PSP5 2014
Facing Phosphorus Scarcity
Phosphorus in Soils and Plants

Le Corum, Montpellier, France
26-29 August 2014
Welcome to PSP5, Montpellier, France

On behalf of the International Scientific Committee and Local Organizing Committee it is a pleasure for me to welcome you to this event in Montpellier, Southern France, as part of the PHOSPHORUS week 2014.

PSP5 is the fifth international symposium of a successful series on Phosphorus Dynamics in the Soil-Plant Continuum that was launched in Beijing (China) in 2000, then went to Perth (Australia) in 2003, Uberlandia (Brazil) in 2006 before coming back to Beijing (China) in 2010. Phosphorus Sustains Life was the subheading at the last of these events in 2010.

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PSP5, the 5th Phosphorus in Soils and Plants Symposium, will be a multidisciplinary event, gathering plant nutritionists (plant physiology, genetics and systems biology), agronomists, ecologists, biogeochemists and soil scientists from worldwide, fostering scientific exchanges across discipline boundaries, in order to face the challenge of phosphorus limitations in many agroecosystems and terrestrial ecosystems. PSP5 will be immediately followed by the 4th Sustainable Phosphorus Summit - SPS 2014 to be held in Montpellier from 1st to 3rd September 2014, where global concerns about Phosphorus sustainability will be discussed. You will thus have the opportunity to attend both events and be part of this unique P week.

When putting together this event over the past years and months, we were encouraged greatly by the huge interest and kind support received for PSP5, the 5th Phosphorus in Soils and Plants Symposium. The excellent scientific contributions received, with about 250 submitted abstracts, clearly shows that the global challenge of Facing Phosphorus Scarcity is both vibrant and increasingly addressed.

There are many people to be thanked for making this event a success: FuSuo Zhang and Zed Rengel for initiating this series of international symposia and the former Steering Committee for choosing Montpellier to host PSP5. An active Local Organising Committee did all of the groundwork, ranging from choosing the venue to organising social events such as the Welcome Cocktail and Gala Dinner at Chateau de Pouget, both being orchestrated by the renowned chef Germain. This dedicated group of colleagues did a great job in searching for sponsors, making the right decision for all organisational matters, including the necessary links with SPS 2014 and the YSW - Young Scientists Workshop - held in between, on the 31st August 2014. Nathalie Curiallet and Hélène Guillemain from CIRAD, Laure Corbarieu and Michel Ginestet from Alpha Visa Congrès offered highly professional support and advice to keep the scientists on tracks all along the process!

The PSP5 International Scientific Committee, which had been reshaped after the Beijing symposium, is deeply thanked for initially designing and subsequently helping to deliver the scientific programme, identifying session titles and keynote speakers, selecting the oral and poster contributions and their allocation to the five sessions. We were delighted and impressed by the quality of the submissions received and by the widest-yet global representation of any Symposium of this successful series.

This promises to be a fascinating PHOSPHORUS week, which we very much hope you will enjoy.
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Committees

Local Organising Committee

- Philippe Hinsinger (INRA Eco&Sols, Montpellier) (Chair)
- Alain Brauman (IRD Eco&Sols, Montpellier)
- Jean-Luc Chotte (IRD Eco&Sols, Montpellier)
- Brigitte Courtois (Cirad AGAP, Montpellier)
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- Philippe Nacry (INRA B&PMP, Montpellier)
- Laurent Nussaume (CEA, Cadarache)
- Claude Plassard (INRA Eco&Sols, Montpellier)
- Agnès Robin (Cirad Eco&Sols, Montpellier)
- Hatem Rouached (INRA B&PMP, Montpellier)
- Hervé Sanguin (Cirad LSTM, Montpellier)

Web site and Communication

- Nathalie Curiallet (Cirad Communication, Montpellier)
- Hélène Guillemain (Cirad Eco&Sols, Montpellier)
- Philippe Hinsinger (INRA Eco&Sols, Montpellier)
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Design and Logo

- Delphine Guard (Cirad Communication, Montpellier)
- Philippe Hinsinger (INRA Eco&Sols, Montpellier)

YSW Award Committee

- Matthieu Bravin (CIRAD UPR78, La Réunion)
- Jean-Luc Chotte (IRD Eco&Sols, Montpellier)
- Nathalie Fromin (CNRS CEFE, Montpellier)
- Hélène Guillemain (Cirad Eco&Sols, Montpellier)
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- Agnès Robin (Cirad Eco&Sols, Montpellier)
- Hatem Rouached (INRA B&PMP, Montpellier)
- Hervé Sanguin (Cirad LSTM, Montpellier)

Host Institutions

CIRAD
www.cirad.fr
Contact:
Dr. Jean-Paul Laclau
UMR Eco&Sols
Place Viala
F-34060 Montpellier cedex 1
France
jean-paul.laclau@cirad.fr

International Scientific Committee

- Philippe Hinsinger (Chair) (Montpellier, France)
- André Bationo (AGRA Africa)
- Else K. Bünemann (Zürich, Switzerland)
- Tim S. George (Dundee, UK)
- Phil Haygarth (Lancaster, UK)
- Iver Jakobsen (Copenhagen, Denmark)
- Hong Liao (Guangzhou, China)
- Jonathan Lynch (University Park, USA)
- Mike McLaughlin (Adelaide, Australia)
- Günter Neumann (Stuttgart, Germany)
- Laurent Nussaume (Cedarache, France)
- Javier Paz-Ares (Madrid, Spain)
- Josep Peñuelas (Barcelona, Spain)
- Yves Poirier (Lausanne, Switzerland)
- Claude Plassard (Montpellier, France)
- Zed Rengel (Perth, Australia)
- Alan Richardson (Canberra, Australia)
- Benjamin L. Turner (Panama)
- Matthias Wissuwa (Canberra, Australia)
- Fusuo Zhang (Beijing, China)
The Local Organising Committee wishes to acknowledge the following sponsors for their support to PSP5.

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Montpellier and the Languedoc-Roussillon Region

Montpellier has become over the past decades a major hub for research on agriculture, environment and sustainable development issues. It is part of the “Global Partnership on Cities and Biodiversity” of the CBD, and hosts (among others) two of the National LabEx (Laboratory of Excellence) that are supporting PSP5: the LabEx AGRO-Agropolis Fondation, gathering a broad number of research groups in the fields of agricultural and plant sciences, and the LabEx CeMEB (Mediterranean Center for Environment and Biodiversity), which brings together prominent research groups working in ecology and conservation issues. Montpellier, via Agropolis International, is one of the major agricultural science campus worldwide, with a large focus on Mediterranean and tropical agriculture. This is one of the reasons for Montpellier having been selected to host the secretary for the Consultative Group on International Agricultural Research (CGIAR).

Montpellier is also one of the oldest University cities in France (XIIIth Century). It is located on hilly ground 10 kilometers inland from the Mediterranean Sea coast on the banks of the Lez River. The medieval center, the so-called Ecusson, gives to the city its unique and intimate feeling.

Local transportation - Tramway & buses

Tickets can be bought in the automatic machines at each tramway station. The tramway Line 1, decorated in blue with white swallows, connects the northern part of the city with the Odysseum terminal on the southeast side. The Line 2, decorated in a flower-power theme, goes from east to west. The colorful Line 3, designed by the famous fashion designer Christian Lacroix, goes from west to east, arriving near the seaside at Perols. From there, you can rent a bike or take a short walk (around 20 minutes) to get to the beach. The golden Line 4, also designed by Christian Lacroix, is only for downtown. About 30 bus lines are connected to the tramway lines to offer a comprehensive network that will transport you in and around Montpellier.

Local transportation - VéloMagg bicycle service

To take full advantage of the beautiful weather, stop by one of the city's numerous bike stations and pick up a bike! You will feel truly free meandering through town and along 150 km of bicycle paths. You can buy tickets at the Esplanade bike station (next to Montpellier’s Tourist Office).

Restaurants

A large variety of restaurants, cafés and bars can be found all over Montpellier, with a very large selection available at walking distance from the Corum Convention Center. Some of them are open late at night. Prices for a menu usually start from 12 € at lunch and 18 € for dinner.

Getting around

Montpellier is the ideal place to stay and take advantage of both the seashore of Southern France and the many hidden treasures in the hinterlands of the Languedoc-Roussillon region. Discover major UNESCO World Heritage Sites, scenic villages and landscapes, and vast natural areas such as the Camargue marshland, and the Cévennes mountains.

Natural sites

- Camargue marshes, with pink flamingos, ranches with black bulls and white horses
- Cévennes mountains, great for biking, mountain biking or bushwalking
- Pyrénées mountains, between Spain, Andorra and Ariège
- Mediterranean coastline, with many swamps near Montpellier, and rocks and cliffs when getting near the spanish boarder, in the scenic Côte Vermeille
Historic cities
- Nîmes, living Roman history (45 kms from Montpellier)
- Sète, the fascinating birthplace of famous musician Brassens and poet Paul Valéry, situated between the Mediterranean sea and Thau lagoon, famous for its oyster farms (30 kms)
- Pézenas, Molière's hometown (60 kms)
- Aigues-Mortes, the medieval city of Saint Louis (30 kms)
- Collioure, capital of Fauvism painting (190 kms)

Unesco World Heritage Sites
- The colossal walled city of Carcassonne, a magnificent medieval city with its ramparts, the Basilica of St Nazaire and Château Comtal
- The Pont du Gard, an impressive Roman aqueduct
- The Canal du Midi, a beautiful canal with a succession of straits, locks and tunnels
- The medieval Gellone Abbey, located in the beautiful village of Saint-Guilhem-le-Désert on the route to Saint Jacques de Compostelle at the edge of the Gorges of the Hérault river.
- The Causses (elevated calcareous plateaux) and the unique Cirque de Navacelles where the Vis river has been carving the landscape and designing magnificent and peaceful gorges.

Social program
- **Welcome cocktail**: held at Le Corum Convention Center – Tuesday 26th August, 18:30-20:30
- **Gala dinner**: held at Chateau de Pouget – Thursday 28th August, 18:30-24:00
  Buses will leave at 18:30 from Corum level 0
  Chateau de Pouget is a magnificent castle (dating back to the 12th Century, renovated in the 18th Century), surrounded by wheat fields and vineyards, which is located mid-way between Montpellier and Nîmes.

Insurance
French health care does not cover visitors to France. Please ensure that you have a suitable insurance coverage for the event of illness or accident. The organizing committee will not accept liability for personal injuries sustained by, or for loss or damage to property belonging to, the participants.
General Information on Le Corum Convention Center

Venue
Le Corum Palais des Congrès, Esplanade Charles de Gaulle, Montpellier City Centre

Registration
The Registration Desk is located in the main lounge at the first floor and will be open to delegates from 7:30 am on Tuesday 26 August 2014 and will remain open throughout the remainder of the conference until 16:00 on Friday 29 August 2014.

The telephone number for calling the Registration Desk is: 04 67 61 66 42

Cloakroom
This will be open to delegates throughout the symposium.

Exhibition
The exhibition area will be located in the Joffre Room and will be open to delegates from 7:30 am on Tuesday 26 August 2014 and will remain open throughout the remainder of the conference until 16:00 on Friday 29 August 2014. This room will not be accessible after 18:30 everyday.

Delegates are encouraged to take time during the morning and afternoon coffee breaks to visit the exhibition stands in the Exhibition Joffre Room, which is the same location as Posters and catering areas.

Car Park
Le Corum Palais des Congrès has underground car parks. Rates apply. Weekly special rates for delegates apply for registered participants. Information to be obtained at the Registration Desk in the Joffre Space at the first floor.

Lost Property
Please report any lost property to Le Corum Palais des Congrès Registration Desk in the main lounge at the first floor.

Messages
A message board is located adjacent to the Registration Desk in Joffre Space. Messages may be left at the Registration Desk or pinned to the board. No responsibility will be taken to deliver messages personally, so please check this board at regular intervals.

Mobile Phones
As a courtesy to all other delegates, please ensure that mobile phones are switched off during all sessions (both poster and oral) and social functions. Public telephones may be found in the foyers within Le Corum Palais des Congrès. Phone cards or credit cards are needed for this purpose.

Smoking
Le Corum Palais des Congrès is a designated non-smoking venue.

Internet Access
A Cyber-Café equipped with a few computers will be available at the Eastern tip of the exhibition area in Joffre Room. Internet access will be accessible free of charge during the whole conference from 8:30am until 18:30.

As a courtesy to all other delegates, you are encouraged to spend minimal time to read/write your emails in order to enable quick access to everyone. The Cyber-Café is also equipped with WiFi wireless access to internet.

Speaker Support Centre
The Speaker Support Centre is located in the Joffre 4 Room at the first floor. There are facilities to upload and review your presentations on both PC and MacIntosh computers. Technical assistance is provided in this room.

All presentations will be projected from this room via Le Corum Palais des Congrès venue network.

Tuesday 26 August 2014 07:30-18:30
Wednesday 27 August 2014 08:00-18:00
Thursday 28 August 2014 08:00-18:00
Friday 29 August 2014 08:00-15:30

Presentations should be uploaded onto the conference system as early as possible, and at least the day before.

It will not be possible to upload them directly in the conference lecture room (Einstein Auditorium).

Special Considerations
Dietary: any special dietary requirements indicated on your registration form have been forwarded to Le Corum Palais des Congrès. However, please make your requirements known to waiting staff at each social function.

Taxis in Montpellier
Taxi Tram - Tel: 04 67 58 10 10
Allo Taxi 34 - Tel: 04 67 81 42 74
Taxi Bleu - Tel: 04 67 03 20 00
Taxi Radio du Midi - Tel: 04 67 10 00 00

Doctor
Montpellier Emergency Hospital
Hôpital Lapeyronie
Avenue Charles Flahaut
Tel: 04 67 33 81 67 or 04 67 33 81 68

Alternatively, please contact Le Corum Palais des Congrès Desk in the main lounge at the first floor, for any assistance. Tel: 04 67 61 66 42
Map of Le Corum Convention Center
Scientific Sessions and Keynote Speakers

- **Session 1** – Phosphorus forms, availability and cycling in soils
  - Federica Tamburini (ETHZ, Zürich, Switzerland)

- **Session 2** – Phosphorus acquisition by plants and microorganisms
  - Maria Harrison (Cornell University, Ithaca, USA)
  - Thierry Desnos (CEA, Cadarache, France)

- **Session 3** – Phosphorus utilization and signalling in plants
  - Tzyy-Jen Chiou (Academia Sinica, Taipei, Taiwan)
  - Terry Rose (Southern Cross University, Lismore, Australia)

- **Session 4** – Ecosystem dynamics and environmental impact of phosphorus
  - Val H. Smith (University of Kansas, Lawrence, USA)

  **IMBALANCE-P Lecture**
  - Josep Peñuelas (CREAF-CSIC-UAB, Barcelona, Spain)

- **Session 5** – Sustainable phosphorus use in agroecosystems
  - Generose Nziguheba (IITA, Nairobi, Kenya)
  - Thomas Nesme (Bordeaux Sciences Agro, Bordeaux, France)
Practical information for authors of oral or poster presentations

Oral presentations

All talks are presented in plenary in the Einstein Auditorium, at the ground floor (Level 0). Each presenting author needs to upload her/his oral presentation as early as possible and at least on the day before at the Speaker Support Centre located in the Joffre 4 Room at the first floor. It will not be possible to upload them directly in the conference lecture room (Einstein Auditorium).

Poster presentations

Posters are displayed in the Joffre Space, situated at the first floor (Level 1). Each presenting author needs to mount her/his poster in the morning and to remove it in the evening, except for those poster sessions scheduled on two consecutive days.

Catering information

Coffee breaks

Tea and coffee breaks will be served in the Joffre Space.

