World's first blue rose

Breeding a blue rose has been the 'Holy Grail' of rose breeding for centuries, but roses have proven a particularly difficult candidate to turn blue. That has all now changed with the joint venture between the Australian based Florigene and the Japanese Suntory company, successfully using CSIRO's gene silencing technology to help create the world's first blue rose.

Roses are famous for their beautiful colours including red, pink, orange, yellow and even white. These colours have been developed through traditional breeding but never has a blue rose successfully been bred.

Some mauve roses have been bred but as it turns out these colours are actually produced by variations of red pigment not by the production of blue pigment.

To develop the world's first blue rose with blue pigment three steps had to be achieved:

1. Turn off the production of red pigment;

2. Open the 'door' to production of blue pigment; and then

3. Produce blue pigment.

One gene involved in flower colour, is the dihydroflavonol reductase (DFR) gene. The DFR gene makes the enzyme dihydroflavonol reductase (DFR) which turns on the manufacturing process in the plant that produces pigment that in turn colours flowers.

In roses the DFR gene is very good at producing red pigment and hence the range of commonly seen rose colours. However, the rose DFR gene is particularly bad at producing blue pigment, hence the difficulty in breeding a blue rose.

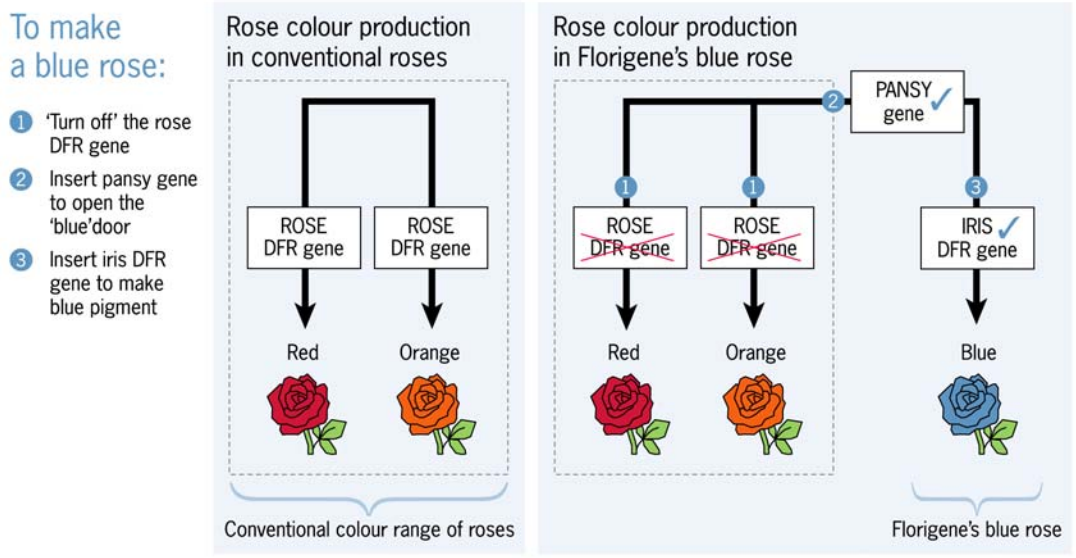
The first critical step in producing a blue rose was to stop the rose DFR gene making red pigment.

Preventing red pigment

CSIRO first developed gene silencing, or hairpin RNAi, in 1997. It was a significant breakthrough allowing scientists to turn down or switch off completely the activity of genes.

Gene silencing uses a natural mechanism that degrades RNA – the courier that delivers the gene's instructions to make proteins, like the enzyme DFR.

Florigene and Suntory used CSIRO's gene silencing technology to turn off the activity of the rose DFR gene so that it didn't produce red pigment.



Gene silencing has been used in a number of research applications to determine gene function and in the development of experimental plants with favourable properties. Its use in the development of the blue rose is likely to be its first commercial application.

Opening the blue door

The second step towards a blue rose was to open the 'door' to allow for blue pigment to be produced.

The production process of colouring flowers is like a pathway. In roses the pathway to producing red pigment is open, but the blue pathway is closed.

Florigene and Suntory inserted a gene commonly called a delphinidin gene from pansy that opened the door to the production of blue pigment in the rose flowers.

Importing the blue colour

With the red pigment production turned off using CSIRO's gene silencing and the door open to the production of blue pigment, the final task was to find a DFR gene good at producing blue and placing it in the rose.

Florigene and Suntory decided to replace the rose DFR gene with a DFR gene from an iris, which is excellent at producing blue pigment. The iris DFR gene was inserted into the rose and subsequently a rose with a blue flower was produced.

A bluer rose

While the prototype blue rose made by Florigene and Suntory is in fact a pale violet colour it is the first rose of this colour that comes from blue pigment. The colour of other 'blue' roses currently on the market is only a modification of red pigment.

Even bluer flowers should be achievable if rose petals can be made less acidic, as acidity inhibits blue pigment.

Florigene and Suntory researchers are searching for genes that affect petal acidity or that affect petal colour in other ways, to breed a bluer rose.

Commercial availability

Florigene has already successfully created blue carnations using gene technology and these have been available in Australia since 1996.

It will be at least 3 years before blue roses will be commercially available in Australia, pending approval from the Office of the Gene Technology Regulator for their commercial release.

Dr Peter Waterhouse, leader of the CSIRO team who discovered the gene silencing technology used to develop the blue rose.

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