

**ՏԵՂԵԿԱԳԻՐ
ԲԱՐՁՐ ՏԵԽՆՈԼՈԳԻԱՆԵՐԻ**

**ИЗВЕСТИЯ
ВЫСОКИХ ТЕХНОЛОГИЙ**

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ԲԱՐՁՐ ՏԵԽՆՈԼՈԳԻԱՆԵՐԻ ՏԵՂԵԿԱԳԻՐ
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THE METHODOLOGY OF EVALUATION OF HARMFUL INFLUENCE OF WATERS

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General methodology for the evaluation (determination) of the harmful effects of water resources is not applicable in Armenia which allows the sizes of such impacts to be evaluated for each emergency situation, to evaluate the negative impact of the disaster and to recover damages to the victims. Instead, such functions are delegated to committees created for special cases who are responsible for the damage evaluation either by themselves as experts or for inviting the expert expert(s) to realize the damage evaluation function.

Key words: water, disaster, resource, precipitation, flood, damage, emergency situation, ecosystem

Introduction

Climatic disasters have sharply increased in recent years which are linked by a number of specialists with global climate change; others view them as a result of human activity. Yet in 2009 it was estimated that more than 40% of the land resources of the planet is considered dry, i.e. they are located in lowland, semi-desert and desert areas. Such situation has direct impact on a quarter of a billion people and has an indirect effect on another billion people. It should also be noted that in some regions a sharp increase in the number of natural disasters such as precipitations is recorded that exceed the capacity of the canals that often lead to waterlogging, endanger the sustainable operation of water infrastructures and the ecosystem stability [1].

Conflict settings

The key issues facing the mitigation of consequences of climate-related disasters and damages, including the damages to the population and economic entities are in the centre of attention of the executive body. This is one of the reasons that, for example, it was foreseen to envisage the concept of prevention of natural disasters (drought, hail, etc.) by the programme approved by the Government decision N 1060-A of 18 October, 2016 of the Republic of Armenia [2].

Only annual damage to the agriculture as a result of drought, hail, breeze, spring frosts and mudflows is estimated at 15-30 billion AMD in recent years. Moreover, most of the damage is caused by hail. According to the climate change scenarios, it is possible that the frequency of unstable weather accompanied by thunderstorms and hail will increase in spring and summer. In this case, the agricultural fields of the middle mountain belt between the northern and southern regions of Armenia will be the most vulnerable. At present, nearly half of the cultivated lands in Armenia are irrigated and about 70% of crop production grows there. The anticipated reduction of water resources from climate change will cause serious problems in irrigated farming [3].

The flood damage in Armenia is the largest and the gradual increase in floods and their consequences is noted. During the period from 1994 to 2007, the flood damage was amounted to \$ 41 million, including \$ 18 million in Lori region, \$ 13 million in Shirak, \$ 5 million in Tavush and \$ 2.5 million in Gegharkunik [4].

Thus, the main preferable directions towards the preventing the damages from natural climatic disasters and decreasing their results in RA include the following according to the regulation:

- Implementation of the system of insurance in agriculture,
- Improving the irrigation system through reducing the damages,
- implementation of water saving modern technologies,

- application of the hail protection structures and technologies,
- correct prediction of natural climatic disasters through application of effective warning methods to rise the level of acknowledgement of farmers in agriculture,
- promotion of local production of modern methods of struggle against natural climatic disasters in the state-private sector cooperation.

The term "Harmful effects of water" includes: rinsing, erosion, flooding, mudflows, waterfalls, coastal dams and rising of groundwater, soil swamping and salinization, emergence of new gorges, deepening of previous ones, activation of landslide phenomena, drought and the prevention of harmful effects of water is one of the problems of the RA Water Code [5].

The study of damage compensation mechanisms written down in the Water Code of Armenia is as follows: the procedure for the elimination of consequences of accidents of hydraulic structures and the order for compensation of damages are defined by the RA Government decision (Article 89) and the emergency situation caused by the harmful effects of water and the order of their prevention envisages the activity of information system about floods, mudflows, landslide and drought (with its sub-systems) and the record of emerging such risky events in State water cadaster (Article 91). The RA Water Code also envisages elaboration of programs to protect settlements, areas of economic value and the population's property from risk of floods, mudflows and landslides with the National Water Program where appropriate measures should be described.

The Code also establishes that the Government creates committees and defines the order of their activities for the recording of the damage caused by natural disasters, by the harmful effects of waters and application of their elimination measures.

The regulation on compensation for damages caused by the use of water resources contains the decision No 1861-N of 16 December, 2004 of the Government of the Republic of Armenia according to which the damage caused to the property of physical and legal persons, to the lives and health of physical persons as a result of the crash of hydraulic structures is subjected to compensation by law according to the established procedure (point 19 of the decision) [6]. Taking into consideration the size of damage caused by the accident, it shall be determined by mutual agreement of the interested parts, and, in case of disagreements, in the manner prescribed by the RA legislation (paragraph 20 of the decision).

Research results

The evaluation of risk of dangerous natural processes and events is done in several ways. The first group of methods for assessing risk can be attributed: those that practically replace the concept of risk with the concept of danger which is fundamentally wrong. Risk is the probability of undesirable consequences and danger is a potential threat. Danger, as a rule, is qualitative characteristics obtained in various ways. Among them one can mention an expert evaluation, a widely distributed scoring. Another group of risk assessment methods include those that assess the likelihood of the consequences. They are, as a rule, based on theoretical and statistical research. The basis is the assertion that risk is a function of exposure, vulnerability and security of an object from a hazardous natural impact. The latter are the most promising methods of risk assessment.

In evaluating the risk of slope processes (mudflows), the following indicators are used: the probability of an event (the frequency of mudflow processes), the vulnerability of the assessed objects (vulnerability in space and vulnerability over time), social economic indicators [7]. The proposed method for assessing the economic risk of mudflows is applicable on a small and medium scale.

To assess the risk of mudflows in economic indicators, instead of population density and population size, the values of the conditional gross municipal product in administrative regions were used. Studies have shown that even within the mudflow basin, no more than 5% of the territory falls into the zone of mudflow, and most often the affected area is 1-2% of the mudflow area. The coefficient of vulnerability of objects was used instead of the lethality factor. Therefore, the final formula for calculating the overall economic risk from mudflows is as follows:

$$R_p = P \times Y_t \times Y_s \times S \times K_y, \quad (1)$$

where R_p is the complete economic risk, P is the frequency of mudflows, Y_t is vulnerability in times, Y_s is the vulnerability in space, S is the conditional gross municipal product, K_y is the coefficient of the vulnerability of the building.

The vulnerability of the territory in space is determined by the infection of the territory by mudflows which is defined by

$$Y_s = F_{\text{mdf}} / F_{\text{tot}}, \quad (2)$$

where F_{mdf} is the area of mudflow endangered basins within the administrative regions, F_{tot} is the area of administrative regions.

The vulnerability of the area in time is determined by $Y_t = L_{\text{mdf}} / 365$, where L_{mdf} is the duration of mudflow threatened period, 365 is the number of days in a year.

The values of vulnerability index of the objects in the areas of municipal forms are accepted according to dependence from the degree of danger of mudflows, for the territories with low degree of danger - 0,01, in average - 0,02 and for high - 0,05.

The studies show that therefore it is possible to generalize certain approaches and use them in evaluating the damages by water resources [8].

The total algorithm for methodology (block-circuit) includes the following four sections continuing each other:

In block 1 the calculation of the value is determined. It may be helping the subject inside, determining the necessary occasions and evaluation of their effectiveness, the calculation of influence of possible results of ES for the further development of area which is subjected to the impact of the elements. In block 2 in accordance with the purpose set the collection of indicators is determined which characterize the social economic consequences of ES. They can be all or only separate indicators from the list shown in this Methodology.

The direct losses of budget of the governing bodies of different levels connected with unnecessary expenditures for abolition the consequences of ES and reduction of tax incomes include:

- the amount of expenditures for evacuation and resettlement of the population;
- the amount of expenditures for feeding the population;
- the amount of expenditures for rendering medical assistance to the affected population;
- the amount of expenditures for emergency rescue, emergency and recovery;
- the amount of expenditures for other urgent affairs;
- the amount of expenditure for providing communal services to the affected population;
- the amount of expenditures for providing one-time material assistance to the affected population;
- the amount of social benefits and guarantees to ensure the preservation of the living standards of the affected population;
- the amount of non-receipt of tax deductions to the state budget and budget of the territory (region).

Potential losses of budgets of the governing bodies of various levels, related to the need for expenses for the restoration of the functioning of the country's main economic systems include:

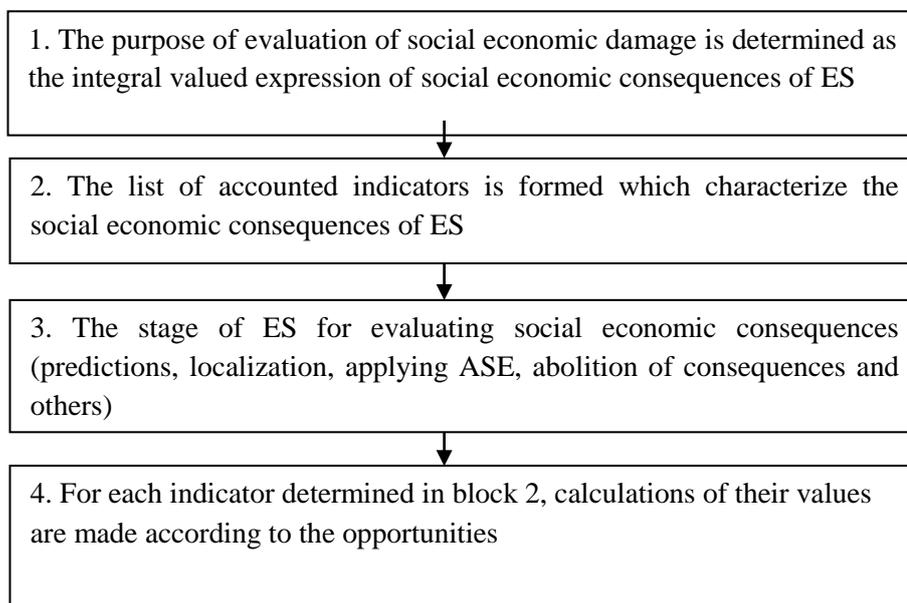
- loss of population;
- loss of labour;
- loss of social infrastructure;
- amount of damage in industry;
- amount of damage in the transport system;
- size of damage in the fuel and energy complex;
- the amount of damage in the social sphere and life welfare infrastructure;

- amount of damage in livestock;
- amount of damage in crop production;
- amount of damage in the ecology.

The summative indicator of evaluating social economic damage is the amount of damage of the region from ES.

In block 3 the certain conditions of evaluating social economic consequences from ES are determined whether this can be the stage of prediction when characteristics of ES are only suggested or this is the stage when the characteristics are already known (localization of ES carrying emergency security activity and so on), but the data was not received from the places on the values of the indicators of social economic consequences or the stage when all factual meanings of those indicators are already known or their separate components with the help of which the real picture can be estimated.

In block 4 the calculation of certain conditions determined by previous blocks to get the starting information from those chosen indicators in block 2 are shown.



Pic.1. The formation of the conditions of calculation and the calculation of evaluation of social economic consequences of emergency situations

The indicators of economic damage are calculated for each ES.

For comparative analysis the indicators are purposefully determined over the branches in accordance with calculation of the data of state statistics as follows:

For techno gene ES and emergencies the indicators are defined for the objects (enterprises):

- industry and construction which include industrial facilities associated with the use, production, storage, transportation through fire hazardous and explosive pipelines, harmful radiation substances, the exploitation of slag ponds and slag accumulators;
- energetics including hydroelectric power stations, thermal power plants, nuclear power plants, hydraulic engineering structures;
- municipal services only for water supply and sewerage facilities, central heating, heat supply systems;
- means of transport connected with transportation of dangerous luggage by cars, railway, water and air transport.

The summative economic indicator of the damage by ES is the damage by ES which presents itself the summary of the following elements:

- cost of lost fixed assets due to emergencies;
- Cost of lost materials of different resources (material storage, ready products, household things etc.) as a result of ES;
- Lost amount of production as a result of ES presenting itself the difference between planned and factual indicators of the amount of production;
- expenditures for realizing search activities in the zones of ES;
- expenditures for passing emergency rescue activities in the zones of ES;
- expenditures for passing the urgent emergency reconstructing activities for the objects suffered as a result of ES;
- expenditures for shopping, delivery and short time storage of material resources for preliminary living support of affected population;
- expenditures for the deployment and maintenance of temporary accommodation and food for evacuated affected citizens within the required period but not more than a month (including the cost of renting buildings (constructions) for living and feeding the affected people, the provision of temporary accommodation and food, the acquisition of household equipment, the purchase of building materials, the payment of works for the construction of sites (towns) for the living and food of the victims, the maintenance of sites (cities) for living and food, the cost of utilities, household expenses, the cost of food and cooking);
- expenditures for reimbursement of expenses related to the abolition of emergency situation;
- expenditures for the repayment of state housing certificates issued to citizens of the Republic of Armenia who lost their homes as a result of emergency situations;
- the expenditures of providing lump-sum material assistance to the affected citizens;
- Expenses for social payments to persons affected by the disaster.

Conclusion

The analysis of current state of disaster prevention shows that it is urgent in this sphere to clarify the state policy and to determine the composition of relevant measures based on that. The studies conducted by us show that in the main directions of prevention of damage caused by climatic disasters (including those from water resources) in Armenia and in the list of proposed solutions the development of the methodology of damage evaluation (as a document) has not found its place.

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ՋՐԻ ՎՆԱՍԱԿԱՐ ԱԶԴԵՑՈՒԹՅԱՆ ԳՆԱՀԱՏՄԱՆ ՄԵԹՈԴԱԲԱՆՈՒԹՅՈՒՆԸ

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Հայաստանում չի կիրառվում ջրային ռեսուրսների վնասարար ազդեցության որոշման (գնահատման) ընդհանրական մեթոդաբանություն, որը թույլ կտար որոշել այդպիսի ներգործության չափերը յուրաքանչյուր արտակարգ իրավիճակում, գնահատել աղետի բացասական ազդեցությունը՝ տուժած անձանց վնասները փոխհատուցելու համար: Փոխարենը, այդպիսի գործառույթների իրականացումը պատվիրակված է առանձին դեպքերի համար ստեղծվող հանձնաժողովներին, որոնք կամ իրենք պետք է ստանձնեն վնասները գնահատող փորձագետի դերը, կամ պետք է հրավիրեն փորձագետներ՝ վնասների գնահատման գործառույթն իրականացնելու նպատակով:

Բանալի բառեր. ջուր, աղետ, ռեսուրս, տեղումներ, հեղեղ, վնաս, արտակարգ իրավիճակ, էկոհամակարգ

МЕТОДИКА ОЦЕНКИ ВРЕДНЕГО ВОЗДЕЙСТВИЯ ВОДЫ

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В Армении не применяется обобщенная методика определения вредного воздействия водных ресурсов, которая позволила бы определить размеры потерь для каждой чрезвычайной ситуации, оценить отрицательное воздействие катастроф – для возмещения ущерба пострадавшим лицам. Вместо этого, осуществление таких функций делегируются создаваемым для отдельных случаев комиссиям, которые или сами должны взять на себя роль эксперта по определению ущерба, или с этой целью должны приглашать экспертов.

Ключевые слова: вода, катастрофа, ресурс, осадки, наводнение, ущерб, чрезвычайная ситуация, экосистема

THE PERSPECTIVES OF PROVIDING THE STORAGE OF IRRIGATION WATER IN THE CASE OF USING WATER COLLECTING ADDITIVES IN THE GROUND

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Taking into account that the flow of rivers in Armenia is small during the plant growth and can not satisfy the water demand of all crops, especially because of the widespread surface watering, the water leakage is high. They are also conditioned by the absence of a method for calculating parameters of irrigation regimes for crops in local conditions. At the same time, in mountainous countries, such as Armenia, there are many sand and clay basins, through which the water is filtered, causing the need to increase the irrigation frequency and the amount of water supplies. With the use of extreme storage facilities, it will be possible to significantly reduce the amount of irrigation water supplies and reduce the water supply frequency. Reducing the irrigation water supply will also help to reduce groundwater levels, leading to land degradation. This will also lead to the reduction of scattering of land plots on the lower levels.

Key words: water, irrigation, plant, ground, sand, filtration, water saving, polymer, additive, jelly

Introduction

The problem of water scarcity in agriculture is often faced not only by arid southern countries, but also by the middle zone regions. Since timely irrigation is important for the growth of plants, in conditions of water shortage, many areas that are quite suitable for agriculture stand idle or do not bring the expected harvest.

Among the promising ameliorative techniques expanding the possibilities for controlling the water regime of soils are moisture-swelling polymer additives, which repeatedly increase the volume as a result of swelling, have a high water-absorbing capacity, but do not dissolve.

For the first time, a similar idea on the accumulation of water with subsequent release into the soil was proposed by the Mexican researcher Sergio Velasco. His technological solution, called "Solid Rain" was interesting and innovative, but it did not come to the practical implementation because of the high cost of the project.

Nowadays, a moisture-swelling polymer derived from waste from the petroleum industry is often used.

In laboratory conditions, T. N. Danilova studied the water-retaining capacity of soils without additives and with applying dry additives to the soil. In the field conditions various methods of using polymer additives, their influence on the growth, development and productivity of wheat were investigated [1].

As a polymer additive she used a hydrogel. Hydrogel - a polymer that retains moisture is an environmentally safe preparation, it is non-toxic for both plants and humans. In conditions of climate change, the use of hydrogels to manage the water-retaining capacity of sandy and loamy soils seems promising. From a chemical point of view, moisture-swelling additives are insoluble polymers of a net structure. Due to the net structure, the macromolecule of the polymer is capable of swelling - absorbing a large amount of water to form a hydrogel. The amount of absorbed water exceeds the mass of the polymer itself by hundreds of times. Since swelling does not firmly bind water to the polymer molecule, plants can easily receive water from the hydrogel.

The grains of the hydrogel during the soaking swell very quickly to a coarse-grained consistency. The water absorption coefficient of hydrogel directly depends on the composition of water and soil. The hydrogel introduced into the soil improves its properties, making clay soil more

loose, and sandy soil - lumpy. The hydrogel transforms ground dust into stable large granules, protecting the soil from crust formation on its surface. Adding even a small amount of hydrogel to the ground allows not only to reduce fluctuations in soil moisture next to the root system of plants, but also increases the intervals between watering. Due to the reduction in the number of watering, nutrients and fertilizers are not washed out from the root zone, which also makes it possible to reduce the number of fertilizing. The plant itself selects moisture as much as it needs. Moreover, the surplus of moisture is in a bound state, which does not allow over moistening and rotting of the roots.

In drought-resistant terrain, on dried up soils, in mountainous terrain, on sloping fields as well as in deserts and on lands where surveying was conducted the use of hydrogel allows rational improvement of the surrounding landscape and accelerate the restoration of the natural environment for a given area. Hydrogel prevents water leakage and soil erosion, and, therefore, prevents water pollution in water dams.

The introduction of hydrogel in the soil and in the mixture simultaneously with the seeds significantly increases the germination rate, shortens the germination time, the plant grows better and develops, blooms more abundantly and longer, looks better. One gram of hydrogel can hold up to 300 ml of water, and the saturation and release of water by hydrogel are completely reversible, water and fertilizers dissolved in it are constantly in the root zone and can be used by the plant as needed. One application of the hydrogel can be used up to five years [2].

After five years, the hydrogel in the soil is completely decomposed. This is one of the serious disadvantages of hydrogel.

The hydrogel can be applied to all trees and shrubs in dry and swollen form. According to [2], when applying the hydrogel in dry form, it is possible to solve the problem partially with high groundwater. It absorbs excess moisture from the roots of plants. However, in our opinion, this method in combating high ground waters is not only inefficient, but it can also lead to the reverse effect. In the swollen gel, water remains in the soil and does not solve the problem of lowering groundwater in any way: according to the law of the bounding vessels, the place released in the ground after the hydrogel has collected moisture is filled with the same amount of water at once. The issue of reducing groundwater is solved by reducing the volume of water supplied to the soil under irrigation. An alternative way to reduce groundwater can be obtained by building sand basins with the addition of moisture-swelling polymer additives, which will play the role of drainage. The water collected there from the soil will disappear by evaporation. When analyzing the effect of reducing the amount of water supplied to the process of reducing groundwater, it is also necessary to take into account the water-holding capacity of the soil.

Water in the soil is in a complex interaction with the solid phase. The soil has a different degree of humidity. The term "moisture" characterizes the water content in the soil, expressed as a percentage of the mass of dry soil (wet weight) or the volume of soil (volumetric moisture). It is known that depending on the mobility and availability of plants, several forms of water in the soil are distinguished: gravitational, capillary, sorbet, vaporous, ground, solid, chemically bound and crystallized. Bounded waters are those ground waters that are physically or chemically related to the solid matter of rocks and therefore are immovable themselves as opposed to free gravitational waters. Directly for nourishing the plant only the gravitational and capillary waters are important, and the remaining forms of soil moisture, except for a small part of the plaque, are inaccessible to plants. Gravitational water fills the capillary pores between the structural parts, by which it moves under the influence of gravity. [3]. In [4], a mathematical model of the hysteresis of the water-holding capacity of the soil was proposed. The model describes the main and scanning curves of withers and moistening of the soil, as well as turning points. In constructing the model, a physically reasonable assumption was used that the function of the differential moisture capacity of the soil at each point on the hysteresis curves takes only two values that correspond to the sorption and desorption equilibrium of soil moisture.

The conducted studies showed that the best effect of hydrogel on the water-holding capacity of grainy sandy loam soil was noted when it was applied at a dose of 0.2%. The highest yield increase (11.2%) was obtained in the hydrogel variant introduced into the soil. Sowing in inlaid seeds also led to an increase in yield by 10.4% compared to the control. However, it has been established that it is more effective and economically justified with the use of hydrogel to inlaid seeds than to apply hydrogel to the soil [2].

One of the important parameters is the drying time of the hydrogel. To determine this indicator, plant roots were immersed in the hydrogel and then removed, placed on a flat surface in the shade in the open air at temperature of 20-21 ° C. The plants were immersed in the hydrogel at the same time. During the day, all the hydrogel samples on the plant with an open root system lost accumulated moisture. However, when the root of the seedlings is wrapped in polyethylene pellicle, the duration of preservation of the hydrogel on the roots increases many times, and as a result - the preservation of the roots, too. And with the more addition of wet peat, moisture remains up to 3-4 weeks [5].

Spheres of application of hydrogel [7]:

- Increasing the water absorbing abilities of soil;
- Decreasing the gravitation flow of moisture;
- The accumulation of moisture in condensed vapor space in soil in the regions with noticeable daily fluctuations of temperature and moisture;
- Increasing field growing of seeds;
- Inlaid seeds;
- Increasing the persistence of plants against soil drainage inlaid on seedlings of veggie plants, which demand moisture in the initial growing period;
- Increasing the effectiveness of using the fertilizers;
- Using polymers as amelioration of sands;
- Creating water holding capacity by preventing double salinity of soils with ground water;
- Applying water screens of swollen polymer in the form of depressor of ground oil vaporization;
- Condensing soil;
- Rural farming: grain crops, food grains and grasses;
- Preventing erosion and weathering of the soil;
- Irrigation of dry soils, regeneration of grazed pastures;
- Waterproof screens with the device of irrigated furrows, irrigation canals, rice checks, for accumulation of spring seasonal precipitation, for creating groundwater repositories, gravity drains and rising salt streams;
- Vegetable farming and gardening;
- Greenhouse and hothouse farming;
- Horticulture and gardening;
- Summerhouse and homestead farming;
- Growing berries and berry shrubs;
- Growing fruit trees and viniculture;
- Growing decorative trees and room plants;
- Transportation, preservation and planting of seedlings;
- Growing mushrooms;
- Floristic;
- Landscape design, greenery of towns: flowerbeds, parks, squares.
- Lawns and hydro sawing, sports grounds such as for golf, football, rugby etc;
- Agroforestry;
- Re-cultivation and regeneration of the ecology of techno genic zones, territories polluted as a result of industrial activity and atmospheric precipitation (strengthening and green planting on river dumps and water reservoirs, slopes, digging excavations, dumps, etc.);

- When creating fields under the steam (fire stop strips) in forest areas;
- Mixtures with grounds and fertilizers;

Application of hydrogel expands noticeably the opportunities of landscape design, allows to reach good results while creating the elements of landscaping. An opportunity occurs to do difficult land surveying, to prevent the slope flow and fertilize with high efficiency.

Conflict settings

Quantitative assessment of the changes in water-holding capacity of soils with introduced hydrogel and availability of accumulated moisture for root systems of plants is important for determining irrigation regimes.

Research results

The water-holding capacity of soils in the range of humidity measurements of 45-50% characterizes the moisture available for plants. The introduction of hydrogel into the soil contributes to an increase in the amount of moisture in this range. From the analysis of the water retention curves it follows that samples of sandy loam soil with the addition of a gel in an amount of 0.2 g of 100 g of soil are the most water-retaining capacity. When gel is added to soil samples, it shows that the water-retaining capacity of soils varies - the soil retains more moisture available for plants. With the onset of hot, arid weather, when the air temperature was within 28-32 ° C, the hydrogel introduced into the soil began to work. There was an improvement in the state of plants both in appearance and in biomass increment compared to other variants. With an increase in the dose of hydrogel to 0.2 g of 100 g of soil, the density of sandy soil decreases, which creates additional porosity and, correspondingly, increases the moisture capacity [2].

Voronezh State University is proposed to use a specially developed polymer in the form of small grains that are able to accumulate moisture. This sorbent is introduced into the soil together with fertilizers, and as the soil dries up, it can give up the water accumulated in its grains. According to the research group, the use of the technology developed by them "Solid Water" reduces irrigation costs twice and significantly reduces the amount of water necessary for the favorable ripening of agricultural plants. One kilogram of granulated Sorbent made by Voronezh scientists can accumulate up to half a ton of water, and the volume of the granules themselves can increase by 100 times. Upon penetration into the granule, the water binds to the walls of the sorbent and is fixed in it in the form of structured ice. When the moisture concentration around the pellets drops below the threshold value, the internal bonds of water with the sorbent begin to break, so that the liquid begins to be released from the granules into the soil. In order for the sorbent to work efficiently, the field after the granules is to be carefully poured with water. The grains store the necessary reserve of water and give it away when the soil dries up, and accumulate moisture back in proportion to the rainfall, thereby regulating the moisture content of the soil. According to scientists, the abundant and primary irrigation is sufficient to ensure that the accumulated water is sufficient for one season of growing crops. Grains can also save fields from excessive water flooding, abundantly absorbing moisture in case of too long rains. The big advantage of the new technology is that the sorbent is not washed out of the soil and can effectively provide soil with moisture for ten years. In addition to water, granules can accumulate in their water solutions of the necessary mineral fertilizers and additional trace elements, so that during the entire period of vegetative growth the root system will receive nutrients necessary for the plant. At the same time, the cost of 1 kilogram sorbent by Voronezh scientists will cost about \$ 10, which is two times lower compared to foreign counterparts. Also, the undoubted advantage of the new technology is the stability of the sorbent to low temperatures, which makes it possible to use safely "hard water" in conditions with a harsh climate. The most important advantage of the new granulated sorbent is its high economic efficiency in comparison with the traditional forms of irrigation and even super-economic drip irrigation. According to research estimates, the use of sorbent reduces at least twice the

water costs for irrigation of the soil. To that, when using granules, water-soluble fertilizers and minerals are not washed out of the soil and are consumed for a long time in the most efficient manner [6].

One of the ways of using water swelling polymeric additives is the fermentation of seeds. The aim of coating is to create a surface layer of hydrogel, which, accumulating the moisture, must support an appropriate water-nourishing regime round the seeds in the conditions of water deficit and lack of microelements in the ground. As coating the food yeast may be used. The technological process of fermentation consists of the following operations:

- Loading the seeds in the tanker of fermentation;
- Adjusting the fermentation process and moisturizing the seeds with liquor hydrogel (for 50 kg seeds 5 liter of liquor is needed);
- Gradual addition of hydrogel in the camera box and mixing with hydrogel (for 50 kg seeds 5 kg of hydrogel is needed) till a solid crust is formed round the seeds.

For effective fermentation it is necessary to use hydrogel of small grains of fraction d shorter than 0.1 mm. The shell of fermented seed material has the ability to accumulate up to 4000% out of its weight of water.

Conclusion

Moisture swelling polymeric additives, which repeatedly increase the volume as a result of swelling, can be effectively applied in agriculture, both for the cultivation of decorative plants, as well as for vegetable growing and horticulture. Particularly effective will be the use of polymer additives for the manufacture of grass coatings. However, the use of a hydrogel is not effective enough, it spoils under the influence of the sun.

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**ՈՌՈԳՄԱՆ ԶՐԻ ԽՆԱՅՈՂՈՒԹՅԱՆ ԱՊԱՀՈՎՄԱՆ ՀԵՌԱՆԿԱՐՆԵՐԸ՝ ԳՐՈՒՆՏԻ ՄԵՋ ԶՈՒՐ
ԿՈՒՏԱԿՈՂ ՀԱՎԵԼՈՒՄՆԵՐ ՕԳՏԱԳՈՐԾԵԼՈՒ ԴԵՊՔՈՒՄ**

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Բուսածի շրջանում Հայաստանի գետերի հոսքը փոքր է և այն չի կարող բավարարել բոլոր մշակաբույսերի դաշտերի ջրապահանջը, նամանավանդ, որ համատարած կիրառվող մակերեսային ջրման եղանակի պատճառով մեծ են ջրի հոսակորուստները: Դրանք պայմանավորված են նաև տեղական պայմանների համար մշակաբույսերի ոռոգման ռեժիմների պարամետրերի հաշվարկման մեթոդի բացակայությամբ: Միևնույն ժամանակ, լեռնային երկրներում, ինչպիսին է Հայաստանը, շատ են ավազային և կավավազային գրունտները, որոց միջով ջուրը ֆիլտրացվում է , որի պատճառով անհրաժեշտություն է առաջանում ավելացնել ոռոգման հաճախականությունը և տրվող ջրի քանակությունը: Ջուր կուտակելու հատկանիշներով օժտված պոլիմերային հավելանութերի օգտագործմամբ հնարավորություն կընձեռնվի զգալիորեն կրճատել ոռոգման նպատակով մատակարարվող ջրի ծավալը և կրճատել ջրամատակարարման հաճախականությունը: Ոռոգման նպատակով մատակարարվող ջրի նվազեցումը հնարավորություն կտա նաև նվազեցնել գրունտային ջրերի բարձրացման մակարդակը, ինչը հանգեցնում է հողերի աղակալմանը: Դա կբերի նաև առավել ցածր նիշերի վրա գտնվող հողատարածքների ճահճացման մասշտաբների նվազեցմանը:

Բանալի բառեր. ջուր, ոռոգում, բույս, գրունտ, ավազ, ֆիլտրացիա, ջրի խնայողություն, պոլիմեր, հավելանյութ, դոնդող

**ПЕРСПЕКТИВЫ ОБЕСПЕЧЕНИЯ СБЕРЕЖЕНИЙ ОРОСИТЕЛЬНОЙ ВОДЫ ПУТЕМ
ИСПОЛЬЗОВАНИЯ В ГРУНТЕ ВОДОАККУМУЛИРУЮЩИХ ДОБАВОК**

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Сток рек Армении мал и он не может удовлетворить потребность в воде всех возделываемых культур на полях, тем более, что из-за применения поверхностной системы полива - потери воды значительны. Большие потери также обусловлены несовершенством методов расчета орошения культур в местных условиях. В то же время, в горных странах, как Армения, много песчаных и суглинистых грунтов, сквозь которые происходит интенсивная фильтрация, из-за чего возникает необходимость увеличения частоты орошения и объема подаваемой воды. Способность аккумуляирования воды полимерных добавок позволяет сократить объемы и частоту орошения, при их внесении в грунт. С целью орошения уменьшение подаваемой воды также дает возможность уменьшить уровень поднятия грунтовых вод, что приводит к засолению земель. Это приведет также к масштабному уменьшению заболачивания земель, находящихся на наиболее низших отметках.