Lunches are not provided, but the programme leaves enough time for delegates to look for restaurants or take-away food, as there are plenty of opportunities at short walking distance from the Convention Center.
## Session Schedule

**Tuesday 26th August**

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>07h30</td>
<td>Registration</td>
</tr>
<tr>
<td>09:00-09:20</td>
<td><strong>Opening session</strong>&lt;br&gt;Chair: P. Hinsinger &amp; MJ. McLaughlin</td>
</tr>
<tr>
<td>09:20-10:00</td>
<td><strong>Theme 1 - P forms, availability and cycling in Soils</strong>&lt;br&gt;Chair: MJ. McLaughlin &amp; P. Hinsinger&lt;br&gt;Keynote Federica Tamburini (ETH, Zürich, Switzerland) - Oxygen stable isotopes in phosphate: improving our understanding on the fate of phosphorus in the soil/plant system</td>
</tr>
<tr>
<td>10:00-11:00</td>
<td><strong>Theme 1 - P forms, availability and cycling in Soils (cont'd)</strong>&lt;br&gt;Chair: MJ. McLaughlin &amp; P. Hinsinger&lt;br&gt;Bruno Ringeval - Contribution of anthropogenic phosphorus to agricultural soil fertility and food production&lt;br&gt;Tim McLaren - The fate of fertilizer phosphorus in pastures&lt;br&gt;Phil Haygarth - Soil organic phosphorus in critical and non-critical hydrological source areas&lt;br&gt;Else Bünemann - A \textsuperscript{33}P tracing model for quantifying gross P transformation rates in soil</td>
</tr>
<tr>
<td>11:00-11:30</td>
<td>Coffee break</td>
</tr>
<tr>
<td>11:30-12:30</td>
<td><strong>Theme 1 - P forms, availability and cycling in Soils (cont'd)</strong>&lt;br&gt;Chair: EK. Bünemann &amp; AE. Richardson&lt;br&gt;Daniela Montalvo - Colloidal phosphorus and its contribution to plant nutrition&lt;br&gt;Camille Rivard - Distribution and speciation of phosphorus in soils using ( \mu )-X-ray fluorescence and X-ray absorption near edge structure&lt;br&gt;Christian Vogel - Deep Ultraviolet Raman Microspectroscopy - Novel technique for the characterization of phosphorus in soil&lt;br&gt;Klaus Jarosch - Organic phosphorus characterisation by ( ^{31} )P NMR spectroscopy and enzyme addition assays across a range of soil types</td>
</tr>
<tr>
<td>12:30-14:20</td>
<td>Lunch break</td>
</tr>
<tr>
<td>14:20-15:00</td>
<td><strong>Theme 2 - P acquisition by plants and microorganisms</strong>&lt;br&gt;Chair: TS. George &amp; Y. Poirier&lt;br&gt;Keynote Thierry Desnos (CEA, Cadarache, France) - Genetics and chemical genetics dissection of the Arabidopsis root growth response to low-phosphate</td>
</tr>
<tr>
<td>15:00-16:30</td>
<td>Posters&lt;br&gt;Themes 1 + 3 + 4 + 5</td>
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<tr>
<td>16:30-17:00</td>
<td>Coffee break</td>
</tr>
<tr>
<td>17:00-18:00</td>
<td><strong>Theme 1 - P forms, availability and cycling in Soils (cont'd)</strong>&lt;br&gt;Chair: AE. Richardson &amp; TS. George&lt;br&gt;Mart Ros - Earthworms can increase plant growth through elevated phosphorus availability in their casts&lt;br&gt;Sabine Ragot - Active and total microbial communities respond differently to P fertilization and pH in permanent grassland&lt;br&gt;Foyjunnessa - Using ( ^{33} )P to quantify phosphorus accumulation below-ground by canola and the contribution to following wheat&lt;br&gt;Sarah Placella - Acid phosphatase activity in the rhizosphere: how a cereal and a legume create local hotspots</td>
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<tr>
<td>18:30-20:30</td>
<td>Welcome cocktail</td>
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### Wednesday 27th August

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Chair(s)</th>
<th>Presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30-09:10</td>
<td><strong>Theme 2 - P acquisition by plants and microorganisms (cont'd)</strong></td>
<td>I. Jakobsen &amp; H. Liao</td>
<td>Keynote Maria Harrison (Cornell University, Ithaca, USA) - Arbuscule development and phosphate acquisition through arbuscular mycorrhizal symbiosis</td>
</tr>
</tbody>
</table>
| 09:10-10:30 | **Theme 2 - P acquisition by plants and microorganisms (cont'd)**                               | H. Liao & I. Jakobsen                        | Peter Ryan - Large rhizosheaths improve phosphorus acquisition and growth of wheat on P-deficient acid soils  
Matthias Wissuwa - Assessment of root trait variation under phosphorus deficiency through Genome-Wide Association Analysis  
Willmar Leiser - Breeding sorghum for P-limited soils in Western Africa: from field to gene level  
Sharif Ahmed - Imaging of plant roots response to the placement of phosphate fertiliser using 4D X-ray tomography  
Jakob Santner - Phosphorus efflux from maize roots is highly localised to the root tip |
| 10:30-11:00 | **Coffee break**                                                                                 |                                               |                                                                                                                                                                                                          |
| 11:00-12:00 | **Theme 2 - P acquisition by plants and microorganisms (cont'd)**                               | G. Neumann & TS. George                      | Simon Fii Svane - Variation in mycorrhiza effects on P acquisition efficiency among inbred maize lines  
Adeline Becquer - The phosphate transporter HcPT2, first candidate for phosphate efflux in ectomycorrhizal symbiosis  
Xiurong Wang - A purple acid phosphatase, GmPAP33, participates in phosphorous reutilization of arbuscular mycorrhizae in soybean  
Zhengrui Wang - Hormonal networks involved in phosphate deficiency-induced cluster root formation of Lupinus albus L. |
| 12:00-13:50 | **Lunch break**                                                                                  |                                               |                                                                                                                                                                                                          |
| 13:50-14:30 | **Theme 3 - P utilization and signaling in plants**                                               | Y. Poirier & L. Nussaume                     | Keynote Terry Rose (Southern Cross University, Lismore, Australia) - Enhancing internal phosphorus use efficiency in crops: concepts and approaches                                                                  |
| 14:30-16:00 | **Posters**                                                                                      |                                               | Themes 1 + 2 + 4                                                                                                                                                                                                |
| 16:00-16:30 | **Coffee break**                                                                                 |                                               |                                                                                                                                                                                                          |
| 16:30-17:30 | **Theme 2 - P acquisition by plants and microorganisms (cont'd)**                               | I. Jakobsen & C. Plassard                   | Ouakoltio Youssouf Abidine Traore - Influence of soil fertility management on microbial phosphorus and nitrogen limitation in a lixisol  
Marie Spohn - The distribution of acid and alkaline phosphatase activity in the rhizosphere  
Jianbo Shen - Coordination of root morphological and physiological adaptations to phosphorus deficiency for contrasting plant species  
Florian Fort - Root functional traits and their plasticity drive grasslands' Fabaceae capacities to face phosphorus shortage |
| 17:30-18:00 | **The IMBALANCE-P Lecture**                                                                      | P. Haygarth & AE. Richardson                | Plenary Lecture Josep Peñuelas (Global Ecology Unit CREAF-CSIC-UAB, Barcelona, Spain) - Effects of phosphorus limitations on Life, Earth system and Society                                                                   |
### Thursday 28th August

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Chair</th>
<th>Presenter / Details</th>
</tr>
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<tbody>
<tr>
<td>08:30-09:10</td>
<td><strong>Theme 3 - P utilization and signaling in plants (cont’d)</strong></td>
<td>M. Wissuwa &amp; L. Nussaume</td>
<td>Tzyy-Jen Chiou (Academia Sinica, Taipei, Taiwan) - Regulation of phosphate homeostasis: microRNA-mediated surveillance of phosphate transport</td>
</tr>
</tbody>
</table>
| 09:10-10:30 | **Theme 3 - P utilization and signaling in plants (cont’d)**                                    | L. Nussaume & M. Wissuwa | Yves Poirier - A rice cis-natural antisense RNA acts as a translational enhancer for its cognate mRNA and contributes to Pi homeostasis  
David Secco - Methylomes of plants starved for Pi reveals dynamic DNA methylation changes at Pi starvation responsive genes  
Katsuhiko Kondo - Multiple loci identified in a Genome-Wide Association Studies of internal phosphorus utilization efficiency in rice  
Dong Liu - Arabidopsis HPS10/ALS3 interacts with AtSTAR1 to serve as a signaling hub for responses to P deficiency and Al toxicity  
Vicente Rubio - The ESCRT-III-associated protein AtALIX mediates high affinity phosphate transporter trafficking in Arabidopsis |
| 10:30-11:00 | **Coffee break**                                                                                |                        |                                                                                      |
| 11:00-12:00 | **Theme 3 - P utilization and signaling in plants (cont’d)**                                    | J. Paz-Ares & Y. Poirier | Rainer Hoefgen - Systems biology of plant phosphate and sulphate metabolism  
Verena Pfahler - Effect of the phosphorus status on the isotopic composition of oxygen bound to phosphorus in Glycine max  
Marie-Christine Thibaud - Root cap cells play a key role in phosphate nutrition  
Ricarda Jost - Organ-specific phosphorus-allocation patterns and transcript profiles linked to P efficiency in wheat |
| 12:00-13:50 | **Lunch break**                                                                                 |                        |                                                                                      |
| 13:50-14:30 | **Theme 4 - Ecosystem dynamics and environmental impacts of P**                                  | J. Peñuelas & P. Haygarth | Val H. Smith (University of Kansas, Lawrence, USA) - Landscape exports of P and their effects on aquatic ecosystems |
| 14:30-16:00 | **Posters**                                                                                     |                        | Themes 2 + 3 + 5                                                                     |
| 16:00-16:30 | **Coffee break**                                                                                |                        |                                                                                      |
| 16:30-17:30 | **Theme 4 - Ecosystem dynamics and environmental impacts of P (cont’d)**                         | P. Haygarth & J. Peñuelas | Jordi Sardans - Phosphorus a pivotal element in plant-soil system stoichiometry: equilibrium and imbalances  
Claude Plassard - Do trophic relationships in soil enhance plant P nutrition: Phytate mineralization as a case study  
Stephan Hättenschwiler - Linking P and C cycling in the decomposer system of an Amazonian rainforest  
Stijn Baken - The bioavailability of colloidal P to freshwater algae |
<p>| 18:30-24:00 | <strong>Gala Dinner at Chateau de Pouget</strong>                                                            |                        |                                                                                      |</p>
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<th>Time</th>
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<tr>
<td>08:30-09:10</td>
<td><strong>Theme 5 - Sustainable P use in agroecosystems</strong></td>
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<td>Chair: M. Wissuwa &amp; H. Liao</td>
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<td><strong>Keynote</strong> Generose Nziguheba (Internatl Institute of Tropical Agriculture, Nairobi, Kenya) - Overcoming phosphorus deficiency in agricultural systems of sub-Saharan Africa: recent advances and limitations</td>
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<td>09:10-10:30</td>
<td><strong>Theme 5 - Sustainable P use in agroecosystems (cont’d)</strong></td>
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<td>Chair: H. Liao &amp; M. Wissuwa</td>
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<td>James Heppell - Modelling the optimal phosphate fertiliser and soil management strategy for crops</td>
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<td>Elke Vandamme - Reducing grain P concentration in rice through genetic improvement: an option for sustainable P management?</td>
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<td>Lin Ma - Trends of phosphorus use efficiency in the food chain of China</td>
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<td>Elodie Betencourt - Is P acquisition facilitated by intercropping of durum wheat and grain legumes in field conditions?</td>
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<td>Marney Isaac - Soil phosphorus and N₂ fixation of leguminous trees: consequences for rates and transfer in agroforestry systems</td>
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<td>10:30-11:00</td>
<td><strong>Coffee break</strong></td>
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<td>11:00-12:00</td>
<td><strong>Theme 5 - Sustainable P use in agroecosystems (cont’d)</strong></td>
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<td>Chair: MJ. McLaughlin &amp; P. Haygarth</td>
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<td>Erik Smolders - Future trends in soil cadmium concentration under current cadmium fluxes to European agricultural soils</td>
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<td>Nikolinka Shakhramanayan - The potential of agricultural sector waste streams for phosphorus recovery on global scale</td>
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<td>Simone Nanzer - Wet-chemically recovered sewage sludge ash P: high plant availability despite low water solubility</td>
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<td>Peter Leinweber - Bone char as renewable P-fertilizer with cadmium-immobilization by-effect</td>
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<td>12:00-13:50</td>
<td><strong>Lunch break</strong></td>
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<td>13:50-14:30</td>
<td><strong>Theme 5 - Sustainable P use in agroecosystems (cont’d)</strong></td>
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<td>Chair: FS. Zhang &amp; AE. Richardson</td>
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<td>Keynote Thomas Nesme (Univ. Bordeaux, Gradignan, France / McGill University, Montreal, Canada) - Sustainable phosphorus use in agroecosystems: a story of global imbalance and resource recycling</td>
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<td>14:30-15:30</td>
<td><strong>Theme 5 - Sustainable P use in agroecosystems (cont’d)</strong></td>
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<td>Chair: FS. Zhang &amp; AE. Richardson</td>
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<td>Timothy George - Designer riparian buffers ' using plant phylogeny to close the arable agricultural phosphorus (P) cycle</td>
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<td>Luis Prochnow - How to optimize the use of phosphate resources by producing alternative totally acidulated phosphate fertilizers</td>
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<td>Didier Lesueur - Population of native PSM increased by Minjingu PR application and positive impact on crop yields in a Kenyan Ferralsol</td>
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<td>Dorcus Gemenet - Seedling and adult plant phosphorus uptake and utilization in West and Central African pearl millet inbred lines</td>
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<td>15:30-16:00</td>
<td><strong>Closing session</strong></td>
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<td>Chair: P. Hinsinger &amp; FS. Zhang</td>
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*Next Phosphorus in Soils and Plants Symposium (PSP6 in 2018) to be announced...*
Theme 1 - P forms, availability and cycling in soils

Tuesday, August 26, 2014
09:20-10:00

Keynote presentation

K101

Oxygen stable isotopes in phosphate: improving our understanding on the fate of phosphorus in the soil/plant system

Federica Tamburini 1, Verena Pfahler 1, Christian von Sperber 1, Stefano M. Bernasconi 2, Emmanuel Frossard 1

1. Institute of Agricultural Sciences, ETH Zurich, Switzerland
2. Geological Institute, ETH Zurich, Switzerland
Theme 1 - P forms, availability and cycling in soils

Tuesday, August 26, 2014
10:00-11:00

Oral presentations

O101
Contribution of anthropogenic phosphorus to agricultural soil fertility and food production
Bruno Ringeval 1,2, Benjamin Nowak 2,1, Thomas Nesme 3,2,1, Magalie Delmas 4, Sylvain Pellerin 1,2
1. INRA, UMR 1391 ISPA, F-33140 Villenave d’Ornon, France
2. Bordeaux Sciences Agro, UMR 1391 ISPA, F-33170 Gradignan, France
3. McGill School of Environment, McGill University, Montreal, Quebec, Canada
4. Montpellier SupAgro, UMR LISAH, F-34060 Montpellier, France

O102
The fate of fertilizer phosphorus in pastures
Tim McLaren 1, Ron Smerik 1, Richard Simpson 2, Mike McLaughlin 1,3, Therese McBeath 3, Chris Guppy 4, Alan Richardson 2
1. School of Agriculture, Food and Wine, Waite Research Institute, The University of Adelaide, Glen Osmond 5064 SA, Australia
2. CSIRO Sustainable Agriculture Flagship/CSIRO Plant Industry, GPO Box 1600, Canberra 2601 ACT, Australia
3. CSIRO Sustainable Agriculture Flagship, Glen Osmond 5064 SA, Australia
4. School of Environmental and Rural Science, University of New England, Armidale 2351 NSW, Australia

O103
Soil organic phosphorus in critical and non-critical hydrological source areas
Ying Wang, Ben W.J. Surridge, Philip M. Haygarth
Lancaster Environment Centre, Lancaster University, LA1 4YQ, UK

O104
A 31P tracing model for quantifying gross P transformation rates in soil
Else K. Bünemann 1, Christoph Müller 2,3
1. Institute of Agricultural Sciences, ETH Zurich, Eschikon 33, CH-8315 Lindau, Switzerland
2. School of Biology and Environmental Science, Earth Institute, University College Dublin, Dublin, Ireland
3. Department of Plant Ecology (IFZ), Justus-Liebig University Giessen, Germany

Tuesday, August 26, 2014
11:30-12:30

Oral presentations (cont’d)

