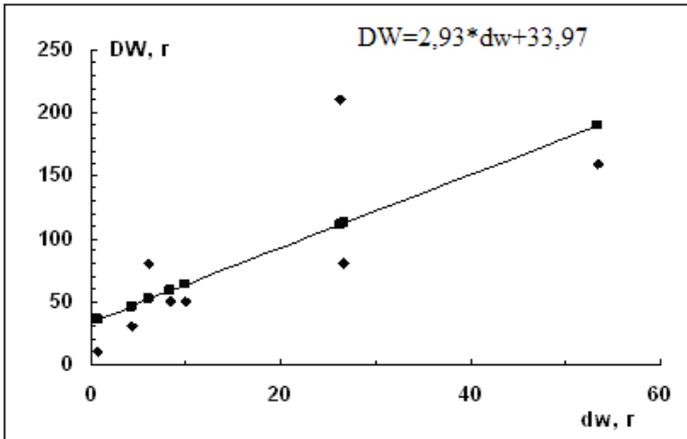
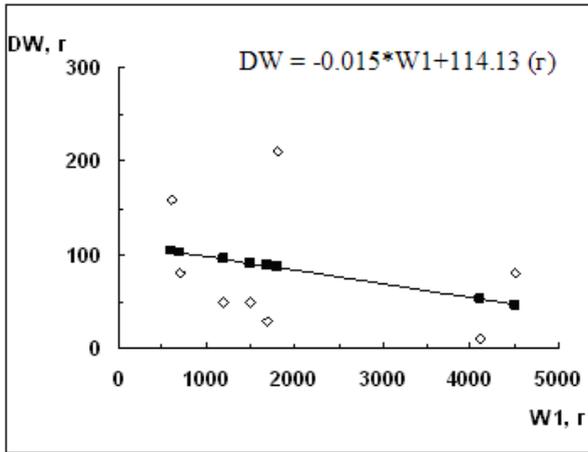
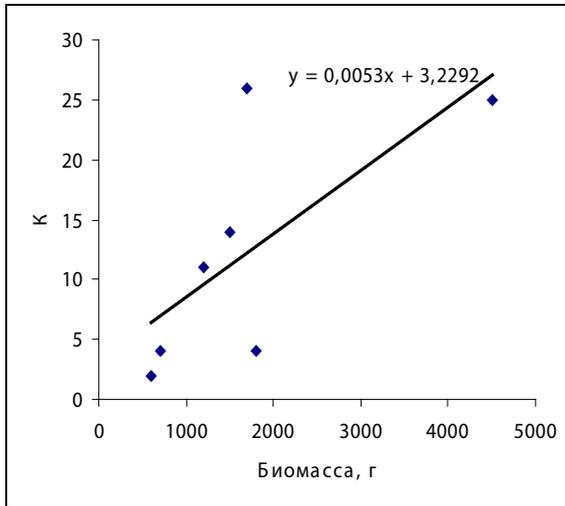


Fig. 1. The dependence of the increase in the biomass of carps in the cage (DW) on the initial biomass of the fish (W1) and on the increase in the average body weight of the fish (dw)

The feed coefficient for the diet adopted in the experiment varied within 2–25 (12 on average) (Table 2). For such a simple feed mixture, such low feed ratios as 2-4 are not possible, which once again shows the decisive influence of the natural feed base on fish growth compared to introduced feed.

**Table 2**  
The value of the feed coefficient of feed used for extensive carp farming

Cage	Carp density, ind./m <sup>3</sup>	Feed coefficient
1	3	2
2	3	4
3	7	25
4	8	4
5	13	25
6	3	13
7	3	11



**Fig. 3** Dependence of the value of the feed coefficient (K) of the used feed mixture on the biomass of fish in the cage. On the left are the cages in which the experiments were carried out

The feed coefficient is higher in cages with a greater biomass of fish, i.e. with extensive content, carp used feed more efficiently in cages with fewer fish. It is explained by the decisive influence of the natural forage base on the growth of carps in comparison with the introduced feed. Correlation analysis showed a positive dependence of indicators ( $r_{w1-k} = 0,65$ ) (Fig3).

The test has shown that cages installed in a well-fertilized pond with a rich forage base are beneficial. In our experience, the landing density was 1-4.5 kg/m<sup>3</sup>, which is much higher than the productivity of the pond (0.2 kg/m<sup>3</sup>). At the same time, in the pond itself the usual polyculture of silver carp, carp and grass carp, were found, i.e. cages gave additional products. In extensive conditions, the influence of natural fodder bases is great. In this case, a rarer planting density allows for faster growth of fish, both individual and biomass. With a denser landing, the fish quickly eat out the feed base falling into the cage and starve. Roughly, better results showed planting densities of up to 1 kg/m<sup>3</sup> during extensive cultivation

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## CALCULATION OF THE RADIATIVE PARAMETERS OF FRRB MOLECULE

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**Abstract.** The radiation parameters were calculated (Einstein's coefficients for spontaneous emission, oscillator strengths for absorption, Frank-Condon factors, wave numbers of electron-vibrational transitions in the system of bands  $2^1\Sigma^+ - X^1\Sigma^+$  of the FrRb molecule ( $0 \leq v' \leq 45$ ,  $0 \leq v'' \leq 75$ ), and radiative lifetimes of an excited electronic state. Calculations are based on potential curves constructed in this work. Radiation parameters and lifetimes are obtained for the first time.

**Keywords:** Einstein coefficient, oscillator strength, Frank-Condon factor, radiation lifetime of an excited electronic state.

Knowledge of the radiation properties of alkali metal dimers is necessary both for creating powerful laser sources of continuous radiation [1] and for quantum computers [2].

The radiation parameters (Einstein coefficients, oscillator strengths, electronic state lifetimes) for dimers and mixed alkali metal dimers were calculated by us in [3-6]. The calculations were carried out by the quantum-chemical method based on semi-empirical potential curves. Comparison of the calculation results of radiation parameters and lifetimes of electronic energy levels with experimental data showed the effectiveness of the calculation method. A similar technique was used in this work to calculate the radiation parameters and lifetimes of the electronic transition  $A^1\Sigma^+ - X^1\Sigma^+$  of the FrRb molecule. The FrRb molecule is one of the heavy mixed alkali metal dimers. Spectral studies of heavy molecules involve the use of laser techniques and high-resolution techniques. To date, experimental studies of the FrRb molecule have not been

conducted. A theoretical study of FrRb using the quantum chemical method was carried out in [7]. Vibrational and rotational molecular constants were obtained for the ground and excited electronic states of the  $A^1\Sigma^+ - X^1\Sigma^+$  FrRb transition.

**Building potential curves.** To approximate the potential curves of the ground and excited electronic states of the FrRb molecule, the semi-empirical five-parameter Hulbert-Hirschfelder potential function was used [8]:

$$U(R) = D_e [(1 - \exp(-\rho q))^2 + B \rho^3 q^3 \exp(-2\rho q(1 + C \rho q))], \quad (1)$$

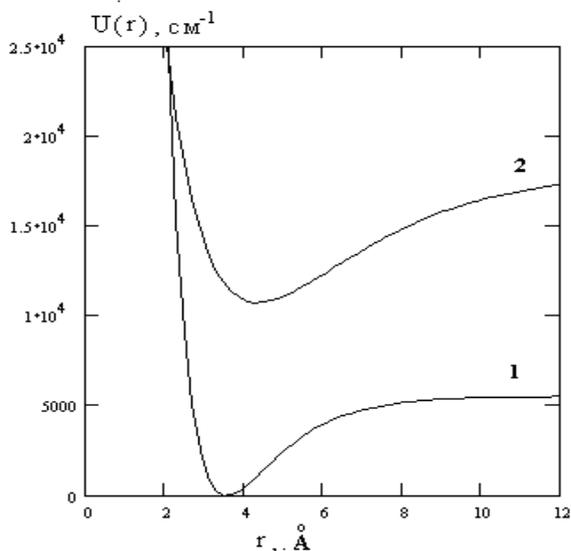
where  $\rho = \omega_e / 2 r_e (B_e D_e)^{1/2}$ ;  $D_e$  - molecule dissociation energy;

$\omega_e$  - molecule vibration frequency;

$B_e$  - rotational constant of the molecule;

$q = R - R_e$ ,  $R_e$  - equilibrium internuclear distance;

$C$  - parameters of the potential Hulbert - Hirschfelder function. Figure 1 shows the constructed potential curves for the ground and excited electronic states of the FrRb molecule.



