

KOMODITAS: KARET

PROQUEST 2006-2010

PLANT PROPAGATION (1 jdl)

Biological characterization of young and aged embryogenic cultures of *Pinus pinaster* (Ait.)/ K Klimaszewska, C Noceda, G Pelletier, P Label, R Rodriguez, M A Lelu-Walter.

In Vitro Cellular & Developmental Biology.: Plant Columbia:Jan/Feb 2009. Vol. 45, Iss. 1, p. 20-33 (14 pp.)

Abstract:

Pinus pinaster (Ait.) somatic embryogenesis (SE) has been developed during the last decade, and its application in tree improvement programs is underway. Nevertheless, a few more or less important problems still exist, which have an impact on the efficiency of specific SE stages. One phenomenon, which had been observed in embryogenic tissue (embryonal mass, EM) initiated from immature seed, has been the loss of the ability to produce mature somatic embryos after the tissue had been cultured for several months. In an attempt to get insight into the differences between young cultures of EM (3-mo-old since the first subculture) of *P. pinaster* that produced mature somatic embryos and the same lines of significantly increased age (18-mo-old, aged EM) that stopped producing mature somatic embryos, we analyzed in both types of materials the levels of endogenous hormones, polyamines, the global DNA methylation, and associated methylation patterns. In addition, we included in the analysis secondary EM induced from mature somatic embryos. The analysis showed that the two tested genotypes displayed inconsistent hormonal and polyamine profiles in EM cultures of a similar phenotype and that it might be difficult to attribute one specific profile to a specific culture phenotype among genotypes. Experiments were also undertaken to determine if the global DNA methylation and/or the resulting methylation pattern could be manipulated by treatment of the cultures with a hypomethylating drug 5-azacytidine (5-azaC). An aged EM was exposed to different concentrations and durations of 5-azaC, and its response in culture was established by fresh mass increases and somatic embryo maturation potential. All of the analyses are new in maritime pine, and thus, they provide the first data on the biochemistry of EM in this species related to embryogenic potential. [PUBLICATION ABSTRACT]

PLANT PHYSIOLOGY AND BIOCHEMISTRY (4 jdl)

Stress and developmental responses of terpenoid biosynthetic genes in *Cistus creticus* subsp. *Creticus*/ Irene Pateraki, Angelos K Kanellis.

Plant Cell Reports. Berlin:Jun 2010. Vol. 29, Iss. 6, p. 629-641

Abstract:

Plants, and specially species adapted in non-friendly environments, produce secondary metabolites that help them to cope with biotic or abiotic stresses. These metabolites could be of great pharmaceutical interest because several of those show cytotoxic, antibacterial or antioxidant activities. Leaves' trichomes of *Cistus creticus* ssp. *creticus*, a Mediterranean xerophytic shrub, excrete a resin rich in several labdane-type diterpenes with verified in vitro and in vivo cytotoxic and cytostatic activity against human cancer cell lines. Bearing in mind the properties and possible future exploitation of these natural products, it seemed interesting to study their biosynthesis and its regulation, initially at the molecular level. For this purpose, genes encoding enzymes participating in the early steps of the terpenoids biosynthetic pathways were isolated and their gene expression patterns were investigated in different organs and in response to various stresses and defence signals. The genes studied were the CcHMGR from the mevalonate pathway, CcDXS and CcDXR from the methylerythritol 4-phosphate pathway and the two geranylgeranyl diphosphate synthases (CcGGDPS1 and 2) previously characterized from this species. The present work indicates that the leaf trichomes are very active biosynthetically as far as it concerns terpenoids biosynthesis, and the terpenoid production from this tissue seems to be transcriptionally regulated. Moreover, the CcHMGR and CcDXS genes (the rate-limiting steps of the isoprenoids' pathways) showed an increase during mechanical wounding and application of defence signals (like meJA and SA), which is possible to reflect an increased need of the plant tissues for the corresponding metabolites.[PUBLICATION ABSTRACT]

Involvement of HbPIP2;1 and HbTIP1;1 Aquaporins in Ethylene Stimulation of Latex Yield through Regulation of Water Exchanges between Inner Liber and Latex Cells in *Hevea brasiliensis* [C][W] / Kessar Tunngoen, Panida Kongsawadworakul, Unchera Viboonjun, Maki Katsuhara, Nicole Brunel, Soulaïman Sakr, Jarunya Narangajavana, Hervé Chrestin.

