

KOMODITAS: KELAPA

PROQUEST 2006-2010

SEED PRODUCTION AND PROCESSING (1 JdL)

The effect of gibberellic acid on the in vitro germination of coconut zygotic embryos and their conversion into plantlets /A Pech y Aké, B Maust, A Orozco-Segovia, C Oropeza. *In Vitro Cellular & Developmental Biology*.: Plant Columbia:May/Jun 2007. Vol. 43, Iss. 3, p. 247-253 (7 pp.)

Abstract:

The effect of gibberellic acid ($GA^{sub 3^}$) was tested on germination of coconut zygotic embryos, their conversion into plantlets and ex vitro survival. There were four treatments consisting of 5 wk of culture in semi-solid medium or liquid medium, with or without $GA^{sub 3^}$. Embryos were then transferred to $GA^{sub 3^}$ free-liquid medium for the rest of a 32-wk culture. Germination and conversion percentages were higher in semi-solid medium than in liquid medium, and with both media percentages increased with $GA^{sub 3^}$ treatment (with the exception of the highest $GA^{sub 3^}$ concentration). Embryos of two varieties (MGD and MYD) were used. The following are the results with MGD embryos. Optimum $GA^{sub 3^}$ concentration in liquid medium was 0.46 μ M, with 80% germination (62% in the control without $GA^{sub 3^}$) and 4.6 μ M in semi-solid medium with 98% germination (71% in the control). With $GA^{sub 3^}$ treatment, germination was also faster. Conversion in semi-solid medium with $GA^{sub 3^}$ was 87% (60% in the control), and 45% in liquid medium with $GA^{sub 3^}$ (25% in the control). Once the plantlets had at least three bifid leaves and three primary roots at the time of transfer to ex vitro, they survived independently of the treatment. When MYD embryos were used, germination and conversion percentages were higher in semi-solid medium than in liquid medium, and they increased when $GA^{sub 3^}$ was used, although percentages were lower than those obtained with MGD embryos. The results showed that the use of $GA^{sub 3^}$ benefited coconut embryos in culture because it favored germination and conversion to plants on semi-solid medium, and hence improved previous protocols. [PUBLICATION ABSTRACT

PLANT GENETICS AND BREEDING (6 jdl)

Genetic diversity among coconut varieties for susceptibility to Cape St /Paul Wilt Disease S K Dery, R Philippe, L Baudouin, R N Quaiocoe, J Nkansah-Poku, J Owusu-Nipah, R Arthur, D Dare, N Yankey, M Dollet.

Euphytica. Dordrecht:Nov 2008. Vol. 164, Iss. 1, p. 1-11

Abstract:

The CSPWD is the Ghanaian form of lethal yellowing disease (LYD) of coconut, caused by a phytoplasma and has been active in Ghana since 1932. The paper updates the results of screening trials conducted with 38 pure and hybrid coconut varieties since 1981. Although no variety was found totally resistant, a wide range of susceptibility level was observed: almost all SGD were still unaffected, while the local WAT had almost totally disappeared, additive values were calculated for the parental varieties and it was shown that, in the average, hybrids are slightly more susceptible than predicted by a purely additive model. According to this genetic model, the SGD × VTT hybrid will be appreciably less susceptible than the MYD × VTT currently being used for replanting devastated farms in Ghana. Our results tend to confirm the general trend that cultivars from the Pacific group (especially the Dwarfs) are less susceptible than the Indo-Atlantic cultivars. Proposals are made to adapt planting material to the risk level. Genetic control can only be efficient if it is considered as a link in a chain of control measures involving the choice of a proper planting site, good management and early eradication of diseased trees. [PUBLICATION ABSTRACT]

Use of SSR markers to determine the anther-derived homozygous lines in coconut /P I P Perera, L Perera, V Hoher, J -L Verdeil, D M D Yakandawala, L K Weerakoon. ***Plant Cell Reports***. Berlin:Nov 2008. Vol. 27, Iss. 11, p. 1697-703

Abstract:

Anther culture was used to obtain dihaploid (DH) coconut plants and their ploidy level was determined by flow cytometric analysis. Simple sequence repeat (SSR) marker analysis was conducted to identify the homozygous diploid individuals. Ploidy analysis showed that 50% of the tested plantlets were haploid and 50% were diploid. Polymorphic fragments of the mother palm and their segregation patterns in anther-derived plantlets were used to determine the origin of the diploid plantlets. Using a diagnostic SSR marker (CNZ43), all the diploid plantlets tested were identified as being derived from microspores (i.e. were homozygous) and were thus candidates for use in coconut breeding programs. Anther culture was used to obtain dihaploid (DH) coconut plants and their ploidy level was determined by flow cytometric analysis. Simple sequence repeat (SSR) marker analysis was conducted to identify the homozygous diploid individuals. Ploidy analysis showed that 50% of the tested plantlets were haploid and 50% were diploid. Polymorphic fragments of the mother palm and their segregation patterns in anther-derived plantlets were used to determine the origin of the diploid plantlets. Using a diagnostic SSR marker (CNZ43), all the diploid plantlets tested were identified as being derived from microspores (i.e. were homozygous) and were thus candidates for use in coconut breeding programs.