O105
Colloidal phosphorus and its contribution to plant nutrition
Daniela Montalvo 1, Fien Degryse 1, Mike J. McLaughlin 1,2
1. Soil Science, Waite Research Institute, The University of Adelaide, PMB 1, Glen Osmond, SA 5064, Australia
2. CSIRO Land and Water, Sustainable Agriculture Flagship, Waite Precinct, PMB 2, Glen Osmond, SA 5064, Australia

O106
Distribution and speciation of phosphorus in soils using µ-X-ray fluorescence and X-ray absorption near edge structure
Camille Rivard 1, Bruno Lanson 2, Marine Cotte 1,3
1. European Synchrotron Radiation Facility, 38000, Grenoble, France
2. Institut des Sciences de la Terre, Univ. Grenoble Alpes – CNRS, 38041, Grenoble, France
3. Laboratoire d’archéologie moléculaire et structurale, UMR 8220, CNRS 75005, Paris, France

O107
Deep Ultraviolet Raman Microspectroscopy - Novel technique for the characterization of phosphorus in soil
Christian Vogel 1, Manfred Ramsteiner 2, Christian Adam 1
1. BAM Federal Institute for Materials Research and Testing, Division 4.4 Thermochemical Residues Treatment and Resource Recovery, Unter den Eichen 87, D-12205 Berlin, Germany
2. Paul-Drude-Institut für Festkörperelektronik, Hausvogteiplatz 5-7, D-10117 Berlin, Germany

O108
Organic phosphorus characterisation by 31P NMR spectroscopy and enzyme addition assays across a range of soil types
Klaus Jarosch 1, Ashlea L. Doolete 2, Ronald J. Smernik 2, Federica Tamburini 1, Emmanuel Frossard 1, Else K. Bünemann 1
1. ETH Zurich, Group of Plant Nutrition, Eschikon 33, 8315 Lindau, Switzerland
2. The University of Adelaide, School of Agriculture, Food and Wine and Waite Research Institute, 5064 Urrbrae, Australia
Tuesday, August 26, 2014
17:00-18:00
Oral presentations (cont’d)

O109  Earthworms can increase plant growth through elevated phosphorus availability in their casts
Mart B.H. Ros, Jan Willem van Groenigen, Hannah M.J. Vos, Anupol Charreesri, Oene Oenema, Gerwin F. Koopmans
Department of Soil Quality, Wageningen University, PO Box 47, 6700 AA, Wageningen, The Netherlands

O110  Active and total microbial communities respond differently to P fertilization and pH in permanent grassland
Sabine A. Ragot 1, Michael A. Kertesz 2, Emmanuel Frossard 1, Else K. Bünemann 1
1. Swiss Federal Institute of Technology Zurich (ETH), Institute of Agricultural Sciences, 8315 Lindau, Switzerland
2. The University of Sydney, Faculty of Agriculture and Environment, 2006, NWS, Australia

O111  Using 33P to quantify phosphorus accumulation below-ground by canola and the contribution to following wheat
Foyjunnessa 1, Ann McNeill 2, Ashlea Doolette 3, Sean Mason 3, Mike McLaughlin 4
1. The University of Adelaide and Waite Research Institute, 122 Davies Bld, Paratoo Rd, Urrbrae, South Australia 5064
2. The University of Adelaide and Waite Research Institute, 112 Davies Bld, Paratoo Rd, Urrbrae, South Australia 5064
3. The University of Adelaide and Waite Research Institute, 111 Davies Bld, Paratoo Rd, South Australia 5064
4. The University of Adelaide and Waite Research Institute and CSIRO Sustainable Agriculture Flagship, CSIRO Land and Water, PMB 2, Urrbrae, South Australia 5064

O112  Acid phosphatase activity in the rhizosphere: how a cereal and a legume create local hotspots
Sarah Placella 1, Josiane Abadie 1, Gabrielle Daudin 1, Esther Guillot 2, Camille Cros 1, Tiphaine Chevallier 2, Agnès Martin 3, Agnès Robin 3, Claire Marsden 4, Naoise Nunan 5, Jean Trap 2, Philippe Hinsinger 1
1. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
2. IRD, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
3. CIRAD, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
4. SupAgro, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
5. CNRS, UMR BioEMCo, Campus AgroParisTech, 78850 Thiverval-Grignon, France
Theme 1 - P forms, availability and cycling in soils

Tuesday, August 26, 2014
15:00-16:30 and
Wednesday, August 27, 2014
14:30-16:00

Posters

P101

Fine mapping of soil phosphatase activity as affected by endogeic earthworms, in presence or absence of plants

Esther Guillot 1,2, Camille Cros 1, Sarah Placella 1, Josiane Abadie 1, Gabrielle Daudin 1, Claire Marsden 3, Agnès Robin 4, Jean Trap 2, Philippe Hinsinger 1
1. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
2. IRD, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
3. SupAgro, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
4. CNRS, IEES, UMR 7618, 78850 Thiverval-Grignon, France

P102

Fine mapping of soil phosphatase activity in the rhizosphere of intercropped chickpea and durum wheat

Camille Cros 1, Esther Guillot 1,2, Sarah Placella 1, Josiane Abadie 1, Gabrielle Daudin 1, Claire Marsden 3, Agnès Robin 4, Jean Trap 2, Philippe Hinsinger 1
1. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
2. IRD, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
3. SupAgro, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
4. CNRS, IEES, UMR 7618, 78850 Thiverval-Grignon, France

P103

Using DGT (Diffusive Gradient in Thin films) as an indicator of phosphorus (P) availability in the Nordic countries

Simon Mundus, Andreas Carstensen, Søren Husted
Department for Plant and Environmental Sciences, University of Copenhagen, 1871 Frederiksberg C, Denmark

P104

The Hedley phosphorus fractions transformations of a soil incubated with different animal manures

Marta Roboredo, Jessica Graça, João Coutinho
Centro de Química Vila Real, Universidade de Trás-os-Montes e Alto Douro, 5001-801 Vila Real, Portugal

P105

Phosphate recovery from iron phosphate rich sludge

Philipp Wilfert 1,2, Leon Korving 2, Geert-Jan Witkamp 1, Mark C.M. van Loosdrecht 1
1. Delft University of Technology, Department of Biotechnology, 2628 BC, Delft, The Netherlands
2. Wetsus- Centre of excellence sustainable water technology, 8934 CJ, Leeuwarden, The Netherlands

P106

Chemical nature of the residual phosphorus in Andisols

Gabriela Velásquez 1, Phuong-Thi Ngo 2, Cornelia Rumpel 2, Yonathan Redel 1, Marcela Calabi-Floody 1, Benjamin L. Turner 3, Leo Condron 4, María de la Luz Mora 1
1. Center of Plant, Soil Interaction and Natural Resources Biotechnology, Scientific and Biotechnological Bioresource Nucleus (BIOREN-UFRO), Avenida Francisco Salazar 01145, Universidad de La Frontera, Temuco, Chile
2. CNRS, IEES, UMR 7618, 78850, Thiverval-Grignon, France
3. Smithsonian Tropical Research Institute, Apartado 0843-03092, Balboa, Ancon, Republic of Panama
4. Faculty of Agriculture and Life Sciences, Lincoln University, Christchurch 7647, New Zealand

P107

Chemical nature of phosphorus in soils dominated by bracken and bluebell plants

Victor Ebuele, Vera Thoss and Anna Santoro
School of Chemistry, Bangor University, Bangor, LL 57 UW, Wales

P108

Effect of grassland management on amount and quality of organic P forms in a Cambisol

Phuong Thi Ngo 1, Cornelia Rumpel 1, Maria de la Luz Mora 2, Abad Chabbi 3
1. CNRS, IEES, UMR 7618, 78850 Thiverval-Grignon, France
2. Universidad de la Frontera, BIOREN-UFR, T4780000 Temuco, Chile
3. INRA, UR P3F, 86600 Lusignan, France
P109
Soil properties affect the relationship between Olsen P and solution P

Inmaculada Sánchez-Alcalá 1, María del C. del Campillo 1, Vidal Barrón 1, Antonio Delgado 2, José Torrent 1
1. Departamento de Agronomía, Universidad de Córdoba, Edificio C4, Campus de Rabanales, 14071 Córdoba, Spain
2. Departamento Ciencias Agroforestales, Universidad de Sevilla, EUIITA Seville, Spain

P110
Long term effects of different soil management systems and winter cover crops on phosphorus forms in aggregates

Carlos Alberto Casali 1, João Kaminski 2, Danilo Rheinheimer dos Santos 2, Ademir Caregari 3, Tales Tiecher 2, Rogério Piccin 2, Roque Junior S. Bellinasso 2, Luís Felipe R. Rossato 2, Fabio Henrique Gebert 2
1. Universidade Tecnológica Federal do Paraná - Campus Dois Vizinhos (UTFPR-DV), CEP: 85660-000, Dois Vizinhos-PR, Brazil
2. Universidade Federal de Santa Maria (UFSM), CEP: 97105-900, Santa Maria-RS, Brazil
3. Instituto Agronômico do Paraná (IAPAR), experimental station of Londrina, CEP 86047-902, Londrina-PR, Brazil

P111
Laboratory methods for estimating plant available P in manure and sludges

Tapio Salo 1, Helena Kahiluoto 2, Miia Kuisma 2, Janne Heikkinen 2
1. MTT Agrifood Research Finland, Plant production, FI-31600 Jokioinen, Finland
2. MTT Agrifood Research Finland, Plant production, Lönrotinkatu 5, FI-50100 Mikkeli, Finland

P112
Soil phosphorus forms in natural grassland affected by additions of soluble and natural phosphate

Leandro Bittencourt de Oliveira 1, Tales Tiecher 2, Fernando Luiz Ferreira de Quadros 3, José Pedro Pereira Trindade 4, Danilo Rheinheimer dos Santos 3
1. Natural Grasslands Ecology Research Group - Department of Animal Science - Universidade Federal de Santa Maria – UFSM, Brazil
2. Department of Soils, Universidade Federal de Santa Maria – UFSM, Brazil
3. Department of Animal Science, Universidade Federal de Santa Maria – UFSM, Brazil
4. EMBRAPA Pecuária Sul, Brazil

P113
Changes in soil P pools and phosphate enzyme activity following long term pig slurry application under no-tillage system

Tales Tiecher 1, Tadeu Luis Tiecher 1, Fábio Joel Kochem Mallmann 1, Mohsin Zafar 1, Carlos Alberto Ceretta 1, Cledimar Rogério Lourenzi 1, Gustavo Brunetto 1, Eduardo Girotto 2, Danilo Rheinheimer dos Santos 1
1. Department of Soil Science, Universidade Federal de Santa Maria. CEP: 97105-900, Santa Maria, Rio Grande do Sul State, Brazil
2. Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul, Campus Ibirubá, CEP 97105-120, Santa Maria, Rio Grande do Sul State, Brazil

P114
Impact of fertilizer integration with farmyard manure on crop yield and soil P pools in a long-term trial in Germany

Andres Felipe Rangel Becerra, Melkamu Jate, Joachim Lammel
Research Centre Hanninghof, Yara International, Hanninghof 35, 48249 Duelmen, Germany

P115
Prediction of stock and fate of phosphorus forms according to soil classification

Malorie Renneson 1, Joseph Dufey 2, Sophie Barbieux 1, Florian Cobert 1, Gilles Colinet 1
1. University of Liege – Gembloux Agro-Bio Tech, Soil & Water Systems Unit, 5030 Gembloux, Belgium
2. University of Louvain-la-Neuve, Earth and Life Institute, 1348 Louvain-la-Neuve, Belgium

P116
Predicting bioavailability of phosphorus in biochar: an assessment of analysis methods

Jessica Shepherd 1,2, Wolfram Buss 1,2, Kate Heal 2, Saran Sohi 1
1. School of GeoSciences, University of Edinburgh, the King’s Buildings, EH9 3JN, Edinburgh, Scotland
2. UK Biochar Research Centre, University of Edinburgh, the King’s Buildings, EH9 3JN, Edinburgh, Scotland
P117
Phosphorus availability in an acidic Belgian Luvisol amended with biochar

David Houben 1, Jean-Thomas Cornélis 2, Michel-Pierre Faucon 1, Philippe Sonnet 2
1. Institut Polytechnique LaSalle Beauvais, HydriSE, 60026, Beauvais, France
2. Université catholique de Louvain, Earth and Life Institute, 1348, Louvain-la-Neuve, Belgium

P118
Soil and plant phosphorus status and crop yields after 40 years of mineral P fertilization

Sinaj Sokrat 1, Cadot Selma 1, Belanger Gilles 2, Ziad Noura 2, Moré Christian 3
1. Agroscope, Institute of crop sciences, Route de Duillier 50, 1260 Nyon, Switzerland
2. Agriculture and Agri-Food Canada (AAFC), Soils and Crops Research and Development Centre, Quebec, Canada
3. Institut National de la Recherche Agronomique (INRA), UMR 1391 ISPA, CS 20032, 33882 Villeneuve-d’Ornon cedex, France

P119
Phosphorus recyclable in agrifood residues

Miia Kuisma 1, Helena Kahiliuoto 1, Elise Ketoja 2, Tapio Salo 3, Janne Heikkinen 1,4
1. MTT Agrifood Research Finland, Plant Production Research, Lönrotinkatu 5, FI-50100 Mikkeli, Finland
2. MTT Agrifood Research Finland, Biotechnology and Food Research, FI-31600 Jokioinen, Finland
3. MTT Agrifood Research Finland, Plant Production Research, FI-31600 Jokioinen, Finland

P120
The phytate enigma: just how stable is it?

Tim McLaren, Ron Smernik, Ashlea Doolette
School of Agriculture, Food and Wine, Waite Research Institute, The University of Adelaide, Glen Osmond 5064 SA, Australia

P121
Improved detection of organic P forms in pasture subsoils

Tim McLaren 1, Ron Smernik 1, Richard Simpson 2, Mike McLaughlin 1,3, Therese McBeth 3, Chris Guppy 4, Alan Richardson 2
1. School of Agriculture, Food and Wine, Waite Research Institute, The University of Adelaide, Glen Osmond 5064 SA, Australia
2. CSIRO Sustainable Agriculture Flagship/CSIRO Plant Industry, GPO Box 1600, Canberra 2601 ACT, Australia
3. CSIRO Sustainable Agriculture Flagship, Glen Osmond 5064 SA, Australia
4. School of Environmental and Rural Science, University of New England, Armidale 2351 NSW, Australia

P122
Phosphate-coated nanoparticles as mobile P carriers in soil: fate study

Jessica Bollyn 1, Geert Cornelis 2, Erik Smolders 1
1. KU Leuven, Department of Earth and Environmental Sciences, Kasteelpark Arenberg 20 bus 2459, 3001 Leuven, Belgium
2. University of Gothenburg, Department of Chemistry and Molecular Biology, Kemigården 4, 412 96 Göteborg, Sweden

P123
Phosphorus cycling in forest ecosystems as revealed by the isotopic composition of oxygen in phosphate

Chiara Pistocchi, Federica Tamburini, Else Bünemann, Emmanuel Frossard
ETH Zürich Group of Plant Nutrition, Eschikon Experimental Station Eschikon 33 - 8315 Lindau, Suisse

P124
Total and organic phosphorus as a basis of the regression model for mineral phosphorus prediction

Brigita Popović, Zdenko Lončarić, Krunoslav Karalić, Meri Engler, Gordana Bukvić
Faculty of agriculture in Osijek, Kralja Petra Svačića 1d, HR-31000 Osijek, Croatia
P125
Phosphorus fraction characteristics after P fertilization under aerated and flooded Ferralsols and Argosols
G.N. Zhang 1,2, Z.H. Chen 1, L.J. Chen 1, Z.J. Wu 3
1. State Key Laboratory of Forest and Soil Ecology, Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110164, China
2. Shandong Provincial Key Laboratory of Water and Soil Conservation & Environmental Protection, Linyi University, Linyi 276000, China
3. Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110016, China

P126
Effects of soil Mg content on the adsorption isotherm constants and P solubility in agricultural soils of Wallonia
Florian Cobert, Sophie Barbieux, Malorie Renneson, Gilles Colinet
Université de Liège, Gembloux Agro-Bio Tech., Unité Systèmes Sol-Eau, 2 Passage des déportés, B-5030 Gembloux, Belgium