Ключевые слова: вода, орошение, растение, грунт, песок, фильтрация, сбережение воды, полимер, добавка, гель

THE WATER SUPPLY SYSTEM OF AYGEHOVIT COMMUNITY

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The source of the water supply system of Aygehovit community is the aquifer situated about 9 km east to the settlement. The outlet carries seasonal weak changes. According to the measurements in spring 2017, the results are about 2 liters/s. The community's daily regulating 2 reservoirs (DRBs) are envisaged to be implemented in 2 turns. The first-turn reservoir will satisfy the water demand of the consumers of the community and the second, prospective basin is calculated to cover fire and emergency water intake. These reservoirs will be located near the north-eastern slopes of about 565m height near the community. Water will be distributed among consumers through a deadlock polyethylene pipeline. In order to calculate the amount of water consumed by the population, installation of water meters is envisaged with their polymeric-type wells.

Key words: water, spring, water line, outlet, water regulatory reservoir, distribution system

Introduction

In the 20th century the world population has enlarged four times and the amount of freshwater taken from the natural environment increased for eight times and the amount of extracted water will have increased by 40% till 2025 [1, 2].

The problem of water supply in small settlements with the increase of water shortage is of great importance. Water balance has been made for the territory of Ashtarak town for the first time and predictions on the changes in water supply sources are based on the global climate change [3,4].

The territory of Aygehovit community of Kashatagh administrative district is located on the left bank of Aghavno River between the altitudes of 500-540 m above the sea level.

The climate of the study area is temperate and relatively dry all year round. Since the measurements of the climatic parameters have not been performed in the area and there are no exact data available, their values are presented according to the analogous location. Specifically:

The average annual air temperature is 13, the absolute minimum is -17°C , the absolute maximum is 43°C . The average annual temperature on the soil surface is 16°C . In the studied area the maximum depth of soil cooling is 37 cm. During the year the winds blowing to the north-east dominate with annual average speed of 1.2m/s and winds of at more than 15m/s are registered for not more than 3 days. Annual precipitation is 400-450 mm, 136 mm per day maximum. The heaviest precipitations are observed in May with average monthly and maximum daily precipitation of 102 mm and 78 mm respectively. The amount of precipitation in the form of snow is 54 mm. The soil is light clay partly cultivated, partly sterile.

It will be necessary to carry out complex measures in the direction of ensuring the quality of the service, the security and technical calculations of water supply system, pipelines, springs, the maintenance of the main road reconstruction, its uninterrupted operation, the replacement of internal worn-out networks in Artsakh.

In the sphere of water supply and water remove the following tasks are actual:

➤ The investment of the newest cleaning technologies and materials with the purpose of satisfaction of more strict sanitary requirements towards the water quality [5],

- Application of effective schemes in water supply nets and the usage of automated control systems in them [6],
- In the difficult conditions of landscape and seismic danger the study of the proposal of efficient project solutions and the presence of appropriate normative documents for realising safe exploitation [7].

The waters of mountain springs are rarely polluted with technical effects. They are mostly clean and qualitative and meet the requirements for drinking water. The water supply systems fed by them are profitable.

When groundwater quality does not comply with standards [8, 9], cleaning measures should be provided.

When using surface water flows for water supply, serious problems with water purification occur during spring and autumn floods when alluvial sediments and pollutants are increasing in the current. This problem is especially important in mountainous and foothill settlements [8, 10].

In terms of water quality it is important to determine the water pollution index by hydro chemical and hydro biological indicators. Based on the results of the work, the waters are usually divided into seven categories according to their pollution index: very clean, clean, moderately polluted, polluted, dirty, very dirty and extremely dirty [11, 12, 13, 14].

Conflict results

The practice of exploitation of gravity pressure systems in mountainous regions shows that their design stage the peculiarities of a number of hydraulic regimes are not taken into account as a result of which the water pipe can not be operated with calculated outlets and serious difficulties occur in the water supply. Aygehovit community, although not having much population, is mostly placed in a fairly large area. It stretches along the ground road to the south with more than 2.5 km.

Water consumers are about 160 people living in the community who are included in 45 individual farms. The community has school with about 25 pupils and a club. There are 100 heads of cattle and over 600 livestock in individual farms.

Research results

The study and localization of water quality policies and water quality guidelines set by the water quality standards, water use areas, water quality standards, water pollution control, wastewater treatment standards, drinking water directives and other relevant documents have an important importance and need to be taken into account in building or rebuilding new water supply systems.

Relief conditions in Aygehovit community enable the water supply design network to be implemented in one zone as the difference between the maximum and minimal points of the area constructed by one and rarely two-storied private houses is 40m.

Depending on the number of the floors of the private houses 10-12m free pressures are foreseen nearby.

We had carried out engineering and geological studies for Aygehovit community water supply system design and construction in June 2017.

The geological clippings of the surveyed area include the lower and upper chalk stones, which are represented by sandstones, limestones and grenades. These rocks are located in the study area on a small section of the main water pipe while in the remaining areas they are covered with aluvial and deluvial sediments of the fourth age which are represented by sandstones, cobblestones and glaciers. The survey area is considered to be dry from the

hydrogeological point of view. Most of the atmospheric precipitations are absorbed into the grounds of deluvial origin and they finish near Aghavno River or feed the groundwater horizon. Groundwater levels reach 50-60m in the Aghavno Valley. Physico-mechanical phenomena have not been observed in the study area.

Based on field and archive studies, four layers of soil are separated into the study area.

- Sandy clay with crushed mixtures up to 25%, capacity 0.5-1.0 m.
- Crumbs, sandstone filling up to 25%, capacity 1.0-1.5 m.
- Limestone strongly impacted by sandstones, with a capacity of 0.5 m.
- Limestone powder, capacity more than 5 m.

Summarizing the results of the survey, we can say that geological conditions of the area are sufficient for construction. Ground water level is in huge depth. Physico-geological properties are expressed by the wind beaten main rocks. The area surveyed in terms of seismic zones is included in the 2nd zone. The score is IX according to UN-64 scale.

Aygehovit community water supply system is offered from 2 main joints: external and distribution water supply systems, including daily routing basin (DRB). This system will get water from an existing artesian source having 972 m absolute score. From the head site it is envisaged to arrange the spring water intake with 3 water intake cabins and deliver it to the catchment basin with wet and dry cabins by collector which is secured by joints corresponding to the norms.

From the head of the water line it is foreseen to realise the intake for watering the animals with 3/4 CB pipe on which a lock is installed.

Water will be drilled from the water intake basin with polyethylene pipes of 1 MPa pressure resistance of 63 mm in the downstream and upstream and 75 mm in diameter which reaches DRB having 558 mm absolute point. The total length of the water supply outlet is 9.1km from the catch basin. It has 4 hubs, 7 emptying and 6 air pumps fitted with appropriate nodes.

The water will be out with pipes of 13m average length from each emptying wells to the adjacent natural ponds.

Water users are about 160 people in the community included in 44 individual housings. The community has a school with around 25 pupils. The distribution net has been designed with polyethylene PE810 type pipes resisting 1 MPa pressure. Steel pipes have been used in several joints the total length of which has relatively small percentage compared to the net.

The network is mainly designed with $d_e = 63, 90, 110, 125, 140, 160$ mm diameter pipes. Their total length is about 4.9 km. This size does not include pipes with total length of 900 m (average 20m per tube for each consumer) for home connectors. However, their deployment volumes have been taken into account (Fig. 1).

The sewage depth of water lines and outlets exceed the calculated depth of penetration of negative temperatures in the soil in order to avoid the heat deformations of the pipelines, especially its undesirable effects (due to lack of data, the depth of analogous freezing in the given area was approximated by 37 cm).

The water supply net is furnished with four water supply and water disposal wells (See general layout - section 2, page 2). The network or its separate branches, if necessary, can not only be completely disconnected through the valves located in them but they also regulate the flow of water to the consumers.

The network has 2 fire protection taps installed in the corresponding wells.

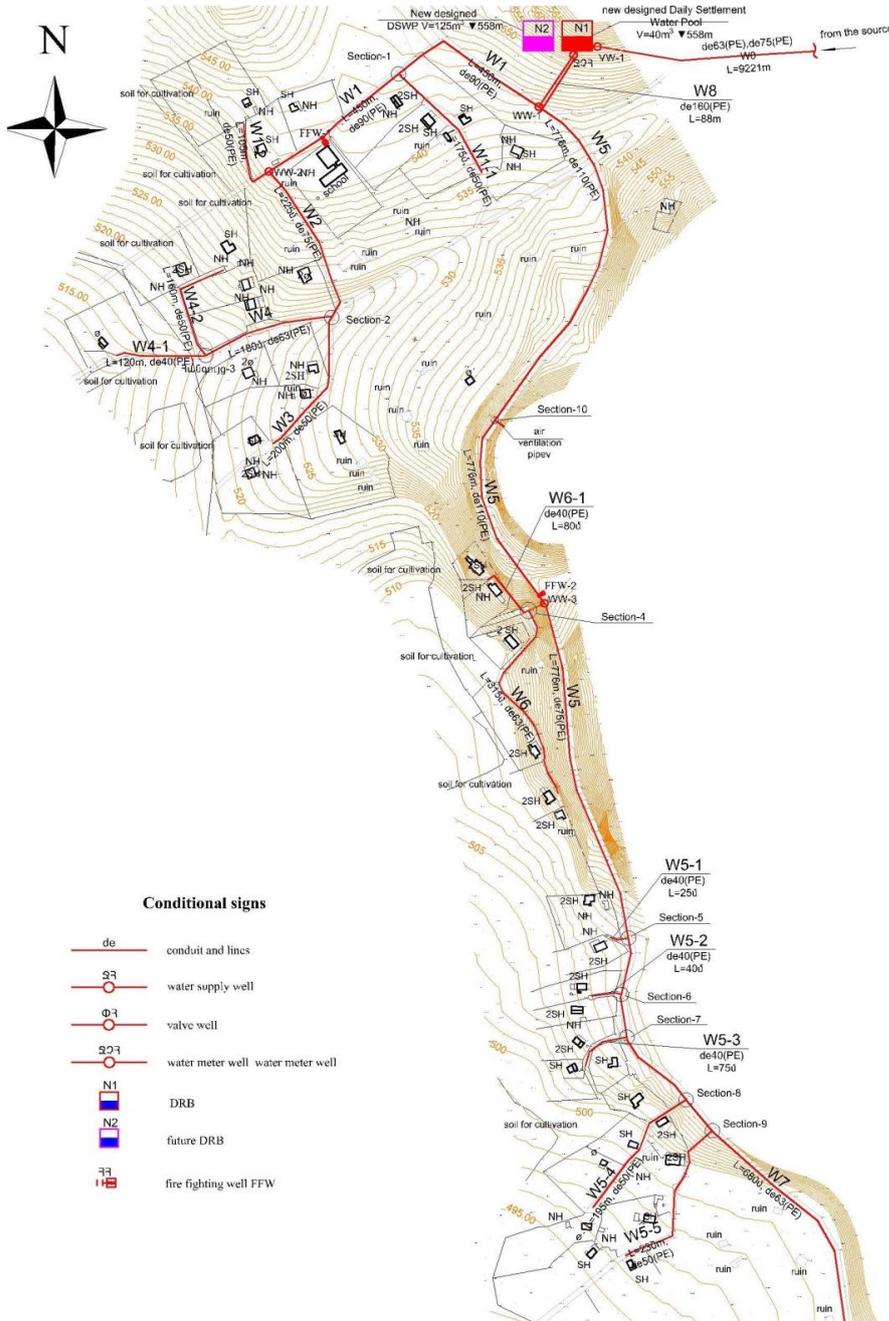


Fig. 1 The water supply system of Aygehovit community

For the calculation of the amount of water consumed by the population which is designed in the water supply net 35 water measuring standard silicat sandy wells are foreseen including 25 wells with 1 water meter, 10 wells with 2 water meters. The diameter of all water meters is 15 mm, except for the water line going to school where $d = 20$ mm diameter water meter is installed.

The metering devices are placed in wells at a height of about 20 cm above the floor which allows them to be protected from the effects of accidental waters gathered on the floor.

In case of necessity of transformation or prophylactic work during the operation of the water supply network, the faucets of the heads of the entrances which are supplied from the network or the particular section shall be kept open. These requirements must be ensured particularly in the implementation of exploitation and construction and during the completion of

the works as well while testing, washing, disinfection of water lines and other pipelines are being done which may cause the above-mentioned undesirable phenomenon - the creation of a vacuum in the network.

After the installation and before the operation of the pipelines, as a rule, the working pressure must be exceeded by 5% with hydraulic testing.

According to the current norms, the total volumes of regulating, fire, emergency and DRB components of the regulatory reservoir of the day were fulfilled.

It is predetermined to provide the calculated volume of the DRB with 2 separate basins. In order to solve the drinking water problem of the community quickly, the construction of one 40m³ basin has been envisaged. Secondly, the promising DRB will be built later.

The first DRB is a reinforced concrete basin equipped with water access, overflowing, drainage and exit lines. Valve and water meter wells are designed for access and exit water lines (FF-1 and DPM) with their valves respectively for inside mounting. A ventilation system and the access hole with its own door are installed on the roof of the DRR. The sanitary zone of the basin has been blockaded by 2.5 m height fence, which has access to the source water line. Guard room is not provided.

First of all, the reservoir floor is 558 m and the height is 3.5 m which the hydraulic calculations of the deadline internal and distribution network pipes originate from.

After completion of the constructive works, the regulation and reservoir dams as well as other elements of the system will be subjected to hydraulic testing after which they should pass through the solvent of 50 mg/l calcium hypochlorite concentration (chloride) for 24 hours of disinfection.

Such measures should be periodically implemented while exploitation according to the existing norms.

DRB drainpipe has been brought to the main irrigation ditch. When cleaning a pool with a chlorine solvent, it is necessary to warn the community's residents not to use the irrigation ditch for a few hours as the polluted water may cause serious damage to crops.

For the population, the water use norm was first adopted for 150 l/ day per inhabitant and 100 l/day and 60 l/ day respectively for large and small cattle. But the community, as it was mentioned before, has not yet had a master plan by which the further promising development of community's population would have been predicted for the next 20-25 years, so based on the normative requirement of the documents the coefficient to increase water use norms was adopted.

It is considered that unforeseen and possible unavoidable losses from the network are taken into account.

The number of simultaneous possible fires in the community, according to seismicity of the area, is one. The total output of external and internal firefighting components, depending on the village population, is 5 l/sec. Among residential and public buildings located within the village only for the school building an internal fire of 5 l/sec is set out which is taken into account in the calculations. The diameters of the water lines coming from the two fire hydrants intended for the territory of the community were calculated by these values.

Conclusion

Aygehovit community water supply system is offered from 2 main units: water supply and distribution systems. In the headwater, the abstraction is arranged by a spring with a 3-hollowed water intake. Water will be drilled from the water intake basin with polyethylene pipes of 1 MPa pressure resistance of 63 mm in the downstream and upstream and 75 mm in

diameter which reaches DRB having 558 mm of absolute point. It is foreseen to install 4 hubs, 7 emptying and 6 air pumps fitted.

The reconstruction of the Aygehovit community water supply system will provide sufficient reliability for exploitation and efficient management indicators.

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ԱՅԳԵՆՈՎԻՏ ՀԱՄԱՅՆՔԻ ԶՐԱՄԱՏԱԿԱՐԱՐՄԱՆ ՀԱՄԱԿԱՐԳԸ

Հ.Վ. Բայունց

Շուշիի տեխնոլոգիական համալսարան

Այգեհովիտ համայնքի ջրամատակարարման համակարգի սնման աղբյուր է հանդիսանում բնակավայրից դեպի արևելք մոտ 9 կմ հեռավորության վրա գտնվող քահրիզային աղբյուրը: Դրա ելքը, սեզոնային թույլ փոփոխություններ է կրում: Համաձայն 2017թ. գարնանը մեր կողմից

կատարված չափումների այն կազմում է շուրջ 2 լ/վ: Համայնքի օրական կարգավորիչ 2 ջրամբարները (ՕԿՋ) նախատեսվել է իրականացնել 2 հերթով: Առաջին հերթի ջրամբարով կբավարարվի համայնքի սպառողների ջրապահանջը, իսկ երկրորդ, հեռանկարային ավագանը հաշվարկված է հակահրդեհային և վթարային ջրապահանջը ծածկելու համար: Այդ ջրամբարները կտեղադրվեն համայնքին հարակից հյուսիս-արևելյան բլրալանջի՝ 565մ նիշին մոտիկ տարածքում: Ջրօգտագործողների միջև ջուրը բաշխվելու է պոլիէթիլենային խողովակաշարերից կազմված փակուղային ցանցի միջոցով: Բնակչության կողմից սպառվող ջրաքանակի հաշվառման համար առանձնատների կից նախատեսված են տեղադրել ջրաչափեր՝ իրենց պոլիմերաավազային տեսակի հորերով:

Բանալի բառեր. ջուր, աղբյուր, ջրագիծ, ելք, օրվա կարգավորիչ ջրամբար, բաշխիչ համակարգ

СИСТЕМА ВОДОСНАБЖЕНИЯ НП АЙГЕОВИТ

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Источником системы водоснабжения населенного пункта Айгеовит является родник, находящийся примерно в 9 км к востоку от поселка. Его расход имеет сезонные слабые изменения. Согласно измерениям, проведенным весной 2017г., они составляют 2 л/с. Строительство 2 водохранилищ дневного регулирования планируется осуществить в 2 очереди.

Резервуаром суточного регулирования первой очереди планируется удовлетворение водопотребности жителей общины, а перспективный резервуар второй очереди рассчитан на покрытие противопожарных и аварийных потребностей. Эти Резервуары будут расположены на северо-восточном склоне холма в 565-метрах от общины. Вода между водопользователями будет распределяться через тупиковую сеть, составленную из полиэтиленовых труб. Для расчета количества воды, потребляемой населением, предусматривается установить водомеры в собственных домах со своими люками полимерорезервуарного вида.

Ключевые слова: вода, родник, ватерлиния, водохранилище дневного регулирования, водохранилище, распределяющая система

THE CHANGES OF CHEMICAL COMPONENTS OF MINERAL WATERS OF ARTSAKH AS EARTHQUAKE PROGNOSTIC

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As groundwater is considered as a seismic process indicator, the purpose of the study was to detect and assess the direct link between the changes in the chemical composition of the earthquakes and groundwater. A systematic monitoring of the chemical composition of the investigated water has been carried out in the hydrochemical and analytical laboratory of the RA Ministry of Emergency Situations, "Eastern Seismic Protection Service" SNCO. A sample of the monitoring was served in particular the mineral water called "Ttu Jur" of Stepanakert suburb.

Studies show that hydro geochemical indices of underground waters are characterized by complex time-based changes in acid-base conditions, mining, macro- and micronutrient concentrations. The latter confirm the obvious changes in the composition of groundwater during the survey period.

Key words: seismohydrogeochemistry, earthquake, underground water, hydrocarbon, magnesium, sulfur, photoelectrocalorimetric, ion meter

Introduction

Earthquakes and especially its crust researches show that earthquakes are permanent and regular phenomena.

Earthquakes belong to the form of the internal energy of the earth, the results of which are evident abruptly, while their preparatory period lasts for years.

It is known that during the strong earthquake, energy from 10^{19} to 10^{25} erg is produced. According to Professor P.F. Nikiforov 10^{25} is equivalent to 22 billion simultaneous shooting of cannons of 16 inches, or for Verney (Almat) 9.1 magnitude earthquake of 04. 01. 1911 the simultaneous voltages of Dnepr HPS of 226 years running is necessary (assuming its capacity of 50 MW) to get the power [1]: A question arises: is it possible to predict Earthquakes beforehand? when, where, what magnitude? These issues continue to be one of the most important and most problematic issues of modern seismology, and science has some success in this area. By means of special equipment, the smallest earth crust is recorded on seismic stations. The observations have shown that before the earthquake, a number of phenomena occur in the surface of the Earth, first of all, expressed in the presence of electromagnetic currents and the increase in radioactive materials in mineral waters, and especially the amount of radon [2]. Studies have shown that indicators of "earthquakes stat" can be the strange behavior of wildlife, dogs, cats, rats, serpents, lizards, and fish on the eve of the earthquake as well (even two days before) [1].

The progress of science gives less space to unsound assumptions, gives realistic explanations to horrific phenomena of nature and elaborates ways to avoid their devastating activity.

Set of the problem

The article presents qualitative characteristics of earthquake symptoms, based on the principle of periodicity of seismic activation. The purpose of the research was to find out the nature of changes in the behavior of the chemical composition of underground waters in relation to strong earthquakes.

Research results. According to the observations and researches of scientists, it was clear that not only the changes in the earth crust are the prognostics of coming earthquakes, but also the changes of chemical components of ground waters, the ionosphere etc. For this purpose a hydro geochemical and analytic laboratory was opened in the NKR department of RA MES National Service in 2002.

In the laboratory permanent observations are realized which is a systematic control over observed water's chemical components. We work mainly with the mineral water "Ttu jur" near Stepanakert, the permanent observation of chemical component of which gives information about the current seismic situation.

Moreover, those changes of chemical components are the pointers of observed anomalies. In the laboratory the changes of chemical components of 11 ions are determined (Ca^{2+} , Mg^{2+} , HCO_3^- , Cl^- , SO_4^{2-} , NO_2^- , NO_3^- , NH_4^+ , Fe^{2+} , Cu^{2+} , F^-) and other parameters as well.

In the observed water example the following parameters were determined quantitatively He , pH , Ca^{2+} , Mg^{2+} , HCO_3^- , Cl^- , SO_4^{2-} , NO_2^- , NO_3^- , NH_4^+ , Fe^{2+} , Cu^{2+} , F^- :

The results from analyses were elaborated with Seishelp and Advance Grapher computer programs and appropriate tables were formed.

The content of Helium (He) was determined by special instrument which can determine the solved helium in the watercolor from $5 \cdot 10^{-6}$ % to $5 \cdot 10^{-1}$ %. Along with Helium the temperatures of air and water were determined and air pressure as well. The main measuring instrument for Helium concentration was magnetic charging indicator (ИНГЕМ):

The concentration of Ftor ion (F^-) was determined by Eonic Expert pH-meter-ion meter instrument. The changes of the most mobile, very sensitive and most electromechanical elements of Ftor ion can be the prognostic of seismic events.

The content of Copper ion (Cu^{2+}) was determined by photo-electro-calorimetric way which, interacting with starch, signet salt, ammonia and nitrate diethyl carbon formed w liquid of yellow color.

We stopped the decision about the concentration of copper ion (Cu^{2+}) in "Ttu jur" in 2016p dependent on the circumstance that during the whole period of researches its quantity hasn't changed and no connection was noticed between certain ion quantity and the earthquakes observed in the region.

pH (environment) was determined by the pH-ion meter, a production of *Eonic Expert*.

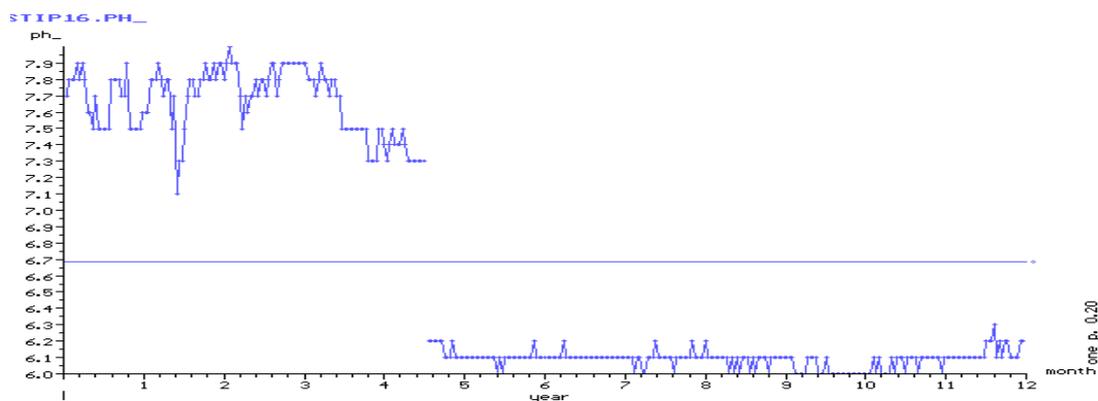


Fig.1. pH (environment) change

The quantitative analysis of Hydrocarbon ion (HCO_3^-) was realized by titrimetric way. For the titrating the strong acid 0,1N was used as fix anal and as indicator methyl orange was used.

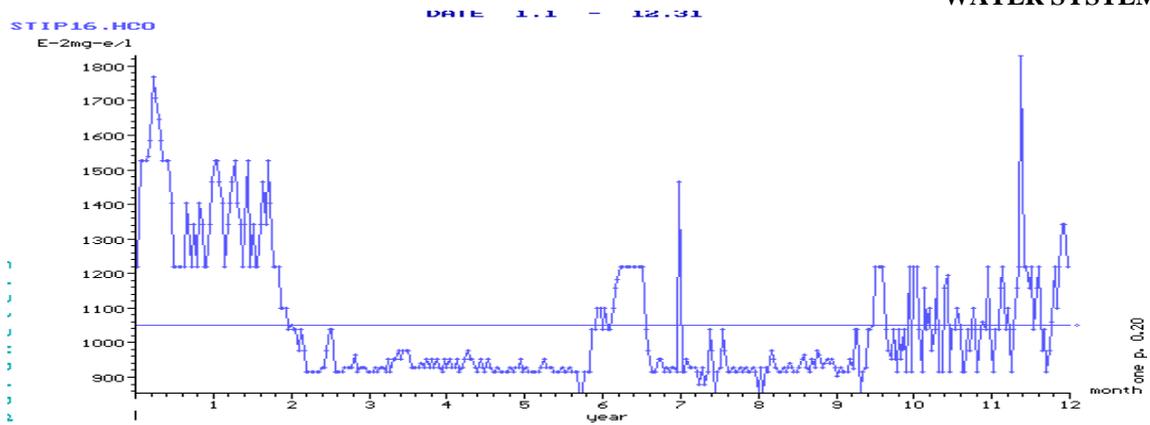


Fig.2. The change of concentration of hydrocarbon ion

The quantitative analysis of Chloride ion (Cl^-) was done by silver-metric method. For titrating we must use the liquid of silver nitrate ($AgNO_3$) 0,02N.

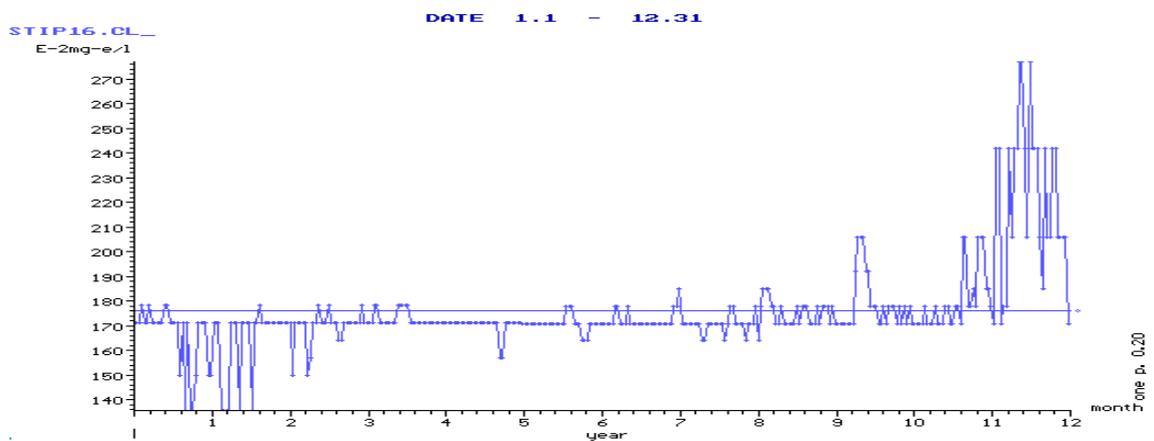


Fig.3. The change of concentration of Chloride ion

The content of Calcium ion (Ca^{2+}) was determined by complexonometric method using trillion B fix anal for titrating. As a indicator it is necessary to use murexid.

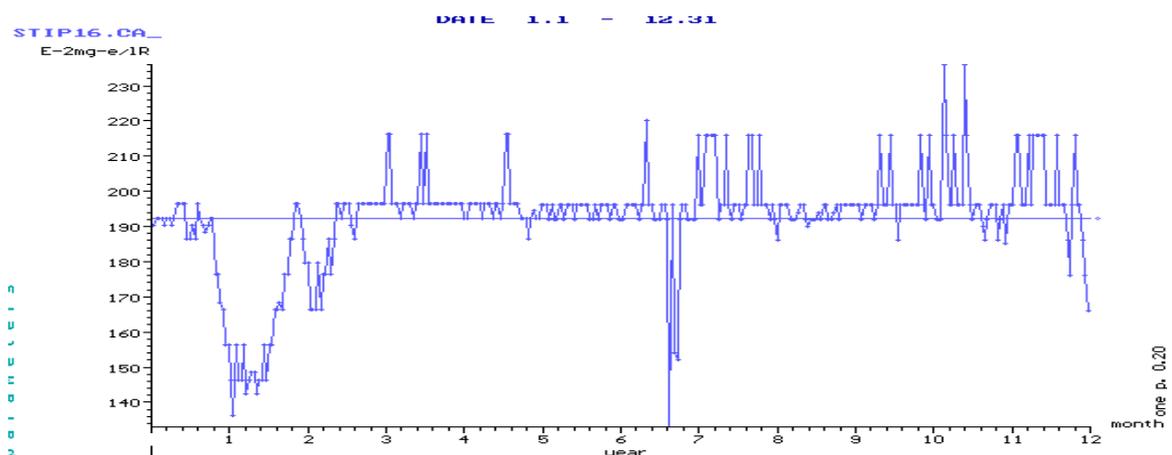


Fig.4. The change of Calcium ion concentration

The content of Magnesium ion (Mg^{2+}) was determined by calculation method taking away the content of calcium from general roughness, and for titrating using trillion B fix anal, and as indicator using erichrome.

