Press release

To the media

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The awakening of Sleeping Beauty

A team of the University of Geneva demonstrates how the coat of dormant seeds controls the process of germination

Certain plants have devised very clever strategies to ensure that their progeny overcomes the crucial step of germination. One of the safeguards to prevent "false starts" is provided by the dormancy of newly made seeds, which is maintained until the right environmental conditions appear. A team led by prof. Lopez-Molina at the University of Geneva (UNIGE), Switzerland, has recently identified an essential process allowing the plant embryo to wake up and which takes place in the seed coat. The researcher presents the latter as an organ capable of actively controlling seed germination. Furthermore, these findings, reported in the October 18th 2010 edition of *PNAS*, provide a framework to study how environmental factors eventually break dormancy.

Seed germination is a crucial step in the life cycle of a plant. This is a decisive moment where the plant abandons the highly protected state of the dry seed to face the vagaries of the environment. The embryo within the grain is indeed going to metamorphose into a young and fragile green seedling that may be killed by a sudden drought or frost. Moreover, the place where germination occurs will determine where the plant spends the rest of its life.

The benefits of dormancy

Although simple imbibition by water may be sufficient to trigger seed germination, other conditions may be required as well. Thus, unfavorable light, as under the denser parts of the tropical forest, might block the process even after seed imbibition. Similarly, a grain exposed to a summer or winter rain will not germinate, in order to protect the future seedling from a harmful environment. This protection is ensured by dormancy, a safeguard that appeared during evolution.

"Upon the end of embryogenesis, seeds are produced in a dormant state, which endows the plant with several advantages. This property prevents germination out of season and avoids competition among individuals of the same species", explains Luis Lopez-Molina, professor at the Faculty of science of UNIGE. The scientist adds that the mechanisms responsible for acquisition and loss of seed dormancy are not known.

The Key to Dreams
"We knew that the seed coat acts as a barrier preventing seed germination but the underlining mechanisms remained elusive", says Keun Pyo Lee, member of the research group. A hint towards elucidating the coat's function was provided by the fact that dormant seeds constitutively produce a hormone, called ABA, that represses germination. Our news findings now allow to establish a link between these two pieces of information and to fill-in the gaps, with the help of a newly developed technique.

The embryos are physically separated from the seed coat and then disposed on a bed of dormant or non-dormant emptied seed coats on a nutritive medium. "We discovered that dormant seed coats release diffusible molecules inhibiting germination, such as ABA. This requires the continuous production by the seed coat of a protein called RGL2, known to promote ABA synthesis" adds Urszula Piskurewicz of the Department of Plant Biology. Understanding how dormant seeds lose the capacity to produce RGL2 in a constitutive manner will be the next step in unveiling the mechanisms that allow seed awakening.

Crucial for agriculture
The process of dormancy is of key importance for agriculture since it prevents precocious germination in the cob. "A few years ago, abundant rain took place during the development of wheat seeds and this interfered with the onset of their dormancy. The seeds became useless for making bread and the price of cereals skyrocketed", explains Luis Lopez-Molina. The identification of molecular sensors allowing the seed to assess the optimal environmental conditions to break dormancy constitutes therefore a major issue.

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