The Panama Tall and the Maypan hybrid coconut in Jamaica: did genetic contamination cause a loss of resistance to Lethal Yellowing? /Luc Baudouin, Patricia Lebrun, Angélique Berger, Wayne Myrie, Basil Been, Michel Dollet.

Euphytica. Dordrecht:Jun 2008. Vol. 161, Iss. 3, p. 353-360

Abstract:

We applied Bayesian population assignment methods to assess the trueness to type of four populations of the coconut cultivar Panama Tall (PNT) located in Jamaica and found that two of them presented a high percentage of off-types, while genetic contamination was low in the two others. The PNT is the pollen parent of the MAYPAN hybrid, which used to be planted in Jamaica to control an epidemic disease: Lethal Yellowing. The main source of contamination was the susceptible Jamaica Tall, thus increasing the susceptibility in the resulting MAYPAN progeny. The incidence of genetic contamination seems however to be insufficient to be the only cause of the latest outbreak of the disease. Neither the MAYPAN nor its parents can be said resistant in the present context of Jamaica. (PUBLICATION ABSTRACT)

Fatty acid profile of coconut oil in relation to nut maturity and season in selected cultivars/hybrids /Shamina Azeez.

British Food Journal. Bradford:2007. Vol. 109, Iss. 4, p. 272-279

Abstract:

The objective of this work is to study the fatty acid profile of coconut oil in the kernel in relation to maturity of the nut and season of fertilization in five selected varieties of coconut. The coconut oil from the popular cultivars/hybrids were studied in post-monsoon, pre-monsoon and monsoon seasons at 7, 8, 10 and 12 months after fertilization. Nuts that fertilized in the post monsoon season were found to have higher oil contents. Of the five varieties, COD×WCT had lesser amounts of caprylic, capric and lauric acids and greater amounts of the long chain fatty acids. Though significant differences were observed in fatty acid concentrations in nuts differing in their variety and season of tagging, the trend remained the same. The study helps to ensure the safety of the usage of coconut oil as dietary oil, from the nature of fatty acids present.

Population Genetics, Lethal Yellowing Disease, and Relationships among Mexican and Imported Coconut Ecotypes /Daniel Zizumbo-Villarreal, Mariana Ruiz-Rodriguez, Hugh Harries, Patricia Colunga-GarcíaMarín.

Crop Science. Madison:Nov/Dec 2006. Vol. 46, Iss. 6, p. 2509-2516 (8 pp.)

Abstract:

The morphological variation patterns observed worldwide in coconut are the product of four main factors: (i) natural selection, for sea-born seed dissemination between islands, and colonization of isolated coastal locations; (ii) direct and indirect selection during domestication, resulting in higher fruit water content, cultivation at inland locations and exposure to epidemic disease; (iii) introgressive hybridization when domestic forms were dispersed by humans to localities where the wild forma already existed; and (iv) genetic drift in natural and introduced populations (Harries, 1978, 1990). Tackling LY and reviving coconut's profitability as a crop requires integrated disease management including measures such as genetic improvement; replanting with resistant, high-yielding varieties; introduction of new agricultural technology in coconut cultivation; associating coconut with other crops; product

diversification; improving post-harvest processing; and developing new uses and processes to increase its value.

Identification of molecular markers associated with mite resistance in coconut (*Cocos nucifera* L.) /K V Shalini, S Manjunatha, P Lebrun, A Berger, et al.

Genome. Ottawa:Jan 2007. Vol. 50, Iss. 1, p. 35-42 (8 pp.)

Abstract:

Coconut mite (*Aceria guerreronis* 'Keifer') has become a major threat to Indian coconut (*Coçcos nucifera* L.) cultivators and the processing industry. Chemical and biological control measures have proved to be costly, ineffective, and ecologically undesirable. Planting mite-resistant coconut cultivars is the most effective method of preventing yield loss and should form a major component of any integrated pest management stratagem. Coconut genotypes, and mite-resistant and -susceptible accessions were collected from different parts of South India. Thirty-two simple sequence repeat (SSR) and 7 RAPD primers were used for molecular analyses. In single-marker analysis, 9 SSR and 4 RAPD markers associated with mite resistance were identified. In stepwise multiple regression analysis of SSRs, a combination of 6 markers showed 100% association with mite infestation. Stepwise multiple regression analysis for RAPD data revealed that a combination of 3 markers accounted for 83.86% of mite resistance in the selected materials. Combined stepwise multiple regression analysis of RAPD and SSR data showed that a combination of 5 markers explained 100% of the association with mite resistance in coconut. Markers associated with mite resistance are important in coconut breeding programs and will facilitate the selection of mite-resistant plants at an early stage as well as mother plants for breeding programs. [PUBLICATION ABSTRACT]

CROPPING PATTERNS AND SYSTEMS (1 jdl)

Using 3D architectural models to assess light availability and root bulkiness in coconut agroforestry systems /Nathalie Lamanda, Jean Dausat, Christophe Jourdan, Philippe Martin, Eric Malézieux.