Plant Physiology. Rockville: Oct 2009. Vol. 151, Iss. 2, p. 843-56 (14 pp.)

Abstract:

Natural rubber is synthesized in specialized articulated cells (laticifers) located in the inner liber of *Hevea brasiliensis*. Upon bark tapping, the laticifer cytoplasm (latex) is expelled due to liber tissue turgor pressure. In mature virgin (untapped) trees, short-term kinetic studies confirmed that ethylene, the rubber yield stimulant used worldwide, increased latex yield, with a concomitant decrease in latex total solid content, probably through water influx in the laticifers. As the mature laticifers are devoid of plasmodesmata, the rapid water exchanges with surrounding liber cells probably occur via the aquaporin pathway. Two full-length aquaporin cDNAs (HbPIP2;1 and HbTIP1;1, for plasma membrane intrinsic protein and tonoplast intrinsic protein, respectively) were cloned and characterized. The higher efficiency of HbPIP2;1 than HbTIP1;1 in increasing plasmalemma water conductance was verified in *Xenopus laevis* oocytes. HbPIP2;1 was insensitive to HgCl₂. In situ hybridization demonstrated that HbPIP2;1 was expressed in all liber tissues in the young stem, including the laticifers. HbPIP2;1 was up-regulated in both liber tissues and laticifers, whereas HbTIP1;1 was down-

regulated in liber tissues but up-regulated in laticifers in response to bark Ethrel treatment. Ethylene-induced HbPIP2;1 up-regulation was confirmed by western-blot analysis. The promoter sequences of both genes were cloned and found to harbor, among many others, ethylene-responsive and other chemical-responsive (auxin, copper, and sulfur) elements known to increase latex yield. Increase in latex yield in response to ethylene was emphasized to be linked with water circulation between the laticifers and their surrounding tissues as well as with the probable maintenance of liber tissue turgor, which together favor prolongation of latex flow.

The Influence of Drying Temperature on the Hygroscopicity of Rubberwood (Hevea Brasiliensis) /Hueishing Sik, Khengten Choo, Sarani Zakaria, Sahrim Ahmad, Maisarah

Yusoff, Chinhua Chia.

Journal of Agricultural Science. Toronto:Mar 2010. Vol. 2, Iss. 1, p. 48-58 (11 pp.)

Abstract:

The influence of drying temperature on the hysteresis effect of rubberwood is determined in this study. Results showed reductions in sorption capacity of rubberwood dried at high temperatures as compared to the control conventional temperature dried material at respective corresponding set conditions. The reduction of the hygroscopicity of rubberwood is a combined effect of both physical, morphological structure and chemical composition as affected by the drying temperature. This improvement is found to be primarily attributed to the (i) hysteresis effect enhanced by increased drying temperature, (ii) loss of hygroscopic hemicelluloses, and (iii) rearrangement/ degradation of amorphous cellulose content in the cell wall. [PUBLICATION ABSTRACT]

Sucrose importation into laticifers of Hevea brasiliensis, in relation to ethylene stimulation of latex production /Anaïs Dusotoit-coucaud, Nicole Brunel, Panida Kongsawadworakul, Unchera Viboonjun, André Lacoite, Jean-louis Julien, Hervé Chrestin, Soulaïman Sakr.

Annals of Botany. Oxford:Sep 2009. Vol. 104, Iss. 4, p. 635-47 (13 pp.)

Background and Aims

The major economic product of Hevea brasiliensis is a rubber-containing cytoplasm (latex), which flows out of laticifers (latex cells) when the bark is tapped. The latex yield is stimulated by ethylene. Sucrose, the unique precursor of rubber synthesis, must cross the plasma membrane through specific sucrose transporters before being metabolized in the laticifers. The relative importance of sucrose transporters in determining latex yield is unknown. Here, the effects of ethylene (by application of Ethrel®) on sucrose transporter gene expression in the inner bark tissues and latex cells of H. brasiliensis are described.

