KOMODITAS: KELAPA SAWIT

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CROP HUSBANDRY (5 jdl)

Addressing the threats to biodiversity from oil-palm agriculture /David S Wilcove, Lian Pin Koh.
Biodiversity & Conservation. London:Apr 2010. Vol. 19, Iss. 4, p. 999-1007
Issue Title: Special Issue: Conserving Southeast Asia's Imperiled Biodiversity - Scientific, Management, and Policy Challenges/ Guest Edited by Lian Pin Koh and Navjot S. Sodhi

Abstract:

Oil-palm agriculture is the greatest immediate threat to biodiversity in Southeast Asia. Despite the efforts of environmentalists, oil palm continues to expand across the tropics. Those concerned about the impacts of oil palm on biodiversity must face some harsh social, economic, and ecological realities: (i) oil palm has been a very profitable crop; (ii) palm oil is used in so many products that simple, direct actions, such as boycotts, are unlikely to succeed; (iii) there is currently insufficient demand for certified sustainable palm oil and inadequate political clout from environmental groups in two of the biggest markets for palm oil--China and India--to slow the rate of forest conversion; and (iv) oil-palm agriculture has improved the lives of poor rural communities in Southeast Asia (although it has also disenfranchised some indigenous communities). To address the threats posed by oil-palm agriculture to biodiversity, environmentalists must change the behavior of the palm oil business through: (i) regulations to curb undesirable activities (e.g., a ban on converting forests to oil palm); (ii) financial incentives to promote desirable behavior (e.g., production of certified, sustainable oil palm); (iii) financial disincentives designed to discourage undesirable behavior (e.g., consumer pressure on major manufacturers and retailers to use palm oil that does not come from plantations created at the expense of forests); and (iv) the promotion of alternative, more biodiversity-friendly uses of forested land that might otherwise be converted to oil palm. There is no single best approach for dealing with the oil-palm crisis in Southeast Asia; a mixture of regulations, incentives, and disincentives targeted at all sectors of the oil-palm industry is necessary to protect the region's rapidly disappearing forests.[PUBLICATION ABSTRACT]

The livelihood impacts of oil palm: smallholders in Indonesia Lucy Rist, Laurène Feintrenie, Patrice Levang.
Biodiversity & Conservation. London:Apr 2010. Vol. 19, Iss. 4, p. 1009-1024
Issue Title: Special Issue: Conserving Southeast Asia's Imperiled Biodiversity - Scientific, Management, and Policy Challenges/ Guest Edited by Lian Pin Koh and Navjot S. Sodhi

Abstract:

The biodiversity and climate consequences of oil palm (Elaeis guineensis) expansion across South East Asia have received considerable attention. The human side of the issue, highlighted with reports of negative livelihood outcomes and rights abuses by oil palm companies, has also led to controversy. Oil palm related conflicts have been widely documented in Indonesia yet uptake by farmers has also been extensive. An assessment of the livelihood impacts of oil palm development, including sources of conflict, is needed to shed light on the apparent contradiction between these reports and the evident enthusiasm of farmers to join the oil palm craze thereby informing future expansion. We assessed the impact of oil palm development on the economic wellbeing of rural farmers in Indonesia. We found that many smallholders have benefited substantially from the higher returns to land and labour afforded by oil palm but district authorities and smallholder cooperatives play key roles in the realisation of benefits. Conflicts between communities and companies have resulted almost entirely from lack of transparency, the absence of free, prior, and informed consent and unequal benefit sharing, and have been exacerbated by the absence of clear land rights. We make specific recommendations to improve the present situation and foster the establishment of smallholder friendly production regimes. Oil palm expansion in Indonesia is set to continue. If environmental standards can be raised and policy interventions targeted at the broader social impacts of land development this expansion may be achieved to the significant benefit of large numbers of rural smallholders.[PUBLICATION ABSTRACT]

Fuelling the biodiversity crisis: species loss of ground-dwelling forest ants in oil palm plantations in Sabah, Malaysia (Borneo) Carsten A Brühl, Thomas Eltz.
Biodiversity & Conservation. London:Feb 2010. Vol. 19, Iss. 2, p. 519-529
Issue Title: Special Issue: Tropical Islands Biodiversity Crisis: The Indo-West Pacific/ Guest edited by David J.W. Lane