Agroforestry Systems. The Hague:Jan 2008. Vol. 72, Iss. 1, p. 63-74

Abstract:

Using 3D architectural models to assess light availability and root bulkiness in agroforestry systems. In many parts of the humid tropics, coconut trees are frequently intercropped with food crops, or tree crops such as cocoa. The performance of such systems depends on planting patterns, but also on growing conditions for crops below the coconut canopy throughout the development of the coconut trees. We used a modelling approach providing indicators for assessing above-ground competition for light and below-ground competition for space, in order to optimize intercropping in coconut smallholdings. Light transmission and the number of coconut roots in the interrow were assessed in coconut smallholdings from 6 to 60 years old. The modelling

of light transmission through coconut stands was based on three-dimensional virtual coconut trees and a numerical light model that computed the shade cast by coconut trees on underlying crops. Root colonization in the interrow was assessed with virtual 3D coconut root systems. Our results showed that intercropping with shade-tolerant species was not limited by light transmission from the 35th year after coconut tree planting. However, at that stage of coconut tree development, the density of primary roots in the interrow limited intercrop development, especially for root and tuber crops. Alteration of the planting pattern over time increased light transmission but did not significantly affect root density. This modelling approach, which involved little parameterization that was easily done, appeared to be an efficient tool for recommending coconut tree planting patterns and densities, as well as indicating intercrop potential depending on their location in the most sunlit areas with minimum root competition. [PUBLICATION ABSTRACT]

PLANT PHYSIOLOGY-BIOCHEMISTRY (3 jdl)

Enzymatic Interesterification of Palm Stearin and Coconut Oil by a Dual Lipase System /Nuzul A Ibrahim, Zheng Guo, Xuebing Xu.

JAOCS, *Journal of the American Oil Chemists' Society*. Champaign:Jan 2008. Vol. 85, Iss. 1, p. 37-45 (9 pp.)

Abstract:

Enzymatic interesterification of palm stearin with coconut oil was conducted by applying a dual lipase system in comparison with individual lipase-catalyzed reactions. The results indicated that a synergistic effect occurred for many lipase combinations, but largely depending on the lipase species mixed and their ratios. The combination of Lipozyme TL IM and RM IM was found to generate a positive synergistic action at all test mixing ratios. Only equivalent amount mixtures of Lipozyme TL IM with Novozym 435 or Lipozyme RM IM with Novozym 435 produced a significant synergistic effect as well as the enhanced degree of interesterification. The interesterification catalyzed by Lipozyme TL IM mixed with thermally inactivated immobilized lipase preparations indicated that the carrier property may play an important role in affecting the interaction of two mixed lipases and the subsequent reactions. A dual enzyme system, consisting of immobilized lipases and a non-immobilized one (Lipase AK), in most cases apparently endows the free lipase with a considerably enhanced activity. 70% Lipase AK mixed with 30% immobilized lipase (Lipozyme TL IM, RM IM and Novozym 435) can achieve an increase in activity greater than 100% over the theoretical value when the reaction proceeds for 2 h. The co-immobilization action of the carrier of the immobilized lipases towards the free lipase was proposed as being one of the reasons leading to the synergistic effect and this has been experimentally verified by a reaction catalyzed by a Lipase AK-inactivated preparation. No apparently synergistic effect of the combinations of Lipozyme TL IM and RM IM was observed when the dual enzyme systems applied to the continuous reaction performed in a packed bed reactor. In brief,

this work demonstrated the possibility of increasing the reaction rate or enhancing the degree of conversion by employing a dual lipase system as a biocatalyst. [PUBLICATION ABSTRACT]

Studies on Quality of Coconut Oil Blends after Frying Potato Chips /Mohammad Imtiyaj Khan, M R Asha, K K Bhat, Sakina Khatoon. *JAOCS, Journal of the American Oil Chemists' Society*. Champaign:Dec 2008. Vol. 85, Iss. 12, p. 1165-1172 (8 pp.)

Abstract:

The quality (chemical and sensory) of oil blends prepared by blending equal proportions of coconut oil with sesame oil (blend 1), coconut olein with sesame oil (blend 2) and coconut olein with palmolein (blend 3) was evaluated after deep-fat frying of potato chips. After frying, the free fatty acid content did not change, however, the anisidine value increased. Blend 2 had the highest anisidine value (44.0). A marginal decrease in the iodine value and an increase in the thene values were observed in blends 1 and 2. The ²-carotene content in blend 3 and tocopherols in all the three blends were found to decrease after frying. Sensory odor profiles of oil blends after frying showed a decrease in the characteristic coconut oil aroma. The earthy and seedy aroma associated with sesame oil was found to decrease on frying. The sensory profile of potato chips showed a slight bitter taste in the samples fried in blends 1 and 2. However, the intensity of bitterness decreased and the earthy note increased on storage. Blend 3 had the highest overall quality. [PUBLICATION ABSTRACT]

Is abscisic acid involved in the drought responses of Brazilian green dwarf coconut?
F P Gomes, M A Oliva, M S Mielke, A-A F DE Almeida, H G Leite, L A Aquino. *Experimental Agriculture*. Cambridge:Apr 2009. Vol. 45, Iss. 2, p. 189-198 (10 pp.)