Methods: Experiments, including cloning sucrose transporters, real time RT-PCR and in situ hybridization, were carried out on virgin (untapped) trees, treated or untreated with the latex yield stimulant Ethrel. Key Results Seven putative full-length cDNAs of sucrose transporters were cloned from a latex-specific cDNA library. These transporters belong

to all SUT (sucrose transporter) groups and differ by their basal gene expression in latex and inner soft bark, with a predominance of HbSUT1A and HbSUT1B . Of these sucrose transporters, only HbSUT1A and HbSUT2A were distinctly increased by ethylene. Moreover, this increase was shown to be specific to laticifers and to ethylene application.

Conclusion: The data and all previous information on sucrose transport show that HbSUT1A and HbSUT2A are related to the increase in sucrose import into laticifers, required for the stimulation of latex yield by ethylene in virgin trees.

BACKGROUND AND AIMS: The major economic product of *Hevea brasiliensis* is a rubber-containing cytoplasm (latex), which flows out of laticifers (latex cells) when the bark is tapped. The latex yield is stimulated by ethylene. Sucrose, the unique precursor of rubber synthesis, must cross the plasma membrane through specific sucrose transporters before being metabolized in the laticifers. The relative importance of sucrose transporters in determining latex yield is unknown. Here, the effects of ethylene (by application of Ethrel on sucrose transporter gene expression in the inner bark tissues and latex cells of *H. brasiliensis* are described. METHODS: Experiments, including cloning sucrose transporters, real time RT-PCR and in situ hybridization, were carried out on virgin (untapped) trees, treated or untreated with the latex yield stimulant Ethrel. KEY RESULTS: Seven putative full-length cDNAs of sucrose transporters were cloned from a latex-specific cDNA library. These transporters belong to all SUT (sucrose transporter) groups and differ by their basal gene expression in latex and inner soft bark, with a predominance of HbSUT1A and HbSUT1B. Of these sucrose transporters, only HbSUT1A and HbSUT2A were distinctly increased by ethylene. Moreover, this increase was shown to be specific to laticifers and to ethylene application. CONCLUSION: The data and all previous information on sucrose transport show that HbSUT1A and HbSUT2A are related to the increase in sucrose import into laticifers, required for the stimulation of latex yield by ethylene in virgin trees.

PLANT PHYSIOLOGY-NUTRITION (3 jdl)

The green fluorescent protein as an efficient selection marker for *Agrobacterium tumefaciens*-mediated transformation in *Hevea brasiliensis* (Müll. Arg)/ J Leclercq, L Lardet, F Martin, T Chapuset, G Oliver, P Montoro.

Plant Cell Reports. Berlin: May 2010. Vol. 29, Iss. 5, p. 513-522

Abstract:

An efficient genetic transformation procedure using a recombinant green fluorescent protein (GFP) has been developed in *Hevea brasiliensis* clone PB260. Transformation experiments have been performed using an *Agrobacterium tumefaciens* binary vector harbouring both *uidA* and S65T-GFP reporter genes in order to compare selection methods using glucuronidase assay (GUS activity) and paromomycin resistance, GFP activity and paromomycin resistance, or GFP activity only. At transient level, the number of spots showing GUS or GFP activities was similar for 4 and 5 days after coculture. After selection, stable transformation events were observed and led to

the establishment of transgenic callus lines. A higher number of lines were generated with GFP selection compared to the GUS one. GFP selection is less time-consuming in terms of callus subculturing, and offers the possibility of producing antibiotic resistance marker-free transgenic plants.[PUBLICATION ABSTRACT]

Polyphenoloxidase Silencing Affects Latex Coagulation in *Taraxacum* Species1[W]
/Daniela Wahler, Christian Schulze Gronover, Carolin Richter, Florence Foucu, Richard M Twyman, Bruno M Moerschbacher, Rainer Fischer, Jost Muth, Dirk Prüfer.
Plant Physiology. Rockville:Sep 2009. Vol. 151, Iss. 1, p. 334-46 (13 pp.)