Abstract:

Oil palm plantations today cover large areas of former tropical lowland rain forest in Southeast Asia and are rapidly expanding on the island of Borneo. Study of the community of ground-dwelling ants in different plantations in Sabah, Malaysia, over 2 years using tuna baiting, revealed that the oil palm plantation ground ant community was severely reduced in species richness in comparison to the forest interior, regardless of age, undergrowth cover, or proximity to neighbouring forest. The results indicate that oil palm plantation habitats, now covering more than 15% of Sabah's land area, can sustain only about 5% of the ground-dwelling ant species of the forest interior. Nine of the 23 ant species baited in the plantations were never recorded inside forest. All numerically dominant ants were non-forest species. The most common species was Anoplolepis gracilipes, an invasive species present at 70% of all bait sites and known to cause 'ecological meltdowns' in other situations. The low frequency and species number of forest ground ants indicates that oil palm plantations act as effective dispersal barriers leading to community isolation in rain forest remnants. The replacement of natural forests with oil palm plantations poses a serious threat to the

conservation of biodiversity on Borneo if similar results are confirmed in other taxa.[PUBLICATION ABSTRACT]

The orangutan-oil palm conflict: economic constraints and opportunities for conservation /Hemanath Swarna Nantha, Clem Tisdell.
Biodiversity & Conservation. London:Feb 2009. Vol. 18, Iss. 2, p. 487-502
Abstract:

The future of the orangutan (Pongo spp.) is far from secure despite the species' high profile and media attention. The traditional threat to the orangutan has been widespread logging, but the continuing conversion of remaining habitat for oil palm (Elaeis guineensis) cultivation is hastening its extinction in the wild. This situation is driven by a robust global market for palm oil as a vegetable oil and biofuel. In tackling this conservation problem, therefore, economic factors cannot be overlooked. This article analyses these factors and how they curtail effective orangutan conservation. Of significance are the high opportunity costs of orangutan conservation and market failures associated with the public-goods nature of the orangutan's forest habitat. Conservationists should consider these constraints when formulating remedial action. This article assesses strategies that reduce the opportunity cost of conserving habitat (via supply-side approaches that divert oil palm cultivation away from forests) and enhance the realisable value of orangutan habitat (by capitalising on the demand for non-market values such as carbon storage). It is concluded that the former group of strategies are likely to have limited effect on curtailing deforestation, but with the right institutional policies in place they can act as stopgaps while strategies involving carbon financing and payments for biodiversity develop sufficiently to render habitat retention financially competitive. [PUBLICATION ABSTRACT]

Multi-year assessment of Unilever's progress towards agricultural sustainability II: outcomes for peas (UK), spinach (Germany, Italy), tomatoes (Australia, Brazil, Greece, USA), tea (Kenya, Tanzania, India) and oil palm (Ghana) /J Pretty, G Smith, K W T Goulding, S J Groves, I Henderson, R E Hine, V King, J van Oostrum, D J Pendlington, J K Vis, C Walter.
International Journal of Agricultural Sustainability. London:2008. Vol. 6, Iss. 1, p. 63-88 (26 pp.)
Abstract:

The foods, home and personal care company, Unilever, is a large user of raw materials from agriculture, and a major buyer of goods on world markets. The continued supply of these materials is seen as an important component in the business's long-term success. The company has a long history of seeking to farm responsibly on company farms and for directly contracted raw materials, but it became clear that an approach based solely on suppliers' good agricultural practice would not safeguard supplies where increasing social and environmental pressures on agriculture were growing, or where increasing consumer concerns about the food chain could undermine markets and brands. Both threats suggested the need for a more radical approach. This resulted in the development of a mission statement, the

