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Go fishing where there is enough fish, not where the place is convenient

The agricultural community is a collective of life-loving and optimistic people. Any other community does not have as many fishers, hunters, borscht lovers or travellers as this one. The very nature of agriculture encourages growing crops without rain due to soil nourishment and protection, which is by no means easy but we do cope with it!

Academician of the Engineering Academy of Sciences, PhD, the author of more than 65 inventions which have got patents in Ukraine, Canada, USA, China, Europe, Director of the TEKMASH Institute and Bio-gel company is one of them. Physicist, inventor and writer, all in one! We have already written about his unique bio-gel, the product which saves plants from stress and drought. But now this should be the hottest topic possible.

– Last year was recognized as the warmest in the entire history but, as I see it, this year will be hotter and drier. We have already described the bio-gel varieties sold by Spectr-Agro as LEANUM and

by Nor-Est Agro as Sterk BIOgel. They are greatly appreciated by agrarians. But their relevance is growing at a rapid pace as meteorologists forecast a hot and dry spring. What about sowing? How can we save plants?

– You can't get guarantees even from God and insuring crops against drought is also very difficult. It is probably the first time that the surface and deep moisture have not connected this year. Thus possible losses up to 15% should be included in the economic model. The figure is not critical but certain resources should be provided if resowing becomes necessary. This is the key to sustainable development in today's stressful environment. Official data shows that precipitation in many regions of Ukraine is insufficient, approximately half the average. What can we hope for? That moisture will rise from below when the process that has lasted for centuries is disrupted? We have been preparing for this, we made experiments in the extreme conditions of the Kherson region when drought was a problem only in the south of Ukraine. Now our company is prepared for this. We cannot work wonders but we can ensure vegetation in drought conditions (both air and soil drought). Our products can increase plants'

endurance by 30-40% in case of thermal, ultraviolet load and magnetic storms.

In search of proportion (almost after Leonardo da Vinci)

Osypenko's living conditions are almost ideal: a lake is about 50 m from his home, so you can go fishing any time. But angling should be done where there is a lot of fish, not where there is a convenient place for staying. That is the way the physicist considers the problem and such an approach seems quite realistic, his inventions hit the target.

– Let us consider the initial development of a plant. We inoculate seeds with bio-gel. Here we have three in one. There are signaling molecules which affect the plant genome and contribute to the formation of a large root. And there are two components which stimulate its formation: probiotics and prebiotics. The plant has not yet suffered from drought but a large root is being formed due to signaling molecules which testify to the biological system reaction to drought. The bio-gel production technology recreates the properties of the biosystem: plant, soil and microbiota surrounding the root.



We take the main components – soil and bacteria and harden them at a certain temperature. Some companies suggest provision of phosphorus for enlarging the root, others ask to add cytokinins, gibberellins, auxins, that is, enzymes of natural origin. But what about their proportion? After all, when you cook borscht you follow the proven proportions of beet, cabbage, potato. The same concerns plants: proportion violation necessarily harms the plant. There are numerous examples of the situation when adding enzymes caused a plant's death, as it could not withstand additional stimulation under stress. So what should be the proportion? Nobody knows. We have tested dozens of products. All of them are stimulants but categorically contraindicated in drought conditions. That is why our aim is to cause the biosystem reaction to drought. The bio-gel contains nitrogen oxide, hydrogen sulfide, a lot of micro- and macro elements of plant origin. Besides, there are a lot of amino compounds which constitute the complex produced by the ecosystem as a reaction to drought. Such an approach is the essence of the patents.

– Sounds convincing. Da Vinci looked for a golden ratio, while you look for the proportions... But when should the plants be treated? I believe before the drought comes?

– If possible, it should be done in early spring when the soil is frozen if the sprayer can work, because at +5°C injectors freeze. But bacteria are not afraid of cold, ultraviolet light and drought. Bio-gel is not a technology, it is an addition to the technology adopted on the farm. It can be used in any treatment, for example, it can be added



which is quite substantial. For every hryvnia or dollar invested, bio-gel generates 2.5 additional profits.

