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CHEMICAL SCIENCES

QUANTITATIVE ASSESSMENT OF LABORATORY CHEMICAL WASTE

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Abstract

Using the example of a specific laboratory, the problem of the formation and accumulation of chemical waste as a result of its testing activities is considered. It has been shown that during the year, more than 100 kg of chemical reagents belonging to substances of different chemical classes, having different physical states and degrees of danger, are consumed to test agricultural and food products. It is recommended to develop standard laboratory regulations on accounting, collection and storage methods, and methods of disposal of the resulting residues of laboratory chemicals.

Keywords: laboratory chemical waste, treatment.

Introduction. At present, the problem of disposal of chemical reagent wastes generated in the course of numerous studies of various product groups is becoming acute. There are more than 2,000 accredited testing laboratories in Belarus and even more production laboratories that use various chemicals, including toxic ones, to test products. In addition, during these tests, new chemical compounds are formed, which can also be toxic. An analysis of the regulatory documentation in force in Belarus in the field of chemical waste management from laboratory research [1, 2] showed the following. Classification codes have been established for such substances [3]. The code consists of 7 digits showing the assignment of a chemical to a specific block, section, group, subgroup and species. Laboratory chemical waste codes include: 5930100 (chemicals), 5930200 and 5930300 (organic and inorganic laboratory chemical residues), 5930400 (expired chemicals), 5931000 and 5931900 (other chemicals). According to Instruction No. 41/108/65 [4], all chemicals belong to 4 hazard classes, which are classified according to seven indicators and the following properties: ecotoxicity, toxicity, explosion and fire hazard, toxicity of combustion products and infectiousness. In the literature available to us, we did not find information on the rules for the disposal of such chemicals, with the exception of article [5], which provides the following recommendations for handling chemical waste in a testing laboratory:

a) the disposal of chemical reagents is carried out in a complex manner, taking into account the physico-chemical properties of a particular substance;

b) the process is carried out only by highly qualified personnel using special equipment, containers and transport;

c) to eliminate hazardous waste generated in the laboratory, neutralization with other reagents is used to obtain a neutralized product (carried out in the laboratory itself) and incineration in a vacuum (waste is transferred to third-party organizations licensed for this type of activity).

Analyzing some foreign sources of literature [6, 7], it turned out that chemical wastes are classified as

hazardous if they have any of the following four characteristics: flammability, corrosivity, reaction hazard, toxicity. In the United States, the classification of chemical waste from laboratory activities consists of a code and a name of the substance. The code consists of letters and numbers. The letter denotes belonging to one of the lists, denoted by F (highly hazardous for disposal), U (unused chemicals that become waste (for example, chemicals that have expired, spilled or no longer needed for laboratory experiments)), P (frequently generated chemical waste in certain concentrations). Two methods for reducing chemical waste are recommended for waste reduction: neutralization (pH is brought to a neutral value using a neutralizing agent) and distillation with processing in place (distillation for reuse). Utilization of chemical waste is carried out by specialized organizations. For chemical waste removal by a third party, the laboratory must collect and store chemical waste in appropriate containers and plastic bottles with specific labeling; for each sealed container (bottle), fill out a form and send it to the Office of Environmental Protection and Safety to obtain a permit for the export of chemical waste. Disposal of chemicals in the sewer system requires a written permit from the EHS [8].

Thus, the correct handling of chemical waste generated in testing laboratories is not only aimed at protecting the environment, but is also important for ensuring the safety of personnel working with chemical reagents.

Aim. Assess the significance of the problem of handling chemical waste from laboratory activities using the example of a specific testing laboratory.

Materials and methods. The objects of the study were accounting cards for chemical reagents (responsible for maintaining – leading engineers of divisions; frequency of filling – once a month) used in the testing laboratory of the territorial body of state supervision accredited in the National Accreditation System of the Republic of Belarus. The field of activity of the laboratory is the testing of agricultural and food products in terms of quality and safety.

The subject of the study was the kinds and amount of chemical waste generated in the testing laboratory from 01/01/2022 to 12/31/2022. Research methods:

analysis and classification, as well as mathematical data processing using MS Excel.

Results and discussion. As a result of summarizing the information given in the accounting cards for chemical reagents, we found the following. In 2022, 315 kg of chemical reagents were spent, of which 42.81

% were flammable liquids, 5.46 % – other solvents, 32.49 % – acids, 16.73 % – alkalis and 2.51 % – salts. More than 150 types of chemical reagents were used monthly in the testing laboratory, the remains of which were subject to disposal. We divided these substances into 4 groups (Table).

Table

Classification of chemical waste generated in the testing laboratory	
Groups	Kinds
Inorganic and organic chemicals	Acids
	Alkalis
	Salts
Organic solvents	Flammable liquids
	Halogenated solvents
	Non-halogenated solvents
Hard materials	Contaminated filter and chromatographic materials
Product examples	With inorganic residues
	With solvent residues

To determine the dynamics of the consumption of chemical reagents and waste generation, we constructed histograms of the distribution of the total amount of chemicals most often used when testing chemical reagents in the period from January to December 2022 in the testing laboratory (Fig. 1–4).

As can be seen from the data shown in Fig. 1, the minimum consumption of acids during the year was 5

kg, the maximum was 16 kg. As the analysis of the working records of the tests performed showed, the increased consumption of these reagents (from 10 to 16 kg) was associated with testing a large number of samples of agricultural raw materials in terms of physical and chemical indicators.

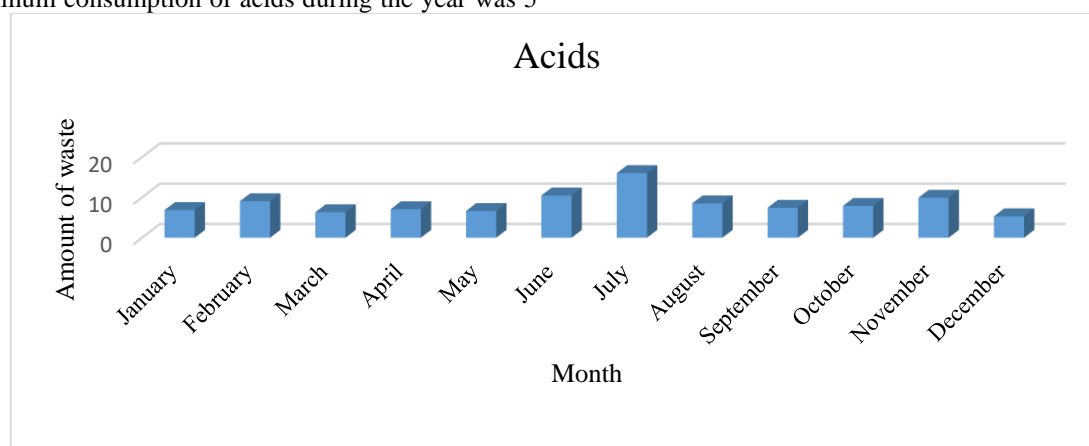


Fig. 1. Histogram of the distribution of the total amount of acids used in tests by months

Analysis of the data presented in Fig. 2 indicates that there is no regularity in alkali consumption by months. The minimum amount of alkalis (0.784 kg)

was used in March, the maximum (8.133 kg) - in April. In other months, the amount of alkali consumed varied from 2.8 to 5.8 kg.

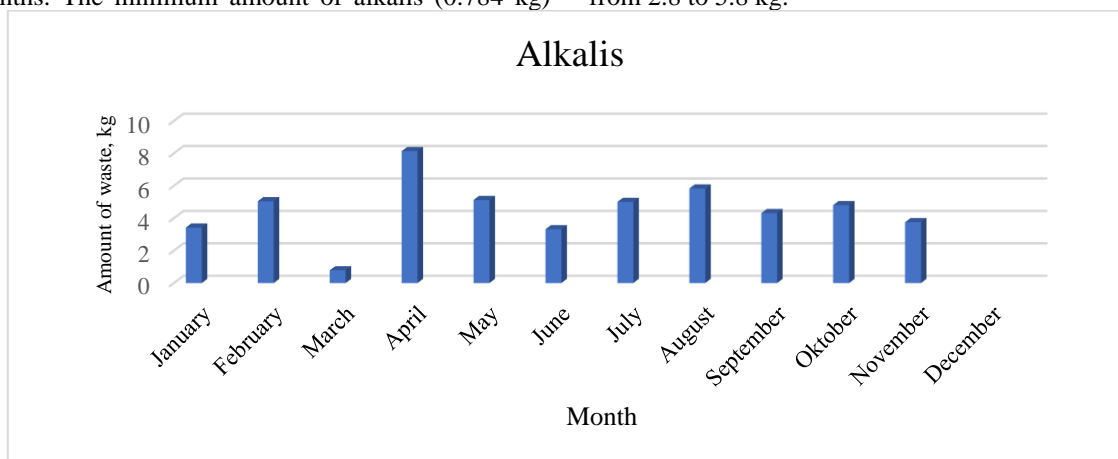


Fig. 2. Histogram of the distribution of the total amount of alkali used in tests by months

Fig. 3 shows that the main part of the organic solvents used in the testing laboratory is occupied by flammable liquids. The consumption of these reagents during the year was uneven: in July and December, flammable liquids were used in the minimum amount (slightly more than 5 kg), in the first, partially in the third and fourth quarters, their consumption ranged

from 10.5 kg to 14.0 kg, the maximum amount was used in August (about 18.5 kg). The share of other solvents in the total consumption of organic solvents fluctuated in a wide range: from 1.2% to 17.3%, the maximum amount of these substances in the total consumption was recorded in July – 33.1%.

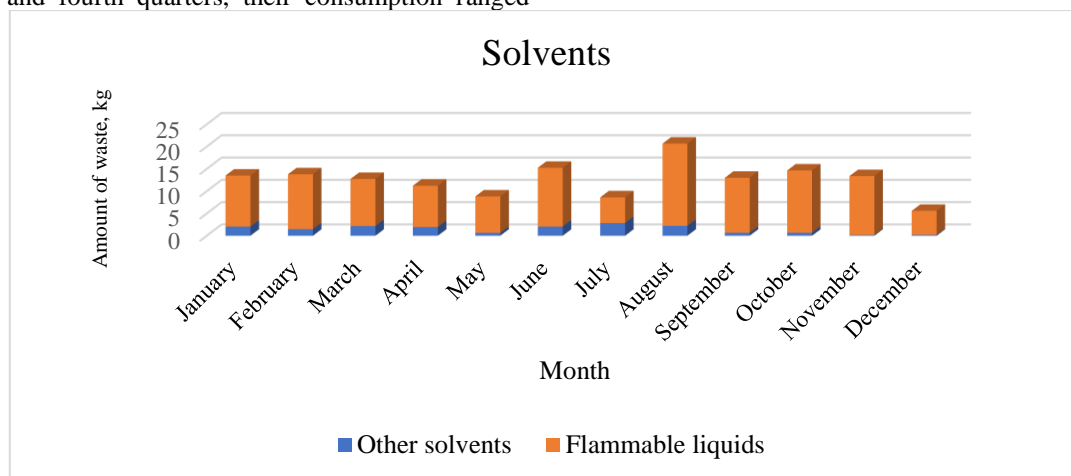


Fig. 3. Histogram of the distribution of the total amount of solvents used in tests by months

Comparison of data on the consumption of acids (Fig. 1), alkalis (Fig. 2) and salts (Fig. 4) showed that the need for inorganic and organic salts for testing during the year was insignificant: from 0.4 kg to 1.2 kg,

while the consumption of inorganic salts, as a rule, prevailed.

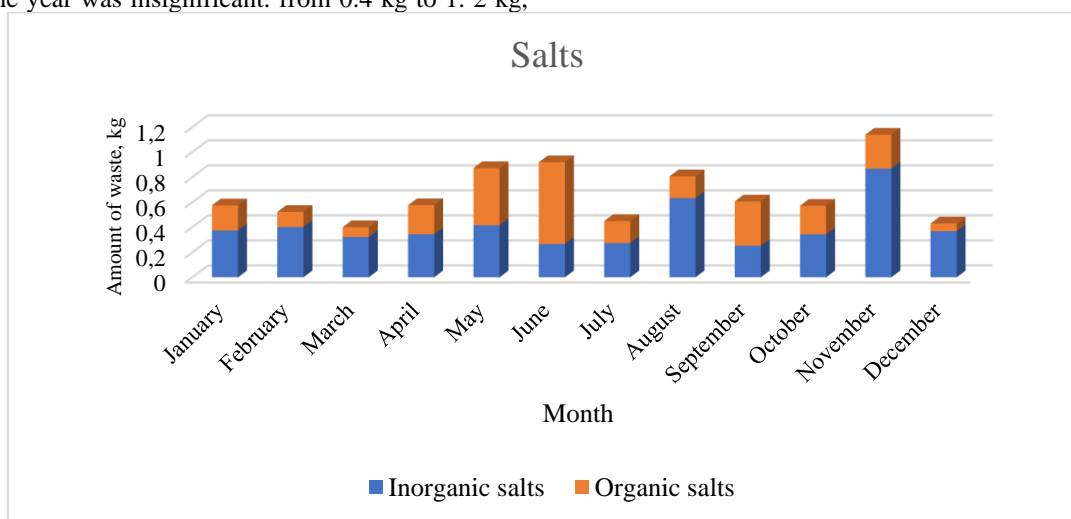


Fig. 4. Histogram of the distribution of the total amount of salts used in tests by months

Conclusions. Thus, our studies allow us to draw the following conclusions. In the testing laboratory, a significant amount of chemical waste is generated, belonging to substances of different chemical classes, having a different state of aggregation and degree of danger. The consumption of chemical reagents and waste generation during the year was uneven and depended on the test program. Most of the tests were carried out by chromatographic methods. To streamline work on accounting, methods of collection and storage, methods of disposal of the forming residues of laboratory chemicals, it is advisable to develop an appropriate standard operating procedure.

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JURIDICAL SCIENCES

LEGAL CONSEQUENCES OF ELECTRIC POWER FACILITIES DAMAGE IN CONTEMPORARY UKRAINE

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Abstract

Article proposed are devoted to the problem of new form of military terror: shelling of electric power facilities in wartime Ukraine. The problem of damage to electric power facilities, in the context of economic and legal protection of the environment, is gaining prominence among the current problems of law in wartime is presented. In general maintained that in order to establish legislative measures to regulate environmental protection in the context of electricity production in the wartime, we support the key points presented by UNDP, in exclusion to the position on the nuclear energy of Ukraine. The author's recommendations for reforming the regulatory framework in the area under study are given.

Keywords: energy facilities, missile attacks, environmental damages, UNDP programme, recovery energy sources, international cooperation, wartime Ukraine.

Introduction. Full-scale military aggression of the Russian Federation on the territory of Ukraine presented the world with a new form of military terror: shelling of electric power facilities. The "legitimate" goals of Putin's imperial chauvinistic policy became peaceful transformers, power lines, units of thermal and nuclear power plants, which the history of world civilization has never known. In this regard, the study of the legal consequences for management and environmental protection, in the context of finding a fair balance and preventing both economic and environmental catastrophe, seems not only an urgent requirement of the day, but also an actual legal problem of assessing the consequences of aggression and bringing those responsible to justice.

Since the research topic represents current events, the scientific community has not yet had time to properly pay attention to it.

However, the problem of damage to electric power facilities, in the context of economic and legal protection of the environment, is gaining prominence among the current problems of law in wartime.

The purpose of these papers is to evaluate the level of environmental legal protection in the context of war economic activities in the field of energy, wartime damages' impact taking into account and a review of foreign doctrine in aforesaid field.

Materials and Methods. Presented papers have done with assistance of formal and compares methods as special and ontology, deduction, analysis and synthesis as common, which led to obtain a new data and background for discussion and further investigations from contemporary scientific viewpoint. Therefore, research methodology is based on general scientific methods such as analysis, synthesis, induction, deduction, analogy and empirical methods - observation, comparison and so on and so forth.

Methodological basis of the survey, presumably, is a dialectical method, the introduction of which provides an opportunity to study the object and subject of

research in their gnoseological unity, as well as the nature of medical law development and their impact, as cause and effect.

Results and Discussion. According to Ukrinform's report, in Ukraine, as a result of a Russian missile attack, there is damage to energy infrastructure facilities, power supply restrictions were applied in the Zhytomyr, Kharkiv and Odessa regions. On March 9, 2023, the 15th massive missile attack on the energy infrastructure by the Russians continued. Restrictions in all regions were preemptively applied to mitigate risks. The restoration of the power system, power supply gradually continues. Repair crews have already left to eliminate the effects of shelling and restore power. Earlier, due to a missile attack in Kyiv, power engineers used technological emergency power outages. At the same time, as a result of the attack, there is damage to energy infrastructure facilities [4].

Previously, on the anniversary of the seizure of Zaporizhzhya NPP by Russian troops, the Minister of Energy of Ukraine Herman Galushchenko emphasized that Russia's military aggression against Ukraine is unprecedented on the scale of destruction of civilian energy facilities and violation of international law in world history. The terrorist state must take political, financial, criminal and historical responsibility for crimes against humanity, nuclear terror and blackmail around the world, the destruction of the civilian energy infrastructure of Ukraine. Today is the year the Russians captured the largest Zaporizhzhya nuclear power plant in Europe. They turned it into a military base and use it to nuclear blackmail the whole world. Enemy missiles flew over nuclear power plants. In November 2022, a massive Russian missile attack on energy infrastructure facilities led to a blackout at all Ukrainian nuclear power plants: power units crashed and switched to diesel generators - power the last hope. "It was a real threat of a repeat of the Fukushima scenario and a nuclear disaster that would affect all of humanity. This is nothing more than nuclear terrorism," said German Galushchenko. Ukrainian energy infrastructure facilities have been in Russian crosshairs since the start of the

full-scale invasion. At the same time, from October 2022, the Russians headed for its complete destruction. About 50% of energy infrastructure was affected by shelling. "It's civilian infrastructure. Its deliberate destruction is a serious war crime. International Humanitarian Law, the Geneva Conventions and the Additional Protocols clearly prohibit attacks on civilian facilities, such as power plants and electrical networks," the Minister emphasized. Herman Galushchenko underlined that military criminals are military who fire at energy infrastructure, as well as energy, who advise on how to cause maximum damage and help occupy energy facilities. "Quick and non-standard solutions, assistance of the international partners and the heroic work of Ukrainian power engineers allowed Ukraine to win the battle on the energy front against Russia this winter. At the same time, the aggressor should be severely punished for his crimes," the head of the Ministry of Energy summed up [6].