agreement of four principles for sustainable agriculture, the identification of ten sustainable agriculture indicators (later 11), and the selection of five key crops the sustainable supply of which was significant to the company. This paper summarizes progress towards the sustainable supply of these crops by reporting on selected sustainability indicators for the crops (peas, spinach, tomatoes, tea and oil palm) in 11 countries. Some of the businesses using these products have been subsequently sold, but these are reported here because the aim is to explore how responsive are different indicators of sustainability to management action in different crops in widely differing locations. This paper focuses on a selection of findings for each of the 10 indicators, in order to illustrate the extent of changes that have been observed over time. These also indicate some of the difficulties faced in making improvements on the ground. The gathering of data on sustainability indicators is closely tied to the development of alternative practices that should quickly deliver improvements in a variety of outcomes. An assessment is also made of the key changes that have occurred for each of the main five crops as a result of adopting the sustainability indicator system and associated new management practices. Multi-year assessments were conceived as the way to understand and demonstrate progress towards more sustainable agriculture. The important developments were of systems that combined ensuring that agricultural suppliers performed to an acceptable set of criteria, and then had the capacity and willingness to identify the most critical areas where further progress was required. The challenge for the company is now to encourage others to adopt their approach to making supply chains more sustainable, both for their customers and the consumers of their branded goods. [PUBLICATION ABSTRACT]

PLANT PROPAGATION (1 jdl)

Somatic embryogenesis and plant regeneration in oil palm using the thin cell layer technique /Jonny E Scherwinski-Pereira, Rodrigo S da Guedes, Paulo César P Fermino Jr, Tatiane L Silva, Frederico Henrique S Costa.

In Vitro Cellular & Developmental Biology.: Plant Columbia:Aug 2010. Vol. 46, Iss. 4, p. 378-385 (8 pp.)

Abstract:

An efficient procedure has been developed for inducing somatic embryogenesis and regeneration of plants from tissue cultures of oil palm (Elaeis guineensis Jacq.). Thin transverse sections (thin cell layer explants) of different position in the shoot apex and leaf sheath of oil palm were cultivated in Murashige and Skoog (MS) (Physiol Plant 15:473-497, 1962) medium supplemented with 0-450 µM picloram and 2,4-D with 3.0% sucrose, 500 mg L^sup -1^ glutamine, and 0.3 gL^sup -1^ activated charcoal and gelled with 2.5 gL^sup -1^ Phytagel. Embryogenic calluses were evaluated 12 wk after inoculation. Picloram (450 µM) was effective in inducing embryogenic calluses in 41.5% of the basal explants. Embryogenic calluses were maintained on a maturation medium composed of basal media, plus 0.6 µM NAA and 12.30 µM 2iP, 0.3 gL^sup -1^ activated charcoal, and 500 mg L^sup -1^ glutamine, with subcultures at 4-wk intervals. Somatic embryos were converted to plants on MS medium with macro- and

micronutrients at half-strength, 2% sucrose, and 1.0 gL^sup -1^ activated charcoal and gelled with 2.5 gL^sup -1^ Phytagel. [PUBLICATION ABSTRACT]

PLANT GENETICS AND BREEDING (5 jdl)

Experimental modification of reciprocal recurrent selection in oil palm breeding in Cameroon /Claude Bakoumé, Madi Galdima, Fabien Fonguimgo Tengoua.
Euphytica. Dordrecht:Jan 2010. Vol. 171, Iss. 2, p. 235-240

Abstract:

Reciprocal recurrent selection (RRS) exploits the genetic complementarity of dura populations of palms with a small number of large bunches and tenera/pisifera group of palms with large number of small bunches. An extra phase was introduced to RRS just after the second cycle of selection where outstanding dura derived from (DA3D × DA5D) combinations of the second cycle were self-pollinated for seed production. Best palms based on the phenotype were selected and crossed with pisifera of second cycle offspring of LM2T. [(DA3D × DA5D) self-pollinated × LM2T self-pollinated] progenies were field tested at La Dibamba (Cameroun) from 1987 to 1997. They were precocious with regard to the three-first years' bunch yields (13.16-15.77 t/ha). Homogeneity for all bunch yield components and homogeneity for vertical growth were illustrated by low values of the variation coefficient (5.75-7.75%). The oil yield was 107% of the control against 115% from [(DA3D × DA5D) × LM2T self-pollinated] progenies of the second cycle of RRS, mostly due to poor mesocarp to fruit and poor oil to mesocarp ratios which led to a low oil extraction rate. The extra selection phase led mainly to homogenisation of progenies but also reduced the fruit quality. However, three progenies whose average oil yield represented 115% of the control (4.87 t/ha) in addition to their precocity can be released to oil palm growers. The extension of RRS did not fully meet expectations and poses the problem of its reliability.[PUBLICATION ABSTRACT]