Abstract:

Latex is the milky sap that is found in many different plants. It is produced by specialized cells known as laticifers and can comprise a mixture of proteins, carbohydrates, oils, secondary metabolites, and rubber that may help to prevent herbivory and protect wound sites against infection. The wound-induced browning of latex suggests that it contains one or more phenol-oxidizing enzymes. Here, we present a comprehensive analysis of the major latex proteins from two dandelion species, *Taraxacum officinale* and *Taraxacum kok-saghyz*, and enzymatic studies showing that polyphenoloxidase (PPO) is responsible for latex browning. Electrophoretic analysis and amino-terminal sequencing of the most abundant proteins in the aqueous latex fraction revealed the presence of three PPO-related proteins generated by the proteolytic cleavage of a single precursor (pre-PPO). The laticifer-specific pre-PPO protein contains a transit peptide that can target reporter proteins into chloroplasts when constitutively expressed in dandelion protoplasts, perhaps indicating the presence of structures similar to plastids in laticifers, which lack genuine chloroplasts. Silencing the PPO gene by constitutive RNA interference in transgenic plants reduced PPO activity compared with wild-type controls, allowing *T. kok-saghyz* RNA interference lines to expel four to five times more latex than controls. Latex fluidity analysis in silenced plants showed a strong correlation between residual PPO activity and the coagulation rate, indicating that laticifer-specific PPO plays a major role in latex coagulation and wound sealing in dandelions. In contrast, very little PPO activity is found in the latex of the rubber tree *Hevea brasiliensis*, suggesting functional divergence of latex proteins during plant evolution.

Histochemical study of detailed laticifer structure and rubber biosynthesis-related protein localization in *Hevea brasiliensis* using spectral confocal laser scanning microscopy /Tomoki Sando, Tatsushi Hayashi, Tsuyoshi Takeda, Yasunori Akiyama, Yoshihisa Nakazawa, Eiichiro Fukusaki, Akio Kobayashi.

Planta. Berlin:Jun 2009. Vol. 230, Iss. 1, p. 215-25

Abstract:

In *Hevea brasiliensis*, laticifers produce and accumulate rubber particles. Despite observation using histochemical methods, development stage structure and structures with ceasing functions have rarely been described. Spectral confocal laser scanning microscopy with Nile red staining simplifies laticifer structure observation in tangential sections while enhancing the resolution. Laticifer and ray images were extracted from

unmixed images and used to monitor changes during growth. A laticifer network structure developed from increased anastomoses between adjoining laticifers outside of the conducting phloem, but because of increased radial division and growth of rays, the network structure ruptured and disintegrated. We also investigated immunohistochemical localization of two rubber particle-associated proteins in the laticifers: small rubber particle protein (SRPP) and rubber elongation factor (REF). Mature bark test results show that SRPP is localized only in the laticifer layers in the conducting phloem; REF is localized in all laticifer layers. Because SRPP plays a positive role in rubber biosynthesis, results show that the rubber biosynthesis capability of laticifers is concentrated where rays and the sieve tube actively transport metabolites. In *Hevea brasiliensis*, laticifers produce and accumulate rubber particles. Despite observation using histochemical methods, development stage structure and structures with ceasing functions have rarely been described. Spectral confocal laser scanning microscopy with Nile red staining simplifies laticifer structure observation in tangential sections while enhancing the resolution. Laticifer and ray images were extracted from unmixed images and used to monitor changes during growth. A laticifer network structure developed from increased anastomoses between adjoining laticifers outside of the conducting phloem, but because of increased radial division and growth of rays, the network structure ruptured and disintegrated. We also investigated immunohistochemical localization of two rubber particle-associated proteins in the laticifers: small rubber particle protein (SRPP) and rubber elongation factor (REF). Mature bark test results show that SRPP is localized only in the laticifer layers in the conducting phloem; REF is localized in all laticifer layers. Because SRPP plays a positive role in rubber biosynthesis, results show that the rubber biosynthesis capability of laticifers is concentrated where rays and the sieve tube actively transport metabolites. Removal of Hexavalent Chromium-Contaminated Water and Wastewater: A Review

PLANT PHYSIOLOGY-GROWTH AND DEVELOPMENT (3 jdl)

Effects of corn (*Zea mays* L.) on the local and overall root development of young rubber tree (*Hevea brasiliensis* Muel. Arg)/ Santimaitree Gonkhamdee, Alain Pierret, Jean-Luc Maeght, Valérie Serra, Krirk Pannengpetch, Claude Doussan, Loic Pagès. ***Plant and Soil***. The Hague: Sep 2010. Vol. 334, Iss. 1-2, p. 335-351