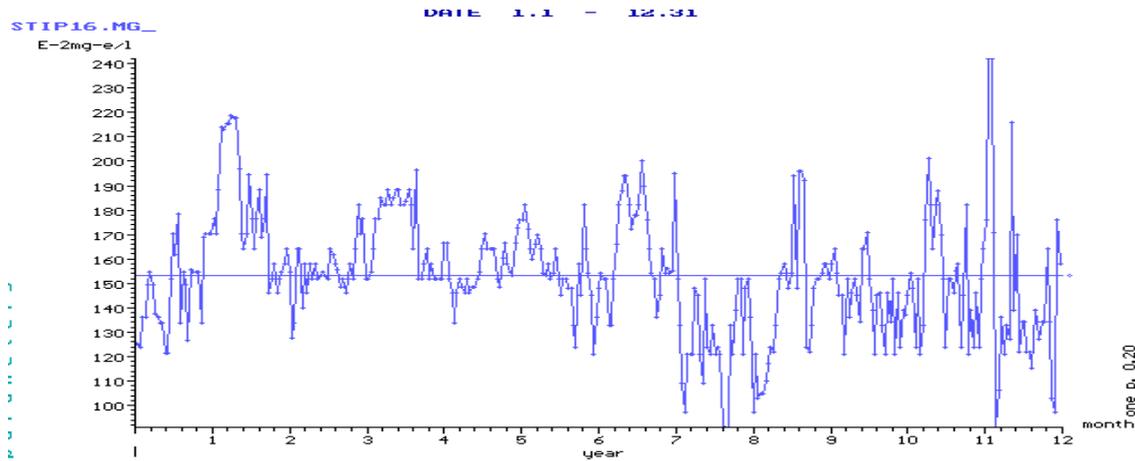


Fig.5. The change of Magnesium ion concentration

The content of Sulfur ion (SO_4^{2-}) was determined by titter metric method for tittering using lead nitrate [$Pb(NO_3)_2$] liquid of 0,1N.

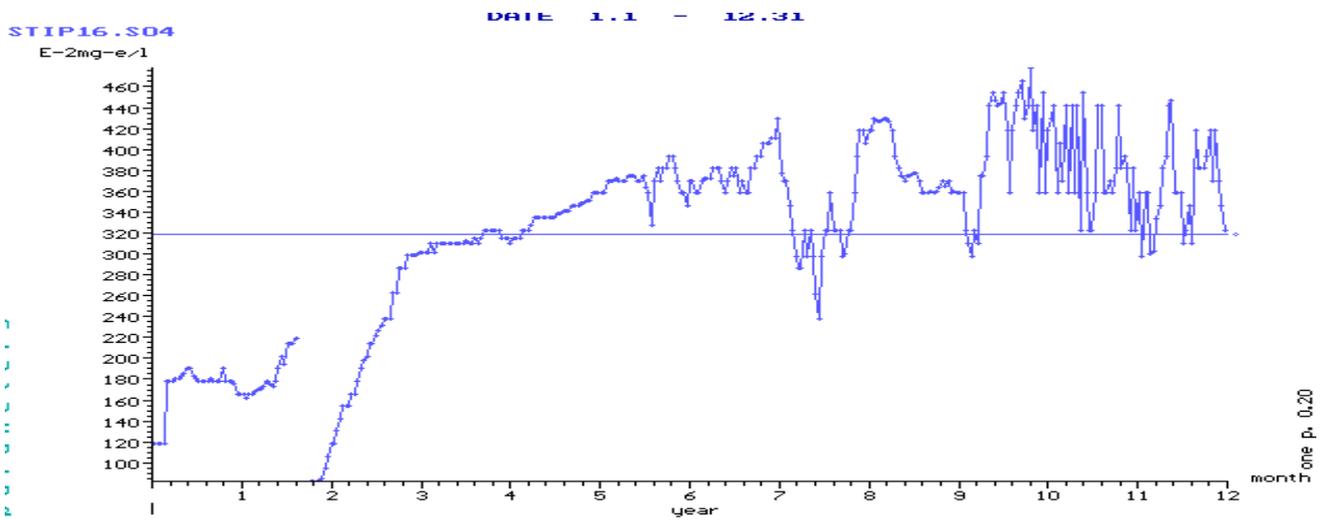


Fig. 6. The change of Sulfur nitrate concentration

The content of Nitrate ion (NO_3^-) was determined by photo-caloric-metric method thus using sodium salicylate, which, interacting with nitrate ion by sulfuric acid had formed yellow liquid.

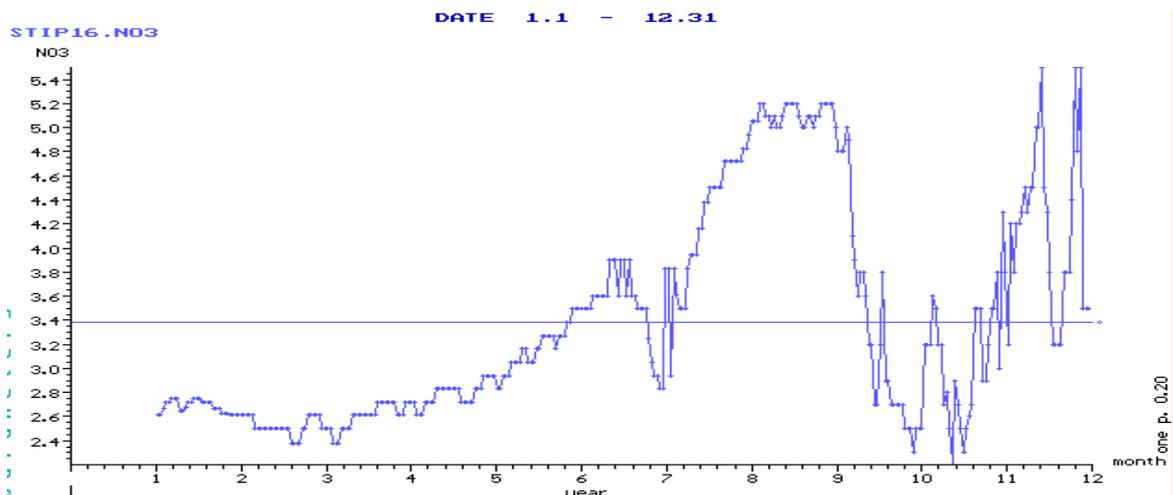


Fig.7. The change of Nitrate ion concentration

To determine the content of Nitrate ion (NO_2^-) Gris's reactive was used.

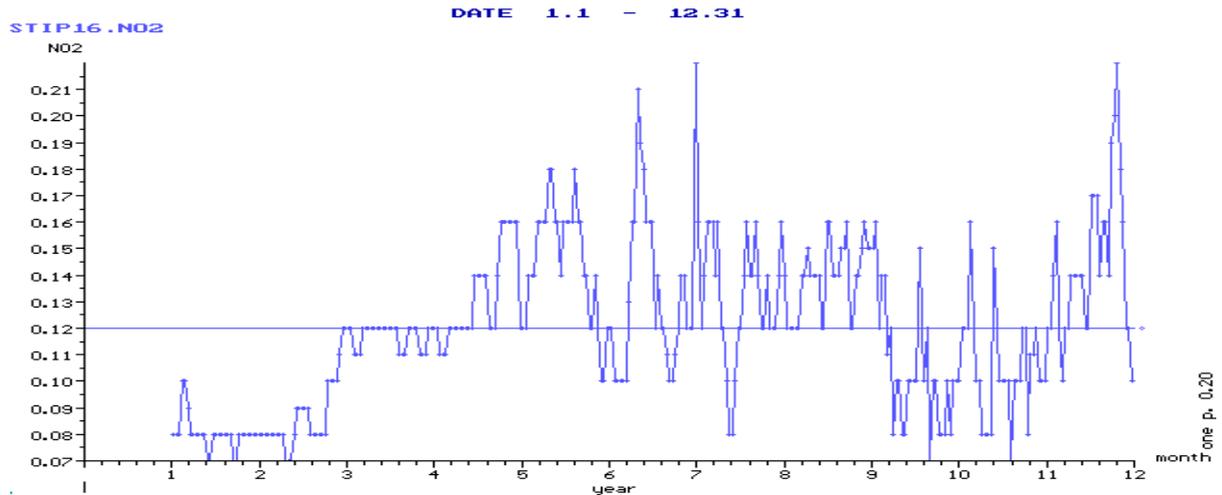


Fig.8. The change of Nitrate ion concentration

The content of ammonium ion (NH_4^+) was determined by photo-electrical calorimetric method. Nessler's reactive was used, which interacting with ammonium ion had formed mercuric-ammonium yodium liquid of yellow color.

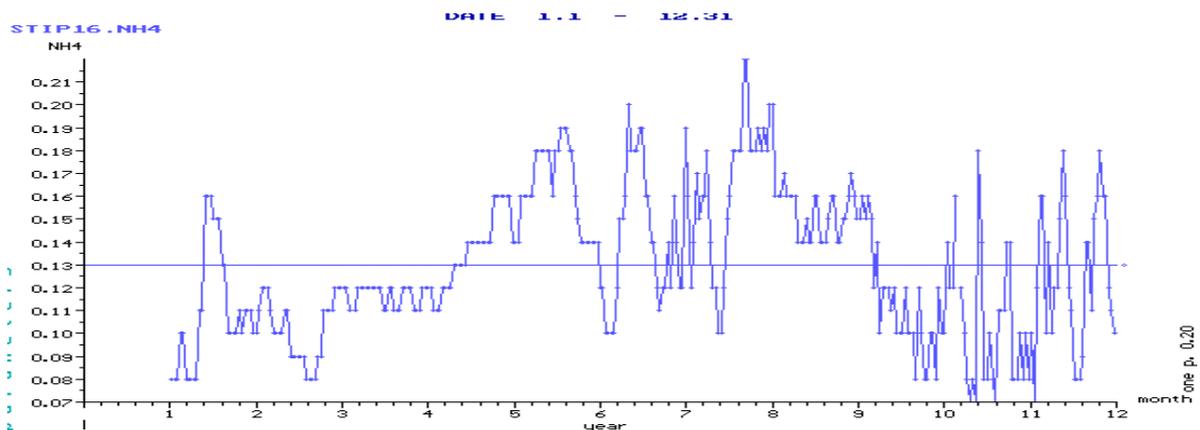


Fig.9. The change of ammonium ion concentration

The content of Iron ion (Fe^{2+}) was determined by the same instrument, which, interacting with salt acid, rhodium and ammonium per sulfur, had formed red colored liquid.

Table 1

Results from analyses

N/N	Parameter	Average cost(mg/l)	Maximum cost, max (mg/l)	Minimum cost, min (mg/l)
1	2	3	4	5
1	Ca^{2+}	192	236	133
2	Mg^{2+}	153	242	91.0
3	HCO_3^-	1052	1830	854
4	Cl^-	176	277,0	135.7
5	SO_4^{2-}	319	478	82.0
6	ph	6,68	8,0	6,0
7	NO_3^-	3.38	5,5	2.20
1	2	3	4	5

WATER SYSTEMS

8	NO ₂ ⁻	0,12	0,22	0,07
9	NH ₄ ⁺	0,13	0,22	0,07
10	Fe ²⁺	0,15	2,4	2.25
11	F ⁻	0,03	0,67	0,35

In 2016 46 regularities were noted between the connections of values of water parameters analyses by AEA laboratory and the earthquakes timing registered by “Stepanakert” complex station which were expressed by the changes of concentrations of HCO₃⁻, Magnesium Mg²⁺, Sulfur SO₄²⁻, Helium He, Calcium Ca²⁺ in water. On the data received after the elaborations of registered seismic events the list of earthquakes happened in the region was formed.

Below more typical examples are given

Table 2

The list of earthquakes noted in 2016

N	lat	long	yy	mm	dd	M	hh	mm	ss	Region
1	2	3	4	5	6	7	8	9	10	11
1	38.02	43.17	2016	1	7	3.6	02	02	42	Turkey
2	40.03	48.40	2016	1	8	3.15	00	45	54	Azerbaijan
3	38.42	45.07	2016	1	9	2.4	11	15	57	Iran
4	39.13	44.56	2016	1	11	2.75	02	43	25	Iran
5	39.01	48.27	2016	1	12	4.0	02	39	17	Azerbaijan
6	39.18	48.03	2016	1	12	2.1	17	33	55	Iran
7	39.40	47.55	2016	1	22	3.5	10	43	17	Iran
8	39.40	47.55	2016	1	22	3.5	10	43	17	Iran
9	35.55	53.12	2016	1	26	4.0	04	56	44	Iran
10	38.27	45.03	2016	2	4	2.95	15	53	08	Iran
11	39.42	46.07	2016	2	7	2.0	15	50	52	NKR
12	39.03	45.49	2016	2	11	2.15	02	32	25	Azerbaijan
13	40.24	45.49	2016	2	14	2.65	14	05	07	Azerbaijan
14	39.19	46.13	2016	3	6	1.95	18	02	58	Armenia
15	41.06	44.27	2016	3	9	3.1	12	13	20	Armenia
16	40.17	47.12	2016	3	10	2.2	10	12	40	Azerbaijan
17	40.13	46.51	2016	3	11	1.5	11	40	44	NKR
18	40.56	44.23	2016	3	24	2.7	03	55	04	Armenia
19	40.16	48.45	2016	3	24	3.2	14	09	02	Azerbaijan
20	37.15	47.14	2016	3	24	3.85	19	52	58	Iran
21	40.37	46.54	2016	3	29	2.35	15	37	18	Azerbaijan
22	38.25	46.37	2016	4	1	2.55	09	11	13	Iran
23	40.46	48.11	2016	4	2	3.35	19	06	44	Azerbaijan
24	40.26	46.03	2016	4	4	1.95	05	06	31	Azerbaijan
25	38.53	48.39	2016	4	6	3.1	00	15	01	Azerbaijan
26	39.54	48.28	2016	4	10	2.9	10	33	03	Azerbaijan
27	39.37	48.13	2016	4	14	3.3	07	45	08	Azerbaijan
28	41.51	49.18	2016	4	19	3.9	20	22	45	Azerbaijan
29	40.06	48.15	2016	8	1	5.6	08	46	37	Azerbaijan
30	38.43	48.36	2016	8	3	2.8	15	15	04	Azerbaijan
31	40.04	46.44	2016	8	30	1.9	15	32	25	NKR
32	39.35	46.27	2016	9	29	1.5	12	51	58	NKR
33	38.28	45.07	2016	10	2	2.5	20	10	03	Iran
1	2	3	4	5	6	7	8	9	10	11
34	41.58	44.07	2016	12	4	3.0	23	24	45	Georgia

35	38.39	44.28	2016	12	6	2.9	20	54	45	Iran
36	38.09	48.01	2016	12	10	2.3	01	56	09	Iran
37	38.37	43.48	2016	12	11	4.3	22	42	54	Turkey
38	42.33	43.24	2016	12	12	3.7	23	37	17	Georgia
39	40.54	48.30	2016	12	13	4.2	00	32	59	Azerbaijan
40	38.31	43.52	2016	12	13	3.7	01	32	00	Georgia
41	41.50	46.10	2016	12	20	4.3	16	40	48	Georgia
42	38.42	48.19	2016	12	20	1.9	21	33	17	Azerbaijan
43	40.6	45.59	2016	12	22	2.4	09	56	18	NKR, Qarvachar
44	38.24	45.24	2016	12	26	2.9	01	55	24	Iran
45	40.27	48.10	2016	12	26	2.8	11	51	54	Azerbaijan
46	39.07	46.10	2016	12	26	1.8	12	46	15	Armenia

In the Graphics of 10-11 we see the changes of Sulfur ion concentration on the eve of earthquakes in 01.08.16, M=5,6 in Sabirabad in Azerbaijan and in 30.08.16, M=1,9, in Askeran region, NKR, in 26.12.16. M=2,8 in Qyurdamir in Azerbaijan, and in Qajaran, Armenia, M=1,8.

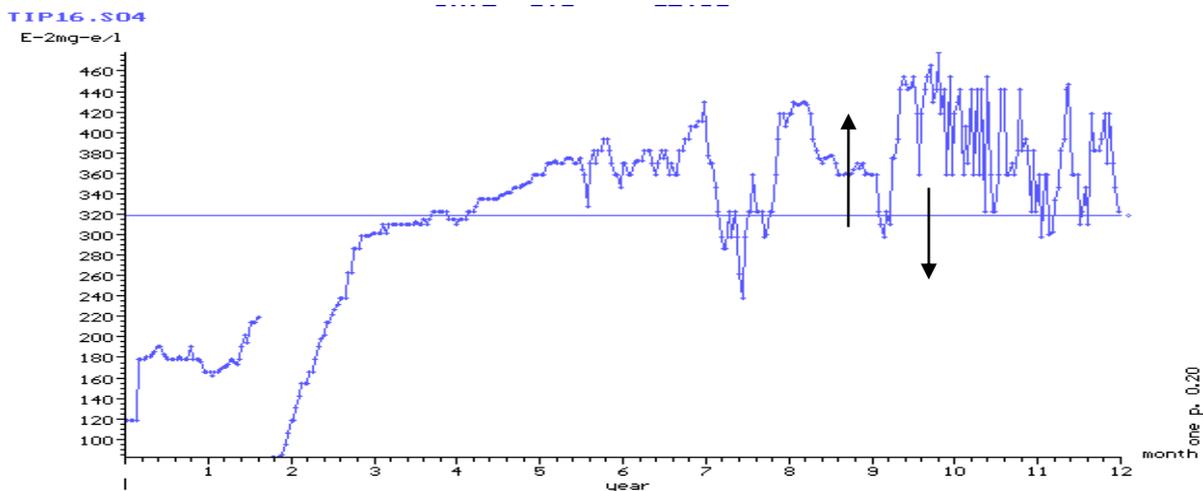


Fig.10. The change of Sulfur ion concentration

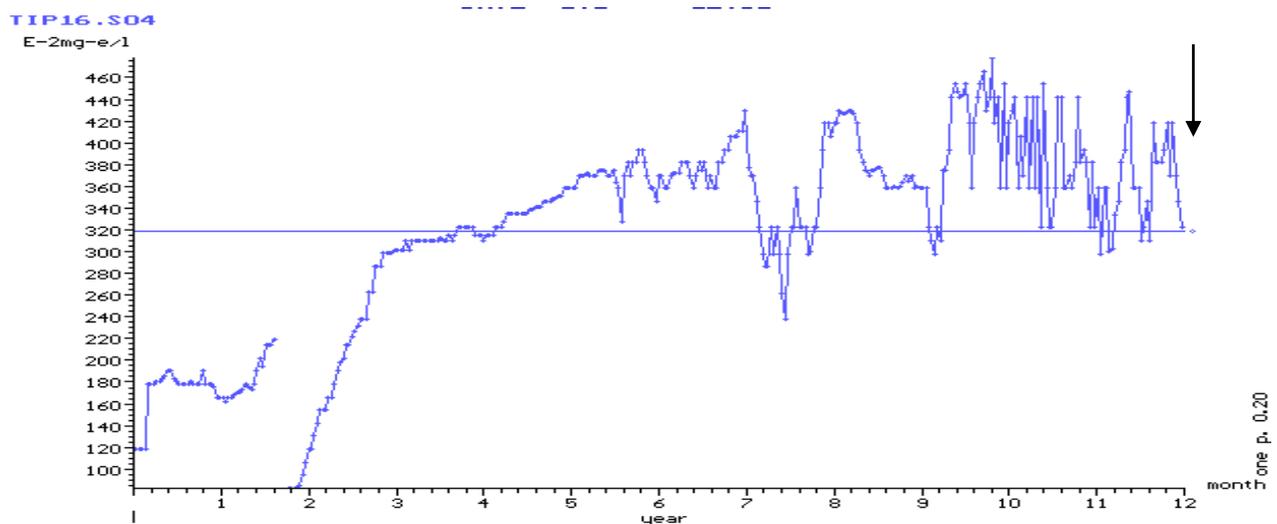


Fig.11. The change of Sulfur ion concentration

In Graphics 12-13 we see the changes of hydrocarbon ion concentration on the eve of the earthquake in 08.01.16, M=2,4 in the territory of Turkey and NKR, in 01.08.16, M=5,6 in Sabirabad region of Azerbaijan and in Askeran region, NKR, in 13.12.16, M=4,2 in Shamakhi, Azerbaijan.

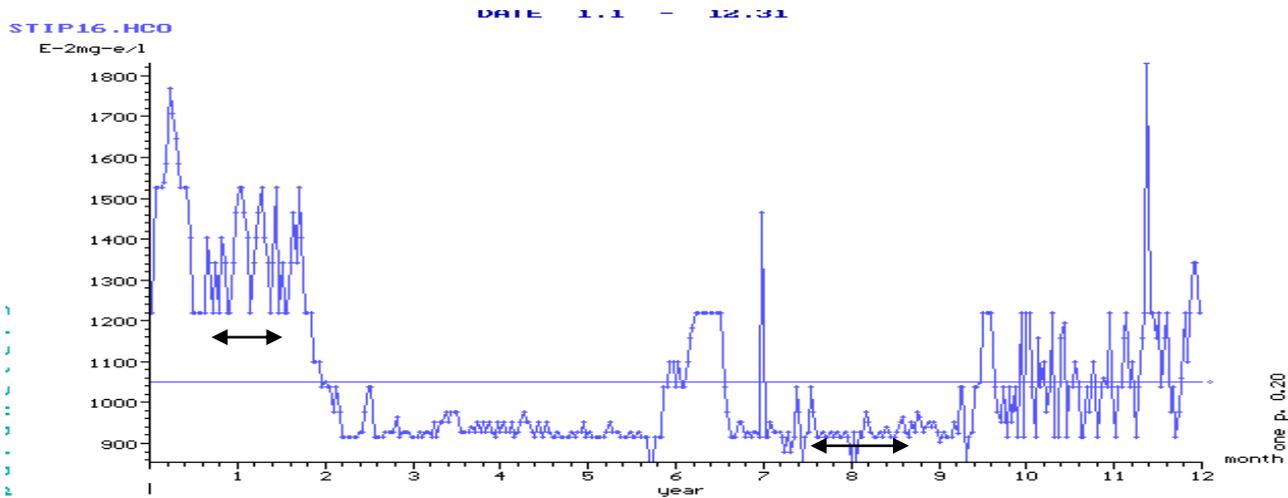


Fig.12. The changes of hydrocarbon concentration

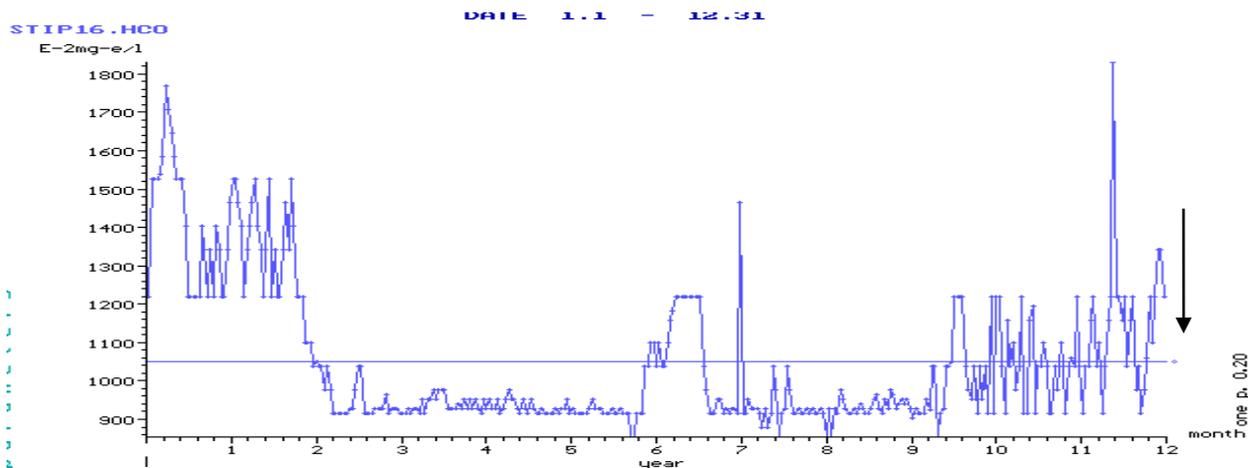


Fig.13. The change of hydrocarbon ion concentration

In Graphics 14-15 the change of Magnesium ion concentration is shown on the eve of earthquakes in 08.01.16 M=2,4, NKR and Azerbaijan towns of Sabirabad in 01.08.16. M=5,6 and Lerik in 29.12.16 M=3,8.

The earthquake of 3.6 magnitude in 2017, March 6, in Qarvachar region became the reason of exploring the mineral water near Zuar of the same region.

On March 7 mineral water of “Taq jur” was analyzed for the purpose of investigating the changes of water parameters values. As a result the rise of HCO_3^- , magnesium Mg^{2+} , Sulfur SO_4^{2-} ions concentrations was noted.

On March 22 the mentioned water was also analyzed. The results received can't be compared with the results got on March 7 as these values were lower.

We hope that the coordination and completion of these two waters laboratory researches will help us to give more complete description about the connection between the chemical changes and registered seismic events.

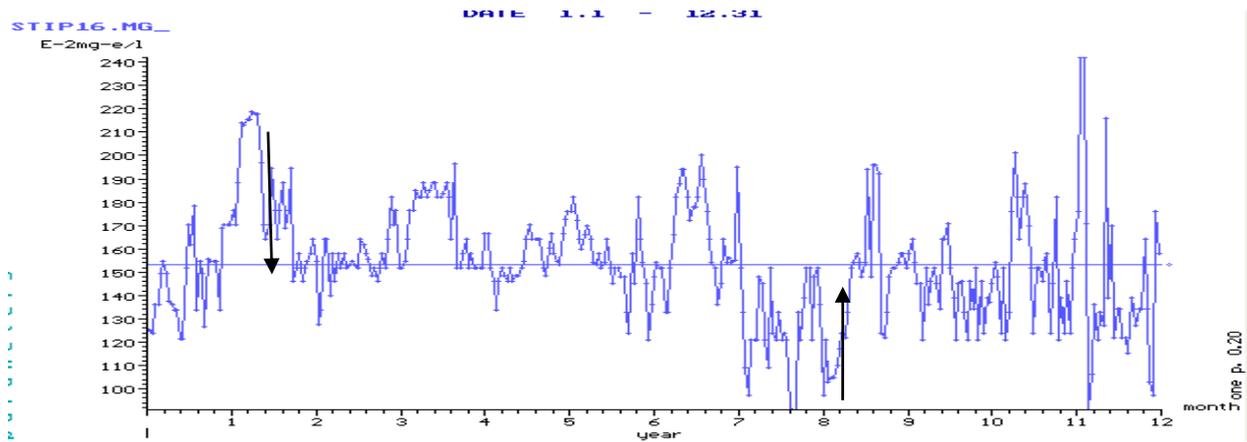


Fig.14. The changes of Magnesium ion concentration

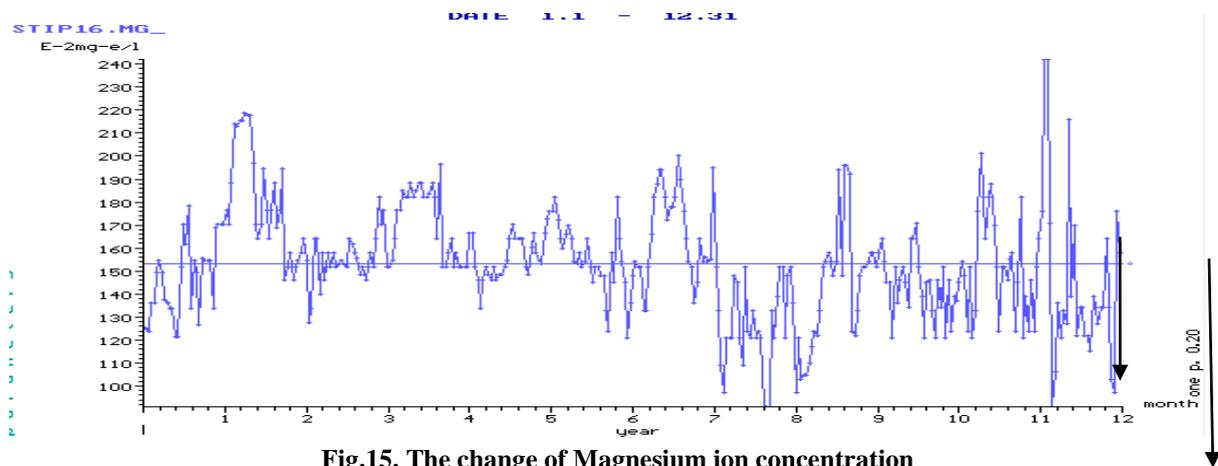


Fig.15. The change of Magnesium ion concentration

Conclusion

In the article we represented shortly the hydro geochemical characteristics of ground waters in the Artsakh Republic region. Starting upon the results of hydrodynamic processes research, the following graphics of chemical elements were achieved as HCO₃, SO₄, Mg. Typical effective signs determining the macro components of mineral waters are considered to be the rising or falling of the concentrations of latters which allows us to fix the anomaly changes of water component.

We may judge from the micro component content changes of mineral waters that in Artsakh region the geodynamic processes are active.

