

Press release- 02 August 2024

Why do roses have thorns?

Prickles, wrongly named “thorns” for roses, have appeared in various plant species over hundreds of millions of years of evolution. An international research consortium, led by Cold Spring Harbor Laboratory in the USA and involving INRAE, has discovered the gene responsible for the presence of prickles in various plant species, including Roses. These results, published on August 02 in the journal Science, point to the existence of a common genetic program at the origin of prickles.

Roses don't actually have thorns, but rather prickles, which are lateral outgrowths of the epidermis, similar to those found on eggplants. Unlike thorns, which are modified stems or leaves, prickles can be detached without tearing the plant's fibers. Over 400 million years of evolution, many distant plant species have convergently developed prickles. These outgrowths offer numerous advantages for these plants, enabling them to deter herbivores, retain and absorb atmospheric water, or support the growth of climbing plants.

It is in this context that a consortium of scientists has been investigating the origin of prickles in different plants, such as the Solanum genus (which includes eggplants, potatoes and tomatoes) and the Rosa genus, which has been particularly studied by INRAE scientists.

The researchers used a combination of genetic approaches, including the creation of a genetic map by crossing different eggplant species, to locate the position of the previously unidentified gene controlling prickle development.

Thanks to their analyses, they discovered that the LOG gene is the determinant in the control of prickle development. This gene is involved in the synthesis of cytokinin, a plant hormone essential for cell proliferation and plant development. The researchers then identified this gene in the genomes of other species, including roses. Alteration or deletion of the gene, causing a loss of prickles, confirmed its role in the appearance of outgrowths.

These results demonstrate the existence of a common genetic program, at the origin of a plant morphological innovation, prickles, which is widespread and recurrent throughout evolution. They also open up the possibility of understanding a developmental mechanism at the origin of shared adaptive evolution in several plant species.

Reference:

Satterlee J.W., Alonso D., Gramazio P. et al. (2024). Convergent evolution of plant prickles by repeated gene co-option over deep time. *Science*, DOI: <https://doi.org/10.1126/science.ado1663>

Scientific contact:

Mohammed Bendahmane - mohammed.bendahmane@inrae.fr

Plant Reproduction and Development Joint Research Unit

Plant Biology and Breeding Division

INRAE Lyon-Grenoble-Auvergne-Rhône-Alpes Centre