Chubik A. constituted that Ukraine in today's war for its existence opposes the unprecedented methods and scale of attacks on energy sector. Experience of confrontation includes many years of cyber attacks, as well as the physical destruction of critical infrastructure facilities at the top of their use during the cold season. As a result of 33 massive missile attacks, more than 47% of the energy infrastructure suffered various degrees of destruction, namely 44% of nuclear generation (including occupied nuclear power plants), 78% of TPP capacities, 66% of block CHPs, 12% of hydroelectric power plants, 75% of wind generation and more than 20% of solar power plants [10].

As presented UNIAN agency, the Russian occupiers have carried out dozens of missile and drone attacks on Ukraine's critical infrastructure since October 2022. According to official data, a total of 255 enemy missiles and drones hit energy infrastructure. Of these, more than two hundred are in the facilities of the high-voltage network of NPC Ukrenergo. However, according to Dmitry Sakharuk, Executive Director of DTEK energy holding, digital indicators of Russian attacks on the Ukrainian power system may actually be much greater. Thus, since the beginning of the full-scale invasion of Russian armed groups on Ukrainian soil, our country has lost 44 percent of nuclear generation and three quarters of the capacity of TPP: some part has been occupied, the other - destroyed. Because of this, the generating capacity of domestic power plants has fallen significantly [3].

National Energy Company of "Ukrenergo" stated that 365 days Ukraine confronts the Russian occupiers and seeks its independence. Ukrainian energy has held an energy front since the beginning of the Russian invasion. In the fall, all Ukrainians stood side by side with them on this front. Russians dropped more than 1200 missiles and drones on the power system of our country. More than 200 of them hit the target. 50% of power plants and more than 40% of the network have been significantly affected. About 12 million Ukrainians were without light every hour. The enemy, losing to the heroic Armed Forces in battle, tried to destroy our power system and plunge the country into darkness and cold. Russian energy terror and blackmail was chosen

as one of the main means of warfare. Ukrainian energy did not allow the enemy to carry out criminal intentions. This winter confrontation was won by Ukrainians. We won the battle, but our fight is still ongoing [2].

A new UNDP report on the assessment of damage to the energy sector of Ukraine after months of targeted attacks offers a sober assessment of the existing situation in the industry and outlines a strategic path to recovery and sustainability. The report, compiled shortly before the destruction of the Kakhov Dam, shows that the Ukrainian energy system remains extremely vulnerable and continues to operate in an emergency mode with a reduced and limited margin of strength, overcoming the consequences of damage that exceeded US \$10 billion. The power system of Ukraine continues to operate in an emergency mode, which affects both the electricity supply and the generation of electricity. The results of the report show that 42 of 94 (45%) key high-voltage transformers in government-controlled territories have been damaged or destroyed by rocket attacks or drone strikes since the beginning of the current stage of the war. More than half of these transformers suffered repeated shelling, which prevented attempts to repair them. Electricity generation capacity has shrunk to nearly 50 percent of pre-2022 levels, according to the report. Of the nearly 37GW available, more than 19GW has been destroyed, damaged or seized since February 2022. The situation is complicated by a significant reduction in maneuvering capacity, in particular, the loss of more than 67 percent of thermal generation capacity. These large-scale damages have significantly affected energy supply during the last winter and continue to threaten the stability of Ukrainian consumers' access to electricity. UNDP's Permanent Representative to Ukraine, Jako Silje, noted that the report's findings highlight the urgent need for swift, coordinated and strategic action. "The UNDP assessment is a compelling argument for aligning immediate responses with the medium-term goals of the National Energy Strategy," he said. – "The actual loss of obsolete coal generation should be seen as an opportunity to accelerate the green transition and decentralization. We have already begun cooperation with several local governments to ensure their urgent energy supply needs, as well as to prepare the basis for financing the development of a more ecological and sustainable energy infrastructure. "The report suggested a number of clear and practical recommendations to help make the energy sector more sustainable and environmentally friendly than before. UNDP uses these guidelines in its collaboration with stakeholders at the national and local levels to restore the energy sector. The following recommendations include: (a) dispersion of generation capacities across the country and decentralization of the power system to increase its stability and adaptability; (b) introduction of modern high-manure and more environmentally friendly generating capacities to enhance the maneuverability of the power system; (c) increase the share of renewable energy sources in the power system, use of large potential of clean and sustainable energy; (d) initiating a gradual reduction and final abandonment of coal use in accordance with Ukraine's commitments to reduce CO₂ emissions and contribute to global climate

change mitigation efforts; (e) explore further opportunities to improve the utilization of nuclear and hydro-power capacities and maintain optimal energy balance [8].

Kolosov I.V., in this context, draws attention to the fact that all existing nuclear power plants at the end of the war should be decommissioned and mothballed. Despite significant economic costs and considerable stress on the electricity market, this step is the only correct and absolutely necessary to ensure the safety of all mankind. After all, to date, all operating nuclear reactors in Ukrainian nuclear power plants - Russian-made. Thus, a state with a terrorist-authoritarian regime of power has all the array of technical, design and technological information, which keeps the existence of the entire human civilization under threat. According to the scientist, updates also need legal regulation of the Exclusion Zone. From the world's largest landfill of nuclear waste, it is necessary to stop making a tourist object. This is dangerous for people's health, and also attractive for collaborators and spies of the enemy state. We are convinced that the policy of the "passage yard" regarding both the Exclusion Zone and satellite cities of operating nuclear power plants should be suspended. Given the challenges of modernity and the realities of Horde geopolitics, we must return to the legal regime of closed satellite cities, with increased control, checkpoints, detailed checks of documents, admission to such cities or places exclusively for work or research needs, if there are supporting documents or by invitation from humanitarian needs, notarized [5, p. 601-603].

Separately, should be focuses on renewable energy sources. According to the Razumkov Center's data, most of the currently installed renewable energy facilities in the country are concentrated in the southern and southeastern regions of Ukraine, where active hostilities have been continuously taking place over the past 6 months. According to various experts, as of August 2022, 30-40% of renewable power plants in these regions or about 1 120-1 500 MW of installed capacity have already been affected in one way or another. For example, according to the Ukrainian Wind Energy Association, since the beginning of the large-scale war, more than 3/4 wind power capacities have been stopped in Ukraine, that is, out of a total of 1,673 MW, currently about 1,462 MW of Ukrainian wind farms are not operating, and 5 wind turbines in the Kherson region, installed at the Mirna, Sivash and Novotroitsk wind farms, are currently not operating. Due to damage to 330 kW, power lines in Melitopol also do not work almost 600 MW of wind power capacity in the Zaporozhye region. It should be emphasized that this damage indicator may be greater, since today the level of damage at those stations that are under the occupation of Russian terrorists without the possibility of physical access to them is unknown. However, it is known for certain that RES assets worth more than US \$5.6 billion are located in the active warfare zone, and more than US \$3.6 billion in regions neighboring the areas where active hostilities are underway. 1.8 MW of bioenergy capacity in Chernihiv suffered damage, while bioenergy stations with a total capacity of 2 MW were found

in the occupied territories of the Donetsk region, namely, in Volnovakha and Mariupol, that is, 3.8 MW out of 245 MW installed at the end of 2021, do not currently supply electricity to the power grid. The issue of repayment of debt to producers with RES was temporarily postponed, and the percentage of payments for supplied electricity in 2022 was limited for the duration of the military condition to 15% of the weighted average "green" tariff for 2021 for producers of electricity from solar radiation; up to 16% - for wind power producers; up to 35% - for producers producing electric energy from hydropower; up to 40% - for producers engaged in the production of electric energy from biogas; and up to 60% for producers producing electric energy from biomass. The corresponding Order of the Ministry of Energy of Ukraine No. 140 of March 28, 2022, which actually established the above minimum levels of payment for "green" electricity, obliged the State Enterprise "Guaranteed Buyer" to also direct 60% of the balance of funds to repay the debt to SE "Energoatom" and 40% to repay the debt to NEC "Ukrenergo." Even though RES producers, in particular solar and wind power producers, never received full payment for electricity delivered in 2021 and continued to incur operating costs for the maintenance of their power plants, had financial obligations both to the state of Ukraine and its personnel, and before international investors, they still did not complaint with such financial policies in the RES sector and state decisions. [1;7;9].

Conclusions.

1. Losses from missile attacks by the Russian army on Ukrainian energy facilities can be conditionally divided into direct economic, further economic, socio-demographic and environmental. Such a classification is mediated by the fact that energy suppliers suffer losses from damage/destruction of generating capacities, the care of future investments, the population suffers from cold, diseases and difficulties of medical care, and nature - from diesel fuel pollution from generators and additional emissions of carbon oxide.

2. In this regard, the domestic legislator to the insult pays few attention to the legal consequences of violation of environmental legislation. Moreover, it allows to establish financial restrictions leading to the degradation of recoverable energy generation, which is implied as friendly to the environment.

3. In general, in order to establish legislative measures to regulate environmental protection in the context of electricity production in the wartime, we support the key points presented by UNDP, in exclusion to the position on the nuclear energy of Ukraine. In this part, we fully uphold the position of I.V. Kolosov, outlined above.

However, problems of overcoming the environmental consequences of undermining the Kakhovskaya hydroelectric power station and the rationality of its restoration, further operation of dry storage facilities for spent of nuclear fuel in a military conflict circumstances should be devoted to subsequent scientific research and author's investigations.

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MEDICAL SCIENCES

EXPRESSION OF p53 AND Ki67 IN TYPE 1 AND TYPE 2 ENDOMETRIAL CARCINOMAS AND IN LOW AND HIGH GRADE SEROUS OVARIAN CARCINOMAS

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Abstract

Ovarian cancer is the deadliest of gynecological malignancies, and despite the efforts to improve existing treatment methods and early diagnosis, no progress has been made. Endometrial carcinoma (EC) is the fourth most common malignancy in women.

The p53 gene has a leading role in the control of the cell cycle and the initiation of carcinogenesis. The p53 protein induces apoptosis, or cell cycle arrest, which allows the cell to repair genomic damage. Loss of p53 function plays a central role in the development of malignant tumors. P53 is a tumor suppressor gene whose expression in tumors is associated with progression and poor prognosis.

Ki67 protein is a cell proliferation marker. Immunohistochemical staining with Ki-67 provides reliable data on the growth fraction of tumors. The Ki67 marker reflects cell proliferation in the tissue being examined. By reading the immunohistochemical expression of Ki67, we can obtain information about the proliferative index and about the growth fraction of tumors. The number of Ki67 positive tumor cells often correlates with the clinical course.

Keywords: p53, Ki67, endometrial cancer, ovarian cancer.

Introduction

The mechanisms underlying the progression of noninvasive serous borderline ovarian tumors to low-grade invasive carcinomas are poorly understood. Cheng J-C et al. demonstrated that inhibition of p53 induces tumor cell invasion in serous borderline ovarian tumors through activation of the PI3K/Akt pathway and transcriptional repression of E-cadherin (1). The other histological subtypes of ovarian carcinoma, which more often present at an early stage (endometrioid, clear cell, mucinous), have a much lower frequency of TP53 mutations (2). The heterogeneous nature of adenocarcinomas is the reason for the different results of the study of this expression.

Ki67 is an indicator of cell activity and proliferation. Its gene is located on chromosome 10 and its protein product is located in the nucleus. The expression of ki67 is closely related to cell proliferation and differentiation and is often used as an indicator of carcinogenesis and cell activity. Data can be obtained from immunohistochemical results at the time of initial diagnosis.

10 - 20% of endometrial carcinomas and 90% of serous carcinomas may have a P53 mutation (3). P53 is mostly expressed in high-grade, poor-prognosis non-endometrioid endometrial carcinoma (4).

Ki67 expression in endometrial carcinoma is associated with prognosis (5). This study shows that when Ki67 is higher than 35%, it is necessary to be careful about the possibility of deep invasion of EC into the myometrium.

P53 plays an important role in the regulation of cell proliferation, DNA repair, apoptosis, genomic stability, and metabolic homeostasis.

The p53 gene has a leading role in cell cycle control and initiation of carcinogenesis. It is localized in

the short arm of chromosome 17 (6). It is a tumor suppressor gene that encodes a nuclear phosphoprotein. The p53 gene is one of the most frequently mutated tumor suppressor genes and is damaged in 40-80% of ovarian carcinomas. The p53 protein accumulates in the cell nucleus and is activated as a transcription factor in response to DNA damage, hypoxia, oncogene activation, and other genotoxic injuries. It has a negative regulatory effect on the cell cycle. Loss of p53 function plays a central role in the development of malignant tumors (7).

Aim

The present study aims to compare the expression of p53 and ki67 in type 1 and type 2 endometrial carcinomas and in low and high grade serous ovarian carcinomas.

Materials and methods

We studied 58 cases of patients with type 1 and type 2 endometrial carcinomas (n=30), and low and high grade serous ovarian carcinomas (n=28) in the age range 43-82 years. 4 µm thick paraffin sections were dewaxed and rehydrated through descending alcohols. Haematoxylineosin staining was performed according to standard methods.

The immunohistochemical study was performed according to standard protocols. Antibodies used, manufactured by Leica Biosystems, Newcastle:

- Bond p53 Protein, clone DO-7, ready to use, 7 ml, cat. No. PA0057. Nuclear staining and diffuse patterns were reported.

- Bond Ki67, clone K2, ready to use, 7 ml, cat. No. PA0230. We reported nuclear expression.

DAB was used as the chromogen. An automated coloring platform was used.

Expression estimation system

Giurgea L et al. defined the following patterns for p53- and Ki-67-positivity of tumor cells (6): focal pattern, which shows a small number of expressing tumor cells; heterogeneous pattern, with islands of strong positive expression alternating with regions of low positive expression; diffuse model representing diffuse positivity. Also, they use a quantitative assessment, depending on the number of stained cells: 0: 0; 1-10%: score 1; 10-50%: score 2; 50-100%: score 3.

Immunohistochemical expression is the sum of the percentage of positive cells and the intensity. At least 10 x400 magnification fields are examined from each preparation.

Statistical analysis

Statistical hypotheses with accurate p-value calculation are applied. To accept the null hypothesis (H0) the criterion "p-value" ≥ 0.05 was used (the probability of making a first-order error is below 5%), and to accept the alternative hypothesis (H1) the criterion "p-value" was applied < 0.05 (the probability of a correct decision is over 95%).

To detect a statistical difference between the values of a parameter representing a continuous random variable, the non-parametric Mann-Whitney U tests (for the comparison of two defined groups of patients) and Kruskal-Wallis with Dunn's post hoc analysis for

more than two groups were applied. For comparisons regarding variables taking discrete values, Fisher's Exact Test was applied.

In all cases, a null hypothesis (H0) is defined - the values of the studied parameter for the compared groups originate from the same general population and an alternative hypothesis (H1) - the values of the studied parameter for the studied groups differ statistically.

Presence of statistical significance is determined at a value of $p < 0.05$; at a value of $p \geq 0.05$, there is no statistically significant difference.

Results

In our studies, we reported interesting results and dependencies of these two markers in ovarian and endometrial carcinomas.

Outcomes in endometrial carcinomas

The analysis of our results regarding the difference in p53 expression in relation to the degree of differentiation of endometrial carcinomas found that such a difference existed and it was significant ($p=0.017$).

Highly differentiated endometrial carcinomas (G1) were negative for p53 expression.

The more poorly differentiated the carcinoma, the stronger the expression of p53 in it. This dependence is shown in Fig. 1.

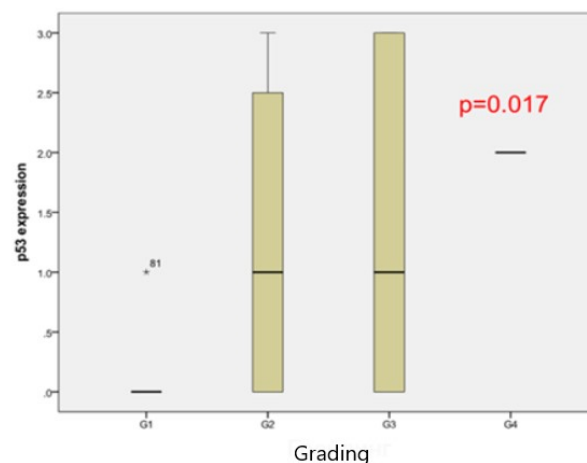
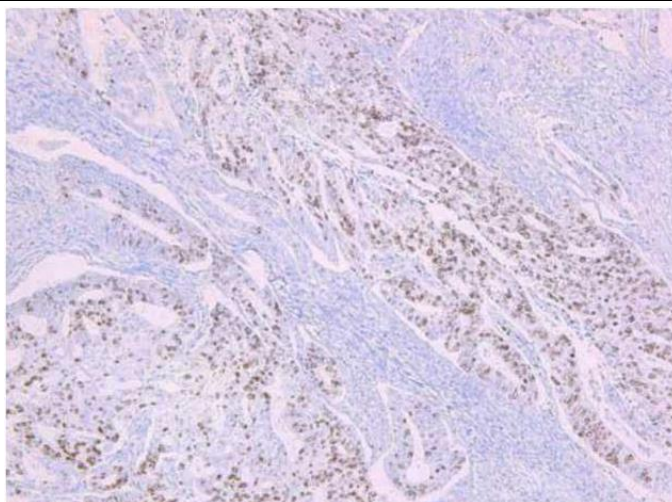


Fig.1 p53 expression

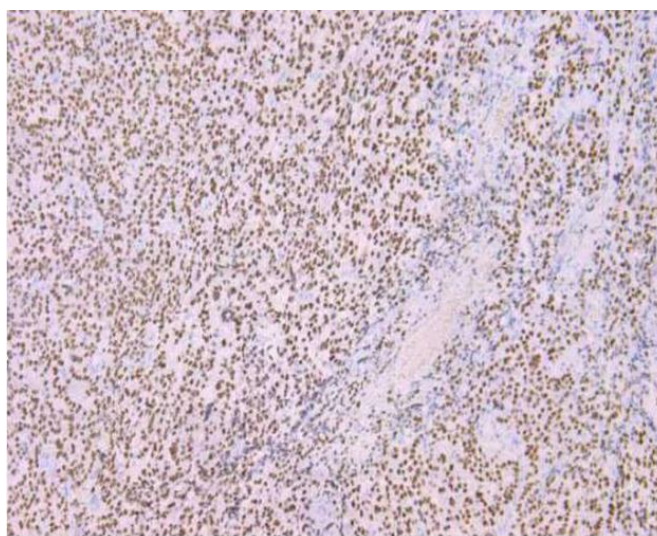
According to the histological type of the carcinomas, we observed a higher expression of p53 in the group of carcinomas type 2, the difference between the two types being significant ($p=0.025$).

In cases with endometrial carcinomas, we found a statistically significant difference in Ki67 expression

relative to the degree of carcinoma differentiation ($p=0.018$). The expression of the marker becomes stronger as the degree of differentiation of the carcinoma decreases.



