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THE EFFECT OF GEOMAGNETIC HURRICANE ON THE DEVELOPMENT OF LACTIC ACID BACTERIA STRAINS ISOLATED FROM SPONTANEOUS SOUR COURSE PRODUCT

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Abstract

In this study, three strains of lactic acid bacteria (BDU-BA7, BDU-BA8, BDU-BA9) were isolated from spontaneous sour milk products during solar flares, coronal mass ejections, and geomagnetic storms (solar wind). The influence of the geomagnetic storm on the studied strains was investigated in a comparative form. It was observed that, unlike the strains cultivated under normal weather conditions for the same period of time (5 days), as the level of the geomagnetic storm increased, during the incubation of the strains, the size of the colonies and microbial cells significantly changed and decreased. The obtained result may be important in conducting further research and using these characteristics of strains sensitive to geomagnetic storm for various purposes.

Keywords: *Geomagnetic storm, solar wind, sour milk product, lactic acid bacteria, colony, strain, microbial cell*

1. Introduction

The influence of the solar wind on the Earth makes the study of cosmic plasma relevant in all fields: the generation of geomagnetic storms, depending on the intensity of the solar wind plasma, control devices, ground complexes, flying machines and control systems, remote control systems, radio engineering, radio navigation, radar and television systems and devices, navigation and air traffic control, micro- and nanoelectronic devices, as well as plants and people are not unaffected. At present, experiments are ongoing in the direction of studying the effect of cosmic rays on growing vegetables in space.

Solar flares are divided into classes A, B, C, M and X. Class A and B flares are less intense, so they have almost no impact on the Earth and the living world. Class C and other higher ignitions are strong

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ignitions and differ in their radiation power. Coronal mass ejections from the Sun cause serious changes in the Earth's geomagnetic field during contact with the Earth, since the plasma carries a magnetic field. This appears as a geomagnetic storm. Geomagnetic hurricanes come in five levels: G1 (mild), G2 (moderate), G3 (strong), G4 (very strong) and G5 (extreme). During these storms, radio communication, mobile communication, satellite control, etc. on Earth are disrupted. transmission of signals is blocked, even electrical transformers can fail. In addition, geomagnetic storms can lead to geodynamic processes [4], flora and fauna, human behavior and physiological problems [1], change in the rate of epidemics [2, 3].

From this point of view, it is important to monitor the incubation of microbial strains and the changes that occur during the days when there is no geomagnetic storm and when there is a storm.

2. Material and methods

Three lactic acid bacteria strains (BDU-BA7, BDU-BA8, BDU-BA9) were isolated from the spontaneous sour milk product taken from Bala Bahmanli settlement of Fizuli region and brought out in pure culture. These strains were planted in Petri dishes with meat-peptone agar nutrient medium under normal weather conditions without vortex by spiraling or dilution with a bacteriological pen and incubated in a thermostat with a temperature of 30^0C for 5 days. After the end of the incubation period, the finished microbial colonies in Petri dishes were analyzed, and a permanent preparation was prepared from each microbial colony, and its cellular structure was viewed with the immersion system of a light microscope, and its dimensions were determined with a micrometer [5, 6].

The same microbial strains were incubated for 5 days at 30^0C during the G3 geomagnetic storm on May 14, 2024 and during the G2 geomagnetic storm on May 20, 2024 and incubated for 5 days to analyze the changes in the shape and size of both the colony and the cell. was conducted. Finally, the effect of geomagnetic storm on the studied strains was investigated in a comparative way.

3. Discussion and results

As a result of the research, it was determined that the colony of the BDU-BA7 lactic acid bacteria strain isolated from spontaneous sour milk products grown in normal weather or under normal conditions was whitish in color, its diameter was 0.5 cm, its cell was coke-shaped and its size was 1.7x1.6 μm. The size of the colony of the BDU-BA7 strain incubated when there is a G2 geomagnetic storm in the atmosphere is 0.4 cm, and the size of the cell is 1.4x1.2 μm. It was 1.3x1.2 μm (Fig. 1.2; Table; Diagram 1.2).