Abstract:

Abscisic acid (ABA) accumulation in leaves of drought-stressed coconut palms and its involvement with stomatal regulation of gas exchange during and after stress were investigated. Two Brazilian Green Dwarf coconut ecotypes from hot/humid and hot/dry environments were submitted to three consecutive drying/recovery cycles under greenhouse conditions. ABA accumulated in leaflets before significant changes in pre-dawn leaflet water potential ([Psi]PD) and did not recover completely in the two ecotypes after 8 days of rewatering. Stomatal conductance was influenced by ABA under mild drought and by [Psi]PD under severe drought. There were no significant differences between the ecotypes for most variables measured. However, the ecotype from a hot/dry environment showed higher water use efficiency after repeated cycles of water stress. [PUBLICATION ABSTRACT]

PLANT PHYSIOLOGY- NUTRITION (1 jdl)

The influence of vapour pressure deficit on leaf water relations of *Cocos nucifera* in northeast Brazil E E M Passos, C H B A Prado, W M Aragão.

Experimental Agriculture. Cambridge:Jan 2009. Vol. 45, Iss. 1, p. 93-106 (14 pp.)

Abstract:

Daily courses of leaf gas exchange and leaf water potential ($[\Psi]_{\text{leaf}}$) of green dwarf coconut palm (*Cocos nucifera*) were measured in irrigated plantations on the wet coastal plateau and in a dry semi-arid area of northeast Brazil. At both sites, significant correlations were obtained between stomatal conductance (g_s) and vapour pressure deficit (VPD_{air}), $[\Psi]_{\text{leaf}}$ and VPD_{air} , leaf transpiration (E) and g_s , and $E-[\Psi]_{\text{leaf}}$. Despite these similar relationships between sites, stronger correlations involving g_s-VPD_{air} and $E-[\Psi]_{\text{leaf}}$ were found at the semi-arid site, where whole-plant hydraulic conductance (g_p) was correlated significantly with VPD_{air} . In addition, at the semi-arid site, only, the net photosynthesis (PN) was not correlated with E and $[\Psi]_{\text{leaf}}$, and the intrinsic water use efficiency (WUE_i) was disconnected from VPD_{air} and $[\Psi]_{\text{leaf}}$. The different behaviour of leaf gas exchange and $[\Psi]_{\text{leaf}}$ between sites was probably caused by low g_s in response to high VPD_{air} at the semi-arid site. Our results indicate potential for significant alterations in the pattern of leaf gas exchange during future climatic changes with increasing temperature and concomitant increases in VPD_{air} . The atmospheric water stress will probably reinforce the strength of connection among water relation variables (E , $[\Psi]_{\text{leaf}}$, g_s , g_p , and VPD_{air}), but it will disrupt the linear relationship between net CO_2 assimilation and leaf water relations such as $PN-E$, $PN-[\Psi]_{\text{leaf}}$, WUE_i-VPD_{air} and $WUE_i-[\Psi]_{\text{leaf}}$. [PUBLICATION ABSTRACT]

PLANT PHYSIOLOGY- REPRODUCTION (1 jdl)

Unfertilized ovary: a novel explant for coconut (*Cocos nucifera* L.) somatic embryogenesis /Prasanthi I P Perera, Valerie Hocher, Jean Luc Verdeil, Sylvie Doulebeau, Deepthi M D Yakandawala, L Kaushalya Weerakoon.

Plant Cell Reports. Berlin:Jan 2007. Vol. 26, Iss. 1, p. 21-8

Abstract:

Unfertilized ovaries isolated from immature female flowers of coconut (*Cocos nucifera* L.) were tested as a source of explants for callogenesis and somatic embryogenesis. The correct developmental stage of ovary explants and suitable in vitro culture conditions for consistent callus production were identified. The concentration of 2,4-dichlorophenoxyacetic acid (2,4-D) and activated charcoal was found to be critical for callogenesis. When cultured in a medium containing 100 μ M 2,4-D and 0.1%

activated charcoal, ovary explants gave rise to 41% callusing. Embryogenic calli were sub-cultured into somatic embryogenesis induction medium containing 5 μ M abscisic acid, followed by plant regeneration medium (with 5 μ M 6-benzylaminopurine). Many of the somatic embryos formed were complete with shoot and root poles and upon germination they gave rise to normal shoots. However, some abnormal developments

were also observed. Flow cytometric analysis revealed that all the calli tested were diploid. Through histological studies, it was possible to study the sequence of the events that take place during somatic embryogenesis including orientation, polarization and elongation of the embryos.[PUBLICATION ABSTRACT]

PESTS OF PLANTS (7 jdl)

Compatibility of *Neoseiulus paspalivorus* and *Proctolaelaps bickleyi*, candidate biocontrol agents of the coconut mite *Aceria guerreronis*: spatial niche use and intraguild predation /L M Lawson-Balagbo, M G C Gondim Jr, G J de Moraes, R Hanna, P Schausberger.

