ECOS SCIENCE FOR SUSTAINABILITY

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Published: 17 December 2013

Silver banksia a gold standard for phosphate efficiency?

Plants from the leached soils of Western Australia have developed a special strategy for coping with phosphorus scarcity. Scientists from the University of Western Australia and the Max Planck Institute of Molecular Plant Physiology in Germany have discovered that plants from the *Banksia* genus can make severe cutbacks in phosphorus use – in particular to ribosomal RNA (rRNA).

Credit: Max Plank Institute

As global phosphorus reserves decline, the strategies of banksias and other members of the Proteaceae family could be of interest for optimising crop plants through breeding.

Plants in WA have to be tough to survive. The heat is oppressive, rain is rare, and phosphorus in the form of phosphate is virtually nowhere to be found in the soil. However, phosphorus is crucial to the survival of plants.

A plant cell's protein factories are the biggest consumers of phosphorus. The element attaches itself to sugar and proteins and is a component of DNA, the cell membrane and energy production. When phosphorus is scarce, photosynthesis declines and plants hardly grow.

However, some plants from the *Banksia* genus thrive in the tough conditions. ‘These plants grow on soils which contain a hundred times less phosphate than unfertilised soils in Europe,’ says Mark Stitt, one of the authors of the study.

This is partly due to their brush-like roots, which suck phosphorus from the soil with their fine hairs. The plants are also extremely prudent in their use of the little phosphorus available to them. They save most in the nucleic acids, which account for between 30 and 50 per cent of the cell's total phosphorus.

Phosphorus ‘cutbacks’ are strongest for ribosomal RNA, a component of a plant cell's protein factories. Silver banksia has fewer ribosomes, which produce fewer proteins and enzymes. The plant grows more slowly as a result, but does not present any symptoms of phosphorus deficiency. In fact, too much phosphorus could prove dangerous to it.

‘The plants can be fertilised to death, as they cannot halt the absorption of phosphate,’ says Dr Stitt. Other plants simply close down when over-fertilised. ‘Up to now, we did not know why the Proteaceae, which have adapted to phosphorus deficiency, are no longer able to do this.’

Dr Stitt says the banksias may have simply never been in such a situation, as WA’s are old and weathered and did not acquire additional phosphate in the past from volcanic eruptions, people or animals.

Silver banksias are also extremely economic when they form new leaves. Instead of investing simultaneously in the growth and formation of the photosynthesis equipment, which would bind huge volumes of ribosomes, and thus phosphorus,they focus first on the formation of the leaf and later on the production of the green chlorophyll.

Phosphorus is very rarely found on the Earth and deposits are concentrated in small geographical areas: almost 75 per cent of the world's total phosphate rock is found in Morocco and the Western Sahara and a further 15 per cent is distributed between China, Algeria, Syria, South Africa and Jordan.

Source: EurekAlert!

From **ECOS** online http://www.ecosmagazine.com/?paper=EC13292