Picture 1. Moderate nuclear expression of Ki67 in highly differentiated endometrioid carcinoma of the endometrium, x100



Picture 2. Strong and diffuse nuclear expression of Ki67 in poorly differentiated endometrioid carcinoma of the endometrium, x100

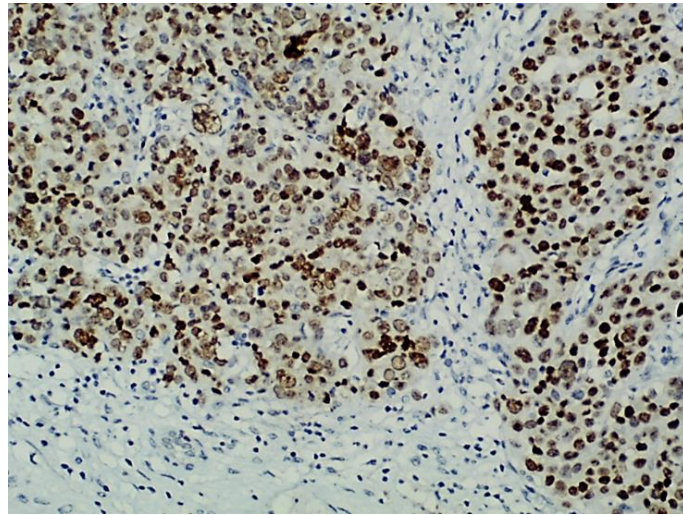
Outcomes in ovarian carcinomas

When comparing the expression of p53 with the proliferative index reported with Ki67 we found an association between the two markers. It is most strongly expressed in the negative expression of p53. 88% of Ki-67 negative cases were p53 negative. P53 negative cases were associated with weak or negative expression for Ki67.

The expression of Ki-67

Data from our study show a direct correlation between p53 and Ki-67 expression in serous ovarian carcinomas, i.e. in the presence of IXX reported mutant p53 molecules, a higher proliferative index of the corresponding tumor was also observed.

The majority of immunohistochemically examined ovarian carcinomas were of a high degree of malignancy. In the p53 positive cases with the highest frequency, we observed tumors with 50 - 100% p53 positive tumor cells.



Picture 3. High-grade serous carcinoma. IHC study: p53: nuclear expression in 50-100% of tumor cells, x100.

Although we did not find a statistical relationship between EMT status and proliferative index in each of the studied groups of working material, we also performed a comparative analysis of the same tumor areas in cases with EMT positive status with a heterogeneous pattern and Ki-67 expression in 50-100% from the tumor cells also with a heterogeneous pattern.

Discussion

Since EMP represents a transition from epithelial to mesenchymal morphology of tumor cells, reduced immunohistochemical expression (negative, weak and moderate expression) of epithelial markers such as E-cadherin is counted as a positive EMP status of the studied tumor (8). The decrease in E-cadherin expression can only occur in groups of cells that represent specific branches in the tumor with different adhesive properties. In order to refine the results for EMP positive status, in our study the E-cadherin positive cases with the presence of regions with negative expression, i.e. with a heterogeneous staining pattern, were assigned to the group of tumors with EMP positive status.

Some authors do not find a correlation of nuclear expression of the p53-marker with clinicopathological factors, incl. age, histological subtype, grading and staging (9). Other authors have reported that p53 overexpression is more common in serous ovarian carcinomas than in mucinous carcinomas and correlates with the malignant potential of serous tumors. In most studies, there was a positive association between p53-expression and higher grade (lower differentiation) of ovarian serous carcinomas (6).

The role of mutant p53 molecules in the initiation of EMP in the progression of carcinomas is unclear. Loss of p53-protein function suppresses epithelial markers such as E-cadherin and activates mesenchymal markers such as Vimentin and N-cadherin (10). As a result, epithelial-mesenchymal transition is induced in borderline serous ovarian tumors (1). Suppression of mutant p53 molecules in cancer cells leads to reversal of epithelial-mesenchymal transition into mesenchymal-epithelial transition and inhibition of cell invasive ability (11).

Ki67-positive tumor cells often correlate with the clinical course (6). The Ki-67 index is higher in advanced stage tumors and a higher Ki-67 index indicates

a more aggressive tumor behavior and a worse clinical course.

A significant difference in Ki67 immunohistochemistry was found between ovarian carcinomas and benign tumors, and between borderline tumors and carcinomas, but not between benign and borderline tumors (12). The frequency of Ki-67-positive carcinomas increases with increasing grade of malignancy (13). These results indicate that a morphologically problematic serous carcinoma with a significantly elevated Ki-67-index is unlikely to be of low grade. Other authors found no correlation between the degree of differentiation and the Ki-67-index (12).

The p53 gene is an EMF inhibitor. When mutations occur in the p53 gene, the mutant molecules can be visualized immunohistochemically. They suppress epithelial markers such as E-cadherin and induce a positive EMP status in the corresponding tumors (11).

We analyzed our results regarding the difference in p53 expression in relation to the degree of differentiation of endometrial carcinomas. We found that such a difference existed and it was significant ($p=0.038$). The lower the differentiation of the carcinoma, the stronger the expression of p53 in it. Our results agree with those of other authors (14).

Unlike other authors, however, we did not find a statistically significant difference in p53 expression in the group of carcinomas according to the depth of invasion and FIGO stage ($p=0.442$). There was no such difference between the expression of p53 in the tumor parenchyma and in the invasive front of the carcinoma ($p=0.787$). The marker Ki67 is used to assess cell proliferation and is increasingly used in the preoperative phase in patients with endometrial carcinoma as a prognostic marker (15).

In our study, Ki67 expression was nuclear in all cases with positive expression. In endometrial carcinomas, we scored Ki67 expression according to the degree of differentiation. We found that in highly differentiated carcinomas (G1), 2(40%) had negative expression, 2(40%) had expression in 1-10% of tumor cells and only 1(20%) case had expression in 50 -100% of tumor cells. In moderately differentiated carcinomas (G2), those with negative expression were 4(26.7%), those with expression in 1-10% of tumor cells were

6(40%) cases, and those with expression in 10-50% of tumor cells, were 5 (33.3%). We had no cases of highly or moderately differentiated carcinomas with expression in 50-100% of tumor cells.

In poorly differentiated carcinomas, the number of Ki67-negative cases was only 1 (8.3%). Those with expression in 1-10% of tumor cells were 3(25%), 7(58.3%) had expression in 10-50% and one (8.3%) case had Ki67 expression in 50-100% of tumor cells. Our results are similar to those of other authors (5).

In the group of endometrial carcinomas, we found a statistically significant difference in Ki67 expression relative to the degree of carcinoma differentiation ($p=0.046$). The expression of the marker becomes stronger as the degree of differentiation of the carcinoma decreases. These data correspond to the observations of other authors (5).

Regarding the expression pattern of Ki67 in the group of endometrial carcinomas, 7(21.2%) of the cases had a negative expression, those in a focal expression pattern were 13(39.4%), with heterogeneous - 11 (33.3%), and with diffuse - 2 (6.1%) cases. These results are similar to other studies (6), where the focal pattern predominates in the more highly differentiated carcinomas, and the heterogeneous and diffuse pattern predominates in higher grade.

Conclusion

On the difference in p53 expression in relation to the degree of differentiation of endometrial carcinomas. We found that such a difference existed and it was significant ($p=0.038$). The lower the differentiation of the carcinoma, the stronger the expression of p53 in it.

In the group of endometrial carcinomas, we found a statistically significant difference in Ki67 expression relative to the degree of carcinoma differentiation ($p=0.046$). The expression of the marker becomes stronger as the degree of differentiation of the carcinoma decreases.

There is a strong correlation between p53 expression and proliferative index (Ki67) in endometrial carcinoma cases, with more aggressive forms of carcinomas with a higher FIGO stage having stronger expression of these markers.

The expression of p53 and Ki67 depended on the degree of differentiation of endometrial carcinomas, with less differentiated carcinomas showing stronger expression of p53 and Ki67 in tumor cells.

In p53-positive high-grade serous ovarian carcinomas, a higher proliferative index is reported, which is a sign of more aggressive tumor growth.

Acknowledgments

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PHILOLOGICAL SCIENCES

A.NAVOI'S GHAZALS TRANSLATION AND ANALYSE

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Abstract

The article is devoted to the French translation of A. Navoi's gazelle, which begins "Meni men istagan uz suhbatiga arjumand etmas" and "Jonga chun derman not erdi ulmakim kayfiyati" by Hamid Ismoilov and Jean-Pierre Balpa. The author studied the work of translators in this area and conducted a deep analysis of the translation of a ghazal, that is, an Eastern work translated into Western European languages.

Keywords: Navoi, gazelle, translation, tadpole, dictionary, literary criticism, western, eastern, languages.

Introduction

The value of the work of art to be translated is determined by its content, ideological qualities, educational and educational significance, artistic aesthetic features. Scientific research in the fields of foreign literature, comparative literature, theory and practice of translation has become one of the current topics. After all, it is impossible to enjoy the ocean of world literature without translation, which is a tool of communication and influence, and in turn, it is impossible to fill it with the achievements of our national literature. The translation of the literature of peoples belonging to other nations and languages has always caused various problems and complications for the translator. The translation of historicity and nationality in the original should not cause difficulties for the reader, and the original should not contradict the reader's belief. If we look at the history of Uzbek artistic translations, we can see that the translation of the works that reflect the issues of nationality, historicity, and color in one or another degree has been followed in different ways, and no strict standards have been developed in this regard until now. In particular, it is noticeable that nationalism and historicity are not clearly reflected in works translated into Uzbek from foreign literature, especially from French literature, at the end of the 19th century and the beginning of the 20th century. One of them is insufficient knowledge of the history, culture, religion, life-style and traditions of Western nations. But in today's translations, it can be felt that the content of the work is adapted to the original as much as possible. Such defects can also be found in translations of samples of Uzbek literature into foreign languages. In the works of Uzbek writers translated into European languages, not only nationalism and historicity are violated in many cases, but also there are cases of introducing images and metaphors into the work that do not understand the main idea of the original, but are interesting to the Western reader. Contemporary translation studies support the point of view that it is necessary to create a translation according to the original in any case. Based on the best practices of the world translation practice, reaching a consensus in this regard is a requirement of today.

Methods and materials

The translation of Navoi's ghazals into French definitely shows the French reader that our nation has a very rich literary heritage. Translated into French by Hamid Ismailov and Jean-Pierre Balp, published by ORPHEE/LA DIFFERENCE..(ALISHER NAVOI. GAZELS ET AUTRES POEMES)¹ Алишер Навоий "Ғазал ва бошқа поэмалари" нашридан ўрин олган "Мени мен истаган ўз суҳбатига аржуманд этмас", матлаъли ғазалини француз тилига таржимаси таҳлилини кўриб чиқамиз. Таржима қилинган бошқа барча ғазаллар каби бу ғазал ҳам тадбил қилиниб, француз тилига эркин таржима усулида ўгирилган. We will analyze the translation into French of Alisher Navoi's "Ghazal and Other Poems" edition of the ghazal "Мени мен истаган ўз суҳбатига аржуманд этмас", "You don't want me to talk to you". Like all other translated ghazals, this ghazal was adapted and translated into French in a free translation method.

46-бет *Бадойиъ ул-бидоя 1 том 266 ғазал*

Мени мен истаган ўз суҳбатига аржуманд
этмас,

Мени истар кишини суҳбатин кўнглим писанд
этмас.

Не баҳра топқамен ондинки, мендин истагай
баҳра,

Чу улким, баҳрае ондин тиларман баҳраманд
этмас.

Нетай хуру пари базминки, қатлим ё ҳаётимға
Аён ул захрчашм айлаб, ниҳон бу нўшханд
этмас.²

L'homme dont je rêve ne mérite pas mes paroles
et la parole

de celui qui me cherche, mon cœur ne peut pas ne
pas ignorer.

Quel profit tirerais-je de lui qui ne trouve profit de
moi ?

Quel est ce profit que j'attends de lui et qu'il ne
peut me donner ?

Que dois-je faire au festin des houris et des périss
si pour ma mort et ma vie ,

les premières ne laissent pas couler le poison de
leurs

¹ ORPHEE/ LA DIFFERENCE (ALISHER NAVOI. GAZELS ET AUTRES POEMES)

² Alisher Navoiy. Mukammal asarlar to'plami. 20 jildli. 7-jild. -T.: Fan, 1991.

yeux, les secondees ne se cachent pas pour sourire?

La forme de la lune et du soleil ne me sert de rien si, de leurs beautés,

Elles ne déchirent pas mon âme en multiples morceaux,

ne recousent pas mon corps à force de piques.

J'ai besoin du cri de ces assassines à cheval

qui ne galopent que dans mon cœur en ruines.

Cœur de clochard céleste ne consomme pas le mensonge,

pour ta fin le ciel ne mettra à ton cou d'autre corde que celle de la mort.

Si, pour ne pas lancer de sort, cette femme au visage de

lune cache le feu de sa face,

ne donne pas, Navoi, à ce feu de simples d'autre aliment que celui de l'amour.

arjumand - dear, precious, honorable, worthy;

Zahrchashm - eye, eye contact;

Researches and results

Noshkhand - beautiful smile, sweet laugh; chobushi - godman, palace official; kotilvash-killer-like, like a murderer; majnunshior-following the path of madness; samandar-tulpor, a beautiful horse; tip of sarishta-kalava; basis of work; belt-loop, belt, chain, band; words like sipand-isiriq were used.³

The word "arjumand" in the ghazal matlaa is not used in the modern Uzbek language, but the Uzbek reader understands this archaism in the sense of "must". L'homme dont je rêve ne mérite pas mes paroles et la parole

de celui qui me cherche, mon cœur ne peut pas ne pas ignorer.

In the dictionary, this word means dear, precious, honorable, worthy. The fact that the translator chose the most correct option and gave the French word "merit" made it very easy for the French reader to understand the meaning of the ghazal. The lexeme of zahrchashm in the sixth verse of the third stanza of the ghazal is also an archaism, and we can see that the translator (le poison de leurs yeux) is given by two words, just like in the Uzbek language. Que dois-je faire au festin des houris et des périls si pour ma mort et ma vie ,

les premières ne laissent pas couler le poison de leurs

yeux, les secondees ne se cachent pas pour sourire?

the lexeme noshkhand in this verse is also an old word, and the translator expressed it through the word (pour sourire) because it means to burst out laughing, to laugh openly. In the translation of the next verses of the ghazal, tadbil translation was used in the same way.

In-depth study of the history of translation is not only important for studying the general process of cultural development or the history of specific national literature, but also for determining the current development process, features, scope of literary relations of that literature, and determining the perspective of development. It is known that the recognition of values specific to the spirituality of a

nation by other nations is, of course, an expression of deep respect for the history of that nation. Such recognition serves to increase the pride and pride of the people, national identity. The possibilities of translation of literary works of any language are realized on the basis of literary traditions and rich experience gained in the field of translation for several decades.

The goal of each new translation and new work of art is to accept the best artistic monuments of other nations in their native language, to introduce them to the people, to creatively assimilate the best qualities of the culture of the brotherly nations, to translate the noteworthy works created in their literature into the language of other nations, and to present them to them. is a tool. The value of an artistic work being translated into the languages of other nations cannot be determined by the price or unit accepted in each country. The value of a work of art is determined by its content, that is, its ideological qualities, educational-educational significance, artistic-aesthetic properties.

The customs, cultures, and dreams of foreign countries often seem strange to us. Navoi's ghazal "Jong'a chun derman" is being analyzed

Jong'a chun derman: ne erdi olmakim kayfiyati?

They say that the reason is the intensity of the internal disease.

The lyrical hero of the ghazal is a lover. He came to the brink of death from the fire of love. That's why he asks his soul directly in the matla (beginning of the ghazal): "What is the reason for his death?" And John answers him: "It was caused by the severity of the disease in the body."

J'interroge mon âme: «Quelle est la source de ma mort?»

Elle répond: «De la puissance du mal dans ton corps.

Жисмдин сўрсамки, бу заъфингга не эрди сабаб?

Дер: анга бўлди сабаб ўтлуқ бағирнинг хиркати

In the second stanza, the lyrical hero turns to the body and asks: "What caused you to get into this situation?" And the body's answer is as follows: "It was caused by the squealing of the grass." J'interroge mon corps: «Quelle est la cause de ton mal?»

Il répond: «L'ardeur de ta flamme intérieure.»

Чун бағирдин сўрдим, айтур: андин ўт тушди манга

Ким, кўнгулга шуъла солди ишқ барки офати.

In the third stanza, the question is asked to Baghir, and he answers: "My heart is burning, because the disaster of thirst for love has struck my heart." J'interroge ma flamme intérieure: elle répond que ce feu qui s'étend

n'est que reflet des brasiers de l'Amour en mon cœur.

Кўнглима қилма ғазаб, айтурки, кўздиндур гунаҳ,

Кўрмайин ул тушмади бизга бу ишнинг тўхмати.

³ Navoiy asarlari tilining izohli lug'ati. II jild.. –T.: Fan, 1983.

In the fourth stanza, logically, the lyrical hero "makes the heart angry", so he blames the sin on the eyes: "If the eyes had not seen, we would not have suffered the slander of this deed." Je m'emporte contre mon cœur, il dit: « Tes yeux provoquent le péché,

s'ils ne regardaient pas celui-ci ne pourrait te maudire.»

Кўзга чун дерманки, эй тардомани юзи каро,
Сендин ўлмиш телба кўнглимнинг балою ваҳшати.

In the fifth stanza, the lover now "takes" the eye: "O black face with a wet skirt, the trouble and terror of my heart is from you." Je dit à mes yeux: «Mécréants à la face noire douleur

et sauvagerie de mon cœur fou viennent de vous.

»
Йиғлаб айтур кўзки, йўқ эрди манга ҳам ихтиёр,

Ким, кўринди ногоҳон ул шўхи маҳваш талъати.

In the sixth stanza, the eye's crying answer is given: "I had no choice either, what should I do if suddenly the ul-shokhi mahvash (moon) talat was seen?" Pleurant, ils repondent: « Lorsque le feu solaire de ce visage à beauté de lune

s'impose à nous nous n'avons plus de volonté.»

Эй Навоий, барча ўз узрин деди, ўлгунча куй

Ким, санга ишқ ўти- ўқ эрмиш азалнинг кисмати.

Coming to the eulogy (the last stanza of the ghazal), the lyrical hero turns to the poet and says: "O Navoi, everyone has apologized, sing until you die, because love is your eternal destiny.

"Ecoute Navoi, tous se trouvent des excuses, enflamme –toi à mort :

le feu de l'Amour est pour toi seul la dernière des fleches de l'éternité.

