

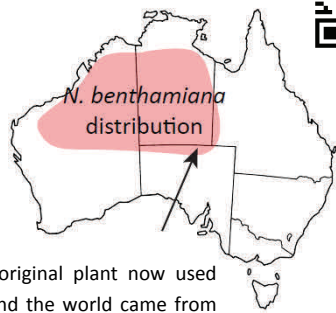
Nicotiana benthamiana

A Workhorse for Biotechnology

An Aussie conquers science



© Rob Davis, Western Australian Herbarium¹



The original plant now used around the world came from here.



Nicotiana benthamiana is an Australian wild relative of tobacco. The original type specimen is part of Kew's herbarium collection. *N. benthamiana* was named in honour of George Bentham (English botanist 1800-1844).

<http://specimens.kew.org/herbarium/K000196107> ©The Board of Trustees of the Royal Botanic Gardens, Kew²

A host to microbes

N. benthamiana leaves can be infiltrated easily with cultures of a natural bacterial genetic engineer (*Agrobacterium tumefaciens*), which integrates foreign genes into the plant genome. The plant then reads the genes as its own and produces the protein the foreign genes encode.



Agroinfiltration image by Chandres⁴

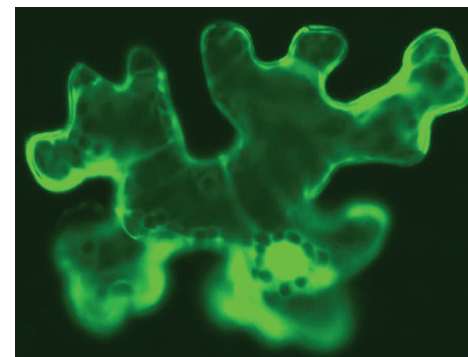


Image by Sebastian Schornack³

Here a green fluorescent protein (GFP) is introduced into a cell using this method, and microscopy allows us to study the GFP's distribution.

Virus-induced gene silencing

Virologists found that *N. benthamiana* is susceptible to many plant-infecting viruses. Virus induced gene silencing (VIGS) is a method of studying the function of genes by lowering their activity. *N. benthamiana* is infected with an RNA plant virus carrying a piece of plant RNA.

When the virus spreads inside the plant it triggers the plant machinery to remove foreign RNAs. At the same time it also removes all of its own RNA that matches the introduced RNA sequence.

In the picture, part of a gene important for chlorophyll protection has been inserted (left plant).



Image by Sebastian Schornack³

Silencing of this gene in plants results in bleached leaves as the chlorophyll is not protected from light and degrades. White patches develop everywhere where the virus is present inside the plant.

High on protein

Production of antibodies against Ebola



Ebola image by Phil Moyer⁵

ZMAPP, an experimental treatment for Ebola, contains antibodies that were produced in *N. benthamiana*, the workhorse for plant

production of medically relevant proteins. *N. benthamiana* can tolerate particularly high amounts of foreign protein.



Image by Sebastian Schornack³

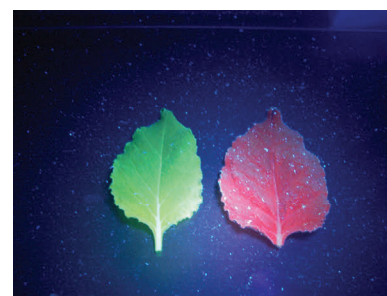


Image by Sebastian Schornack³

The leaf on the left is from a plant producing high amounts of GFP which under UV light glows green while normal plants glow red.



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