P127
Pasture degradation affects forms and distribution of phosphorus in aggregates of tropical soils
Astrid Oberson 1, Maike Nesper 1, Else K. Bünemann 1, Steven J. Fonte 2, Idupulapati M. Rao 3, Jaime E. Velásquez 3, Bertha Ramirez 3, Django Hegglin 1, Emmanuel Frossard 1
1. ETH Zurich, Institute of Agricultural Sciences, Lindau, Switzerland
2. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia
3. Universidad de la Amazonia, Florencia, Colombia

P128
The effect of Acacias introduction in Eucalyptus plantations on phosphorus availability in Congo and Brazil
Louis Mareschal 1,2, Lydie-Stella Koutika 1, Edith Le Cadre 3, Jean-Pierre Bouillet 2,4, Daniel Epron 1,5,6, Jean-Paul Laclau 2
1. Centre de Recherche sur la Durabilité et la Productivité des Plantations Industrielles, BP 1291, Pointe-Noire, République du Congo
2. CIRAD, UMR 111, Ecologie Fonctionnelle & Biogéochimie des Sols & Agro-écosystèmes, 34060 Montpellier, France
3. Montpellier SupAgro, UMR Eco&Sols, 34060 Montpellier, France
4. Universidade de Sao Paulo, Brazil
5. Université de Lorraine, UMR 1137, Ecologie et Ecophysiologie Forestières, 54500 Vandoeuvre-les-Nancy, France
6. INRA, Centre de Nancy, 54200 Champenoux, France

P129
Organically bound and microbial phosphorus in the topsoil of 20 European beech (Fagus sylvatica L.) stands in Germany
Ulrike Talkner
Northwest German Forest Research Station, Department of Environmental Control, Graetzelsstr. 2, 37079 Goettingen, Germany

P130
High plant availability of P and low availability of Cd in ashes from combustion of straw and wood
Peter Sørensen, Gitte H. Rubæk
Aarhus University, Department of Agroecology, P.O. Box 50, 8830 Tjele, Denmark

P131
Can deficit irrigation techniques be used to enhance phosphorus and water use efficiency and benefit crop yields?
Hannah R. Wright 1,2, Ian C. Dodd 2, Martin S. A. Blackwell 1
1. Rothamsted Research, North Wyke, Okehampton, EX20 2SB, Devon, UK
2. Lancaster Environment Centre, Lancaster University, LA1 4YQ, Lancaster, UK

P132
Phosphorus for cereal production; comparing the uptake efficiency of different fertiliser application methods
David P. Wall, Mark Plunkett
Teagasc, Crops Environment and Land Use Programme, Johnstown Castle, Wexford, Ireland

P133
Phosphorus fractions in a clay loam soil under natural and long-term (44 Years) managed agricultural ecosystems
T.Q. Zhang, C.S. Tan, Q.C. Hu, and C.F. Drury
Greenhouse and Processing Crops Research Center, Agriculture and Agri-Food Canada, 2585 County Rd. 20 E. Harrow, ON, Canada, N0R 1G0
P134

Interactions between magnesium and phosphorus in silty soils of Wallonia and their uptake by ryegrass

Sophie Barbieux, Florian Cobert, Malorie Renneson, Gilles Colinet

University of Liege – Gembloux Agro-Bio Tech – Soil-Water System Unit, 5030 Gembloux, Belgium

P135

Evaluation of the P availability of Gafsa phosphate rock in several soils using $^{32}$P isotopic dilution method

Bendaly Mouna 1, Mollier Alain 2,3, Morel Christian 2,3, Ben Mimoun Mehdi 1

1. National Agronomic Institute of Tunisia (INAT), Laboratory of crop production, 43 Av. Charles Nicole 1082, Tunis, Tunisia
2. INRA, UMR1391 ISPA, CS20032, 71 Av E Bourlaux, 33883 Villenave d’Ornon, France
3. Bordeaux Sciences Agro, UMR1391 ISPA, CS20032, 71 Av E Bourlaux, 33883 Villenave d’Ornon, France

P136

Correlation of phosphorus leaf concentration with yield components and concentration of nutrients in leaves of pistachio

Vahid Mozafari, Akbar Solestanzadeh

Departement of Soil Science, Faculty of Agriculture, Vali-E-Asr University of Rafsanjan, Rafsanjan, Iran

P137

Abiotic processes controlling the effects of citrate on phosphorus availability: study of a fertilized ferralsol

Manitrinarina Henintsoa 1,2, Thierry Becquer 3, Michaël Clairrotte 2, Jean Larvy Delariviére 3, Andry Andriamananaraja 1, Lila Rabeharisoa 1, Frédéric Gérard 2

1. Laboratoire des Radio-isotopes (LRI), University of Antananarivo, PO Box 3383, Route d’Andraisoar, Antananarivo, Madagascar
2. INRA, UMR Eco&Sols, 2 Place Pierre Viala, 34060 Montpellier, France
3. IRD, UMR Eco&Sols, 2 Place Pierre Viala, 34060 Montpellier, France

P138

Factors controlling phytases produced by the fungi Aspergillus niger and Debaryomyces castellii in rhizosphere soils

Alix Vidal 1,2, Claude Plassard 2, Michael Clairrotte 2, Philippe Deleporte 3, Josiane Abbadie 3, Jean-Louis Aznar 4, Edith Le Cadre 4

1. UMPC, UMR Metis (ex Bioemco Gome), 75252 Paris, France
2. INRA, UMR Eco&Sols, 34060 Montpellier, France
3. CIRAD, UMR Eco&Sols, 34060 Montpellier, France
4. Montpellier SupAgro, UMR Eco&Sols, 34060 Montpellier, France

P139

Comparative uptake of phosphorus from organic and inorganic forms in Australian Mediterranean soils

Mike T F Wong 1, Kathy Wittwer 1, Richard W Bell 2, Mike McLaughlin 3, Tim McLaren 4, Caroline Johnston 3

1. CSIRO Land and Water, Underwood Avenue, Floreat, 6014, Australia
2. School of Veterinary and Life Sciences, Murdoch University, South Street, Murdoch, 6150, Australia
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P140

Effects of P on Vigna unguiculata cv. 305 and Stylosanthes hamata cv. Verano in rubber plantation

Kiriya Sungthongwises 1, Roland Poss 2, Jean Jacques Drevon 3

1. Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand
2. IRD, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
3. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France

P141

Soil and plant mechanisms affecting transformations of phosphorus from organic and inorganic amendments

Yuki Audette 1, Leslie J. Evans 1, Ivan P. O’Halloran 2, Ralph C. Martin 3, R. Paul Voroney 1

1. School of Environmental Sciences, University of Guelph, Guelph N1G2W1, Canada
2. School of Environmental Sciences, University of Guelph Ridgetown, N0P2C0, Canada
3. Department of Plant Agriculture, University of Guelph, Guelph, N1G2W1, Canada
P142

Clay minerals and phosphate sorption in soils
Frédéric Gérard 1, Marek Duputel 2, Laurent Caner 3, Chanapa Kongmark 4
1. INRA, UMR Eco&Sols, 34060 Montpellier, France
2. ITK, CAP Alpha, 34830 Clapiers, France
3. Univ. Poitiers, UMR IC2MP-HydRASA, 86073 Poitiers, France
4. Synchrotron Light Research Institute, 30000, Nakhon Ratchasima, Thailand

P143

Spatial variability of phosphorus concentration in leaves of pistachio trees in Rafsanjan area of Iran
V. Mozafari, T. Zeighami
Dept. of Soil Sci., College of Agric., Vali-e-Asr Univ. of Rafsanjan, Rafsanjan, Iran

P144

Phosphorus status in agricultural soils of Fribourg canton, Switzerland
Sokrat Sinaj 1, Aurélien Roger 1, Zamir Libohova 2, Nicolas Rossier 3, Emmanuel Frossard 4
1. Agroscope, Institute of crop sciences, Route de Duillier 50, 1260 Nyon, Switzerland
2. USDA-NRCS National Soil Survey Center, 100 Centennial Mall North, Federal Building, Room 152, Lincoln, NE USA 68508
3. Agriculture Institute of the Fribourg canton, route de Grangeneuve 31, 1725 Posieux, Switzerland
4. Institute of Agricultural Sciences, ETH Zurich, 8315 Lindau, Switzerland

P145

Compost from anaerobic digestate: available phosphorus in soil and ryegrass utilization efficiency
Marco Grigatti, Luciano Cavani, Claudio Ciavatta, Claudio Marzadori
Alma Mater Studiorum University of Bologna, Department of Agricultural Sciences Viale Fanin 40, 40127 Bologna, Italy

P146

Phosphorus adsorption and desorption behavior on different biochars
Muqiu Zhao 1,2, Xin Chen 1, Yi Shi 1, Yajie Zhao 1,3
1. State Key Laboratory of Forest and Soil Ecology, Institute of Applied Ecology, Chinese Academy of Sciences, 110164, Shenyang, China
2. Qiongzhou University, 572022, Sanya, China
3. Graduate School of the Chinese Academy of Sciences, 100049, Beijing, China

P147

Effect of N derived from mineral fertilizer or leguminous species on P forms of grassland soil
Alexandra Creme 1,2, Cornelia Rumpel 2, Abad Chabbi 1,2
1. INRA, UR P3F, 86600, Lusignan, France
2. UPMC, CNRS, INRA, IEES, UMR 7618, 78850, Thiverval-Grignon, France

P148

N-fixing tree species introduced in Eucalyptus forest modify soil organic P and low molecular weight organic acid pools
Kittima Waithaisong 1, Agnès Robin 2, Agnès Martin 2, Michael Clairotte 1, Manon Villeneuve 3, Philippe Deleporte 2, Claude Plassard 1
1. INRA, UMR Eco&Sols, 34060 Montpellier, France
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Theme 2 - P acquisition by plants and microorganisms

Tuesday, August 26, 2014
14:20-15:00

Keynote presentations

K201

Genetics and chemical genetics dissection of the Arabidopsis root growth response to low-phosphate

Thierry Desnos 1,2,3, Benjamin Péret 1,2,3, Sabrina Deschamps 1,2,3, Clémence Bonnot 1,2,3,4, Carole Arnaud 1,2,3, Mathilde Clément 1,2,3,5, Thibault Darriauelle 1,2,3, Coline Balzerge 1,2,3, Corinne Brouchoud 1,2,3, Cécile Blanchard 1,2,3, Nathalie Leonhardt 1,2,3, Edith Laugier 1,2,3, Audrey Creff 1,2,3,6, Laurent Nussaume 1,2,3

1. CEA, Institut de Biologie Environnementale et de Biotechnologie, Laboratoire de Biologie du Développement des Plantes, Saint-Paul-lez-Durance, 13108, France
2. CNRS, Unité Mixte de Recherche 7265 Biologie Végétale & Microbiologie Environnementale, Saint-Paul-lez-Durance, 13108, France
3. Université Aix-Marseille, Saint-Paul-lez-Durance, 13108, France
4. Present address: Department of Plant sciences, University of Oxford, South Parks Road, Oxford, OX1 3RB, UK
5. Present address: Génétique, Environnement et Plasticité, Institut Sophia Agrobiotech, Inra PACA, 400 route des chappes, 06903 Sophia Antipolis Cedex, France
6. Present address: Laboratoire Reproduction et Développement des Plantes, Ecole Normale Supérieure de Lyon, 46 allée d’Italie, 69364 Lyon cedex 07, France

Wednesday, August 27, 2014
08:30-09:10

Keynote presentations (cont’d)

K202

Arbuscule development and phosphate acquisition through arbuscular mycorrhizal symbiosis

Maria J. Harrison, Daniela Floss, Xinchun Zhang, Sergey Ivanov

Boyce Thompson Institute for Plant Research, Tower Road, Ithaca, NY, 14853, USA
Theme 2 - P acquisition by plants and microorganisms

Wednesday, August 27, 2014
09:10-10:30

Oral presentations

**O201**

Large rhizosheaths improve phosphorus acquisition and growth of wheat on P-deficient acid soils.

Richard A. James, Kumara Weligama, Gregory J. Rebetzke, Allan Rattey, Alan E. Richardson, Peter R. Ryan, Emmanuel Delhaize

CSIRO Plant Industry, GPO Box 1600, Canberra, ACT 2601, Australia

**O202**

Assessment of root trait variation under phosphorus deficiency through Genome-Wide Association Analysis

Matthias Wissuwa, Takuya Fukuda, Josefine Nestler, Chen Pu, Juan Pariasca-Tanaka, Asako Mori

Japan International Research Center for Agricultural Sciences (JIRCAS), 305-8686, Tsukuba, Japan

**O203**

Breeding sorghum for P-limited soils in Western Africa: from field to gene level

Willmar L. Leiser 1,2, Henry Frederick W. Rattunde 1, Eva Weltzien 1, Ndiaga Cisse 4, Magagi Abdou 5, Abdoulaye Diallo 3, Abocar O. Touré 3, Barbara Hufnagel 6, Jurandir V. Magalhaes 6, Bettina I.G. Haussmann 2

1. International Crops Research Institute for the Semi-Arid Tropics, BP 320 Bamako, Mali
2. Institute of Plant Breeding, Seed Science and Population Genetics, University of Hohenheim, 70593 Stuttgart, Germany
3. L’Institut d’Economie Rurale, BP 258 Bamako, Mali
4. Institut Sénégalais de Recherches Agricoles, BP 3320, Thiès, Senegal
5. Institut National de la Recherche Agronomique, CERRA de Maradi, BP 240, Maradi, Niger
6. Embrapa Maize and Sorghum, Rod. MG 424, Km 65, 35701-970, Sete Lagoas, Minas Gerais, Brazil

**O204**

Imaging of plant roots response to the placement of phosphate fertiliser using 4D X-ray tomography

Sharif Ahmed 1,5,6, Trudy Naugler Klassen 2, Michael Daly 3, Dan Froehlich 2, Pete Talboys 4, David Jones 4, Mark Mavrogordato 6, Tiina Roose 1,5

1. Crop Systems Engineering Group, Institute for Life Sciences, University of Southampton, University Road, Southampton, SO17 1BJ, UK
2. Ostara Nutrient Recovery Technologies, Vancouver BC V6E 2R1, Canada
3. The Agrology House, 7 Roselea Avenue, Welton, Lincoln, LN2 3RT, UK
4. School of Environment, Natural Resources and Geography, Bangor University, Bangor, Gwynedd, LL57 2UW, UK
5. Bioengineering Sciences Research Group, Faculty of Engineering and the Environment, University of Southampton, University Road, Southampton, SO17 1BJ, UK
6. µ-VIS X-Ray Imaging Centre, Faculty of Engineering and the Environment, University of Southampton, University Road, Southampton, SO17 1BJ, UK

**O205**

Phosphorus efflux from maize roots is highly localised to the root tip

Jakob Santner, Rainer Muehlbacher, Andreas Kreuzeder, Walter W. Wenzel

University of Natural Resources and Life Sciences, Department of Forest and Soil Sciences, Institute of Soil Research, 3430 Konrad-Lorenz-Strasse 24, Tulln, Austria
Wednesday, August 27, 2014
11:00-12:00
Oral presentations (cont'd)

O206
Variation in mycorrhiza effects on P acquisition efficiency among inbred maize lines
Simon F. Svane 1, Mette Grønlund 1, Ruairidh J. H. Sawers 3, Uta Paszkowski 2, Iver Jakobsen 1
1. Technical University of Denmark, Department of Chemical and Biochemical Engineering, DK-4000 Roskilde, Denmark
2. University of Cambridge, Department of Plant Sciences, Cambridge CB2 3EA, United Kingdom
3. Laboratorio Nacional de Genómica para la Biodiversidad, Centro de Investigación y Estudios Avanzados, Irapuato, México

O207
The phosphate transporter HcPT2, first candidate for phosphate efflux in ectomycorrhizal symbiosis?
Adeline Becquer 1, Laurie Amenc 1, Kevin Garcia 2, Sylvie Ruset 1, Yoan Baaza 1, Sabine Zimmermann 3, Claude Plassard 1
1. INRA, UMR 1222 Eco&Sols, 2 Place Viala, 34060 Montpellier Cedex 2, France
2. University of Wisconsin, Department of Agronomy, 219 Moore Hall, 1575 Linden Drive, Madison, WI, USA
3. Biochimie et Physiologie Moléculaire des Plantes, UMR 5004, CNRS/INRA/Supagro/UM2, Campus INRA/Supagro, 2 Place Viala, 34060 Montpellier Cedex 2, France