Tardoman - corrupt, shameless; Weakness - weakness; illness; tal'at- image; mahvash-like a moon⁴

Conclusion

It is necessary to find the equivalent of modern Uzbek words and translate them correctly, because if such lexicons are not given modern meanings, the meaning of the entire ghazal may change. Therefore, when translating historical works, the translator should make a special dictionary of obsolete words in the work and give their meanings today, if this is not possible, he should explain them through annotations. It will be important to the world literature as a masterpiece from Uzbek literature. Having taken from the sample of this article, not only East literature fonder, but also West fonder can be motivated from this literature. It will be first analyses from Old Uzbek hand scripts translated without any linking words.

We should analyze such kind of materials much more than as usual. In conclusion, we can say East Middle literature can illustrate the healthy life style, culture and science can be easily understandable to the European readers and can be integration to in the world literature.

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⁴ Navoiy asarlari tilining izohli lug'ati. III jild. -T.: Fan, 1984.

THE MANIFESTATION OF VERBAL AND NON-VERBAL SYMBOLIC MEANS IN THE SYSTEM OF CULTURAL CONSTANTS "SUPERIOR - INFERIOR"

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Abstract

The article deals with symbolic signs, which, being instruments of social regulation, use the language according to the social position of the communicant. These symbols of power and subordination in society contribute to the consolidation of the dichotomy "superior" - "lower" in the performance of the function of regulating social relations and the function of social orientation.

Keywords: hierarchical relations, socially oriented function, speech behavior, superior, inferior, social status, verbal symbolic signs, non-verbal symbolic signs.

Service relations are characterized by a pronounced hierarchy. The expression in speech behavior of the hierarchy of service relations depends primarily on the type of communication, on the degree of officiality. The more formal the relationship, the more signs of subordination in speech. Team members - employees of the same department - are usually "their own". Here, in non-strictly official and semi-official situations of official communication, the boss and subordinates can behave calmly, at ease, especially if they are of the same age and are on good terms. . When communicating with employees of other departments whom employees do not know very well, the interlocutors already control their behavior, even if they are equal in status. And of course, strict control of verbal behavior is present in an official conversation with a communicant whose position on the career ladder is much higher than the official status of the interlocutor. An attempt to determine the essence of the phenomenon of "social status" was made by Folomeeva T.V. and Fedotova S.V. During the experiment, they were divided into several groups. Within the framework of the first, social status is considered as a person's position in society. Similar data were obtained within the framework of the collected social representations, the core of which contained precisely these two concepts - "position" and "society". The second group of definitions reveals social status as a phenomenon that is constructed and chosen by the person himself, the individual can correct it. As part of the third group, it was indicated that social status is a characteristic that is assessed by members of society and affects how an individual is perceived, how they are treated, as well as the choice of a strategy of behavior in interaction with him [1, 7].

In any social action of people, T. Shibutani emphasizes, "the roles are in a mandatory relationship with each other, as in a drama, any role makes sense only when it is associated with the behavior of other actors" [2].

According to Z.A. Badretdinov power appears not as an imposition of one's plans, but as a process of possessing the very fact of this coercion, as a phenomenon that is significant for us [3]. By virtue of this understanding, it is necessary to approach power not through

the motive "why" we impose the will, but based on the principle "because" [4].

In particular, a successful attempt to analyze the relationship between superiors and inferiors was made by I.I. Dubinin in the dissertation on the topic "Methods of Expressing Hierarchical Relations in Organizational Communication". Focusing on the opposition "boss - subordinate" and putting forward the mutual influence of the parties on the success of hierarchical communication as one of the important factors, the researcher comes to the conclusion that at the verbal level it is realized in the features of the types of speech acts, referring to various speech genres, in a mismatch in "methods of influence and characteristics of the mode of expression" [5, 3], in operating with etiquette norms, in the pragmatic specifics of the language units used. According to I.I. Dubinina, building hierarchical relations with subordinates by the boss is based on the strategy of "official self-positioning and official distancing" [5, 3]. Maintaining them at the proper level is ensured by the strategy of "veiling", which implies the preference for indirect means of communication in order to "save face" of the boss (the author includes in the list of means of communication "euphemisms, indirect speech acts, hypothetical, impersonal and passive constructions, evasive answers, indefinite personal pronouns" [5, 13]). The use by the boss of other strategies - "discredit and job expansion" [5, 3] - on the contrary, causes damage to hierarchical relations. Behavioral characteristics of participants in hierarchical official business communication are also considered by the author in non-verbal terms. At the same time, the linguist sees the essential "temporal and spatial conditions of the communicative process, artifacts used by the subjects of the organization, kinetic, prosodic and proxemic components that perform the function of establishing, maintaining or breaking hierarchical relations" [5, 4].

Savenkova L.B., Galiy A.S. made an attempt to identify the type of boss in the current linguistic culture, namely in social networks. In their opinion, the boss is an individual who enters into direct official business contact with the author of the speech. Based on the re-

sults of the study, the authors make the following conclusion that there are two images or two sides of the linguo-communicative type "boss". First: "The chief as an ideal (model personality) is characterized by the ability not only to organize the work of subordinates and to fulfill the task that is set for the labor association. This is an objective person, combining a position and informal leadership, sociable, responsive to the needs of subordinates, capable of cooperation."

The second image: "The boss as a reality rarely meets the ideal. More often, this is a person who seeks to acquire a relatively high social status (the boss appears as an individual who is subordinate to a completely observable circle of subordinates) and the benefits associated with it. The chief, for the most part, is not endowed with high intelligence, does not know how to objectively assess the situation and organize the labor process, exploits his subordinates, is distinguished by aggressiveness, and is capable of psychological violence. In addition to this, he is quite ambitious and approaches his person, overestimating self-esteem" [6, 95].

Of course, the relationship between the leader and subordinates, starting from the moment they are hired, relationships in the process of work and dismissal, is one of the important points in the field of business communication. In this regard, we are interested in the problem of the functions of speech behavior implemented in the conditions of official communication, limited by the social role and status of communicants.

The material of the study was examples from the literary works of Gorbatoev B., Sanbaev S., Arkhipenko V., Ustinova T. and others. The research methods were discourse analysis of the text, as well as methods of semantic, syntactic, contextual analysis.

By regulating and controlling the activities of subordinates, managers enter into interaction with them, which in form and content differs both from ordinary interpersonal communication and from that which is typical for communication of professionals of the same status. The interaction of the subjects of the organization at the level of hierarchical positions and activity roles, to which this or that conventional communicative behavior is assigned, can be called hierarchical. Within the framework of this interaction, the subject of the organization acts, first of all, as a hierarchical person whose behavior depends on his position on the career ladder.

Description of the spatial characteristics of the premises, symbolic things that demonstrate the social status of the communicant, actualize one of the most important functions of speech behavior. The socially-oriented function on the part of the superior is manifested in the fact that it actualizes a special non-verbal behavior that demonstrates his social status, his actions are authoritarian and testify to his high position. Even an office, furniture - all this is designed to show its significance.

"But, having become the district Komsomol leader, he ceased to be our Alyosha. Is it really that simple, thin, restless boy from the factory street, whom I loved so much in childhood? Where did these important, rounded gestures come from? This imperious,

sharp, demanding tone, and this look, empty cold, not noticing anyone, a look that passes through a person, coloring and not lighting up? I was overwhelmed by his noisiness. Everywhere - in the theater, on the street, in the club - he walked, pushing people aside and talking loudly. He couldn't speak quietly. He did not know how to listen - he was used to being listened to. He did not know how to agree - he was used to agreeing with him, obeying him. And everything he said, explained, told, did - he did noisily, sweepingly, in a businesslike way" [7, 6].

Social distance is also preserved when expressing verbal behavior that emphasizes the position of the subordinate in relation to the superior, which is manifested by a dismissive attitude towards a person with a low status. The upbringing learned in the "superior" group allows the representative of the group to feel at the height of his position in any case, emphasizing his high status in front of his subordinates: *"Welcomingly and majestically smiling, she said that she was glad and happy to see guests at her place, and apologized that she and her husband were deprived this time of the opportunity to invite the gentlemen of the officers to spend the night with them. From her beautiful majestic smile, which instantly disappeared from her face every time she turned away from the guests for something, it was clear that in her lifetime she had seen many mister officers, that she was not up to them now, and if she invited them to her house and apologizes, it is only because her upbringing and position in the world require it" [8].*

Such awareness of one's group belonging to one of the groups "superior" - "lower" is manifested in the following social distance and regulation of social relations between the privileged classes and those groups that occupy lower positions in the system of social inequality: *"he [Franklin - T.K.] understood that no reconciliation with the lords of the English king is possible, either now or in the future. For seventeen whole years he was a guest in the homes of these important gentlemen, they kindly conversed with him, paying tribute to his learning, his inquisitiveness, his philosophy: and now they, grinning, listened to how this horloder attorney abused him, how he showered him with street scolding. Now they have shown themselves. Now it became clear how happy they were to humiliate him. They humiliated him because he was no match for them. Because he is not a noble. And a simple tradesman, the son of a soap maker, who dared to open his mouth in defense of little people [9, 81].*

The position of social orientation is also visible in relation to junior military ranks in relation to the highest: *"Malykhin was the first to slide down the ladder, followed by Kraukhov just as quickly. Printing a step, they approached the officer, clicked their heels in unison, and froze with protruding chins" [10, 43].*

The subordinate understands his place and his position on the bottom rung of the social ladder: *"Perhaps you will seat him next to you, venerable khan! he remarked with ill-concealed anger. Askar shook his head: - Khan's dastarkhan is not for me. If you'll excuse me, khan, we'll go where it's easier" [11, 147].*

The attitude towards the subordinates from the superiors may be dismissive, for example: "*The secretary tried to figure out the reason, but Yevgeny Petrovich looked at her the way the dean of the faculty of international relations once looked at him. The secretary immediately shut up and went away*" [12, 222].

Thus, the analysis of the actualization of signs of social symbolization in a non-verbal form shows that they perform regulative and socially oriented functions, helping to maintain social distance in a situation of status inequality.

Hierarchical communication is the interaction of the subjects of the organization at the level of hierarchical positions and activity roles, which are assigned to one or another conventional communicative behavior. The verbal markers of hierarchical communication are intentional and non-intentional, direct and indirect forms of speech influence - categorical and non-categorical directives: orders, instructions, prohibitions from superiors and requests, wishes, advice and recommendations from lower subjects of communication.

At the same time, in the "higher-lower" status dichotomy, the range of verbal means used by the boss is much wider than those used by subordinates, since social norms allow greater freedom of communicative behavior of the subject occupying a higher position on the career ladder [13, 26].

Signs of social symbolization in a non-verbal form perform regulative and socially-oriented functions, helping to maintain social distance in a situation of status inequality.

An analysis of the functions implemented in a situation of symbolic interactionism shows that, in addition to the instrumental and regulatory functions, within the "we-them" groups, a socially oriented function is observed, when the lower ones orient themselves in relation to the higher ones, and the higher ones tend to keep a distance in relation to those standing on the lower level. rungs of the social ladder.

Thus, verbal and non-verbal symbolic signs - tools of social regulation, used in the realized meaning, perform the function of regulating social relations and the function of social orientation, when communicants use the language in accordance with their position in society.

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PHYSICS AND MATHEMATICS

РАСЧЕТ СОЕДИНЕНИЯ С НАТЯГОМ НА УДАРНУЮ НАГРУЗКУ

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CONNECTION CALCULATION WITH INTERFERENCE FOR IMPACT LOAD

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Аннотация

Определяется значение ударной нагрузки и значения максимального и минимального контактного давления в соединении с натягом. В машиностроении соединения с натягом широко применяются при больших, и особенно динамических нагрузках [1,2,3]. При изготовлении зубчатых колес расстояния между зубьями практически всегда отличаются друг от друга, что вызывают дополнительные динамические удары в зацеплении вибрации и способствует повышению уровня шума при работе [4].

Abstract

The value of the shock load and the values of the maximum and minimum contact pressure in the connection with interference are determined. In mechanical engineering, interference connections are widely used for large, and especially dynamic loads [1,2,3]. In the manufacture of gears, the distances between the teeth almost always differ from each other, which causes additional dynamic impacts in the engagement of vibration and contributes to an increase in the noise level during operation [4].

Ключевые слова: Зубчатые колеса, ударная сила, максимальное и минимальное контактное давление.

Keywords: Gear wheels, impact force, maximum and minimum contact pressure.

Подстановка задачи: Часто в зубчатых передачах колеса сажают на вал с натягом (рис.1). По этому при передаче вращающего момента с зубчатой передачей с прямыми зубьями между зубьев появляется удары. Эти удары отрицательно действуют к прочности колеса с валом с натягом.

Решение задачи: В настоящей статье рассматривается задача определение контактного давления между валом и соединенным с ним зубчатым колесом с прямыми зубьями при действии ударной силы.

Определим значение действующей силу на зубьев зубчатого колеса при удара. С целью этого напишем выражения кинетического момента для ведомого колеса относительно осью вала за время удара. С целью этого напишем изменение момента количества движения ведомого колеса относительно центрального оси вращения за время удара:

$$J_{z_2} \omega_2 - J_{z_2} \omega_{02} = S \cdot h, \quad (1)$$

где S - ударный импульс действующей на ведомого колеса; J_{z_2} момент инерция ведомого колеса; ω_{02} и ω_2 - угловые скорости ведомого колеса в начале и в конце удара соответственно; $h = R_0 \sin \gamma$ - длина перпендикуляра опущенного от центра вращения ведомого колеса до линии действия ударной силы.

После удара кинетическая энергия ведомого колеса изменяется. Тогда выражение теоремы о кинетической энергии системы для ведомого колеса после удара будет:

$$\frac{J_{z_2} \omega_2^2}{2} - \frac{J_{z_2} \omega_{02}^2}{2} = A, \quad (2)$$

где A - совершаемая работа ударной силы,

$$A = \frac{S \cdot h}{\tau};$$

τ - время удара.

Умножая каждую стороны (1) ω_1 и ω_2 в отделимости, получим:

$$\left. \begin{aligned} J_{z_2} \omega_{02} \omega_2 - J_{z_2} \omega_{02}^2 &= S \cdot h \cdot \omega_{02} \\ J_{z_2} \omega_2^2 - J_{z_2} \omega_{02} \omega_2 &= S \cdot h \cdot \omega_2 \end{aligned} \right\}.$$

Отсюда определяем, что

$$S = \frac{J_{z_2}}{h} (\omega_2 - \omega_{02}). \quad (3)$$

Если принять, что удар совершается в τ времени тогда значение ударной силы будет:

$$F = \frac{J_{z_2}}{h \cdot \tau} (\omega_2 - \omega_{02}). \quad (4)$$

Значение ω_1 определяется по формуле (10) ра-
боты [4]:

$$\omega_1 = \frac{\frac{R_0 r_0}{\left[R_0 \cos \alpha + (R_0 + r_0) \operatorname{tg} \alpha \cdot \sin \left(\alpha - \frac{\pi}{z_1} \right) \right]^2} - \frac{J_{z_1}}{J_{z_2}}}{\frac{r_0^2 \cos \alpha \cdot \operatorname{tg} \left(\alpha - \frac{\pi}{z_1} \right)}{R R_0 \sin(\alpha - \psi)} - \frac{J_{z_1}}{J_{z_2}}} \cdot \omega_{01},$$

где R_0 и r_0 - начальные радиусы ведомого и ведущего колеса; R - наружный радиус ведомого колеса; Z_1 - количества зубьев ведущего колеса; ω_{01} и ω_1 - угловые скорости ведущего колеса до и после удара.

Определим значение ω_2 в зависимости ω_1 .
По рис.1 определяем, что

$$\omega_2 \cdot R_0 = \omega_1 \cdot r_0.$$

Отсюда определяем, что

$$\omega_2 = \frac{r_0}{R_0} \cdot \omega_1, \quad (6)$$

$$\omega_{02} = \frac{r_0}{R_0} \cdot \omega_{01}.$$

Тогда учитывая (6) в (4) получим:

$$F = \frac{J_{z_2} r_0}{h R_0 \tau} (\omega_1 - \omega_{01}). \quad (7)$$

Как видно из формулы (7) с уменьшением время удара, ударная сила увеличивается. Это отрицательно действует к прочности зубьев колес.

С целью определения значения максимального и минимального контактного давления на контактных поверхностях выбираем координатную систему с началом O_2 (рис.1), Ось y проводим через точку контактной линии, в которой контактное давление максимальное значение.

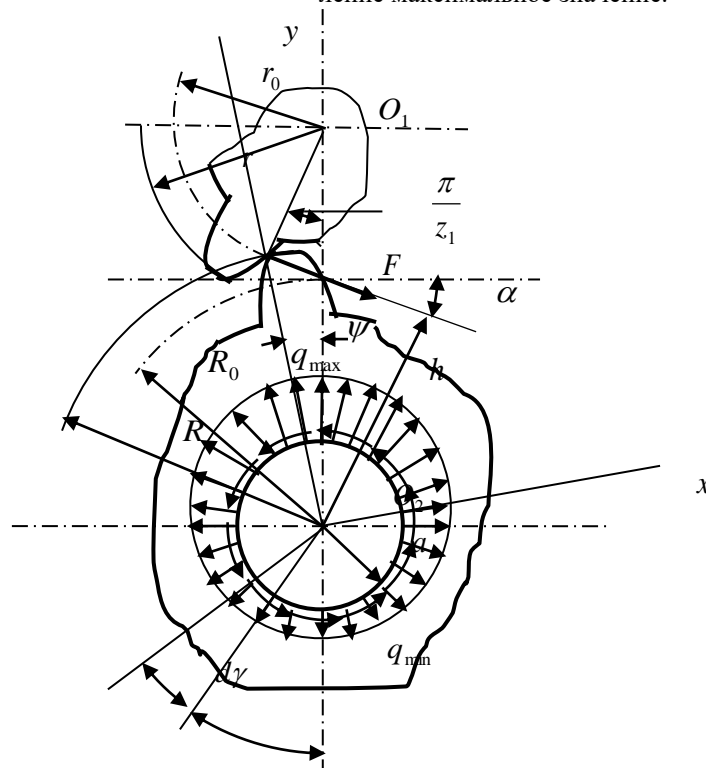


Рис.1. Зацепление цилиндрических зубчатых колес с прямыми зубьями

В соответствии работы [4] предполагаем, что контактное давление от минимального значения до максимального изменяется по синусоидальному закону в зависимости от угла γ . Этот угол численно равен углу между двумя радиусами, соединяющими центр колеса соответственно с рассматриваемой точкой соединения и точкой, в которой контактное давление имеет максимальное значение. Таким образом

$$q = q_{\min} + k \sin \frac{\gamma}{2}, \quad (8)$$

где q - контактное давление в рассматриваемой точке; q_{\min} - минимальное контактное давление; $k \sin \frac{\gamma}{2}$ - переменная составляющая контактного давления. Напишем условия равновесия действующих сил, учитывая ударной силы F .

$$\left. \begin{aligned} f \int_0^{2\pi} \cos \gamma \cdot dN + F \cos(\alpha + \psi) &= 0 \\ - \int_0^{2\pi} \cos \gamma \cdot dN - F \sin(\alpha + \psi) &= 0 \\ a \cdot f \cdot N - F \cdot h &= 0 \end{aligned} \right\}, \quad (9)$$

где f - коэффициент трения; $dN = q \alpha d\gamma$ - элементарная нормальная сила; β - угол между

осью y и направлением ударной силы; a - радиус контактной поверхности; α - угол зацепления.