In vitro conservation of oil palm somatic embryos for 20 years on a hormone-free culture medium: characteristics of the embryogenic cultures, derived plantlets and adult palms /K Eugene Konan, Tristan Durand-Gasselin, Y Justin Kouadio, Albert Flori, Alain Rival, Yves Duval, Catherine Pannetier.
Plant Cell Reports. Berlin:Jan 2010. Vol. 29, Iss. 1, p. 1-13

Abstract:

This study was conducted over a period of 20 years, to assess the problems involved in developing subcultures over a very long period, of oil palm (Elaeis guineensis Jacq.) somatic embryos which were maintained in vitro on a Murashige and Skoog mineral-based culture medium, without growth regulators. Analysis of the proliferation rate of the embryogenic cultures, along with the survivability of the regenerated plantlets after their transfer into soil and of the flowering of the derived adult palms has been conducted for cultures maintained in vitro during 1 to 20 years.

From the ninth year of maintenance, the tissue quality of the somatic embryos gradually began to decline. However, after more than 20 years, 30% of the 20 clones tested still continued to proliferate satisfactorily on the same maintenance medium, keeping their multiplication potential intact. Even though a depressive effect of the age of the lines has been observed on the survival capacity of plants under natural conditions, it is noteworthy that among the clones originating from 20-year-old cultures only eight of them (40%) have exhibited the "mantled" floral abnormality. Different hypotheses concerning the origin of the disruptions observed on the in vitro cultures, plantlets and adult palms that occur over a very long period of in vitro conservation are discussed.

Genetic transformation and molecular analysis of polyhydroxybutyrate biosynthetic gene expression in oil palm (Elaeis guineensis Jacq. var Tenera) tissues Ismanizan Ismail, Nor Fakhrana Iskandar, Gor Mian Chee, Ruslan Abdullah.
Plant Omics. Lismore:Jan 2010. Vol. 3, Iss. 1, p. 18-27 (10 pp.)
Abstract:

Bioplastics are an alternative substitute for petrochemical synthetic plastics. Polyhydroxybutyrate (PHB) genes are involved in bioplastic synthesis. In this study, bioplastic synthesis genes were incorporated into the genome of oil palm because this plant has a high concentration of the PHB precursor acetyl-CoA. Immature embryos (IEs) of Elaeis guineensis var Tenera were infected with Agrobacterium tumefaciens LBA4404 that contained the binary vector pJLPHB3, which encoded the phb genes, ²-ketothiolase (bktB), acetoacetyl-CoA reductase (phaB) and PHA synthase (phaC) flanked by a modified CaMV35S promoter, a plastid targeting sequence and the nos terminator. GUS assay revealed that about 78-100% transient transformation frequency was obtained for calluses and 55-65% for plantlets 1 month after transformation. However, GUS assays of leaf tissue from 12-month-old plantlets showed that only 10-33% transformation frequency was obtained. The presence of the phb genes in GUS positive plantlets was confirmed using PCR and multiplex PCR analyses. Southern blot analyses verified that the phb genes were integrated in transformed leaves and calluses using the phaB probe (0.805 kb) and phaC probe (1.730 kb). Quantitative transgene expression comparison in the transformed tissues measured using real-time PCR showed that the expression levels of the phaB and phaC transgenes were 6.06- and 6.02-fold higher compared to the non-transformed oil palm. [PUBLICATION ABSTRACT]

A transient assay to evaluate the expression of polyhydroxybutyrate genes regulated by oil palm mesocarp-specific promoter /V Omidvar, A Siti Nor Akmar, M Marziah, A A Maheran.
Plant Cell Reports. Berlin:Sep 2008. Vol. 27, Iss. 9, p. 1451-9
Abstract:

