Scientists discover final piece in phytate jigsaw

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A team of scientists in Spain and the UK have identified the final piece in the jigsaw of how phytate is produced in plants.

Published today by *PNAS*, the breakthrough discovery by the Consejo Superior de Investigaciones Cientificas (CSIC) in Madrid and the University of East Anglia (UEA) has implications for agribusiness, the environment and human health.

Phytate is a naturally-occurring phosphate deposit which accumulates in the seeds, beans and tubers of many crops. The researchers have identified for the first time how the enzyme that produces phytate works, by solving the molecular structure of the protein IP5 2-kinase.

Because many animals are unable to digest the phytate present in their feed, the phytate phosphorus is transferred to the soil as manure, leading to the harmful pollution of waterways.

As a result, the animal feedstuffs industry currently adds a special enzyme called phytase to the feedstuff which allows animals to absorb the phosphorus complexed within phytate. This is a costly process, and so the industry needs to identify low-phytate varieties of crops such as maize, rice, wheat, barley and soya bean. This new discovery completes our understanding of how phytate is made by plants.

Not only does phytate contribute to pollution, the phytate in crops is also an 'anti-nutrient' that can have a detrimental effect on human health.

In the developing world, where diets are often grain- or bean-based with little or no meat, phytate has been identified by the World Health Organisation as one of the main causes of iron deficiency anaemia - a major disease affecting millions of people.

"This is a hugely exciting discovery as scientists have been searching for this final piece in this jigsaw for so long, and because phytate has such a wide-ranging impact in agriculture, the environment and human health," said co-author Dr Charles Brearley, of UEA's School of Biological Sciences, who collaborated in this work with Dr Beatriz González of CSIC's Intituto de Quimica-Fisica "Rocasolano".

Victor Raboy, a crop geneticist at the US Department of Agriculture, commented: "Understanding this unique aspect of inositol phosphate chemistry has broad significance not only for plant biology and agriculture but also for non-plant eukaryotic cellular metabolism and signal transduction.

"For example, it will also enhance our understanding of how yeast, slime molds and fruit flies function, and potentially could have future importance in understanding human disease and in designing therapies."

More information: 'Inositol 1,3,4,5,6-pentakisphosphate 2-kinase is a distant IPK member with a singular inositide binding site for axial 2-OH recognition' by B González (CSIC), J Banos-Sanz (CSIC), M Villate (CSIC), C Brearley (UEA) and J Sanz-Aparicio (CSIC) is published online by PNAS on April 26.

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