**Fig. 1. Potential curves for the ground (1) and excited (2) electronic states of the FrRb molecule**

To construct potential curves of the ground and excited electronic states of the FrRb molecule, vibrational and rotational molecular constants were used [8]. To check the reliability of the constructed potential curves based on them, vibrational energies were calculated, as well as rotational and centrifugal constants, and a comparison was made with literature data. The vibrational energies are found as a result of the numerical solution of the radial Schrödinger wave equation. The calculation of rotational and centrifugal constants is carried out according to the perturbation theory for the model of a rotating oscillator of a diatomic molecule [9] according to the relations:

$$B_v = \beta \langle v | R^{-2} | v \rangle, \quad (2)$$

$$D_v = \beta^2 \sum_{u \neq v} \frac{\langle u | R^{-2} | v \rangle^2}{(E_u - E_v)}, \quad (3)$$

$$H_v = \beta^3 \sum_{t \neq v} \sum_{u \neq v} \frac{\langle u | R^{-2} | u \rangle \langle u | R^{-2} | t \rangle \langle t | R^{-2} | v \rangle}{(E_u - E_v)(E_t - E_v)} - \beta^2 B_v \sum_{u \neq v} \frac{\langle u | R^{-2} | v \rangle^2}{(E_u - E_v)^2}$$

(4)

where is the matrix element is

$$\langle u | R^{-2} | v \rangle = \int_0^{\infty} \Psi_u(R) R^{-2} \Psi_v(R) dR.$$

The values of vibrational energies, rotational and centrifugal constants calculated for the ground and excited electronic states of the FrRb molecule calculated on the basis of the constructed potential curves were approximated by power functions whose parameters are spectroscopic constants

$$E_v = \omega_e(v + 0.5) - \omega_e x_e(v + 0.5)^2 + \dots, \quad (5)$$

$$B_v = B_e - \alpha_e(v + 0.5) + \gamma_e(v + 0.5)^2 + \dots, \quad (6)$$

$$D_v = D_e - \beta_e(v + 0.5) + \delta_e(v + 0.5)^2 + \dots, \quad (7)$$

$$H_v = H_e - \xi_e(v + 0.5) + \epsilon_e(B_e - 0.5)^2 + \dots \quad (8)$$

The spectroscopic constants obtained from the optimal approximating functions for the ground and excited electronic states of FrRb are given in Table 1 and are compared with published data. The calculated vibrational ( $\omega_e$ ,  $\omega_e x_e$ ) and rotational constants ( $B_e$ ) for the ground and excited electronic states agree well with the literature data. The rotational molecular

constants  $\alpha_e$  and centrifugal molecular constants  $D_e, H_e$ , calculated in this work, the values of which for FrRb are absent in the literature, are compared with the values calculated using the literature data [7] based on the empirical relations of Pekeris [10]

$$\alpha_e = \frac{6B_e^2 \left[ (\omega_e x_e / B_e)^{1/2} - 1 \right]}{\omega_e}, \quad (9)$$

Kratzer [11]:

$$D_e = \frac{4B_e^3}{\omega_e^2}, \quad (10)$$

and Kamble et al. [12]:

$$H_e = \frac{2D_e(12B_e^2 - \alpha_e \omega_e)}{3\omega_e^2}. \quad (11)$$

**Table 1. The results of the calculation of vibrational, rotational and centrifugal spectroscopic constants (cm<sup>-1</sup>) and comparison with published data for the ground and excited electronic states of the FrRb molecule**

Spectroscopic constants	$A \ ^1\Sigma^+$	$X \ ^1\Sigma^+$
$w_e$	103.880 103.889	181.110 181.113
$w_e x_e$	0.35 0.35	1.5 1.5
$B_e$	0.129 0.129	0.1959 0.1959
$a_e$	6.220(-4)* 6.211(-4)	2.247(-3)* 2.247(-3)
$D_e$	7.957(-7)** 7.961(-7)	9.168(-7)** 9.182(-7)
$H_e$	6.640(-12)*** 6.631(-12)	9.992(-13)*** 10.169(-13)

Note. The first line is the literary data: the second line is the calculation results;

\*, \*\* and \*\*\* - calculations based on the ratios of Pekeris, Kratzer and Kembl using literature data (7). The numbers in parentheses are decimal orders.

Calculation of radiation parameters. The radiation parameters include the Einstein coefficients for spontaneous emission  $A_{v',v''}$ , the oscillator strength  $f_{v',v''}$ , the Franck-Condon factors (FCF)  $q_{v',v''}$ , the wave numbers of the electron-vibrational bands  $\mathbf{V}_{v',v''}$ , the lifetimes of the vibrational levels of the excited electronic state  $\mathbf{T}_{v'}$ , the function of the dependence of the dipole moment of the electronic transition on the internuclear distance  $R_e(r)$ . The Einstein coefficient ( $s^{-1}$ ) and the oscillator strength for absorption (dimensionless quantity) are related to the function  $R_e(r)$  (in atomic units) according to the relations [13]:

$$A_{v',v''} = 2.026 \cdot 10^{-6} \frac{\mathbf{v}_{v',v''}^3 (2 - \delta_{0,\Lambda'+\Lambda''})}{(2 - \delta_{0,\Lambda'})} \cdot [\langle \Psi_{v'}(r) | R_e(r) | \Psi_{v''}(r) \rangle]^2 \quad (12)$$

$$f_{v',v''}^{nozt} = 3.0376 \times 10^{-6} \frac{\mathbf{v}_{v',v''} (2 - \delta_{0,\Lambda'+\Lambda''})}{(2 - \delta_{0,\Lambda''})} \cdot [\langle \Psi_{v'}(r) | R_e(r) | \Psi_{v''}(r) \rangle]^2, \quad (13)$$

where  $\Lambda$  – projection of the orbital angular momentum of the electron on the internuclear axis ( $\Lambda = 0, 1, 2, \dots$  for states  $\Sigma, \Pi, \Delta, \dots$ );

$\delta_{0,\Lambda}$  – Kronecker symbol equal to 1 if  $\Lambda = 0$  and zero for other values of  $\Lambda$  ;

$\mathbf{V}_{v',v''}$  - wave number of the electron - vibrational transition ( $\text{cm}^{-1}$ );

$\Psi_{v'}(r), \Psi_{v''}(r)$  - vibrational wave functions of the excited and ground electronic states.

The radiation lifetime of the excited electron-vibrational level  $\mathbf{T}_{v'}(c)$  is related to the Einstein coefficients by the relation:

$$\mathbf{T}_{v'} = \left( \sum_{v''} A_{v',v''} \right)^{-1}. \quad (14)$$

FCF characterize the relative distribution of intensities of the electron-vibrational bands and are the squares of the overlap integral of the vibrational wave functions of combining electronic states

$$q_{v',v''} = \langle v' | v'' \rangle = \left| \int_0^{\infty} \Psi_{v'}(r) \Psi_{v''}(r) dr \right|^2 \cdot \begin{matrix} 1 \Sigma^+ \\ - X \\ 1 \Sigma^+ \end{matrix} \quad (15)$$

To calculate the wave numbers of the vibrational bands  $\mathbf{A}_{v',v''}$  of the electronic transition, there's the expression

$$\mathbf{V}_{v',v''} = T_e' + E'(v) - E''(v), \quad (16)$$

where  $T_e'$  - electronic energy of an excited state;

$E'(v), E''(v)$  - vibrational energies of the excited and ground electronic state.

Table 2 shows a part of the calculated radiation parameters ( $0 \leq v' \leq 45, 0 \leq v'' \leq 75$ ). Figure 2 shows the calculated lifetimes for the excited electronic state of the FrRb molecule

$$A_{v',v''} = 2.026 \cdot 10^{-6} \frac{v_{v',v''}^3 (2 - \delta_{0,\Lambda'+\Lambda''})}{(2 - \delta_{0,\Lambda'})} \cdot [\langle \Psi_{v'}(r) | R_e(r) | \Psi_{v''}(r) \rangle]^2, \quad (12)$$

$$f_{v',v''}^{nozl} = 3.0376 \times 10^{-6} \frac{v_{v',v''} (2 - \delta_{0,\Lambda'+\Lambda''})}{(2 - \delta_{0,\Lambda''})} \cdot [\langle \Psi_{v'}(r) | R_e(r) | \Psi_{v''}(r) \rangle]^2, \quad (13)$$

where  $\Lambda$  – projection of the orbital angular momentum of the electron on the internuclear axis ( $\Lambda = 0, 1, 2, \dots$  for states  $\Sigma, \Pi, \Delta, \dots$ );  $\delta_{0,\Lambda}$  – Kronecker symbol equal to 1 if  $\Lambda = 0$  and zero for other values of  $\Lambda$ ;  $v_{v',v''}$  – wave number of the electron - vibrational transition ( $\text{cm}^{-1}$ );  $\Psi_{v'}(r), \Psi_{v''}(r)$  - vibrational wave functions of the excited and ground electronic states.

The radiation lifetime of the excited electron-vibrational level  $\tau_{v'}(c)$  is related to the Einstein coefficients by the relation:

$$\tau_{v'} = \left( \sum_{v''} A_{v',v''} \right)^{-1}. \quad (14)$$

FCF characterize the relative distribution of intensities of the electron-vibrational bands and are the squares of the overlap integral of the vibrational wave functions of combining electronic states

$$q_{v',v''} = \langle v' | v'' \rangle = \left| \int_0^{\infty} \Psi_{v'}(r) \Psi_{v''}(r) dr \right|^2. \quad (15)$$

To calculate the wave numbers of the vibrational bands  $A^1 \Sigma^+ - X^1 \Sigma^+$  of the electronic transition, there's the expression

$$v_{v',v''} = T_e' + E^1(v) - E''(v), \quad (16)$$

where  $T_e'$  - electronic energy of an excited state;

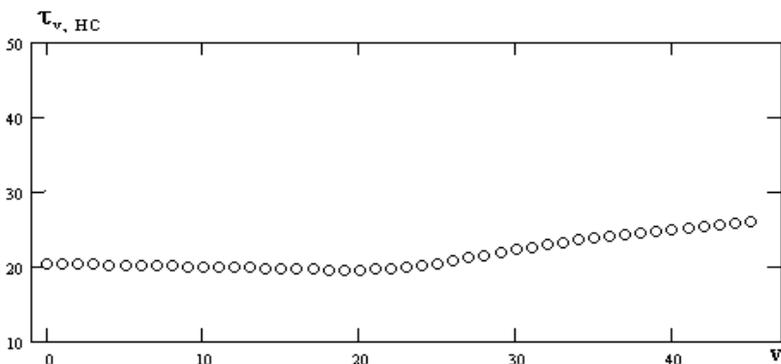
$E^1(v), E''(v)$  - vibrational energies of the excited and ground electronic state.