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ԱՐՑԱԽԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ՀԱՆՔԱՅԻՆ ԶՐԵՐԻ ՔԻՄԻԱԿԱՆ ԲԱՂԱԴՐՈՒԹՅԱՆ ՓՈՓՈԽՈՒԹՅՈՒՆՆԵՐԸ ՈՐՊԵՍ ԵՐԿՐԱՇԱՐԺԻ ՆԱԽԱՆՇԱՆ

Թ.Գ. Վերդյան¹, Ռ.Ս. Հակոբյան²

¹ՀՀ ԱԻՆ Սեյսմիկ Պաշտպանության Արևելյան Ծառայություն ՊՈԱԿ

²Շուշիի Տեխնոլոգիական Համալսարան

Քանի-որ ստորգետնյա ջրերը համարվում են սեյսմիկ պրոցեսների ինդիկատոր, հետազոտության նպատակն էր ի հայտ բերել ու գնահատել երկրաշարժերի և ստորգետնյա ջրերի քիմիական բաղադրության փոփոխությունների միջև անմիջական կապը: Արցախի Հանրապետության գործնական իրականացնող ՀՀ ԱԻՆ «Սեյսմիկ Պաշտպանության Արևելյան ծառայություն» ՊՈԱԿ-ի հիդրոերկրաքիմիական և անալիտիկ լաբորատորիայում իրականացվել է մշտադիտարկում՝ հետազոտվող ջրերի քիմիական բաղադրության

սիստեմատիկ վերահսկողություն: Մշտադիտարկման նմուշ է ծառայել մասնավորապես ք. Ստեփանակերտի արվարձանի «Թթու Ջուր» կոչվող հանքային ջուրը:

Ուսումնասիրությունները վկայում են, որ ստորգետնյա ջրերի հիդրոերկրաքիմիական ցուցանիշները բնութագրվում են թթվահիմնային պայմանների, հանքայնացման, մակրո- և միկրոէլեմենտների կոնցենտրացիաների բարդ տարածաժամանակային փոփոխություններով:

Վերջիններս հաստատում են հետազոտությունների իրականացան ժամանակահատվածում ստորգետնյա ջրերի բաղադրության ակնհայտ փոփոխությունները:

Բանալի բառեր. սեյսմոհիդրոերկրաքիմիա, երկրաշարժ, ստորգետնյա ջուր, հիդրոկարբոնատ, մագնեզիում, սուլֆատ, ֆոտոէլեկտրոկալորիմետրիկ մեթոդ, իոնաչափ

ХИМИЧЕСКИЙ СОСТАВ ИЗМЕНЕНИЯ МИНЕРАЛЬНОЙ ВОДЫ В АРЦАХСКОЙ РЕСПУБЛИКЕ КАК ЗНАК ЗЕМЛЕТРЯСЕНИЯ

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Так как подземные воды являются индикатором сейсмических процессов, целью исследования являлось выявление и оценка непосредственной связи между землетрясением и изменениями химического состава подземных вод. В основу работы положены результаты мониторинга подземных вод на территории Республика Арцах, образцом для мониторинга служит в основном минеральная вода □Туджур□ города Степанакерта. В результате мониторинговых исследований, производимых на территории Республики Арцах, зафиксировано изменение химического состава подземных вод, связанное с влиянием сейсмических событий.

Гидрохимические показатели подземных вод характеризуются сложными пространственно-временными изменениями минерализации, кислотно-щелочных условий, содержаний концентраций макро- и микрокомпонентов. За период мониторинга, исследования подтверждают очевидные изменения в составе подземных вод.

Ключевые слова: сейсмология, водород, землетрясение, подземные воды, гидрокарбонат, магний, сульфат, фотоэлектродиметрический метод, ионометр

QUALITATIVE REQUIREMENTS OF THE PRODUCTION OF POMEGRANATE AND CHERRY COMPOTES

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The concept of the state policy in the field of healthy nutrition of the population provides for the improvement of the systems of cultivation, storage and processing of fruits and berries along the total way of their progress, from the field to the consumer. The use of high-quality ecologically clean raw materials, modern technologies and equipment is especially actual which ensure maximum preservation of nutrients, organoleptic advantages of the canned product thus increasing the expiration of the products. The analysis of the condition and processing of fruit and berry raw materials showed that scientists and specialists are seeking opportunities to preserve and use the harvested crop rationally thus ensuring that the competitiveness of the final product without using highly efficient various technologies is impossible. Consequently, the considered problem of development of biochemical and technological scientific bases of production of high-quality raw materials and technologies for its storage and processing throughout the technological cycle is topical and of great practical importance as well, especially in a market economy [1, 2].

Over the past few years, a large number of national brands have been identified in the vegetable and fruit canned market. Currently, vegetable and fruit cans are widely represented in the trade network.

Aim of the research - to study the biological value of cherries and pomegranate and the technology of producing cherry and pomegranate compotes.

Key words: quality, canned products, normative demands, degustation

Introduction

Fruit, berries and vegetables are processed by the fruit and vegetable industry including canning, vegetable-drying industries and the production of quick-frozen products. The word “can” originated from the Latin “conservo”, that means “save.” By the word **canned food** we understand food products of vegetable or animal origin which are specifically processed for long-term storage. The processing of fruits, berries and vegetables is important in preserving the harvest, ensuring the uninterrupted supply of food for the population during the years. The production and scientific organizations set the task to increase the quantity of processing fruits, berries, fruits and vegetables, to expand the varieties and to improve the quality of products. The use of high-quality ecologically clean raw materials, modern technologies and equipment that ensure maximum preservation of nutrients, organoleptic advantages of the product is of great importance that increases the expiration of the products. Timely solution of the tasks set will contribute to optimizing the nutrition of the population of Artsakh, increasing the competitiveness of domestic canned products in the local and foreign markets.

The problems of producing high-quality raw materials maximizing their storage during preservation and processing remain relevant. One of the determining factors for improving the complex system of fruit and berries production is the scientifically grounded approach to raw materials as an object of storage and processing, the quality of which is determined by the genotype of the variety, environmental, soil, climatic and technological factors. Varietal composition of raw materials is constantly updated which raises new tasks of selection of adaptive varieties for the region, development of varietal technology of cultivation, storage and processing [1, 3, 5].

Aim of the research - to study the biological value of cherries and pomegranate and the technology of producing cherry and pomegranate compotes.

Methodology: Compotes are dessert products made of fruits and berries filled with sugar syrup, hermetically sealed in containers and sterilized.

Increased sugar content and the use of fresh high quality raw materials for the preparation of compotes make them valuable in terms of nutrition. Therefore, the production of compotes is widespread. Compotes are made by almost all kinds of fruits and berries. Their name usually corresponds to the name of the species of fruit and berry raw materials. Apricot, cherry plum, grape, plum, cherry, raspberry, pomegranate, peach and pear compotes are especially of high food quality.

A variety of compotes are fruit filled with fruit juice and fruit in wine. Concentrated compotes from partially dehydrated fruits and berries are considered to be new kinds of compotes. Compotes from the fruits of stone crops are produced without seeds and from the pome fruits without ovary with skin or without skin for children and dietary food.

The most important technological task in the manufacture of compote from stone fruits is the improvement of the methods and devices used in their processing and allowing to increase the permeability of cells to accelerate the diffusion of syrup into fruits and to improve the quality of the ready compote on this basis[6].

From a mixture of fruits and berries, whole and cut into halves, slices or cubes various compotes-assortments are produced. Not only cultural, but also wild-growing raw materials such as red bilberry, cranberries, blackberries, gooseberries, cloudberries and ash berries are widely used for compotes as well.

The most suitable for compotes are sugary varieties having beautiful fruits with high taste qualities, with a good aroma, not boiling and not changing the color while being processed.

It is known from literature sources that high temperature and long term heat treatment deteriorate the quality of compotes during which the chemical composition and organoleptic parameters of the ready product change [7].

Therefore, a relatively short technological process of preparing compotes allows to preserve biologically valuable and active substances, natural color, taste and smell of fruits and berries practically without any changes from which the compotes are made. The content of dry substances in compotes is from 20 to 28% due to the introduction of sugar compotes into the recipes, so their caloric content is higher in comparison with juices. The higher the dry content of the raw material is, the lower the sugar consumption is when preparing the syrup. The main sugars are glucose and fructose and invert sugar which is formed from sucrose as a result of hydrolysis during heat treatment under the influence of organic acids contained in the raw material. Organic acids are present in amounts ranging from 0.2 to 1.3%, depending on their amount in the feedstock and also on the concentration of sugars in the syrup. Fiber is contained in small amounts (0.2-0.5). The total ash content of compotes is also insignificant and ranges from 0.2 to 0.5%.

Sometimes compotes are prepared from quick-frozen raw materials or sterilized semi-fabricated products if the fruit has retained its shape, has not changed its color and has not lost its elasticity. In this case, they often produce assorted compotes. Fruits and berries should be healthy for making compotes, without wormholes and spots, mechanical damages and other defects. They are removed in technical maturity. Unripe fruits contain many acids, they are poorly colored and therefore reduce the quality of compotes; overripe fruits are easy to boil during sterilization. The diameter of the fruit (for canning as whole fruit) should not be more than 45 mm.

Cherry and pomegranate compotes belong to the assortment group III "Canned fruits and berries (fruit)". Compote is a canned drink, made from fresh berries of cherry or pomegranate, filled with sugar syrup and sterilized. The chemical composition of cherry and pomegranate compote is enriched with vitamins of group A, B, C, E, and also PP. In addition, the benefits of these compotes is the high content of such useful macro and micro elements as calcium, potassium, iron, phosphorus, magnesium, sodium and beta-carotene. The benefits of cherry and pomegranate compotes are not only in the chemical composition of the product, but also in the excellent properties of the drink.

On the table you see the machine-technological scheme of producing the compotes.

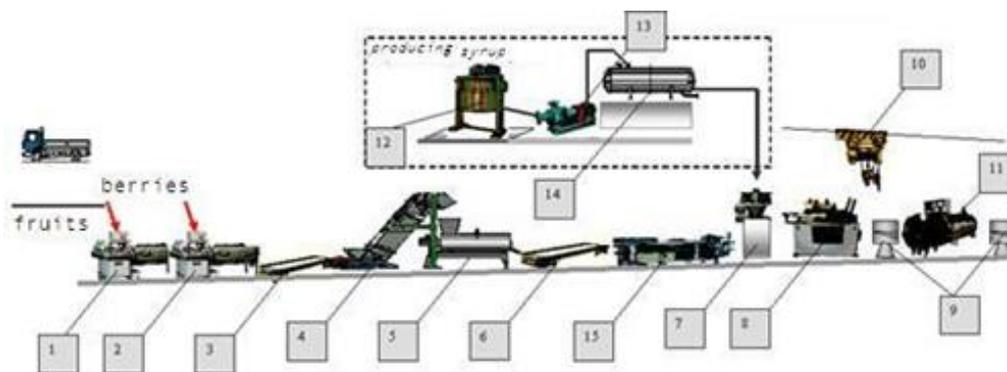


Fig 1. Machine-equipment scheme for the production of “Dietary and low caloric stewed fruit”.

1-washing machine KYM, 2 - washing machine KMI, 3 - inspecting transporter TCH, 4 -transporter elevator TЭ, 5 - auger steaming, 6 - filling transporter, 7 - filler for syrup, 8 - canning machine Ж7-YMT-6, 9 - installation of autoclavecontainer for uploading and downloading, 10 - multiple electric pulley, 11 - horizontal canning machine, 12 - boiling container MЭC-320M, 13 - pump, 14 - container for the syrup, 15 - Filler for fruiting part.

These compotes affect the level of hemoglobin in the blood. Thus, the drink helps to normalize the level of hemoglobin in anemia. In addition to the vitamin-mineral composition, special attention should be paid to the low caloric content of cherry and pomegranate compote, which amounts to only 57 kcal per 100 g. of berry drink, while garnet has 32 kcal. The energy value of the cherry compote (the ratio of proteins, fats, carbohydrates) is 0.2 g. (~ 1 kcal) proteins, 0.1 g. fats (~ 1 kcal), carbohydrates 13.8.g (~55 kcal) , and the energy value of the pomegranate compote: carbohydrates - 8 g. (32 kcal). For the production of cherry and pomegranate compote the following conditions must be created: a laboratory for quality analysis; necessary equipment for the production of compotes, a warehouse for raw materials and containers and storage for finished products as well. The preparation of compotes consists of the following technological operations: sorting, calibration, washing, cleaning, removal of bone and ovary (if necessary), blanching, packaging, syrup filling, capping and sterilization. When preparing raw materials, the share of the waste from the total weight of raw materials (6%) is taken into account as one of the main indicators. While blanching, digestion can occur and the faster it is, the higher the acidity of the raw material becomes [3]. The concentration of sugar syrups is usually set in the range of 30-60% in accordance with the characteristics (mainly acidity) of the raw materials. So, they take 30% syrup for grapes of Hungarian type; for apples, pears, sweet cherries - 35%; quince - 40%; raspberries, strawberries, cherries, cherry plums - 60%. To prepare the syrup, you should use water in which the fruits are blanched. For the production of cherry and pomegranate compote, raw materials are used in accordance with the requirements. Fruits must be clean, whole, fresh, healthy, without excessive moisture, mechanical damage and wormholes, not cracked, well preserved form, without foreign smell and taste [4]. Cherry, intended for processing, is divided into two commodity grades: the first and the second. For the first grade, the fruits should be typical in shape and color, for a given pomological grade they should be homogeneous in color, not green and unrestricted. Size should not be less than 15 mm for large fruit, and for small-fruited - not less than 12 mm. For the second grade, the fruits can be typical and atypical in form. Difference in color is allowed. The size is not standardized. Standard fruits without stem (if the main weight is with the peduncle), with healed mechanical damages, fruits with fresh mechanical damages (crumpled or with cracks in the peduncle) and with healed damage to pests are allowed. Green, crushed, overripe fruits with signs of fermentation, with wormholes are not allowed. The degree of maturity in the procurement should be so that the fruits and seeds can withstand transportation, and to the destinations they should have the appearance and taste, corresponding to the consumer degree of maturity. The content of toxic elements and pesticides should not exceed the permissible levels established by medical and biological requirements and sanitary standards of quality of food raw materials and food products. The compote should meet the following requirements: fruits or seeds are clean, without mechanical damage and wormholes, undiluted, unrestrained, in well-preserved form. The following is allowed: unequal in size fruits, no more than: for premium - 10%, for the first - 20%,

for table - without restrictions; - fruits with cracked but not slipped skin, for premium - no more than 10%, for the first - 20%, for dining class - 50%; - boiled, partially lost form fruits for the highest grade are not allowed, for the first grade - not more than 25%, for the table - not more than 50%. The syrup is transparent or slightly opalescent, without foreign impurities [3, 5]. Taste and smell: well-expressed, typical for cherries and pomegranates compotes are made of, without foreign smell and taste [2, 5].

Technological scheme of the can production “Cherry and pomegranate compotes” is shown in the vector scheme in Figure 2.

Basic calculations [8].

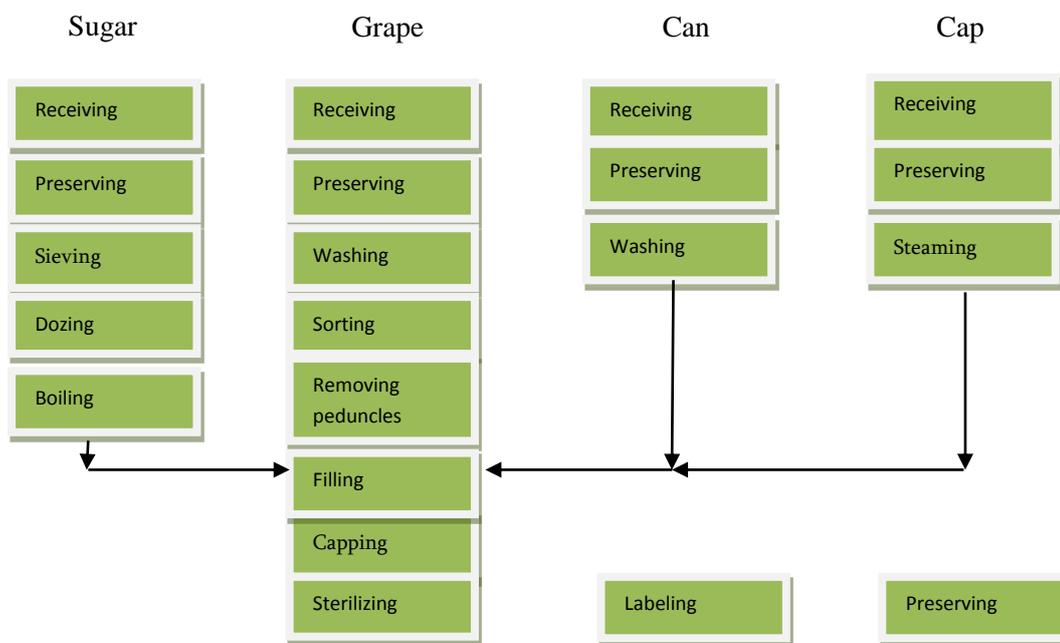


Fig. 2. Vector scheme of the can production “Cherry and pomegranate compotes”

Count of production line

Productivity of the technological line is counted by the formula 1.1:

$$\Pi_c = 3_c / K \tag{1.1}$$

where: Π_c – productivity of the line, cans/change;

3_c – task for producing cans, kg/change;

K – coefficient of over counting of physical cans conditionally

The norms of loss and waste of raw material

For each sort of raw material and semi-fabricates the summative norm of waste and loss is calculated, and the norms of loss and waste for separate operations in percentage with the direction what mass of raw material and semi fabricates they are taken from.

Count of norms of raw material for one ton of cans

Total waste of raw material is counted by the formula 1.2

$$T = S * 100 / 100 - X \tag{1.2}$$

where: T – norm of waste of raw for one ton, kg;

S – the quantity of processed product according to the recipe, kg;

X – sum of loss and waste according to operations in % to the mass of initial raw, %

Count of line power

Count of change able line power is produced by the formula 1.3.

$$N_c = S_c / \varphi \quad (1.3)$$

where: N_c – changing line power in tons of ready product, t/chng;

S_c – changing task in tubes of ready product, t/chng;

φ – coefficient of using the changeable power of equipment, accepted by ($\varphi = 0,8-0,9$).

Transfer of tubes in tones:

$$35 \cdot 0,353 = 12,355 \text{ t\change}$$

$$N_c = 12,355 / 0,8 = 15,45 \text{ tons of change.}$$

Count of time line power by the formula 1.4:

$$N_{\tau} = N_c / \tau \quad (1.4)$$

where: N_{τ} – time line power in tons of ready product, t/h;

τ – number of hours in change.

Count of productive program of can production

The productive program of can production “Cherry and pomegranate compote” during the period is given in the Table 1.5. Count of productive program of can production is expressed by the formula 1.5.

$$N_r = N_c \cdot \Phi_{\text{chng/yea}} \quad (1.5)$$

where: N_r – annual line power in tons of ready product, t/h;

N_c – changing line power in tons of ready product, t/h;

$\Phi_{\text{chng/yea}}$ – number of working changes in a year.

Conclusion. Having studied the proposed materials for the production of cherry and pomegranate compote, we may conclude: canning can compensate for the deficit of fruit and vegetable products in the population's nutrition in the winter-spring period; reduce losses of berries, fruits and vegetables during the storage; create state reserves in the event of a crop failure or a natural disaster; to increase the nutritional value of food products by enriching them with various components, by boiling, by the separation of low-valued parts of raw materials in preparation for canning.

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ՆՈԱՆ ԵՎ ԲԱԼԻ ԿՈՄՊՈՆՆԵՐԻ ԱՐՏԱԴՐՈՒԹՅԱՆ ՈՐԱԿԻՆ ՆԵՐԿԱՅԱՑՎՈՂ ՊԱՀԱՆՋՆԵՐԸ

Ռ.Ս. Հակոբյան, Ա.Յ. Արզումանյան, Շ.Ա. Դավթյան, Ի.Գ. Նավթալյան

Շուշիի տեխնոլոգիական համալսարան

Բնակչությանն առողջ սննդով ապահովելու նպատակով՝ հանրային քաղաքականությունն ակնկալում է մրգերի մշակման և պահպանման փուլերն ամբողջ ցիկլում բարելավել՝ սկսված դաշտից մինչև սպառող: Առավել արդիական է օգտագործել բարձրորակ, էկոլոգիապես մաքուր հումք, կիրառել ժամանակակից տեխնոլոգիաներ և սարքավորումներ, որոնք ապահովում են սննդանյութերի, միկրո- և մակրոէլեմենտների առավելագույն պահպանումը, պահածոյացված արտադրանքի օրգանոլեպտիկ հատկությունները, ինչպես և պահպանման ու պիտանելության ժամկետները:

Մրգահատապտղային հումքի որակի և մշակման ուսումնասիրությունները վկայում են, որ գիտնականներն ու մասնագետները փնտրում են օպտիմալ մեթոդներ՝ աճեցված բերքի ռացիոնալ օգտագործման ու պահպանման համար: Այնուամենայնիվ, վերջնական արտադրանքի մրցունակության ապահովումն անհնարին է, առանց բարձր արդյունավետությամբ տեխնոլոգիաների օգտագործման:

Խնդրի լուծման լավագույն տարբերակն է՝ ազգաբնակչությանը պահպանման ու պահածոյման հիմքում ընկած գործընթացների, ինչպես նաև՝ բաղադրատոմսերի ու ռեժիմների պահպանմամբ, պարզագույն տեխնոլոգիաների

իրականացման ուսուցումը: Կարևորվում է նաև եղած սարքերի ճիշտ օգտագործման, պարզ հարմարանքների պատրաստման և կիրառման ուսուցումը, ինչպես նաև վտանգավոր սննդամթերքների տարբերակման ունակությունը:

Աշխատանքի նպատակն էր՝ ուսումնասիրել նոսան և բալի կենսաբանական արժեքը, ինչպես և դրանց համապատասխան կոմպոտների արտադրության տեխնոլոգիան:

Բանալի բառեր. որակ, պահածոներ, կարգավորիչ պահանջներ, համտեսում

ТРЕБОВАНИЯ К КАЧЕСТВУ ПРОИЗВОДСТВА КОМПОТОВ ИЗ ВИШНИ И ГРАНАТА

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Концепцией государственной политики в области здорового питания населения предусматривается совершенствование систем возделывания, хранения и переработки плодов и ягод на всем пути их продвижения – от поля до потребителя. Особую актуальность имеет использование высококачественного экологически чистого сырья, современных технологий и оборудования, обеспечивающих максимальную сохранность питательных веществ, органолептические достоинства консервированного продукта, повышение сроков его хранения. Анализ состояния и переработки плодово-ягодного сырья показал, что ученые и специалисты изыскивают возможности сохранения и рационального использования выращенного урожая, однако обеспечение конкурентоспособности конечного продукта без применения высокоэффективных сортовых технологий невозможно. Исходя из этого, рассматриваемая проблема развития биохимических и технологических научных основ производства высококачественного сырья, а также технологий его хранения и переработки по всему технологическому циклу является актуальной и имеет важное практическое значение, особенно в условиях рыночной экономики [1, 2].

За последние несколько лет на рынке овощных и фруктовых консервов обозначилось большое количество национальных марок. В настоящее время в торговой сети широко представлены овощные и фруктовые консервы.

Целью работы было изучить биологическую ценность вишни и граната, а так же технологию производства компота вишневого и гранатового.

Ключевые слова. качество, консервированные продукты, нормативные требования, дегустация

THE STUDY OF THE WAY OF THE COST PRICE OF THE TRANSPORTATION OF AGRICULTURAL SLIPPING LUGGAGE FROM SMALL LAND PLOTS, THE EXPLOITATION CRITERIA OF AUTO VEHICLE

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The problems connected with the crop transportation on the small land plots are analyzed, particularly, the reasons of high cost price of transportation which do not support the rise of the efficiency of crop cultivation on those plots. One of the main reasons is that each rural farm crop is transported by separate way which results in incomplete use of body volume and carrying capacity and the number of marches required for the transportation of the crop of equal amount also increases in vain. We suggest to divide the truck of the vehicle into three parts belonging to different people for crop transportation from small land plots which enables to use the carrying capacity of the vehicle fully, consequently, to reduce the cost price of the transportation significantly and also support the crop cultivation process on such land plots.

Key words: carrying capacity, volume, corn, truck, transportation, cost price

Introduction

The efficiency of any farming is connected with the correct organization of transport, particularly, with the correct organization of the vehicle work which is the guarantee of efficient use of rolling stock.

Today the condition of the transportation of agricultural cargo is low leveled in Armenia for different reasons one of which is the bad organization of the transportation of agricultural cargo which results directly on the agricultural development, particularly, in the case of crop cultivation on small land plot.

Plot and methods

One of the intensive labour processes of cereal crops / wheat, barley, corn / and other similar crop cultivation is the transportation of the crop from the field. According to recent studies in the Republic of Armenia, the average crop yield per hectare is 2 to 3 tons [2].

As a result of the privatization of the Republic of Armenia, the smaller crops vary from 0.05 to 1 hectare of agricultural land, the grain harvest yield comprises maximum 0.15-3.0 tonnes per field. Moreover, related to crop rotation, various types of cereal crops are often sown on these plots whose crop transportation in the same body is incompatible.

The studies conducted by us have shown that inner economic transportation of the crop in the communities of the republic within the range of 1 to 15 km is carried out by the internal contractor of the farmers and is not related to the harvest quantity. The transportation of each farm's crop is carried out in a single march, for the reason the coefficients of vehicle body weight and the carrying capacity are significantly low. As a result, the vehicle's operational indicators deteriorate, the number of marches and the cost of transportation increase. However, at present, due to the lack of small trucks, grain transportation in the republic is carried out by mid-loaded trucks, in particular, ZIL-MM3-554M tipper with a capacity of 5,5 tons, the width of the body is 2.3 m, length is 3.35 m, depth of the body is 0.9 m with risen sides and the body volume is 7.0 m³ [3]. Therefore, we choose this vehicle as the object of our further study.

The factual capacity of the vehicle is determined by the following popular formula $q_f = \rho V_b k, t$, where ρ is the volume of weight of cargo, t/m^3 , V_b is the volume of the body, m^3 , k is the coefficient of using /filling/ the body volume [1].

Practice has shown that during the harvest the volume weight of the crop fluctuates between 0.6-0.8 t/m^3 , and the coefficient of using body volume fluctuates between 0.85-0.92, consequently, the maximum factual capacity of the chosen vehicle will be $q_f = \rho V_b k = 7 \cdot 0.8 \cdot 0.84 = 5.2, t$.

The static coefficient of using the the vehicle capacity is defined by $\gamma = \frac{q_f}{q_n}$ formula, where q_n is the namely capacity of the vehicle of 5.5 t. Consequently, $\gamma = \frac{5.2}{5.5} = 0.94$.

Let's define the coefficients of the static capacity of the vehicle and using the body volume when the crop of every plot is transported separately. Marking the surface of the plot with S , hectare, yield with g /hectare, we can write

$$\gamma = \frac{Sg}{q_n}, \quad k = \frac{V_f}{V_b} \cdot 100\% = \frac{q_f}{\rho V_b} \cdot 100\% = \frac{gS}{\rho V_b} \cdot 100\%, \quad (1)$$

where V_f is the factual volume of the grain filled into the body, m^3 , and V_b is the body volume, m^3 .

The dependence of the coefficients of the carrying capacity and using the body volume of ZIL-MM3-554M from the surface of the plot for the values of 2.5 t/hectare and 0.8 t/m^3 is shown in Fig.1.

The analysis of the graphics show that the capacity and body volume are used completely in the case of the plot having more than 2.01 hectare surface while most of the surface of small plots is from 0.5 hectare to one hectare. Consequently, it is not difficult to understand from the graphics that in case of plots of 0.5-1 hectare 21-42 % of the body volume is used, and the static coefficient of using the capacity is 0,227-0,454. It is evident that these indicators are lower for 0.1 till 0.5 hectare. So, the static coefficient of using capacity fluctuates between 0.045 to 0.224 and the coefficient of using body volume between 4.2-21 % as well.

Thus, we may conclude that the use of ZIL-MM3-554M tipper is not appropriate for transporting the grain crops from the mentioned areas. On the other hand, it is not appropriate for small rural farmers to buy modern cars with large body and small capacity, because, unlike those cars, ZIL-MMZ-554M tipper truck is widely used to transport other cargo after grain harvest. It should also be noted that these cars which were mainly produced during Soviet times, have a relatively low cost and, above all, a high technical characteristics.

Taking into account the above mentioned, we plan to make structural featuring in the chosen truck body for the purpose of to fully use its carrying capacity and body use coefficients, minimize useless driving, increase operating rates and to lower the cost of grain transportation. Using the crop indicators of small rural farms and the data of Fig. 1, we found out from the primary calculations that in order to ensure high operating data, it is expedient to divide the car body of ZIL-MM3-554M tipper into three equal parts, i.e. to put two dislocated partitions in the body /Fig.2/. Obviously, in case of partitioning, the coefficient of utilization of the 1st and 2nd divisions should be chosen in such a way that while downloading the grain it should not fall into the adjacent section.

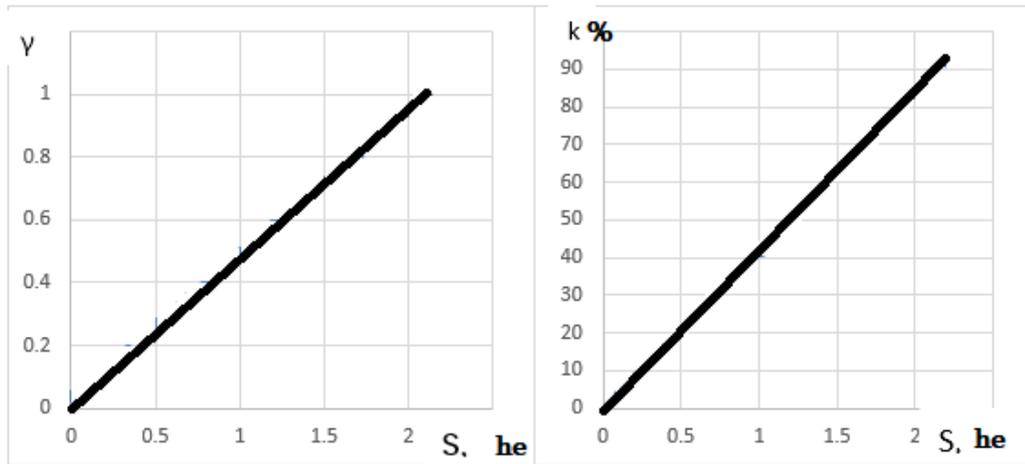


Fig.1. The dependence of the coefficients of carrying capacity of the truck ZIL-MM3-554M (γ) and using of body volume (k) from the surface of the plots ($g=2.5$ t/h; $\rho=0.85$ t/m³)

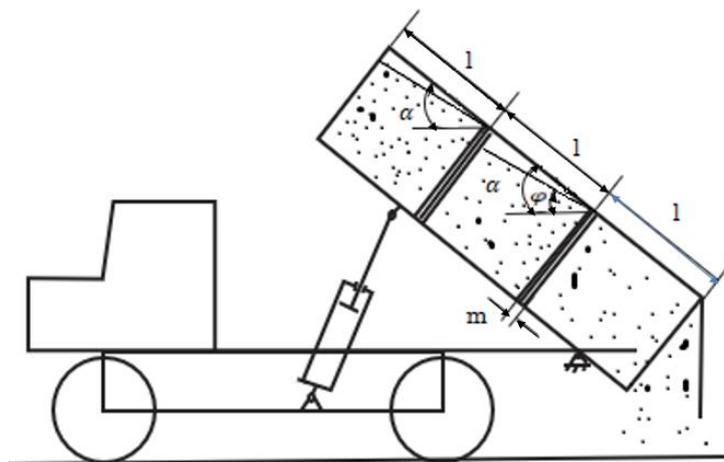


Fig. 2. The scheme of defining the coefficient of the use of the body volume of vehicle

It is natural that in this case the coefficient of using the volumes of the first and second sections will be smaller than that of the third.