The promoter of the oil palm metallothionein-like gene (MT3-A) demonstrated mesocarp-specific activity in functional analysis using transient expression assay of reporter gene in bombarded oil palm tissue slices. In order to investigate the tissue-specific expression of polyhydroxybutyrate (PHB) biosynthetic pathway genes, a multi-

gene construct carrying PHB genes fused to the oil palm MT3-A promoter was co-transferred with a construct carrying GFP reporter gene using microprojectile bombardment targeting the mesocarp and leaf tissues of the oil palm. Transcriptional analysis using RT-PCR revealed successful transcription of all the three phbA, phbB, and phbC genes in transiently transformed mesocarp but not in transiently transformed leaf tissues. Furthermore, all the three expected sizes of PHB-encoded protein products were only detected in transiently transformed mesocarp tissues on a silver stained polyacrylamide gel. Western blot analysis using polyclonal antibody specific for phbB product confirmed successful translation of phbB mRNA transcript into protein product. This study provided valuable information, supporting the future engineering of PHB-producing transgenic palms.

Breeding for oil yield and short oil palms in the second cycle of selection at La Dibamba (Cameroon) /Claude Bakoumé, Claude Louise.
Euphytica. Dordrecht:Jul 2007. Vol. 156, Iss. 1-2, p. 195-202
Abstract:

Breeding in oil palm aims mainly at improving palm oil yield. Short palms are also desired because they are easy to harvest and increase the economic life of the plantation. A total of 23 progenies from Deli × La Mé and Deli × PO 1097 P (Yangambi) crosses were field tested at La Dibamba Oil Palm Research Centre in Cameroon from 1988 to 1998. Oil yield components were measured on per palm basis from 3 to 9 years after planting, and the vertical growth at 6 years after planting. The mean oil yield of the trial was average, representing 102% of the control (3.515 t/ha), and the mean height 6 years after planting was 101% that of the control (88.0 cm). The analysis of variance detected differences among progenies for various yield parameters and vertical growth. The comparison of means showed clear separation of groups of progenies for oil yield at the juvenile period (3-5 years after planting). At maturity (6-9 years after planting), the groups of progenies were overlapping indicating that progenies were comparable each other. However, four precocious progenies and high oil yielding at maturity (119-122% of the control) in absolute values can be released to planters. Though their vertical growth represented 116-127% of that of the control, short pisifera palm are expected from parental selfs or crosses given the intrinsic heterozygosity of oil palm.[PUBLICATION ABSTRACT]

PLANT PHYSIOLOGY-NUTRITION (1 jdl)

Acute postprandial effect of hydrogenated fish oil, palm oil and lard on plasma cholesterol, triacylglycerol and non-esterified fatty acid metabolism in normocholesterolaemic males /Marie M Cantwell, Mary AT Flynn, Michael J Gibney.
The British Journal of Nutrition. Cambridge:Apr 2006. Vol. 95, Iss. 4, p. 787-94 (8 pp.)

Abstract:

The majority of research has focused on the association between trans unsaturated fatty acids (TUFA) from hydrogenated vegetable oils and heart disease even though TUFA are also produced from hydrogenated fish oil. We compared the acute effect of three solid fats on postprandial cholesterol, triacylglycerol (TAG) and NEFA concentrations in normocholesterolaemic males. Eight healthy male volunteers consumed each of the three 40g fat meals (partially hydrogenated fish oil (PHFO), palm oil and lard) in random order and blood samples were drawn at 2, 4, 6 and 8h thereafter for lipid analysis. The postprandial response in plasma TAG, TAG-rich lipoprotein-TAG (TRL-TAG), total cholesterol and plasma NEFA, measured as the area under the postprandial curve, was not significantly different between the three meals (p >0·05), which varied in MUFA, PUFA and TUFA content. There was no marked elevation of longer-chain fatty acids (C20-22, cis or trans isomers) into the TRL-TAG fraction following the PHFO meal even though they provided 40% of the total fatty acids in the PHFO meal. The postprandial TRL-TAG response to PHFO was expected to be higher, as it is higher in TUFA, lower in PUFA and similar in saturated fatty acid composition compared with the lard and palm oil test meals. The absence of a higher postprandial response following ingestion of PHFO could be as a result of reduced absorption and increased oxidation of long-chain fatty acids (both cis and trans isomers) [PUBLICATION ABSTRACT]