Table 2 shows a part of the calculated radiation parameters ( $0 \leq v' \leq 45, 0 \leq v'' \leq 75$ ). Figure 2 shows the calculated lifetimes for the excited electronic state of the FrRb molecule

**Table 2. The calculation results of the radiation parameters  $2^1\Sigma^+ - X^1\Sigma^+$  electronic transition of the FrRb molecule**

$v'$	$v'' = 0$	$v'' = 1$	$v'' = 2$	$v'' = 3$	$v'' = 4$	$v'' = 5$	$v'' = 6$	$v'' = 7$	$v'' = 8$
0	0	0	0	0.00009	0.00018	0.00080	0.00279	0.00797	0.01963
	0	0	0	1.89(+3)	1.05(+4)	4.47(+4)	1.52(+5)	4.26(+5)	9.99(+5)
	0	0	0	2.45(-5)	1.37(-4)	5.89(-4)	2.03(-3)	5.72(-3)	1.35(-2)
	10883.2	10838.1	10793.3	10748.7	10704.4	10660.3	10616.5	10572.9	10529.7
1	0	0	0.000005	0.00032	0.00153	0.00553	0.01560	0.03499	0.06289
	0	0	2.81(+3)	1.87(+4)	8.79(+4)	3.12(+5)	8.64(+5)	1.90(+6)	3.35(+6)
	0	0	3.60(-5)	2.41(-4)	1.14(-3)	4.09(-3)	1.14(-2)	2.53(-2)	4.50(-2)
	10918.7	10873.6	10828.8	10784.2	10739.9	10695.8	10652.0	10608.5	10565.2
2	0	0.00003	0.00027	0.00157	0.00632	0.01868	0.04158	0.09886	0.08678
	0	1.80(+3)	1.64(+4)	9.32(+4)	3.69(+5)	1.07(+6)	2.34(+6)	3.86(+6)	4.70(+6)
	0	2.27(-5)	2.08(-4)	1.19(-3)	4.76(-3)	1.39(-2)	3.07(-2)	5.10(-2)	6.27(-2)
	10954.2	10909.1	10864.3	10819.7	10775.4	10731.3	10687.5	10643.9	10600.7
3	0.00001	0.00013	0.00105	0.00517	0.01722	0.0463	0.06823	0.07883	0.05570
	4.84(+2)	8.20(+3)	6.47(+4)	3.12(+5)	1.02(+6)	2.36(+6)	3.90(+6)	4.42(+6)	3.0621(+6)
	6.01(-6)	1.03(-4)	8.16(-4)	3.97(-3)	1.31(-2)	3.06(-2)	5.08(-2)	5.81(-2)	4.06(-2)
	10989.6	10944.5	10899.6	10855.0	10810.7	10766.7	10722.9	10679.9	10636.0
4	0.00003	0.00045	0.00310	0.01278	0.03453	0.06261	0.07363	0.04850	0.00913
	1.92(+3)	2.85(+4)	1.93(+5)	7.84(+5)	2.08(+6)	3.70(+6)	4.27(+6)	2.76(+6)	5.11(+5)
	2.37(-5)	3.55(-4)	2.42(-3)	9.90(-3)	2.65(-2)	4.76(-2)	5.53(-2)	3.51(-2)	6.73(-3)
	11024.8	10979.7	10934.9	10890.3	10845.9	10801.9	10758.1	10714.6	10671.3
5	0.00010	0.00125	0.00738	0.02515	0.05359	0.07053	0.05005	0.00986	0.00430
	6.26(+3)	8.08(+4)	4.67(+5)	1.56(+6)	3.27(+6)	4.23(+6)	2.95(+6)	5.71(+5)	2.43(+5)
	7.68(-5)	9.99(-4)	5.82(-3)	1.96(-2)	4.14(-2)	5.40(-3)	3.79(-2)	7.41(-3)	3.18(-3)
	11060.0	11014.9	10970.1	10925.5	10881.2	10837.1	10793.3	10749.7	10706.5
6	0.00060	0.00297	0.01473	0.04073	0.06579	0.05680	0.01619	0.00165	0.03224
	1.74(+4)	1.94(+5)	9.46(+5)	2.57(+6)	4.08(+6)	3.46(+6)	9.69(-5)	9.66(+4)	1.85(+6)
	2.11(-4)	2.38(-3)	1.17(-4)	3.21(-2)	5.13(-2)	4.39(-2)	1.24(-2)	1.24(-3)	2.41(-2)
	11095.1	11049.9	11005.1	10960.6	10916.2	10872.2	10828.4	10784.8	10741.5
7	0.00062	0.00611	0.02528	0.05529	0.06365	0.02906	0.00005	0.02313	0.04187
	4.22(+4)	4.05(+5)	4.65(+6)	3.54(+6)	4.00(+6)	1.79(+6)	3.37(+3)	1.38(+6)	2.45(+6)
	5.10(-4)	4.94(-3)	2.03(-2)	4.39(-2)	5.01(-2)	2.26(-2)	4.28(-5)	1.76(-2)	3.16(-2)
	11095.1	110849	11040.1	10995.5	10951.2	10907.1	10863.3	10819.8	10776.5
8	0.00134	0.01117	0.03792	0.06332	0.04673	0.00561	0.01069	0.04017	0.01983
	9.15(+4)	7.51(+5)	2.50(+6)	4.11(+6)	2.98(+6)	3.52(+5)	6.57(+5)	2.43(+6)	1.17(+6)
	1.10(-3)	9.11(-3)	3.06(-2)	5.06(-2)	3.70(-2)	4.41(-3)	8.29(-3)	3.09(-2)	1.51(-2)
	11164.9	11119.8	11030.1	11030.4	10986.1	10942.0	10898.2	10854.7	10811.4
9	0.00273	0.01902	0.05112	0.06055	0.02190	0.00112	0.03198	0.03009	0.00037
	1.89(+5)	1.29(+5)	3.42(+6)	3.98(+6)	1.41(+6)	7.10(+4)	1.99(+6)	1.84(+6)	2.26(+4)
	2.26(-3)	1.56(-2)	4.16(-2)	4.88(-2)	1.75(-2)	8.84(-4)	2.50(-2)	2.33(-2)	2.58(-4)
	11197.3	11152.2	11107.4	11062.8	11018.4	10974.4	10930.6	10887.0	10843.8
10	0.00487	0.02834	0.05963	0.04684	0.00411	0.01486	0.03794	0.00790	0.00945
	3.42(+5)	1.95(+6)	4.05(+6)	3.12(+6)	3.12(+6)	2.70(+5)	9.56(+5)	4.92(+5)	5.76(+5)
	4.06(-3)	2.34(-2)	4.89(-2)	3.81(-2)	3.31(-3)	1.18(-2)	1.99(-2)	6.18(-3)	7.30(-3)
	11231.7	11186.6	11141.8	11097.2	11052.9	11008.8	10965.0	10921.5	10878.2

Note. First line -  $q_{v',v''}$ ; second line -  $A_{v',v''}$  ( $c^{-1}$ ); third line -  $f_{v',v''}^{nozi}$  (dimensionless quantity); fourth line -  $\nu_{v',v''}$  ( $cm^{-1}$ ). For  $q_{v',v''} < 10^{-5}$  values  $q_{v',v''}$ ,  $A_{v',v''}$ ,  $f_{v',v''}^{nozi}$  are given, equal to zero.



**Fig. 2. Lifetimes for vibrational energy levels of an excited electronic state  $A\ ^1\Sigma^+$  of an FrRb molecule**

**Results and Conclusions.** Calculated for the first time radiation parameters in the present work for the  $A\ ^1\Sigma^+ - X\ ^1\Sigma^+$  electronic transition of the FrRb molecule containing data on the intensities and wave numbers of the electron-vibrational bands can be used to experimentally study the spectrum of the FrRb molecule, to supplement the database on the radiation parameters and lifetimes of alkali metal dimers and other practical applications.

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## ECOLOGICAL-RECREATIONAL ZONING: MEDICAL-ECOLOGICAL AND SOCIO-ECONOMIC DIMENSION

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**Abstract.** Spatial and recreational planning of the Orenburg oblast involves the development of a system of measures to preserve and improve the quality of the environment, taking into account current trends in the development of socio-economic relations and focusing not only on extensive development factors, but also on the use of the innovative potential of the region. Ecological and recreational zoning was carried out in order to develop, use and maintain recreational areas to provide the population with places of rest and sanatorium-resort treatment. Ecological and recreational zoning of the territory of the region will make it possible to assess the general condition of the recreational environment, the degree of its transformation and the severity of medical and environmental problems.