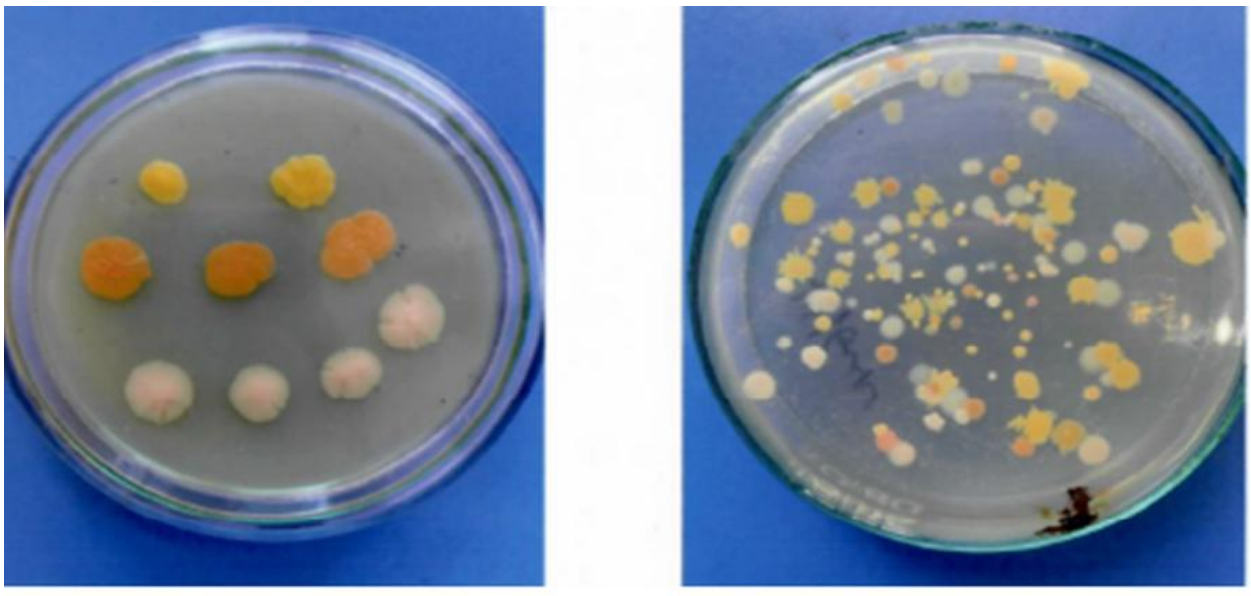


Fig. 1. Colony form of Lactic acid bacteria strains (BDU-BA7, BDU-BA8, BDU-BA9): a) incubation under normalweather conditions; b) incubation during a geomagnetic storm