– How can farmers check the efficiency of bio-gel?

The only way is to use the control plot and the plot with bio-gel applied. In the bio-gel plot the vegetation period will last some weeks longer. Vegetation cannot be prolonged. Corn vegetates for 150 days but stress conditions shorten it to 135 days. Under stress conditions, bio-gel brings the plant's genetic potential closer to realization. It is similar to giving birth to a 9-month-old baby instead of a 7-month-old baby, besides, the grain quality is higher. The main idea is working within the limits of genetics.

– Yes, last year we had a lot of problems caused by premature ripening of soybeans and poor grain quality.

– We studied not only soybeans but also corn and sunflowers.

– As I understand, you have not invented the proportion and composition of elements and amino acids, you found them out in nature recording the chemical stress response.

– We were the first to do it. We have not invented anything but took the natural bacteria complexes and put them under high temperature stress. That is, we have not invented the divine proportion of nitric oxide, hydrogen sulfide, amino compounds because you cannot guess the signaling molecules proportion at present. We found it out as the reaction of a certain biosystem in order to offer it to another one. We provoke the bio system's response to stress, we get a huge amount of phytocom-

ponents using our HTD-technology and apply this cocktail to prepare a cultivated plant for adverse conditions.

to the first herbicide treatment. No additional treatments are required, bio-gel can be added to herbicides, fungicides, insecticides. It does not concern insecticides, but as for herbicides and fungicides, their amounts can be decreased by 30%. The product will work as an anti stress, as treating with herbicide suppresses the main monocotyledonous crop for at least a week. In case of drought it is much worse. That is why bio-gel should be used not only as anti drought but as anti stress product against herbicide as well. The research performed at the Microbiology and Virology Institute testify to the suppression of the main crop after herbicide application.

– That is, when inoculating with bio-gel, you can save on fungicides.

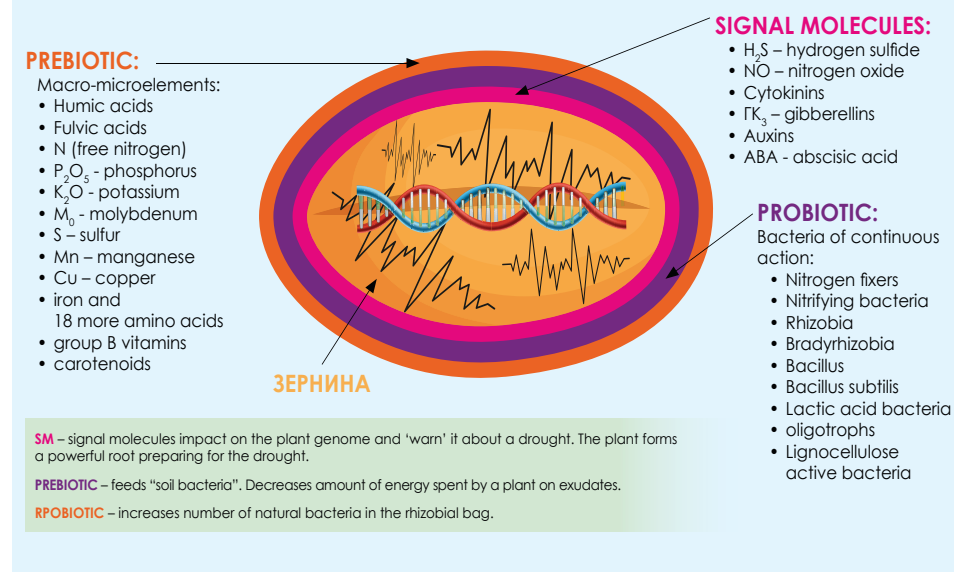
– We mean the early stage of plant development, the second treatment being herbicidal-fungicidal. Adding bio-gel makes it work as a

natural fungicide. Our experiments with no fungicides at all showed good results. If you use bio-gel as a fungicide, you will see the results, it really works.

– What is better: soil inoculation or foliar spraying?