Experimental & Applied Acarology. Amsterdam:Jun 2008. Vol. 45, Iss. 1-2, p. 1-13 (13 pp.)

Abstract:

The eriophyid mite *Aceria guerreronis* occurs in most coconut growing regions of the world and causes enormous damage to coconut fruits. The concealed environment of the fruit perianth under which the mite resides renders its control extremely difficult. Recent studies suggest that biological control could mitigate the problems caused by this pest. *Neoseiulus paspalivorus* and *Proctolaelaps bickleyi* are two of the most frequently found predatory mites associated with *A. guerreronis* on coconut fruits. Regarding biological control, the former has an advantage in invading the tight areas under the coconut fruit perianth while the latter is more voracious on the pest mites and has a higher reproductive capacity. Based on the idea of the combined use/release of both predators on coconut fruits, we studied their compatibility in spatial niche use and intraguild predation (IGP). Spatial niche use on coconut fruits was examined on artificial arenas mimicking the area under the coconut fruit perianth and the open fruit surface. Both *N. paspalivorus* and *P. bickleyi* preferentially resided and oviposited inside the tight artificial chamber. Oviposition rate of *P. bickleyi* and residence time of *N. paspalivorus* inside the chamber were reduced in the presence of a conspecific female. Residence of *N. paspalivorus* inside the chamber was also influenced by the presence of *P. bickleyi*. Both *N. paspalivorus* and *P. bickleyi* preyed upon each other with relatively moderate IGP rates of adult females on larvae but neither species yielded nutritional benefits from IGP in terms of adult survival and oviposition. We discuss the relevance of our findings for a hypothetic combined use of both predators in biological control of *A. guerreronis*. [PUBLICATION ABSTRACT]

Rearing of coconut mite *Aceria guerreronis* and the predatory mite *Neoseiulus baraki* in the laboratory/ P H P R De Silva, L C P Fernando.

Experimental & Applied Acarology. Amsterdam:Jan 2008. Vol. 44, Iss. 1, p. 37-42 (6 pp.)

Abstract:

A method was developed for the rearing of coconut mite, *Aceria guerreronis* Keifer (Acari: Eriophyidae), and its predatory mite *Neoseiulus baraki* (Athias-Henriot)

(Acari: Phytoseiidae) on embryo culture seedlings of coconut (*Cocos nucifera*) in the laboratory. Seedlings in the ages of <2, 2-4 and 4-6 months were infested with 75 field-collected coconut mites and the population growth was determined up to six weeks after introduction. The populations of coconut mites increased exponentially up to five weeks after introduction and declined thereafter on seedlings of all ages with significant differences among the three groups of seedlings occurring over time. At week 5, a significantly higher mean number (\pm SE) of coconut mites ($20,098 \pm 3,465$) was bred on 4-6-month-old seedlings than on smaller seedlings, and on the largest seedlings the numbers were highest at all time intervals, except at week 2. *Neoseiulus baraki* was reared on embryo culture seedlings of the three age groups infested with coconut mites, by introduction of five female deutonymphs and one male, three weeks after introducing coconut mites. Predator numbers progressed significantly over time, but the size of seedlings did not significantly influence the numbers. On all groups of seedlings, the mean number of *N. baraki* increased up to two weeks after introduction on to seedlings and then declined. Many coconut mites were successfully reared in the laboratory for a longer period by this method and it could also be used as an alternative method to rear *N. baraki*. Development of this method may contribute to the progress of studies on the biology and ecology of coconut mite and its interactions with natural enemies. [PUBLICATION ABSTRACT]

Controlling *sufetula* spp.: a coconut insect pest on peat soils /X Bonneau, M Husni, L Beaudoin-Ollivier, Joko Susilo.

Experimental Agriculture. Cambridge:Jul 2007. Vol. 43, Iss. 3, p. 289-299 (11 pp.)

Abstract:

We demonstrated experimentally that *Sufetula*, a root-mining insect, has a depressive effect on coconut yields on peat soils. The impact of the pest resulted in a shortfall in earnings that warranted taking control measures. We considered control methods suitable for rehabilitating infested mature coconut plantings and for preserving young coconut plantings. Currently, cultural control is the only effective method. It involves eliminating all identified shelters for the adult insect, i.e. fern cover and heaps of coconut waste (dry fronds and husks). The aim is to achieve totally bare soil, with moss cover that does not attract the pest, or planted with an unattractive intercrop such as pineapple. [PUBLICATION ABSTRACT]

A review of the issues and management of the red palm weevil *Rhynchophorus ferrugineus* (Coleoptera: Rhynchophoridae) in coconut and date palm during the last one hundred years /J R Faleiro.

International Journal of Tropical Insect Science. Cambridge:Sep 2006. Vol. 26, Iss. 3, p. 135-154 (20 pp.)