В качестве примера рассчитываем значение ударной силы и значения максимального и минимального контактного давления при этих данных:

$$P = 20 \text{ Н}; a = 20 \text{ мм}; l = 50 \text{ мм}; r_0 = 30 \text{ мм}; R_0$$

$$= 60 \text{ мм}; J_{Z_2} = \frac{m R_0^2}{2}; h = R_0 \cos \alpha; \alpha = 20^\circ;$$

$$f = 0.1; n_{01} = 900 \text{ об/мин}; Z_1 = 18; Z_2 = 36;$$

$$\tau = 0,07 \text{ сек. После вычисления получили } F =$$

$$1714 \text{ кН}; q_{\max} = 805,58 \text{ кН/см}^2; q_{\min} = 692,7$$

$$\text{кН/см}^2, \text{ что являются существенные величины, их}$$

надо учесть в расчетах соединений с натягом, когда соединению действует ударная сила.

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PSYCHOLOGICAL SCIENCES

JEALOUSY AS PSYCHOEMOTIONAL TRAUMA

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Abstract

The present study has focused on the dimension of jealousy existing in different age groups. The results indicate that participants of younger age have a statistically significant lower level of jealousy compared to the other two age groups: 25–29 and 30–35. An explanation would be that the group of participants from the group category 18–24 years ($N = 60$) are less involved in and assumed towards romantic relationships, more important for them being socialization and the group of friends, especially during the period of after Covid 19, when these aspects were considerably absent from their lives.

Keywords: psychoemotional trauma, jealousy, couple partner, neuroscience.

Introduction

Psychoemotional trauma represents the effect left by emotional disorders which manifest mostly due to unmet emotional needs and can be displayed throughout adulthood.

Generally speaking, trauma has been called “the hidden epidemic” since various aspects of individual’s personality development (such as social encounters, friendships, romantic relationships, socializing needs) can be affected by it. Life experience inside dysfunctional families might lead to psychoemotional trauma which in its turn can become trans-generational determining as such the decision one takes in relationship while choosing their partner.

When jealousy, as a negative emotion, emerges in a relationship it should be seen as a dysfunctional attitude bearing the shape of an attachment trauma. We tend to choose our partner according to our own needs, be they conscious or unconscious, and our mental programs that have been deeply implanted in our subconscious by early childhood connections to our parents. As a result one may find out that he got married to figure similar to his mother or she got married to figure resembling her father. It is an aspect that one becomes aware long after they get married.

The choice of a partner should come from that ground of fulfillment, but unfortunately there is no educational culture and no psychoeducation to teach us that. Thus we end up choosing relationships that can meet our unfulfilled needs of a specific developmental stage.

At 16 of age, there is the need to spend more time with our partner, given the fact that teenagers at this stage still live with their parents. This tends to be the main language of love.

At 20 of age we are drawn towards a career path and we enroll in a college and at the same time we want for our partner to join us if at all possible.

At 30 we start talking about different principles and values and it becomes pretty clear that at some time in life we have specific needs that start changing as the time passes by and we grow older.

For a woman, in search of a partner in a relationship, she will look for the man of her dreams who is always there to provide for her needs: the need for se-

curity, for tenderness, the need to be supported and contained – the natural needs. According to Roberto Assagioli, renown psychiatrist and the father of psychosynthesis, we, as human beings, have a multitude of subpersonalities. He elaborated a validly sustained theory according to which subpersonalities make up the general portrait of our personality.

One such subpersonality encompasses an entire set of needs, beliefs and ways of behaving helping us to interact with another person. For instance, I hold the role of mother when I am with my child, while I hold the position of a manager when I am at my working place.

Therefore it appears to be very important to consider from which subpersonality I decide to choose my wife or my husband, since each of these subpersonalities has its own core of specific needs. For instance, if I am more in the role of a little girl, I will choose a partner to fulfill the role of a father for that girl. In order to identify this potential partner, it is important to ask one what are one’s needs, *e.g.* is it there a financial need, is there the need to have someone to rely on when I want to pick up a travel destination etc. The way I see myself in relation to him will not be from the equal positions, but mostly from that of a daughter-father positions. This type of marriage won’t be for the long run, that’s for sure.

When going for a date we usually have some expectations from the person we are about to meet. For instance, a man expects the woman to tell him what sort of a shirt he is supposed to wear; later on, maybe, to decide on his behalf what color should his furniture have; in short, to control him. On the other hand, the woman expects her partner on a first date to tell her what job is good for her, how to wear her make-up in the morning, how to make a choice – all these come not from the role of a partner, but rather from a position of authority that she invested him with, becoming as such, dependent on his moods and states of mind. Once this happens, nobody can be happy about it, because the person will turn into the child in search of a parent. It is the need to continue having the relationship with their parents or, in the situation of a childhood trauma, to replace it.

Whenever we are looking for something, there must be something that we are missing. When we talk

about a fulfilled romantic relationship, this one should have its start from a plus position – if I am fulfilled I can start looking for a partner who could sustain me with continuing fulfillment. Whereas if I am on a minus position and I expect that someone else would meet my needs, then I already start from a wrong position within a romantic relationship. I will become dependent on the other person's states of mind. If both of us had been independent, then we would live a life at its extremes.

It is therefore important to find a co-dependency in relationship where we could ask the right questions to identify our partner. In his book, *"I am OK – You are OK"*, Thomas Harris promotes the idea that if a partner is not OK, having big expectations from their partner, then they won't perceive the other as being OK either. On the other hand, being self-fulfilled, having a good emotional and overall mental balance, one will be able to offer their love and choose their partner from a plus position.

Choosing a partner for the sake of having someone to support myself, to have something to offer, it means that subconsciously I choose from a position of lacking something. But when I, as a woman, bring in my feminine energy, my availability, gentleness and power to contain you, then it is a totally different position. When a man brings into the relationship his own emotional stability, his common sense, understanding the emotional flow of each and every mood triggered by the inevitable daily stress, then he can be a good candidate for a partner who is committed to the relationship.

But as long as I am not satisfied as a person, then I can't see the other one as a good match, on contrary, this thing can lead to anxiety. I will inevitably relate to the reptilian brain and at my first date I will be tempted to pick up on the smallest detail of my partner's behavior, telling myself that he is not paying enough attention to my needs.

We all need to be respected, to be heard, to be mirrored when we talk to each other. Being on a date doesn't imply only a physical encounter, but also an interaction with somebody else's soul, with their own values. It is an interaction that evolves on different levels. The encounter is the first one, followed by the stage of getting to know the other.

If from the very start you feel ignored or used in some way, if your partner pays more attention to their phone or to their own needs, without acknowledging you, it shows immaturity on their behalf. This means that they are not there to meet you, to greet you, to get to know you. It is therefore very important to adjust our expectations in accordance to the moment that we together, as a couple, are creating. Beyond respect, there is the need for attention and the need to spend time together without skipping the specific stages of a date, creating space for the other to exist, while making a difference between extreme expectations and tolerable humanity. Holding a mutual esteem for each other's identity, getting to know certain attitudes, rules, good manners - these are some of the aspects that allow women to preserve their feminine energy and men to step into their own masculinity offering as such the possibility for a second date.

Showing interest in the other partner involves giving the other some space for expressing themselves, for asking questions, mirroring the other at the level of "I am here because I want to get to know you at every aspect of yourself". It is therefore recommended to draw beforehand a 'sketch' of what exactly it is we want to bring in a lasting relationship, what exactly it is that we need to co-create together with our partner. Having this sort of clarity, will enable us to make room for different aspects (like: different interests, passions, and not being "the twin-partner") owned by each partner, while he gets to preserve his psychoemotional masculinity and she preserving her own psychoemotional femininity.

As human beings we are a work in progress and knowing our own needs and features from previous unfulfilled relationships will become benchmarks for our future relationships. For instance, a childhood fraught with adversities will turn adulthood into a life fraught with neuroticism, according to Jeronimus & al. (2013). The child's brain develops in stages that are shaped by the environmental needs that help him survive.

In literature (Siegel, 2011, Cozolino, 2014) we find that attachment trauma leads to certain behaviors, therefore it is important to know the neural mechanisms involved in this process. Alongside with this, the level of development into emotional intelligence is a must-know when it comes to interacting with others.

At birth, neurons located in the limbic system (which is the brain area for emotional learning - the basis into establishing the subjective sense of self and of others) are not completely developed. Genetically speaking, these neurons are "wired" to form synaptic connections through relational experiences that one has with those close to them. Through mutual interactions and emotional availability of the care providers, these brain regions will be activated and start their growth process, including the release of connectivity and pleasure hormones through intimate and contingent relating.

Any type of experience will result in wiring brain neurons and once this action is repeated, the same neurons will fire together, connecting each other into reinforced neuronal pathways. These ones will end up becoming reaction patterns (including here attachment patterns) and the entire brain structure will mature in the same way.

Neuroscience can explain the neural mechanisms involved in attachment trauma, according to recent researches [1]. Amygdala is the center of fear and represents the basis of emotional learning due to socializing, but it maintains also a big role in storing the experimented reactions.

Hippocampus, attached to the limbic system, is responsible with storing memories both at subconscious and conscious level. Hypothalamus is in charge with releasing the hormones, the most important one being oxytocin – the hormone of affective connection released together with the touch, warmth contained for instance, in breast feeding of a baby. This is the reason why we feel connected and safe every time the loved ones hug us or we remember people who offered us unconditional love.

Healing attachment trauma is a process that requires acknowledging one's coping strategies they developed to help them deal with intense situations. These strategies come in the form of defenses that block the emotions, resulting in a behavior that is meant to avoid the painful stimulus or to confront it in a dysfunctional manner.

Neuroplasticity is the new term in psychology literature which indicates that viewing things through a new perspective, a new filter, we could understand better the other person while using the familiar past so that we won't have to make the same choices. This entails practicing awareness, creating a positive mindset, defining and developing a new subpersonality, that of a lover.

We often tend to make choices based on trauma experience and our life script and so it happens that our partner who could be quite suitable, albeit different, might end up appearing kind of boring to us.

However, things do not evolve so quickly, they take their normal, quite path starting with a friendship that doesn't necessarily exclude the erotic attraction between the partners. In fact, the state of 'being in love' is not similar to that of having found the desired one; we must not exclude those moments of dating where there are no fireworks, no dramas, no fights; those moments where we are not carried into the limbic brain activating the sympathetic nervous system. If not, all these could mean that we choose from our trauma history, searching for that intensity which is often poisonous and turning our relationships into toxic ones.

From a psychotherapy perspective, we can easily get trapped into the dynamic called Drama Triangle (according to Stephen Karpman who developed the concept). It is overwhelming for a man to become the Rescuer for the little girl inside his partner. He turns into her bank cards provider, holiday maker, anything she wishes and needs for. This part of his, generates a Victim position in his partner, a position that she is not aware of, but at the same time comes with all sorts of restrictions.

Other times, women turn into a trophy-partner and this is where the Persecutor comes in. She can be quite aggressive or he is the passive-aggressor not offering what she desires for. Her answer, in turn, would be punishment since she knows very well that she is his trophy to boast about to the world. All these types of relationships are profoundly transactional.

Long term relationships come in the form of "intentional dating" which reflects the way we feel around that partner, whether or not we share the same values, paying attention to the rhythm of living the other one prefers, how much freedom we get from that relationship.

Traditionally speaking, we develop in several stages: first we are children, who get bored with the same toys, then we become teenagers with growth hormones to increase the level of irritability, playing havoc around us. That doesn't mean that once teenage years are over, we stop being teenagers. On contrary, we tend to be the same teenagers as adults giving up a relationship and rapidly choosing a new partner. This is a sure way to avoid the commitment that maturity comes with.

Being superficial, irritable, pretentious is the way to be for that stage of life where psychoemotional development is at its beginning. It's important to own one's commitment, but first of all towards ourselves and this can happen through the power of communication. Talking to people of opposite sex leads to another stage wherein we select and get to know ourselves through different relationships. For a teenage female-partner it is the right start to crystallize into the future woman. Now it is not the time to behave as if she is already married or goes by the marriage rules. The relationship becomes her space where she defines herself as a woman.

Having an efficient and committed communication implies that at least one of the partners to become involved in an open discussion. Those who steer away from commitment are in different stages of development and have different needs; it all comes down to emotional maturity.

It is important to understand that if you are not chosen as a partner or as a friend, it is not about you, but rather about the other person's taste.

Physical attraction seems to be, at least at the beginning, very important because one shares their emotional intimacy with another. Erotic and sexual intimacies seem to come at later time, since emotional intimacy lays the foundation for sexuality.

Emotional compatibility persists throughout time, even long after hormonal period and consists of being open and courageous enough to show yourself the way you truly are.

Once we become aware of ourselves, we can identify the patterns according to which we tend to make our choices. These choices go hand in hand with our present behavior and our developmental needs. Once we step out of our subconscious archetypal patterns we will be able to choose freely.

Trauma can be the consequence of an experience loaded with suffering or of recurrent events that have been too overwhelming to bear, events that have lasted for weeks or even years, throughout which the individual has struggled to adjust, but in the end suffering seriously negative results, such as: anxiety, major depression, substance or/and alcohol abuse.

Researches indicate the relationship between jealousy and alcohol abuse with the following conclusions:

- alcoholism plays an etiological role in developing morbid jealousy [7]
- in men, there is a negative correlation between sexual jealousy and sexual satisfaction and conjugal stability; in women there is a negative correlation between sexual jealousy and marriage duration and a positive correlation with severity of alcohol addiction [9]
- pathological jealousy is wide spread in both men and women, more so with old age.

The antecedents of this affliction can be of neurological nature or related to drugs or even psychological, more often preceded by low self esteem and excessive dependency to the romantic partner. Pathological jealousy can be triggered by the partner's behavior and maintained by errors in judgment and by psychological benefits that are initially rendered to the relationship itself [8].

The present research has aimed into identifying the relationships between personality traits and various intra- and inter-personal factors regarding the dysfunctional jealous behavior. The sample consisting of 180 participants (aged between 18 and 35) has been investigated to find out the relationship between age and level of jealousy.

We took into account the observations and interviews performed in prior couple therapy sessions as well as individual sessions.

According to the results, it appears that the jealousy level ($m=13.92$) in the younger age group (18 – 24 yo) seems to be lower when compared to the jealousy level ($m=17.8$) of older individuals (25 – 29 yo) and those of 30 – 35 yo ($m=17.58$). (Table 1)

Table 1

Descriptive statistics of participants on age groups according to jealousy as dependent variable

Age group	DV	N	Min	Max	Median	Mean	SD
18-24	jealousy	60	12.00	19.00	13.00	13.92	1.66
25-29	jealousy	60	16.00	20.00	18.00	17.80	1.34
30-35	jealousy	60	16.00	20.00	18.00	17.58	1.39

Comparing other findings in literature which indicate that with aging the jealousy level tends to decrease [5] and jealousy is at its peak during teenage years [6], the results of our study indicate the contrary: participants in younger group have a statistically significant lower level of jealousy when compared to the other age groups: 25-29 and 30- 35 ($Wilcoxon(60, 60)=169.5$, $p < 0.001$, $es= 0.79$), ($Wilcoxon(60, 60)=205$, $p < 0.001$, $es= 0.77$). This can be explained by the fact that participants in first group (18-24, $N = 60$) could be less involved and less committed to romantic relationships, more important for them being socializing and group of peers, especially following the Covid-19 times, when these things have been absent from their life. Additionally, youngsters in Romania, at this group of age are more in search of exploring their identity, emphasizing other aspects of their life, such as enrolling in the right college, looking for a job to provide the least comfort for their life, while romantic relationships become just a detail in their need for socializing. But with aging, individuals tend to become more aware of what entails being involved in a romantic relationship and it is possible that the pressure of such a responsibility to implicitly activate their unresolved attachment traumas.

This study is part of the doctoral research project called “Psychoemotional traumas and their effects on personality development” run by LEUȚANU Gabriela and coordinated by CUCER Angela, doctor in psychology, research professor at Center for Continuous Education and Leadership at “Ion Creangă” University, Chisinau, Moldova

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TECHNICAL SCIENCES

AUTOMATED EVALUATION OF ACOUSTIC QUALITY OF PREMISES USING DEEP LEARNING

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Abstract

This research is dedicated to the development and evaluation of a deep learning model for automated evaluation of acoustic quality of premises. The model was trained on a large dataset, which included various acoustic parameters, and showed high accuracy, sensitivity, specificity, and F1-score. However, some areas were identified where the model could be improved, particularly in assessing the acoustic quality of premises with a high level of noise. Despite these challenges, the research results confirm the potential of using deep learning in the field of acoustic design. This opens up new opportunities for further development and improvement of methods for automated evaluation of acoustic quality of premises, which may have important practical implications for this field.

Keywords: deep learning, acoustic quality of premises, automated evaluation, acoustic design, deep learning model, noise assessment

INTRODUCTION

The acoustic quality of premises plays an important role in the comfort and productivity of people who stay in them. It affects language understanding, music perception, and the overall comfort of users of the premises. However, the evaluation of acoustic quality of premises is a complex process, which traditionally requires significant effort and expert knowledge [1].

Modern methods of evaluating the acoustic quality of premises include measuring various acoustic parameters, such as post-resonance time, speech clarity, and others. These methods can be labor-intensive and require special equipment and expert knowledge to interpret the results [2].

However, with the advent of deep learning, there is an opportunity to automate this process. Deep learning is a subfield of artificial intelligence that uses neural networks with many layers (so-called "deep" networks) to model complex relationships. It is already successfully applied in many fields, including acoustics.

METHODS

For processing these data, a deep learning model was developed. The model was based on convolutional neural networks (CNN), which are effective for processing audio data. The architecture of the model included several convolutional and fully connected layers. The ReLU activation function was used in all layers, except the last one, where the softmax function was used for the output of the final class [3].

The ReLU activation function (Rectified Linear Unit) is one of the most popular activation functions used in neural networks. It introduces nonlinearity into the model, allowing the neural network to learn and model more complex patterns.

