

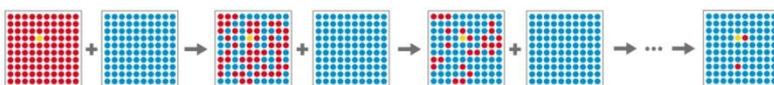
Cisgenesis: accelerating innovation

For many years, plant breeding has been a trial and error exercise, whereby new varieties are produced from a cross between parental plants or through self-pollination. The process is based on identifying a desired characteristic in one plant - for instance higher resistance to a specific disease - and crossing it with another plant which allows the desired trait to appear in the offspring. However, a series of unwanted characteristics are transferred as well, which require several more breeding cycles in order to be replaced by desired traits. This form of breeding takes many years to accomplish, which represents a very long time span given the need to rapidly address issues linked to climate change and food security. In order to speed up the process and allow for more precision and efficiency, new methods are needed. Several New Breeding Techniques (NBTs) have already been developed, among which cisgenesis.

A more rapid and precise method of plant breeding

As a technique, cisgenesis is very similar to conventional breeding, but allows for a more specific transfer of genes between closely related crossable plant species. With this technique, a specific trait, such as disease resistance, is transferred from a same or closely related crossable plant species to another - without altering the plant's overall genetic makeup. Cisgenesis allows the natural breeding process to occur up to four times faster and in a controlled manner, as the desired trait is exclusively introduced and no further breeding must be undertaken to eliminate unwanted characteristics in the new plant variety. As with conventional breeding, the donor plant must be crossable with the recipient plant, and the genetic transfer could also occur naturally as a result of crossbreeding. As cisgenesis produces varieties that are comparable to those produced by conventional breeding techniques, the European Food Safety Authority (EFSA) is of the opinion that cisgenesis presents the same level of safety as conventional breeding¹.

Conventional breeding



Cisgenesis

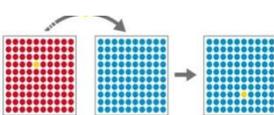


Figure: Comparison of conventional breeding and cisgenesis for the transfer of a single desired characteristic (yellow dot) from the plant represented in red into the plant represented in blue. Each dot represents a single characteristic. With cisgenesis, a characteristic can be introduced in one step, without losing the properties of the "blue plant".

Where could cisgenesis be applied?

Cisgenesis could be used to enhance the durable resistance to diseases in a large number of crops such as potatoes, apples and bananas. This would enable less pesticides to be applied, which would not only have a positive impact on the environment and for consumers, but would also present an

economic benefit for producers. Cisgenesis therefore holds great potential for grape cultivators and winemakers. Indeed, as a result of mildew, grapes are one of the most susceptible crops within the EU. Using cisgenesis to introduce mildew resistance in existing grape varieties would significantly contribute to sustainable production within the EU, without changing the characteristics or quality of the grapes. This combination of specific characteristics and resistance cannot be obtained through conventional grape breeding, as the offspring are a genetic mix of two parental varieties and thus do not present the typical qualities and traits - for instance flavour - of the original varieties.

In 12 years to scab resistant apple trees

Many apple varieties are susceptible to apple scab and must be sprayed with fungicides 20 to 30 times a year. Cisgenesis allows scab resistant apples to be produced in approximately 12 years - compared to 50 years with conventional breeding techniques. This not only represents substantial cost reductions for farmers, but also benefits consumers and the environment.

Cisgenesis: added value for Europe's economy and innovative potential

Small and Medium Enterprises (SMEs), which represent a large part of the EU's innovative plant breeding sector, could especially benefit from cisgenesis to answer market demands and develop new varieties that are more sustainable or produce higher yields in a whole range of crops, including fruit and vegetable crops. Before this can happen however, EU Member States must align their position toward cisgenesis. In January 2012, the EU Expert Working Group on New Breeding Techniques published a report outlining that cisgenesis creates similar varieties to those obtained through conventional breeding techniques or via normal biological reproduction methods. If the EU can build further on this conclusion, the European plant breeding sector will be freed from expensive regulatory burden and its competitiveness will be given a strong boost. Indeed, companies, and SMEs in particular, will be able to focus their resources on research and valorisation of innovation within Europe rather than having to do so in non-EU countries - an added value for the European agricultural sector and economy as a whole. It will also level the playing field and allow the EU to effectively compete with other markets where the technique could be applied.

¹ Scientific opinion addressing the safety assessment of plants developed through cisgenesis and intragenesis (2012). EFSA Journal 10:2561 [33 pp.]. doi:10.2903/j.efsa.2012.2561 <http://www.efsa.europa.eu/en/efsajournal/pub/2561.htm>

About the NBT Platform

The NBT Platform is a coalition of SMEs, large industry and prominent academic research institutes, which strives to bring clarity to the European debate on NBTs. Its aim is to provide policy makers and stakeholders with clear and precise information on NBTs and to generate awareness about their potential benefits for the European economy and society as a whole.

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