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4. Original method for excitation energy dissipation at photodynamic effect on DNA which proposes water molecules electrolytic dissociation for hydrolysis reactions of phosphodiester and glycoside linkages.

These approaches enable us to detect cell free DNA, to determine defects in blood cell DNA (point defects, hydrolysis of chemical bonds) using optical spectroscopic methods (absorption spectrophotometry, spectrofluorimetry, light scattering, plasma atomic emission spectral analysis) the **novelty** of the research is its **actual** and **modern** great informational capability, quick analysis in real time and early detection of risk factors.

The proposed method can solve **important medical problems**, particularly, for

**I. diagnostic** purposes in oncology by:

a) determination of the number of wrong Watson-Crick GC pairs in blood cell DNA by comparing normal and pathological DNA using UV absorption spectrometry [V. Bregadze, I. Khutsishvili, et al. *Inorganic Chemical Acta*, 339, 145-159, (2002)].

b) measuring the concentration of cell-free DNA in blood serum/plasma (quality and quantity). For the purpose our group has specially developed FRET method for intercalated dyes in DNA which can be effectively applied [V. G. Bregadze, et al. *Laser Phys. Lett.*, 13115601 (7pp), (2016)].

c) the efficiency of energy transfers in blood cells DNA using FRET method which allows us to estimate the concentration of double helix areas with high quality stability applicable for intercalation in DNA after its exposure to stress effect. It gives the opportunity to compare various types of DNAs having: different origin, various damage degrees and being in various functional state.

**II.** simultaneous use of laser and original low-pressure (argon of 1-30 Torr) plasma radiation (line spectrum 700-1500 nm) [Giorgadze TG., ... Bregadze VG., *Advanced Techniques in Biology & Medicine* V.5, Issue 2, (2017)] in **phototherapy** lead to the excitation of the ground state  $S_0$  by strong inelastic Raman scattering of biological macromolecules, on the one hand, and excitation of valence vibrations overtones in water molecules, on the other. The result of this joint action will be the hydrolysis of biological macromolecules, which is the main reason of programmed death of the cells (apoptosis).

## THE IMPACT OF REGIONAL CLIMATE CHANGE ON THE IRRIGATION MODE OF FRUIT AND VEGETABLE CROPS IN THE SOUTH OF UKRAINE

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The extraordinary changeability of the quantitative parameters and variants of combining agro-meteorological factors in the years and regions causes considerable fluctuations of yields, and the level of using agro-meteorological resources in production conditions does not exceed 40–60%. R. Williams stated that “climate factors in our country, taken as a whole, are determining in the problem of crop productivity. They are stronger than economy, stronger than machinery”. Under conditions of climate transformations the

importance of irrigation as a stabilizing factor of agrarian production is considerably increasing.

Climate change is objective reality. At present the prevailing majority of outstanding scientific studies and observations prove that the average temperature in Ukraine has increased by almost 1 °C for the past 100 years and only by 0.3 °C for the past 10 years. It considerably affects the irrigation mode of agricultural crops, determined by the rate, number and time of irrigation of the crops grown.

The average air temperature (°C) and annual precipitation (mm) over the periods of 1945–2011 and 2011–2018 were analyzed in order to determine and analyze possible climate change on the research territory in future. Additionally, potential evaporation and moisture coefficient were calculated and analyzed (M.M. Ivanov, 1981).

The analysis of the data for many years show that the average annual air temperature has increased by 1.4 ... 1.8 °C for the past 12 years. The process of temperature changes is followed by a reduction in the total amount of rainfall by 55.5 for the period of 1998–2018 mm per year. Precipitation occurs as heavy showers during the growing season and the coefficient of soil moisture is low.

It should be mentioned that there is a relatively continuous increase of the years with abnormally high amount of rainfall in the South of Ukraine. Such rotation of dry years with the years characterized by abnormally high amount of rainfall, causes considerable and often negative changes in the operation of irrigation systems. An increase in the amount of rainfall, especially during the growing season, may lead to a reduction in irrigation rates or to the refusal to irrigate particular fruit and vegetable crops. The profitability of irrigated agriculture will fall because of these factors.