**Keywords:** Orenburg region, tourist and recreational areas, ecology, recreation, regionalization, medical and environmental conditions, socio-economic factors

In the recreational and geographical studies of the Orenburg region, we took as a basis the method of *ecological and recreational zoning*, as a way of determining territories by the degree of similarity and difference in their internal ecological, economic and ecological and social structure, the direction of geodynamic processes and the nature of the relationship of recreational processes with the natural environment. This methodological approach allows us to assess the general state of the recreational environment, the degree of its transformation and the severity of medical and environmental problems [2].

Earlier, work was carried out on the allocation of landscape-recreational zones (LRZ) based on zonal-provincial affiliation on the basis of the map "Recreational Landscapes" developed by the author with the allocation of types of localities within the LRZ according to the prospects of using natural objects in tourism and recreation [1].

The proposed tourist-recreational zones (TRZ) are distinguished by the fact that they are a special type of economic zone where competitive recreational activities are being formed to develop spa resort, medical institutions, historical and cultural sites. This is a very vast and heterogeneous territory, distinguished on the basis of significant natural and socio-economic conditions, taking into account the following features: types of recreational nature management and their nature of use; the degree of variability of natural complexes (including man-made); the presence of natural resource potential; degree of knowledge and state of socio-economic and medical-environmental conditions, etc. [1,2].

We distinguish three TRZ – Western tourist-recreational zone, Central and Eastern tourist-recreational zones.

The contrasting physical and geographical appearance of the territory (located within two physical and geographical countries - the Russian Plain and the Ural Folded Country) clearly reveals the socio-economic and medical-ecological differences within its Eastern and Western zones. The recreational needs of the population will be met in different ways, and, first of all, in spa treatment.

In the East TRZ region, environmental and climatic conditions (low air temperatures and strong cold winds in the winter months — the risk of frostbite and hypothermia, insufficient solar radiation, dusty “storms” in the summer, and low resistance of the territory to technogenic processes - the concentration of toxic waste, anomalous zones contaminated with lead, chromium, copper, etc.), have a significant impact on the health of the population as well as the socio-economic conditions of the population (unemployment, alcoholism, halt and elimination of a few large companies, etc.), which contributes to a kind of complex features of the area: the deterioration of recreational and health and geographical conditions. Here, a very high technogenic load is observed at such industrial sites as Kuvandyks-Mednogorsk, Orsk [2].

In the Western TRZ region, socio-economic factors have a significant impact on the lifestyle (health, leisure) of the population: significant population density and urbanization, a developed network of transport communications, a high degree of economic development (intensive oil production and negative impact on the regime of river ecosystems), widespread development technogenesis (acute soil and environmental problem). A high concentration of oil and gas production in a number of areas of this zone (Grachevsky, Kurmanaevsky, Sorochinsky, Pervomaisky) led to a sharp deterioration of the environmental situation [2].

To distinguish and characterize ecological-recreational and medical-ecological regions within TRZ, we, at the first stage, analyzed data on the comfort of natural conditions for the life of the population, including a certain number of natural indicators (medical-climatic, industrial loads, characteristics of buildings, the risk of natural disasters etc). Based on the totality of data, we classify territories by type: 1 - comfortable; 2 – semi-comfortable; 3 - uncomfortable [4]. We also evaluate socio-economic conditions by a number of indicators: the level of improvement of the housing stock and the area of housing per person; gross regional product value; the share of the poor (percentage of people with an income below the subsistence level), etc. According to the results of scores, we distinguish: 1 - successful; 2 - satisfactory; 3 - unsatisfactory.

Western tourist and recreational area – with a satisfactory level of urban health and a lower level of the rural population, with a high fragmentation of the natural living conditions of the population (from semi-comfortable to uncomfortable), a medium-urban area with a difficult medical and environmental situation in industrial concentration zones (oil and gas fields) and along pipeline routes, agricultural and industrial territory with a medium to high ecological reserve, from a satisfactory to a poorly developed social infrastructure.

*Central tourist and recreation area* with a satisfactory level of health of the urban population and a low level of health of the rural population, agrarian and agro-industrial, medium-urbanized with semi-comfortable and uncomfortable natural conditions (in the Ural river valley) with a moderately difficult medical and environmental situation and its sharp aggravation in industrial areas, with an average ecological potential, with satisfactory to safely (areal) well-developed social infrastructure.

*Eastern tourist and recreational area* with lowered and low health levels of the population, agricultural and agro-industrial, slightly urbanized areas, semi-comfortable, sometimes uncomfortable (in the border areas with Kazakhstan) with semi-uncomfortable areas (in the border areas with Bashkortostan), with an extremely unfavorable medical and environmental situation in industrial concentration zones and intensive cattle breeding, with an average (sometimes low) ecological reserve, with a lag in the development of social infrastructure.

Each tourist and recreational zone includes several ecological and recreational areas that are geographically close to each other, connected by transport and functional links and having common natural and recreational resources. The methodological approach for identifying ecological and recreational areas (ERA) within the tourist and recreational zone (TRZ) pro-

vides the following initial indicators in accordance with the regionalization criteria: structure and quality of the natural resource potential of the territory; the nature of the combination of natural, medico-environmental and socio-economic conditions of recreation; the presence of a key territory (core) ERA with a set of environmental and recreational problems; creation of a cartographic model of recreational nature management (RNM) using point and expert assessment methods [ ].

The second stage of the study involves the development of a calculation methodology in the selected types of areas with ecological-recreational and medical-ecological situations for finding the integral index of recreational-technogenic load ( $I_t$ ) and the integral index of quality of the medical-recreational environment ( $I_s$ ). Calculation and assessment of integral indices are important for the development of recreation and tourism in certain ecological and recreational areas. The higher the values of technogenic loads on natural complexes, the lower the quality indicators of the recreational environment, and therefore the severity of the ecological-recreational situation in the region is higher.

Analysis of tourist and recreational areas shows that the prevailing role in the structure of the recreational potential of the Orenburg region is played by socio-economic factors with a significant influence of medical and environmental situations and the physical and geographical characteristics of the territory.

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## EXPERIENCE OF GROWING AUSTRALIAN CRAYFISH AND FRESHWATER SHRIMP IN ASTRAKHAN REGION

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**Abstract.** Tropical species require individual study and approach depending on the ecological conditions of the species being grown and their biological productivity. One of the main components of the characteristics of the ponds used is the composition of the natural feed base, in artificial conditions the presence of full feed. The study of the feed base of ponds and applied artificial feed formulations is still relevant today, as in order to develop the cultivation of new objects of thermal water aquaculture in the Astrakhan region there are no clear recommendations on the pond and industrial content of objects of thermal water aquaculture, in particular Australian crayfish and freshwater shrimp. As a result of the experimental work, the production potential of different categories of ponds used for the production of commercial products was studied, the feed base, biomass of zooplankton and zoobenthos, which will meet the food needs of the grown objects, which determines fish production, was studied; The possibility of industrial content on feed of own production has been studied.

**Key words:** Bioproductive, ponds, fodder, australian crayfish, freshwater shrimp.

### Introduction

Biological features of tropical species allow you to get high-quality products during the growing season, while the content of Australian crayfish and freshwater shrimp are economically attractive for farmers who have limited stocks of pond areas. The pond method of growing grown juveniles weighing 1.0-1.5 g to a marketable mass is the most economically profitable, while the production potential of fast-growing species characterizing

this object is realized. There is a real possibility of organizing the cultivation of heat-loving objects in the sixth fish breeding zone, obtaining commercial Australian fish and fresh-water shrimp is very promising due to the fact that fish farms have several advantages of growing on a natural forage base (zooplankton and zoobenthos), but it is necessary to evaluate the forage base, and in some cases, the directed formation of its stability. The results of experimental cultivation in ponds of various categories confirmed the high efficiency and promise of growing Australian crayfish and freshwater shrimp in an open fish pond. At the same time, there is a direct dependence of the results of cultivation on the conditions of detention formed in a particular pond.

### **Material and research methods**

The studies were carried out on experimental ponds of "SRK Sharapovsky" of various sizes from 0.5 to 1.5 ha, and different categories of ponds were used. The bed of ponds has the correct engineering layout, with the absence of non-drainage areas, irregularities and strong overgrowing.

When stocking, as a rule in June, they used high-quality landing juveniles not injured, clinically healthy, weighing 150 - 500 mg. The density of landing of juveniles per 1 ha of pond area averaged: 8 thousand pieces of Australian crayfish and 2.5 thousand pieces Freshwater shrimp. The hydrochemical regime was maintained in accordance with regulations for carp ponds.

Assessment of food security was carried out by the concentration of biomass feed base. The material for the study was the collection of samples of zooplankton, zoobenthos used ponds. Sampling of zooplankton was carried out by filtering 50 liters of water using an Epstein network with immersion at the central point of the pond and near the monk. Canned plankton was poured into a flask, washing the net several times, fixed with 40% formalin in the amount of 7% of the volume of the sample taken.

The caught plankton is found in the bank or in the net, especially if there is a lot of phytoplankton in the sample and the net has to be washed several times. To fix the sample with 40% formalin, it merges into the bank or into the net, especially if there is a lot of phytoplankton in the sample and the network has to be washed several times. Fix the sample with 40% formalin.

Benthos samples were taken using a Petersen bottom grab with a 157.5 cm<sup>2</sup> capture. After that, the samples were washed, disassembled at the sampling site and fixed with 4% formalin. The determination of zooplankton and zoobenthos was carried out according to generally accepted

methods accepted in fish farming practice according to the manual on the methods of hydrobiological analysis (1983) (Smetanina, 1985), the manual on chemical analysis of surface waters (1993) in the laboratory.