Abstract:

Understanding better the interactions between root systems in associated crops is significant for basic knowledge in plant science and to help designing cropping systems. Current research on inter-specific root interactions concentrates on static descriptions of the horizontal extension of root systems or on the dynamics of provoked root encounters. This study considers detailed observations of the dynamics of inter-specific root interactions, in the vertical plane, at both the whole root system and the individual root levels. Corn and young rubber trees were grown in association in artificial conditions that excluded the possibility of competition for resources, using rhizoboxes, i.e. thin containers with a transparent wall. The paper presents novel approaches, such as the study of root system growth trajectories, to document root system development in

terms of overall growth rate, colonization of soil space and individual root growth patterns. It was found that (i) corn roots developed towards rubber roots until a contact was established, (ii) rubber roots expanded faster and more vertically in association with corn, (iii) the expansion rates of both root systems varied concomitantly and (iv) inter-specific root encounters resulted in reduced elongation rates in both species. Implications of these results for corn/rubber inter-cropping are discussed. This work advocates in favour of a better understanding of under-ground facilitative effects between species. If understood enough to be manipulated, such knowledge might become a powerful tool for the design of more sustainable and efficient cropping systems.[PUBLICATION ABSTRACT]

Constitutive expression of CaSRP1, a hot pepper small rubber particle protein homolog, resulted in fast growth and improved drought tolerance in transgenic Arabidopsis plant/
Eun Yu Kim, Young Sam Seo, Hanna Lee, Woo Taek Kim.

Planta. Berlin:Jun 2010. Vol. 232, Iss. 1, p. 71-83

Abstract:

Transient and long-term shortages of fresh water are major adverse environmental factors that cause dramatic reductions in crop production and distribution globally. In this study, we isolated a full-length CaSRP1 (Capsicum annum stress-related protein 1) cDNA, which was rapidly induced by dehydration in hot pepper plants. The predicted CaSRP1 protein sequence exhibited significant amino acid identity to putative stress-related proteins and the small rubber particle protein (SRPP) found in rubber trees (*Hevea brasiliensis*). To study the cellular functions of CaSRP1, transgenic Arabidopsis plants (35S:CaSRP1) that constitutively expressed the CaSRP1 gene were constructed. Overexpression of CaSRP1 resulted in enhanced root and shoot growth and earlier bolting in the transgenic plants relative to wild-type plants. In addition, 35S:CaSRP1 overexpressors exhibited enhanced tolerance to drought stress as compared to the control plants. These results suggest that CaSRP1 plays dual functions as a positive factor for tissue growth and development and for drought-defensive responses. A possible cellular function of SRPP homologs in non-rubber-producing plants in relation to drought stress tolerance is discussed.[PUBLICATION ABSTRACT]

Active root distribution pattern of *Hevea brasiliensis* determined by radioassay of latex serum /Sherin George, P R Suresh, P A Wahid, Ramesh B Nair, K I Punnoose.

Agroforestry Systems. The Hague:Jun 2009. Vol. 76, Iss. 2, p. 275-281

Issue Title: Agroforestry for Commodity Production: Ecological and Social Dimensions

Abstract:

The active root distribution pattern of mature rubber (*Hevea brasiliensis* Muell. Arg.) up to a lateral distance of 250 cm from the tree and to a soil depth of 90 cm was studied in an oxisol by employing ³²P soil injection technique in Kerala, the state which accounts for 83% of rubber cultivation in India. The trees were aged 18 years and grown at a spacing of 4.9 × 4.9 m. The extent of absorption of applied ³²P by the tree from various placements was assessed by radio assay of leaf and latex serum. Latex serum registered higher counts and variability was less compared to leaf indicating the

suitability of latex serum as a potential source for radio assay for ^{32}P studies in rubber. The results revealed that rubber is a surface feeder with 55% of the root activity confining to the top 10 cm of soil layer. Root activity declined with increasing depths and the concentration of physiologically active roots at 90 cm depth was only 6%. A more or less uniform distribution of root activity was noticed with respect to lateral distance indicating more extensive spread of lateral roots. Concentration of physiologically active roots in the surface layer suggests the possibility for competition under intercropped situation in mature plantations. [PUBLICATION ABSTRACT]

PLANT DISEASES (4 jdl)

Single-chain variable fragments antibody specific to *Corynespora cassiicola* toxin, cassiicolin, reduces necrotic lesion formation in *Hevea brasiliensis*/ E Sunderasan, Rusni A Kadir, Valérie Pujade-Renaud, Frédéric de Lamotte, H Y Yeang, Sheila Nathan.