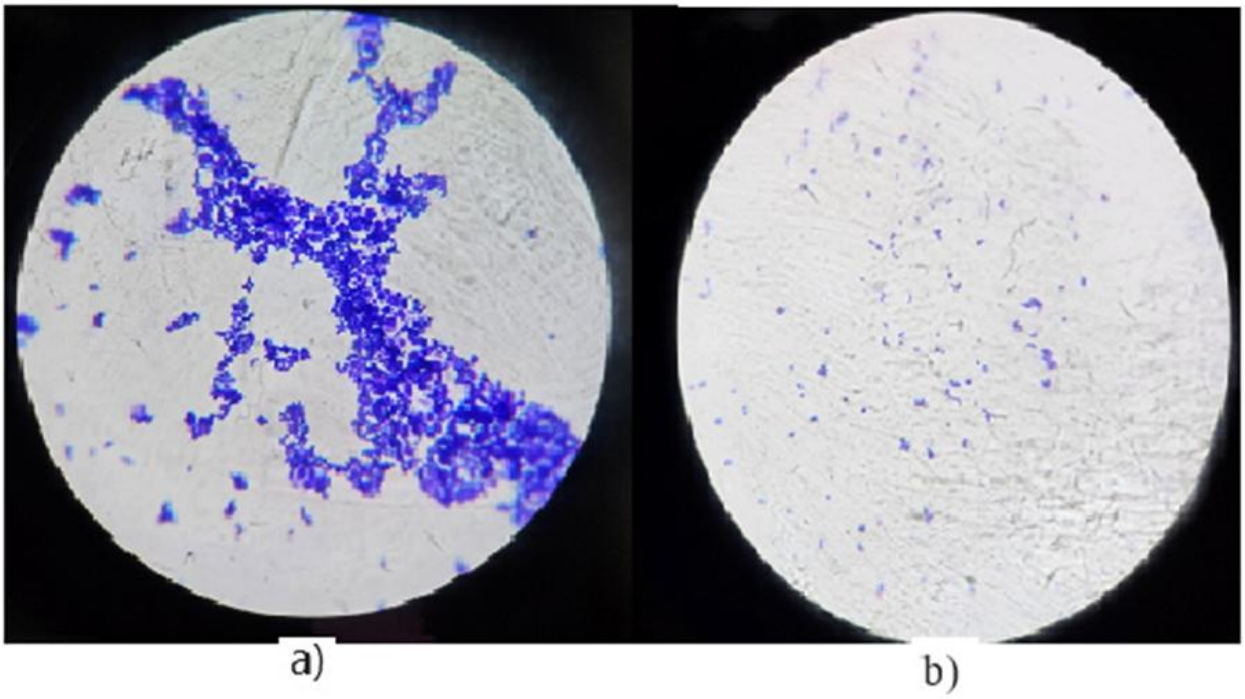


Fig. 2. Cell structure of BDU-BA7 Lactic acid bacteria strain: a) incubation under normal weather conditions; b) incubation during a geomagnetic storm

The color of the colony of the BDU-BA8 lactic acid bacteria strain incubated under normal conditions is yellowish, the diameter is 0.4 cm, the cell shape is coke-shaped, and the size is 1.2x1.1 μm, the size of the colony planted during the G3 geomagnetic storm is 0.2 cm, the cell size is 1, 0x0.8 μm, when the geomagnetic storm level was G2, the size of the colony was 0.2-0.3 cm, and the size of the cell corresponded to the size during the G3 geomagnetic storm (Fig. 1.3; Table; diagram 1.2).