Taking into account the case that turning the truck in α angle the grain will slip and will stand under the angle of natural bending $\varphi=35-40^\circ$, we will define the maximum filling height of the grain.

$$h_{max} = h_b - \left(l_s - \frac{m}{2} \right) tg(\alpha - \varphi), sm \tag{2}$$

where $h_b=90$ cm, is the depth of the body, $l_s = \frac{l_b}{3} = \frac{3.362}{3} = 112, sm$, the length of each section is $m=4$ uf, the thickness of section, $\alpha=50^\circ$ is the maximum angle of turning the body. Verifying the values, we will have

$$h_{max} = 90 - \left(112 - \frac{4}{2} \right) tg(50 - 40) = 78sm \tag{3}$$

Thus, the volume of the grain poured into each of the first and second sections will be $V_{s12} = 0,78 \cdot 1,12 \cdot 2,3 = 2,01m^3$, and the volume of the third section will be $V_{s3} = 0,9 \cdot 1,1 \cdot 2,3 \cdot 0,94 = 2,14m^3$, and the total volume of the grain in body will be

$$V_b = V_{s1} + V_{s2} + V_{s3} = 2,01 + 2,01 + 2,14 = 6,16m^3, \tag{4}$$

The weight of the grain in this case will be $q_f = 6,16 \cdot 0,8 = 4,93t$.

The maximum value of the coefficient of body volume will be $k = \frac{6,16}{7} = 0,88$ or 88%, and the maximum value of the static coefficient of capacity use will be static $\gamma = \frac{4,93}{5,5} = 0,89$, i.e. it will be reduced correspondingly by 6% and 0,04.

The coefficients of capacity use and body volume use will be defined after such changes by $\gamma = 3 \cdot \frac{q_f}{q_{n-500}}$; $k = 3 \cdot \frac{V_f}{V_b} \cdot 100\%$ formulas.

It is clear from the formulas that despite of namely capacity is reduced by 0,01% and the body volume is reduced by 6 %, the factual capacity increases by 3 times.

It is evident that using the modular volumes we can make the using coefficients of capacity and body volume maximum while loading crop or other food from plots with different surfaces.

The change graphs of static coefficients of using the capacity and body volume by the mentioned formulas are given in Fig. 3.

It is clear from the graph that the static coefficient of capacity is 0.94 for 3 land plots of approximately 0.65 hectares, but it does not mean that in case of larger plots, the efficiency of the vehicle will decrease. Using the two dimensions of the body combined, without partial use, the maximum values for the use and exploitation of individual land and expected harvest modulation trucks will be maintained.

As a result of this structural change, the high values of coefficients of body volume and carrying capacity will not only be kept but the amount of required transportation marches of the crop of the same amount will also be reduced.

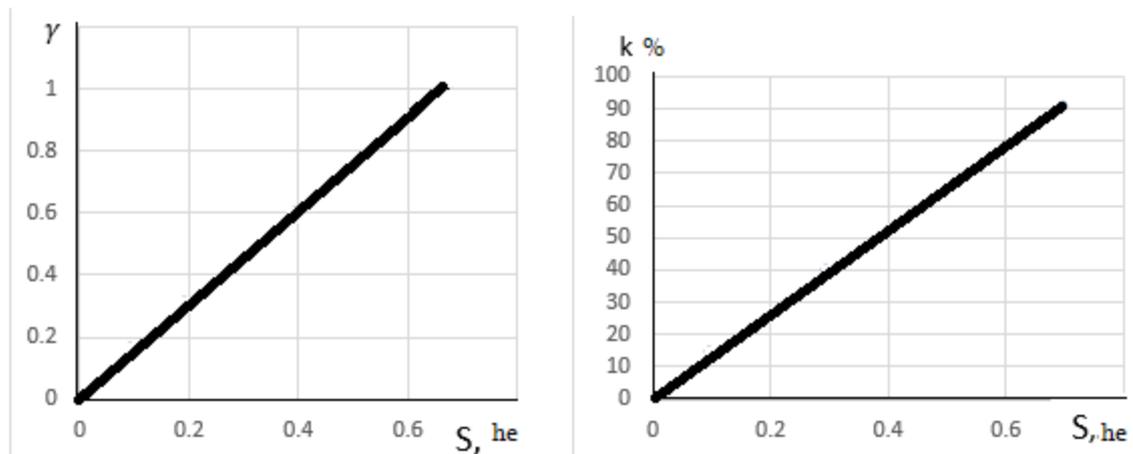


Fig. 3. The static coefficients of carrying capacities of the truck with transformed body and volume use in the case of lands with different surfaces

It is seen from the graph that the number of marches decreases up to 3 times for the lands with 0.65 hectares per day and twice for the lands up to 2.1 hectares.

Obviously, the exploitation cost of transportation and the cost of transportation will also be reduced correspondingly.

Preliminary calculations and production experience have shown that, due to the increase in the static coefficient and the decrease of the number of marches, the cost price of the crop transportation decreases for plots up to 0.65 hectares by about 9 times compared with the statistical data, and by 4 times for the plots of up to 2.1 hectares.

Conclusions

1. Vehicles with middle carrying capacities are still widely used in the communities in the RA for crop transportation, particularly tipper ZIL-MMZ-554M, the exploitation of which becomes inefficient while transporting separately each of the farm crop of small plots because of incomplete use of carrying capacity and body volume and unnecessary marches.
2. When transporting crops separately from plots having 0,1 hectare to 1 hectare surface with tipper ZIL-MMM-554M, the carrying capacity coefficient is 0.045-0.454, the body-weight ratio is 4.2-242% in case of 1.1-2.05 plots respectively 0.5-0.92 and 46.2-86% and the data foreseen by technical characteristics are provided in case of having 2.1 hectares of land.
3. In order to increase the efficiency of ZIL-MMZ-554M tipper, it is necessary to perform a structural change of body, in particular, to divide the body into three equal parts, as a result of which the value of the static coefficient of using the carrying capacity of the vehicle reaches 0.94 and the body weight ratio reaches 92%, the number of marches during the day decreases 3 times in case of three divisions, two times in case of two divisions and an opportunity is given to transfer different cereal crops during one march.
4. Due to complete use of body volume and carrying capacity and decrease of marches of the vehicle the cost price of crop transportation from up to 0.65 hectare plots decreases for about 9 times and for about 4 times from the plots up to 2.1 hectares.

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**ՓՈՔՐ ՀՈՂԱԿՏՈՐՆԵՐԻՑ ԳՅՈՒՂԱՏՆՏԵՍԱԿԱՆ ՍՈՐՈՒՆ ԲԵՌՆԵՐԻ ԻՆՔՆԱՐԺԵՔԻ,
ԱԿՏՈՄՈՐԲԼԱՅԻՆ ՓՈԽԱԴՐԱՄԻՋՈՑԻ ՇԱՀԱԳՈՐԾԱԿԱՆ ՑՈՒՑԱՆԻՇՆԵՐԻ
ԵՂԱՆԱԿՆԵՐԻ ՈՒՍՈՒՄՆԱՍԻՐՈՒՄ**

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²Շուշիի տեխնոլոգիական համալսարան

Վեր են լուծված փոքր հողակտորների վրա հացահատիկի փոխադրման հետ կապված խնդիրները, մասնավորապես, փոխադրման բարձր ինքնարժեքի պատճառները, որոնք չեն նպաստում այդ հողակտորների վրա հացահատիկի մշակման արդյունավետության բարձրացմանը: Ամենահիմնական պատճառներից մեկը կայանում է նրանում, որ յուրաքանչյուր գյուղացիական տնտեսության բերք փոխադրվում է առանձին երթով, որի պատճառով լիարժեք չի օգտագործվում փոխադրամիջոցի բեռնատարողությունը և թափքի ծավալը:

Առաջարկվում է տարբեր անձանց պատկանող փոքր հողակտորներից հացահատիկի փոխադրման համար փոխադրամիջոցի թափքը բաժանել երեք հավասար մասերի, ինչը հնարավորություն է տալիս լիարժեք օգտագործելու փոխադրամիջոցի բեռնատարողությունը, հետևաբար նաև զգալիորեն իջեցնելու փոխադրման ինքնարժեքը, նպաստում նման հողակտորների վրա հացահատիկի մշակման գործընթացի խթանմանը:

Բանալի բառեր. բեռնատարողություն, ծավալ, վազք, բեռնատար ավտոմոբիլ, փոխադրում, ինքնարժեք

ИССЛЕДОВАНИЕ СПОСОБА ПОВЫШЕНИЯ ЭКСПЛУАТАЦИОННЫХ ПОКАЗАТЕЛЕЙ САМОСВАЛА ПРИ ПЕРЕВОЗКЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ СЫПУЧИХ ГРУЗОВ ИЗ МАЛЫХ ЗЕМЕЛЬНЫХ УЧАСТКОВ

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Выявлены проблемы перевозки сыпучих сельскохозяйственных грузов, в частности, зерна из малых земельных участков, которые мешают масштабному возделыванию зерновых на таких участках. Основной причиной повышения себестоимости перевозки и низких эксплуатационных показателей транспортных средств является то, что урожай каждого хозяйства перевозится отдельно, в результате чего значительно низки уровень использования грузоподъемности и объема кузова автомобиля.

Предлагается кузов автомобиля разделить на три отсека, которые принадлежат разным людям, для перевозки зерна из малых земельных участков что способствует в три раза повысить эти показатели, укоротить качество рейсов и значительно уменьшить себестоимость перевозки.

Ключевые слова: грузоподъемность, объем, пробег, грузовая машина, перевозка, себестоимость

DETERMINATION OF DYNAMIC CHARACTERISTICS OF RESIDENTIAL FRAME BUILDINGS OF THE SINGLE TYPICAL SERIES IN DIFFERENT GROUND CONDITIONS BY EXPERIMENTAL METHOD

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The article is devoted to the study of the oscillations of buildings of the typical series 111 in various soil conditions using seismic sensors and a logger developed by IGES. By means of microtremor records, spectral analysis was performed, dynamical features of buildings and soils have been determined, and the peculiarities of the joint work of the building and ground have been revealed based on the results.

Keywords: dynamic characteristics, period of vibrations, spectral analysis, Fourier spectrum, mode shapes, buildings of the series 111

Introduction

Testing of the constructions of typical buildings with prefabricated reinforced concrete frame systems and the interaction between soil (ground) and structure is an important scientific-practical task. When implementing anti-seismic measures in building designs it is necessary to take into account the values of periods of natural vibrations of the buildings and structures as well as the values of the dominant vibration periods of the soil so that these values do not match since in the case of seismic effects it will lead to the occurrence of resonance phenomena, as well as the collapse of buildings.

During the 1988 Spitak earthquake, residential 9 story buildings of the typical series 111 with prefabricated reinforced concrete frame systems were subjected to the major collapse in Gyumri. 95% of 133 buildings of this kind erected in Gyumri have not survived and the rest received strong deformations and were later demolished. Meanwhile, none of the 108 buildings of the same type erected in Vanadzor didn't collapse, nor they didn't even get serious injuries. The mass destruction of such buildings in Gyumri is explained with a combination of a number of factors [1].

The results of the dynamic tests of these buildings, which were carried out before the Spitak earthquake in 1978-1987 showed that the values of their periods of natural vibrations range from 0.55-0.75 sec. Vibrations of such values of periods have been recorded in Gyumri in 1988 during the December 31 earthquake (aftershock). Immediately after the 1988 Spitak Earthquake, the results of the Japanese researchers, who arrived in the disaster zone, have shown that the values of the dominant vibration periods of the soil in Gyumri range from 0.5 to 0.6 sec, in Spitak 0.2-0.3 seconds and in Vanadzor 0.2-0.4 seconds [12].

After the earthquake, experiments were also carried out on the buildings of different types and the results obtained were even greater. Thus, the values periods of natural vibrations for the buildings of the 111 series were obtained in the range of 0.8-1.2 s [3], which shows that the stiffness of these buildings has significantly decreased.

Since the 1970s, most of the buildings of this series have been erected in a number of cities of Armenia, especially in Yerevan, Gyumri and Vanadzor. The construction of the buildings of the typical series 111 was banned after the earthquake, as the greatest human and material losses were caused by the collapse of these buildings in Gyumri.

Statement of the problem

The aim of the study is to investigate the dynamic features of the behavior of two residential 9 story buildings of the typical series 111 erected on different ground conditions, based on the results obtained from the

experiments of microtremor using the super sensitive seismic sensors and the logger developed by the IGES. Its implementation involves the solution of the following tasks:

1. obtain the actual dynamic characteristics of the buildings,
2. investigate the allocation of peak values of natural vibrations' amplitudes in constructive elements,
3. identify the peculiarities of the joint work of the building and the soil.

One of the most important advantages of microtremor research is that the number of recorded micro-pulses on Earth's surface and buildings and structures is too large, so in a short period of time great information can be obtained for analysis [5,9]. This information allows to solve a number of important scientific and practical issues [6,7,9,10].

The tested buildings are located on different soils: basalt and pebbles, the first building is located in Malatia-Sebastia administrative district and the second is in Shengavit. The building №1 has been erected in 1983 and is located at Babajanyan 23/1 (Fig.1a). The building is a typical 111-point structure with IIS-04 series construction. The building is square with 18.0×18.0 m in size (Fig.2a), it has one entrance, basement and overground 9 floors with a height of 29 m (Fig.2b), the height of the floor is 3 m. The basis of the foundation ground is the basalt soil.



Fig. 1. Views of the a) building №1, b) building №2

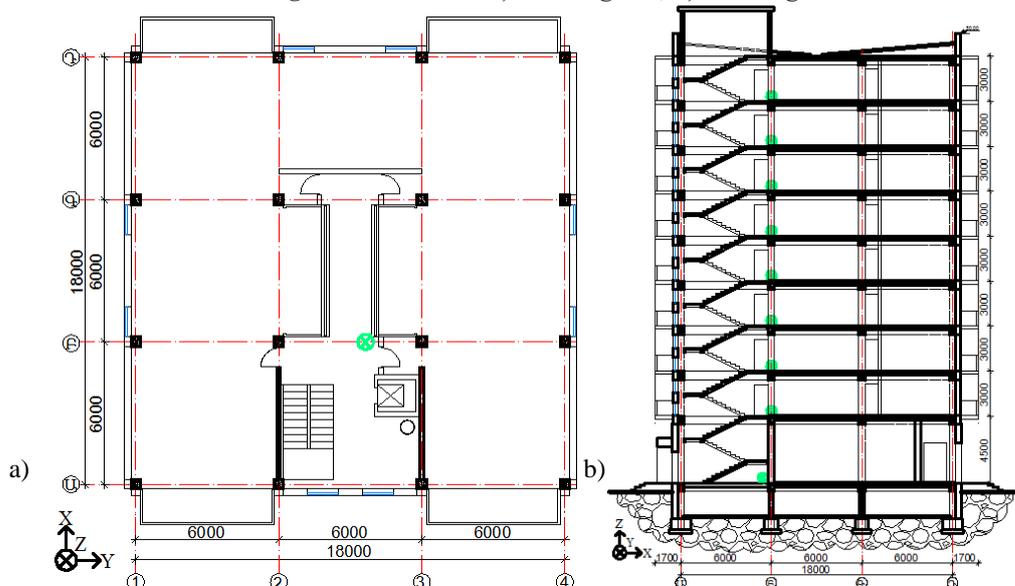


Fig. 2. The schematic a) plan and b) section of the buildings

The building's constructive system is framed. The foundations are isolated spread footings under individual columns from prefabricated reinforced concrete. Columns and beams are from prefabricated reinforced concrete with 400×400 mm and 400×530 mm in size. Shear walls and internal staircase are also

prefabricated reinforced concrete. The covers are executed with precast voided floor slabs. The interior walls were installed with masonry of hollow concrete blocks. The roof is terraced/flat with rolling-lamellar waterproof cover and with organized water drainage.

The building №2 was erected in 1976 and is located at Sharur 24/3 (Fig.1b). It is a building of the same 111 series as the building №1. The basis of the foundation ground is the pebbles soil.

Results of the study

Measurements were made by means of a mobile seismic station consisting of three receivers - seismic sensors CM-3 (two horizontal (H) - N-S, E-W and one vertical component (V) – Z), 8 input logger, powered by IGES, with the wireless network that provides connectivity with a laptop [5]. This device (logger) enables online viewing of records that are displayed on the notebook monitor by using specially developed software. The registration frequency is 200 samples per second.

The same experimental works were carried out for these two buildings. Instrumental observations, measurements and microtremor recording were performed on certain sections of buildings (on each floor) and in the surrounding area for the study of the dynamic characteristics of the structure and soils (Fig.3). A spectral analysis was performed based on data from instrumental recordings.



Fig. 3. The location of the seismic sensors a) in the building and b) on the soil

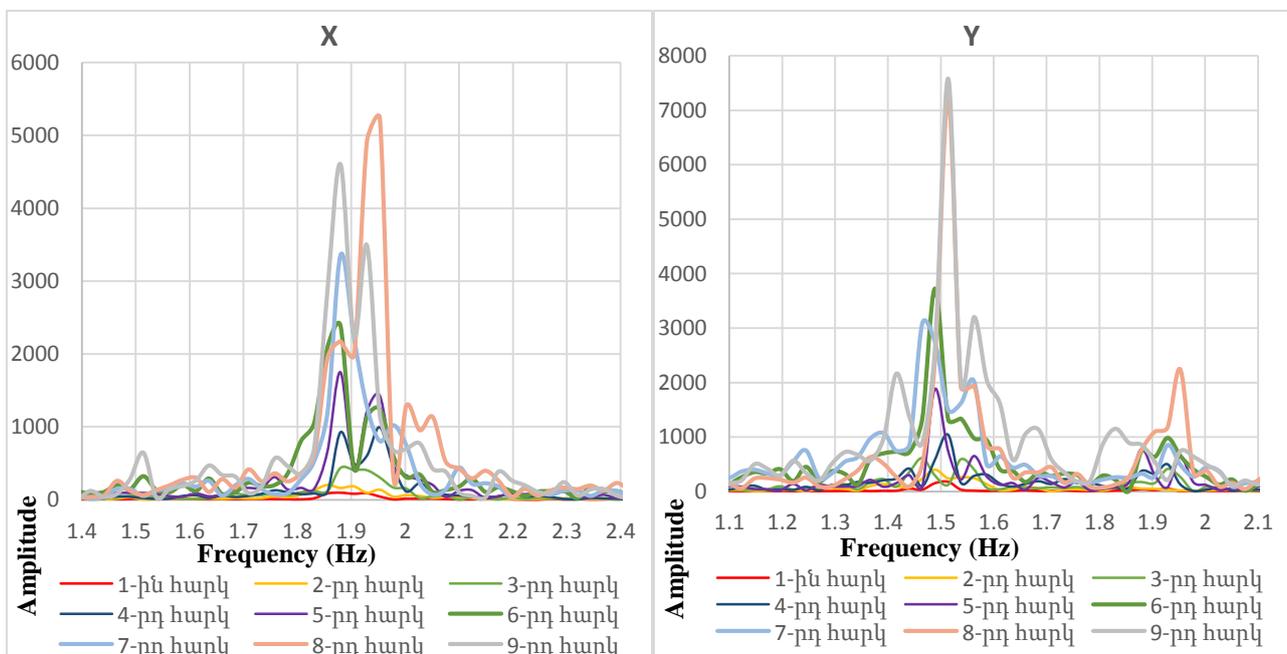


Fig. 4. Comparison of Fourier spectra of components X and Y of all floors of Building №1

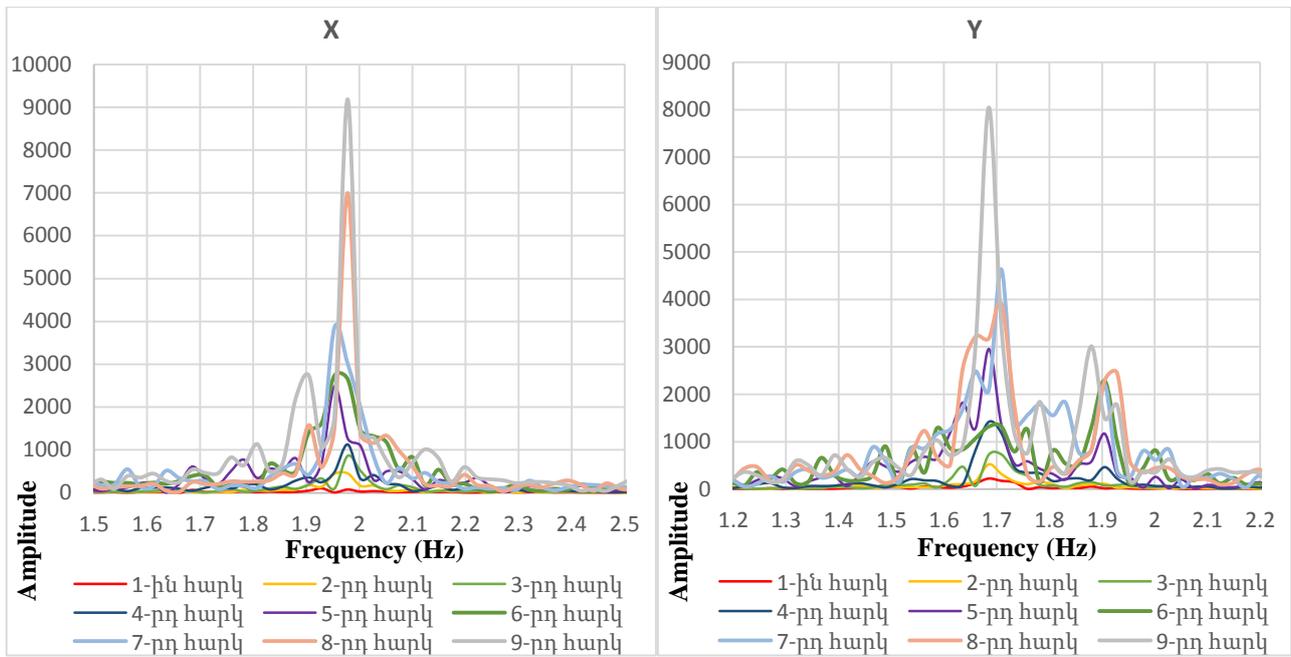


Fig. 5. Comparison of Fourier spectra of components X and Y of all floors of Building №2

Experimental values of buildings, including amplitudes of buildings vibrations in two vertical horizontals and one vertical directions are given in Table 1 and Table 2.

Table 1

		The building №1							
		X			Y			Z	
Floor	Frequency (Hz)	Amplit.	Period (sec)	Frequency (Hz)	Amplit.	Period (sec)	Frequency (Hz)	Amplit.	Period (sec)
soil	8.253	320.22	0.121	8.253	1093	0.121	8.253	940.15	0.121
1	1.88	95.04	0.532	1.514	178.22	0.661	1.88	99.74	0.532
2	1.856	203.61	0.539	1.489	404.43	0.672	1.489	42.28	0.672
3	1.88	437.24	0.532	1.465	611.72	0.683	1.929	74.69	0.518
4	1.953	997.63	0.512	1.514	1045	0.661	1.929	112.28	0.518
5	1.88	1749	0.532	1.489	1879	0.672	1.953	55.94	0.512
6	1.88	2385	0.532	1.489	3727	0.672	1.514	118.11	0.661
7	1.88	3360	0.532	1.465	3086	0.683	1.465	107.5	0.683
8	1.88	5229	0.532	1.514	7214	0.661	1.514	307.97	0.661
9	1.88	4602	0.532	1.514	7580	0.661	1.514	330.785	0.661
average	1.885	-	0.530	1.495	-	0.669	1.687	-	0.602

Table 2

		The building №2							
		X			Y			Z	
Floor	Frequency (Hz)	Amplit.	Period (sec)	Frequency (Hz)	Amplit.	Period (sec)	Frequency (Hz)	Amplit.	Period (sec)
soil	1.978	68.71	0.506	1.685	49.86	0.593	1.978	72.66	0.506
1	1.929	104.59	0.518	1.685	222.5	0.593	1.978	91.61	0.506
2	1.978	452.87	0.506	1.685	525.28	0.593	1.685	96.34	0.593
3	1.978	863.41	0.506	1.685	726.47	0.593	1.685	116.92	0.593
4	1.978	1129	0.506	1.685	1418	0.593	1.709	134.7	0.585
5	1.953	2486	0.512	1.685	2955	0.593	1.685	281.41	0.593
6	1.953	2736	0.512	1.905	2284	0.525	1.978	98.46	0.506
7	1.953	3857	0.512	1.709	4633	0.585	1.709	336.25	0.585
8	1.978	6996	0.506	1.709	3914	0.585	1.929	143.53	0.518
9	1.978	9184	0.506	1.685	8047	0.593	1.978	325.46	0.506
average	1.964	-	0.509	1.715	-	0.584	1.815	-	0.554

Analysis of the data obtained for building №1 shows that the average values of the building's periods of natural vibrations: in the direction of X equals 0.53 sec (frequency: 1.885 Hz); in the direction of Y equals 0.669 seconds (frequency: 1.495 Hz) and the Z-direction diffraction is great, with the peak obtained at 1.514 Hz, i.e. 0.661 sec. Comparing with the calculated values of the first form of the horizontal vibrations T_1 in the normative document [2]:

- for reinforced concrete frame with shear wall structural system buildings:

$$T_1 = 0.06n = 0.06 \times 9 = 0.54 \text{ (sec)}$$

it turns out that the periods of natural vibrations of the building in the X direction are approximately equal to the normative value, with a slight difference. The average value of the logarithmic decrements of the building's natural vibrations' basic tone in the direction of X is 0.128, in the direction Y is 0.109, and in the direction of Z is 0.101.

The value of the dominant vibration periods of the soil is 0.121 sec (frequency: 8.253 Hz) in the direction of all the components, with a striking peak. The value of the logarithmic decrements in the direction of all the components equals 0.009. As seen from the values obtained, the period of natural vibrations of the building essentially differs from the dominant vibration periods of the soil more than 1.5 times, therefore, the condition of the point 7.1.8 of “ՀՀՇՆ II-2.02–2006” normative document [2] is satisfied.

Analysis of the data obtained for building №2 shows that the average values of the building's periods of natural vibrations: in the direction of X equals 0.509 sec (frequency: 1.964 Hz); in the direction of Y equals 0.584 seconds (frequency: 1.715 Hz) and the Z-direction diffraction is great, with the peak obtained at 1.978 Hz, i.e. 0.506 sec. Comparing with the calculated values of the first form of the horizontal vibrations T_1 in the normative document [2]: $T_1 = 0.54$ (sec) it turns out that the periods of natural vibrations of the building in the X direction are approximately equal to the normative value, with a slight difference. The average value of the logarithmic decrements of the building's natural vibrations basic tone in the direction of X is 0.084, in the direction Y is 0.113, and in the direction of Z is 0.09.

The Fourier spectrum has been constructed in the direction of all the components of the soil microtremor data processing of this location and there are no bright peaks in the spectrum, but many peaks with small amplitudes. The values of the basic tone's period coincide with the values of periods the building vibrations in the X and Y directions. It can be regarded as a tone transmitted from the building vibrations. By the way, the amplitudes of these frequencies are higher than the amplitude of the second tone frequencies. The values of the second tone's periods are within the range of 0.125-0.135 sec, which is also well expressed in the spectra of Z of the building vibrations. Here are the peculiarities of the joint work of the building and the ground.

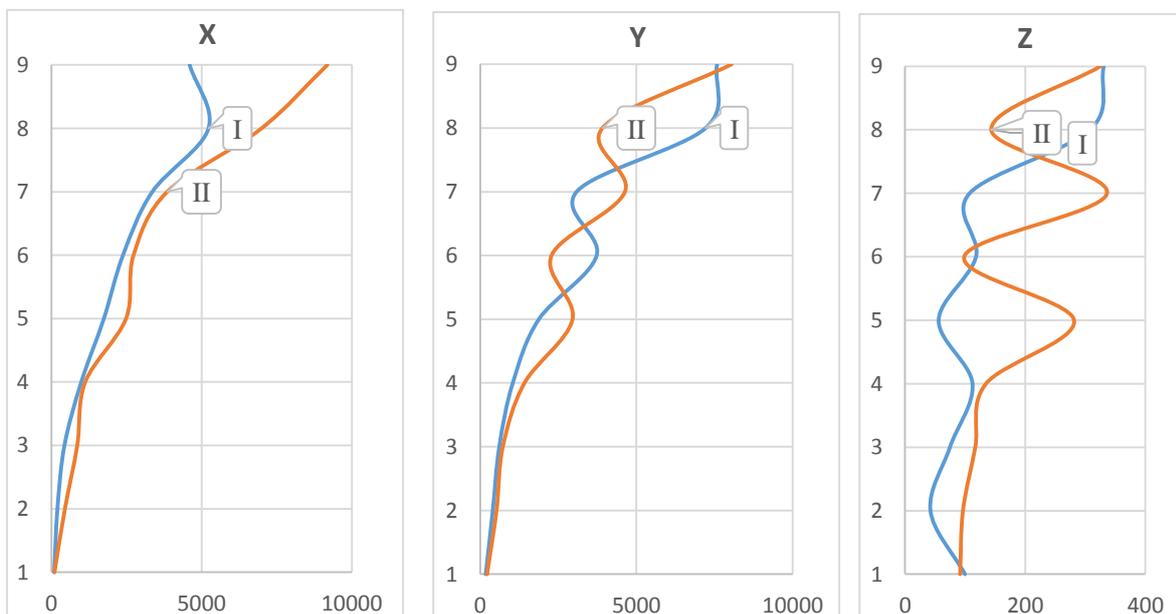


Fig. 6. Diagrams of allocation of peak values of natural vibrations' amplitudes to the floors (I - Building №1, II - Building №2)

The allocation of peak values of natural vibrations' amplitudes in constructive elements has been investigated. From the diagrams, it is clear that the buildings up to the 4th floor have a look of the first mode shapes of vibrations, and in the upper floors, there are several shapes of mode, even 4 forms.