PLANT PHYSIOLOGY-GROWTH AND DEVELOPMENT (4 jdl)

Breaking Seed Dormancy: Revisiting Heat-treatment Duration on Germination and Subsequent Seedling Growth of Oil Palm (Elaeis guineensis Jacq.) Progenies /Nicolas Y Fondom, Culbertson E Etta, Afui M Mih.

Journal of Agricultural Science. Toronto:Jun 2010. Vol. 2, Iss. 2, p. 101-110 (10 pp.)

Abstract:

The role of duration of various varying heat-treatment durations on the germination of oil palm seeds is well documented. We investigated the effects of different heat-treatment durations on germination and seedling growth of 10 oil palm progenies. Batches of 250 oil palm seeds from each progeny were heat-treated at a temperature of 39° C ± 1° C for 60, 80, 100 and 120 days, to break dormancy. Seedling growth parameters measured included rate of leaf production, leaf area and relative leaf area growth rate, rate of leaf elongation, and diameter of base of seedlings stem. Germination rates for 60, 80, 100, and 120 days combined were highest for progenies A5240 and A5221 (> 80 %) but very low (< 5%) for progenies A5228 and A5268. Progenies A5240, A5291, A5234 and A5221 were found to be the most outstanding progenies in terms of germination. Prolonged heat-treatment resulted in reduced germination and less vigorous seedling growth. Heat-treatment of 60 days gave the best seedling growth performance and seedling growth was adversely affected when heat-treatment exceeded 100 days. The study indicated that heat-treatment duration of 60 days and not 80 days was effective for breaking dormancy of

the oil palm seeds and successful seedling growth. This study shows that oil palm seeds germination can be obtained successfully within a short period (60 days) of heat-treatment compared to the current 80 days application by PAMOL Plantation Ltd. Lobe estate. These results could provide significant solutions to the numerous demands of oil palm seeds by local farmers. [PUBLICATION ABSTRACT]

Vermicomposting of Oil Palm Empty Fruit Bunch And its Potential in Supplying of Nutrients For Crop Growth /D T Sabrina, M M Hanafi, T M M Mahmud, A A Nor Azwady.

Compost Science & Utilization. Emmaus:Winter 2009. Vol. 17, Iss. 1, p. 61-67 (7 pp.)

Abstract:

Oil palm (Elaeis guineensis Jacq.) plantations generate a large quantity of by-products, such as empty fruit bunches (EFB) and palm fronds. These by-products are very difficult to decompose in natural condition. Vermicomposting of these by-products would be able to provide some useful nutrients for crop growth. There was no information available on the composting condition of these oil palm by-products using earthworms. Therefore, the objective of this study was to evaluate the ability of earthworms in vermicomposting of oil palm by-products and to evaluate the quality of the vermicompost. Only one species of earthworm, E foetida, was able to survive in these by-products and further evaluated for stocking density, precomposting time and size of organic materials, and vermicompost quality. One month precomposting and the addition of cow dung as food supplement to earthworms would be able to reduce the mortality rate and maintain the growth of earthworms. The ratio of 1:10 (earthworm/media) was the most appropriate for the earthworms to survive in EFB culture. Vermicomposting of EFB was able to provide beneficial nutrients, such as N, K, and Mg to plants. [PUBLICATION ABSTRACT]

EgAP2-1, an AINTEGUMENTA-like (AIL) gene expressed in meristematic and proliferating tissues of embryos in oil palm

/F Morcillo, A Gallard, M Pillot, S Jouannic, F Aberlenc-Bertossi, M Collin, J L Verdeil, J W Tregear.