Journal of General Plant Pathology : JGPP. Tokyo:Feb 2009. Vol. 75, Iss. 1, p. 19-26 (8 pp.)

Abstract:

Corynespora leaf disease poses a serious threat to rubber cultivation because infected leaves develop necrotic lesions and abscise, leaving the tree unproductive. The destructiveness of *Corynespora cassiicola* has been largely attributed to cassiicolin, a protein toxin secreted by the fungus. Recombinant antibody technology offers hope to curtail the disease whereby single-chain variable fragments (scFv) specific to cassiicolin could bind and deactivate the toxin in genetically modified rubber trees that harbour the antibody gene. A scFv phage library was constructed from heavy and light variable chains of IgG from cassiicolin immunized Balb/C mice spleen. Biopanning of the phage library yielded a scFv clone with high specificity to cassiicolin. The nucleotide sequence and deduced amino acid sequence information of the scFv were obtained. Hemagglutinin (HA)-tagged scFv expressed in *Escherichia coli* is discerned as a band at ca. 30 kDa on SDS-PAGE, and the corresponding band was detected by anti-HA IgG on a Western immunoblot. Deactivation of cassiicolin by the affinity-purified scFv was demonstrated in a detached-leaf bio-assay on selected susceptible *Hevea* clones (PB 260, RRIM 2020, RRIM 901 and RRIM 929). The assay was also performed on clones that are relatively more resistant to the fungus (RRIM 600 and GT-1), and the results were as expected. Thus, we have successfully demonstrated that the cassiicolin-specific scFv can effectively reduce cassiicolin toxicity. [PUBLICATION ABSTRACT]

Involvement of the Pepper Antimicrobial Protein CaAMP1 Gene in Broad Spectrum Disease Resistance1[C][OA]/ Sung Chul Lee, In Sun Hwang, Hyong Woo Choi, Byung Kook Hwang.

Plant Physiology. Rockville:Oct 2008. Vol. 148, Iss. 2, p. 1004-20 (17 pp.)

Abstract:

Pathogen-inducible antimicrobial defense-related proteins have emerged as key antibiotic peptides and enzymes involved in disease resistance in plants. A novel

antimicrobial protein gene, CaAMP1 (for *Capsicum annuum* ANTIMICROBIAL PROTEIN1), was isolated from pepper (*C. annuum*) leaves infected with *Xanthomonas campestris* pv *vesicatoria*. Expression of the CaAMP1 gene was strongly induced in pepper leaves not only during pathogen infection but also after exposure to abiotic elicitors. The purified recombinant CaAMP1 protein possessed broad-spectrum antimicrobial activity against phytopathogenic bacteria and fungi. CaAMP1:smGFP fusion protein was localized mainly in the external and intercellular regions of onion (*Allium cepa*) epidermal cells. The virus-induced gene silencing technique and gain-of-function transgenic plants were used to determine the CaAMP1 gene function in plant defense. Silencing of CaAMP1 led to enhanced susceptibility to *X. campestris* pv *vesicatoria* and *Colletotrichum coccodes* infection, accompanied by reduced PATHOGENESIS-RELATED (PR) gene expression. In contrast, overexpression of CaAMP1 in *Arabidopsis* (*Arabidopsis thaliana*) conferred broad-spectrum resistance to the hemibiotrophic bacterial pathogen *Pseudomonas syringae* pv *tomato*, the biotrophic oomycete *Hyaloperonospora parasitica*, and the fungal necrotrophic pathogens *Fusarium oxysporum* f. sp. *matthiolae* and *Alternaria brassicicola*. CaAMP1 overexpression induced the salicylic acid pathway-dependent genes PR1 and PR5 but not the jasmonic acid-dependent defense gene PDF1.2 during *P. syringae* pv *tomato* infection. Together, these results suggest that the antimicrobial CaAMP1 protein is involved in broad-spectrum resistance to bacterial and fungal pathogen infection.

