Plant nutrition *courier*

The best bits of plant nutrition research ***Since 2009***

Digital manganese analyser

A portable analyser detects latent manganese deficiency within seconds. The digital tool shows a manganese deficiency long before symptoms can be seen. The instrument 'reads' the manganese state of a plant from the spectrum of fluorescent radiation, which is emitted by a specific manganese containing protein system. All crops have this protein, the Danish plant nutrition specialist Søren Husted says. Together with colleagues from the University of Copenhagen, Husted founded the spin-off company NutriNostica to bring this apparatus on the market. The digital analyser is sold under the name NN-Easy55 and costs about € 4,000 ex VAT.

Photograph: NutriNostica

Research highlights

Phosphite enhances rape yield
Foliar fertilisation with a potassium phosphite containing composition increases the yield of winter rape. The German plant pathologist Joseph-Alexander Verreet concludes this from four years' field experiment at the university Institute of Phytopathology in Kiel. Japanese researchers affirm the bio-stimulatory or growth regulating activity of this compound (see review and article on spinach nutrition).

Seed oil reduces nitrification
Urea prills coated with meliacins from neem oil perform better than uncoated urea prills. Researchers from the Indian Agricultural Research Institute conclude this from efficacy tests with saturated and unsaturated fractions from seed oil extracted from the neem tree (*Azadirachta indica*). According to the Indian researchers, a *Jatropha* seed cake or *Jatropha* seed oil coating too inhibits nitrification of urea-derived ammonium.

Stomata reassessed
Uptake of foliar fertilisers through stomata is often underrated, says Thomas Eichert from the University of Bonn's INRES Department of Plant Nutrition. Eichert studies the so-called stomatal pathway and found stomata to be a main route for foliar uptake of nutrients. Uptake through the waxy leave cuticula of leek is negligible and the stomatal pathway is also important for a lot of other plant species.

Publications about plant nutrition research

General
Glyphosate-induced impairment of plant growth and micronutrient status in glyphosate-resistant soybean (*Glycine max* L.). Plant and soil 312(2008)1-2:185-194
Do input subsidy programs "crowd in" or "crowd out" commercial market development? Modeling fertilizer demand in a two-channel marketing system. Agricultural economics 40(2009)1:79-94
The effects of a seaweed extract in addition to nitrogen and boron fertilization on productivity, fruit maturation, leaf nutritional status and oil quality of the olive (*Olea europaea* L.) cultivar Koroneiki. Journal of the science of food and agriculture 89(2009)6:984-988 and erratum
Low light and low leaf calcium and boron concentrations are associated with fruit pitting, a new disorder in mango (*Mangifera indica* L.) in India. The journal of horticultural science & biotechnology 84(2009)1:83-86
Influences of nitrogen, phosphorus, potassium and boron combined application on the nectar production of oilseed rape (*Brassica campestris* L.). Plant nutrition and fertilizer science 15(2009)2:435-440

A case of sufficiency

Bees only visit rape that is sufficiently supplied with sulphur. The aberrant colour and smell of flowers from sulphur-deprived plants is a signal that other insects already have collected the nectar.

Photograph: Werner von der Ohne, Institut für Bienenkunde (Germany)

Publications about plant nutrition research

Forecasting long-term global fertilizer demand. Nutrient cycling in agroecosystems 83(2009)3:233-247
Seed treatment with 2,4-diacetylphloroglucinol-producing Pseudomonads improves crop health in low-pH soils by altering patterns of nutrient uptake. Phytopathology 99(2009)5:506-511

Mapping, sampling and analytics
Small-increment electric soil sampler. Soil Science Society of America journal 72(2008)6:1554-1556
Comparing the EM38DD and DUALEM-21S sensors for depth-to-clay mapping. Soil Science Society of America journal 73(2008)1:7-12
In situ monitoring of soil solution nitrate: Proof of concept. Soil Science Society of America journal 73(2008)2:501-509
Re-evaluation of hot water extraction for boron availability by use of a boron sorption index. Communications in soil science and plant analysis 39(2008)19-20:2839-2860
Comparison of some soil extractants for determination of boron. Communications in soil science and plant analysis 40(2009)1-6:96-105
Direct determination of phosphite in fertilizers by amperometric titration. Journal of agricultural and food chemistry 57(2008)2:372–374