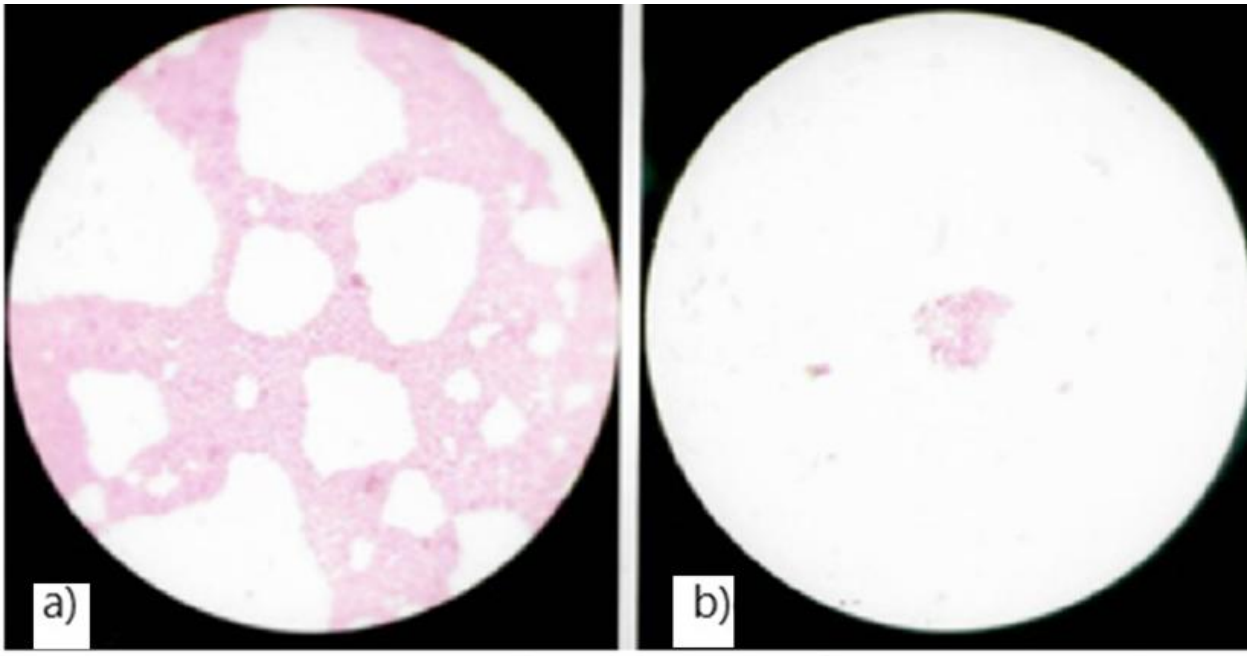


Fig. 3. Cell structure of BDU-BA8 Lactic acid bacteria strain: a) incubation under normal weather conditions; b) incubation during a geomagnetic storm

The color of the colony of the BDU-BA9 lactic acid bacteria strain cultivated under normal conditions is orange, the diameter is 0.7 cm, the cell shape is straw-shaped, the size is 4.0x4.8 μm, the colony size of the microbial culture cultivated under the conditions of geomagnetic storm level G2 is 0.4 cm, the cell size is 3, 5x4.2 μm, and at the G3 geomagnetic storm level, the size of the colony remained the same as at the G2 geomagnetic storm level, and the cell size was 2.9x3.7 μm (Fig. 1.4; Table; Diagram 1.2).