– In fact, seed treatment ensures 5.5–8% yield increase, while foliar treatment increases yield by more than 10%. It concerns a single treatment but we would advise to perform two treatments using 2 l/ha. In total you will not get 20%, though in the Nibulon company the increase amounted to 27%. Here the relationship is as follows: the lower the yield, the greater the stress, the greater the percentage increase. The worse the yield, the more noticeable the bio-gel effect. When the wheat yield was 7 t/ha, it amounted to 8 t/ha with bio-gel added. But when the yield was 3.5 t/ha because of stress in the south, the bio-gel added 7-8 cwt,

SEED INOCULATION WITH BIO-GEL



pounds using our HTD-technology and apply this cocktail to prepare a cultivated plant for adverse conditions.

– What is HTD-technology?

– It is heating liquids and "grinding" of suspension and emulsions using friction and water hammer. We heat liquid, "cook borscht" which is very tasty for plants. By heating soil we get a product which can respond to high temperatures. Nobody studied this molecular complex before, its proportions are natural and you cannot guess them. How can you warm your hands in the cold? By rubbing or slapping. These are beats and cavitation. Cavitation can kill bacteria, that is why we need other methods, some integrated approaches. If you process the raw materials cleverly, you can find a complex that will work in all Ukrainian soils.

Osypenko is not only good at cooking borscht, he is a cavitation and water hammer specialist. Besides some time ago he dealt with

torpedoes. Can you remember the "Shkval" which sank? This was the torpedo he dealt with! And now he tries to solve problems not as an agronomist or a chemist, but as a physicist. And that's why it works!

– How many times should we treat crops with bio-gel to get a good result?

– Once we got 12 t/ha of corn hybrid compared to 6 t/ha on the control plot but it was due to four treatments (2 l/ha) with 1% solution, plus seed treatment (2 l/t). All in all it makes 15 \$/ha which is not much for survival in drought.

– Where is your plant at present as Kherson has suffered a lot?

– We collect bacteria in the Kherson region in very difficult conditions, while the storehouse is in Cherkasy. The total number of personnel during the war remained almost unchanged, though one person has been killed and two persons are under occupation. We dream of returning to Kherson and restoring it. For me it's the

best city though I have visited a lot of countries.

– As far as I know, you are going to work with Saudi Arabia. Why are Arabs interested in cooperating with you?

– Yes, we have signed a cooperation agreement. They were impressed by the fact that a European company was dealing with desert problems. What finally convinced them was that we weren't looking for money, we needed partners. But I was greatly impressed by their love for their country which is well-known for its terrible living conditions. Date palms are covered with a thick layer of dust, the water is about 300 m below the soil surface. They have to use seawater desalination plants. But roads and infrastructure are being built intensively and a lot of trees are planted along roads. All this shows that people are confident of their future. A lot of their citizens study abroad but then come back to their country. There is something to be jealous of.

– You also have a project in Canada.

– Yes, we are building a plant there. Investors invest money and we invest technology. The prospects are not bad.

– So, is your product better appreciated by the world or in Ukraine?

– There is no better market than in Ukraine. People are more willing to experiment here. And there are almost no areas in sole ownership like ours anywhere else in the world. The product is sensed very positively by the world because we have high-quality patents, because there were no bio-gel analogues and still there are none. Besides, we have our own know-how, some



technological achievements and secrets. The suggested technology of soil inoculation at the time of sowing also offers great advantages. We increase the soil fertility, which is beneficial for any plants and compliant with any cultivation technologies. It is effective for any crop: rapeseed, corn, sunflower. Soil inoculation is important because encrusted seeds cannot be inoculated, while our method provides good results.

– Can you appreciate the dynamics of your idea development in Ukraine?

– Before the war during three years our business doubled every year, starting from 65 t to 250 t a year. When our cooperation with the Agroskop company began, the sales increased by 100 t a year. We have become the number one seller of organic fertilizers in Ukraine. But the war destroyed everything, we had to move first to Western Ukraine, then to Cherkasy. At present we sell about half of the pre-war maximum. We are restoring our positions, we have registered the product in Europe, this year it will be on sale in Slovakia, Hungary and Italy.