Conclusion

- Dynamic behavioral peculiarities of two 9 story buildings of the same 111 series with different soil conditions were studied by field tests, 56 spectra of microtremor recordings were developed and analyzed.
- The actual dynamics characteristics of the basic tone of these buildings and their foundations, their natural vibrations of the buildings and the logarithmic decrements' values according to X, Y, Z components that can be used to assess the technical condition of the buildings and their material passport.
- Although the plan of the buildings looks like a square, however, the Y-direction values of the periods are greater (not so large) than that of X. This can be explained by the existence of the shear walls.
- The peculiarities of the joint work of the building and the ground have been investigated. It has been found that in the case of basalt soil, the average value of the periods of natural vibrations of the building is greater than the building erected on pebbles soil.
- Comparing the results of the two buildings, we can conclude that there are no resonance phenomena in buildings of 111 series erected on basalt soils, but in the case of more fragile ground, the probability of this phenomenon increases.
- In the future, an attempt will be made to detect the actual dynamic characteristics of similar buildings erected on other soil conditions and to identify the values of their periods of natural vibrations in the fragile soils.

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ՏԱՐՔԵՐ ԳՐՈՒՆՏԱՅԻՆ ՊԱՅՄԱՆՆԵՐՈՒՄ ԳՏՆՎՈՂ ՄԻԵՎՆՈՒՅՆ ՏԻՊԱՅԻՆ ՍԵՐԻԱՅԻ ԲՆԱԿԵԼԻ ԿԱՐԿԱՍԱՅԻՆ ՇԵՆՔԵՐԻ ԴԻՆԱՄԻԿ ԲՆՈՒԹԱԳՐԵՐԻ ՈՐՈՇՈՒՄԸ ՓՈՐՁԱՐԱՐԱԿԱՆ ԵՂԱՆԱԿՈՎ
Հ.Յ. Հայրապետյան

ՀՀ ԳԱԱ Ա.Նազարովի անվ. Երկրաֆիզիկայի և ինժեներային սեյսմաբանության ինստիտուտ, Գյումրի

Հոդվածը նվիրված է տարբեր գրունտային պայմաններում գտնվող տիպային 111 սերիայի 2 շենքերի տատանումների առանձնահատկությունների ուսումնասիրման խնդրին, ԵԻՍԻ-ի կողմից հատուկ մշակված սեյսմիկ սվիչների և գրանցող սարքի միջոցով: Միկրոսեյսմների գրանցումների միջոցով կատարվել է սպեկտրալ

վերլուծություն, որոշվել են շենքերի և գրունտների դինամիկական վարքի առանձնահատկությունները և ստացված արդյունքներով բացահայտվել են շենքերի և գրունտների համատեղ աշխատանքի առանձնահատկությունները:

Բանալի բառեր. դինամիկական բնութագրեր, տատանումների պարբերություն, սպեկտրալ վերլուծություն, Ֆուրյեի սպեկտր, տատանման ձևեր, 111 սերիայի շենքեր

ОПРЕДЕЛЕНИЕ ДИНАМИЧЕСКИХ ХАРАКТЕРИСТИК ЖИЛЫХ КАРКАСНЫХ ЗДАНИЙ ОДИНАКОВОЙ ТИПОВОЙ СЕРИИ В РАЗЛИЧНЫХ ГРУНТОВЫХ УСЛОВИЯХ ЭКСПЕРИМЕНТАЛЬНЫМ СПОСОБОМ

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Статья посвящена вопросу изучения колебаний зданий типовой серий 111 в различных грунтовых условиях с помощью сейсмических датчиков и регистратора, разработанными ИГИС. Средством записей микросейм был выполнен спектральный анализ, были определены динамические особенности зданий и грунтов, по полученным результатам выявлены особенности совместной работы здания и грунта.

Ключевые слова: динамические характеристики, период колебаний, спектральный анализ, спектр Фурье, формы колебаний, здания 111 серии

A METHOD OF SALARY CALCULATION OF THE LECTURER

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In higher educational institutions of the Soviet Union and Post-Soviet Armenia salaries of lecturers were calculated at the rate plus hourly payment format where the same lecturer received a higher salary in case of teaching the same subject on the rate basis than when teaching the same on an hourly basis, which is not fair. Taking into consideration the experience of recent years at a number of universities, this article introduces a methodology for professorial staff salaries, based on the principle that, irrespective of rate or hourly based teaching, the lecturer receives the same fee for the class.

Key words: higher educational institution, academic staff, academic degree, academic rank, individual teaching capacity, curriculum, salary, number of hours

Introduction

Within the frameworks of the European Association of Higher Educational Institutions (EURASHE) and the European Standards and Guidance (ESG) programs it was clear that only external quality assurance functions can not provide a satisfactory quality of education. Quality assurance can only succeed when it is associated with the traditions, culture, fundamental values, principles, vision and mission formed in the organization. And in this context, the most important factor is the human resource. Man and his activity have always been the main power of society, the core of the productive forces and the driving force, the main source of wealth, the main means of increasing the value among other factors of production. Quantitative and qualitative assessment of human activities is one of the problems which require economic solutions [1]. Any good that is created in the world involves material work, and from this point of view the substance of the whole of the goods and services surrounding us is the work that is taking place between man and nature where man uses his physical and mental abilities, his experience and skills, makes the subject of nature a useful value for himself and others as well. It is not accidental that in the countries with developed economies, a large proportion of national wealth (with broad definition, wealth is what man values [2, p. 303]) is human capital. Thus, in 2012, the US national wealth was estimated at \$ 285 trillion, from which \$ 247 trillion (86.7%) is the cost of human capital, while natural resources cost \$ 2.1 trillion (0.74%). The share of human capital in national wealth is 90% in Canada, 60-80% in EU countries and 75% in Japan. It is also worth mentioning K. Marx's words that rich nations are those who have more free time. It is precisely this very circumstance that defines the meaning of scientific and technical progress when employers in the field of material production (in the broadest sense of the production of value and wealth [2, p. 298]) get the implementation of their activity in the non material sphere, i.e. in service sector.

The lack of inflow of young scientists, aging educational potential and non attractive salaries in the scientific and educational field are a serious threat not only to developing countries, but also to developed countries such as the USA, Germany and Japan. *The New York Times* has released a remarkable article about a survey in which the salaries of professors in different countries around the world are compared [3]. The specialists of the US Center for International Higher Education Philip Altbach and his colleagues published a book entitled "Paying the Professoriate" in which they have sought to clarify the salaries and benefits of professors in state universities of 28 countries by

comparing salaries to other sectors. According to the survey, salaries are the lowest in the sphere of science and education in Armenia, about \$ 500, and the highest in Canada, about \$ 7,000. The authors have divided the world into two parts, those of brain outflow and brain-concentrated thus showing how countries with high incomes attract academic talents from poor countries. Certainly, in some developing countries some universities are trying to prevent this trend by offering certain benefits. For example, during the first marriage in Mexico, lecturers are provided with marriage bonuses and "two cider bottles and a frozen turkey on the eve of Christmas." During the survey, the salaries of the academic sector in each country were first compared to GDP per capita in that country and then to salaries of other sectors. In each of the 28 countries, the research team conducted a survey whether the average academic salary in that country is sufficient for having an average living standard. According to the survey, in many countries the gap between the leading research universities' professors and those of colleges who are at the lower levels of the academic hierarchy is increasing.

It turned out that the academic newcomers who earn \$ 259 per month are the lowest paid professors in China. According to the survey, they earn less than their counterparts in Armenia (\$ 405) or Ethiopia (\$ 864). The highest salary is paid to young Canadian professors, \$ 5730 per month, and the experienced professors with average \$ 9485 monthly. Experienced instructors are highly appreciated in Italy (\$ 9118), South Africa (\$ 9330), Saudi Arabia (\$ 8524), Great Britain (\$ 8369), Malaysia (\$ 7864), Australia (\$ 7499), India (\$ 7433) and the United States (\$ 7358).

An interesting result has been obtained in Ethiopia where though the average monthly salary in education is \$ 1207, the professors are considered the highest paid professionals because their salaries exceed for 23 times the average GDP per capita. (For comparison, the average salary of professors in the United States, Germany or Australia is about twice as much per capita than the GDP per capita). According to the survey, despite the fact that Russia is the only country in which the actual average salary of the teaching staff is less than the GDP per capita (60%), in almost all studied countries professors earn significantly less than other skilled workforce in other sectors. For example, professors earn about 50% less than those with the same experience in Kazakhstan. In addition, the authors of the book warn that in the near future "it will be difficult for young talents to engage in education in Japan, Germany, Israel and the United States if salaries do not rise in lower hierarchy." In Germany where lecturers are considered to be civil servants, the work has become less attractive than that in the industry or in the state administration system. As a result, professorial staff is forced to find other sources of income. According to the authors, a common way of survival is to provide counseling outside the university. Additionally, lecturers are required to provide additional lessons in private, noncommercial or business schools. According to Kerry Nelson, president of the Association of Professors of American Universities even higher salaries can be misleading. "The hidden truth about the salaries of lecturers is that some professors are paid abundantly and have gained wealth but others are on the verge of poverty.

Surprisingly it is possible to meet the representatives of the two groups in the same country" [3].

The amount of monthly salary of the teaching staff (hereinafter referred to as the Lecturer) of higher educational institutions is defined taking into account the academic load, academic degree, academic title and position of the lecturer in the academic year in a number of universities. Each lecturer is presented his/her teaching capacity for the academic year by the chairs. The submitted load is apt to be approved by the dean of the relevant faculty or the chair. The lecturer confirms that he agrees with the submitted capacity. Then, the academic department of the University checks the overall load of the chair and individual loads for individual Lecturers. The Vice Rector for Academic Affairs, according to the presentation of academic department, approves the individual loadings provided by the chairs which determines A capacity for the Lecturer. There are 2 ways to calculate salary: a lecturer with rate and hourly pay. The employer is considered to be hourly rate lecturer with

the annual capacity of 175-1080 hours - 175-270 hours (0.25 rate), 271-540 (0.5 rate) and 541-1080 (1 rate).

One rate lecturer's monthly salary is calculated by $A \cdot k$ formula where A is the lecturer's annual capacity, k is the salary index (approved by the decision of the board of trustees of the university) depending on the academic degree [4].

If there are not changes in the lecturer's capacity during the year, he gets the same salary from September to June.

The salary of the hourly – paid lecturer is calculated by $a \cdot k \cdot 10$ formula in which a is the number of hours taught by the lecturer in the given month, k - is the coefficient mentioned above [4].

Conflict settings

The University often deals with realities when the lecturer's annual capacity is altered and as a result we have.

- during the academic year, the rate lecturer's annual capacity is changed
 - a) continuing to be a rate lecturer
 - b) becoming an hourly paid lecturer
- an hourly–paid lecturer's annual capacity is changed
 - q) becoming a rate lecturer
 - η) continuing to be an hourly-paid lecturer
- k of the lecturer is changed

The task is set to work a method out in these cases to determine the amount of the salary of the lecturer.

Research results

To calculate the salary of the lecturer of the university in case of change in his/her annual capacity it is necessary to

- a) calculate according to the case a)

$$B = \left(a \pm \frac{b \cdot 10}{10 - n} \right) k \quad (1)$$

formula where B is the amount of new salary, a is the capacity at the beginning of the year, b is capacity change, n is the number of months since the beginning of the academic year till the period of change, k is the index of salary.

If the change corresponds to the case b) above mentioned, i.e. $a - b < 175$, then the calculation of the salary is done as follows.

- the factual salary of the lecturer before the change of capacity is calculated by the formula C and the number of hours corresponding to the salary by the formula

$$c = \frac{c}{10 \cdot k}$$

- the number of hours taught factually before the change of capacity is calculated by e and $E = e \cdot k \cdot 10$ (the salary which corresponds to the number of hours)

- if $e - c \geq a - b > 0$ then the lecturer is paid $10 \cdot (e - c) \cdot k$ sum and he stops teaching in that academic year without new agreement
- if $0 < e - c < a - b$, then the lecturer is paid $(e - c) \cdot k \cdot 10$ salary, and the rest $(a - b) - (e - c)$ number of hours is distributed according to the remained months
- if $e - c < 0$, then $e - c$ is added to changing b hour and is distributed to the remained months

When the capacity a of the hourly rate lecturer increases with b during the year and $(a + b) \geq 175$, then his salary is calculated by minusing the taught a' amount of hours and the money he had already got for it from his annual capacity and adding b as a result of which we get $(a - a') + b$ despite the last sum is more that 175 or not, his salary for the remained months is calculated by $((a - a') + b) \cdot k$ formula.

If the rate lecturer shows disability sheet then the calculation of his salary is different from the traditional salary calculation.

If the lecturer submits a disability sheet at the University in any month, then the monthly salary is calculated by hourly rate, i.e. the corresponding salary is calculated on the hours she / he has taught during the month and the benefits calculated by the disability sheet are added to it.

The principle of the calculation of the salary by formula (1) also applies when the lecturer's hour capacity changes twice a year so if the first change of the capacity occurred in the beginning of the year after n months, then after m month the second change occurs and after the second change the salary calculation formula will be

$$\left(a' \pm \frac{b' \cdot 10}{(10 - n) - m} \right) k \quad (2)$$

where $a' = a \pm \frac{b \cdot 10}{a - n}$, b' is the capacity of the second change, n is the number of months from the beginning of the year till the first change, m is the number of months between the first and the second change.

(2) formula is correct when $a' \geq 175$, in the opposite case the lecturer's salary after the second change of his hour capacity will be calculated by hourly rate principle.

During the academic year to determine the amount of the salary of the lecturer the following steps are done in case of substituting the salary index k by k' :

- the corresponding amount of hours of the salary d is calculated by index k till the month changed
- the amount of hours f factually taught till the change is calculated
- since the change of k month new salary is calculated by formula

$$a \cdot k' + \frac{(k' - k)(d + f)}{10 - n} \cdot 10$$

All the mentioned algorithms and formulas are checked by specific examples and are correct (the main principle of the article is working).

Conclusion

The proposed method of calculating the salary of professorial staff in higher educational institutions eliminates the difference in the amount of salary calculated for professors having the same academic degree depending on the mode of work whether the lecturer is rate or on the hourly basis. The method allows considering the changes in the capacity, the lack of availability, the presence of disability sheets and other factors connected with academic affairs while calculating the salary of the lecturer.

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ԴԱՍԱԽՈՍԻ ՎԱՐՉԱՏՐՈՒԹՅԱՆ ՉԱՓԻ ՀԱՇՎԱՐԿԻ ՄԻ ՄԵԹՈԴԻ ՄԱՍԻՆ

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Խորհրդային Միության և հետխորհրդային Հայաստանի բուհերում դասախոսների աշխատավարձի հաշվարկը կատարվում էր դրույք գումարած ժամավճարային ժամեր ձևաչափով, որտեղ դրույքով աշխատելու դեպքում նույն դասախոսը նույն դասը դասավանդելու պարագայում ստանում էր ավելի բարձր աշխատավարձ, քան նույն դասը ժամավճարային հիմունքներով դասավանդելու դեպքում, ինչը արդարացի չէ: Հաշվի առնելով մի շարք համալսարաններում վերջին տարիներին կիրառվող փորձը, սույն հոդվածում ներկայացվում է պրոֆեսորադասախոսական կազմի աշխատավարձի հաշվարկման մեթոդ, որի հիմքում դրված է այն սկզբունքը, երբ դրույքով թե ժամավճարային հիմունքներով դասավանդելուց անկախ, Դասախոսը դասաժամի համար ստանում է նույն վճարը:

Բանալի բառեր. բարձրագույն ուսումնական գաստատություն, պրոֆեսորադասախոսական կազմ, գիտական աստիճան, գիտական կոչում, անհատական բեռնվածություն, ուսումնական պլան, աշխատավարձ, ժամաքանակ

ОБ ОДНОМ МЕТОДЕ РАСЧЕТА ЗАРАБОТНОЙ ПЛАТЫ ПРЕПОДАВАТЕЛЯ

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В Советском Союзе и в постсоветской Армении расчёт заработной платы в вузах выполнялся по схеме: ставка плюс почасовой формат, где в случае работы по ставке один и тот же преподаватель, преподавая один и тот же урок, получал более высокую зарплату, чем преподавая в почасовом формате, что на наш взгляд, несправедливо. Учитывая опыт в ряде университетов последних лет, в статье представлен метод расчёта зарплаты, в основе которого заложен принцип, когда в независимости от условия труда Преподавателя, за учебный урок он получает одну и ту же зарплату.

Ключевые слова: высшее учебное заведение, профессорско- преподавательский состав, учёная степень, научное звание, годовая нагрузка, учебный план, зарплата, часы

ROUND THE ISSUE OF THE PROTECTION OF ECONOMIC COMPETITION

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The State Commission for the Protection of Economic Competition of the Republic of Armenia publishes its annual program of activities for the next year in the manner prescribed by law, including the evaluation of the competitive environment in the commodity markets, the identified problems and the ways of solving them based on these problems, the activities, mechanisms and recommendations of the next year. In the past few years of the program, omissions and special mistakes of inaccuracy have been observed. In particular, despite the fact that every year a large number of state support activities are being carried out, the public only becomes aware of the "ice upper layer", but the Commission has never initiated any proceedings on them (the statute of state aid has been enshrined in legislation since 2007). Programs that do not correspond to the legislative requirements and public expectations of the last few years, and the state body operating at the expense of the taxpayers, should radically change its attitude towards the development and market analysis activities, demonstrating professional approach and tolerance towards the case.

Key words: economic competition, goods market, plan of activity, defense of competitiveness, committee

Introduction

With the entry into force of the RA Law on Protection of Economic Competition (December 15, 2000), the launch of the economic competition protection system was one of the most important institutions promoting the development of Armenia's economy. According to Article 27 (1) of the Law, the State Commission for the Protection of Economic Competition (hereinafter referred to as "the Commission") annually publishes the National Assembly annual reports of its annual activities for next year (hereinafter Program)¹: It is worth mentioning that the 2018 Program is the 18th by its turn, and each of them was presented in time without exception.

The purposes of the following Program are:

1. To protect and promote free economic competition in product market
2. To support the necessary environment for tolerant and free competition
3. To support the formation of favorable atmosphere and the protection of consumers' interests
4. To promote the competitive culture².

In the introduction, it is written after the purposes: "The aforementioned goals are consistent with the objectives set by the Law on the Commission, the fundamental principles adopted by the state for the development of market economy, as well as the requirements for the development of competitive culture in modern economic and legal conditions."

¹ The program includes the information

1) about the investigation of present problems and the analysis of the situation of economic competition

2) about the schedule of the activities on the protection of economic competition and their

3) about the mechanisms regulating the economic competition

3.1) the offers on suggestions about the improvement of competitive situation

4) about the information of the rules necessary for the realization of the tasks and issues stated by the Law from the Commission

² http://competition.am/uploads/resources/Annual_Program_2018.pdf

The first three groups of purposes are confirmed in the first article of Law, and the fourth is purposed by the Commission's own initiative³. We will see further on that how the Commission will solve the problems leading to that purpose by the Program 2018.

These goals are followed by the task of promoting their achievement, the monopoly in the markets of goods and services, abuse of dominant position, anti-competitive agreements, unfair competition, and control over the concentration of research into the areas of unfavorable competitive environment, all public administration bodies in the field of business administration so mountain-related activities in a fair and equal approach, as well as cooperation with international organizations operating in the field of economic competition. At the same time, the issue of control necessity over the state aid was out of attention of regulatory body⁴. Meanwhile, state support will not only have a positive impact on individual areas and activities, but will also have a negative impact on the competitive environment in case of improper use. In order to assess that impact, the Legislation has also provided a mechanism for the conclusion of the Commission on the basis of a request from a public support or receiver. Although every year, the state-sponsored public action is being undertaken, many of which are known only to the public, but after the amendment has been put into effect, the Commission has never commenced any proceedings.

In the 2018 Commission Program activity a special place was devoted to international cooperation. For this purpose the realization of a number of issues became important⁵.

According to the law, the first section of the project is dedicated to the analysis of the economic competition situation and the investigation of existing problems.

Before proceeding to an analysis of the economic competition situation, the Commission considered it necessary to clarify the terms "monopoly position" and "dominant position" as, according to him, "Companies with monopoly and dominant position in the society often become nullified, resulting in a misleading impression on the number and scope of monopolies in the republic"⁶.

Conflict settings

First of all, we do not think that there is a need to clarify the concepts in the Regulator's Annual Action Plan in the case they are clearly defined in Article 4 of the Law (at least in terms of monopoly and dominating positions).

Secondly, in the first version of the Law, Chapter 3 and Article 6 are called "Dominant Position", under which they have no competition in the market or lack of significant competition and

³ The term of "competitive culture" is not included in the concepts confirmed in Law

⁴ The importance of State aid is conditioned by also the necessity of balancing with the European Union Legislation. The hypothesis was put into Law in February 22, 2007. /see the RA Law on "The protection of economic competition", making changes and additions in the Law of the Republic of Armenia, 23.03.2007, ՇՕ-107, <http://www.parliament.am/legislation.php?sel=show&ID=2949&lang=arm>): According to Article 16¹. State aid is considered to be any aid given by the government, state or local authority body, from the part of state or organization with state participation to any state group of managing face or certain group of faces /including financial means, help, loan, lending, property, privileges or other terms/.

⁵ The following problems have been set in the program: Exchange of best practice of competition policy implementation, implementation of legislative reforms in line with international experience, including harmonization of legislation in the context of commitments on issues relating to the application of common principles and rules of competition within the framework of Armenia's accession to the Eurasian Economic Union, for the purpose of carrying out studies on competition situation in target markets, staff development of partnerships, strengthening of partnerships and implementation of joint projects, raising awareness on competition policy, involving international experts in case of consultation on competitive issues, organization of thematic trainings and seminars for Commission staff and other target groups (2018 թ. Program of annual activities, SCPEC of the RA26.09.2017, supplement of the decision number 190-A, http://competition.am/uploads/resources/Annual_Program_2018.pdf):

⁶ See the Program, p. 5. By the way, the regulator has touched upon the same issue with the same professional composition in the Commission's 2016 annual activity report (http://competition.am/uploads/resources/Annual_report_2016.pdf, p. 4):

have at least one of their shares in the market ("RA Law on Protection of Economic Competition", Article 6)⁷. Further on the Legislative body by the change made in the Law renamed Chapter 3 and Article 6 as "Monopoly or dominating position", distinguishing terms of "monopoly" and "dominating position", reasonably, as we think so, adding the terms of corporate domination, (the additions and changes in the Law in 2007, February 22, see the same item, Article 6). It seems that change will clarify the uncertainties and missing items during the regulation. But from the point of view of the regulation the distinction between the terms "monopoly" and "dominating position" practically doesn't solve any question. Both according to Law and practice the actions of monopolistic and dominating organizations "are set in one field" and their economic and legal consequences are the same. They are apt to do the same abuses, and the same sanctions are foreseen for them. Hence, the society "equals" these two terms right. The same "attitude" must be shown towards them by the Commission as well⁸.

Thirdly, in Armenian reality the "distinction" between the monopoly and dominating position is subtle and conditional. It is enough for the running individual having 100 % of share in the market to let appear another individual having 0.1 % share that he will immediately lose his monopoly⁹. Moreover, the monopolist can create an entity who legally has no relation with him (practically such cases are often met).

Research results

Even if 100 individuals are working in the market, one of which having 95% of share and the others only 5%, that one can afford himself to do the same actions as if he will do it in case of having 100% share. Consequently, the essence is not having the monopoly, but acting according to it. It is not accidental that in some countries' competition protection legislations the monopoly is not targeted as regulation object, but the monopolist's activity. For example, the name of the second chapter of the RF Competition protection is "Monopoly activity" under which the hypothesis concerning the dominating position and anti competitive agreements are regarded¹⁰.

After clarifying the above mentioned regulations, the Commission, considering only the report about the increasing number of importers in goods groups in 2016 compared to 2014 and the decrease of rates of Herfindal-Hirshman index, which, to our mind, came to a disputable conclusion about the improving the competitive environment¹¹. Particularly, it is not confirmed that whether 48 and 40 entities importing correspondingly sugar or banana acted in market or not, and if they had so much market rule to be able to influence the activities of main "players". And whether the 45 butter importers belong to the same goods market¹². If we consider that all market importers of sugar, butter and banana had acted, then the Commission had to clarify first whether all they had individually grouped with great firms acting in the market¹³.

⁷ <http://www.parliament.am/legislation.php?sel=show&ID=1272&lang=arm>.

⁸ Practically in case of abuses by both monopolist or dominant the same decision is held

⁹ In Armenia there are goods markets in which the society "knows" to whom goes their 100% share, but legally these markets have no relation with owners (owner).

¹⁰ See Federal Law N 135-ФЗ «About the protection of competition» Russian newspaper on 27.07.2006. See also law of the Republic of Kazakhstan on 25 December 2008, № 112-IV «About the competition» (with changes and additions on the date 05.05.2015). Enterprises Codex of Kazakhstan from 29 October, 2015, №375-V 3PK, articles 160-231

¹¹ Program, p. 7.

¹² One part of them is probably imported for the purpose of productive activity and not for consumption. It is also possible that they are two, three different market subjects according to their price parameters. Consequently, the sizes of markets and shares of marketing individuals should be different and the dominating subjects in these markets.

¹³ Article 4 of the Law.

So, the number of organizations acting in goods markets (not the importers) is a necessary, not sufficient condition for evaluating the competitive situation.

The analysis of the situation of economic competition supposes the evaluation of competitive situation through goods market analysis in them, investigation of income and outcome of markets and other main issues¹⁴, on the basis of which the list of next year activities, performances and suggestions of the Commission will be decided. Without the above mentioned analysis of goods markets and the methodology of analysis of goods markets which demand other actions it will be impossible and senseless to realize the analysis of the situation of economic competition, to calculate the Herfindal-Hirshman index and investigate present issues¹⁵.

In this part of the program as a result of analysis and achievement of activity the three indicators concerning the effectiveness of competitive policy and competitive economic environment of the countries in the report of World Competitiveness 2016-2017 of the international organization of “World Economic forum” are presented, according to which compared to 2010 during 2016 noticeable progress has been encircled¹⁶. The progress encircled by the above mentioned indicators should be concerned very carefully.

First of all, these indicators characterize the movements of the countries. Even if the country's position has risen to a certain extent, it does not necessarily mean that it is due to the activity of the responsible state body in the given sphere. Even in the case of poor regulatory work, it is possible to improve the index if the competent authorities of the competitor countries work even worse.

Second, the positive influence of the regulator's work, consequently, the effectiveness of his activity, should be felt by the consumers and competitive subjects acting in the markets¹⁷:

Therefore, in this section of the program, a number of directions of the activity of the Commission are shown (investigation of abuses of monopoly or of the dominating position, signing anti competitive agreements, the control over the camping, expression of bad competition and other tasks of analysis of economic competition), which due to their composition and presentation remind a report and mostly repeat the annual report of the Commission of 2016 (hereinafter Report)¹⁸.

From the professional point of view in this section, to our minds, more offensive is the “analysis” concerning the “Petroleum” goods market and the conclusion. To be honest, we should present directly the report of the Commission presented in the program¹⁹. First, from 2016 September

¹⁴ The economic competition is expressed only in goods markets (service, labor). Out of markets there is no economic competition, hence, no competitive environment.

¹⁵ Starting with the annual activity program of the Commission of 2014, in its further programs the regulatory body hadn't also done any analysis of goods markets for the purpose of the analysis on economic competition situation.

¹⁶ About a month before the presentation of the program in the National Assembly the World competitiveness report of 2017-2018 of “World economic forum” was published.

¹⁷ For the rate of effectiveness of anti monopolistic policy Armenia had taken the 77th place in 2016, replacing its 138th horizontal in 2010, for the rate of influence of companies having dominating position in goods markets it had taken the 51st place instead of 133th, for the rate of inner market strength the 91st place instead of the 136th.

¹⁸ In the subsequent narrative, we will try to refer to the example of separate product markets. In particular, in the case of disclosure of cases of abuses committed by subjects of dominant position or participants of an anti-competitive agreement and in the subsequent exclusion of such phenomena.

¹⁹ See http://competition.am/uploads/resources//Annual_report_2016.pdf.

²⁰ According to the study, the prices in Armenian market have been decreasing since September 2016, as a result of which the retail prices for petrol have dropped by about 50 drams to 330 drams by January 2017. Then, at the end of January 2017, retail prices for petrol began to rise to 370 drams in March. In view of the aforementioned, the Commission considered the purchase prices of petrol importing companies, residual values of available inventories, international petrol prices and other indications as a result of which price changes were determined by changes in the price of purchasing petrol. Particularly, studies show that in January 2017, the prices for imported petrol decreased by 50 drams as compared with September 2016, as a result of which retail sales fell to that proportion, and in February as compared with January Prices for one liter petrol have risen by about 50 drams, so petrol prices have increased by almost 40 drams (Figure 5). "And the conclusion, "Essentially, there were comparable price changes in international

to 2017 January the prices of purchasing petroleum reduced for 50 drams and this reducing supposes that petroleum was imported with several group amount (according to picture 5 its price became 180 drams from 230 drams). Retail prices reduced from 308 drams to 330 drams in the same period. The differences between retail prices and purchase prices (importing prices and sale prices plus profit) in 2016 September and 2017 January made correspondingly 130 drams and 150 drams. It means that the reducing of retail price and purchase price for 50 drams provided the individual 20 drams profit per liter. And if we take into consideration that when the cost of acquisition will decrease, other components of the product's value will also be reduced (customs tax, customs duty, etc.), then the additional profit will be greater. Consequently, the Commission was obliged to consider the possible role of the superiors²⁰. And already in 2017 the increase in the price of one petrol by 50 drams in February and 40 drams in the price of natural gas will cause the difference of 140 drams, which is 10 drams more than 1 liter of petrol by 2016. It was in September. If we compare these prices by 2016, as of January 1 (Chart 5 of the project contains the information corresponding to 280 AMD and 390 AMD), the difference was 110 drams, which also provided profit to businesses. It means that dominant economic entities have had super profits over a one year period, but according to the Commission, "violations of competition legislation have not been disclosed".

The Commission did not have any interest in the fact that only 3 entities operate in the petrol market, the share of one of which (MaxPetrol) is only 6%. In the case of 2007, 7 business entities were operating in the market, and they were excluded from the positions of Civil Petrol Service (40.4%) and Mika Armenia Trading LSC (5.4%). In other words, over the past 10 years, about 60% of businesses have been driven out of the market. Meanwhile, the Commission did not "notice" it.

The Commission's ineffectiveness also testifies to the fact that for the past several years, the same entity has been systematically violating the same offense for a number of years, especially because of its "friendly" attitude, especially in the case of unfair competition²¹.