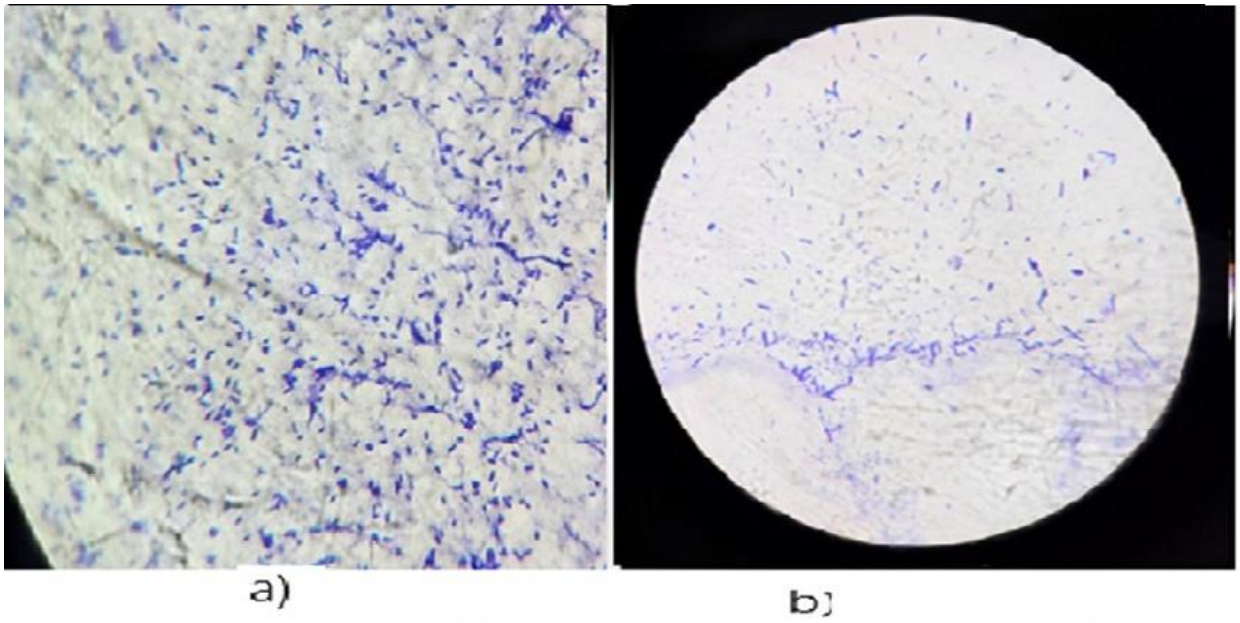


Fig. 4. Cell structure of BDU-BA9 Lactic acid bacteria strain: a) incubation under normal weather conditions; b) incubation during a geomagnetic storm

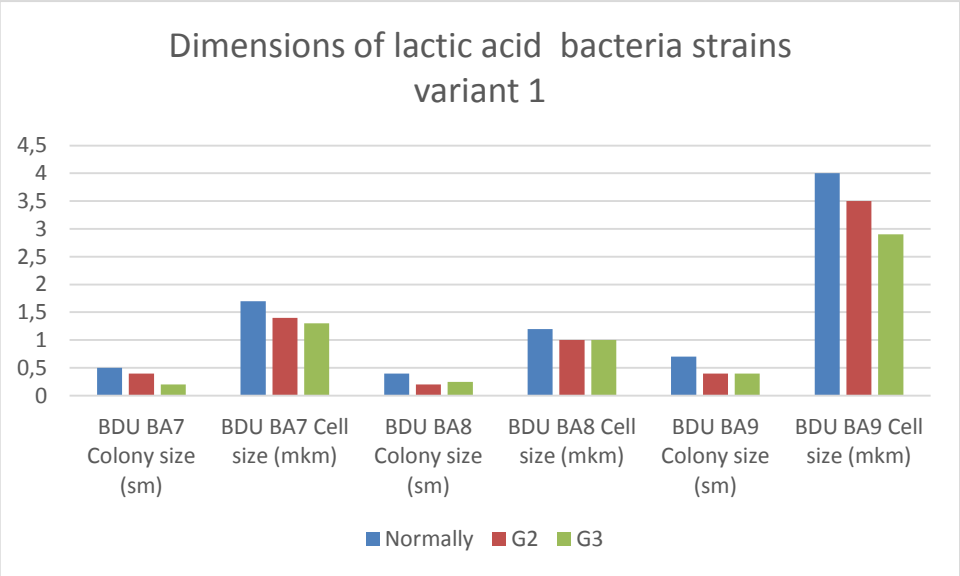
Colony and cell sizes during incubation of lactic acid bacteria strains isolated from sour milk solution under normal weather conditions and during a geomagnetic storm are given in the table below**.**

Table. Incubation of lactic acid bacteria strains isolated from sour milk solution under normal weather conditions and during a geomagnetic storm

Lactic acid bacteria strains	Incubation under normal weather conditions		Incubation during a geomagnetic storm			
	Colony diameter (cm)	Cell size (μm)	G2		G3	
			Colony diameter (cm)	Cell size (μm)	Colony diameter (cm)	Cell size (μm)
BDU-BA7	0,5	1,7x1,6	0,4	1,4x1,2	0,1-0,3	1,3x1,2
BDU-BA8	0,4	1,2x1,1	0,2	1,0x0,8	0,2-0,3	1,0x0,9
BDU-BA9	0,7	4,0x4,8	0,4	3,5x4,2	0,4	2,9x3,7