Brassica juncea chitinase BjCHI1 inhibits growth of fungal phytopathogens and agglutinates Gram-negative bacteria/ Yuanfang Guan, Sathishkumar Ramalingam, Dinesh Nagegowda, Paul W. J. Taylor, Mee-len Chye.

Journal of Experimental Botany. Oxford:Sep 2008. Vol. 59, Iss. 12, p. 3475-3484
Abstract:

Brassica juncea BjCHI1 is a plant chitinase with two chitin-binding domains. Its expression, induced in response to wounding, methyl jasmonate treatment, *Aspergillus niger* infection, and caterpillar *Pieris rapae* feeding, suggests that it plays a role in defence. In this study, to investigate the potential of using BjCHI1 in agriculture, Pichia-expressed BjCHI1 and its deletion derivatives that lack one or both chitin-binding domains were tested against phytopathogenic fungi and bacteria. Transplastomic tobacco expressing BjCHI1 was also generated and its extracts assessed. In radial growth-inhibition assays, BjCHI1 and its derivative with one chitin-binding domain showed anti-fungal activities against phytopathogens, *Colletotrichum truncatum*, *C. acutatum*, *Botrytis cinerea*, and *Ascochyta rabiei*. BjCHI1 also inhibited spore germination of *C. truncatum*. Furthermore, BjCHI1, but not its derivatives lacking one or both domains, inhibited the growth of Gram-negative bacteria (*Escherichia coli*, *Ralstonia solanacearum*, *Pseudomonas aeruginosa*) more effectively than Gram-positive bacteria (*Micrococcus luteus* and *Bacillus megaterium*), indicating that the duplicated chitin-binding domain, uncommon in chitinases, is essential for bacterial agglutination. Galactose, glucose, and lactose relieved agglutination, suggesting that BjCHI1 interacts with the carbohydrate components of the Gram-negative bacterial cell wall. Retention of chitinase and bacterial agglutination activities in transplastomic tobacco extracts implicates that BjCHI1 is potentially useful against both fungal and bacterial phytopathogens in agriculture.

Morphological and Inter Simple Sequence Repeat (ISSR) Markers Analyses of *Corynespora cassiicola* Isolates from Rubber Plantations in Malaysia/ Nguyen Anh Nghia, Jugah Kadir, E Sunderasan, Mohd Puad Abdullah, Adam Malik, Suhaimi Napis.

Mycopathologia. Dordrecht:Oct 2008. Vol. 166, Iss. 4, p. 189-201 (13 pp.)

Abstract:

Morphological features and Inter Simple Sequence Repeat (ISSR) polymorphism were employed to analyse 21 *Corynespora cassiicola* isolates obtained from a number of Hevea clones grown in rubber plantations in Malaysia. The *C. cassiicola* isolates used in this study were collected from several states in Malaysia from 1998 to 2005. The morphology of the isolates was characteristic of that previously described for *C. cassiicola*. Variations in colony and conidial morphology were observed not only among isolates but also within a single isolate with no inclination to either clonal or geographical origin of the isolates. ISSR analysis delineated the isolates into two distinct clusters. The dendrogram created from UPGMA analysis based on Nei and Li's coefficient (calculated from the binary matrix data of 106 amplified DNA bands generated from 8 ISSR primers) showed that cluster 1 encompasses 12 isolates from the states of Johor and Selangor (this cluster was further split into 2 sub clusters (1A, 1B), sub cluster 1B consists of a unique isolate, CKT05D); while cluster 2 comprises of 9 isolates that were obtained from the other states. Detached leaf assay performed on selected Hevea clones showed that the pathogenicity of representative isolates from cluster 1 (with the exception of CKT05D) resembled that of race 1; and isolates in cluster 2 showed pathogenicity similar to race 2 of the fungus that was previously identified in Malaysia. The isolate CKT05D from sub cluster 1B showed pathogenicity dissimilar to either race 1 or race 2. [PUBLICATION ABSTRACT]

SOIL CHEMISTRY (1 jdl)

Sorption Behaviors of Sodium Dodecylbenzene Sulfonate (SDBS) on Marine Sediments/ Xin-Xin Li, Gui-Peng Yang, Xiao-Yan Cao.