Thus, the actual state of anti-monopoly policy in Armenia, the influence of dominant companies and the intensity of competition in the domestic market, and the efficiency of the state body regulating the competition field are low. Moreover, the lack of professionalism that is fraught with a number of negative consequences is of great importance in the activity of this body, which, first of all, affects thousands of consumers.

True, the second part of the Program (Economic Competition Protection Measures and their Implementation Schedule) contains prominent events. Particularly, studies aimed at identifying anti-competitive agreements, monopoly or abuse of dominant position, carrying out activities to improve competitive culture, including raising public awareness of the public, as well as with non-governmental organizations and the business community, including mass media and other stakeholders, exercise restraint, of holding public meetings at the Commission raised through discussion and conduct studies on the competitive issues. Let's try to go beyond these events separately.

First of all, on the implementation of studies to identify anti-competitive agreements, monopoly or abuse of dominating position. As we have already described above, the petrol market is similar to the public for "bear service delivery" when the cases of explicit abuse of a dominant firm have not been qualified as competition law violations.

petrol markets as well as violations of competition legislation were not disclosed as a result of studying the activities of large companies dealing with petrol import and sale in Armenia"

²¹About the methodology of proving abuses. M. Miqaelyan, About the investigation issues of price abuses. The problems of economic development and stabilization /proceedings of 18th Scientific session of YSEU professor and lecturer staff and post graduates /, Yerevan, 2003, p. 147-150.

²²See Miqael Miqaelyan, Unfair competition and the challenges of its regulation in Armenia, Banber, Yerevan State University, Sociology, Economy, N 3 (24), 2017, p. 11-18.

Secondly, as we have already mentioned, one of the goals set in the Program is the promotion of competitive culture, which is not enshrined in the concepts interpreted in the Law, and it is unclear how the committee will "carry out activities aimed at improving the competitive culture".

Not to mislead the truth, we should mention that the Commission "opens" in its further annotation that for this purpose, particularly, it should "increase the level of informing the wide ranges of society...". It means that the Commission has to "act" publicly in 2018. And it is the demand of Law (Article 18, Part 2). To act publicly the Commission had assumed before in its programs in the same formation²². But in the annual report of the Commission on its activity it is not mentioned how it realized the "duty"²³. By the way, since 2009 the Commission escapes from the function of acting publicly and doesn't publish the bulletin foreseen by Law (see Article 18, part 2, paragraph 10), and since 2013 it doesn't upload its decisions in the web²⁴. The fact, that the Commission does not highlight the act concerning the publicity is proved by not foreseeing the mechanism supporting it in the program.

Conclusion

One of the ways in which the Commission "raises awareness of the broader public awareness of the issue" is "observing the sessions of the Public Council adjunct to the Commission." The requirement of the mentioned body does not follow the requirements of the Law, and this study indicates that the members of the current Board, which were involved in the Commission's "choice", were not prominent in professionalism and impartiality. And in such a situation, "session of the Public Council adjunct to the Commission" becomes self – purposed and meaningless, which will be a waste of time for the Commission.

As we have already mentioned at the beginning of this study, the Commission has not set a task in the Project to control state aid and it is not accidental that, in this respect, such an event did not provide for the protection of economic competition, and how surprising it is to provide a mechanism for the suspension of state support for competition protection by "dissolving an unlawful act adopted". Thus, the Commission's annual activities for the past few years do not comply with the legislative requirements and expectations of the public, and the state body acting on the account of taxpayers has to drastically change their attitude towards their development and market analysis, demonstrating professional approach and sympathy for the case.

References

1. Miqaelyan M. Unfair competition and the challenges of its regulation in Armenia, p. 16,

²³ See, for example, RA ECPSC 2016 annual activity program http://competition.am/uploads/resources/Activity_plan_2017.pdf, p. 23, RA ECPSC 2017 annual activity program, http://competition.am/uploads/resources/Activity_plan_2017.pdf, p. 24:

²⁴ RA ECPSC 2016 report of annual activity, http://competition.am/uploads/resources/Annual_report_2016.pdf:

ՏՆՏԵՍԱԿԱՆ ՄՐՑԱԿՑՈՒԹՅԱՆ ՊԱՇՏՊԱՆՈՒԹՅԱՆ ՀԱՐՑԻ ՇՈՒՐԶ

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ՀՀ տնտեսական մրցակցության պաշտպանության պետական հանձնաժողովն օրենսդրությամբ սահմանված կարգով յուրաքանչյուր տարի հրապարակում է հաջորդ տարվա իր գործունեության ծրագիրը: Դրանում ներկայացվում են ապրանքային շուկաներում մրցակցային միջավայրի գնահատականը, բացահայտված հիմնախնդիրներն ու դրանց հիման վրա՝ այդ իմնախնդիրների լուծման ուղիները, հաջորդ տարվա գործունեության միջոցառումները, մեխանիզմները և առաջարկությունները: Հանձնաժողովի գործունեության վերջին մի քանի տարիների ծրագրերում նկատվել են բացթողումներ և մասնագիտական առումով անճշտություններ: Մասնավորապես, չնայած յուրաքանչյուր տարի պետական օժանդակության բազմաթիվ գործողություններ են կատարվում, որոնցից հանրությանը հայտնի են դառնում միայն «սառցաբեկորի վերին շերտը», սակայն Հանձնաժողովը դրանց վերաբերյալ երբևիցե որևէ վարույթ չի սկսել (պետական օժանդակության կարգավորման դրույթն օրենսդրությամբ ամրագրվել է 2007 թվականից):

Մասնագիտական առումով՝ ոչ ճշգրիտ վերլուծության պատճառով բենզինի շուկայի մրցակցային միջավայրի վերաբերյալ ոչ համարժեք գնահատական է տրվել: Վերջին մի քանի տարիների տարեկան գործունեության Ծրագրերը չեն համապատասխանում օրենսդրի նախատեսած պահանջներին և հասարակության սպասումներին և հարկատուներին հաշվին գործող պետական մարմինը պետք է արմատապես փոխի դրանց մշակման և շուկաների վերլուծության աշխատանքների վերաբերյալ վերաբերմունքը՝ ցուցաբերելով պրոֆեսիոնալ մոտեցում և գործի նկատմամբ բարխդություն:

Բանալի բառեր. տնտեսական մրցակցություն, ապրանքային շուկա, գործունեության ծրագիր, մրցակցության պաշտպանություն, հանձնաժողով

К ВОПРОСУ ЗАЩИТЫ ЭКОНОМИЧЕСКОЙ КОНКУРЕНЦИИ

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Государственная комиссия РА по защите экономической конкуренции публикует свою ежегодную программу мероприятий на следующий год. В ней представлена оценка конкурентной среды на товарных рынках, выявлены проблемы и способы решения этих проблем, мероприятия, механизмы и рекомендации на следующий год. В программах действий комиссии за последние годы наблюдались проблемы и профессиональные неточности. В частности, несмотря на то, что каждый год проводятся мероприятия государственной поддержки, комиссия никогда не проводила никаких административных разбирательств. Из-за некорректного анализа, отсутствует адекватная оценка конкурентной среды на рынке бензина.

Программа действий комиссии за последние годы соответствует законодательным требованиям и ожиданиям общественности, а государственный орган, действующий за счет налогоплательщика, должен радикально изменить свое отношение к их разработкам и анализу рынков, демонстрируя профессиональный подход к этому делу.

Ключевые слова: экономическое соперничество, товарный рынок, программа действий, защита соперничества, комиссия.

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OBTAINING AND DEVELOPING SEVERAL QUALITY INDICATORS OF BAY LAUREL LEAF ETHER OIL IN ARTSAKH

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Ether oils are fragrant, easily volatile substances contained in various parts of the plants. Esther oils are easily distilled from the plant by steam. Laurel leaves contain 0.5 - 0.6% ether oil the medicinal properties of which are determined by the content of eugenic, cineol and a number of terpenic compounds. With its antibacterial and anti-inflammatory properties, laurel oil is effectively used in aromatherapy.

The extraction of the bay laurel ether oil is studied by the method of complicated steam distillation with multiple distillation of water vapor, after which the physical and chemical properties such as density, refractive index, acid number and optical rotation have been determined. Determination of the density (specific gravity, d_{20}^4) was conducted with the help of a pycnometer according to the method 1 of the GF XIII edition (OFS.1.2.1.0014.15). The determination of the refractive index was carried out using an IRF 454 B2M refract meter. Additionally, it was adjusted over purified water, for which n_{20}^D equals 1.3330.

Specific optical rotation ($^{\circ} \times ml \times dm^{-1} \times g^{-1}$) was determined in compliance with the requirements of the GF XIII edition. Acidity number (cc) is the mass of potassium hydroxide in milligrams that was required to neutralize one gram of free acids contained in ether oil.

Key words: ether oil, bay laurel, density, refractive index, acidity number, optical rotation

Introduction

Among the diversity of flora, since the earliest times man paid attention to plants with a pleasant or acute aroma, sticky to touch. Applying them in a mixture with the plant, and later, when the man learned to extract certain aromatic substances from plants, the most valuable properties of these substances –the ether oils and aromatic resins were discovered.

The science of ether oils was highly developed in Egypt and other countries, where the ancients used them for embalming and healing purposes.

With the rapid development of chemistry, it seemed that the application of ether oils in medicine should have expanded. However, that did not happen. The industry of chemical preparations diminished the role of natural remedies, especially the ether oils. Yet only in recent years phytotherapy, aromatherapy and the undeservedly forgotten glory of ether oils were returned to mankind.

Ether oils are fragrant, easily volatile substances contained in various parts of plants, mainly in flowers, leaves, fruits, roots. Ether oils are easily distilled from the plant by steam. Since ancient times, the laurel plant was known as both food and herb.

Laurusnobilis is one of the most famous evergreen trees. The leaves and fruits of plants and its extracts are used for seasoning in cooking, in folk medicine and cosmetology. Ether oils, sesquiterpene lactones, phenolic compounds are found in bay laurel as the main groups of biologically active substances [1, 2].

Laurel leaves contain 0.5 - 0.6% ether oil the medicinal properties of which are determined by the content of eugenic, cineol and a number of terpenic compounds. With its antibacterial and anti-inflammatory properties, laurel oil is best used in aromatherapy. In folk remedies, the laurel leaf is

used as an external cure for itching, rheumatic pains, spasms, tumors and as an agent of strengthening the nervous system.

For these purposes ointment of the following composition is recommended: six parts of laurel leaf powder, one part of juniper leaves and twelve pieces of unsalted butter. All this should be carefully ground. This ointment is a very effective cure, acts as an analgesic and anti-spasmodic relief from rheumatic and awakening pains. Dry bay laurel leaves are widely used in culinary and canning industry.

Laurusnobilis is native to Mediterranean region; this plant is also spread in Georgia, the southwestern part of Krasnodar region and in small quantities on the southern coast of the Crimea.

Ether oils of plants are complex natural mixtures of substances, in which, in addition to terpenoids, there are aromatic, poly-acetylene and other compounds [3, 4]. Some of the ether oils and sesquiterpene lactones possess phytotoxic, antibacterial and other kinds of pharmacological activity and are clinically tested [5-8]. The leaves of the *laurusnobilis* are among the most studied raw materials for the extraction of ether oils.

Conflict settings

Studies of the chemical composition of the laurel leaves, conducted by domestic and overseas researchers, showed that the content of ether oil in them varies from 0.5 to 1.5% (in cases of absolutely dry raw material) [2]. Its main components are 1,8-cineol (31,4- 56%), linalool, eugenol, methyl eugenol, sabinen compounds known for their antibacterial, antifungal, antitubercular and phytotoxic properties.

Ether oil from the *laurusnobilis* was obtained by hydrodistillation. Experimental studies have shown that the process of intensive distillation of oil from the laurel yield with the use of the Klevanger device in the Loshkarev modification ends after 4 hours given 1:30 the raw material and water. The extracted ether oil was passed through a molecular sieve A4 to remove excess water. In appearance, laurel oil is easily volatile liquid of yellowish color with a bitter taste and typical odor.

The output of ethereal oil comprises 0.4-0.5%. To increase the extraction of the main product, the water portion was extracted three times with hexane with ratio of hexane-water 5: 1. The extraction was carried out in a sharing funnel: the hexane layer is separated, all 3 portions are combined, then the hexane extract is dried over heated magnesium sulfate ($MgSO_4$) for 20 hours.

The dried hexane solution of laurel ethereal oil is distilled in rotary evaporator at the temperature of 51-55 ° C. After distillation of 90-95% of hexane, the vacuum apparatus is connected to the rotary evaporator and the residuals of hexane are distilled off. After the hexane is completely stripped, 10 ml of ethyl alcohol are added to the flask, it is distilled at the temperature of 71-78 ° C and then it is put under vacuum at 30-35 mm/Ng.

The extraction of ethereal oil is 0.15-0.2% or 0.5-0.7%.

In order to achieve more extraction of laurel ethereal oil, other methods of obtaining were investigated.

The essence of the methods is the extraction of dry leaves of the laurel bay with two easy-boiled solvents at low temperatures.

Method 1

In a two-liter flask equipped with a hermetically sealed glycerin bolt with an anchor stirrer and a reverse spherical condenser, put 300 g of crushed dried leaves of the laurel bay, pour 1.2 L of hexane with a ratio of 1: 4, heat at 51-53 ° C, the mixture stir for 10-12 hours, then filter 2 times through the filtered paper. On a rotary evaporator, 98-99% of hexane is distilled from the filtrate. After distillation, a very viscous dark green mass is obtained which is further distilled with water vapor at 99-100 ° C and a water-ether-oil mixture is obtained which is then extracted again with hexane.

After extraction, the hexane layer is dried over heated magnesium sulfate, insisted, left for 8-10 hours, filtered with filter paper. Hexane is completely distilled off connecting the vacuum apparatus

to the rotary evaporator. After the final distillation, 10 ml of alcohol are added to the flask with ethereal oil and 30-40 ml Hg to be distilled under vacuum to remove residual hexane. The output of essential oil is up to 1-1.01% which is close to the theoretical amount.

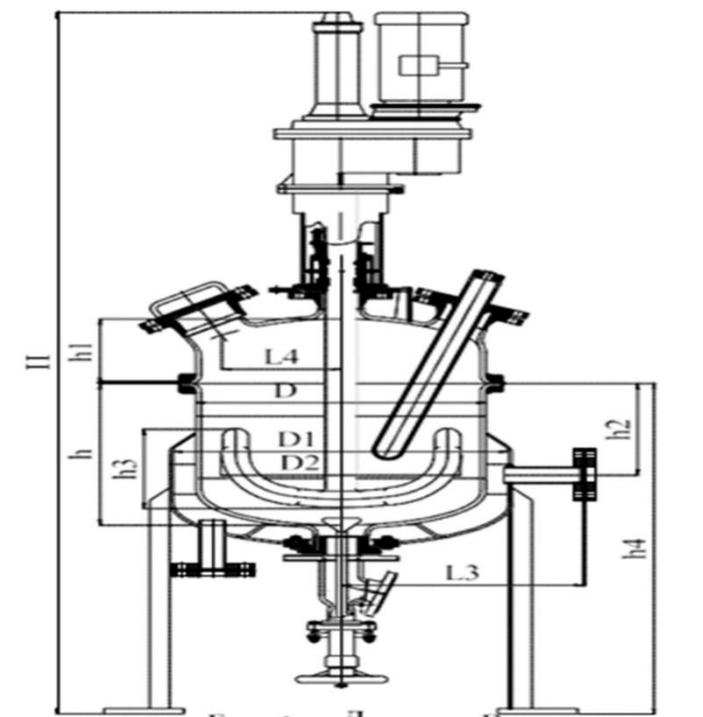


Fig.1.Anchor stirrer

Method 2

The process of the experiment and the duration of the extraction are similar to those of Method 1. We use a more volatile solvent: methylene chloride, boiling temperature and removal is 31-32 ° C.

After removal of methylene chloride, 10 ml of water are added to the flask containing the ethereal oil, the water is distilled off in a vacuum, then it is freed from chloride compounds and then the alcohol is distilled off. Pure ether oil is obtained in an output of 1.2-1.25 ml.

Table 1

Qualitative composition and meaning of the constant of ethereal oil of laurel bay (n=3)

Nº	Method of extraction	Output of ethereal oil %	Density g\cm	Indicator of refraction n20	Optical rotation of density
1	Distillation with water vapor	0.8	0.9200	1.4698	10.02198
2	Extraction with hexane with water	0.2-0.25	0.9190	1.4697	10.9950
3	Extraction of dry laurel bay with hexane and distillation with water vapor	1-1.01	0.9192	1.4700	11.1200
4	Extraction of dry leaves with chlorine methanol and hydro distillation	1.2-1.25	0.9200	1.4698	11.1150

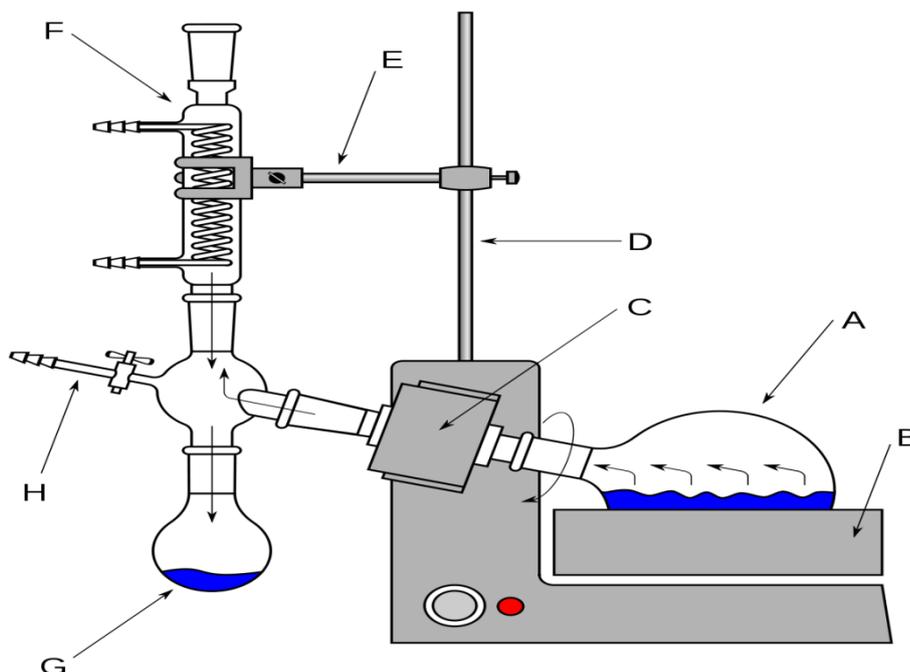


Fig. 2. Rotary evaporator

Research results

To study the constants of ether oil of laurel leaves and their variability, raw materials were harvested in the main phases of the plant development (budding, flowering and fruiting). The yield was dried in the shade, in open air: the samples were evaluated after two months since their collection. The analysis of the samples was carried out in two stages: 1) extracting the ether oil and 2) the subsequent determination of the constants.

Determination of the density (specific gravity, d_{20}^4) was carried out with the help of a pycnometer according to the method 1 of the GF XIII edition (OFS.1.2.1.0014.15).

The refractive index (refraction, n_{20}^D) was determined in accordance with the requirements of the GF XIII edition (OFS.1.2.1.0017.15). High refraction and high density usually characterize the richness of the studied ether oil with oxygen compounds, which indicates, in particular, the timely collection of the yield. The determination of the refractive index was carried out using an IRF 454 B2M refract meter. Additionally, it was adjusted over purified water, for which n_{20}^D is equal to 1.3330.

Specific optical rotation ($^{\circ} \times \text{ml} \times \text{dm}^{-1} \times \text{g}^{-1}$) was determined in compliance with the requirements of the GF XIII edition (OFS.1.2.1.0018.15).

Acidity number (cc) is the mass of potassium hydroxide in milligrams that was required to neutralize one gram of free acids contained in ether oil [GF XIII, (OFS.1.2.1.0004.15)]. This is an important constant, since the content of free acids usually varies within certain limits for each ether oil. As a rule, it is small (0.5-5), but when stored, it increases as a result of the decomposition of compound ethers.

The results of the determined quantitative content and physicochemical constants (average values) of the laurel ether oil are featured in the table.

Quantitative content and values of the constants of ether oil of laurel leaves (n = 3)

The phases of plant development	Ether oil extraction Per %	Density g/cm	Index of refraction n ₂₀ D	Specific optic rotation (°)×ml×dm ⁻¹ ×g ⁻¹	Acidity number
Artsakh					
Budding	0,76	0,9200	1,4698	10,2198	2,22
Flowering	1,21	0,9218	1,4715	12,1543	2,13
Fruiting	0,96	0,9236	1,4729	13,2458	2,16

Conclusion

1. Depending on the phase of the plant's vegetation the quantitative content, physical and chemical constants of the bay laurel growing in Artsakh have various characteristics, namely quantitative outcome of the ether oil, its density, refractive index and optical rotation.
2. The obtained product is used to support digestion, stimulate appetite and boost the secretion of stomach juice, hence increasing the functional activity of the stomach. It can be an excellent relief for cleansing the kidneys, liver and urogenital system of the human body. Its stimulating and toning properties can significantly improve well-being and contribute to early recovery after ailments. Also, this oil can be used for all ailments, which are accompanied by temperature, as the laurel oil possesses good antipyretic properties.
3. The use of laurel oil is recommended for the alleviation of various kinds of chronic and aching disorders, namely arthritic or rheumatic pains in the joints, pains and discomfort in the stomach, muscle pains and spasms, etc. It has antiseptic properties, which can help with diseases such as bronchitis or various ear infections. Moreover, laurel oil positively influences the reproductive function, helps to deal with infertility. Women are recommended this oil to regulate the menstrual flow. Bay laurel oil can trigger and accelerate childbirth, as well as reduce the likelihood of various complications during labour.

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ԱՐՑԱԽՈՒՄ ԴԱՓՆՈՒ ԵԹԵՐԱՅԻՆՅՈՒՂԻ ՍՏԱՅՈՒՄՆ ՈՒ ՈՐԱԿԱԿԱՆ ՑՈՒՑԱՆԻՇՆԵՐԻ ՈՐՈՇՈՒՄԸ

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Շուշիի պեղնոլողիական համալսարան

Եթերային յուղերը բուրավետ, հեշտ թռչող նյութեր են, որոնք պարունակվում են բույսերի տարբեր հատվածներում:

Եթերային յուղերը հեշտությամբ տարանջատվում են բուսական հումքից՝ ջրի գոլորշիների միջոցով:

Դափնու տերևները պարունակում են 0,5-0,6% եթերային յուղեր, որոնց բուժիչ հատկությունները պայմանավորված են էվգենոլի, ցինեոլի և մի շարք միացությունների պարունակությամբ: Դրանով են բացատրվում դրանց հակաբիոտիկ և հակաբորբոքային հատկությունները, ինչը թույլ է տալիս օգտագործել դափնու յուղը արոմաթերապիայում: Դափնու եթերային յուղը ստացվել է բարդացված ջրային թորման մեթոդով՝ ջրային գոլորշու բազմիցս գտմամբ, ինչից հետո որոշվում են ֆիզիկաքիմիական

CHEMISTRY

հաստատունները՝ խտությունը, բեկման ցուցիչը, թթվային թիվը, օպտիկական հատկությունները: Խտության որոշումը (հատուկ ուժգնությունը՝ d_{20}^4) իրականացվել է պիկնոմետրի օգնությամբ: Քայքայիչ ցուցանիշը (ռեֆրակցիա, n_{20}^D) որոշվել է ԴՓ XIII հրատարակության պահանջներին համապատասխան: Ռեֆրեկցիան դեքսիորոշումը կատարվել է ռեֆրակտոմետրի օգնությամբ (ԻՐՓ 454 Բ2Մ): Նախապես կարգավորել են մաքրված ջրի մակերևույթին, որի համար n_{20}^D հավասար է 1,3330: Տեսակարար օպտիկական ռոտացիան ($[\alpha]_{D}^{20}$) որոշված է ԴՓ XIII հրատարակման պահանջներին համապատասխան: Թթվային թիվը՝ կալիումի հիդրօքսիդի քանակությունը՝ միլիգրամով, ծախսվել է ազատ թթուների չեզոքացման համար, որը պարունակվում է 1 գ եթերային յուղում:

Բանալի բառեր. եթերային յուղ, դափնի, խտություն, բեկման ցուցիչ, թթվային թիվ, օպտիկական ռոտացիա

ПОЛУЧЕНИЕ И РАЗРАБОТКА КАЧЕСТВЕННЫХ ПОКАЗАТЕЛЕЙ ЭФИРНОГО МАСЛА ЛАВРА В АРЦАХЕ

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Эфирные масла - душистые, легко летучие вещества, содержащиеся в различных частях растений. Эфирные масла легко перегоняются из растительного сырья водяным паром. Листья лавра содержат эфирное масло 0,5 - 0,6%, целебные свойства которого обусловлены содержанием эвгенола, цинеола и ряда терпеновых соединений. Этим объясняются его антимикробные и противовоспалительные свойства, что позволяет использовать лавровое масло в ароматотерапии.

Нами получено эфирное масло лавра методом усложненной паровой дистилляции с многократными перегонками водных паров, после чего определено физико-химические константы: плотность, показатель преломления, кислотное число, оптическое вращение. Определение плотности (удельный вес, d_{20}^4) проводили с помощью пикнометра. Показатель преломления (рефракция, n_{20}^D) определяли в соответствии с требованиями ԴՓ XIII издания. Определение показателя преломления проводили с помощью рефрактометра ԻՐՓ 454 Բ2Մ. Предварительно его юстировали по очищенной воде для которой n_{20}^D равно 1,3330.

Удельное оптическое вращение ($[\alpha]_{D}^{20}$) определено в соответствии с требованиями ԴՓ XIII издания. Кислотное число (к.ч.) – количество миллиграммов калия гидроксида, израсходованное на нейтрализацию свободных кислот, содержащихся в 1 г эфирного масла.

Ключевые слова: эфирное масло, лавр, плотность, показатель преломления, кислотное число, оптическое вращение

ANTIOXIDANT ACTIVITY OF POMEGRANATE SEED OIL AND SOWING CORIANDER FRUIT

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The purpose of our work is to study the antioxidant properties of pomegranate seed oil (PSO) and coriander fruit oil one(CFO). Used oils were received by the means of extraction from seeds of the mature pomegranate and coriander fruits growing in the areas of Shushi, Arsakh Republic. On the example of the model reaction of the cumene-initiated oxidation, the antioxidant (AO) effect of pomegranate seed oil and sowing coriander is investigated. . Experiments on oxidation were carried out on a manometric unit with automatic pressure regulation. It is shown that both types of oil demonstrate antioxidant features. The efficient antioxidant contents ($f \cdot [InH]$) and their antioxidant activities are determined. The response rate constant is $RO_2 + InH \xrightarrow{k_7} ROOH + In$. It is demonstrated that 1 mg of pomegranate seed oil contains $0,91 \cdot 10^{-4}$ moles / l of antioxidants which exceeds antioxidant content in the oil of coriander fruit 10 times.

Key words: oils, antioxidant content, antioxidant activity, pomegranate seed, coriander fruit

Introduction

In recent years the use of natural bio-antioxidants in folk and conventional medicine, food and beverage, cosmetic industry has greatly increased due to the growing consumer interest in the ingredients of natural origin, because synthetic additives are potentially harmful [1,2]. Thereby, it is noted that the alternative synthetic antioxidants (AO) can be the ether oils of vegetative raw materials. Recently, as a result of numerous studies, the biological activity of ether oils of spicy aromatic plants has been established, including their AO activity(AOA) [4-6]. Natural balance violation of radical peroxidation rate and AO activity of body resistance occurring under unfavorable external factors (environmental contamination, ultraviolet radiation, emotional stress, high content of easily digestible carbohydrates and fats in the diet, with synchronous decline of bio antioxidants in content) plays an important role in the emergence of many diseases such as oncologic, cardiovascular, gastrointestinal, etc. [7-9]. In this connection, the search and investigation of promising non-toxic substances with antiradical and high AO activity is an urgent task. Official herbs are rich in similar substances, which are the main intake sources of bioactive substances for human and other living organisms [10,11]. Among the main active ingredients in the essential oils of plant raw materials are flavonoids, polyphenols, x c c xphenolic carboxylic acids, tannins, vitamins, selenium, etc. In folk medicine pomegranate seed oil and coriander fruit oil have been used long ago. The healing properties of these oils are explained by nutrients of bioactive substances in their makeup. In particular, pomegranate seed oil contains *Punica Granatum* acid (62-85%), fatty acids (linoleic-9.8%, palmitic-3.2%, stearic-2.1%, oleic-7.7%), vitamins E (0, 33%), C, B, P, tocopherols (0.66%), flavonoids, copper, manganese, chromium, magnesium, phosphorus, calcium and other elements [20]. The main components of coriander oil are fatty oil (up to 28%), consisting of oleic, isooleic, linoleic, palmitic, stearic and myristic acids, proteins (up to 17%), vitamin C (0.14%), carotene (0.01 %), rutin (up to 0.145%), polyphenols [21]. The chemical constitution of these oils should be widely used in perfumery, cosmetics manufacturing and in medicine. In particular, pomegranate seed oil acts as an anti-inflammatory cure [11,14]. In folk medicine coriander oil is used in gastrointestinal diseases as an antihelminthic cure, pain reliever and cold remedy and is the originated material for the synthesis of aldehyde citral applied in ocular practice at the treatment of cataracts [14].

Conflict settings

The purpose of our work is to study the antioxidant properties of pomegranate seed oil (PSO) and coriander fruit oil one(CFO). Used oils were received by the means of extraction [16] from seeds of the mature pomegranate and coriander fruits growing in the areas of Shushi, Arsakh Republic. The yield of PSO amounts 10,6%, CFO one is 8,4%. PSO is a viscous liquid of pale yellow color with density $d = 0,942$ g/ml having a refractive index $n_D^{20} = 1,5207$, CFO is a viscous liquid of pale green color with $d = 0,871$ g/ml and $n_D^{20} = 1,4707$. AO properties of PSO and CFO were studied by the kinetic method on the example of the model response initiated by azo-di-iso-butyronitrile (AIBN) cumene oxidation. Experiments on oxidation were carried out on a manometric unit with automatic pressure regulation. In all experiments the reaction mixture volume was 5 ml, cumene concentration 2.87 mol / l, the ether oil content varied between 0 ÷ 25 mg. Used reagents such as cumene, chlorobenzene, AIBN, ethyl acetate wererefined according to the above-described procedure. The AO content of the oils investigated is determined by the periods of induction (τ) found out on kinetic curves oxygen absorption via an equation (1) [16]

$$\tau = \frac{f \cdot [InH]_0}{V_i}$$

(1)

where $[InH]_0$ is the AO content in the given sample of ether oil, V_i - the initiation rate, f – stoichiometric inhibition factor (the number of radicals terminating on one inhibitor molecule InH). Since the studied ether oils contain two or more AO in their chemical makeup, the parameters f have remained unmeasured hence, for this reason, not absolute, but effective contents of the AO are given in our calculations. The calculation results of AO activity (AOA) are also presented in the work. AOA inhibitors in oxidation reactions are characterized by a constant rate response of linear chain break.