Planta. Berlin:Nov 2007. Vol. 226, Iss. 6, p. 1353-62

Abstract: In order to better understand the developmental processes that govern the formation of somatic embryos in oil palm (Elaeis guineensis Jacq.), we investigated the transcription factor genes expressed during embryogenesis in this species. The AP2/EREBP transcription factor family includes the AP2 subgroup, which contains several proteins that play important roles in plant development. We identified and characterized EgAP2-1, which codes for a protein that contains two AP2 domains similar to those of the transcription factor BABYBOOM (BBM) and more generally AINTEGUMENTA-like (AIL) proteins of the AP2 subgroup. In a similar way to related genes from eudicots, ectopic expression of EgAP2-1 in transgenic Arabidopsis plants alters leaf morphology and enhances regeneration capacity. In oil palm, EgAP2-1 transcripts accumulate to the greatest extent in zygotic embryos. This expression

pattern was investigated in more detail by in-situ hybridization, revealing that in both zygotic and somatic embryos, EgAP2-1 expression is concentrated in proliferating tissues associated with the early development of leaf primordia, root initials and provascular tissues.[PUBLICATION ABSTRACT]

Evidence for an interaction effect during in vitro rooting of oil palm (Elaeis guineensis Jacq.) somatic embryo-derived plantlets /Eugène K Konan, Justin Y Kouadio, Albert Flori, Tristan Durand-Gasselin, Alain Rival.
In Vitro Cellular & Developmental Biology.: Plant Columbia:Sep/Oct 2007. Vol. 43, Iss. 5, p. 456-466 (11 pp.)
Abstract:

In vitro rooting of oil palm shoots derived from somatic embryos was achieved through a single-phase protocol in which three shoots are cultured in the same culture tube on an ±-naphtaleacetic acid-enriched culture medium. Rooting performance was dependent on both the genetic origin and initial size of the shoot explants. All shoots from a given tube showed a tendency to give roots of the same type, independent of the original size of the explant. Whatever the clonal line, longer-size shoots (L-type: >9 cm) showed higher rooting rates than medium-size (M-type: 7-9 cm) and short-size ones (S-type: 5-7 cm). When groups of three shoots from the same clonal line were rooted together in the same culture tube, the combination of plant size within the group impacted overall quality of rooting. Within triplets of shoots containing more than one short individual, the probability of obtaining adequate rooting was low. Similarly, when more than one long shoot was included in the triplet rooting, quality was also poor. By avoiding such combinations, the rate of well-rooted plantlets increased by 25%, with a maximum of 66% when triplets of S/M/L combination were used. Smaller shoots, which usually showed poor rooting performance, were therefore found to benefit from the presence of their neighbors. This interaction between the sizes of individuals in a given tube was found to be associated with a within-tube correlation effect, a phenomenon previously described as "event coupling," which was estimated using a distorted binomial-type distribution of probabilities. The resulting calculation of a coupling factor (average r=0.60) explains the behavior of shoots within the same culture tube and their average rooting performance. Modeling of the interactions that occurred during in vitro rooting is described here and is recommended for improvement of this critical step in micropropagation. [PUBLICATION ABSTRACT]

PEST OF PLANTS (1 jdl)

Purification and characterization of a novel thermoacidophilic and thermostable [alpha]-mannosidase from the digestive fluid of oil palm weevil Rhynchophorus palmarum (Coleoptera: Curculionidae) larvae /Micaël Bédikou, Pascal Ahi, Martial Koné, Betty Faulet, Jean Gonnety, Patrice Kouamé, Sébastien Niamké.
European Journal of Entomology. Ceske Budejovice:2009. Vol. 106, Iss. 2, p. 185-191 (7 pp.)