It should be noted that the initial formation of the food supply occurs partly due to organisms that enter the water when the ponds are flooded, and is also replenished by removing hydrobionts in the soil of the reservoir from the resting stages. It is important that there are a sufficient number of feed organisms that meet the requirements of the body at different stages of development, which largely determines the effectiveness of the cultivation itself. The preparation of the ponds for summer operation was carried out as planned; the bed of the ponds was harrowed, while not violating the slopes and ditches of the fishing net, while maintaining the turf layer and meadow vegetation, the mowed vegetation was placed on dams. Ponds were poured through a fish catcher (to prevent the ingress of weed fish), to avoid the early development of filamentous algae, water was collected quickly.

In a freshly pond, the water temperature gradually increased from 100 ° C to 210 ° C, under these conditions there was a massive development of zooplankton and benthos. The maximum overgrowth of the pond bed with higher aquatic vegetation was approximately 15% of the total water area along the coast, before filling with water, the bed of ponds was covered with soft meadow vegetation. After filling the ponds in late May, this vegetation persisted in the first weeks, after which it was replaced by soft algae and higher aquatic vegetation.

The natural forage base (zooplankton and benthos biomass) corresponded to the species composition of feeding ponds of the VI fish farming zone, operated in an extensive mode [1–4]. Violation of compliance - the inaccessibility of fodder organisms for the cultivated objects, leads to a decrease in nutrition intensity, to growth lag; in some cases, the objects turn out to be unsecured by food, even if it is abundant in a reservoir.

Considering that the young of Australian crayfish and freshwater shrimp in the first month of keeping in pond conditions also feed on fouling, therefore, bags of hay (cutter) in the amount of 30 pieces were installed in the ponds at a distance of 50 cm from each other, special immersed for their formation.

Selected crayfish and shrimp to receive offspring from them were placed in containers for artificial keeping on feed of their own production. The qualitative composition of these feeds (components of animal and vegetable origin), as well as literature data, served as the basis for the creation of experimental feed formulations for Australian crayfish and freshwater shrimp.

The qualitative composition of these feeds (components of animal and vegetable origin), as well as literature data, served as the basis for the creation of experimental formulations of starter and production feeds for Australian crayfish. The composition of the feed is balanced in nutrients with a protein content of up to 45%, the feed contained the following components: fishmeal, shrimp, fish oil, egg, kelp, carrots, oak leaves, wheat flour, soleros, vitamin complex and Coriander flavor.

### Research results and discussion

The research was carried out for several years in the ponds of one of the modern pond farms in the Astrakhan region, zooplankton and benthic samples were taken from the ponds where Australian crayfish and freshwater shrimp were grown. These organisms by their biology are consumers of planktonic organisms, detritus of plant and animal origin, benthic organisms in vivo. Zooplankton and fouling consumes mainly juveniles; adults consume zooplankton in the form of a random component or forced food [5].

A comparative analysis of changes in the quantitative characteristics of zooplankton was carried out using the Kruskal-Wallis criterion, the ratio of the number of Cladocera and Copepoda ( $NC_{Clad} / NC_{Cope}$ ) and the ratio of Rotifera and Crustacea biomass ( $BR_{Rot} / BC_{Crust}$ ) were calculated.

According to the results of the analysis, it was revealed that in pond No. 1 the percentage of major groups of zooplankton in number and biomass was dominated by copepods - 50% and 78.42%, respectively. Rotifers were small in number - 10.23% and 0.47%, respectively.

Of the total species composition, the dominant group in terms of numbers includes such organisms as: naupliicyclopoida - 17 thousand ind./m<sup>3</sup>; cocepodittecyclopoida - 18 thousand ind./m<sup>3</sup>; Diaphanosomadubiu - 11.75 thousand ind./m<sup>3</sup>, eggs *Metacyclopsgracilis* 27, 5 thousand ind./m<sup>3</sup>.

By biomass, the dominant complex included: cocepodittecyclopoida - 263.6 mg / m<sup>3</sup>; *Paracyclopsaffinis* - 242.5 mg / m<sup>3</sup>; *Sinodiaptomussarsi* - 313.5 mg / m<sup>3</sup>; *Diaphanosomadubium* - 230.5 mg / m<sup>3</sup>.

It should be noted that the branchy crustacean *Diaphanosomadubium* and the copepod stage cyclops are the main components of the zooplankton community of feeding pond No. 1, where Australian cancer is grown.

In pond No. 2, the percentage of the main groups of zooplankton in number and biomass was dominated by copepods - 77% and 85.6%, respectively. Small organisms were attributed to others - 0.4% in number and in rotifers biomass - 0.12%, respectively.

Of the total species composition, the dominant group in terms of numbers includes such organisms as: *naupliicyclopoida* - 13.5 thousand ind./m<sup>3</sup>; *cocepodittecyclopoida* - 24.5 thousand ind. / m<sup>3</sup>; *Metacyclopsgracilis* - 15 thousand ind./ m<sup>3</sup>.

By biomass, the dominant complex included: *cocepodittecyclopoida* - 310.15 mg / m<sup>3</sup>; *Metacyclopsgracilis* - 777.1 mg / m<sup>3</sup>; *Sinodiaptomus-sarsi* - 1822.5 mg / m<sup>3</sup>; *Diaphanosomadubium* - 380.9 mg / m<sup>3</sup>. It should be noted that cyclopes of the copepod stage of development and mature individuals of *Metacyclopsgracilis* in pond № 2 are the main components of the zooplankton community where Freshwater shrimp is grown.

Considering the species composition, it is noted that in pond №. 2 there are five species of branched crustaceans (*Diaphanosomadubium*, *Moinabranchiata*, *SydacrySTALLINE*, *Chydorussphaericus*, *Alonacostata*), and one representative from the Rotifera group (*Branchionusquadridentatusancyonatus*), while №.1 *Synchaetastylata*, *Branchionus* with *Calocyflorus*, *Branchionusbudapetinensis*), and only one species (*Diaphanosomadubium*) is represented from *Cladocera*.

We consider it is most probable that the observed species composition of the ponds studied by us is due to the selectivity in the consumption of zooplankton by cultivated objects.

A comparative analysis of changes in the quantitative characteristics of zooplankton was carried out using the Kruskal-Wallis test for pond № 1: (NClad / NCop) - 0.22596154; (BRot / BCrust) - 0.01306413, for pond № 2 it was: (NClad / NCop) - 0.277039848; (BRot / BCrust) - 0.001211073. Therefore, in both reservoirs, the ratio of Cladocera and Copepoda, and the ratio of Rotifera and Crustacea biomass have a comparative similar difference in medians.

During the cultivation of Australian crayfish and freshwater shrimp, the food supply in benthic organisms was also limited, at the end of the decade of June mosquito larvae - chironomids were completely absent, throughout the entire cultivation their concentration was not high 0.5 - 0.7 g / m<sup>2</sup>. The low fodder and unstable food supply of farmed objects also affects the decrease in overall productivity [6–7]; at the end of cultivation, there was a significant variation in the average body weight of Australian crayfish obtained — 25–90 g and freshwater shrimp — 15–50 g.

A significant influence on adaptation to natural conditions and, as a consequence, a high growth rate (in particular of tropical aquaculture objects) is also influenced by the presence of soft higher aquatic vegetation, as various macrophytes, such as cattail, sedge and their stems, are readily eaten by Australian crayfish and freshwater shrimp, leaves and young shoots.

In previous experiments, it was found that it is possible to increase the efficiency of growing in ponds and increase their bio-productivity in a “natural” way, namely by applying alternate cultivation of aquaculture and agricultural products [6–7], for example, but of melons and grains (Table. one). Hydrobiological analysis showed that the supply of ponds with a natural forage base was 100%, based on these data, the forage base of the ponds was fully provided for the fodder needs of the farmed object.

Thus, the hydrobiological regime of the ponds has significantly improved, which has led to the provision of an optimal level of natural food supply, which will satisfy the nutritional needs of objects grown in polyculture (for example, cyprinids, herbivorous fish, and crustaceans).

**Dynamics of zooplankton and zoobenthos in the period of estivation**

zooplankton	At the beginning of the growing season				At the end of the growing season			
	N, ind./m <sup>3</sup>	B, g/m <sup>3</sup>	N, %	B, %	N, ind./m <sup>3</sup>	B, g/m <sup>3</sup>	N, %	B, %
Before estivation								
Total	56 625	<b>1,93</b>	100	100	92 125	<b>0,85</b>	100	100
After estivation								
Total	13 3375	<b>3,9</b>	100	100	115 125	<b>2,28</b>	100	100
zoobenthos	At the beginning of the growing season				At the end of the growing season			
	N, ind/m <sup>2</sup>	B, g/m <sup>2</sup>	N, %	B, %	N, ind/m <sup>2</sup>	B, g/m <sup>2</sup>	N, %	B, %
Before estivation								
Total	40	<b>0,42</b>	100	100	16	<b>0,65</b>	100	100
After estivation								
Total	344	<b>1,5</b>	100	100	120	<b>4,3</b>	100	100

It should be noted that the zooplankton biomass after removing ponds for flying at the beginning of the growing season increases 2.0 times, at the end of the growing season - 2.7 times, while the biomass in the ponds where it was grown at the beginning of the growing season was 1.93 g / m<sup>3</sup> and after flying - 3.9 g / m<sup>3</sup> and at the end of the growing season was 0.85 g / m<sup>3</sup> and after flying - 2.18 g / m<sup>3</sup>.