In AOA calculations (k_7), we have used the equation (2) [18],

$$[O_2] = -\frac{k_2}{k_7} [RH] \ln \left(1 - \frac{t}{\tau} \right) \quad (3)$$

where k_2 - is the rate constant reaction of chain continuation



$[RH]$ is the concentration of the oxidizing hydrocarbon i.e. cumene

$[O_2]$ – the amount of absorbed oxygen during $t < \tau$, the induction period which is determined graphically on the kinetic curves of oxygen absorption along the coordinate of two lines intersection for which $\text{tg} \alpha_1 = 2 \text{tg} \alpha_2$ or $V_{O_2}^0 = 2V_{O_2}$ where $V_{O_2}^0$ - [oxygen uptake rate](#) after the induction period yield, V_{O_2} -with inhibitor present (fig. 1).

Research results

Experiments have shown that during the cumene oxidation on the kinetic curves of oxygen uptake in the presence of studied extracts well-defined induction periods come out. (fig.1). The induction period occurrence indicates that AO substances exist in oils. The detected induction periods are being described (fig. 2) by the equation (1) that allowed determining the effective AO makeup in the investigated oils.

The results are shown in the featured line graphs:

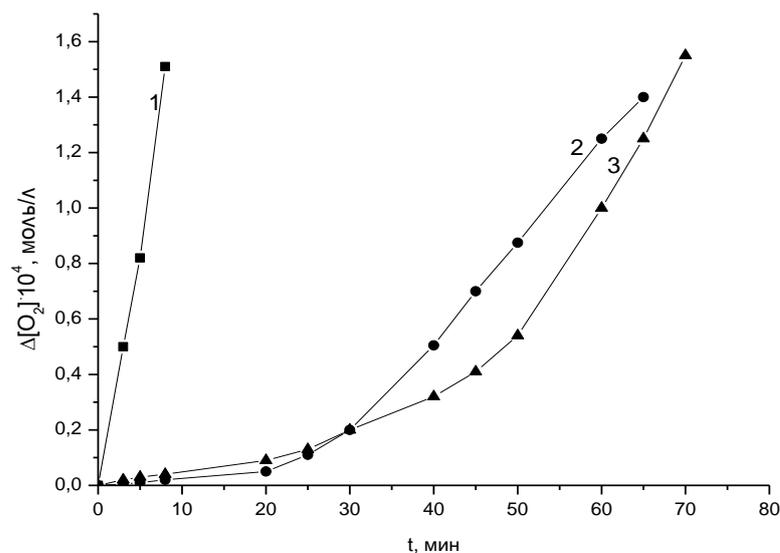


Fig.1. The kinetic curves of oxygen uptake during the process on cumene oxidation without (1) and with 3.9 mg PSO (2) and 22, 64 mg CFO (3). $V_i = 1,25 \cdot 10^{-7}$ Mole/l · s, T=348K

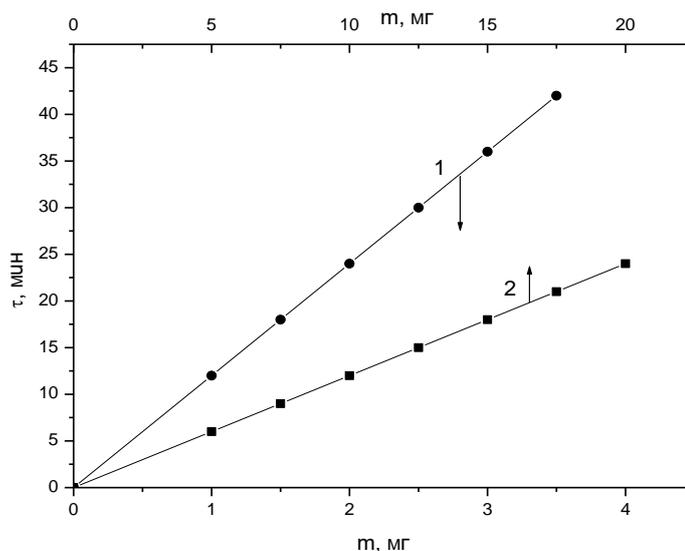


Fig.2. Relation of oxygen uptake induction periods on cumene oxidation from PSO content (1) and CFO (2). $V_i = 1,25 \cdot 10^{-7}$ Mole/l · s, T=348K.

From the results shown in the graphs it is obvious that from PSO investigated oils with 348K contain 10 times more AO than CFO ones. The high content of AO in PSO ensures more than 1-year length of warranty. The graph also illustrates that the measured effectiveness of AO contents increase with the cumene oxidation temperature drop. When the temperature drops to 30 degrees (from 348K up to 328K) the change is 1.4 times in the case of PSO, and 3.3 times in the case of CFO ones. The growth of AO effective concentration can be explained by the fact that the experimented oils contain unsaturated fatty acids in sufficient supply, being subjected to auto oxidation, additionally initiate the

chain process of AO consumption. To determine the AO content at room temperature, we extrapolated the results given at coordinates $\lg(f[\text{InH}])$ from the reverse value of temperatures (Fig.3).

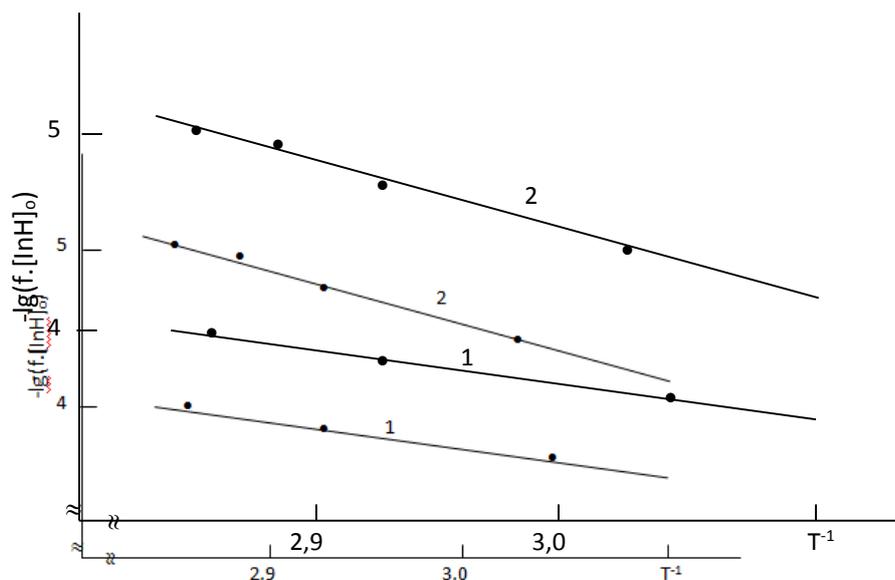


Fig.3. Temperature relation of antioxidants effective content in PSO (1) and CFO (2).

The graph indicates that the effective content of AO in the experimented ether oils per 1 mg depends on the temperature according to these equations:

$$(f[\text{InH}])_{\text{PSO}} = 6,16 \cdot 10^{-8} \exp(5042/RT), \text{ Mole/l}$$

$$(f[\text{InH}])_{\text{CFO}} = 1,99 \cdot 10^{-8} \exp(13721/RT), \text{ Mole/l}$$

The graph also shows the values of the parameters k_7 , characterizing AOA oils. The values of k_7 are determined by straightening out (Fig. 4) the oxygen uptake experimental data during the induction period at the coordinates of equation (2). It was taken into account that for cumene $k_2 = 4,677 \cdot 10^6 \exp(-9800/RT) \text{ l/mole}\cdot\text{s}$ [19].

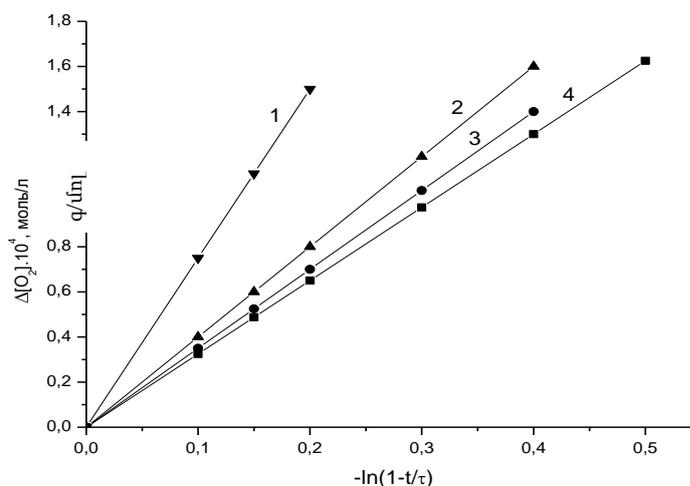


Fig.4. The concentration relation of oxygen uptake from the parameter $-\ln(1-t/\tau)$ during the oxidation of cumene in the presence of 0,714mg (1), 3,90 mg (2) PSO, 3,06 mg (3) & 22,64 mg CFO. mole/l·s, T=328K (1,3) and 348K (2,4).

Experiments have revealed that in the presence of the studied oils, the cumene oxidation rate remains significantly underestimated after the withdrawal from the induction period in comparison with benzene-inhibited oxidation (see column 7 in table). This fact is explained by the AO properties of oxidation products (QH) of the original AO existing in oil [20, 21]. It is shown that the correlation is observed between the rates of uninhibited (V_0) and inhibited cumene oxidation after the withdrawal from the induction period (V),

$$\Phi = \frac{V_0}{V} - \frac{V}{V_0} = \frac{k_{71}[QH]}{\sqrt{k_6 V_i}} \quad (5)$$

Where k_{71} is the rate constant of the chain break on the oxidation products of the original AO, present in the examined oils.



k_6 -rate constant of quadratic chain break $RO_2 + RO_2 \xrightarrow{k_6}$ molecular products.

During the calculations k_{71} , it was taken into account that for cumene $k_6=4,74 \cdot 10^5 \exp(-1800/RT)$ [19] and that $f \cdot [InH]_o = f \cdot [QH]$. The collected data suggest that from the oxidation products the large number of AOA is AO, contained in CFO.

Table 1
AO and AOA content of ether oils in pomegranate seeds and coriander fruits

Ether oils	T°K	$V_i \cdot 10^7$, mole/l.s	Content,mg	τ , min	$f[InH]^a \cdot 10^4$ mole/l	$V^6 \cdot 10^6$ mole/l.s	$k_{71} \cdot 10^4$ l/mole.s	$k_{71} \cdot 10^2$ l/mole.s
Pomegranate seeds	348	1,25	0	0	-	3,00	-	-
	348	1,25	1,46	18	0,92	1,73	2,71	3,80
	348	1,25	2,675	32	0,90	1,57	2,71	3,81
	348	1,25	3,90	46	0,88	1,26	2,72	3,82
	348	2,50	0	0	-	4,25	-	-
			3,90	25	0,96	1,49	2,70	3,83
	348	0,625	0	0	-	2,12	-	-
			3,90	92	0,86	0,97	2,73	3,82
	339	0,733	0	0	-	2,00	-	-
	339	0,733	1,46	40	1,28	1,16	1,19	3,13
	339	0,733	2,92	80	1,29	0,74	1,18	3,15
	339	0,733	0,73	20	1,28	1,48	1,20	3,11
	328	0,344	0	0	-	1,00	-	-
	328	0,344	0,55	35	0,44	0,77	0,53	2,35
	328	0,344	0,714	45	1,43	0,70	0,55	2,32
328	0,344	1,42	89	1,40	0,51	0,57	2,30	
Coriander fruits	348	1,25	8,25	10	0,084	1,39	3,83	16,30
	348	1,25	16,50	18	0,082	0,83	3,81	16,42
	348	1,25	22,64	25	0,083	0,62	3,85	16,29
	348	2,50	22,64	13	0,083	1,23	3,8	15,80
	348	0,625	22,64	50	0,082	0,33	3,75	15,92
	348	0,35	22,64	90	0,084	0,18	3,90	16,48
	339	0,733	12,25	38	0,137	0,55	2,55	10,06
	339	0,733	24,50	76	0,137	0,33	2,60	8,96
	339	0,733	30,75	100	0,143	0,23	2,45	10,05
	339	1,250	48,00	82	0,129	0,25	2,55	11,20
	328	0,344	6,12	82	0,276	0,28	1,52	6,31
	328	0,344	3,06	41	0,280	0,46	1,48	6,34
	328	0,344	1,53	21	0,275	0,67	1,56	6,29
	328	0,344	4,80	64	0,274	0,34	1,53	6,35

a-per 1 mg of extract, b-after the withdrawal from the induction period

Straightening out the experimental data at coordinates $\lg k_i$ from T-1 for the studied oils, the temperature correlation of AOA at coordinates and products of their oxidation are obtained.

Consequently, the results are:

1. for pomegranate seed oil
 $k_7 = 1,17 \cdot 10^{14} \exp(-15488/RT)$, l/mole.s
 $k_{71} = 1,30 \cdot 10^6 \exp(-5620/RT)$, l/mole.s,
2. for pomegranate seed oil
 $k_7 = 1,88 \cdot 10^9 \exp(-10647/RT)$, l/mole.s
 $k_{71} = 8,20 \cdot 10^9 \exp(-10665/RT)$, l/mole.s.

Thus, the research has shown that the ether oils of PS and CF possess AOA. Moreover, the effective AO content depends on the temperature measurement and increases with decreasing temperature which is linked to the extra initiating at the expense of auto-oxidation of unsaturated fatty acids contained in the experimented ether oils and in CFO in particular.

Conclusion

Using the modeling response of cumene oxidation it is shown that the content of AO in PSO is 10 times more than in CFO (measured at 348K). It has been revealed that with decreasing temperature the effective measured content of AO increases, therefore, to prolong their shelf life they must be stored at relatively low temperatures.

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ՆՈՒԱՆ ԿՈՐԻՉԻ ԵՎ ՀԱՄԵՄԻ ՍԵՐՄԵՐԻ ՅՈՒՂԵՐԻ ՀԱԿԱՕՔՍԻԴԱՆՏ ԱԿՏԻՎՈՒԹՅՈՒՆԸ

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Մեր աշխատանքի նպատակն է եղել ուսումնասիրել նույն կորիզայուղի և համեմի սերմերի յուղի հակաօքսիդանտ ակտիվությունը: Օգտագործված յուղերը ստացվել են էքստրակցիոն մեթոդով՝ ԱՀ Շուշիի մերձավակայքում աճող նույն հասուն պտուղների կորիզներից և մշակվող համեմի սերմերից: Ուսումնասիրվել է նույն կորիզի յուղի և համեմի սերմնայուղի հակաօքսիդանտ հատկությունը կոմոլի

օքսիդացման մոդելային ռեակցիայի օրինակով: Օքսիդացման փորձեր իրականացվել են ճնշման ավտոմատ կարգավորվող մոնոմետրիկ սարքով: Ցույց է տրվել, որ երկու յուղերը օժտված են հակաօքսիդանտ հատկություններով: Որոշվել է հակաօքսիդանտների արդյունավետ պարունակությունը՝ ($f \cdot [InH]$) և դրանց հակաօքսիդանտ ակտիվությունը՝ ռեակցիայի արագության հաստատունը՝ $RO_2 + InH \xrightarrow{k_7} ROOH + In\cdot$: Ցույց է տրվել, որ նոսան կորիզայուղի 1մգ պարունակում է $0,91 \cdot 10^{-4}$ մոլ/լ հակաօքսիդանտ, ինչը 10 անգամ գերազանցում է համեմի սերմնայուղի հակաօքսիդանտների պարունակությանը:

Բանալի բառեր. յուղ, հակաօքսիդանտների պարունակություն, հակաօքսիդանտային ակտիվություն, նոսան կորիզ, համեմի սերմ

АНТИОКСИДАНТНАЯ АКТИВНОСТЬ МАСЛА КОСТОЧЕК ГРАНАТА PUNICA GRANATUM L. И ПЛОДОВ КОРИАНДРА ПОСЕВНОГО CORIANDRUM SATIVUM L.

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Целью нашей работы было исследование антиоксидантных свойств масел гранатовых косточек (МКГ) и плодов кориандра (МПК). И использованные масла получали экстракционным методом из косточек зрелых плодов граната и плодов кориандра, произрастающих в окрестностях Шуши Арцахской республики. На примере модельной реакции инициированного окисления кумола исследованы антиоксидантное (АО) действие масел косточек граната и кориандра посевного. Опыты по окислению проводили на манометрической установке с автоматическим регулированием давления. Показано, что оба масла проявляют антиоксидантные свойства. Определены эффективные содержания антиоксидантов ($f \cdot [InH]$) и их антиоксидантные активности – константы скорости реакции $RO_2 + InH \xrightarrow{k_7} ROOH + In\cdot$. Показано, что в 1 мг масла косточек граната содержится $0,91 \cdot 10^{-4}$ моль/л антиоксидантов, что в 10 раз превосходит содержание антиоксидантов в масле плодов кориандра.

Ключевые слова: масло, содержание антиоксидантов, антиоксидантная активность, косточки граната, семена кориандра

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6. Disabling text in horizontal solid line, from the left corner of the page are given the Key Words (up to 5-8 words), in Armenian 10, Russian and English 11 font size
7. Two lines down, in the article’s submitted language, in the middle, (Italic), is written summery of the article., 10-20 lines, in Armenian 9, Russian and English 10 font size
8. Two lines down is given the main text of the article, in Armenian 10, Russian and English 11 font size. The paragraphs begin from new line, 10 mm from the depths. The expound of the theme are guaranteed of the following scheme: “Introduction”, “conflict settings”, “Research results”, “Conclusion”. In case of need can also be other section with corresponding titles.
9. The formulas are presented in separated lines, in the middle and are numbered on the right, in brackets. The formula , as well as math’s symbols and expressions are given in the text in Microsoft Equation, Italic 10 font size.
10. There can be found pictures, diagrams , graphs and tables in texts. The pictures and diagrams are numbered by transit numbering by sign “Figure”. The description of pictures, diagrams , the names of pictures , diagrams graphs and the signs of description are given below. They can be placed vertical or horizontal in Armenian 9,Russian and English 10 bold font. Tables are numbered by “Table” transit numbering. The names of tables , sign description are given above. They could be placed vertical or horizontal. If the table can’t be placed on a single page, it must be transferred to the other page and mentioned as condonation. In table column must not be left free lines, there must be put dash or write “ not” (“determined”).
11. Pictures , diagrams graphs in electronic version are colored as a rule.
12. At the end of the article , two lines down, from 10 mm left corner is typed “literature” Armenian 11, Russian and English 12 bold font. A line down is presented the list of literature numbered by link sequence . In list the sources must be marked [...] and include the authors last name and the first letter of name , full names of theme , publishing dates , (place publishing, town, year, tom and pages). Official information as well as a-mail computer programs, reports, commands, copyrights patents, in case of patents are given the whole details. The sources are given in original languages. At the same time Armenian and Russian sources are given in Latin fonts.
13. On separate pages is given the translation of the article headquarter sand summary.(besides article presented language), Armenian , Russian (resume) and English (summary).
14. The Articles should be sent to the info@bulletin.am.
15. The published and corrected version of the text is submitted with author(s).
16. On a separate sheet of paper are given the information about the authors (surname, name, affiliation (the whole), picture, academic degree, address, telephone, organization, position, e-mail.

Հողվածների հեղինակային օրինակների ձևակերպման համար ներկայացվող պահանջներ

Հողվածները կարելի է ներկայացնել հայերենով, ռուսերենով և անգլերենով՝ մինչև 14 էջի («Էկոնոմիկա» խորագրով՝ մինչև 24 էջի) սահմաններում. էջի ֆորմատը՝ A4, լուսանցքները՝ վերևից, ներքևից՝ 15մմ, աջից՝ 30մմ իսկ ձախից՝ 20 մմ. Տառատեսակը հայերեն՝ Unicode /GHEA Grapalat/, ռուսերեն և անգլերեն՝ Times New Roman. Միջտողային հեռավորությունը՝ 1,15:

1. Էջի վերին աջ անկյունում, հողվածի ներկայացման լեզվով, գլխատառերով՝ հայերեն՝ 11, ռուսերեն և անգլերեն՝ 12 **bold** տառաչափով տրվում է հողվածի խորագիրը:
2. Հաջորդ տողի էջի ձախ անկյունում տրվում է ՀՏԴ-ն՝ առնվազն վեցանիշ թվով:
3. Դրանից մեկ տող ներքև, մեջտեղում, հողվածի ներկայացման լեզվով գլխատառերով դրվում է վերնագիրը՝ հայերեն՝ 12 **bold**, ռուսերեն և անգլերեն՝ 14 **bold** տառաչափով:
4. Երկու տող ներքև, ձախից, հողվածի ներկայացման լեզվով, հեղինակի (հեղինակների, որոնց թիվը, որպես կանոն, չի կարող գերազանցել 4-ը) Անվան, Հայրանվան սկզբնատառերը և Ազգանունը՝ հայերեն՝ 11, ռուսերեն և անգլերեն՝ 12 **bold** տառաչափով:
5. Մեկ տող ներքև, ձախից, հողվածի ներկայացման լեզվով, շեղատառերով (*Italic*) տրվում է կազմակերպության (կազմակերպությունների) անվանումը՝ հայերեն՝ 9, ռուսերեն և անգլերեն՝ 10 տառաչափով:
6. Անջատելով տեքստը հորիզոնական հոծ գծով՝ էջի ձախ անկյունից, հողվածի ներկայացման լեզվով, տրվում են Բանալի բառերը (5-8 բառ)՝ հայերեն՝ 10, ռուսերեն և անգլերեն՝ 11 տառաչափով:
7. Երկու տող ներքև, հողվածի ներկայացման լեզվով, մեջտեղում, շեղատառերով (*Italic*), գրվում է հողվածի համառոտագիրը՝ 10-20 տող՝ հայերեն՝ 9, ռուսերեն և անգլերեն՝ 10 տառաչափով:
8. Երկու տող ներքև ներկայացվում է հողվածի հիմնական տեքստը՝ հայերեն՝ 10, ռուսերեն և անգլերեն՝ 11 տառաչափով: Պարբերությունները սկսվում են նոր տողից՝ 10 մմ խորքից: Երաշխավորվում է նյութի շարադրման հետևյալ սխեման. «**Ներածություն**», «**Խնդրի դրվածքը**», «**Հերթագրության արդյունքները**», «**Եզրակացություն**»: Անհրաժեշտության դեպքում կարող են լինել նաև այլ բաժիններ՝ համապատասխան վերնագրերով:
9. Բանաձևերը ներկայացվում են առանձին տողով, մեջտեղում և համարակալվում են աջ մասում, փակագծերի մեջ: Բանաձևերը, ինչպես նաև տեքստում տեղադրվող մաթեմատիկական սիմվոլներն ու արտահայտությունները տրվում են Microsoft Equation-ով, *Italic*՝ 10 տառաչափով:
10. Տեքստում կարող են լինել նկարներ, գծապատկերներ, գծագրեր և աղյուսակներ: Նկարները և գծապատկերները համարակալվում են միջանցիկ համարակալմամբ՝ «Նկ.» նմուշառմամբ: Նկարների, գծապատկերների, գծագրերի անվանումները, նշանակումների բացատրությունները տրվում են ներքևում: Դրանք կարելի է տեղադրել ուղղաձիգ կամ հորիզոնական դիրքով՝ հայերեն՝ 9, ռուսերեն և անգլերեն՝ 10 **bold** տառաչափով: Աղյուսակները համարակալվում են միջանցիկ համարակալմամբ՝ «Աղ.» նմուշառմամբ: Աղյուսակների անվանումները, նշանակումների բացատրությունները տրվում են վերևում: Դրանք կարելի է տեղադրել ուղղաձիգ կամ հորիզոնական դիրքով: Եթե մեկ թերթի վրա աղյուսակը չի տեղավորվում, պետք է շարունակել մյուս թերթի վրա՝ նշելով, որ շարունակությունն է: Աղյուսակի սյունյակներում ազատ տեղեր չպետք է մնան. պետք է դնել գծիկ կամ գրել «չկա» («չի որոշված»):
11. Նկարները, գծապատկերները, գծագրերը էլեկտրոնային տարբերակով, որպես օբեյք, տրվում են գունավոր տարբերակով:
12. Հողվածի վերջում, երկու տող ներքև, ձախից՝ 10 մմ խորքից տպագրվում է «Գրականություն»՝ հայերեն՝ 11, ռուսերեն և անգլերեն՝ 12 **bold** տառաչափով: Մեկ տող ներքև ներկայացվում է գրականության ցանկը՝ համարակալված ըստ հղումների հերթականության: Ցանկում աղբյուրները պետք է նշվեն [...] տեսքով և ընդգրկեն՝ հեղինակի/ների/ ազգանունը և անվան /Հայրանունի/ առաջին տառը /երը/, նյութերի լրիվ անվանումը, հրատարակության տվյալները /տեղը, հրատարակչությունը, քաղաքը, տարեթիվը, հատորը, էջերը/: Տեղեկատվական պաշտոնական, այդ թվում՝ էլեկտրոնային աղբյուրների, համակարգչային ծրագրերի, հաշվետվությունների, հրահանգների, հեղինակային իրավունքի արտոնագրերի, պատենտների դեպքում ներկայացվում են լրիվ տվյալները: Աղբյուրները բերվում են բնօրինակի լեզվով: Միևնույն ժամանակ, հայերեն և ռուսերեն աղբյուրները ներկայացվում են նաև լատինատառ շարվածքով:
13. Առանձին էջերի վրա տրվում է հողվածի գլխամասի և համառոտագրի թարգմանությունը (բացի հողվածի ներկայացման լեզվի)՝ հայերեն, ռուսերեն (Резюме) և անգլերեն լեզուներով (Summary):
14. Հողվածները պետք է ուղարկել info@bulletin.am էլ. հասցեով:
15. Տեքստի խմբագրված և սրբագրված տարբերակը համաձայնեցվում է հեղինակ(ներ)ի հետ:
16. Առանձին թղթի վրա տրվում է հեղինակների մասին տվյալները (Ազգանուն, Անուն, Հայրանուն (ամբողջական), լուսանկարը, գիտական աստիճանը, գիտական կոչումը, հասցեն, հեռախոսը, կազմակերպությունը, զբաղեցրած պաշտոնը, էլեկտրոնային հասցեն):

Требования, предъявляемые к оформлению авторских образцов статей

Статьи можно представить на армянском, русском и английском языках объемом до 14 страниц (статьи под рубрикой "Экономика" до 24 страниц)

Формат страницы: А4, поля сверху, снизу 15 мм, справа 30мм и слева 20мм

Шрифт армянский - Unicode/GHEAGrapalat/, русский и английский -

TimesNewRoman. Междустрочное расстояние - 1,15

1. В верхнем правом углу страницы заглавными буквами (на языке статьи) записывается название рубрики по шрифту: армянский – 11 **bold**, русский и английский - 12 **bold**.
2. На следующей строке в верхнем левом углу страницы записывается УДК (минимум шестизначное число).
3. На следующей строке набирается заголовок статьи заглавными буквами по центру по шрифту: армянский – 12 **bold**, русский и английский - 14 **bold**.
4. Две строки ниже, слева, на языке статьи набирается фамилия и инициалы автора (соавторов, как правило, не более 4 человек) по шрифту: армянский – 11 **bold**, русский и английский - 12 **bold**.
5. На следующей строке, слева, на языке статьи курсивом (*Italic*) дается название организации (организаций) по шрифту: армянский - 9, русский и английский - 10.
6. Отделив текст горизонтальной выделенной линией, слева даются ключевые слова (5-8 слов) по шрифту: армянский - 10, русский и английский - 11.
7. Две строки ниже, на языке статьи, по центру курсивом (*Italic*) дается аннотация (10-20 строк) по шрифту: армянский - 9, русский и английский - 10.
8. Две строки ниже, дается основной текст статьи по шрифту: армянский - 10, русский и английский - 11. Абзацы начинаются с новой строки с отступом 10 мм. Рекомендуется следующая схема изложения материала: "Введение", "Постановка задачи", "Результаты исследования", "Заключение". В случае необходимости могут быть также другие разделы с соответствующими названиями.
9. Формулы располагаются отдельной строкой по центру и нумеруются в правой части в скобках. Формулы, а также математические символы и выражения приводятся по "MicrosoftEquation", курсивом (*Italic*) по шрифту - 10.
10. В тексте могут быть рисунки, графики, чертежи и таблицы. Рисунки и графики нумеруются по порядку - "Рис.". Названия рисунков, графиков, чертежей, объяснения обозначений приводятся снизу. Их можно расположить в вертикальном или горизонтальном положении по шрифту: армянский - 9 **bold**, русский и английский - 10 **bold**. Таблицы нумеруются по порядку - "Таб.". Названия таблиц, объяснения обозначений приводятся сверху. Их можно расположить в вертикальном или горизонтальном положении. Если таблица не помещается на одной странице, нужно продолжить ее на следующей странице, отметив, что это продолжение данной таблицы. В таблице не должно быть свободных столбцов, в этом случае нужно поставить черточку или написать "нет" ("не определено").
11. Рисунки, графики и чертежи в электронной версии, как правило, приводятся в цветном варианте.
12. В конце статьи, через две строки, с отступом слева 10 мм печатается "Литература" по шрифту: армянский - 11 **bold**, русский и английский - 12 **bold**. На следующей строке приводится список использованной литературы, пронумерованный по последовательности ссылок. В списке источники должны указываться в виде [...] и включать фамилию и инициалы автора (авторов), полное название статьи (материала), данные публикации (место, издательство, город, год, том, страницы). В случае официальной информации, в том числе электронных источников, компьютерных программ, отчетов, инструкций, сертификатов об авторских правах, патентов, приводятся полные данные. Источники приводятся на языке оригинала. В то же время армянские и русские источники печатаются также латинскими буквами.
13. На отдельных листках дается перевод названия статьи, фамилии и инициалов автора (авторов), названия организации (организаций), ключевых слов и аннотации (кроме языка статьи) на армянский язык (Սուժնոցում), русский язык (Резюме) и английский язык (Summary).
14. Статьи нужно отправить на почту info@bulletin.am.
15. Отредактированная версия текста согласовывается с автором (авторами).
16. На отдельном листе приводятся сведения об авторах (Фамилия, Имя, Отчество (полностью), фотография, ученая степень, ученое звание, адрес, номер телефона, организация, занимаемая должность, адрес электронной почты).

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