Abstract:

An extracellular ±-mannosidase with unusual properties was purified from the digestive fluid of oil palm weevil (Rhynchophorus palmarum Linnaeus) larvae using ammonium sulphate saturation, size exclusion and anion-exchange chromatography. The enzyme named RpltM is thermoacidophilic, thermostable and behaves like lysosomal ±-mannosidase (EC 3.2.1.24). The molecular weight, K^sub m^ value, optimum reaction temperature and pH are 108-112 kDa, 0.36 mM, 65°C and 4.5, respectively. Zn^sup 2+^ enhanced whereas Cu^sup 2+^, Sodium dodecyl sulphate, swainsonine and 1,4-dideoxy-1,4-iminomannitol strongly inhibited its hydrolytic activity. The enzyme was stable for 25 min at 65°C and retained 70% of its initial activity after 60 min. At 70°C, around 60% of this activity was conserved after 25 min. RpltM retained more than 90% of its activity over a pH range of 4.2 to 5.0 and remained fully active in the presence of detergents such as nonidet P-40, triton X-100, polyoxyethylen-10-oleyl ether (up to 1%, w/v), dithiothreitol and ²-mercaptoethanol. The stability under these conditions is also better than that reported for other insect ±-mannosidases. Thus, RpltM could be used as an important bioindustrial tool for removing mannose residues from oligosaccharides. [PUBLICATION ABSTRACT]

SOIL BIOLOGY (1 jdl)

Application of 15N natural abundance technique for evaluating biological nitrogen fixation in oil palm ecotypes at nursery stage in pot experiments and at mature plantation sites /André L V de Carvalho, Bruno J R Alves, Vera L D Baldani, Veronica M Reis.

Plant and Soil. The Hague:Jan 2008. Vol. 302, Iss. 1-2, p. 71-78

Abstract:

A range of different species of diazotrophic bacteria has been found in tissues and the rhizosphere of oil palm plants, suggesting a potential to benefit from biological nitrogen fixation (BNF). A few studies have confirmed that plantlets at nursery stage can benefit significantly from BNF after inoculation with Azospirillum spp. but no data are available regarding the benefit from naturally-occurring diazotrophic bacteria in oil palm. The results described here were derived from two pot trials laid out under controlled conditions with plantlets from two important regions for palm oil production in Brazil, as well as from different field sites of mature oil palm plantations. The 15N natural abundance technique was employed to estimate plant dependence on BNF (%Ndfa) by the different ecotypes grown in soil and previously characterized as hosting diazotrophic bacteria. From both pot trials it was possible to identify some ecotypes of high potential for N2-fixation that reached in some cases approximately 50%Ndfa. However, the accuracy of measurement still needs to be improved using more suitable reference plants for pot experiments. Values of ´ 15N signals from oil palm and reference plants in the field were inconclusive concerning any benefit from BNF to oil palm, owing to apparently high temporal and spatial variability of ´ 15N of the plant-available N in the heterogeneous soil matrix for the different palm and reference plant tested. [PUBLICATION ABSTRACT]

SOIL CHEMISTRY AND PHYSICS (1 jdl)

Using Soil Water Depletion to Measure Spatial Distribution of Root Activity in Oil Palm (Elaeis guineensis Jacq.) Plantations /Paul N Nelson, Murom Banabas, David R Scotter, Michael J Webb.

Plant and Soil. The Hague:Aug 2006. Vol. 286, Iss. 1-2, p. 109-121

Abstract:

Knowledge of where roots are active is crucial for efficient management of nutrients in tree crops but measurement of root activity is problematic. Measurement using soil water depletion is an approach that has not been tested in a humid climate. We hypothesised that the three dimensional distribution of root activity of a tree crop in the humid tropics (a) can be determined by measuring soil water depletion during rain-free periods, and (b) is influenced by environment (soil type and climate) and surface management. A field study was carried out in which soil water content was measured and water uptake calculated (by difference between soil water content at beginning and end of rain-free periods) for different surface management zones and depths (0.1 m intervals to 1.6 m depth) under oil palm (Elaeis guineensis Jacq.) at a loam-clay site and a sandy site. Significant differences were measured between sites and between surface management zones at each site. At both sites water uptake was highest under the weeded zone close to the palm stem, slightly lower under the zone where pruned fronds are placed, and lowest under the path used for removing harvested fruit. Vertical distribution of root activity differed between the sites, with higher activity near the surface at the finer textured site. Total water uptake values were lower than estimates of evapotranspiration made using climate data. The difference was probably largely due to water uptake from deeper than 1.6 m. This study showed that the spatial distribution of tree root activity in a humid climate could be quantified using a relatively simple method.[PUBLICATION ABSTRACT]