At the beginning of the growing season, the biomass value in water bodies after estivation is 3.6 times higher than the biomass of the same pond before estivation; at the end of the growing season, this ratio increases to 6.6. So, the zoobenthos biomass before estivation at the beginning of the growing season was 0.42 g / m<sup>2</sup> and after flying, 1.5 g / m<sup>2</sup> and at the end of the growing season was 0.65 g / m<sup>2</sup> and after estivation, 4.3 g / m<sup>2</sup>.

The positive dynamics in the reservoirs of biomass of zooplankton and zoobenthos is due to the fact that the ponds during flight were taken out for sowing melons. at the end of cultivation, the average body weight of the obtained Australian crayfish and freshwater shrimp was homogeneous and amounted to 110 g in the first case and 75 g in the second. The selected specimens were placed in containers for winter keeping and offspring. Feed of own production had negative buoyancy, the reaction to feed in 100% of individuals. The transfer from pond to artificial conditions had a positive effect with 100% survival of individuals.

**Biological productivity and basic indicators of ponds**

Indicator	Norm/Carp	Australian crayfish	Freshwater Shrimp
<b>The main indicators of water hydrochemistry in ponds</b>			
Area	1,5 ha	0,5-0,75-1,0	0,5-0,75-1,0
Water temperature, t° C	20-23	<23	<23
Oxygen, O <sup>2</sup>	7,4	6,3	6,3
Water supply		5,2	5,2
Coastal zone		4,8	4,8
Gutter (monk system)			
Oxygen content mg/dm <sup>3</sup>	Not lower than 7	7,5	7,0
Transparency, cm	50	31	31
Active reaction of the environment (pH)	6,5-7,5	7,0-8,2	7,0-7,3
Implantation density of juveniles, thousand units/ha	500	5,0	2,5
<b>Organic matter in bottom sediments</b>			
Humus content, %	Not lower than 0,5	1,5-3,5	1,5-3,5
<b>Pond Productivity</b>			
Zooplankton, B g/m <sup>3</sup>	3	<3,0	<3,0
Zoobenthos, B g/m <sup>2</sup>	3	<4,0	<4,0
Fish productivity, kg/ha	-	2	1,5
<b>Feeding</b>	Life feed introduction, dry feed	Mixes based on vegetable and animal mince	
<b>Industrial maintenance</b>			
<b>Feeding</b>	Dry feed	Formulation of own production	
<b>Buoyancy</b>	-	Negative	

**Conclusion.** The cultivation of Australian crayfish and freshwater shrimp is possible in small-sized ponds, but their long-term exploitation leads to soil depletion and depletion of the biomass of zooplankton and zoobenthos organisms. The organization of complex events favorably affects the level of the natural forage base, increasing production efficiency. As measures, it was proposed to remove ponds for flying under crops of agricultural crops. Moreover, the conversion from ponds for winter maintenance to industrial conditions must be carried out using a balanced feed with a protein content of 45%, fat is 4.8%, carbon is 17%.

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## APPROACH TO CLASSIFICATION OF HAZARDOUS PRODUCTION SITUATIONS

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**Abstract.** The main characteristics of hazardous production situations arising in coal mining enterprises, which became the basis for the formation of the classification, are determined. The application of the classification of hazardous production situations in practice will ensure their prompt identification and elimination in the process of production activity in transitional conditions. The article was prepared using the results of the study on state assignment № 075-00581-19-00. Topic № 0405-2019-0005.

**Keywords:** coal mining enterprise, ensuring safety, production risk, risk management, hazardous production situation, classification.

The relevance of the study of the laws of the occurrence of hazardous production situations in high-performance coal mines is due to the need to ensure the stability of the mining enterprise during the transition processes. These processes are accompanied by an increase in potential socio-economic damage, including for the health of workers, as a result of the onset of negative events related to the production activity of the enterprise, that is, an increase in production risk.

Studies have confirmed that successful risk management within the framework of the safety management system involves the control of hazardous production situations that arise and develop during production activities and represent a systemic cause of deviations from safety requirements.

It has been established that there are potential hazardous production situations that are specific to certain mining processes. Therefore, it is advisable to develop a classification of potentially hazardous production situations, preparedness for control of which ensures a higher level of mining safety and allows achieving the required level of economic efficiency of the enterprise.

Hazardous production situation (HPS) is a combination of circumstances and factors that arise when personnel carry out production tasks, which leads to an increase in production risk to critical values and the natural occurrence of injuries and accidents. A hazardous production situation has several stages of existence - nucleation, development, realization in an accident or injury. Monitoring hazardous production situations allows you to recognize trends in increasing or decreasing levels of production risk [1, 2]. Other advantages of this method - the identification, control and elimination of HPS are:

- combination of statistical and analytical methods of obtaining information;
- the ability to minimize the costs of preventing (eliminating) HPS by eliminating them at earlier stages of development;
- point, targeted (more rational) distribution of material, labor and other types of resources, since the key factors and circumstances of HPS are eliminated;
- the inclusion of actions to eliminate HPS in the production plan, formed at the level of chief engineer and director, allows you to attract more significant resources than at the level of the production site [3].

The practice of managing production risk through HPS control has shown that at the initial stage of mastering methods for controlling hazardous production situations, they are not detected at the stage of generation, but at the stage of development, where their main features have already been formed, for example, repeated violations of safety requirements [2]. In this regard, to increase the effectiveness of control, it is advisable to begin preventive actions at the stage of HPS nucleation.

Logical models of the emergence and development of HPS, that is, the identification of hazardous production factors or their aggregates that caused negative events, contribute to the prevention of impacts. Based on HPS models using the "event tree" construction method, the most significant factors are identified, the elimination of which will stop the development of HPS, that is, a dangerous situation will not be realized into a negative event.

For example, at the S.M. Kirov mine (SUEK-Kuzbass JSC) in 2018, the identified hazardous production situations were divided into 3 groups according to the type of consequences (negative events) in case of their realization:

- HPS, realized in injuries (41% of all cases);
- HPS, realized in flooding (24%);
- HPS, realized in disruption of ventilation (35%).

For each group, causes, situations and processes were identified during which negative events occurred. Based on these data, “event trees” were built and the risk (probability) of the occurrence of negative events was assessed - according to the stages of development of hazardous production situations in the mine areas (Fig. 1).

All collected statistical and analytical information regarding the origin, development, and effectiveness of the HPS control has been streamlined. It was revealed that the main characteristics of hazardous production situations are the place (production process) of their occurrence, the frequency of occurrence of a dangerous situation, the possibility of elimination, the cost of resources to eliminate a dangerous production situation, etc. (Fig. 2).

These characteristics were used as classification features in the formation of the classification of hazardous production situations. Its creation is due to the need for prompt and timely detection of HPS: knowing the direction of the search and properly structuring its results, it is possible to identify almost all existing hazardous production situations. Therefore, it is reasonable to initially divide the entire set according to some criteria.

In addition, the classification allows you to quickly select methods to eliminate and control HPS. If key principles or effective methods of influence have already been found for a certain category (group, class), then they are most likely to be suitable for each newly identified HPS that falls into this category. That is, knowing which group HPS belongs to, one can immediately determine the main methods of its control [4].