Climate and people: who will win?

– The slogan of your product is “Bio-gel” is drought guarantee”. Last year was very hot, this year is going to be even hotter. Does this encourage farmers to use your product?

– The market is flooded with various “bacterial soups” now and consumers have no faith in them. So we can forecast a sharp decline in demand for biological products. But when we show patents for our products instead of mere talks

about imaginary “uniqueness of bacteria», the attitude changes immediately. People want to have a product which creates a real way out of a difficult and threatening situation. Farmers are also attracted by the fact that we don’t try to interfere with their technology. We do respect agronomists, their great experience and suggest just adding our product, not changing their proven technologies. Our only demand is not to add chemical hummates to the tank mix as they are harmful in combination.

– Does your bio-gel fit into the European sustainable development strategy?

– It certainly does, we stress it. But it is worth understanding that there has been a certain oversaturation with not very high-quality promises. Not long ago a friend of mine took part in some business meetings in Vienna. When some producers of organic products or inoculants used such words as “unique bacteria”, many participants just left the room. There are no unique bacteria and many specialists understand this.

– Should we expect scientific breakthroughs in response to climate change?

– The focus is now on genetic research and studying how plants respond to temperature and other stresses. But I doubt such an approach. After all, there is nothing universal that would help you work in different conditions, with different crops, in different countries with the same efficiency. We are still not one step closer to a common idea of how to adapt to climate change. Yes, geneticists are developing more drought-resistant varieties and hybrids, but in general, today’s challenges do not have a positive response. I don’t under-

stand some trends at all, for example, decarbonization. Microbiota living in soil breathe, absorb oxygen and emit carbon dioxide according to the well-known formula. Carbon oxidation is a life reaction. What is soil fertility? It is a microbiota activity. How can we determine soil biochemical activity? According to the emission of CO₂, as Academician Volodimir Patika says. In Ukraine, black fallow has always dominated: the earth breathed, emitting carbon dioxide. If we reduce tillage, carbon dioxide emissions are reduced too. Soil breathing is necessary, as we try to enhance microbiota and fertility but on the other hand, it is harmful. Where is the optimum? The answer to this question is of little interest to anyone right now. Most people are interested in getting money by decreasing soil breathing.

– People think that all known factors simply could not have caused such total warming, they are looking for other causes of the cataclysms that are not yet known to anyone.

– Not long ago I read a scientific article based on the most modern climate research. Its conclusion is unambiguous: such drastic changes have been caused by anthropological activity. This is so well-founded and proven that there are simply no other hypotheses left. And, in my opinion, this process is irreversible.

Hold on when the gods surrender Olympus

– How can we survive this season?

– Everything will depend on the course of hostilities. We can hardly influence anything if the gods sur-

render Olympus. Our only hope is the armed forces. As for agrarian trends, the situation is supercritical. The central regions which produced most of the agrarian products can’t withstand the heat load. Burning of the upper atmosphere, caused in particular by explosions, led to the formation of huge thermal lenses over the territory of Bulgaria, Romania and Ukraine. There is no atmospheric resistance to magnetic storms, their effect has increased greatly.

– What should agrarians use when temperature goes up?

– Minimum amount of biostimulants, they should minimise their application. If the plant suffers from stress, you shouldn’t stimulate it. The amount of fertilizers should be decreased, aiming not at surplus harvest but trying to maintain a sufficient level of productivity and profitability. Such optimization is both economical and biological. If you manage to prolong the plant maturation period, it will increase both its quality and quantity. Stress shortens the vegetation period determined by genetics, the phases of plant development overlap each other, our task is to get back to the original FAO, to prolong the vegetation period. That is why biological stimulants application should be used only at the initial stages of plant development and only under favorable conditions. If accelerated development occurs together with stress, the plant will die.

Such is the situation before sowing. Well then, if nature can’t help, if there are no rains and drought is approaching, we can get help from physics. As well as from our steadfastness, agrarian indomitability and our scientists’ talent.

The conversation was led by Yuri Goncharenko