Foliar fertilisation
Equivalent pore radii of hydrophilic foliar uptake routes in stomatous and astomatous leaf surfaces – further evidence for a stomatal pathway. Physiologia plantarum 132(2008)4:491-502
Size exclusion limits and lateral heterogeneity of the stomatal foliar uptake pathway for aqueous solutes and water-suspended nanoparticles. Physiologia plantarum 134(2008)1:151-160
Uptake of hydrophilic solutes through plant leaves: Current state of knowledge and perspectives of foliar fertilization. Critical reviews in plant sciences 28(2009)1-2:36-68
Leaf structural changes associated with iron deficiency chlorosis in field-grown pear and peach: physiological implications. Plant and soil 311(2008)1-2:161-172

Humic acids
Effect of humic acid on plant growth, nutrient uptake, and postharvest life of gerbera. Journal of plant nutrition 31(2008)12:2155-2167
Iron(III) bioreduction in soil in the presence of added humic substances. Soil Science Society of America journal 73(2008)1:65-71

Nano-fertilisers
Effects of slow/controlled release fertilizers felted and coated by nano-materials on nitrogen recovery and loss of crops. Plant nutrition and fertiliser science 14(2008)4:778-784
Effects of slow/controlled release fertilizers felted and coated by nano-materials on crop yield and quality. Plant nutrition and fertilizer science 14(2008)5:947-950

Nitrification and urease inhibitors
Structural characteristics of phosphoramide derivatives as urease inhibitors. Requirements for activity. Journal of agricultural and food chemistry 56(2008)18:8451-8460

Plant nutrition on the web

NDICEA stikstofplanner

A fertiliser planner or a diagnostic tool - the web has dozens of interesting websites. In this issue the NDICEA stikstofplanner.

Website NDICEA stikstofplanner
URL http://www.ndicea.nl
Languages Dutch, English
Description Nitrogen planner based on the MINIP model from Wageningen University. Developed and tested by Louis Bolk Instituut.
Offered by Louis Bolk Instituut (NL)

Publications about plant nutrition research

Influence of edaphic factors on the mineralization of neem oil coated urea in four Indian soils. Journal of agricultural and food chemistry 56(2008)21:10183-10191
Free fatty acids from the pasture grass *Brachiaria humidicola* and one of their methyl esters as inhibitors of nitrification. Plant and soil 313(2008)1-2:89-99

Specific release
Controlled-release fertilizer encapsulated by starch/polyvinyl alcohol coating. Desalination 240(2009):21-26 (full text)
Effect of weathered coal-based coated fertilizer on winter wheat growth and soil enzyme activity. Plant nutrition and fertilizer science 14(2008)6:1186-1192
Effects of slow/controlled release fertilizers felted and coated by nano-materials on nitrogen recovery and loss of crops. Plant nutrition and fertiliser science 14(2008)4:778-784
Effects of slow/controlled release fertilizers felted and coated by nano-materials on crop yield and quality. Plant nutrition and fertilizer science 14(2008)5:947-950
Urea particle coating for controlled release by using DCPD modified sulphur. Powder technology 183(2008)1:88-93

Nitrogen
Ammonia volatilization from urea-based fertilizers applied to tall fescue pastures in Georgia, USA. Soil Science Society of America journal 72(2008)6:1665-1671
Free fatty acids from the pasture grass *Brachiaria humidicola* and one of their methyl esters as inhibitors of nitrification. Plant and soil 313(2008)1-2:89-99
Use of a layered double hydroxide (LDH) to buffer nitrate in soil: long-term nitrate exchange properties under cropping and fallow conditions. Plant and soil 315(2009)1-2:257-272
Greenhouse pot trials to determine the efficacy of black urea compared to other nitrogen sources. Communications in soil science and plant analysis 40(2009)1-6:576-586