Abstract:

The red palm weevil (RPW) *Rhynchophorus ferrugineus* (Olivier), a concealed tissue borer, is a lethal pest of palms and is reported to attack 17 palm species worldwide. Although the weevil was first reported on coconut *Cocos nucifera* from South Asia, during the last two decades it has gained a foothold on date palm Phoenix

dactylifera in several Middle Eastern countries from where it has moved to Africa and Europe, mainly due to the movement of infested planting material. In the Mediterranean region, RPW also severely damages *Phoenix canariensis*. Currently, the pest is reported in c. 15% of the coconut-growing countries and in nearly 50% of the date palm-growing countries. Infested palms, if not detected early and treated, often die. However, palms in the early stages of attack respond to chemical treatment with insecticide. RPW has been managed in several countries employing an integrated pest management (IPM) strategy including the use of food-baited pheromone traps. Early detection of infestation in the field is important for the success of any RPW-IPM programme. Ideally, movement of planting material from infested plantations within the country and also from one country to another needs to be stopped. Wherever this is not possible, it is essential to implement strict pre- and post-entry quarantine regimes, wherein only pest-free and certified planting material can be transported. The existing pheromone-based IPM programme can be strengthened by intensifying the search for effective natural enemies, coupled with the introduction of resistance in palms to RPW. This article reviews the work done during the last 100 years on various aspects of RPW viz. life history, damage and symptoms of attack, seasonal activity, spatial distribution, host range, IPM and its main components, including trapping adult weevils and chemical control, besides biological control, host plant resistance and male sterile technique. [PUBLICATION ABSTRACT]

Plant structural changes due to herbivory: Do changes in *Aceria*-infested coconut fruits allow predatory mites to move under the perianth? /Nayanie S Aratchige, Maurice W Sabelis, Izabela Lesna.

Experimental & Applied Acarology. Amsterdam:Oct 2007. Vol. 43, Iss. 2, p. 97-107 (11 pp.)

Abstract:

Being minute in size, eriophyoid mites can reach places that are small enough to be inaccessible to their predators. The coconut mite, *Aceria guerreronis*, is a typical example; it finds partial refuge under the perianth of the coconut fruit. However, some predators can move under the perianth of the coconut fruits and attack the coconut mite. In Sri Lanka, the phytoseiid mite *Neoseiulus baraki*, is the most common predatory mite found in association with the coconut mite. The cross-diameter of this predatory mite is c. 3 times larger than that of the coconut mite. Nevertheless, taking this predator's flat body and elongated idiosoma into account, it is--relative to many other phytoseiid mites--better able to reach the narrow space under the perianth of infested coconut fruits. On uninfested coconut fruits, however, they are hardly ever observed under the perianth. Prompted by earlier work on the accessibility of tulip bulbs to another eriophyoid mite and its predators, we hypothesized that the structure of the coconut fruit perianth is changed in response to damage by eriophyoid mites and as a result predatory mites are better able to enter under the perianth of infested coconut fruits. This was tested in an experiment where we measured the gap between the rim of the perianth and the coconut fruit surface in three cultivars ('Sri Lanka Tall', 'Sri Lanka Dwarf Green' and 'Sri Lanka Dwarf Green × Sri Lanka Tall' hybrid) that are cultivated extensively in Sri Lanka. It was found that the perianth-fruit gap in uninfested

coconut fruits was significantly different between cultivars: the cultivar 'Sri Lanka Dwarf Green' with its smaller and more elongated coconut fruits had a larger perianth-fruit gap. In the uninfested coconut fruits this gap was large enough for the coconut mite to creep under the perianth, yet too small for its predator *N. baraki*. However, when the coconut fruits were infested by coconut mites, the perianth-rim-fruit gap was not different among cultivars and had increased to such an extent that the space under the perianth became accessible to the predatory mites. [PUBLICATION ABSTRACT]

Sex ratio and female sexual status of the coconut pest, *Oryctes monoceros* (Coleoptera: Dynastidae), differ in feeding galleries and pheromone-baited traps/ K Allou, J-P Morin, P Kouassi, F Hala N'klo, D Rochat.

Bulletin of Entomological Research. Cambridge:Dec 2008. Vol. 98, Iss. 6, p. 581-586 (6 pp.)

Abstract:

Oryctes monoceros is a serious coconut pest, causing up to 40% damage in tropical Africa. Synthetic aggregation pheromone, ethyl 4-methyloctanoate, has been used to lure adults to traps. Traps with pheromone plus decaying palm material captured a high proportion of males. This raises the question whether individuals, which damage palms are receptive to the pheromone. We studied the sex ratio of the insects feeding on coconuts and those attracted to pheromone traps. Sixty two percent of adults from feeding galleries on living coconut palms were females. Pheromone with rotting palm material lured 43% females. To investigate the reasons for this difference, we compared the reproductive system of females lured to the odour traps or feeding in coconut galleries, or present in old rotting stems. Ninety six percent of the females trapped by pheromone had mated, and were sexually mature. In the galleries on living palms, 46% of females were immature, and 24% had not mated. In old rotting stems where eggs are laid and larvae develop, a mixture of 52% mated and 48% virgin females was found. Therefore, the pheromone together with the odour of rotting coconut stems signals a reproduction site to beetles, particularly mature females. In practice, the pheromone-baited traps will help in reducing the dissemination of gravid females, but will not affect directly the numbers of immature ones attacking palms. Our results show that when using pheromones for monitoring or controlling insects, the physiological status of the insects may have unexpected effects on the outcome. [PUBLICATION ABSTRACT]

Enabling mycelial application of *Hirsutella thompsonii* for managing the coconut mite /P Sreerama Kumar, Leena Singh.