ReLU is defined by the following formula: $f(x) = \max(0, x)$.

This means that the ReLU activation function returns the input if it is positive, otherwise it returns 0 [4].

The model was trained using the Adam optimization algorithm, using cross-entropy loss as the loss function. The batch size was set to 32, and the number

of epochs - to 100. To prevent overfitting, early stopping was used, with a patience period of 10 epochs.

The Adam optimization algorithm (Adaptive Moment Estimation) is one of the most popular optimization methods for neural networks. It combines the advantages of two other optimization methods: RMSProp (Root Mean Square Propagation) and SGD (Stochastic Gradient Descent) with momentum [5].

The main parameters of the Adam algorithm include:

- Learning rate: this is the step with which the model updates weights in the learning process. Usually set in the range from 0.1 to 0.0001. In our research the document continues:

- Value of 0.001 was used.
- Beta1: this is a parameter that controls the smoothing rate of the first moment (the mean value of gradients). Usually set to 0.9.
- Beta2: this is a parameter that controls the smoothing rate of the second moment (uncorrected variance of gradients). Usually set to 0.999 [6].
- Epsilon: this is a very small number that is added to the denominator when updating weights to prevent division by zero. Set to $1e-8$.

The model's accuracy was evaluated using 5-fold cross-validation. For each fold, accuracy, sensitivity, specificity, and F1-score were calculated, and then the average value of these metrics was calculated.

5-fold cross-validation is a model evaluation method in which the dataset is divided into 5 equal parts, or "folds". The model is trained on 4 folds, and then tested on 1 fold. This process is repeated 5 times, so that each fold is used as a test set once.

Accuracy, sensitivity, specificity, and F1-score are calculated for each of these 5 tests, and then the average value of these metrics is calculated [7].

These methods were chosen with the aim of developing an effective and automated system for evaluating the acoustic quality of premises. They allow the use of large volumes of acoustic data for training a model that can accurately predict acoustic quality based on this data. This can significantly simplify the process of

evaluating the acoustic quality of premises, making it more accessible and efficient.

As a result of the conducted research, a deep learning model for automated evaluation of acoustic quality of premises was developed. The model was trained on a large dataset, which included various acoustic parameters of premises, such as reverberation time, loudness level, and others [8].

After training, the model was tested using 5-fold cross-validation. The average values of the metrics for evaluating the quality of the model were as follows: accuracy - 0.85, sensitivity - 0.83, specificity - 0.87, F1-score - 0.84. These results indicate the high ability of the model to correctly classify the acoustic quality of premises [9].

An analysis of the importance of the features used for training the model was conducted. The most important features turned out to be reverberation time and loudness level, which corresponds to the intuitive understanding of the acoustic quality of premises [10].

Python code for creating and training the deep learning model is provided in the document, as well as Python code using the scikit-learn library for conducting 5-fold cross-validation:

```
from keras.models import Sequential
from keras.layers import Dense
from keras.optimizers import Adam
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
model = Sequential()
model.add(Dense(64, input_dim=10, activation='relu'))
model.add(Dense(1, activation='sigmoid'))
# Налаштування оптимізатора Adam
adam = Adam(learning_rate=0.001, beta_1=0.9, beta_2=0.999, epsilon=1e-8)
model.compile(loss='binary_crossentropy', optimizer=adam, metrics=['accuracy'])
history = model.fit(X_train, y_train, validation_data=(X_test, y_test), epochs=100, batch_size=10)
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
precision = precision_score(y_test, y_pred)
recall = recall_score(y_test, y_pred)
f1 = f1_score(y_test, y_pred)
print(f'Accuracy: {accuracy}')
print(f'Precision: {precision}')
print(f'Recall: {recall}')
print(f'F1 Score: {f1}')

from sklearn.model_selection import cross_val_score, KFold
from sklearn.metrics import make_scorer, accuracy_score, precision_score, recall_score, f1_score

scoring = {'accuracy' : make_scorer(accuracy_score),
'precision' : make_scorer(precision_score),
```

```
'recall' : make_scorer(recall_score),
'f1_score' : make_scorer(f1_score)}
```

```
kfold = KFold(n_splits=5)
# Проведення крос-валідації
results = cross_val_score(model, X, y, cv=kfold,
scoring=scoring)
```

```
mean_accuracy = results['test_accuracy'].mean()
mean_precision = results['test_precision'].mean()
mean_recall = results['test_recall'].mean()
mean_f1_score = results['test_f1_score'].mean()
```

DISCUSSION

This research presented a new approach to evaluating the acoustic quality of premises using deep learning models. This approach involves the use of large datasets containing various acoustic parameters and the application of algorithms for automated evaluation of acoustic quality based on these data. This can significantly simplify the process of evaluating the acoustic quality of premises, making it more accessible and efficient [11].

Despite the promising results, there are several areas where the model could be improved. One of these is the evaluation of the acoustic quality of premises with a high level of noise. The model showed lower accuracy in these cases, which may be due to the complexity of distinguishing between the effects of noise and other acoustic parameters. Future research could focus on improving the model's performance in these challenging conditions.

Another area for improvement is the interpretability of the model. While the model showed high accuracy, it is a "black box" that does not provide insights into the relationships between different acoustic parameters and the overall acoustic quality of premises. Future work could explore methods for increasing the interpretability of the model, such as the use of explainable AI techniques.

Despite these limitations, the research results confirm the potential of using deep learning in the field of acoustic design. The developed model can be used as a tool for automated evaluation of acoustic quality of premises, which can significantly simplify the process and make it more accessible to non-experts. This opens up new opportunities for further development and improvement of methods for automated evaluation of acoustic quality of premises, which may have important practical implications for this field.

CONCLUSION

This research presented a new approach to evaluating the acoustic quality of premises using deep learning. A model was developed and trained on a large dataset, which included various acoustic parameters. The model showed high accuracy, sensitivity, specificity, and F1-score, confirming its ability to correctly classify the acoustic quality of premises.

However, the research also identified several areas where the model could be improved, particularly in the evaluation of the acoustic quality of premises with a high level of noise and in increasing the interpretability

of the model. Despite these challenges, the research results confirm the potential of using deep learning in the field of acoustic design.

The developed model can be used as a tool for automated evaluation of acoustic quality of premises, which can significantly simplify the process and make it more accessible to non-experts. This opens up new opportunities for further development and improvement of methods for automated evaluation of acoustic quality of premises, which may have important practical implications for this field."

Please note that this is a general translation and some technical terms may not be translated accurately. For a professional translation, consider hiring a professional translator.

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РОЗРОБКА ПІДПРОГРАМИ ДЛЯ АНАЛІЗУВАННЯ СТРАТЕГІЇ ВИРОБНИЦТВА ПРОДУКЦІЇ В УМОВАХ КОНКУРЕНТНОГО СЕРЕДОВИЩА

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DEVELOPMENT OF A SUBPROGRAM FOR ANALYZING PRODUCTION STRATEGY IN A COMPETITIVE ENVIRONMENT

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Анотація

В даній статті буде розглянуто роботу ринку в умовах конкуренції на прикладі конкуренції трьох, восьми і п'ятнадцяти виробників. Відбудеться порівняння їх стратегій розвитку відносно розподілу ресурсу на рекламу і якість товару. Що можна зробити завдяки прогнозуванню ринку.

Також буде розглянуто стратегію оптимального розподілення ресурсу і наведено приклади коли варто її дотримуватися, а коли краще ризикувати для більшої продуктивності і прибутку на даній лінійці товару.

Abstract

In this article, we will explore market dynamics in competitive conditions, using examples of competitions involving three, eight, and fifteen manufacturers. We will compare their development strategies in terms of resource allocation between advertising and product quality. We will also discuss the benefits of market forecasting.

Additionally, we will delve into the strategy of optimal resource allocation and provide examples of when it is advisable to adhere to it and when taking risks may lead to higher productivity and profit in a particular product line.

Ключові слова: оптимальне агрегування, виробництво, продаж, імітування.

Keywords: Optimal aggregation, production, sales, simulation.

1. INTRODUCTION

"What if?" - This is a question that managers often ask themselves. But why not ask, "what specifically will happen next?" Because "what will happen if" only analyzes certain states of the business environment. Since it is impossible to predict the state of the future at first glance, it may seem that science is helpless here, but this is not the case. Usually, we can only forecast demand, supply, exchange rates, and so on. However, forecasting the economic system is different from forecasting changes in the solar system. Therefore, it is through the influence on the economic system that we can influence its future, and the more our steps are calculated, the greater impact we can have[1].

"What will happen if" serves as active forecasting - our task is to model several scenarios of a better future so that we can then choose it by simple actions in the present and their impact on the economic market.

The goal of this work is to master the technology of developing and using models for decision-making, using the example of developing a model of a system of producers of a certain class of products and conducting research.

2. PROBLEM STATEMENT

The system of producers of meat and dairy products is considered, for example:

Let's create a model that will answer the following questions:

- Changes in the market share of participants.

- The possibility of competition in this market for newcomers.

- Choice of strategies for firms with different capital.

- Are small firms competitive?
- What is the optimal market distribution for the state?

- The presence of equilibrium states and system stability to disturbances.

- Next, we will develop a mathematical model: Formalize the problem: we have M types of goods and N firms. The firms are independent but connected through the market. The vector of market capacity $V_m =$, the components of which are the market capacities for individual goods, is given. In the first approximation, we consider them constant.

The firm's activity consists of the following stages: 0) procurement of raw materials and components, 1) production of goods, 2) goods sales in the market, 3) distribution of resources (total income) among productions. These stages cyclically (annually, quarterly, monthly, daily...) repeat. We will break the continuous process into discrete steps (year, quarter, month, day...) and relate all actions to these periods. For example, for a month, we need 121 tons of grain to feed 1332 cattle. If we choose a modeling step of 1 month, how much grain is needed to feed cattle for 1 month?

Note. It is known that for many types of products, production costs are a small part of total costs, with advertising and other marketing costs being the main ones. We will not go into too much detail about organizational, logistical, and marketing expenses.

Let's separate two stages of the "money-goods-money" cycle for now - production and the market - as inseparable links of the process. In the first approximation, we will assume that production is deterministic, while the market is probabilistic. Deterministic industrial production will be described by a known growth model with limitations: production growth is proportional to investments, the achieved level, generalized growth reserves - market underutilization (this coefficient can be negative), the availability of funds, personnel, and raw materials.

Let's go through the components of the production and market model[2-3]:

- Production volume - the total quantity of product production during a specified period.
- Production costs - expenses for product manufacturing, advertising, equipment maintenance, personnel.
- Income - the total amount of money earned from product sales.
- Profit - the amount of income minus production costs.
- Uncertainty and risks - risks associated with events that are difficult to predict, such as disease outbreaks.
- Decision-making logic - the best decision in a given situation.

Further, we will provide an example of the operation of this model for 3 producers and 3 products.

As we can see, the model is functional.

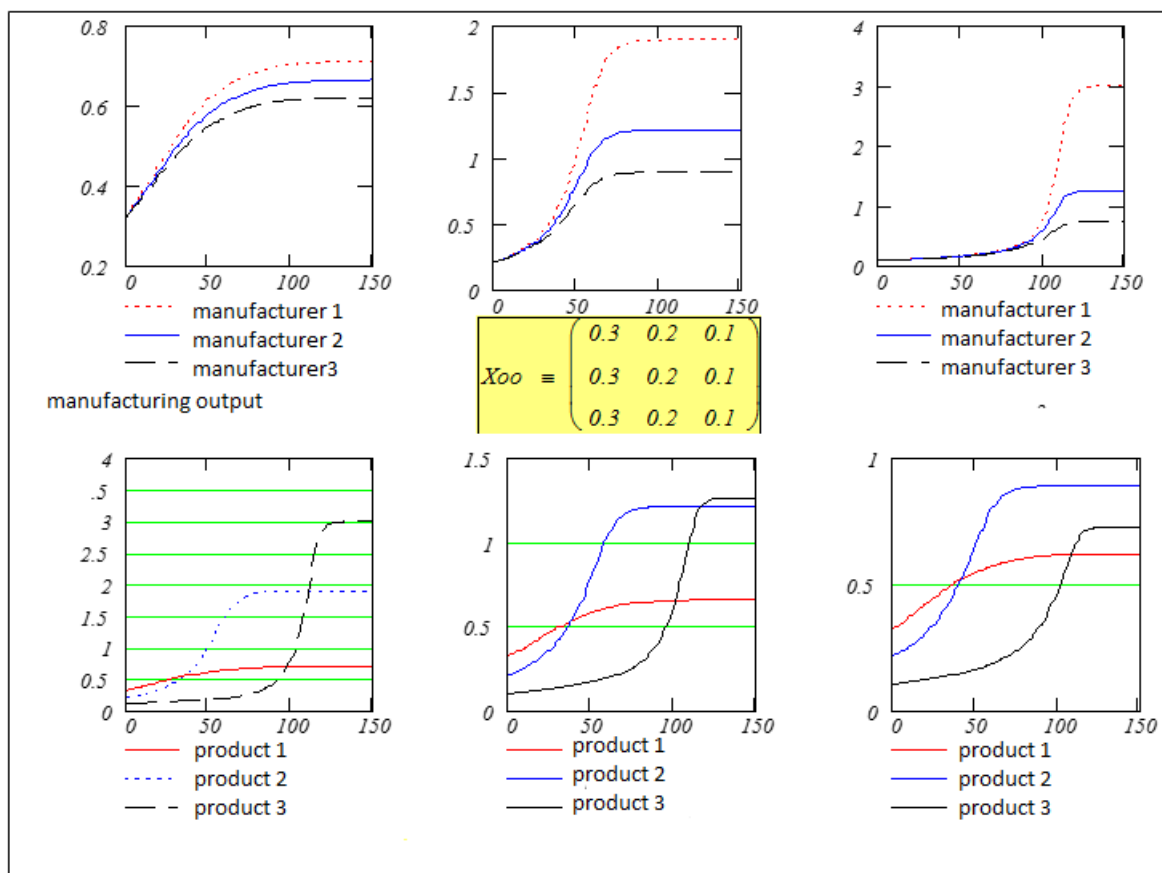


Fig. 1- an example with three manufacturers and three products.

As we can see from the graphs, depending on the strategy, all three producers have recouped their production costs. However, it is also evident that this depends on the timing of sales and the strategy chosen, given that budgets and product parameters are the same.

The first producer followed a strategy of evenly allocating resources to quality and advertising, resulting in a gradual increase in profit.

The second producer adhered to a strategy where 75% of the funds were spent on advertising, while the rest went into product quality and production speed. This resulted in a sharp increase in profit and subsequent stabilization at its peak. However, it's worth noting that such a strategy may not be sustainable and

could lose out to a higher-quality product in the long run.

In the third case, 75% of the budget was allocated to product quality and production speed. As we can see, within a low-competition environment, this strategy gradually yielded the best results. However, in a highly competitive market, there is a risk of being overshadowed by more popular products in terms of quantity.

These observations highlight the importance of choosing the right strategy, understanding market dynamics, and adapting to changing conditions to ensure long-term success in business.

3.THE EXPANSION OF THE MODEL FOR ANALYZING THE MICROECONOMIC

CLIMATE NOW INCLUDES 15 PRODUCERS AND 15 PRODUCTS

We set the dimensions of the system to include 15 producers and 15 products, with a specified "recovery after a downturn" point. This situation is similar to opening a new business[4].

For a 15x15 system, a credit distribution step of $k=3$ is set. Therefore, the initial data for advertising spending is 50%, and with each subsequent step, it will be $Adv=50+k$. This allows for comparing processes based on advertising expenditure.

It's worth noting that the most stable result often comes from a proportional distribution of resources between advertising and production. However, as you

will see from the following graphs, there are situations where an emphasis on advertising spending can lead to either failure or a reasonably positive outcome.

From the graph below, we can observe a trend of decreasing profit as the advertising expenditure coefficient (Adv) increases during multiple tests. In a highly competitive environment, customers typically tend to choose a higher-quality product after initially trying an advertised one, which can lead to a decline in profit and a growing sense of distrust from customers. To prevent this, after the initial investment in advertising, it's better to focus on the quality of your product. This will help solidify the results and maintain the retail of the product at a reasonably high level.

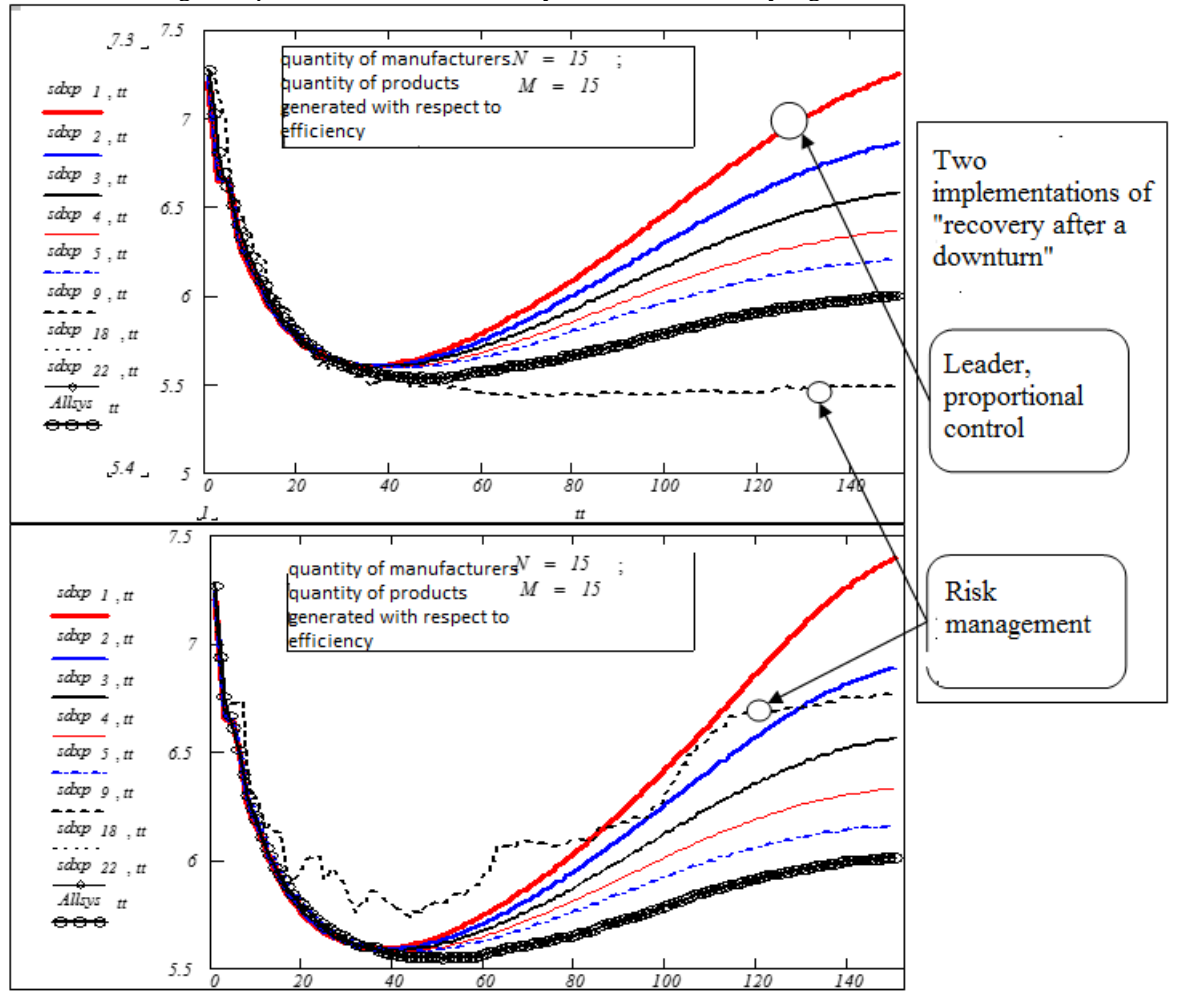


Fig. 2 – Program for 15 manufacturers and 15 products.