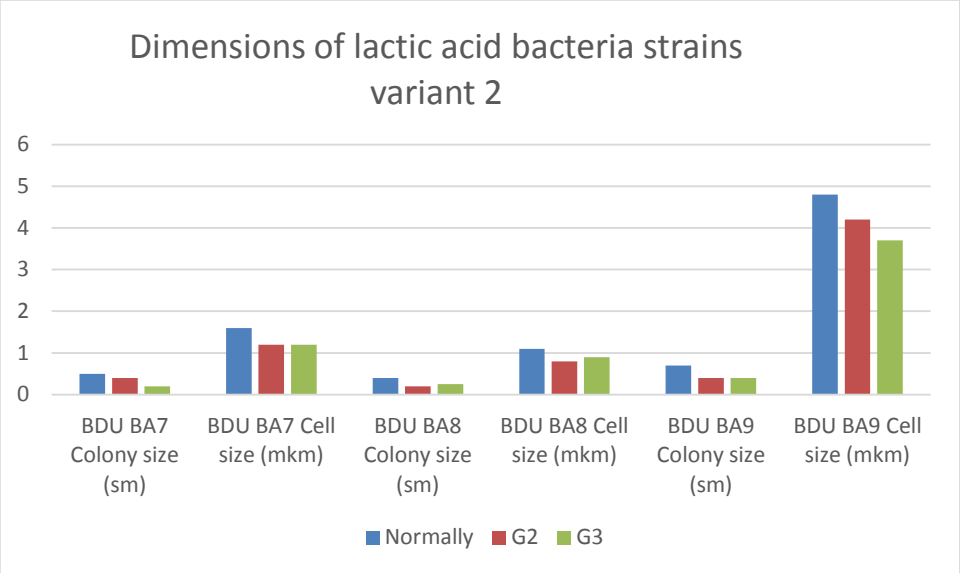
The following diagrams show the diameters and cell sizes of colonies of lactic acid bacteria strains under normal weather conditions, G2 and G3 geomagnetic storm conditions. According to the dimensions of the cell, it was taken in two variants, and the diagrams were drawn up according to those variants.

Diogram 1



As can be seen in diagram 1, as the intensity of the geomagnetic storm increases, the diameter and cell size of the colonies of the strains decreases.

Diogram 2



As can be seen from diagram 2, as the intensity of the geomagnetic storm increases, the diameter and cell size of the colonies of the strains decreases.

The first color of the BDU-BA7 strain was whitish, the color of the BDU-BA8 strain was yellowish, and the color of the BDU-BA9 strain was orange. No change in the color of the lactic acid bacteria strain was observed during the change of the geomagnetic field - during the geomagnetic storm.

Thus, as a result of the research, it was determined that the geomagnetic storm level had a significant effect on the diameter of the colonies and the size of the cells during the incubation of the BDU-BA7, BDU-BA8, BDU-BA9 lactic acid bacteria strains isolated from the spontaneous sour milk product. During magnetic storms, the diameter of the colonies and the size of the cells changed and decreased as the storm level increased.

Changes in the incubation of strains during a geomagnetic storm, changes in size are related to the existing electrochemical potential at the micro level. These potentials, which are sensitive to the changing magnetic field, lead to changes in dimensions. Based on the observation, we can say that it cannot cause the color change of the strains. However, we can say that there are other reasons that prevent the color change of strains. The fact that the strains do not change color is itself an interesting fact for research.

It is planned to conduct experiments to observe color changes with other bacterial strains. Identifying spams with color changes in addition to size changes can lead to their use in different applications. A geomagnetic storm affects not only the plant kingdom, but also the living world. Smaller creatures should feel this effect faster and more strongly.

In general, the smaller the size and weight of any living thing, the more sensitive it is to changes in nature. In this respect, the effect of the geomagnetic storm on the microscopic organisms leads to the emergence of special changes, which indicates the importance of expanding the study with different objectives.

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