O208
A purple acid phosphatase, GmPAP33, participates in phosphorus reutilization of arbuscular mycorrhizae in soybean
Jia Zhou, Xiurong Wang, Hong Liao
State Key Laboratory for Conservation and Utilization of Subtropical Agro-Bioresources, Root Biology Center, South China Agricultural University, 510642, Guangzhou, P.R. China

O209
Hormonal networks involved in phosphate deficiency-induced cluster root formation of Lupinus albus L.
Zhengrui Wang 1,2, A.B.M. Moshiru Rahman 1, Guoying Wang 2, Uwe Ludewig 1, Jianbo Shen 2, Günter Neumann 1
1. Institute of Crop Science, Chair of Nutritional Crop Physiology (340h), University of Hohenheim, 70593, Stuttgart, Germany
2. Centre for Resources, Environment and Food Security, Department of Plant Nutrition, China Agricultural University, Beijing 100193, PR China

Wednesday, August 27, 2014
16:30-17:30
Oral presentations (cont'd)

O210
Influence of soil fertility management on microbial phosphorus and nitrogen limitation in a lixisol
1. Institut de l’Environnement et de Recherches Agricoles (INERA), Laboratoire Sol Eau Plantes Kamboinsé, 01BP 476 Ouagadougou 01, Burkina Faso
2. University of Göttingen, Germany
3. Forschungsanstalt Agroscope Reckenholz-Tänikon ART Reckenholzstrasse 191, CH-8046 Zürich, Switzerland

O211
The distribution of acid and alkaline phosphatase activity in the rhizosphere
Marie Spohn 1, Yakov Kuzyakov 2
1. Department of Soil Ecology, Bayreuth Center of Ecology and Environmental Research (BayCEER), Univ. Bayreuth, Germany
2. Department of Soil Science of Temperate Ecosystems, Georg-August-University Göttingen, Germany

O212
Coordination of root morphological and physiological adaptations to phosphorus deficiency for contrasting plant species
Jianbo Shen, Yang Lu, Fusuo Zhang
Department of Plant Nutrition, Key Laboratory of Plant-Soil Interactions, Ministry of Education, China Agricultural University, Beijing 100193, China

O213
Root functional traits and their plasticity drive grasslands’ Fabaceae capacities to face phosphorus shortage
Florian Fort 1, Pablo Cruz 1, Olivier Catrice 2, Ciprian Stroia 3, Claire Jouany 1
1. INRA, AGIR UMR 1248, 24 Chemin de Borde Rouge – Auzeville CS 52627, 31326 Castanet Tolosan cedex, France
2. INRA, LIPM UMR 2594/441, 24 Chemin de Borde Rouge – Auzeville CS 52627, 31326 Castanet Tolosan cedex, France
3. Banat University of Agricultural Sciences and Veterinary Medicine, Department of Biology and Plant Protection, Calea Aradului 119, 300645 Timisoara, Romania
Theme 2 - P acquisition by plants and microorganisms

**Wednesday, August 27, 2014**
14:30-16:00

**Thursday, August 28, 2014**
14:30-16:00

**Posters**

**P201**
High yielding rice under low P application field: Pup1 breeding
Chenie Zamora 1, Joko Prasetyono 2, Juan Pariaska-Tanaka 3, Victoria P. Lapitan 4, Ian Paul Navea 1, Katreena Titong 1, Tobias Kretzschmar 1, Matthias Wissuwa 3, Joong Hyoun Chin 1
1. International Rice Research Institute, Plant Breeding and Biotechnology, DAPO Box 7777, Metro Manila, Philippines
2. ICABIOGRAD, Molecular Biology Division, 16111, Bogor, Indonesia
3. Japan International Research Center for Agricultural Sciences, Crop Production and Environment Division, 305, Tsukuba, Japan
4. Philippines Rice Research Institute, Plant Breeding and Biotechnology Division, 4031, Los Banos, Laguna, Philippines

**P202**
Influence of root hairs on P deficiency in rice (Oryza sativa) varieties
Josefine Nestler, Pu Chen, Matthias Wissuwa
Japan International Center for Agricultural Sciences (JIRCAS), Crop, Environment and Livestock Division, 305-8686 Tsukuba, Ibaraki, Japan

**P203**
The P demand for growth of C3 and C4 plants at ambient and elevated atmospheric [CO2]
Iver Jakobsen 1, Stephanie Watts-Williams 1,2, Sally Smith 3, Andrew Smith 3, Simon F. Svane 1, Mette Grenlund 1
1. Technical University of Denmark, Department of Chemical and Biochemical Engineering, DK-4000 Roskilde, Denmark
2. Monash University, School of Biological Sciences, Clayton, VIC 3800, Australia
3. The University of Adelaide, School of Agriculture, Food and Wine, Waite Campus, SA 5005, Australia

**P204**
Multiscale modeling for water and nutrient uptake by plant roots
Betiglu Abesha 1, Jan Vanderborght 1, Mathieu Javaux 1,2, Andrea Schnepf 1, Harry Vereecken 1
1. Agrosphere (IBG-3), Forschungszentrum Jülich GmbH, 52425 Jülich, Germany
2. Earth and Life Institute, Université catholique de Louvain, Croix du Sud, 2, L7.05.02, Louvain-la-Neuve, Belgium

**P205**
*Bacillus subtilis* increases phosphorus uptake by plants from phosphate rock
Ana M. García-López 1, Manuel Avilés 1, María del C. del Campillo 2, Antonio Delgado 1
1. Departamento Ciencias Agroforestales, Universidad de Sevilla, 41013 Sevilla, Spain
2. Departamento de Agronomía, Universidad de Córdoba, Edificio C4, Campus de Rabanales, 14071 Córdoba, Spain

**P206**
Effect of modulation of phosphorus uptake and storage in plant by humic substances treatment
Keiji Jindo, Luciano Canellas
University of Tokyo, Japan

**P207**
Grassland Fabaceae grown under contrasted phosphorus supply induced changes in rhizospheric soil phosphatase activity
Florian Fort 1, Pablo Cruz 1, Ciprian Stroia 2, Claire Jouany 1
1. INRA, AGIR UMR 1248, 24 Chemin de Bordo Rouge – Auzeville CS 52627, 31326 Castanet Tolosan cedex, France
2. Banat University of Agricultural Sciences and Veterinary Medicine, Department of Biology and Plant Protection, Calea Aradului 119, 300645 Timisoara, Romania

**P208**
A simple technique for studying root hair development under varying levels of buffered P supply
Elke Vandamme 1, Marian Renkens 2, Erik Smolders 2, Roel Merckx 2
1. Africa Rice Center (AfricaRice), Mikocheni B/Kawe, Avocado Street, P.O. Box 33581, Dar es Salaam, Tanzania
2. Division Soil and Water Management, Department of Earth and Environmental Sciences, KU Leuven, Kasteelpark Arenberg 20, 3001 Leuven, Belgium
P209
Fertilization of phosphorus to the soil can increase iron chlorosis in sensitive plants
Antonio R. Sánchez-Rodríguez, Maria C. del Campillo, José Torrent
Departamento de Agronomía, Universidad de Córdoba, Edificio C4, Campus de Rabanales, 14071 Córdoba, Spain

P210
Phosphate reduces iron bioavailability on model calcium carbonate-iron oxide systems
Antonio R. Sánchez-Rodríguez, Maria C. del Campillo, José Torrent
Departamento de Agronomía, Universidad de Córdoba, Edificio C4, Campus de Rabanales, 14071 Córdoba, Spain

P211
Exploiting root exudation of organic acids and phytases to enhance plant utilisation of soil phosphorus
Daniel Menezes-Blackburn 1, Courtney Giles 2, Timothy S. George 2, Charles Shand 2, David Lumsdon 2, Pat Cooper 2, Renate Wendler 2, Michael Adu 2, Lawrie Brown 2, Marc Stutter 2, Martin Blackwell 3, Catherine Wearing 1, Hao Zhang 1, Philip M. Haygarth 1
1. Lancaster University, Lancaster Environment Centre, Lancaster, LA1 4YQ, UK
2. The James Hutton Institute, Aberdeen, AB15 8QH and Dundee, DD2 5DA, Scotland, UK
3. Rothamsted Research, North Wyke, Okehampton, Devon, EX20 2SB, UK

P212
Effect of foliar application Urea and Putrecine on phosphorus content of pistachio leaves
Saeid Farzizadeh, Vahid Mozafary
Iran RafsanjanValie Asr University, Iran

P213
How Fagus sylvatica L. deal with low P availability - investigation approach
Sonia Meller 1, Beat Frey 1, Emmanuel Frossard 2, Joerg Luster 1
1. Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Forest Soils and Biogeochemistry, 8903 Birmensdorf, Switzerland
2. ETH Zuerich, Group of Plant Nutrition, 8315 Lindau (ZH), Switzerland

P214
Characterization of two putative direct phosphate transporters in Brachypodium distachyon
Signe Sandbech Clausen 1, Mette Grønlund 1, Ingo Lenk 2, Sergey Ivanov 3, Maria J. Harrison 3, Iver Jakobsen 1
1. Technical University of Denmark, Department of Chemical and Biochemical Engineering, DK-4000 Roskilde, Denmark
2. DLF Trifolium, DK-4660 Store Heddinge, Denmark

P215
Real time imaging to analyze phosphate uptake and translocation in planta
Satomi Kanno 1, Marie-Christine Thibaud 2, Atsushi Hirose 3, Keitaro Tanoi 3, Tetsuro Mimura 1, Laurent Nussaume 2, Tomoko M. Nakanishi 3
1. KOBE University, Department of Biology, Graduate School of Science, 657-8501, KOBE, Japan
2. CEA Cadarache, Laboratory of Plant Development Biology, 13108 St Paul lez Durance, France
3. The University of Tokyo, Laboratory of Radio Plant Physiology, 113-0032, Tokyo, Japan

P216
Enhancing fertilization efficiency by phosphate solubilising bacteria: A lab-scale screening study
Karoline Labs 1, Martin Bertau 2, Harald Weigand 3, Stephanie Gokorsch 1
1. THM University of Applied Sciences - Microbiology, Molecular Biology and Immunology, 35390 Giessen, Germany
2. Freiberg University of Mining and Technology - Institute of Chemical Technology, 09596 Freiberg, Germany
3. THM University of Applied Sciences - ZEUUS, 35390 Giessen, Germany

P217
Phosphorus diffusion in a flooded P-deficient soil: a simulation study
Tovohery Rakotoson 1, 2, Lilia Rabeharisoa 1, Erik Smolders 2
1. Laboratory of Radioisotopes, P.O. Box 3383, Route of Andraisoro, University of Antananarivo, Madagascar
2. Department Earth and Environmental Sciences, Division of Soil and Water Management, K.U.Leuven, Kasteelpark Arenberg 20, 3001 Heverlee, Belgium
P218

Interplay between direct and mycorrhizal P uptake in monocots

Mette Grønlund 1, Uta Paszkowski 2, Edith Hammer 1, Signe Sandbach Clausen 1, Krystyna A. Kelly 2, Iver Jakobsen 1

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2. University of Cambridge, Department of Plant Sciences, Cambridge CB2 3EA, UK

P219

Effects of mineral fertilizer and cropping system on endomycorrhizal fungi dynamic and upland rice nutrients acquisition

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3. Laboratoire des Radioisotopes (LRI), Université d’Antananarivo, BP 3383, Antananarivo 101, Madagascar
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5. Laboratoire des Symbioses Tropicales Méditerranéennes LSTM UMR CIRAD/IRD/SupAgro/UM2 USC INRA TA A-82/J Campus International de Baillarguet 34398 Montpellier Cedex 5, France

P220

Root exudates affecting P phytoavailability in soils - biogeochemical mechanisms and experimental approaches

Eva Oburger 1, Markus Punshenreiter 1, Stephan Hann 2, Davey Jones 3, Walter Wenzel 1

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3. School of Environment,Natural Resources & Geography, Bangor University, Bangor, Gwynedd LL57 2UW, UK

P221

Molecular characterization of phosphate-solubilizing rhizobia isolated from V. faba in Marrakech region field cultures

Tasnim Maghraoui 1,2, Loubna Benidire 1, Majida Lahrouni 1, Khalid Ou fluoride 1, Odile Domergue 2, Sanaa Wahbi 2,3, Robin Duponnois 2, Mohamed Hafidi 3, Antoine Galiana 2, Hervé Sanguin 2, Philippe de Lajudie 2

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P222

Phosphorus and nitrogen uptake of potato under water saving irrigation regimes

Caixia Liu 1, Zhenjiang Zhou 1, Fulai Liu 2, Gitte H.Rubæk 1, Mathias N. Andersen 1

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2. University of Copenhagen, Department of Plant and Environmental Sciences, Højbakkegaard Allé 13, DK-2630, Taastrup, Denmark

P223

Cattle manure inoculation with a phytase producing Bacillus: organic P mineralization, bacterial community and P uptake

Daniel Menezes-Blackburn 1,2, Milko Jorquera 2, Nitza Inostrosa 2, Liliana Gianfreda 3, Ralf Greiner 4, María de la Luz Mora 2

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3. Dipartimento di Scienze del Suolo, della Pianta e dell’Ambiente, e delle Produzioni Animali, Università di Napoli, Federico II, Portici, Italy
4. Department of Food Technology and Bioprocess Engineering, Max Rubner-Institut, Federal Research Institute of Nutrition and Food, Karlsruhe, Germany
P224

Improving upland rice production and soil nutrients availability by managing mycorrhizal propagules and cropping system

H. Ramanankierana 1, A.T.E. Razakatiana 1,2, A.A. Rasamianirvelo 2, M. Henintsoa 3, H. Randriambanona 1, R.H. Baohanta 1, M. Raherimandimby 2, L. Rabeharisoa 3, T. Becquer 34, R. Duponnois 5

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P225

Effectiveness of citrate for mobilization of plant-available phosphorus in soil

Alan E. Richardson 1, Emmanuel Delhaize 1, Richard A. James 1, Allan Rattey 1, Timothy S. George 2, Peter R. Ryan1

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2. The James Hutton Institute, Dundee, Scotland, DD2 5DA, United Kingdom

P226

Aluminum, phosphorus and mycorrhizal symbiosis interaction in wheat cultivars growing in volcanic soils

Alex Seguel, Pablo Cornejo, Victor Flores, Violeta Maturana, Fernando Borie

Scientific and Technological Bioresource Nucleus BIOREN-UFO, Universidad de La Frontera

P227

Differences in root morphology of pasture legumes and their association with ‘critical’ soil phosphorus requirements

Richard Simpson 1, Zongjian Yang 1, Natalie Shadwell 1, Richard Culvenor 1, Adam Stefanski 1, Graeme Sandral 2, Daniel Kidd 3, Hans Lambers 3, Megan Ryan 3

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2. NSW Department of Primary Industries, 2650, Wagga Wagga, Australia
3. University of Western Australia, School of Plant Biology, 6009, Perth, Australia

P228

Bacterial beta-propeller phytase transcripts are revealed in nodulated roots of Phaseolus vulgaris supplied with phytate

Rim Tinhinen Maougal 1,2, Adnane Bargaz 3, Alain Braunman 4, Claude Plassard 1, Laurie Amenc 1, Abdelhamid Djaoun 2, Jean-Jacques Drevon 1

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3. Swedish University of Agricultural Sciences, Department of Biosystems and Technology, PO Box 103, SE 23053 – Alnarp, Sweden
4. IRD, UMR Eco&Sols, Land Dep. Development Bangkok, Thailand

P229

Phytate-mineralizing rhizobia from Vicia faba symbiosis in an agro-ecosystem of south of France

Odile Domergue 1,2, H. Chouayekh, J. Abadie 1, L. Amenc 1, C. Pernot 1, P. de Lajudie 1, A. Galiana 1, J.J. Drevon 1

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Impacts of rhizobacterial volatiles on the response of the model grass Brachypodium distachyon to phosphorus deficiency

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Root system characterization of two grasses functional types under different phosphorus levels

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Functional characterization of OsPT13, a rice phosphate transporter required for arbuscular mycorrhizal symbiosis