In the processes of recovery after a downturn, more often than in equilibrium states, the rankings of producers are disrupted due to bankruptcies of some and effective management of others. Next, we will provide a graph depicting the dynamics of these same producers but from different perspectives.

This will allow for a better understanding of the stages of bankruptcy and effective management of future projects through optimal aggregation of processes. The graphs demonstrate the effectiveness of the best and worst strategies in terms of producing 150 units of

a product within a competitive environment saturated with other producers.

As we can see, a stable resource allocation efficiently maintains production in a leadership position, while risky management led to an initial collapse and only subsequent stabilization.

At first glance, it may seem that within this environment, stability is the key to success. However, what will happen if everyone follows the same strategy? This question will be addressed in the next section.

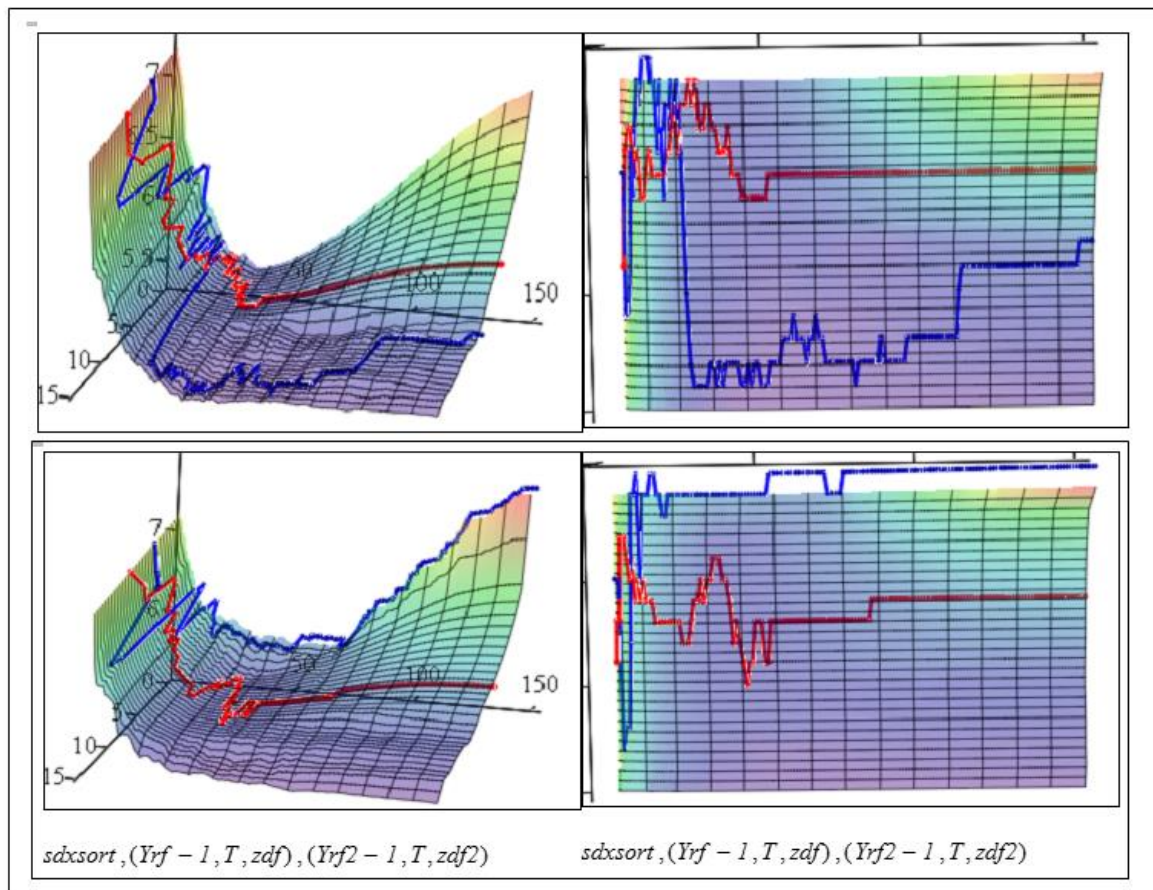


Fig 3 – Testing the RNM program, a system with 15 manufacturers and 15 products. "One against all" processes.

Development and testing of a program for "frequency probability distributions in producer systems" are being carried out. The RNM programs also facilitate histogram construction and analysis. Empirical frequency probability distributions, represented by histograms, allow for the analysis and forecasting of producers in an active environment.

4. THE HISTOGRAMS OF PRODUCT DISTRIBUTION UNDER THE CONDITION OF OPTIMAL PRODUCTION MANAGEMENT BY ALL PRODUCERS ARE SHOWN BELOW.

We can see that the probability distributions are constructed based on samples from 1000 to 2000 runs of the RNM program. The system has a dimension of eight producers, and producers are ranked by productivity. The distributions change not only parametrically but also structurally: unimodal distributions transition into bimodal and others. The distribution shape remains stable, and no significant changes are observed when the sample size exceeds 500-1000[5-6].

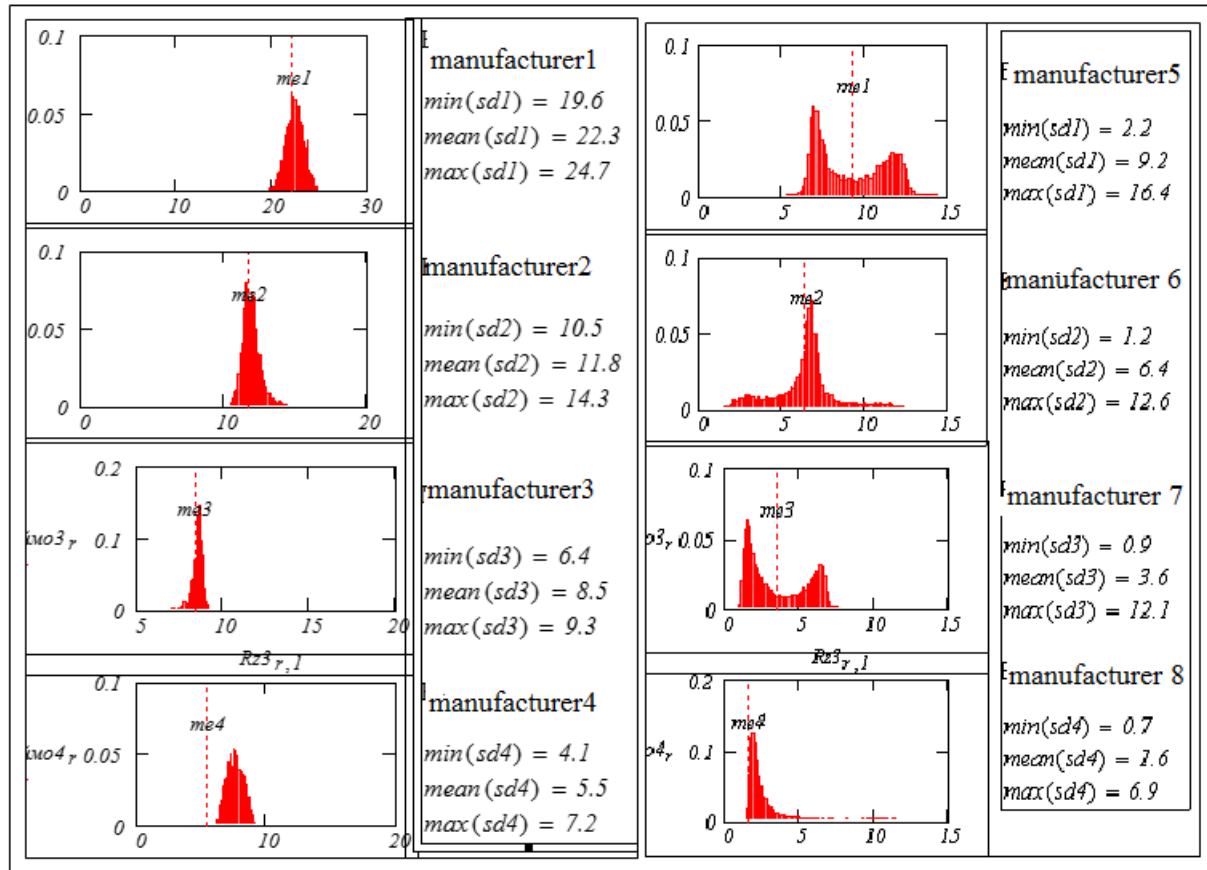


Fig. 4 – Testing the RNM program, a system of small dimensions. The influence of system parameters on the nature of distributions.

Therefore, as we can see, when using the optimal situation, producers can also distribute themselves into different niches, and this will depend on less controllable processes, such as customer preferences or perhaps store placement, assuming we do not influence the interactions between stores and customers.

CONCLUSIONS

Therefore, as we can see, the state and development of the economic system can be predicted, and even more so, it can be controlled, which helps to better understand the development of one's business. Using optimal aggregation modules makes these processes more controllable. In my opinion, if future businesses want to thrive, they should shift their focus towards the methodology of forecasting and controlling the process itself, rather than just dealing with the consequences.

We have also examined processes for 15 product producers who struggled under various conditions depending on advertising and production expenses. As we can see, higher advertising expenses can lead to better results but can also significantly worsen them. However, we have also considered a scenario where everyone acts optimally and noted that in such a situation, not every producer will emerge from the crisis with a profit.

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SCIENTIFIC AND TECHNICAL SOLUTIONS FOR HARVESTING ROOTS

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Abstract

Agricultural products, including root fruits, make up a large part of a person's vital needs. Therefore, cultivating root fruits and harvesting crops without harm is one of the main tasks of agricultural events. Considering the above, it is of great importance to have information about the scientific research and scientific results achieved by our scientists in this field. If the root crop seeds sown in the spring are harvested in the middle of summer, the one in summer is harvested in late October and early November. These two collection seasons will vary from one another according to the soil-climatic conditions. This in turn complicates the harvesting of root crops. An improved carrot digging is designed to harvest the autumn harvest, and applying it for the summer harvest is not recommended. Because of the fact that during the summer season, we are more likely to damage the crop because the soil conditions are hot and dry. Improved carrot digging reduces manual labor and improves work productivity. It is recommended to use a universal root crop harvester to harvest the crop in the summer season since the heat and dry conditions of the soil during the summer season can cause an increase in the level of root crop damage in driving the crop to the surface of the earth. Another reason for the increase in damage is that solid soil cuts should not be crushed because this humidity is low.

Keywords: digging, root crop harvester, tuber, ploughshare, root digger, gearbox, potato digger, energy indicator, carrot digger; root harvester; authors, citations, Scopus database.

1. Introduction

Agriculture is one of the most important parts of any country [1]. It is for this reason that the importance of improving the efficiency of harvesting, including reducing energy consumption and increasing the speed of the harvester, is increasing day by day [2]. To increase the productivity and sustainability of agriculture, technologies and technical means of tillage, sowing and harvesting of agricultural crops and their primary processing have been developed and improved [3], [4]. An important reserve for increasing crop yields is creating optimal soil conditions for the development of the root system of plants [5]. With the development of science and technology, scientists have developed many technological methods of cultivating agricultural crops (Udompant et al., 2021). In many countries of the world, research work is underway aimed at developing new scientific and technical foundations for resource-saving technologies that ensure the movement and separation of a layer with dug roots at lower energy costs, as well as separation from the soil and laying them in a swath without damage [8], [9]. In this regard, an important task is considered to be the implementation of scientific research in such areas as the provision of energy-saving methods with the development of sectional undercut plowshares and the use of side discs, the development of paddle beaters to intensify the soil separation process [2], [10].

Currently, root crops are planted and cultivated on 30-35 million hectares of land all over the world [11].

The cultivation and harvesting of root crops is an important component of agricultural production in almost all countries. At the same time, much attention is paid to the development of highly efficient and resource-saving technical means that ensure the digging of root crops with minimal energy consumption [12], [13]. The variety of climates, soil conditions and water supply of each region around the world, causes a variety of difficulties in the harvesting of root crops. For example, in the soil and climatic conditions of Uzbekistan (high summer temperatures, low relative humidity, soil compaction after irrigation), in the process of harvesting root crops, the soil of the tuberous layer disintegrates into large soil lumps that are harder than root crops, thereby making it difficult to separate it from root crops at the elevator. This circumstance is the main reason that prevents the introduction of root and tuber harvesters [14]. When harvesting the root fruit crop, it is desirable to use the necessary techniques, depending on the season [15].

In Uzbekistan, special attention is paid to the introduction of science, technology and best agriculture practices. To increase the productivity and sustainability of agriculture, technologies and technical means of tillage, sowing and harvesting of agricultural crops and their primary processing have been developed and improved. An important reserve for increasing crop yields is creating optimal soil conditions for the development of the root system of plants. With the development of science and technology, scientists have developed

many technological methods of cultivating agricultural crops.

In many countries of the world, research work is underway aimed at developing new scientific and technical foundations for resource-saving technologies that ensure the movement and separation of a layer with dug roots at lower energy costs, as well as separation from the soil and laying them in a swath without damage. In this regard, an important task is considered to be the implementation of scientific research in such areas as the provision of energy saving methods with the development of sectional undercut plowshares and the use of side discs, the development of paddle beaters to intensify the soil separation process.

Growing and harvesting root crops is an important component of the republic's agricultural production. At the same time, much attention is paid to the development of highly efficient and resource-saving technical means that ensure the digging of root crops with minimal energy consumption. In the soil and climatic conditions of our Republic (high summer temperatures, low relative humidity, soil compaction after irrigation), in the process of harvesting root crops, the soil of the tuberous layer disintegrates into large soil lumps that are more hard than root crops, thereby making it difficult to separate it from root crops at the elevator. This circumstance is the main reason that prevents the introduction of root and tuber harvesters.

Currently, vegetable growing needs the introduction of advanced technologies, equipped with highly efficient technical means adapted to the economic and soil-climatic conditions of the republic. The analysis of the current state of cultivation and harvesting of root crops in the republic showed that in vegetable growing, harvesting of carrot tubers is one of the most labor-intensive operations with a low level of mechanization [1, 2, 3, 4]. When using carrot diggers, the process of selecting tubers after digging them out is performed manually. This circumstance, in turn, leads to an increase in labor costs for the production of products. Numerous studies presented that in the technological process of root crop harvesters, the main thing was to separate the tubers from the clumps of soil without damage under any operating conditions.

The results of the analysis of the quality indicators of the existing root crop harvester showed that the agrotechnical requirements for digging root tubers were most fully met, mainly when working on light soils with optimal humidity and not containing strong soil lumps [5]. In difficult soil and climatic conditions, the machines do not fully meet the agrotechnical requirements for the process of digging tubers. As a result, losses and damage to tubers are quite large, which worsens the marketability of products and, as a result, reduces the cost of its implementation. Therefore, the reduction of losses and the degree of damage to tubers during the development of the root-tuberizer through the use of new technical solutions that meet agrotechnical requirements, with minimal energy costs, is an ur-

gent task. Serial digging working bodies dig out the excess volume of the soil layer (row spacing zone) and as a result, the soil is unloaded in this zone, especially at high speeds of the unit, energy consumption increases, and there is a large loss of tubers. The digger for digging root tubers should provide high-quality, in accordance with agrotechnical requirements, digging with minimal energy consumption, be less metal-intensive and labor-intensive in maintenance.

On the basis of foreign experience in the design of root diggers and taking into account the soil and climatic features and the variety of physical, mechanical and technological properties of the soil in different periods of harvesting root crops, as well as agrotechnical requirements, the following requirements for the digger were formulated: 1) the digging working bodies of the root crop harvester should dig out the part of the bed where the nests with root tubers are located, without unloading the soil, which will reduce their traction resistance; 2) to ensure the maximum release of soil and plant impurities of the root crop harvester by using an intensifier, which will significantly reduce the energy and metal consumption of the separation process; 3) lay the potato harvesters in the roll with minimal damage, for which to ensure the damping of shock effects by reducing the height of the fall in the process of dropping them on the surface of the field, which reduces the complexity of assembling the tubers. Therefore, this scientific research was aimed at developing a more efficient method of harvesting tubers that provides the required quality of work with less energy consumption and greater productivity.

2. Materials and methods

In this article, we went to the selected publications on worldly knowledge from the research done. The search collects the English-language academic literature retrieved from the Scopus database for the period 1982-2022. The analysis was carried out in September 2022. A total of 201 publications were downloaded with the keywords "root and harvester". In the next step, articles were categorized according to the year of publication. A database of all peer-reviewed papers was then created, including the year of publication, authors' names, countries, publication type, journal name, number of citations per paper, the number of citations per journal, the percentage of publications by the topic cluster name and subject area. The analysis was performed using a CSV file, Microsoft Excel 2021, RIS, VOS viewer and Map chart. Figure 1 shows the flow of the selected methodology for the research.

A total of 203 research papers related to root harvesters were obtained from the Scopus database from 1982 to 2022. The number of yearly published papers was divided into two time periods. In the first period between 1982 and 2004 the number of papers fluctuated from 1 to 4 papers (Fig.2). In the second period between 2005 and 2022, the number of papers started to increase from 2009. The largest number of published papers was in 2019 with 22 papers which was 22 times more than the number of papers published in 2002.

