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La contribución de la REDBIO a la región y el mundo

REDBIO's contribution to the region and the world

A contribuição da REDBIO para a região e o mundo

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It is an honor to have been invited to write this article and even a greater honor to have received the prestigious REDBIO medal. For both, I am very grateful to the people who worked so hard to organize this congress, contributing with their expertise, time and effort, to provide the community with the Biotechnology knowledge generated in the region. I would also like to thank the many people who have contributed to my training and work, including teachers, colleagues and students.

Very shortly after this congress, in which our colleagues were able to show their results, exchange ideas, share entertaining talks, and discuss good science, we found ourselves in a pandemic. Today, the need for biotechnology research and knowledge application in critical times becomes even more evident. Unfortunately, these contributions are often not appreciated, and this is a time when scientists from different fields take over the media.

I want to dedicate a tribute to an exceptional journalist dedicated to Science, Nora Bähr, who is fighting this disease today. She contributes daily to the promotion of scientists' from with a professional and rigorous approach.

Among the scientists who came out to give answers to society, I highlight those who were quickly able to produce diagnostic kits, began to develop vaccines, forms of disinfecting spaces and materials, among others. None of these developments would have been possible without previous training and daily advocacy to demonstrate that Biotechnology is essential for human development and that its detractors (anti-vaccines, flat Earthers, etc.) were left without arguments, considering they once had them.

In 2020, it is Covid-19 that has hit all of humanity hard, with a huge and regrettable number of human lives lost. In the future, another emergency or catastrophe may require our active participation as biotechnologists; however, we hope no catastrophes are needed to show the importance of Science. We want to contribute to gradually improve life quality without having to respond to emergencies. It is there, in our daily work, that we add more value.

Higher agricultural productivity with lower environmental footprint

“Higher agricultural productivity with lower environmental footprint” was the 2019 Congress focus, where a good amount of valuable work was presented concerning the topic. I would like to highlight words of the Network's President and Vice President: “… agricultural systems depend on the interconnection of many different elements and processes. Food security global challenge is multidimensional, and only some of these dimensions are susceptible to change through science and innovation.”

The specific message I want to share in this brief article is: let's work in an interdisciplinary way; otherwise, we won't get very far. In other words, only with solid interdisciplinary work we can make significant and sustainable progress in production systems.

It is very hard for us to work in an interdisciplinary way! Why?

Specialists in different disciplines and sub-disciplines speak different languages; and I am not referring to a language barrier that those from countries with different languages experience, but specialists from the same region. We make little effort to learn a common “language”, and by this I refer to a way of communicating that would bring us closer.

I will make some considerations from my personal experience in Science. I was first trained in Chemistry, a field from where I slightly shifted to Plant Biochemistry and from there first to Molecular Biology and then to Plant Biotechnology. It was only in the last few years that I began to interact with plant physiologists, ecophysiologists, agronomists, entrepreneurs, and engineers dedicated to artificial intelligence and sociologists. All I can say is that I learned a lot from all of them, and I continue to learn daily, and the experience is and has been very enriching. The time and effort invested in finding that common language paid off.

As molecular biologists, we tend to look at the biotechnological applications of our observations and findings almost like accidents, because we ask ourselves questions like: how do living things work?

What molecular mechanisms govern the responses? How are these mechanisms regulated? What genes are involved? And other similar questions. We can also be naive and believe that what we see in the laboratory in a model system under controlled conditions, when given love and dedication, could eradicate world hunger or assure human health. And despite our good will and sound science, sometimes we are wrong. From our model plant, our little fly or mouse, to a biotechnological product there is an abyss that cannot be crossed if we do not work cooperatively with other scientists from many other disciplines. That is to say, success is not achieved by good will and effort; only interaction multiplies individual collaboration and speeds up results.

Science can be trusted when the scientific method has been followed. Sometimes it can be applied, sometimes it cannot, at least not promptly

By this I do not want to underestimate the value of fundamental or basic science in each of the disciplines, quite the opposite; fundamental science, answering questions in Biology is what we are passionate about, and the foundation of any application we can achieve. There is no possible application if there is no Science behind. Each of us has to do what we do best without extrapolating our knowledge to other disciplines that we do not master.

An example of this is well represented by the tolerance to abiotic stresses or, rather, by obtaining plants with increased tolerance to adverse environmental conditions. I have read, generally as an evaluator, many projects and manuscripts on genes that confer tolerance to different environmental factors, in particular to water deficit and salinity, which are the two "demons" of plant production. Most of the studies are conducted in model plants inducing in some way the response to abscisic acid, which generates an accelerated and increased stomatal closure, and a concomitant decrease in the fixation of carbon dioxide, that is, in production. These types of studies have been condemned by ecophysiologists since such technologies produce a decrease in yields under field conditions, even when genetic constructions are changed. Likewise, infinity of studies of salinity responses are conducted with plants germinated in optimal conditions, to which salt is added later. Equally condemned in ecophysiologists' studies and manuscripts. None of these technologies constitute a market product today. Notoriously, they do not seem to find out what others say, since most of the studies are published in specialized journals read by a disciplinary audience. Very few appear in high-impact general journals that reach all professionals. Then, the biotechnologists, as a forced nexus between molecular biologists and ecophysiologists, should ask ourselves, always considering this example: *Why doesn't the second generation of transgenics arrive?* And the answer lies not only in the public's bad perception of transgenics, we all know that the bad perception feeds the long and expensive regulatory systems that only great multinational companies deal with. Our states have not dealt with this problem and, probably, part of the responsibility is ours for not investing enough efforts in explaining that the food and technological sovereignty requires real and constant support.

Many studies have been written on the difficulties implied in the regulatory systems, although, at the risk of being repetitive, there has not been a true and necessary “alphabetization” campaign on the advantages of Biotechnology.

Nevertheless, we are leaving aside another important issue: tolerance to stress is not universal, it does not give an "all or nothing" response, as the technologies of herbicides or insecticides in the market do. The second generation of transgenics must be thought as zone-directed, with other numbers in mind, and must be approached by interdisciplinary teams. A given technology can be good for a region and not for another one, depending on its soils, rainfall regimes, seasonal temperatures, specific plagues, nutrient requirements and many other factors that make of each zone or region a unique case. This is not valid only for transgenics but for all the new gene editing technologies.

Therefore, my message is that we must think of biotechnological solutions differently, listening to those in need, not inventing problems that do not exist nor affect the user (either producer or

consumer), with a regional viewpoint but also considering the global one, and, foremost, working as a team. Moreover, we must invest part of our time to disclose, disseminate, and teach about Biotechnology.

The large number of people that are part of REDBIO with their most valuable knowledge can make the difference.