ENVIRONMENT AND SOCIETY

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Unravelling the secrets to achieving high-yield plants

Understanding the basic mechanics of plant growth could help Europe increase crop yield while reducing the need for pesticides — a vitally important consideration given our growing demand for sustainable food. An EU-funded project has made significant advances in this respect, by shedding new light on the behaviour of certain plant hormones and their role in achieving successful crops.

The European BRAVISSIMO[1] project focused on 'brassinosteroids' (BRs), specific plant hormones that control aspects of plant growth and development. Scientists were already aware that these hormones have a positive effect on the quality and productivity of crops, and that they can increase crop resistance to stress and disease.

The BRAVISSIMO project's major contribution in this field has been to successfully unravel the mechanism of brassinosteroid hormones that regulates 'stomata' development. Stomata are microscopic pores through which plants breathe and release water.

'When rain is scarce, for example, the pores will close to prevent the plant from wasting water while an automatic drought-protection mechanism is triggered into action,' explains Dr Jenny Russinova, project coordinator of the EU-funded BRAVISSIMO project. Brassinosteroids play an important role in determining the number of leaf stomata, but the underlying mechanism has not been well understood, until now.'

This breakthrough has important implications for environmental research and for the protection of plants. The results have since been published in the prestigious science journal *Nature Cell Biology*. In a wider sense, better understanding of BRs could lead to innovative new agricultural practices.

'Like human steroid hormones, brassinosteroids are crucially important, since a lack of this hormone can lead to the development of extremely small plants,' explains Dr Russinova. 'Brassinosteroids offer the unique possibility of increasing crop yields by changing plant metabolism and protecting plants.'

Adapting to change

Dr Russinova and her colleagues believe that a better understanding of BR function could provide the basis for developing plant varieties better adapted to anticipated environmental change, and more resistant to disease. This could have significant economic implications.

'Plants are the basis of European industries with an annual turnover of more than EUR 1 trillion, and they will continue to play an even more important role in our

economies in the future,' says Dr Russinova. 'Over the next 20 years, the challenge for European agriculture will be to satisfy the growing demands for producing food in a sustainable manner.'

At the beginning of the project, the tomato was selected as an ideal species for analysis, and also as a model system for fruit production. Together with scientists from Crop Design, a BASF Science Company, a review was carried out of known genes involved in the BR pathway, and several candidates have since been selected for functional tests on rice.

Dr Russinova credits her involvement in the project as a crucial step in her research career. 'Being a coordinator of BRAVISSIMO was an extremely useful experience for me because I learned how to communicate and collaborate with different research teams,' she acknowledges. 'I interacted with many young researchers who introduced me to new ways of approaching certain scientific challenges. I also learned what interests them, and how they see their career development.'

By creating new opportunities and developing potential new technologies for agriculture, the ground-breaking BRAVISSIMO project supports the EU's stated Horizon 2020 goals of creating growth and jobs through research.

As group leader at the VIB Department of Plant Systems Biology at Ghent University, Dr Russinova is currently working on the interaction between plant cells and brassinosteroids. Unravelling this, she says, will be another important step towards the development of effective strategies for producing high-yielding plants.

The project was coordinated by the VIB life-sciences institute in Belgium.

1 'Brassinosteroid venture increasing students' international mobility'.

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http://ec.europa.eu/research > headlines > search > 31033
Project website: http://www.bravissimo-fp7.eu/

Engaging China and India in climate-change abatement

Major reductions are needed in the emissions of greenhouse gases (GHGs) in order to combat global warming and the effects of climate change. Although much of the carbon dioxide (CO_2) accumulated from human activities originates in industrialised countries, a growing share will come from the developing world, particularly China and India.

The participation of China and India in climate-change abatement is essential. However, both nations are reluctant to enter into any binding agreement as they do not wish to impede their development goals. The POEM[1] project is examining different ways in which the two countries can achieve both their development and climate-change abatement objectives.

POEM is developing a range of macro-socio-economic, energy and environment policies for the two nations, thereby facilitating engagement in climate-change protection measures. A range of options, including both international and national climate policies, have been examined, as have institutional frameworks for international cooperation.

By applying an integrated modelling framework the project aims to explore a range of approaches and different impacts and scenarios. The resulting policy options will enable China and India to contribute to international climate change initiatives without compromising national development priorities.

Project partners have identified and developed international climate policies and developed a country-specific modelling framework for studying possible impacts and scenarios. Due to the different gross domestic product (GDP) levels and energy structures, results differ considerably between China and India. The policy options under examination will also address the impact of development pathways on so-called burden-sharing regimes.

The POEM project will support decision-making on energy, environmental and economic matters by indicating how climate and socio-economic policies can be successfully aligned, rather than working against one another.

The project was coordinated by Chalmers University of Technology in Sweden.

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1 'Policy options to engage emerging Asian economies in a post-Kyoto regime'.

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