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P233

Quantitative prediction of plant P uptake by infinite sink extraction

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P234

Nitrate supply controls phosphorus availability and microbial properties in the rhizosphere of intercropped species

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Enhancement of phosphate acquisition and delivery to plants using the cyanobacterium Nostoc punctiforme

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Metabolite profiling of shoot extracts, root extracts, and root exudates of rice cultivars under phosphorus deficiency

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Diversity of arbuscular mycorrhizal fungi and P-solubilising bacteria in rubber tree rhizospheres in Thailand

Laetitia Herrmann 1,2, Lambert Bräu 1, Maarja Õpik 3, Henri Robain 4, Wanpen Wiriyakintkeel 5, Agnès Robin 6, Didier Lesueur 2

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The role of plant and bacterial organic anion production in plant access to insoluble organic phosphorus

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P239
Understanding the genetic control of rhizosheath formation and impacts of multiple stress on phosphorus acquisition
The James Hutton Institute, Invergowrie, Dundee, DD2 5DA, UK

P240
Chemical imaging of phosphorus dynamics in the rhizosphere
Andreas Kreuzeder, Vanessa Scharsching, Jakob Santner, Eva Oburger, Christoph Hoefer, Walter W. Wenzel
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P241
A conceptual model of root hair ideotypes for future agricultural environments
Lawrie K. Brown, Timothy S. George, Lionel X. Dupuy, Philip J. White
The James Hutton Institute, Invergowrie, Dundee, DD2 5DA, UK

P242
Changes in wheat root morphology under different phosphorus fertiliser supply rates
Martin Blackwell 1, Huimin Yuan 1,2, Steve McGrath 3, Steve Granger 1, Jane Hawkins 1, Sarah Dunham 3, Tony Hooper 3, Timothy George 4, Jianbo Shen 2
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P243
Effect of copper application on P concentration of pistachio seedlings in some calcareous soils of Iran
Ahmad Tajabadi Pour, Ehsan Mirjalili
Department of Soil Science, College of Agriculture, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran

P244
Effect of residual copper on P concentration of pistachio seedlings in some calcareous soils of Iran
Ahmad Tajabadi Pour, Hamideh Hosseini
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P245
Effect of foliar application of calcium and zinc on phosphorus content of pistachio buds and leaves
Ahmad Tajabadi Pour, Amin Haidarian
Department of Soil Science, College of Agriculture, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran

P246
A Pi starvation responsive gene, GmMDH12, mediating malate synthesis and facilitating nodule growth in soybean
Zhijian Chen, Jiang Tian, Hong Liao
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P247
Elevated CO2 favors microbial immobilization of phosphorus in the rhizosphere of crop plants
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P248
The interaction of AM fungi with phosphorus resource determine plant composition and productivity in desert grassland
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The modern breeding selecting of maize is not always against arbuscular mycorrhizal association from 1950s to 2000s

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Native arbuscular mycorrhizal fungi enhanced phosphorus capture and regulated ions uptake of crops in salinity soils

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Challenges and opportunities on the use of biofertilizers: Examples from Senegal and Kenya

Aliou Faye 1, K. Ndung ’u-Magiroi 2, J. Jefwac 3, Y. Dalpé 4, I. Ndoyee 5, M. Dioufa 5, Ma Diop 5, Didier Lesueur 6
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Do nitrogen-fixing plants show higher root phosphatase activity on phosphorus-poor soils?

Guochen K. Png 1, Etienne Laliberté 1, Patrick E. Hayes 1, Hans Lambers 1, Benjamin L. Turner 1,2
1. School of Plant Biology, The University of Western Australia, 35 Stirling Highway, Crawley (Perth), WA 6009, Australia
2. Smithsonian Tropical Research Institute, Apartado 0843-03092, Balboa, Ancon, Republic of Panama
Theme 3 - P utilization and signaling in plants

Wednesday, August 27, 2014
13:50-14:30

Keynote presentations

K301
Enhancing internal phosphorus use efficiency in crops: concepts and approaches
Terry Rose
Southern Cross Plant Science, Southern Cross University, PO Box 157 Lismore NSW Australia

Thursday, August 28, 2014
08:30-09:10

Keynote presentations (cont’d)

K302
Regulation of phosphate homeostasis: microRNA-mediated surveillance of phosphate transport
Tzyy-Jen Chiou, Teng-Kuei Huang, Wei-Yi Lin, Tzu-Yin Liu, Shu-I Lin
Academia Sinica, Agricultural Biotechnology Research Center, 115, Taipei, Taiwan
Theme 3 - P utilization and signaling in plants

Thursday, August 28, 2014
09:10-10:30
Oral presentations

O301
A rice cis-natural antisense RNA acts as a translational enhancer for its cognate mRNA and contributes to Pi homeostasis
Mehdi Jabnoune 1, David Secco 1, Cécile Lecampion 2, Christophe Robaglia 2, Qingyao Shu 3, Yves Poirier 1
1. Department of Plant Molecular Biology, University of Lausanne, Lausanne, Switzerland
2. Laboratory of Plant Genetics and Biophysics, Aix Marseille University, Marseille, France
3. Institute of Nuclear Agricultural Sciences, Zhejiang University, Hangzhou, China

O302
Methylomes of plants starved for Pi reveals dynamic DNA methylation changes at Pi starvation responsive genes
David Secco 1, Huixia Shou 2, Ping Wu 2, Matthew D. Schultz 3, Laurent Nussaume 4, Joseph R. Ecker 3, James Whelan 5, Ryan Lister 1
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2. State Key laboratory of Plant Physiology and Biochemistry and Joint Research Laboratory in Genomics and Nutrimics, College of Life Science, Zhejiang University, Hangzhou 310058, China
3. Genomic Analysis Laboratory, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA
4. UMR 5191 CEA, Centre National de la Recherche Scientifique, Laboratoire de Biologie du Développement des Plantes, Université d’Aix-Marseille, 13108 Saint-Paul-lez-Durance, France
5. Department of Botany, School of Life Science, ARC Centre of Excellence in Plant Energy Biology, La Trobe University, Bundoora, 3086, Victoria, Australia

O303
Multiple loci identified in a Genome-Wide Association Studies of internal phosphorus utilization efficiency in rice
Katsuhiko Kondo 1, Takuya Fukuda 1, Asako Mori 1, Michael T Rose 2, Juan Pariasca-Tanaka 1, Tobias Kretzschmar 3, Terry J Rose 4, Matthias Wissuwa 1
1. Japan International Research Center for Agricultural Sciences (JIRCAS), Crop, Livestock and Environment Division, 305-8686, Tsukuba, Japan
2. Monash University, Centre for Green Chemistry and School of Biological Science, 3800, Clayton, Australia
3. International Rice Research Institute (IRRI), Plant Breeding, Genetics and Biotechnology Division, 7777, Metro Manila, Philippines
4. Southern Cross University, Southern Cross Plant Science, 2480, Lismore, Australia

O304
Arabidopsis HPS10/ALS3 interacts with AtSTAR1 to serve as a signaling hub for responses to P deficiency and Al toxicity
Jingsong Dong, Dong Liu
School of Life Sciences, Tsinghua University, Beijing 100084, China

O305
The ESCRT-III-associated protein AtALIX mediates high affinity phosphate transporter trafficking in Arabidopsis
Ximena Cardona 1, Laura Cuyàs 1, Elena Marín 2, María Luisa Irigoyen 1, Maria Isabel Puga 1, Erika Gil 1, Richard Bligny 3, Laurent Nussaume 2, Niko Geldner 4, Javier Paz-Ares 5, Vicente Rubio 1
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2. Unité Mixte de Recherche 6191 Centre National de la Recherche Scientifique-Commissariat à l’Energie Atomique, Aix-Marseille II, F-13108 Saint-Paul-lez-Durance Cedex, France
3. Laboratoire de Physiologie Cellulaire Vegetale, Unite Mixte de Recherche 5168, Institut de Recherche en Technologie et Sciences pour le Vivant, CEA, Grenoble cedex 9, France
4. Department of Plant Molecular Biology, University of Lausanne, UNIL-Sorge, Biophore Building, 1015 Lausanne, Switzerland
Oral presentations (cont’d)

O306
Systems biology of plant phosphate and sulphate metabolism
Mutsumi Watanabe, Daniela Sieh, Franziska Krajinski, Hans-Michael Hubberten, Rainer Hoefgen
Max Planck Institute of Molecular Plant Physiology, Dept. of Molecular Physiology, D-14424 Potsdam-Golm, Germany

O307
Effect of the phosphorus status on the isotopic composition of oxygen bound to phosphorus in *Glycine max*
Verena Pfahler 1, Federica Tamburini 1, Stefano M. Bernasconi 2, Emmanuel Frossard 1
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2. Geological Institute, ETH Zurich, Sonneggstrasse 5, 8092 Zurich, Switzerland

O308
Root cap cells play a key role in phosphate nutrition
Marie-Christine Thibaud 1, Satomi Kanno 2, Jean-François Arrighi 1, Vincent Bayle 1, Serge Chiarenza 1, Etienne Delannoy 1, Tomoko M Nakanishi 2, Laurent Nussaume 1
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2. Graduate School of Agricultural and Life Sciences, University of Tokyo, Tokyo, Japan

O309
Organ-specific phosphorus-allocation patterns and transcript profiles linked to P efficiency in wheat
Tariq Aziz 1,2, Patrick M. Finnegan 1, Hans Lambers 1, Ricarda Jost 1
1. School of Plant Biology, Faculty of Science, The University of Western Australia, Crawley (Perth), WA 6009, Australia
2. Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad-38040, Pakistan
P301
Importance of phosphorus (P) remobilization during grain filling in rice plant regarding the P regime
Cecile Julia, Terry Rose
Southern Cross University, Plant science, 1 Military road, 2480, Lismore, Australia

P302
Remobilization of seed phosphorus reserves and their role in attaining phosphorus autotrophy in maize seedlings
Alain Mollier 1,2, Muhammad Nadeem 3, Sylvain Pellerin 1,2, Alain Vives 1,2, Loïc Prud’homme 1,2, Christian Morel 1,2
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2. Bordeaux Sciences Agro, UMR 1391 ISPA, 33170 Gradignan, France
3. Department of Environmental Sciences, COMSATS Institute of Information Technology, Vehari, Pakistan

P303
Non-coding RNAs in the adaptation of root growth to phosphate starvation
Coline Balzergue 1,2,3, Elena Marín 1,2,3, Pascale David 1,2,3, Marc Gabriel 4, Van Du Tran 4, Caroline Hartmann 5,6, Céline Sorin 5,6, Martin Crespi 5,6, Daniel Gautheret 4, Thierry Desnos 1,2,3
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2. CNRS, UMR7265 Biologie Végétale et & Microbiologie Environnementale, 13108 Saint-Paul-lès-Durance, France
3. Aix-Marseille Université, 13108 Saint-Paul-lès-Durance, France
4. Université Paris-Sud, CNRS, UMR8621, Institut de Génétique et Microbiologie, 91405 Orsay, France
5. CNRS, UPR2355, Institut des Sciences du Végétal (ISV), Saclay Plant Sciences, 91198 Gif-sur-Yvette, France
6. Université Paris-Diderot, Sorbonne Paris Cité, 75205 Paris, France

P304
Genetic regulation of phosphorus homeostasis during grain filling in rice
Kwanho Jeong 1, Terry J. Rose 1, Daniel L.E. Waters 1, Sigrid Heuer 2, Graham J. King 1
1. Southern Cross University, Southern Cross Plant Science, Lismore, NSW 2480, Australia
2. Australian Center for Plant Functional Genomics (ACPFG), Adelaide, SA 5084, Australia

P305
Synthesis and characterization of caged-phosphates for the controlled release of phosphate in living cells
Hélène Javot 1, Cyril Herbivo 2, Ziad Omran 2, Julia Revol 1, Laurent Nussaume 1, Alexandre Specht 2
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2. Laboratoire de Conception et Application de Molécules Bioactives, UMR 7199, CNRS/UDS Faculté de Pharmacie, 74 Route du Rhin, 67400 Illkirch, France

P306
Phosphorus use efficiency in Hakea prostrata: Role of other nutrients
M. Asaduzzaman Prodhan, Patrick M Finnegan, Hans Lambers, Ricardo Jost
School of Plant Biology, The University of Western Australia, 35 Stirling Highway, Crawley, Perth, WA 6009, Australia

P307
Overexpression of a Bacillus subtilis phytase in Arabidopsis thaliana enhances its ability to mobilize P from phytate
Nibras Belgaroui 1,2, Ikram Zaidi 1, Ameny Farhat 3, Hichem Chouayekh 3, Nadia Bouain 2, Khaled Masmoudi 1,5, Pierre Berthomieu 2, Hatem Rouached 2, Moez Hanin 1,4
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5. Current address: International Center for Biosaline Agriculture (ICBA) P.O.Box 14660, Dubai, UAE
P308
Rice phosphate transporter OsPT4 functions on Pi-uptake and embryo development irrespective of Pi-status
Shubin Sun, Fang Zhang, Guohua Xu
Department of Plant Nutrition, College of Resources and Environmental Sciences, Nanjing Agricultural University, Nanjing, 210095, China

P309
Characterization of OsSIZ1 reveals the involvement in the regulation of phosphate responses in rice
Shubin Sun, Huadun Wang, Guohua Xu
Department of Plant Nutrition, College of Resources and Environmental Sciences, Nanjing Agricultural University, Nanjing, 210095, China

P310
OsPHT2;1, one of rice Pht2 family, affects phosphate utilization and yield per plant
Shubin Sun, Shulin Shi, Guohua Xu, Fangjie Zhao
Department of Plant Nutrition, College of Resources and Environmental Sciences, Nanjing Agricultural University, Nanjing, 210095, China

P311
Fine characterization of OsPHO2 knockout mutants reveals its key role in Pi utilization in rice
Shubin Sun, Cao Yue, Guohua Xu
College of Resources and Environmental Sciences, Nanjing Agricultural University, Nanjing, 210095, China

P312
Learning from the extremists - the phosphorus-efficient southwest Australian native Hakea prostrata
Ricarda Jost 1, Hans-Michael Hubberten 2, Patrick Giavalisco 2, Ronan Sulpice 2, Mark Stitt 2, Rainer Hoefgen 2, Wolf-Rüdiger Scheible 2, Hans Lambers 1, Patrick Finnegan 1
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2. Max-Planck Institute of Molecular Plant Physiology, Golm, Germany

P313
Interacting signalling pathway co-regulates the phosphate and zinc loading into root xylem in Arabidopsis
Hatem Rouached
Biochimie et Physiologie Moléculaire des Plantes, Institut National de la Recherche Agronomique, Centre National de la Recherche Scientifique,Université Montpellier 2, Montpellier SupAgro. Bat 7, 2 Place Viala, 34060 Montpellier cedex 2, France

