Interview

An interview with W@lifesciences board member Nathalie Verbruggen, Full Professor at the Universite Libre de Bruxelles (ULB), Head of the Laboratory of Plant Physiology and molecular Genetics

Q/ The long-awaited EU rules on seeds and crops produced using “New Genomic Techniques” (NGTs) are due to be officially unveiled on July the 5th. Why are these gene-edited plants important for the future of agriculture?

As everyone knows, we are facing a challenging and uncertain future with a growing global population and huge threats posed by climate change. These factors combined means that we are likely to see agriculture and food security massively impacted around the world, with risks of drought, resource shortages and loss of biodiversity. We also know that we need to move towards more precise farming techniques to help take the pressure off our natural environment and to reduce the widespread use of crop protection products. This means that the prospect of using technology, to make precise changes that produce more resilient crops, represents an important new tool in our agricultural toolbox.

Q/ Isn’t modifying plants “unnatural”?

Humans have been using different techniques to modify plants to make them more resilient, more nutritious, bigger and tastier for 10,000 years. We have needed to in order to grow, thrive and survive. However up until the 1980s, this had been a process that relied much more on trial and error and was done through a painstaking, slow and often unsuccessful combination of experimentation and through mutagenesis of plant DNA through exposure to chemicals or radiation. These modifications became known as ‘‘conventional’’, rather than unnatural, plant breeding techniques.

Q/ What is the difference between GMOs and gene edited organisms/ between transgenesis and NGTs?

Genetically modified plants and gene edited plants are both genetically modified. There is a difference in the technique used to modify the DNA. In 1983 the first GM plant was developed in Belgium, in the laboratory of Professor Marc Van Montagu at Gent University, through the transfer of DNA from one organism to another at random sites of the (nuclear) DNA and, in this way, the first Transgenic plants were made. However, the next big leap forward in plant breeding took place in 2012, when scientists Jennifer Doudna and Emmanule Charpentier proposed that CRISPR-Cas9 (a system that controls bacterial immunity by cutting viral DNA at specific sites) could be used in the programmable editing of genomes. CRISPR-CAS is actually the most used NGT (new genomic technique). It is considered very precise and involves targeted adaptation to the original organism’s DNA using precise genetic scissors, it can induce specific mutations but can also introduce extra DNA (foreign genes) at specific sites of the genome. Doudna’s and Charpentier’s work earned them the 2020 Nobel Prize in Chemistry, which has been hailed as one of the most significant discoveries in the history of biology.

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Q/ Why should we regulate GMOs and NGTs differently?

There are several reasons for revising the way we regulate these in different ways, in particular if genome editing is performed without integrating extra DNA in the plant genome. Such NGTs, also called in vitro mutagenesis, are produced by tiny and targeted changes. There is good argument that these same changes could occur in nature through “normal” plant evolution, or during random in vivo mutagenesis considered as a “conventional” method and not under the scope of the GMO regulation - see above). Another is that the current regulation, which still applies to all, was developed in 2001, is some of the most stringent legislation in the world, and is extremely costly to comply with. This means that it doesn’t take into account the new techniques which are now available and can often only be complied with by companies with very deep pockets. This significantly slows down capacity to innovate and puts SMEs and research institutes at a big competitive disadvantage.

Q/ Why do you think people might be scared of GMOs or might even become scared of NGTs?

There are several possible sources of fear. Some might be derived from misinformation or from a lack of information. In the 18th century, before the arrival of antibiotics or vaccines, people were quite justifiably scared of nature. A simple paper cut, if infected, could be fatal. Now we live in an age where nature is sacred and technology and science are sometimes feared instead. However, neither technology nor nature are inherently good or bad – it’s simply a question of how we manage our exposure and interaction with them and how we regulate and influence them.

Q/ What do you hope for from the Commission’s new proposal?

Most of all I hope it will help us innovate quickly, safely, affordably and successfully. Technology and plant biotechnology are not a silver bullet – we will need many different disciplines, approaches and techniques to safely feed a growing population while taking care of the environment. We also know that solutions to agricultural challenges and issues are not only technical but are also political. But, at the very least, we need to use every means available to us to survive the threat of climate change. I hope that the new framework empowers us to use technology safely and proportionately to help provide both food security for people and biodiversity protection for nature by delivering smarter, more targeted solutions for the future.