The Blue Rose

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The blue rose has always stood for the unattainable. Breeders have attempted to produce a blue rose for hundreds of years, with little to show for their efforts. Scientists at Florigen and Suntory, however, have finally produced a true blue rose.

The technology behind the development is the exploitation of the RNA interference pathway. This RNAi pathway has the ability to silence gene expression, that is, stop the production of certain proteins by interfering with mRNA (messenger RNA) molecules. This inhibits the production of the protein by essentially eliminating the gene from the mRNA.

First, a relatively long dsRNA (double strand RNA) molecule is inserted. The dsRNA molecule is then cleaved by the Dicer enzyme, which divides the dsRNA into multiple 20-25 nucleotide (nt) siRNA molecules (short interfering RNA). These siRNA molecules then assemble into RISCs (RNA induced silencing complexes), which in turn cleave the mRNA, preventing protein formation from that gene.

In order to actually create a blue rose, however, scientists had to overcome several hurdles, including stopping the production of red pigment, allowing the production of blue pigment, and finally, producing the blue pigment. They were able to stop the production of the red pigment by silencing dihydroflavonol reductase (DFR), the red producing gene. Next, a delphindin gene from a pansy was inserted to allow blue pigment production. Finally, another DFR gene, this time from an iris, was inserted, to actually produce the blue pigment.

While the roses in the above picture are more of a pale violet than a blue, researchers are looking for other genes that affect the acidity of the petals, which affects the color of the rose.

There are hundreds of other potential uses for gene silencing through the RNAi pathway. They include potential cures for hereditary diseases, macular degeneration, Hepatitis C, HIV, cancer, and more.

Sources:

- http://www.ambion.com/techlib/tn/115/11.html
- http://www.pbs.org/wgbh/nova/sciencenow/3210/02-cure.html
- http://www.csiro.au/files/files/p29z.pdf
- http://en.wikipedia.org/wiki/Gene
- RNAi: an ever-growing puzzle
  Biochemical Sciences Vol.28 No.4
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  Ahmet M. Denli and Gregory J. Hannon