The analysis of the evaporation dynamics on the research territory showed that for the period of 2011–2018 this index has increased from 1.06 to 1.21 times regarding the average annual indexes for the period of 1945–2011. It will cause an increase in the total evaporation, which is the base for planning the irrigation mode of fruit and vegetable crops.

It is well known that the limiting factor of determining the maximum rate of irrigation is water-holding capacity of soil, its quantitative characteristic for the research territory is the least moisture-holding capacity of soil (LMC).

On the research territory where the basic types of soil are southern black soils and dark chestnut on loess, the LMC is within the range of 22.30–32.05 and 21.70–32.20% of the soil weight respectively. Because of the negative process of soil densification the indexes of the LMC fall to 20.60–31.90 and 21.30–29.50 respectively depending on the genetic soil horizon.

The experiment allowed determining that under such soil properties the net irrigation rate should not exceed the value of 400–420 m<sup>3</sup>/ha.

However, under the relatively known net irrigation rate, the gross irrigation rate will constantly increase due to the increase in the amount of the total evaporation. Taking into consideration the relative stability of the LMC, the number of irrigations increases as compared to the calculated irrigation mode. For the conditions of the research territory the number of irrigations increases by 1 irrigation at minimum (for fruit crops), and for hygrophilous vegetable crops the number of irrigations may be increased to 2 times. It causes the necessity to correct the calculated irrigation modes of fruit and vegetable crops during the entire growing season.

It should be stated that the research territory refers to semi-deserts with the moisture coefficient within the range of 0.15–0.34 according to M.M. Ivanov's classification, despite the fact that the South of Ukraine geographically belongs to the Southern Steppe. It is confirmed by botanical and zoological studies. At the seaside territory of the South of Ukraine there are populations of wild plants and arachnids, characteristic of semi-desert areas.

Therefore at the current stage, the minimization of reclamation load on soils by means of fixed rational water use and the transition of irrigated agriculture to adaptive landscape environmentally safe farming systems must become a main issue in the restoration of irrigation.

## **DEVELOPMENT OF METHODS FOR QUALITY CONTROL AND SAFETY OF DAIRY RAW MATERIALS AND FOOD PRODUCTS**

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The common strategy for the implementation of microbiological criteria in accordance with the Regulation of the European Parliament and the Council (EC) № 852/2004 on the hygiene of foodstuffs, which includes the definition of microbiological criteria used in the legislation of the Community; principles of the development and application of criteria and proposals for further measures were developed in EU countries (Prylipko, T.M., Honchar, V.I., Ovcharuk). The mentioned microbiological criteria indicate the acceptability of food products and processes for their production. However, the application of microbiological criteria has certain limitations. Due to reasons connected with sample selection, methodology and uneven distribution of microorganisms, only microbiological studies can never guarantee the safety of the food products that are investigated. Thus, the safety of food products can be guaranteed by application of structured preventive approach that provides the proper product and its production process, as well as the use of proper hygienic practice (GHP) and analysis of dangerous factors and critical control points (on the basis of HACCP system) represented in Regulations № 852/2004 on the General sanitary rules and Regulations № 853/2004 on the approval of special hygiene rules for foodstuffs of animal origin.

Microbiological criteria can be used differently depending on the place of its application and the procedure to be taken in case of inadequacy.

The criteria set for end products (food safety criteria) can be applied to food products ready for distribution to the market or already distributed to the market that are applied at the stage of food products sale, delivering them both to the end users and retailers. These criteria are applied at points of foodstuff entry at the territory of the EU in the case of its imports from the third countries.

The defined hygiene criteria for the technological processes are applied to food enterprises that manufacture or produce food. They are set for a food product at certain stages of its manufacturing and are not applied to foodstuffs that are already distributed to the market, which are usually used to test the technological processes of production and manufacture of food products, and, for example, may indicate the observance of proper hygienic practices and help to understand the level of HACCP system functioning.

Microbiological criteria are usually not suitable for monitoring the critical limits defined in HACCP program. Monitoring procedures should be capable of detecting the loss of control in terms of critical points and ensuring the timely provision of such information for the use of correcting activities in order to restore control. Therefore, the measurement of physical and chemical parameters (e.g., acidity, pH, water activity) that can be carried out at