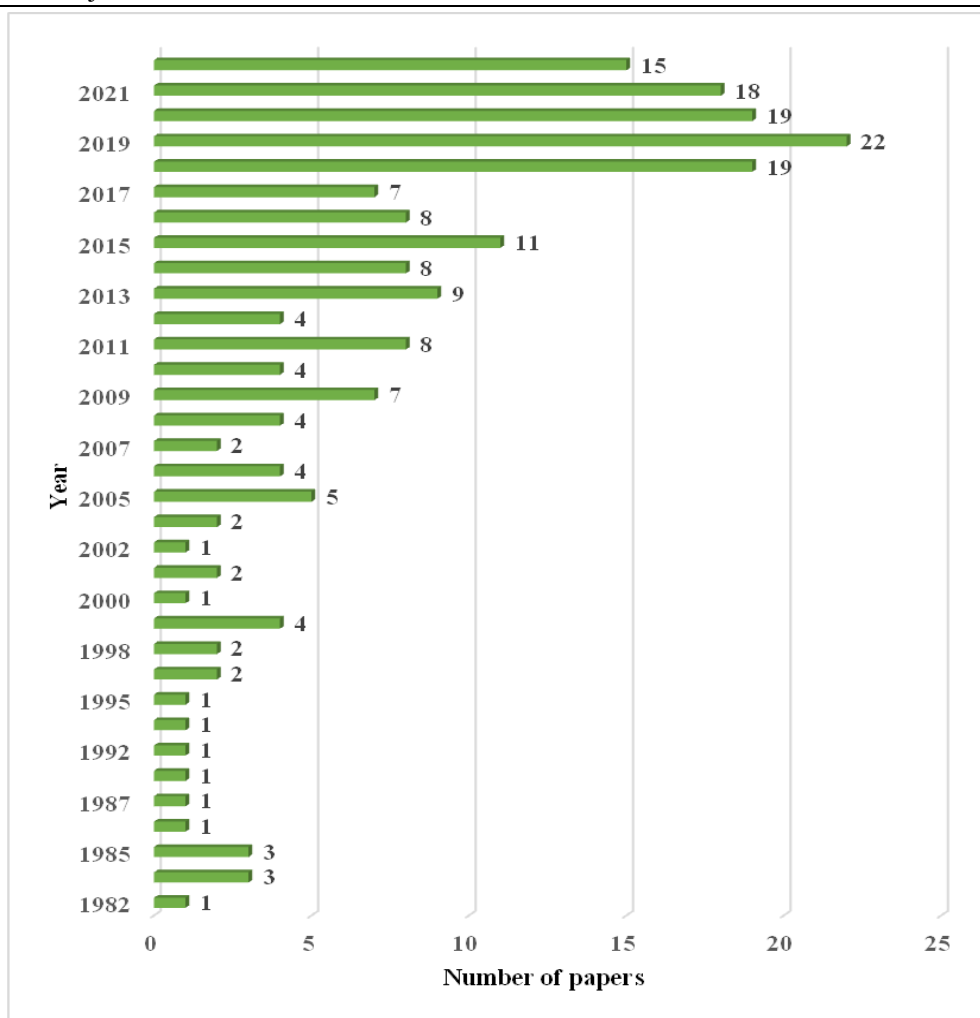


Figure 2. Number of papers on root harvester issues in the world (1982-2022)

The interest in root harvesters started to considerably rise in the second period and the number of published papers consist 86,6% of the total number. However, in the first period, it covers only 13,4%. This research shows the significant concern in the subject of root harvesters.

Further analysis showed that 140 (70%) out of 201 published documents were research articles, followed by 49 (24%) conference papers, 2 (1%) book chapters, 8 (4%) reviews and 2 (1%) conference reviews. This information suggests that researchers preferred to publish in journals rather than in conferences (Fig.3).

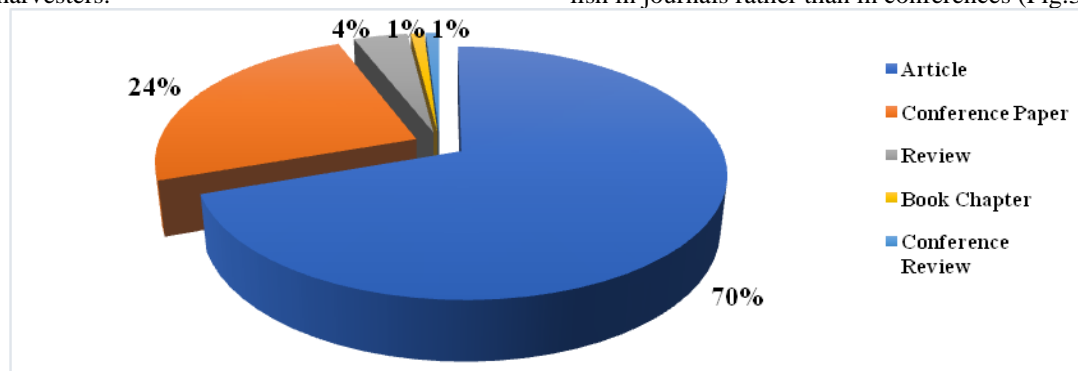


Figure 3. Publication type on root harvester issue in the world

A wide variety of journals in different parts of the world are used by scholars to publish their research. The communication patterns of the scholars indicate that the total output was distributed across 121 journals published in 58 countries. Of these 10 journals pub-

lished 39 (32%) papers and the remaining 68% of papers were published in other journals. Table 1 lists the names of the 31 journals which published a minimum of 2 and a higher number of papers during the above-mentioned period.

Table 1.

List of the journals on harvester machine issues in the world			
Scopus Source title	Number	Scopus Source title	Number
International Journal of Agricultural and Biological Engineering	7	Bulletin of the Transilvania University of Brasov Series II Forestry Wood Industry Agricultural Food Engineering	2
Proceedings of SPIE The International Society for Optical Engineering	5	Electronics Switzerland	2
Smart Materials And Structures	5	Frontiers In Plant Science	2
Soil And Tillage Research	4	IEEE Transactions on Instrumentation and Measurement	2
Agronomy	3	IFAC Proceedings Volumes IFAC Paper-online	2
Agronomy Research	3	Inmateh Agricultural Engineering	2
Economic Botany	3	Iop Conference Series Materials Science and Engineering	2
International Agricultural Engineering Journal	3	Journal of Agricultural Engineering	2
Journal of Intelligent Material Systems and Structures	3	Journal of Vibration and Acoustics Transactions of the ASME	2
Zuckerindustrie	3	Nano Energy	2
AMA Agricultural Mechanization in Asia Africa and Latin America	2	Nongye Gongcheng Xuebao Transactions of The Chinese Society of Agricultural Engineering	2
Acta Horticulturae	2	Proceedings of the ASME Design Engineering Technical Conference	2
Advanced Materials Research	2	Soil Use and Management	2
Agriculture Switzerland	2	South African Journal of Botany	2
Applied Sciences Switzerland	2	Transactions of The American Society of Agricultural Engineers	2
Biological Conservation	2		

The second analyzing criteria is the name of publishing country and impact factor of the top 15 journals (Table 2). Of these fifteen journals were published three from the US, two of them from China, Germany, Switzerland and the other six countries have one journal each from UK, Netherlands, Spanish, Estonian, Japan,

Belgium. The average impact factor of the journals with the highest number of articles was 2,24. Among the 15 journals the *Soil and Tillage Research* had the highest impact factor and the *International Journal of Agricultural and Biological Engineering* had the highest number of publications in this field.

Table 2.

Distribution of research output in prolific journals			
Journal	TNP (%)	Publishing country	IF
International Journal of Agricultural and Biological Engineering	3,4%	China	2,08
Proceedings of SPIE The International Society for Optical Engineering	2,5%	US	0,38
Smart Materials And Structures	2,5%	UK	4,1
Soil and Tillage Research	2,0%	Netherlands	7,3
Agronomy	1,5%	Spanish	3,9
Agronomy Research	1,5%	Estonian	0,36
Economic Botany	1,5%	US	2,35
International Agricultural Engineering Journal	1,5%	China	0,12
Journal of Intelligent Material Systems and Structures	1,5%	US	2,74
Zuckerindustrie	1,5%	Germany	0,24
AMA Agricultural Mechanization in Asia Africa and Latin America	1,0%	Japan	0,14
Acta Horticulturae	1,0%	Belgium	0,28
Advanced Materials Research	1,0%	Germany	3,2
Agriculture Switzerland	1,0%	Switzerland	3,49
Applied Sciences Switzerland	1,0%	Switzerland	3,02
Total:	24,1%		2,24

* TNP – Total number of publications, * IF – Impact factor

The soil-climate conditions of the region are very important in the harvesting of agricultural crops. The harvest of all types of root crops is located under the soil, and the condition of the soil (moisture, hardness, density, etc.) and mechanical composition affect the quality of work of harvesters [6-9].

Soil moisture has a great impact on the quality of work and power consumption of the working unit. Loamy soils stick to the working bodies in wet conditions and soil compaction occurs. In the dry state, large lumps are formed. In both cases, the process of sieving during the collection of root crops is worsened. However, at a certain moisture level, the soil is easily and well compacted, and a minimum amount of energy is spent during its processing. This condition of the soil is called maturity. Depending on the mechanical composition of the soil, its maturity occurs when the absolute humidity is 15...18% percent. According to the results of the research, the maturity of the soil also affects the speed of the aggregates [10-12].

When the soil is ripe, it is advisable to organize the work of machines for harvesting root crops.

Roots crops are planted in our republic in two seasons, spring and summer. Root crops seeds planted in spring are harvested in the middle of summer, and summer ones are harvested in late October and early November. These two harvesting seasons differ from each other according to soil and climate conditions. This, in turn, complicates the collection of root crops.

In summer, in conditions of low soil moisture, hard cuts appear on the surface of the root-fruit pods. When harvesting root crops, these pieces reduce the level of soil sieving without crushing them in elevators. In the fall, when the soil moisture is higher than the optimum, the soil sticks to the sieves, and as a result, the sieving of the soil in the elevator decreases.

Until now, the vegetable growing sector was not sufficiently provided with technical means, some of the existing machines were outdated, low-quality and late

execution of agrotechnical processes, and required the use of large amounts of manual labor instead.

On a global scale, separate harvesters are being used for each type of tubers. These machines are effective in harvesting roots and fruits with a total cultivated area of more than 35 hectares. However, if we take into account that the average land area for each root crop grower in our country is 5 hectares, root crop machines with the same size produced abroad work at a great loss for the farmer. Because the price of these machines is too expensive for a small farm. Taking into account the above, it is one of the urgent issues to develop a project of a tuber digger with a small size and the ability to harvest several types of tuber [13-15]

3. Results and discussion

Experimental works of the improved universal root-fruit digger, which harvests root crop yield, were conducted at the pilot farm of the Scientific Research Institute, in the farms of Yangiyol district of Tashkent region, Kasbi and Karshi districts of Kashkadarya region. Below are scientific works on the creation of two types of root crop harvester.

Currently, in our Republic, mainly hand-made devices are used for harvesting carrots, which cannot provide the required quality of work. And foreign carrot diggers require a lot of energy and metal consumption. In existing carrot diggers, the sieving process takes place satisfactorily in light and medium soils with normal moisture. In heavy soils, especially in conditions of high or low moisture, sieving devices work inefficiently when harvesting.

To solve the above problems, we proposed a carrot digger equipped with an improved elevator (figure 3).

Plows consist of two main and one intermediate. Transversal pushers (plates) are installed on the elevator wires on the lattice softener fixed to the frame, they are made of metal 3 mm thick and covered with rubber. The guide consists of two parts and is firmly fixed at an angle to the frame. It is made in the form of a grid and covered with rubber.

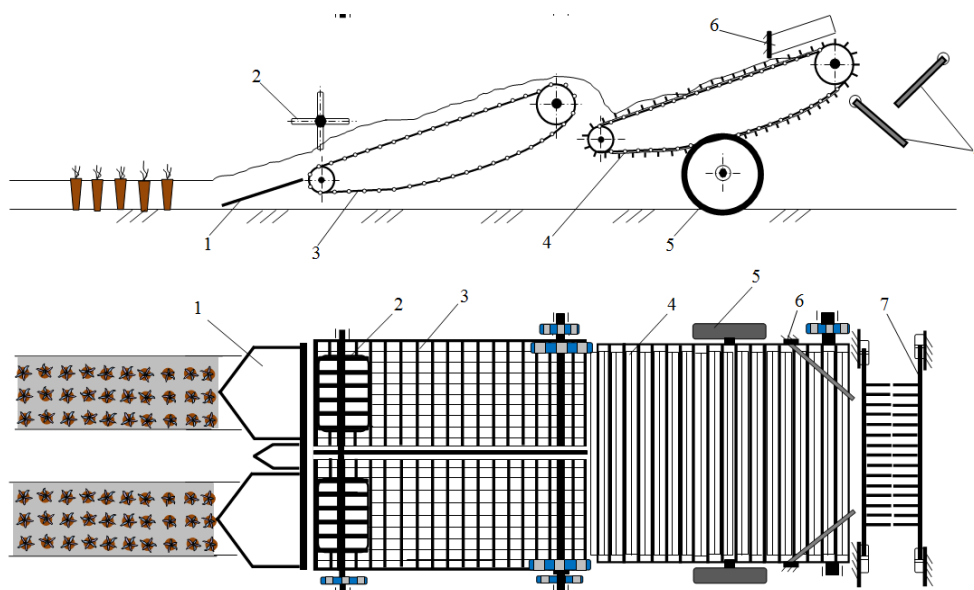


Figure 3. Construction scheme of the improved carrot digger. 1-digger ploughshares; 2-grid softener; 3rd main elevator; 4-cascade elevator; 5-wheels; 6-guides; 7-slatted couches.

The improved carrot digger above is designed for autumn harvest and is not recommended for summer harvest. Because the soil-climate conditions are hot and dry in our country in the summer season, there is a great possibility of damage to the crop. Improved carrot digger reduces manual labor and increases productivity.

For the summer season, a separate root crop harvester constructive scheme was developed (figure 4). Roots and fruits such as onions, garlic, radishes, beets, turnips, potatoes, carrots can be dug through the universal root crop harvester.

It is recommended to use the root crop harvester for harvesting the crop in the summer season, because the soil-climate conditions in the summer season are hot and dry, which may cause an increase in the level

of damage to the root-fruit when bringing the crop to the surface. One of the reasons for the increased damage is that soil clods are not broken down due to poor irrigation. In the root crop harvester, the crop is less damaged because it is not brought to the surface.

Several types of tubers can be dug through the root crop harvester. In this case, the digging depth can be changed depending on the root crop type due to the change of the part that fastens the wheel support to the main body. Also, the main blade can be set at different angles relative to the horizon. In addition, additional plows can be installed on the main plow depending on the type of root and fruit (figure 5). The disadvantage of the universal tuber digger is the use of manual labor.

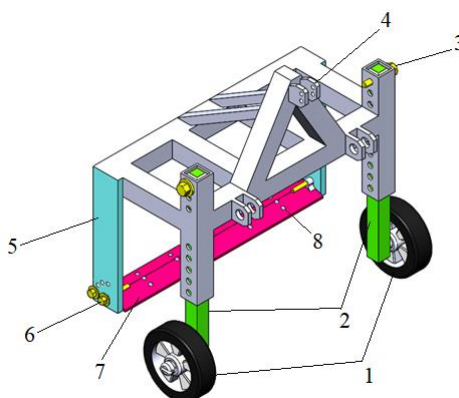


Figure 4. Construction scheme of the universal root crop harvester 1-wheels; 2-moving wheel support; 3-wheel support fastening bolt; 4-root crop harvester suspension; 5-column holding the main ploughshare; 6-bolts securing the main plow; 7-main plow; 8-Place for installing additional coulters.

And also taking into account the above and the solution to this problem, we have developed an experimental sample of a potato digger for a walk-behind tractor to carry out agricultural technological processes for growing vegetables and potatoes on small-circuit land and household plots of farm enterprises that most fully meet the agricultural conditions of the Republic of Uzbekistan.

A potato digger is a structure consisting of a body, a conveyor, a knife (ripper), lugs, a wheel axle and conveyor shafts. In front of the case, there is a rack with which the potato digger is attached to walk-behind tractors of various models. On the side walls, there are holes for fastening and adjusting the knife, as well as holes with plain bearings for installing the conveyor

shaft and wheel axle. The wheel axle has holes for positioning and fastening the lugs and a gear wheel for transmitting torque through the gear to the conveyor shaft. On the conveyor shaft, there are sprockets that engage with the conveyor bars, thereby setting it in motion. The optimal tension of the conveyor is achieved with the help of a tensioner and a driven shaft, which is installed in the grooves of the housing [6].

The tasks of the research included the determination of agrotechnical indicators (losses and damage to potato tubers) of the work of a potato digger. In the tests, the qualitative indicators of the potato digger were studied. The figure shows the process of operation of a potato digger (Fig.).



Figure 2. View of the potato digger in the workflow

Characteristics of the test conditions are given in table.1, and the test results were processed and summarized in the table. 3 and 4.

According to the program, the following indicators were determined during the testing process:

- degree of soil separation;
- loss and damage of tubers;
- traction resistance of the potato digger;
- fuel consumption.

The results obtained in the tests are shown in tables 3-4.

The test results show (Table 4) that at the tested speeds, the degree of soil separation in the experimental energy-saving potato digger was 79.8-83.8%. This is ensured by the destruction of soil clods by supporting clod-destroying devices.

4. Conclusion

This study provided a wide range of views which might be helpful for further analyses. This article can be used as a good scientific database for scientists doing scientific research related to root fruits in the field of agriculture. It will be especially useful for young scientists who are just starting to work on this topic. Important information such as which scientists are working in this field in the world, and in which countries this topic is relevant is given.

Based on the conducted scientific research work, we can give the following conclusions:

Taking into account that the average land area for each root crops farmer in Uzbekistan is 5 hectares, large root crops machines produced abroad work at a great loss for farmers. Because the price of these machines is too expensive for a small farm.

Root crops are planted in our republic in two seasons, spring and summer. Root crop seeds planted in spring are harvested in mid-summer, and summer ones are harvested in late October and early November. These two harvesting seasons differ from each other according to soil-climatic conditions. This, in turn, complicates the collection of root crops.

The improved carrot digger is designed for autumn harvesting and is not recommended for summer harvesting. Because the soil-climate conditions are hot and dry in our country in the summer season, there is a great possibility of damage to the crop. Improved carrot digger reduces manual labor and increases productivity.

It is recommended to use the universal root crop harvester for harvesting the crop in the summer season because the hot and dry soil-climate conditions in the summer season can cause an increase in the level of

root crop damage when the crop is brought to the surface. Another reason for increased damage is that soil clods are not crushed due to poor irrigation. In the universal root crop harvester, the crop is less damaged because it is not brought to the surface.

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