Experimental & Applied Acarology. Amsterdam:Dec 2008. Vol. 46, Iss. 1-4, p. 169-82 (14 pp.)

Issue Title: Diseases of Mites and Ticks

Abstract:

Laboratory and field studies were conducted to examine the prospect of mycelial application of *Hirsutella thompsonii* as an alternative to the use of mycelial-conidial

formulations of the fungus in the suppression of the coconut mite, *Aceria guerreronis*. In a series of laboratory experiments, glycerol, yeast extract powder and dehydrated malt extract broth were found to be the best among nine substances investigated as possible adjuvants for use on coconut palms in the field along with *H. thompsonii* mycelia. *H. thompsonii* biomass in the presence of adjuvants not only produced more colonies but also yielded more conidia per pellet. In terms of the density of conidia generated on a mycelial mat the treatments varied highly significantly in two methods, with glycerol showing an average of 106% increase over control. Though irradiance with simulated sunlight resulted in reduced conidiogenesis, in general, adjuvant-treated pellets, both exposed and unexposed to simulated sunlight, produced substantial conidiation compared with control, irrespective of the two incubation conditions. Better conidiation was observed under alternating light-dark regime than under total darkness in all the treatments. Glycerol boosted the pathogenicity of *H. thompsonii* by 16.5% over control. In the field, a newly developed mycelial formulation of *H. thompsonii* applied after tank-mixing separately with the three selected adjuvants brought down the post-treatment population of the coconut mite by 85.6-97.1%. Application of the fungus in combination with glycerol resulted in a tolerable mean nut damage grade of 2.0 during the pre-harvest stage, compared with an acute score of 4.0 in control palms. Laboratory and field studies were conducted to examine the prospect of mycelial application of *Hirsutella thompsonii* as an alternative to the use of mycelial-conidial formulations of the fungus in the suppression of the coconut mite, *Aceria guerreronis*. In a series of laboratory experiments, glycerol, yeast extract powder and dehydrated malt extract broth were found to be the best among nine substances investigated as possible adjuvants for use on coconut palms in the field along with *H. thompsonii* mycelia. *H. thompsonii* biomass in the presence of adjuvants not only produced more colonies but also yielded more conidia per pellet. In terms of the density of conidia generated on a mycelial mat the treatments varied highly significantly in two methods, with glycerol showing an average of 106% increase over control. Though irradiance with simulated sunlight resulted in reduced conidiogenesis, in general, adjuvant-treated pellets, both exposed and unexposed to simulated sunlight, produced substantial conidiation compared with control, irrespective of the two incubation conditions. Better conidiation was observed under alternating light-dark regime than under total darkness in all the treatments. Glycerol boosted the pathogenicity of *H. thompsonii* by 16.5% over control. In the field, a newly developed mycelial formulation of *H. thompsonii* applied after tank-mixing separately with the three selected adjuvants brought down the post-treatment population of the coconut mite by 85.6-97.1%. Application of the fungus in combination with glycerol resulted in a tolerable mean nut damage grade of 2.0 during the pre-harvest stage, compared with an acute score of 4.0 in control palms

SOIL FERTILITY (1 jdl)

Litter decomposition of *Acacia auriculiformis* Cunn. Ex Benth. and *Acacia mangium* Willd. under coconut trees on quaternary sandy soils in Ivory Coast /A Ngoran, N Zakra, K Ballo, C Kouamé, F Zapata, G Hofman, O Van Cleemput.

Biology and Fertility of Soils. Berlin:Oct 2006. Vol. 43, Iss. 1, p. 102-106

Abstract:

Litter decomposition of *Acacia auriculiformis* and *Acacia mangium* on sandy soil under coconut trees was studied in a field trial using the litterbag technique. The study was conducted during 2001 and 2002 in Ivory Coast. Litterbags containing 450 g of dried leaves and 450 g of dried small stems were set up in two coconut plantations of different ages, 3 and 20 years old. Dry matter weight and concentrations of total nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), and C/N ratio were determined at 90, 180, 270, and 360 days. The decomposition rate constant (k) and the half-life time decomposition of dry matter ($T^{1/2}$) were calculated. The study showed that *A. auriculiformis* and *A. mangium* have the same rate of decomposition on each coconut plantation. The k value varied from -1.592 day^{-1} to -1.492 day^{-1} . The half-life time decomposition value of dry matter ($T^{1/2}$) ranged from 283 to 301 days. Nitrogen was released between 0 and 180 days with an N concentration for *A. auriculiformis* and *A. mangium* varying from 2.03 to 1.80% and 1.97 to 1.79%, respectively. After 180 days, the litters immobilized N. Phosphorus and Mg were released faster from *A. mangium* than from *A. auriculiformis*. A positive correlation was found between the N concentration of each *Acacia* species and the litter dry weight at 90 and 180 days. Likewise, C/N ratio was positively correlated with litter dry weight at 90 days.[PUBLICATION ABSTRACT]

PROCESSING OF AGRICULTURAL PRODUCTS (3 jdl)

Application of FTIR Spectroscopy for the Determination of Virgin Coconut Oil in Binary Mixtures with Olive Oil and Palm Oil /Abdul Rohman, Yaakob B Che Man, Amin Ismail, Puziah Hashim. JAOCS,

Journal of the American Oil Chemists' Society. Champaign:Jun 2010. Vol.

