

Foxglove

Digitalis purpurea

Legendary in medicine,
infamous in murder
mysteries, useful in
molecular science and
making a name for itself in
genetics!

Foxgloves, *Digitalis purpurea*, are biennial or short-lived perennial herbs ever popular worldwide as garden plants. They come from temperate broadleaf and mixed forests, woodlands and scrublands of Europe and the Mediterranean.



All parts of *Digitalis purpurea* are poisonous. They contain two chemically similar toxins, **cardiac glycosides digitoxin** and **digoxin**, that can be extracted from the leaves to produce medication which when used at exactly the correct dose, can strengthen and regulate the heartbeat. However, dosage needs to be extremely accurate as an excessive dosage can be fatal.



Natural distribution of *Digitalis purpurea* in Europe.

The use of *Digitalis* in herbal remedies can be traced back to Roman times but in 1785, English physician and herbalist, William Withering published what is believed to be the first known clinical study investigating *Digitalis* to treat *dropsy*, a general term used at the time to describe leg swelling, which can be a sign of heart failure. Digoxin is still being used in medicine to treat heart failure and some rhythm disturbances, but is extracted from leaves of another species, *Digitalis lanata*. In recent times other drugs, like synthetic beta blockers, have mostly replaced digoxin because they are safer to use and are associated

with better longer-term outcomes. The steroid digoxigenin, also extracted from foxgloves, has a further application as a small molecule marker (immunotag) that can be used to visualise a variety of molecules for research or use in diagnostic assays.



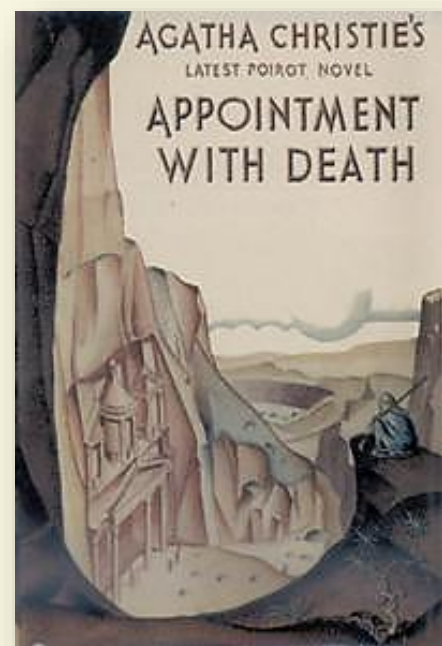
Four phenotypes of *Digitalis*. Mateus S. Figueiredo, CC BY-SA 3.0
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M/_ ; W/_ ; _/_	white flower, purple spots
m/m; _/_ ; _/_	albino flower, yellow spots
M/_ ; w/w ; d/d	light purple flower
M/_ ; w/w ; D/_	dark purple flower

Flower colour in *Digitalis purpurea* is determined by the interaction of at least three genes, **M**, **D** and **W**. The purple pigment, an anthocyanin, is determined by the dominant allele of the **M** gene. A dominant **D** allele enhances the **M** gene, so the purple colour becomes more intense. Remarkably, pigment is deposited in spots if the **W** allele is expressed.

Detective writer **Agatha Christie** is purported to have said “*Give me a decent bottle of poison and I’ll construct the perfect crime.*” *Digitalis* from foxglove leaves was one of many plant-based poisons used to despatch victims in her many books and short stories.

The Herb of Death, published as a short story in 1930 in *The Story-Teller Magazine*, has foxglove leaves mixed with sage leaves stuffed in a roast duck. All guests fall ill, but one dies from *Digitalis* poisoning!



More recently, James Bond falls victim to poisoning in *Casino Royale*. During a game of poker, Bond is poisoned by *Digitalis*, and is only saved from certain death at the very last minute.



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