P314
Forms of phosphorus in tissue of cover crops grown in an Oxisol under no-tillage and conventional tillage
Carlos Alberto Casali 1, João Kaminski 2, Danilo Rheinheimer dos Santos 2, Ademir Calegari 3, Tales Tiecher 4, Rogério Piccin 2, Roque Junior S. Bellinasso 2, Luis Felipe R. Rossato 2
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P315
The auxin influx carrier AUX1 plays a critical role in roots during adaptive responses to phosphorus limitation
Jitender Giri 1,2, Susan Zappala 1, Helen Parker 1, Anne Divett 3, Ranjan Swarup 1, Tony Pridmore 1, Sacha Mooney 1, Adam Price 4, Kathryn Brown 5, Jonathan Lynch 5, Emmanuel Guidordoni 3, Malcolm Bennett 1
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P316
Relationships nitrogen and phosphorus and the nutritional indices in maize hybrids submitted to nitrogen levels.
Fernanda de Fátima da Silva, Pedro Henrique de Cerqueira Luz, Liliane Maria Romualdo, Gabriela Strozzi, Underson Henrique, Barbieri Pateis, Jéssica Daniella Coldebello, Valdo Rodrigues Herling
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P317
Morphological root differences between two rice cultivars in response to phosphorus availability
Júlia Gomes Farias 1, Felipe de Campos Carmona 2, Márcio Renan Weber Schorr 1, Raissa Schwalbert 1, Bianca Knebel Del Frari 1, James Eduardo Lago Londero 1, Fernando Teixeira Nicoloso 1
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P318
Arabidopsis inositol pentakisphosphate 2-kinase AtIPK1 modulates phosphate homeostasis via transcriptional regulation
Hui-Fen Kuo, Tzu-Yun Chang, Su-Fen Chiang, Wei-Di Wang, Yee-Yung Charng, Tzyy-Jen Chiou
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P319
Contribution of phosphatases to adaptation of rhizobial symbiosis with legumes to phosphorus deficiency
Mohamed Lazali 1,2, Laurie Amenc 2, Chahinez Benadis 3, Samira Brahimi 3, Josiane Abadie 2, Mainassara Zaman-Allah 4, Adnane Bargaz 5, Jean-Jacques Drevon 2
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P320
Comparison of P recycling abilities among rice cultivars showed an importance of lipid remodeling
Hayato Maruyama 1, Norihito Tani 2, Takumi Mukada 3, Keitaro Tawaraya 3, Jun Wasaki 1,2
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P321
Deciphering the role of PHO1 in phosphate homeostasis in leaves and seeds
Evangelia Vogiatzaki, Yves Poirier
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P322
P supply effect on photosynthetic performance and antioxidant responses in ryegrass cultivars grown under Mn excess
Alejandra Ribera Fonseca 1,2, Marjorie Reyes-Díaz 2,3, Miren Alberdi 2,3, Daniela Alvarez 4, María de la Luz Mora 2,3
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P323
Regulation of primary root growth by trihelix transcription factors in response to environmental limitations
Christian Breuer 1,2, Rosangela Sozzani 3, Ayako Kawamura 1, Wolfgang Busch 4, Philip Benfey 5, Keiko Sugimoto 1
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Evaluation of genotypic variation for phosphate deficiency tolerance in Sri Lankan rice varieties

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Effects of phosphorus fertilization on phytic acid in seeds of two maize hybrids

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P326

Local and systemic regulation of the root-associated acid phosphatase activity induced by Pi starvation

Ye Zhang, Xiaoyue Wang, Shan Lu, Dong Liu

School of Life Sciences, Tsinghua University, Beijing 100084, China

P327

Phosphorus distribution in maize under phosphorus application and tillage systems on Ferric Acrisol in Ghana

Vincent Logah, Vincent Atobrah, Alfred Acquah, Augustine Bosomtwe, Benedicta Essel

Department of Crop & Soil Sciences, Kwame University, Kumasi, Ghana

P328

Phenotyping for drought and low phosphorus tolerance in tropical legume crops

Nouhou Belko 1,2, Ndiaga Cisse 1, Ousmane Boukar 2, Vincent Vadez 3

1. Centre d’Etude Regional pour l’Amélioration de la l’Adaptation à la Sécheresse, Thies, Senegal
2. International Institute of Tropical Agriculture, Kano, Nigeria
3. International Crops Research Institute for the Semi-Arid Tropics, Patancheru, India

P329

What is the optimal phosphorus supply for growth of faba bean inoculated with rhizobia

Houda Maazaoui 1,2,3, Bouaziz Sifi 1, Jean-Jacques Drevon 3

1. Laboratory of Agronomic Sciences and Techniques, National Institute of Agronomic Research of Tunisia (INRAT) Hédi Karray, 2080 Ariana, Tunisia
2. Faculty of sciences of Bizerte, Tunisia
3. INRA, UMR Eco&Sols, 2 Place Pierre Viala, 34060, Montpellier, France

P330

Phosphate/zinc interaction analysis in two lettuce varieties reveals contrasting effects on biomass and Pi transport

Nadia Bouain 1,2, Mushtak Kisko 1, Aida Rouached 2, Myriam Dauzat 3, Benoît Lacombe 1, Pierre Berthomieu 1, Chedly Abdedly 2, Hatem Rouached 1

1. Biochimie et Physiologie Moleculaire des Plantes, Institut National de la Recherche Agronomique, Centre National de la Recherche Scientifique, Université Montpellier 2, Montpellier SupAgro. Bat 7, 2place Viala, 34060 Montpellier cedex 2, France
2. Laboratoire des Plantes Extrêmes, Centre de Biotechnologie de Borj Cédria, BP 901, 2050 Hammam-Lif, Tunisia
3. Laboratoire d’Ecophysiologie des Plantes sous Stress Environnementaux UMR 759, INRA/SUPAGRO, 34060 Montpellier cedex 1, France
Theme 4 – Ecosystem dynamics and environmental impacts of P

Wednesday, August 27, 2014
17:30-18:00

Special keynote - The IMBALANCE-P lecture

K400

Effects of phosphorus limitations on Life, Earth system and Society

Josep Peñuelas 1, Ivan Janssens 2, Philippe Ciais 3, Michael Obersteiner 4

1. CREAF, Barcelona, Spain
2. University of Antwerpen, Antwerpen, Belgium
3. LSCE, IPSL, Gif-sur-Yvette, France
4. IIASA, Laxenburg, Austria

Thursday, August 28, 2014
13:50-14:30

Keynote presentation

K401

Landscape exports of P and their effects on aquatic ecosystems

Val H. Smith

Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66045 USA
Theme 4 – Ecosystem dynamics and environmental impacts of P

Thursday, August 28, 2014
16:30-17:30

Oral presentations

O401
Phosphorus a pivotal element in plant-soil system stoichiometry: equilibrium and imbalances
Jordi Sardans 1,2, J. Carnicer 1,2, P. Ciais 3, G. Farré-Armengol 1,2, I. Filella 1,2, A. Gargallo-Garriga 1,2, G. Farré-Armengol 1,2, I. Janssens 5, M. Obersteiner 6, A. Rivas-Ubach 1,2, I. Urbina 1,2, J. Peñuelas 1,2
1. CSIC, Global Ecology Unit CREAF-CEAB-UAB, Cerdanyola del Vallès 08193, Catalonia, Spain
2. CREAF, Cerdanyola del Vallès 08193, Catalonia, Spain
3. Laboratoire des Sciences du Climat et de l’Environnement, IPSL, Gif-sur-Yvette, France
4. Servei de Ressonància Magnètica Nuclear, Facultat de Ciències i Biociències, Universitat Autònoma de Barcelona, Bellaterra 08193, Barcelona, Catalonia, Spain
5. UA, Antwerpen, Belgium
6. International Institute for Applied Systems Analysis (IIASA), Ecosystem Services and Management Program, Schlossplatz 1, A-2361, Laxenburg, Austria

O402
Do trophic relationships in soil enhance plant P nutrition? Phytate mineralization as a case study
Claude Plassard 1, Jean Trap 2, Patricia Ranoarisoa 1, Aurélie Perrin 1, Usman Irshad 3, Cécile Villenave 4, Alain Brauman 5
1. INRA, UMR Eco&Sols, 2 Place Viala, 34060 Montpellier Cedex 2, France
2. IRD, UMR Eco&Sols, 2 Place Viala, 34060 Montpellier Cedex 2, France
3. Environmental Sciences Dept. COMSATS Institute of Information Technology, Abbottabad, Pakistan
4. Ellisol Environnement, UMR Eco&Sols, Bâtiment 12, 2 Place Viala, 34060 Montpellier, France
5. IRD, UMR Eco&Sols, Land Department Development, Bangkok, Thailand

O403
Linking P and C cycling in the decomposer system of an Amazonian rainforest
Stephan Hättenschwiler 1, Nicolas Farin 1,2, Johanne Nahmani 1, Heidy Schimm 3, Nathalie Fromin 1,4
1. Centre d’Ecologie Fonctionnelle et Evolutive, CEFE UMR 5175, CNRS, 1919 route de Mende, Montpellier, France
2. INRA, UMR 614 Fractionnement des AgroRessources et Environnement, 2 esplanade Roland Garros, Reims, France
3. UMR Ecologie des Forêts de Guyane (EcoFoG), Campus Agronomique, BP 709, Kourou, Guyane française
4. PROMES CNRS, 7 rue du Four Solaire, Font Romeu, France

O404
The bioavailability of colloidal P to freshwater algae
Stijn Baken, Sophie Nawara, Emmanuel Van Acker, Erik Smolders
KU Leuven, Department of Earth and Environmental Sciences, Kasteelpark Arenberg 20 bus 2459, 3001 Leuven, Belgium
P401
Dynamics of soil carbon, nitrogen, and phosphorus and microbial community composition after land-use abandonment
Marie Spohn 1, Tibor József Novák 2, József Incze 2, Luise Giani 3
1. Department of Soil Ecology, Bayreuth Center of Ecology and Environmental Research (BayCEER), University Bayreuth, Germany
2. Department of Landscape Protection and Environmental Geography, University of Debrecen, Hungary
3. Department of Soil Science, Institute of Biology and Environmental Sciences, Carl von Ossietzky University Oldenburg, Germany

P402
Belowground interactions between a cereal and a legume along a P gradient: a test of the Stress Gradient Hypothesis
Simon Boudsocq 1, Philippe Hinsinger 1, Hans Lammers 2
1. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France
2. School of Plant Biology (M084), University of Western Australia, 35 Stirling Highway, Crawley, WA 6009, Australia

P403
Microbial biomass and catabolic activities in the rhizosphere as impacted by P fertilization, a field study
Annette Bérard 1,2, Line Capowiez 1,2, Ghislain Sévenier 1,2, Claude Doussan 1,2, Philippe Hinsinger 3
1. INRA, UMR1114 EMMAH, 84914 Avignon, France
2. UAPV, UMR1114 EMMAH, 84914 Avignon, France
3. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France

P404
Arbuscular mycorrhizal colonization in maize genotypes grown under contrasted P-regimes in a long-term field experiment.
Lidia Campos-Soriano 1, Marcel Bach 1, Didier Arnal 2, Gérard Souche 2, Philippe Hinsinger 2, Blanca San Segundo 1
1. Centre for Research in Agricultural Genomics (CRAG) CSIC-IRTA-UAB-UB. Edifici CRAG, Campus UAB. Bellaterra (Cerdanyola del Vallès). 08193 Barcelona, Spain
2. INRA, UMR Eco&Sols, Place Viala, 34060 Montpellier cedex 2, France

P405
Phosphorus fractions in discharge from artificially drained lowland catchments
Monika Nausch 1, Jana Woelk 1, Petra Kahle 2, Tim Bigelmann 1,2, Günther Nausch 1, Bernd Lennartz 2
1. Leibniz-Institute for Baltic Sea Research, 18119 Rostock, Germany
2. University of Rostock, Agricultural and Environmental Sciences, 18055 Rostock, Germany

P406
Leibniz ScienceCampus Rostock Phosphorus Research – an interdisciplinary network for a more sustainable P management
Inga Krämer, Ulrich Bathmann, et al. (network members)
Leibniz ScienceCampus Rostock Phosphorus Research, Coordination Office, Leibniz Institute for Baltic Sea Research, Seestr. 15, D-18119 Rostock, Germany

P407
Long and short time effects of phosphates sources on forage mass of natural grasslands in Southern Brazil
Leandro Bittencourt de Oliveira 1, Tales Tiecher 2, José Pedro Pereira Trindade 3, Fernando Luiz Ferreira de Quadros 1, Danilo Rheineheimer dos Santos 2
1. Natural Grasslands Ecology Research Group, Department of Animal Science, Universidade Federal de Santa Maria, Santa Maria, Rio Grande do Sul State, Brazil
2. Department of Soil Science, Universidade Federal de Santa Maria. Santa Maria, Rio Grande do Sul State, Brazil
3. Embrapa Pecuária Sul, Bagé, Rio Grande do Sul State, Brazil
P408
Distribution and estimated release of sediment phosphorus in a mixed land use catchment from Southern Brazil
Mohsin Zafar 1, Danilo Rheinheimer dos Santos 1, Tales Tiecher 1, Maria Alice Santanna 2
1. Soil Chemistry Lab, Department of Soil Science, Universidade Federal de Santa Maria (UFSM), CEP 97105-900 Santa Maria, RS-Brazil
2. Department of Physics, Universidade Federal de Santa Maria (UFSM), CEP 97105-900 Santa Maria, RS-Brazil

P409
Soil properties affect relation between soil phosphorus and plant species diversity of extreme tropical habitats
Michel-Pierre Faucon 1, Maxime Seleck 2, David Houben 1, Grégory Mahy 2, Gilles Colinet 2, Olivier Pourret 1
1. Institut Polytechnique LaSalle Beauvais, HydrISE Unit, Beauvais, France
2. Univ. Liège Gembloux AgroBioTech, Biodiversity and Landscape Unit, Gembloux, Belgium

P410
Freshwater phosphate limits are based on a poorly standardized molybdate reactive P method
Sophie Nawara, Stijn Baken, Erik Smolders
KU Leuven, Department of Earth and Environmental Sciences, Kasteelpark Arenberg 20 bus 2459, 3001 Leuven, Belgium

P411
Physiological responses of Hakea laurina (Proteaceae) to low-P and high-P conditions
Hayato Maruyama 1, Taiki Yamauchi 2, Takuro Kohama 2, Toshihiro Watanabe 3, Jun Wasaki 1,2
1. Graduate School of Biosphere Science, Hiroshima Univ., 739-8521, Higashi-Hiroshima, Japan
2. Faculty of Integrated Arts and Sciences, Hiroshima Univ., 739-8521, Higashi-Hiroshima, Japan
3. Graduate School of Agriculture, Hokkaido Univ., 060-8589, Sapporo, Japan

P412
Effects of myo-inositol hexakisphosphate on Zn(II) sorption on Aluminum Oxide
Yupeng Yan 1, Fan Liu 1, Wei Li 1, Xiongfan Feng 1,2, Donald L. Sparks 2
1. Key Laboratory of Arable Land Conservation (Middle and Lower Reaches of Yangtze River), Ministry of Agriculture, College of Resources and Environment, Huazhong Agricultural University, Wuhan 430070, China
2. Environmental Soil Chemistry Group, Delaware Environmental Institute and Department of Plant and Soil Sciences, University of Delaware, Newark, Delaware, 19716, USA

P413
Phosphorus leaching risk assessment with manure fertilizer application in South China
Xiaodong Ding, Rongping Wang, Xinzrong Liao, Shuyi Li
Guangdong Institute of Eco-Environment and Soil Sciences, No. 808, Tianyuan Road, 510650, Guangzhou, P.R. China

P414
Phosphorus characterization in manures excreted by pigs at three different growth stages
Guohua Li 1,2, Haigang Li 1, Fusuo Zhang 1
1. Center for Resources, Environment and Food Security (CREFS), China Agricultural University, Beijing, 100193, China
2. Plant Production Systems Group, Wageningen University, P.O. Box 430, 6700 AK, Wageningen, The Netherlands

P415
Eco-enzymatic stoichiometry in a land-use gradient
Nicolas Fanin, Isabelle Bertrand
INRA, UMR 614 Fractionnement des AgroRessources et Environnement, 51100 Reims, France
Theme 5 – Sustainable P use in agroecosystems

Friday, August 29, 2014
08:30-09:10

Keynote presentations

K501

Overcoming phosphorus deficiency in agricultural systems of sub-Saharan Africa: recent advances and limitations.