87, Iss. 6, p. 601-606 (6 pp.)

Abstract:

Rapid Fourier transform infrared (FTIR) spectroscopy combined with attenuated total reflectance (ATR) was applied for quantitative analysis of virgin coconut oil (VCO) in binary mixtures with olive oil (OO) and palm oil (PO). The spectral bands correlated with VCO, OO, PO; blends of VCO and OO; VCO and PO were scanned, interpreted, and identified. Two multivariate calibration methods, partial least square (PLS) and principal component regression (PCR), were used to construct the calibration models that correlate between actual and FTIR-predicted values of VCO contents in the mixtures at the FTIR spectral frequencies of 1,120-1,105 and 965-960 cm^{-1} . The calibration models obtained were cross validated using the "leave one out" method. PLS at these frequencies showed the best calibration model, in terms of the

highest coefficient of determination (R^2) and the lowest of root mean standard error of calibration (RMSEC) with $R^2 = 0.9992$ and $RMSEC = 0.756$, respectively, for VCO in mixture with OO. Meanwhile, the R^2 and RMSEC values obtained for VCO in mixture with PO were 0.9996 and 0.494, respectively. In general, FTIR spectroscopy serves as a suitable technique for determination of VCO in mixture with the other oils. [PUBLICATION ABSTRACT]

Use of the SAW Sensor Electronic Nose for Detecting the Adulteration of Virgin Coconut Oil with RBD Palm Kernel Olein /A M Marina, Y B Che Man, I Amin. *JAOCS, Journal of the American Oil Chemists' Society*. Champaign:Mar 2010. Vol. 87, Iss. 3, p. 263-270 (8 pp.)

Abstract:

An electronic nose (zNose(TM)) was applied to the detection of adulteration of virgin coconut oil. The system, which is based on a surface acoustic wave sensor was used to generate a pattern of volatile compounds present in the samples. Virgin coconut oil was mixed with refined, bleached and deodorized palm kernel olein at a level of adulteration from 1 to 20% (wt/wt). Adulterant peaks were identified from the chromatogram profile and fitted to a curve using linear regression. The best relationship ($R^2 = 0.91$) was obtained between the peak tentatively identified as methyl dodecanoate and the percentage of palm kernel olein added. Pearson's correlation coefficients (r) of 0.92 and 0.89 were obtained between adulterant peak methyl dodecanoate and of the iodine and peroxide values, respectively. Principal component analysis (PCA) was used to differentiate between pure and adulterated samples. The PCA provided good differentiation of samples with 74% of the variation accounted for by PC 1 and 17% accounted for by PC 2. Pure samples formed a separate cluster from all of the adulterated samples. [PUBLICATION ABSTRACT]

Characterization of Aromatherapy Massage Oils Prepared from Virgin Coconut Oil and Some Essential Oils /Sarunyoo Songkro, Anusak Sirikatitham, Supreedee Sungkarak, Khemmarat Buaking, Juraithip Wungsintaweekul, Duangkhae Maneenuan, Kwunchit Oungbho.

JAOCS, Journal of the American Oil Chemists' Society. Champaign:Jan 2010. Vol. 87, Iss. 1, p. 93-107 (15 pp.)

Abstract:

The aim of this study was to characterize aromatherapy massage oils prepared from virgin coconut oil (VCO) and some essential oils. VCO extracted from fresh coconut endosperm by a centrifugation method, which was the most effective method to prepare VCO, was composed mainly of saturated fatty acids, in particular myristic acid. Three essential oils (lemon, eucalyptus and lavender oils) at concentrations of 1, 3 and 5% w/w were blended with the VCO to prepare massage oils. Physical and chemical properties as well as microbial analysis of the massage oils were assessed to evaluate quality characteristics of the preparations. Results showed that types and concentrations of essential oils used somewhat affected viscosity, refractive index and three chemical characteristics (acid, peroxide, and iodine values) associated with

oxidative stability of the massage oils. Generally the rank order of acid, peroxide and iodine values of the freshly prepared massage oils appeared to be lemon oil > lavender oil > eucalyptus oil. The results of a accelerated storage stability study (45 °C, 4 months) clearly showed a dramatic increase in both acid and peroxide values of VCO and the blended massage oils compared to initial values, whereas the iodine values of these preparations decreased slightly. The plain VCO and the blended massage oils did not exhibit antimicrobial activity on the test microorganisms and were free from microbial contamination. [PUBLICATION ABSTRACT]