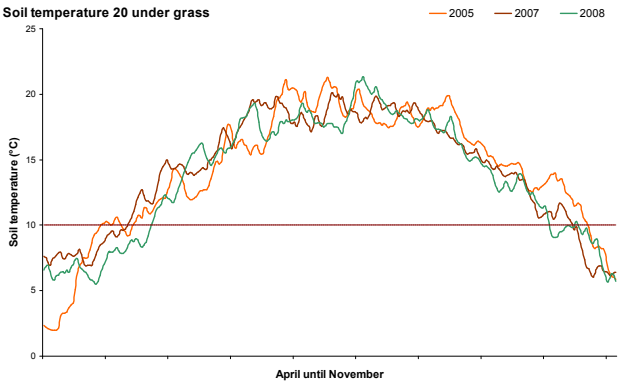
Phosphorus
Comparison of different phosphorus-fertiliser matrices to induce the recovery of phosphorus-deficient maize plants. Journal of the science of food and agriculture 89(2009)6:927-934
Phosphite (phosphorous acid): Fungicide, fertilizer or bio-stimulator? Soil science & plant nutrition 55(2009)2:228-234
Effects of phosphite, a reduced form of phosphate, on the growth and phosphorus nutrition of spinach (*Spinacia oleracea* L.). Soil science & plant nutrition 54(2008)5:761-768

Potassium
Effect of potassium chloride on the exudation of sugars and phenolic acids by maize root and its relation to growth of stalk rot pathogen. Plant nutrition and fertilizer science 14(2008)5:929-934
Activation of antioxidant system by KCl improves the chilling tolerance in hybrid maize. Journal of agronomy and crop science 194(2008)6:438-448

Changing climate

Air temperature rises and so does soil temperature
Wageningen University weather station registers the soil temperature under grass and bare soil. The graphic shows the soil temperature at 20 cm under grass for the very warm year 2005, and for 2007 and 2008. In 2005 the nitrogen mineralization at this depth started three weeks earlier than in 2008! Globally air temperature rises and so does soil temperature, meteorologists from the university group Meteorology and Air Quality and the KNMI say.

The changing global climate and the environmental policy both affect the practice of plant nutrition.
Next issue: sulphur demand increases



Soil temperature 20 cm under grass on river clay.
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Publications about plant nutrition research

Calcium
Cuticular calcium penetration is directly related to the area covered by calcium within droplet spread area. Scientia horticulturae 120(2009)2:201-206
Calcium requirement for ethylene-induced abscission. Journal of plant nutrition 32(2009)3:351-366
Improving NaCl resistance of red-osier dogwood: role of $CaCl_2$ and $CaSO_4$ Plant and soil 315(2008)1-2:123-133
Sodium-induced calcium deficiency in sugar beet during substitution of potassium by sodium. Journal of plant nutrition and soil science 172(2009)2:254-260

Magnesium
Effectiveness of recovered magnesium phosphates as fertilizers in neutral and slightly alkaline soils. Agronomy journal 101(2009)2:323-329

Sulphur
Sulphur consumption in Chinese agriculture: Situation and outlook. Plant nutrition and fertilizer science 14(2008)6:1219-1226
Sulphur and nitrogen content as sulphur deficiency indicator for grasses. European journal of agronomy 30(2009)3:172-176

Iron
Foliar iron-fertilisation of fruit trees: present knowledge and future perspectives - a review. The journal of horticultural science & biotechnology 84(2009)1:1-6
Analytical technologies to study the biological and environmental implications of iron-fertilisation using synthetic ferric chelates: the case of Fe(III)-EDDHA - a review. The journal of horticultural science & biotechnology 84(2009)1:7-12
Efficacy of Fe(o,o-EDDHA) and Fe(o,p-EDDHA) isomers in supplying Fe to strategy I plants differs in nutrient solution and calcareous soil. Journal of agricultural and food chemistry 56(2008)22:10774-10778

Manganese
Latent manganese deficiency increases transpiration in barley (*Hordeum vulgare*). Physiologia plantarum 135(2009)3:307-316
Manganese efficiency in barley: identification and characterization of the metal ion transporter HvIRT1. Plant physiology 148(2008)1:455-466 (full text)

Zinc
Relative efficiency of zinc oxide and zinc sulphate-enriched urea for spring wheat. Nutrient cycling in agroecosystems 82(2008)3:259-264
Residual effects of natural Zn chelates on navy bean response, Zn leaching and soil Zn status. Plant and soil 317(2009)1-2:277-291
Efficiency of a zinc lignosulfonate as Zn source for wheat (*Triticum aestivum* L.) and corn (*Zea mays* L.) under hydroponic culture conditions. Journal of agricultural and food chemistry 57(2009)1:226-231