New kinds of fertilizers for a sustainable forestry

Description

Torgny NÃ¤sholm is awarded the 2018 Marcus Wallenberg Prize for having documented how trees use amino acid molecules as sources of nitrogen. He has also shown how this organic nitrogen dominates the nutrition of trees in boreal forests. The findings have resulted in new types of fertilizers.

Professor Torgny NÃ¤sholm, The Swedish University of Agricultural Sciences, UmeÃ¥, Sweden, has examined the role of amino acids in supplying the nitrogen required for the growth of forest trees. His work has caused a paradigm shift in explaining the nutrition of plants.

For his discoveries Torgny NÃ¤sholm is awarded the 2018 Marcus Wallenberg Prize of SEK 2 million.

With a little help of amino acids
The ability of boreal forests to take up atmospheric carbon dioxide and produce wood depends on the availability of nitrogen in the soil. The growth of most forests is however limited by a low supply of nitrogen.

Some species have developed symbioses with bacteria that can process nitrogen gas into amino acids. More than a century ago some plants were demonstrated to have the capability of taking up amino acids directly. The process was not considered important until the isotopic methods were further developed and could simplify chemical analyses of different elements.

Torgny NÃ¤sholm has in different studies since 1998 investigated the nutrition of forest trees â?? particularly Scots pine and Norway spruce. He found that nitrogen from amino acids was taken up by tree seedlings and discovered that the amino acid concentrations in forest soils are high enough to provide a substantial supply for tree uptake. He could also testify that the major nitrogen source of pine and spruce in boreal forests is amino acids rather than ammonium ions or nitrate.

Environmentally friendly
The new insights inspired Torgny NÃ¤sholm to develop fertilizers based on amino acid and nitrogen. Field studies revealed the improvement of shoot growth when seedlings were grown on this organic nitrogen. Leaching of nitrogen was also reduced compared to conventional inorganic fertilizers.

The findings have had an impact on nursery and forestry practices in coniferous forests in the Nordic countries.

The first patent for this approach was issued in 2000 and a fertilizer called Argrow, based on the amino acid arginine, was introduced on the market. Arginine is a nitrogen rich amino acid that is easily

absorbed by plants. The fertilizer is mainly used in forest nurseries in Sweden, Finland, USA, Canada, Uruguay, China, New Zealand and Australia. It is also being tested on other commercial crops and garden plants.

The innovation has been further developed. Subsequent patents have highlighted improved plant growth.

Seedpad is an example of another new technology for improved germination of pine and spruce seeds, that Torgny NÃ¤sholm recently developed as CEO for the startup company Arevo AB, UmeÃ¥, Sweden. More products characterized by the slow release of amino acid-based fertilizers will soon be introduced on the market.

Groundbreaking innovations
The Prize Selection Committee of the Marcus Wallenberg Foundation states in its motivation that Torgny NÃ¤sholm has made innovative discoveries with substantial practical importance to a sustainable management of forests. He has managed to translate and transfer his groundbreaking scientific discoveries into useful applications.

Erik Normark, forestry specialist at the Swedish Forest Agency, is also impressed by the ability to combine research with practical problem solving.
â?? Fertilizers based on amino acid and nitrogen has lifted Swedish forest seedling production to a higher level of quality. Early results from field studies of fertilizing after seeding indicate a progress in survival and growth of great importance to the forest production in our country, Erik Normark says.

The Marcus Wallenberg Prize 2018 will be presented by HM the King of Sweden to Torgny NÃ¤sholm at a ceremony in Stockholm in September this year.

The Laureate
Torgny NÃ¤sholm was born in Nora, the municipality of Kramfors, Sweden, in 1959. He defended his PhD thesis in Plant Physiology in 1991 at the Swedish University of Agricultural Sciences in UmeÃ¥, Sweden. In 2000 he was appointed Professor in Plant Physiology at the Faculty of Forestry, and in 2007 Professor in Tree Ecophysiology at the same university.

Between 2007 and 2010 Torgny NÃ¤sholm was engaged in SweTree Technologies AB, where he still holds a position as Scientific Advisor and board member. He is also the leading scientist and CEO of Arevo AB. Both companies are focused on plant and forest biotechnology and situated in UmeÃ¥.

Since 2007 Torgny NÃ¤sholm has published 64 scientific articles, many of them in the highest ranked journals of his area of research. He is also the lead scientist on ten patents issued for work on applications of amino acid nutrition for plants.

Encouraging research in forestry
The purpose of the Marcus Wallenberg Prize is to recognize, encourage and stimulate path breaking scientific achievements, which contribute significantly to broadening knowledge and to technical development within the fields of importance to forestry and forest industries.

The official citation and prize motivation is published on http://www.mwp.org/

Official Press Release in two language versions and the Full Prize Motivation

MWP 2018 Press release Announcement ENGLISH

MWP 2018 Pressmeddelande TillkÃ¤nnagivande

MWP 2018 Award â?? Full motivation

Photo for downloading.

Professor Torgny NÃ¤sholm, Swedish University of Agricultural Sciences, UmeÃ¥, Sweden, is awarded the 2018 Marcus Wallenberg Prize. Photo: Johan Marklund.