Generose Nziguheba ¹, Roel Merckx ², Elke Vandamme ³, Bernard Vanlauwe ⁴

1. International Institute of Tropical Agriculture, Nairobi, Kenya
2. Katholieke Universiteit Leuven, Belgium
3. Africa Rice Center, Cotonou, Benin
4. International Institute of Tropical Agriculture, Nairobi, Kenya

Friday, August 29, 2014
13:50-14:30

Keynote presentations (cont’d)

K502

Sustainable phosphorus use in agroecosystems: a story of global imbalance and resource recycling

Thomas Nesme ¹,²,³, Elena Bennett ³,⁴

1. Univ. Bordeaux, Bordeaux Sciences Agro, UMR 1391 ISPA, 33175 Gradignan, France
2. INRA, UMR 1391 ISPA, 33140 Villenave d’Ornon, France
3. McGill School of Environment, McGill University, Montreal, Quebec, Canada
4. McGill University, Department of Natural Resource Sciences, Sainte Anne de Bellevue, Quebec, Canada
Theme 5 – Sustainable P use in agroecosystems
Friday, August 29, 2014
09:10-10:30
Oral presentations

O501
Modelling the optimal phosphate fertiliser and soil management strategy for crops
James Heppell 1,3,4,5, S. Payvandi 2,5, P. Talboys 6, K. Zygalakis 3,5, J. Filege 3,4, R. Sylvester-Bradley 7, R. Walker 8, D. L. Jones 6, T. Roose 2,5
1. Institute for Complex Systems Simulation, University of Southampton, UK
2. Faculty of Engineering and the Environment, University of Southampton, UK
3. Mathematical Sciences, Faculty of Social and Human Sciences, University of Southampton, UK
4. Centre for Operational Research, Management Sciences and Information Systems, University of Southampton, UK
5. IFLS Crop Systems Engineering, University of Southampton, UK
6. School of Environment, Natural Resources and Geography, University of Bangor, UK
7. ADAS, Boxworth, Cambridge CB23 4NN, UK
8. Scotland’s Rural College, Craibstone Estate, Aberdeen AB21 9YA, UK

O502
Reducing grain P concentration in rice through genetic improvement – an option for sustainable P management?
Elke Vandamme 1, Matthias Wissuwa 2, Khady Nani Dramé 1, Mamadou Fofana 3, Ramaiyah Venuprasad 3, Zacharie Segda 4, Ansumana Gibba 5, Damba Jellow 5, Kalimuthu Senthilkumar 1, Terry J. Rose 6, Kazuki Saito 7
1. Africa Rice Center (AfricaRice), Mikocheni B/Kawe, Avocado Street, P.O. Box 33581, Dar es Salaam, Tanzania
2. Japan International Research Center for Agricultural Sciences (JIRCAS), 1-1 Ohwashi, Tsukuba 305-8686, Japan
3. Africa Rice Center (AfricaRice), c/o IITA, PMB 5320 Oyo Road, Ibadan, Nigeria
4. Centre Agricole Polyvalent de Matourkou (CAP-M), B.P. 130 Bobo Dioulasso, Burkina Faso
5. National Agricultural Research Institute (NARI), Brikama, Gambia
6. Southern Cross Plant Science, Southern Cross University, P.O. Box 157, Lismore, NSW 2480, Australia
7. Africa Rice Center (AfricaRice), 01 B.P. 2031, Cotonou, Benin

O503
Trends of phosphorus use efficiency in the food chain of China
Lin Ma 1, Zhaochui Bai 2, Wengi Ma 3, Gerard Velthof 4, Oene Oenema 4, FuSuo Zhang 2
1. Key Laboratory of Agricultural Water Resources, Center for Agricultural Resources Research, Institute of Genetic and Developmental Biology, The Chinese Academy of Sciences, 268 Huazhong Road, Shijiazhuang 050021, Hebei, China
2. Department of Plant Nutrition, China Agricultural University, Key Laboratory of Plant-Soil Interactions, Ministry of Education, Beijing 100094, P. R. China
3. College of Resources and Environmental Sciences, Agricultural University of Hebei, Baoding, 071001, China
4. Alterra, Wageningen University and Research Centre, Wageningen, P.O. Box 47, 6700 AA, The Netherlands

O504
Is P acquisition facilitated by intercropping of durum wheat and grain legumes in field conditions?
Etienne-Pascal Journet 1,2, Laurent Bedoussac 1,3, Elodie Betencourt 4, Julie Campguilhem 1, Philippe Hinsinger 4, Eric Justes 1
1. INRA UMR1248 AGIR, 31320 Castanet-Tolosan, France
2. CNRS, UMR2594 LIPM, 31320 Castanet-Tolosan, France
3. ENFA, 31320 Castanet-Tolosan, France
4. INRA, UMR Eco&Sols, 34060 Montpellier, France

O505
Soil phosphorus and N2 fixation of leguminous trees: consequences for rates and transfer in agroforestry systems
Marney E Isaac 1, Jean-Michel Harmand 2
1. University of Toronto, Department of Physical and Environmental Sciences, 1265 Military Trail, Toronto, Canada M1C 1A4
2. CIRAD, UMR Eco&Sols, 34600 Montpellier, France
Friday, August 29, 2014
11:00-12:00
Oral presentations (cont’d)

O506
Future trends in soil cadmium concentration under current cadmium fluxes to European agricultural soils
Erik Smolders, Laetitia Six
Department of Earth and Environmental Sciences, Division of Soil and Water Management, K.U.Leuven, Kasteelpark Arenberg 20, 3001 Heverlee, Belgium

O507
The potential of agricultural sector waste streams for phosphorus recovery on global scale
Nikolinka G. Shakhramanyan, Uwe A. Schneider, Daniel J. Lang
IETSR, Scharnhorststr. 1, C11.212, 21335 Lüneburg, Fiefstucken 21, Hamburg 22297, Germany

O508
Wet-chemically recovered sewage sludge ash P: high plant availability despite low water solubility
Simone Nanzer 1, Astrid Oberson 1, Stefan Schlumberger 2, Leo Morf 1, Moritz Braun 1, Emmanuel Frossard 1
1. ETH Zürich, Group of Plant Nutrition, 8315, Lindau, Switzerland
2. Canton of Zurich, Office for Waste, Water, Energy and Air, 8090, Zurich, Switzerland
3. P-Mining Team Canton of Zurich, 8125, Zollikon, Switzerland

O509
Bone char as renewable P-fertilizer with cadmium-immobilization by-effect
Peter Leinweber 1, Nina Siebers 2
1. Soil Science, University of Rostock, Justus-von-Liebig-Weg 6, 18059 Rostock, Germany
2. Institute of Crop Science and Resource Conservation, Soil Science and Soil Ecology, University of Bonn, Nussallee 13, 53115 Bonn, Germany

Friday, August 29, 2014
14:30-15:30
Oral presentations (cont’d)

O510
Designer riparian buffers – using plant phylogeny to close the arable agricultural phosphorus (P) cycle
Timothy S. George 1, Lawrie K. Brown 1, Philip J White 1, William M. Roberts 1, Marc I. Stutter 1, Philip M. Haygarth 2
1. The James Hutton Institute, Dundee, DD2 5DA, UK
2. Lancaster Environment Centre, Lancaster University, Lancaster, LA1 4YQ, UK

O511
How to optimize the use of phosphate resources by producing alternative totally acidulated phosphate fertilizers
Luis Prochnow
International Plant Nutrition Institute (IPNI), Av. Independencia 350, Salas 141/142, 13.419-160, Piracicaba, SP, Brasil

O512
Population of native PSM increased by Minjingu PR application and positive impact on crop yields in a Kenyan Ferralsol
Keziah W. Ndong’u-Magiroi, Laetitia Herrmann, John R. Okalebo, Didier Lesueur
CIRAD, UMR Eco&Sols (CIRAD-IRD-INRA-SupAgro), Land Development Department, Office of Science for Land Development, Paholyothin Road, Chatuchak, Bangkok 10900 Thailand

O513
Seedling and adult plant phosphorus uptake and utilization in West and Central African pearl millet inbred lines
Dorcus C. Gemenet 1,2, Charles Thomas Hash 3, Willmar Leiser 1, Bettina I.G Haussmann 1
1. Institute of Plant Breeding, Seed Science and Population Genetics, University of Hohenheim, 70599, Stuttgart, Germany
2. Kenya Agricultural Research Institute, Kakamega P.O. Box 162-50100 Kakamega
3. ICRISAT Sahelian Centre, Niamey, Niger
Theme 5 – Sustainable P use in agroecosystems

Tuesday, August 26, 2014
15:00-16:30

Thursday, August 28, 2014
14:30-16:00

Posters

P501
Grain yield of narrow leafed lupin increased by phosphorus and Bradyrhizobium inoculation in Kenya

Keziah Ndung’u-Magiroi 1, Elikanah M. Nyambati 2, Mary N. Koech 1, William Ayako 2, Japheth M. Wanyama 1, Charles Lusweti 1
1. Kenya Agricultural Research Institute -Kitale P.O. Box 450-30200, Kitale, Kenya
2. Kenya Agricultural Research Institute- Naivasha P.O. Box 25 Naivasha, Kenya

P502
Long-term P dynamic in the Ferralsol of Malagasy highland

Andry Andriamananjara, Marie Paule Razafimanantsoa, Lilia Rabeharisoa
Laboratoire des Radioisotopes-SRA, UR Disponibilité des Nutriments, Route d’Andraisoro, BP 3383, 101 Antananarivo, Madagascar

P503
Earthworms modify soil phosphorus and plant interactions in a Mediterranean legume-cereal intercrop

Mathieu Coulis 1, Laetitia Bernard 1, Frédéric Gérard 2, Philippe Hinsinger 2, Claude Plassard 2, Manon Villeneuve 1, Eric Blanchart 1
1. IRD, UMR Eco&Sols, 2 Place Viala, 34060 Montpellier Cedex 1, France
2. INRA, UMR Eco&Sols, 2 Place Viala, 34060 Montpellier Cedex 1, France

P504
P availability in two different ecosystems: cropping (Kenya) and mixed acacia and eucalyptus plantations (Congo)

Lydie-Stella Koutika 1, Louis Mareschal 1,2, George Ayaga 3, Jean-Pierre Bouillet 2,4, Daniel Epron 1,2,5
1. Centre de Recherche sur la Durabilité et la Productivité des Plantations Industrielles, BP 1291, Pointe-Noire, Congo
2. CIRAD, UMR Eco&Sols, 34060 Montpellier, France
3. Western Kenya Integrated Ecosystem Management Project, KARI, P.O. Box 3613, Kisumu, Kenya
4. Universidade de Sao Paulo, Brazil
5. Université de Lorraine, UMR 1137, Ecologie et Ecophysiologie Forestières, 54500 Vandoeuvre-les-Nancy, France

P505
Natural reactive rock phosphate efficiency when mixed with soluble phosphate for soybean cropped under no-tillage

Ciro A. Rosolem, Danilo S. Almeida
Sao Paulo State University, College of Agricultural Science (UNESP/FCA), Botucatu, Brazil

P506
Phosphorus uptake by rice from organic fertilizers applied to a Ferralsol assessed by isotope technique

Lalajaona Randriamanantsoa 1,2, Emmanuel Frossard 1, Else Bünemann 1, Astrid Oberson 1
1. ETH Zurich, Institute of Agricultural Sciences, Group of Plant Nutrition, 8315 Lindau, Switzerland
2. Laboratoire des Radio-Isotopes, Route d’Andraisoro, BP 3383, 101 Antananarivo, Madagascar

P507
Life Cycle Assessment (LCA) of phosphorus on AVP1 transgenic lettuce

Neng-Iong Chan 1, Roberto A. Gaxiola 1, Amy E. Landis 2, James J. Elser 1
1. Arizona State University, Environmental Life Sciences, School of Life Sciences (SoLS), 85287, Tempe, USA
2. Arizona State University, Fulton Schools of Engineering, 85287, Tempe, USA
P508
Effect of phosphorus and soil on nodulation and production at flowering stage of different small faba bean varieties
K. Daoui 1, H. Masaad 3, M. Karrou 2, R. Mrabet 1, Z.A. Fatemi 1, M. Ouknider 3
1. Institut National de la Recherche Agronomique (INRA), Maroc
2. International Center for Agricultural Research in the Dry Areas
3. Ecole Nationale d’Agriculture de Meknès, Maroc

P509
Pig manure solids and derived char or ash as P fertilizer: Effect of slurry acidification and separation technology
Wibke Christel 1, Sander Bruun 1, Jakob Magid 1, Witold Kwapinski 2, Lars Stoumann Jensen 1
1. Department for Plant and Environmental Sciences, University of Copenhagen, 1871 Frederiksberg C, Denmark
2. Carbolea Research Group, Department of Chemical and Environmental Science, University of Limerick, Limerick, Ireland

P510
Foliar application of Zn improves shoot-grain zinc concentrations of winter wheat decreased by high available P in soil
Chunqin Zhou, Wei Zhang, Yueqiang Zhang, Xinping Chen
Department of Plant Nutrition, Key Laboratory of Plant-Soil Interactions, Ministry of Education, China Agricultural University, Beijing 100193, China Agricultural University, Beijing 100193, China

P511
Development of slow and controlled release P fertiliser using layered double hydroxides
Maarten Everaert 1, Dirk De Vos 1, Erik Smolders 2
1. KU Leuven, Department of Microbial and Molecular Systems, Kasteelpark Arenberg 23 box 2461, 3001 Leuven, Belgium
2. KU Leuven, Department of Earth and Environmental Sciences, Kasteelpark Arenberg 20 box 2459, 3001 Leuven, Belgium

P512
Changes in phosphorus use efficiency and losses in livestock production in China between 1980 and 2010
Zhaohai Bai 1, Lin Ma 2, Wei Qin 3, Oene Oenema 3, Fusuo Zhang 1
1. Department of Plant Nutrition, China Agricultural University, Key Laboratory of Plant-Soil Interactions, Ministry of Education, Beijing 100094, P. R. China
2. Key Laboratory of Agricultural Water Resources, Center for Agricultural Resources Research, Institute of Genetic and Developmental Biology, The Chinese Academy of Sciences, 286 Huazhong Road, Shijiazhuang 050021, Hebei, P. R. China
3. Alterra, Wageningen University and Research Centre, Wageningen, P.O. Box 47, 6700 AA, The Netherlands

P513
Role of cow dung application on soil properties and phosphorus pool in an acid chilean soil
María de la Luz Mora, Rolando Demanet, Marcela Calabi, Gabriela Velasquez, Paola Duran
Scientific and Technological Bioresource Nucleus BIOREN-UFRO

P514
Phosphorus and liming effects on forage production, floristic composition and soil properties in the Campos biome
Tales Tiecher 1, Leandro Bittencourt de Oliveira 2, Danilo Rheinheimer dos Santos 1, Fernando Luiz Ferreira de Quadros 2, Luciano Colpo Gatiboni 3, Gustavo Brunetto 1, João Kaminski 1
1. Department of Soil Science, Universidade Federal de Santa Maria, CEP: 97105-900, Santa Maria, Rio Grande do Sul State, Brazil
2. Department of Animal Science, Universidade Federal de Santa Maria, Santa Maria, Rio Grande do Sul State, Brazil
3. Universidade Estadual de Santa Catarina, CEP 88520-000, Lages, Santa Catarina State, Brazil

P515
Which P inputs are compatible with a sustainable agriculture at short and long-term?
M. Renneson 1, J. Dufey 2, C. Roisin 3, G. Colinet 1
1. University of Liege – Gembloux Agro-Bio Tech, Soil & Water Systems Unit, 5030, Gembloux, Belgium
2. University of Louvain-la-Neuve, Earth and Life Institute, 1348, Louvain-la-Neuve, Belgium
3. Walloon Agricultural Research Center, Agriculture et milieu naturel, 5030, Gembloux, Belgium
P516
Study of Togo’s carbonate-apatite for direct application
F. Koffi Tomety-Mensah, Philippe Sonnet, Joseph Dufey
Université Catholique de Louvain, Earth and Life Institute - Environnemental Sciences, B-1348, Louvain-la-Neuve, Belgium

P517
Phosphorus use efficiency of potato - the influence of maturity type
Siri Caspersen 1, Joakim Ekelöf 1, Ulrika Carlson-Nilsson 2
1. Dep of Biosystems and Technology, Swedish University of Agriculture, SE-230 53 Alnarp, Sweden
2. Dep of Plant Breeding, Swedish University of Agriculture, SE-230 53 Alnarp, Sweden

P518
Nodular diagnosis of contrasting genotypes for rhizospheric phosphorus in Phaseolus vulgaris
Mohamed Lazali 1, 2, Jean-Jacques Drevon 2
2. INRA, UMR Eco&Sols, Place Pierre Viala, 34060 Montpellier, France

P519
Phosphorus in the soil-plant system in long-term field experiment under organic and inorganic soil fertilizing
Gabriela Mühlbachová, Martin Káš, Pavel Čermák
Crop Research Institute, Drnovská 507, CZ-161 06 Prague 6 – Ruzyně, Czech Republic

P520
Sand to soil, best practice for soil amendments and sustainable land management in Australia
Katrina Walton 1, Rajesh Sharma 1, David Allen 2
1. ChemCentre, Resources and Chemistry Precinct, Bentley 6102, Australia
2. MBS Environmental, West Perth 6005, Australia

P521
Phosphorus (P) applied with sewage sludge - distribution on soil P fractions and effect on P adsorption characteristics
Anne Falk Øgaard 1, Tore Krogstad 2
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