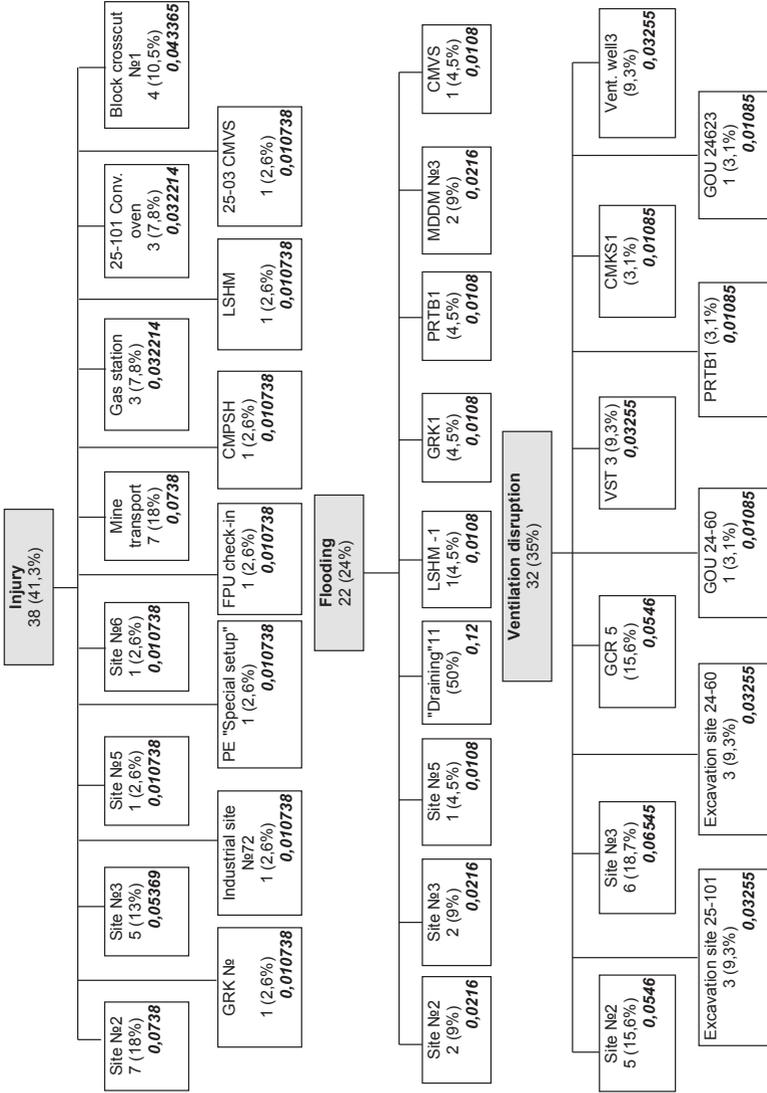
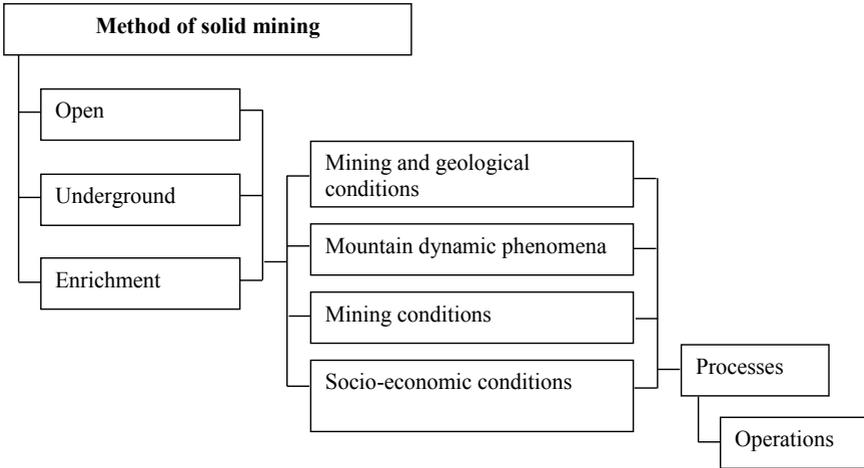
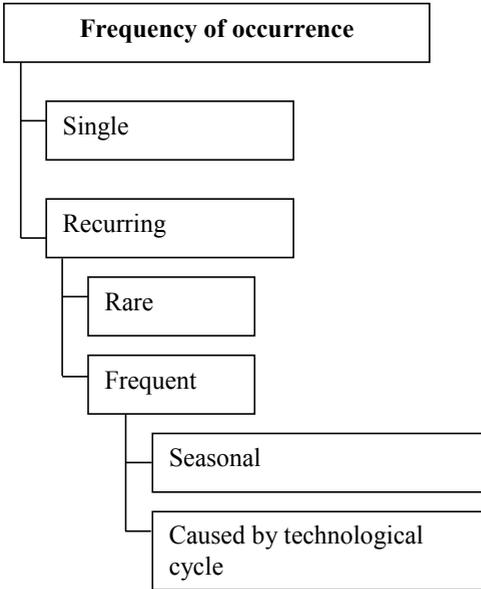


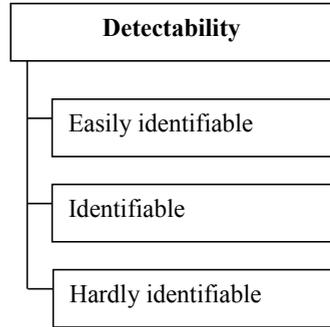
Figure 1 - Distribution of HPS in the S.M. Kirov mine by the probability of types of consequences and by sections



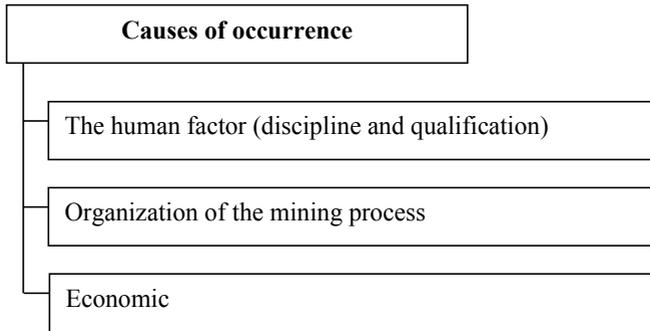
a) mining method



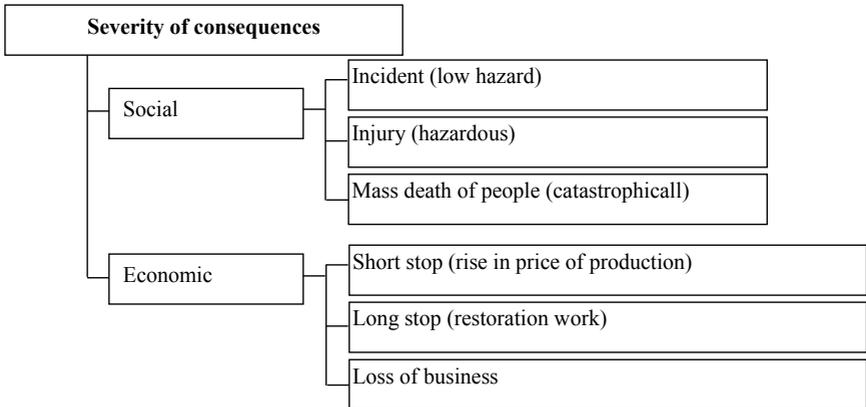
b) the incidence of HPS



c) detectability of HPS



**d) causes of HPS**



**e) the severity of the consequences of the implementation of HPS in a negative event**

**Figure 2 - Signs and main characteristics of hazardous production situations**

Formation of the classification of hazardous production situations will ensure the creation of a new reliable informational and methodological framework for managing production risk. Classification of hazardous production situations in practice can be used to quickly identify and eliminate HPS in the production process. With appropriate filling (statistical and analytical processing of data on HPS according to the indicated criteria), it will become the basis for further forecasting the occurrence and prevention of the generation (occurrence) of hazardous production situations. This will ensure a reduction in the level of production risk and, thereby, achieving the required level of economic efficiency of the main technological processes of mining in transient conditions.

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## ON THE PRODUCTION RISK MANAGEMENT MODEL

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**Abstract.** Based on a generalization of the results of coal mining enterprises in terms of ensuring production safety and managing the risks of accidents and injuries, a logical model of industrial risk management is proposed. It is proved that the required risk management model at the coal mining enterprise should control production risk, which includes the risks of injuries and accidents and failure to fulfill the production task. This model of production risk management will provide the coal mining company with competitive advantages in conditions of high dynamics of the external and internal environment of its functioning. The article was prepared using the results of the study on the State Assignment 007-00293-18-00. Topic № 0405-2018-0001. Project № 18-5-5-10.

**Keywords:** coal mining enterprise, efficiency, safety, competitiveness, production risk, hazardous production situation, logical model, security.

In conditions of high dynamics of the external environment and growing competition in coal sales markets, coal-mining enterprises are in great need of continuous improvement of production efficiency and constant ensuring of their stable operation. Steady and stable operation of a mining enterprise, as shown by studies of domestic and foreign authors and the practice of enterprises, largely depends on the effectiveness of the production safety system. This relationship is especially significant in transitional periods, when changes in the organization and production technology are accompanied by an increase in potential socio-economic damage,

including to the health of workers, as a result of the onset of negative events related to the production activity of the enterprise, i.e., an increase in production risk. Therefore, the need arose for the formation of a production risk management system at a coal mining enterprise that ensured mining conditions characterized by the minimum possible risk of injuries and accidents.

It is advisable to make two basic requirements for the risk management system — the reliability (dependability) of its functioning, and the ability to ensure the social and economic efficiency of the enterprise. Compliance with these particular requirements ensures the operability of the enterprise as an open system with any external changes. That is, the effectiveness of the production risk management system is manifested in the creation of conditions for the uninterrupted flow of the production process.

Production risk — is the potential damage (including to the health of workers) as a result of the occurrence of an undesirable event related to the production activities of the enterprise, determined taking into account the probability of the occurrence of this event. That is, the concept of "production risk" combines both the risks of accidents and injuries, and the risks associated with the failure to fulfill the production program [1].

The development and familiarization of a production risk management system (PRMS) is designed to increase the efficiency of the production system and the enterprise as a whole. The feasibility of creating PRMS, first of all, is due to the continuous complication and specifics of production situations taking shape in modern conditions of development of production enterprises [2].

The main objectives of the enterprise risk management system:

- definition and formalization of permanently occurring decision-making options in the activities of the enterprise in situations associated with the occurrence of risk;
- collection, systematization and analysis of operational information on risk factors and level;
- providing an effective system of operational interaction with all other management subsystems at the enterprise.

In 2015-2019, studies were completed that clarify and supplement the production risk management techniques at mining enterprises, in accordance with which it is advisable to manage production risk by controlling, that is, preventing or eliminating hazardous production situations [3-8]. It is these methodological provisions that became the basis for the development of a logical model of production risk management (table).