Water, Air and Soil Pollution. Dordrecht:Oct 2008. Vol. 194, Iss. 1-4, p. 23-30

Abstract:

The sorption behavior of sodium dodecylbenzene sulfonate (SDBS), an anionic surfactant, on marine sediments was systematically investigated. The experimental results showed that 100 min was required for the adsorption equilibrium. For the sediments treated by HCl and H₂O, sorption behavior of SDBS was fit with linear isotherm very well over the concentration range studied at 298 K. The sorption occurred primarily due to partition function of hydrophobic chains into organic carbon of sediments. Sorption of SDBS on H₂O₂-treated sediments was satisfactorily fit with Freundlich isotherm model and mainly through surface function of clay minerals in the sediment. The sorption was favorably influenced by the increased salinity, decreased pH and decreased temperature of seawater. [PUBLICATION ABSTRACT]

SOIL BIOLOGY (2 jdl)

Limited response to nursery-stage mycorrhiza inoculation of *Shorea* seedlings planted in rubber agroforest in Jambi, Indonesia / Hesti L Tata, Meine van Noordwijk, Richard Summerbell, Marinus J A Werger.

New Forests. Dordrecht:Jan 2010. Vol. 39, Iss. 1, p. 51-74

Abstract:

We transplanted *Shorea selanica* and *Shorea lamellata* seedlings that either had or had not received ectomycorrhiza (*EcM*) *Scleroderma columnare* inoculum, commercially available and prescribed as standard practice in nursery, into rubber gardens of different age and plot history. The objective was to assess whether or not absence of fungal inoculants restricted seedling survival, growth, nutrient uptake and *EcM* formation in the first 2 years after out-planting in Jambi. Inoculation with *EcM* fungi in nursery had only limited positive effects on growth in height and diameter or N and P uptake, but it enhanced survival in the period 6-24 months after outplanting in all plots. With or without nursery stage inoculation, *S. selanica* and *S. lamellata* can be used for enrichment planting or reforestation in Sumatra as the species respond well to high light intensities. Presence of up to five morphotypes of *EcM* confirmed the availability of inoculum also in second generation rubber agroforests. Internal transcribe spacer sequencing revealed no *S. columnare* could be identified from the ectomycorrhizal roots of *S. lamellata* and *S. selanica*. [PUBLICATION ABSTRACT]

Facilitated legume nodulation, phosphate uptake and nitrogen transfer by arbuscular inoculation in an upland rice and mung bean intercropping system/ Yuefeng Li, Wei Ran, Ruiping Zhang, Shubin Sun, Guohua Xu.

Plant and Soil. The Hague:Feb 2009. Vol. 315, Iss. 1-2, p. 285-296

Abstract:

Issue Title: Processes, mechanisms and utilization of organic soils Intercropping of upland rice with short-duration grain legumes has major advantages in increasing crop yields and soil productivity. However, the contribution of arbuscular mycorrhizas, the common mutualistic symbiosis between most crops and mycorrhizal fungi, is not fully understood in intercropping systems. We assayed the contribution of inoculation of the arbuscular mycorrhizal fungus (AMF) *Glomus caledonium* on nutrient acquisition and biomass yield. Using the method of plastic film and nylon net partition and tracing ¹⁵N transferred between the intercropped upland rice (*Oryza sativa* ssp. Japonica Nipponbare) and mung bean (*Vigna radiata* L. Chuanyuan), we compared the intercropping, with separation of the whole root systems by a plastic film, with and without a barrier of nylon net to allow penetration of the fungal hyphae. Intercropping significantly improved the formation of arbuscular mycorrhizas, particularly in the upland rice roots. The improved formation of mycorrhizas by the intercropping increased total P uptake by 57% in rice, total P and N acquisition by 65% and 64% respectively in mung bean, and nodulation by 54% in mung bean. The percentage of total ¹⁵N transfer from mung bean to rice leaves was increased from 5.4% to 15.7% by inoculation with AMF.

In contrast, there was only 2.7% of ^{15}N transfer from rice to mung bean and no AMF effect on N transfer. It is concluded that cereal and legume crop intercropping increase mycorrhiza formation, which in turn improves nodulation, N and P acquisition and N transfer in the legumes. [PUBLICATION ABSTRACT]