

Hairy secret of foraging plants discovered

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Crops that are better at finding nutrients would benefit farmers

(PhysOrg.com) -- The genes that control the hairy 'mining machine' that makes some plants better at finding nutrients in poor soils than others have been discovered by scientists from Oxford University and the John Innes Centre.

The finding, that could help to create crops that are better at feeding themselves and so need less fertiliser, is reported in [Nature Genetics](#).

When crops such as barley and wheat are grown on soils containing small amounts of phosphate it is known that those plants with long hairs on their roots give higher yields than those with short hairs. Similarly, long-haired beans grown on the nutrient-poor tropical soils of Central America do much better than short haired varieties.

Root hairs burrow into the soil like tiny ‘mining machines’ releasing acids and other scouring chemicals that crack open rocky minerals releasing valuable nutrients, such as iron and phosphate, that are necessary for plant growth.

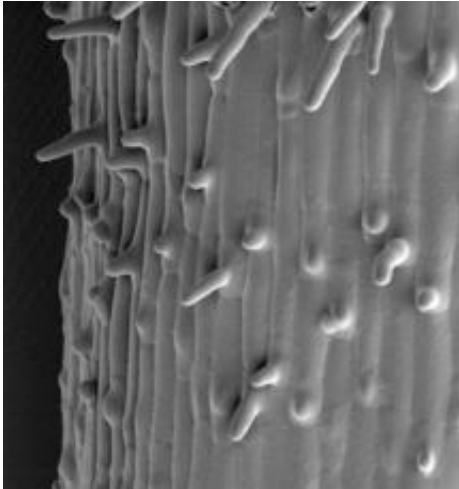
Now, for the first time, scientists have found the mechanism that controls the growth of these specialised nutrient-excavating cells. They discovered that a master [regulatory gene](#) called RSL4 acts like a switch; [hair cells](#) grow when the gene is turned on and growth stops when it is off.

‘When we discovered that RSL4 was a master regulator of hair growth we thought that perhaps the increased growth of root hairs in low phosphate soils might result from turning this gene on,’ said Professor Liam Dolan of Oxford University’s Department of Plant Sciences, who led the team.

‘Our hunch was right: growing plants in phosphate-poor soils turned the gene on resulting in the growth of very long root hairs. So this gene is not only a key [growth regulator](#) but also a critical cog in the mechanism that plants use to cope with a lack of nutrients,’ said Professor Dolan.

Given the ability of RSL4 to increase root hair growth this discovery has the potential to help breeders develop crops that can grow on poor soils. As global food demand increases this could become very important as most soils in Australia, extensive regions of sub-Saharan Africa, and 30 per cent of China, are not productive because plants cannot extract

sufficient phosphate and iron from these soils.



Rice hairs on root.

‘Our hope is that in the future someone will be able to use this gene to develop plant varieties which enhance yields on poor soils. This could have obvious benefits for developing world agriculture. Also, as fertilisers become increasingly expensive, we will need crops that are more efficient in nutrient uptake. This could have the added benefit of decreasing the amount of polluting phosphate that runs off into rivers and lakes,’ Professor Dolan said.

‘What excites me most about this research is that we set out to answer a fundamental question in biology - how organisms control the size of their cells - and ended up discovering something that could have an important impact on world agriculture.’

More information: A report of the research, entitled ‘A basic helix-loop-helix transcription factor controls cell growth and size in root hairs’, is published in *Nature Genetics*.

Provided by Oxford University

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