**Table Logical model of risk management**

Model parameter	Description	Criterion
Management object	Production risk	—
Main mechanism	Forecasting, preventing/detecting, controlling / eliminating a dangerous production situation	—
Socio-economic essence	Smoothing/elimination of the production conflict between the tasks of ensuring the efficiency and safety of production	<p>Economic criterion for the effectiveness of the functioning of the system:</p> $K_p^3 = \frac{C_{\text{нрр}}}{3_{\text{ОНС}}}$ <p>where <math>C_{\text{нрр}}</math> — funds spent on eliminating violations of safety requirements (fines of supervisory authorities, lost profits from downtime, costs of eliminating the consequences of negative events);</p> <p><math>3_{\text{ОНС}}</math> — costs of the normal operation of the enterprise, including the costs of monitoring and eliminating hazardous production situations [10]</p>
Changes in the activities of personnel to ensure safety	<ol style="list-style-type: none"> <li>1. Increase interest in the conflict-free work of all participants in the production and service groups of the personnel of the enterprise.</li> <li>2. Increase the involvement of production group personnel in ensuring safe working conditions (production)</li> </ol>	<p>The coefficient of completeness of the functions:</p> $K_{\Gamma} = \sum_{i=1}^n K_{\Gamma_i}$ <p>where <math>K_{\Gamma_i}</math> — numerical value of the significance of the stage of the function, <math>n</math> — number of completed function steps [11]</p>
Changes in the functioning of the production safety system	Integration of safety activities into production activities	<p>The coefficient of elimination of violations:</p> $K_{\text{устр}} = \frac{N_{\text{устр}}}{N_{\text{БН}}} \cdot K_{\Gamma}$ <p>where <math>N_{\text{устр}}</math> — number of violations resolved;</p> <p><math>N_{\text{БН}}</math> — number of violations detected; <math>K_{\Gamma}</math> — correction factor: <math>K_{\Gamma} = 1</math>, if the violation is eliminated on time; <math>K_{\Gamma} = 0,85</math>, if the violation is eliminated with a delay of 1-3 days; <math>K_{\Gamma} = 0,6</math> — with a delay of 4-6 days; <math>K_{\Gamma} = 0,3</math> — with a delay of 7-10 days; <math>K_{\Gamma} = 0,1</math> — more than 10 days [12]</p>
The result of the functioning of the production safety system	Achieving an acceptable level of production risk - a state of hazardous production situations that can be controlled by known, available and mastered methods and means	System reliability criterion (in development)

Based on the analysis of theoretical and practical concepts and methods of risk management, the formation of risk management systems, etc., the basic principles, conditions and requirements are established that will ensure the effective operation of the production risk management system:

- integration, that is, embedding into the main activities of the enterprise, in decision-making processes at all levels;
- focus on creating a mechanism that can ensure the efficient conduct of the activities of the organizational and production system in conditions of uncertainty due to the high dynamics of the environment.

The developed logical model of production risk management takes into account these principles. The methodological foundations of the creation and functioning of a production risk management system at a coal mining enterprise are determined:

- object of management — production risk, which includes the risks of injuries and accidents and failure to fulfill the production task;
- a production risk management model based on the mechanism of forecasting, identifying, and controlling (eliminating) a hazardous production situation.

Implementation of the proposed model is carried out at the enterprises of “SUEK-Kuzbass” JSC [3, 9], and already at the initial stage an assessment of the performance of the personnel was required. Therefore, for each parameter of the risk management model, criteria for the effectiveness of their provision are established.

Also, during the testing of the model, it was found that the involvement of employees of a coal mining enterprise in production risk management activities necessitates changes in the competence system of the enterprise. It is necessary to introduce the function of managing production risk into the system of competencies and to ensure the appropriate competence of coal mining employees. In this regard, the proposed logical model should be supplemented in terms of the functions, methods, directions and nature of the production risk management system, determining its place in the general enterprise management system.

The use of this risk management model at a mining enterprise, for which the tasks of ensuring production stability in the conditions of transient processes are relevant, will provide an acceptable level of risk of injuries and accidents while continuously increasing the intensity of mining operations in a dynamic external and internal environment, which is real, significant competitive advantage of a mining enterprise (company).

It is advisable to focus further research in this direction on the integration of the proposed methodological foundations into the production (enterprise) management system, as well as on the development of a general (integral) criterion for the reliability of the production risk management system.

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**ESTIMATION OF SOIL GROUNDS' DEFORMATION  
ANISOTROPY EFFECT ON THE CALCULATIONS OF BUILDINGS  
AND CONSTRUCTIONS FOUNDATIONS ACCORDING  
TO THE DEFORMATIONS**

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**Abstract.** The article provides recommendations drawn up in the development of chapter 5, paragraph 5.6 "Calculation of deformation bases" of SP 22.13330.2016 "Foundations of buildings and structures. The updated edition of SNiP 2.02.01—83\*" [1], which sets out the main provisions for calculating isotropic soil bases. The development of a reliable apparatus for calculating soil bases is of particular relevance at the present time, when the available data on the stress-strain state (VAT) of soil bases mainly confirm the provisions of the calculation methods described in SP 22.13330.2016, but, nevertheless, in a number of cases, there is a need to adjust the standard methods for calculating the sediment of soil foundations. Correction factors are developed for use in design practice when it is necessary to determine the estimated soil resistance  $R$  under the soles of the foundations and to determine the dimensions of the soles, as well as when calculating the sediments of hard foundations by the method of layer-by-layer summation of deformations of a homogeneous transversely isotropic single-layer soil base of various thicknesses (including half-planes) under flat deformation. The nature of the deformation anisotropy of the studied types of soils is different - for plastic sandy loam the indicator is  $\alpha \leq 1$ ; for loesslike sandy loams and

su-clinks, as a rule  $\alpha > 1$ ; for sands of medium density and dense, tested under compression  $\alpha < 1$ . With an increase in compressive load, the values of  $\alpha$  increase, and with an increase in  $\alpha$ , the values of the foundation sediments increase. Taking into account the natural anisotropy of soils allows one to more reasonably determine the sizes of the soles of the foundations and determine their settlement, and in some cases to obtain a noticeable economic effect.

Keywords: recommendations, deformation anisotropy, anisotropy index, soil base, numerical methods, experiment planning, calculated soil resistance of the base, coefficients of the influence of soil anisotropy, calculation of sediments.

This study important issue of the stress-strain state (VAT) is to take into account the deformation anisotropy in the calculations of soil massifs, which is recommended to use modern regulatory documents on soil bases calculation [1]. The algorithm for taking into account deformation anisotropy in the calculations of the soil bases, consisting of four main stages is proposed according to the results of large-scale research. At the first stage (preparatory), soil samples were taken from the monolith or directly at the construction site in two mutually perpendicular directions: perpendicular and parallel to the mas-sif bedding.

At the second, laboratory stage (experimental), soil samples were tested according to the modern standard methods [2]. The degree of soils' deformation anisotropy is estimated by the anisotropy indicator  $\alpha = E_z/E_x$  taking into account various values of Pousson's coefficients (coefficients of the soil lateral expansion) during the obtained results analyzing; where  $E_z$  and  $E_x$  are deformation modules in vertical and horizontal directions. The indicator of deformation anisotropy  $\alpha$  is established according to the compression tests' results of standard soil samples, selected in the vertical and horizontal directions [3].

Computer numerical studies (numerical experiment) [4] of the anisotropic soil bases were carried out (on various software packages based on the ideas of the finite element method) using the mathematical planning method of the experiment further, at its third stage. In this case, a model of a continuous, linearly deformable, homogeneous, anisotropic medium with a transversely isotropic anisotropy is considered. The model of an anisotropic soil foundation is used in the calculations, described by five parameters  $E_{x'}$ ,  $E_{z'}$ ,  $\nu_{zx'}$ ,  $\nu_{yx'}$ ,  $G_{xz'}$ . ( $G_{xz}$  - shear modulus).

At the fourth stage (calculation of the soil anisotropy correction factors), a method that took into account the deformation anisotropy of the base soils using the coefficients of the soil anisotropy was developed  $K_\alpha(K^y_\alpha)$

and  $K'_\alpha(K^{y/\alpha})$ , comparing results of calculating the VAT of uniformly anisotropic and isotropic bases as layers of different thickness and half-plan [5]. If it is necessary to determine the values  $K_\alpha(K^{y/\alpha})$  and  $K'_\alpha(K^{y/\alpha})$  for other points of the central and angular verticals, their values are found by the results' interpolating. The values  $K_\alpha(K^{y/\alpha})$  and  $K'_\alpha(K^{y/\alpha})$  are obtained by comparing the corresponding stresses calculated by the finite element method with  $\alpha = 1$  and  $\alpha \neq 1$  show what proportion of the stresses in the isotropic medium are the corresponding stresses in the anisotropic one.

The deformation anisotropy effect on the predicted sediment value, even with poorly expressed anisotropy of conventional soils, is estimated to be 10–40% of the foundation's calculated settlement, located on an isotropic base. The obtained data can be used in calculations of deformational soil bases, taking into account that the calculation leads to overestimated values of sediment for anisotropic soils with an anisotropy index of  $\alpha < 1$  according to the existing method, and traditional calculation gives reduced values of sediment for  $\alpha > 1$ . The proposed improved practical method for calculating soil bases by deformations allows calculating foundations' sediments more accurately and reasonably with their real properties. The developed method can be recommended for the calculation of foundations' sediment taking into account the deformation anisotropy according to SP 22.13330.2016 "Foundations of buildings and structures. Updated version of SNiP 2.02.01-83\*.

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