

Biotech crops: Transforming Agriculture

Chantel Arendse

Lead: Plant Biotechnology, CropLife SA

Many years of human intervention, either through domestication of wild species or selective breeding, has given us the food crops that we eat today. However, advances in plant science based on our improved understanding of genetics, has accelerated crop improvement to become a more exact science with the deployment of plant biotechnology tools, such as genetic modification (GM). Biotech crops, genetically modified crops, or genetically modified organisms (GMOs) are the common terms used to describe plants that have been improved with this technology, which generally involves making targeted changes in the plant's genetic code to promote beneficial characteristics. Here are some of the ways that biotech crops are transforming agriculture and making a difference to the farmers, consumers, and environment.

Benefitting farmers

While genetic modification technology has been around for almost 30 years, biotech crops on the market have been dominated by input traits that assist farmers improve their production efficiencies by minimising crop losses due to pests and diseases. These have primarily included traits that confer resistance to targeted insects, provide tolerance to specific herbicide applications and resistance to various diseases. The global adoption of biotech crops with input traits, including here in South Africa, has given farmers the advantage, by helping them fight pests and diseases, improve crop yields,

and ensure a more efficient and sustainable means of growing our food. Further afield, the technology is catching up to also protect against pests and diseases that undermine yields in lesser known food staple crops. This has included the successful introduction of Bt eggplant varieties in Asia as well as the more recent approval of Bt cowpea in Nigeria, thus ensuring that developing nations and their farmers have access to innovative tools to ward off pest threats and improve their food security status.

But pests are not the only problem. Significant progress has also been made to address plant viruses as a contributor to yield losses in several key crops. Biotech crops on the market with resistance to viruses include papaya ringspot resistant varieties that played a significant part in saving the papaya industry in Hawaii. Other notable developments on the African continent include modified resistance in cassava to two viral diseases namely Cassava Brown Streak Disease (CBSD) and Cassava Mosaic Disease (CMD), which very recently was given the greenlight for cultivation in Kenya. Considering that cassava is an important food security staple in East Africa, developments in Kenya should encourage other countries on the continent to reconsider and adopt a more scientific and pragmatic approach towards deploying biotech crops as a tool to boost agricultural output.



Benefitting Consumers

Improved production efficiencies of farmers with the cultivation of biotech crops have not only brought benefits to agriculture, but significant increases in yield have also ensured that consumers have continuous access to an affordable and safe food supply. In addition, better production practices linked to biotech crops have translated into food being produced more sustainably, using less land and inputs with reduced environmental impact. Therefore, giving some reassurance to consumers with concerns about how their food is produced and its impact on the environment.

But are there any biotech crops that directly address consumer needs? Indeed, there are crops on the market with enhanced nutritional qualities as well as those that limit food spoilage and waste. Biotech foods with nutritional enhancements include canola and soybean with higher levels of healthy fats, like omega-3 fatty acids, as well as “golden rice”

varieties with extra beta carotene to prevent vitamin A deficiency in developing nation populations. Other ways that biotech crops are helping to address consumers needs is by removing undesirable characteristics to ensure that some of our fruits and vegetables last longer. Examples include arctic apples, which do not turn brown after slicing, as well as the innate potato - a non-bruising, non-browning potato with an added food safety benefit of reduced acrylamide during frying. By improving the way we grow our crops, as well as improving the nutritional quality, safety and shelf life of our foods, this technology is helping to shape the way we think about the food that we eat.

Prospects

Looking ahead, biotech crops will need to be more precise and effective to address the unpredictable challenges that threaten our food supply. There are currently many different biotech crops with new traits under development and while it is not possible to know exactly when these crops will enter

the market, they will without question be invaluable for the future of agriculture.

With increased pest and disease pressure due to changing climate, future resistant management traits will need to be more effective against a growing list of damaging pests and diseases to mitigate yield losses and secure the future of our food. As droughts, floods and heatwaves intensify and become the norm, climate resilient crops will also play an important role. Various research efforts are underway to bring biotech crops to market with traits for drought tolerance, heat stress, cold and salt tolerance, making crops more adaptable to survive under these extreme climatic conditions. Biotech traits that help crops grow in areas with marginal soils are also on the horizon. Staple food crops such as wheat, maize and rice are already being adapted to improve their efficiency of nitrogen uptake, helping to reduce the use of nitrogen fertilisers and their environmental impact.

Apart from applications in agriculture and the environment, future innovations will also focus on consumer needs. As the science develops, so too will the technology, by exploring innovative ways of making our food even more nutritious, stay fresher for longer, with less allergens and added immune boosting properties.

The possibilities are endless with biotech crops, but only time will tell whether future innovations will reach farmers' fields where they are most needed and make their way on to the supermarket shelves. The crops of the future may not look very different from the ones that we eat today, but the innovative technologies being used to transform agriculture and our food supply, will play a significant role in boosting production efficiencies of farmers and helping to secure enough food now, and into the future. ■



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