

Mangosteen 1990 - 2004

Author A. E. Hay, J. J. Helesbeux, O. Duval, M. Labaied, P. Grellier and P. Richomme
Title Antimalarial xanthenes from *Calophyllum caledonicum* and *Garcinia vieillardii*.
Year 2004
Source title Life Sciences
Reference 75(25): 3077-3085

Abstract

The antimalarial activity of 22 xanthenes against chloroquino-resistant strains of *Plasmodium falciparum* was evaluated. Natural caloxanthone C (1), demethylcalabaxanthone (2), calothwaitesixanthone (3), calozeyloxanthone (4), dombakinaxanthone (5), macluraxanthone (6), and 6-deoxy- γ -mangostin (7) were isolated from *Calophyllum caledonicum*. 1,6-dihydroxyxanthone (8), pancixanthone A (9), isocudranixanthone B (10), isocudranixanthone A (11), 2-deprenylrheediaxanthone B (12) and 1,4,5-trihydroxyxanthone (13) were isolated from *Garcinia vieillardii*. Moreover, synthetic compounds (14-22) are analogues or intermediates of xanthenes purified from *Calophyllum caledonicum* (Oger J.M., Morel C., Helesbeux J.J., Litaudon M., Seraphin D., Dartiguelongue C., Larcher G., Richomme P., Duval O. 2003. First 2-Hydroxy-3-Methylbut-3-Enyl substituted xanthenes isolated from Plants: structure elucidation, synthesis and antifungal activity. *Natural Product Research* 17(3), 195-199; Helesbeux J.J., Duval O., Dartiguelongue C., Seraphin D., Oger J.M., Richomme P., 2004. Synthesis of 2-hydroxy-3-methylbut-3-enyl substituted coumarins and xanthenes as natural products. Application of the Schenck ene reaction of singlet oxygen with ortho-prenylphenol precursors. *Tetrahedron* 60(10), 2293-2300). The relationship between antimalarial activity and molecular structure of xanthenes has also been explored. The most potent xanthenes (2), (3) and (7) (IC_{50} =c.a. 1.0 μ g/mL) are 1,3,7 tri oxygenated and prenylated on the positions 2 and 8.

Author A. E. Hay, M. C. Aumond, S. Mallet, V. Dumontet, M. Litaudon, D. Rondeau and
Title Antioxidant xanthenes from *Garcinia vieillardii*.
Year 2004
Source title Journal of Natural Products
Reference 67(4): 707-709

Abstract

Two new xanthenes, 6-O-methyl-2-deprenylrheediaxanthone B (1) and vieillardixanthone (2), were isolated from the stem bark of *Garcinia vieillardii*, as were four known compounds (4-7). The structures of 1 and 2 were determined by means of spectroscopic analysis and chemical derivatization. Each isolate was tested for its antioxidant properties based on a scavenging activity study using the stable 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical.

Author B. Karanam, M. Altaf, R. A. Varier, V. Swaminathan, R. Aarti, P. P. Sadhale and
Title Polyisoprenylated benzophenone, garcinol, a natural histone acetyltransferase inhi
Year 2004
Source title Journal of Biological Chemistry
Reference 279(32): 33716-33726

Abstract

Histone acetylation is a diagnostic feature of transcriptionally active genes. The proper recruitment and function of histone acetyltransferases (HATs) and deacetylases (HDACs) are key regulatory steps for gene expression and cell cycle. Functional defects of either of these enzymes may lead to several diseases, including cancer. HATs and HDACs thus are potential therapeutic targets. Here we report that garcinol, a polyisoprenylated benzophenone derivative from *Garcinia indica* fruit rind, is a potent inhibitor of histone acetyltransferases p300 (IC₅₀~7 micro M) and PCAF (IC₅₀~5 micro M) both in vitro and in vivo. The kinetic analysis shows that it is a mixed type of inhibitor with an increased affinity for PCAF compared with p300. HAT activity-dependent chromatin transcription was strongly inhibited by garcinol, whereas transcription from DNA template was not affected. Furthermore, it was found to be a potent inducer of apoptosis, and it alters (predominantly down-regulates) the global gene expression in HeLa cells.

Author C. M. Ramage, L. Sando, C. P. Peace, B. J. Carroll and R. A. Drew
Title Genetic diversity revealed in the apomictic fruit species *Garcinia mangostana* L. (
Year 2004
Source title Euphytica
Reference 136(1): 1-10

Abstract

The novel molecular marker technique Randomly Amplified DNA Fingerprinting (RAF) was used to survey genetic relationships between 37 accessions of the tropical fruit *G. mangostana* (mangosteen) and among 11 accessions from eight other *Garcinia* species. Although mangosteen is believed to reproduce exclusively through apomixis, our results show that considerable genetic diversity exists within *G. mangostana* and between other *Garcinia* species. Among the 37 *G. mangostana* accessions examined, nine different genotypes were identified which clustered into three distinct groups based on correspondence analysis (reciprocal averaging). For 26 (70%) of the accessions no marker variation was detected over 530 loci screened. A further eight (22%) accessions exhibited very low levels of variation (0.2-1%) suggesting at least one well conserved mangosteen genotype. The remaining three accessions (8%) showed extensive variation (22-31%) compared with the majority of accessions. The three mangosteen groups were 63-70% dissimilar to the other *Garcinia* species investigated. The genetic diversity identified in this research will assist in the conservation of *Garcinia* germplasm and provides a valuable framework for the genetic improvement of mangosteen.

Author C. Yapwattanaphun, S. Subhadrabandhu, C. Honsho and K. Yonemori
Title Phylogenetic relationship of mangosteen (*Garcinia mangostana*) and several wild r
Year 2004
Source title Journal of the American Society for Horticultural Science
Reference 129(3): 368-373

Abstract

The phylogenetic relationships among 17 *Garcinia* species including *G. mangostana* (mangosteen) were analysed by comparing sequences of the internal transcribed spacer (ITS) region of nuclear ribosomal DNA. Both parsimonious and neighbour joining (NJ) analyses revealed that *G. mangostana* is closely related to *G. malaccensis* believed to be a progenitor of mangosteen. Another suspected progenitor of mangosteen, *G. hombroniana* [*G. hombrioniana*], was more distant from *G. mangostana* than *G. malaccensis* phylogenetically. *G. hombroniana* formed a cluster with *G. rostrata*, *G. speciosa* and *G. sizygiifolia*, and this cluster was connected with a cluster of *G. mangostana* and *G. malaccensis*. The ITS sequence analysis showed that *G. atroviridis*, *G. cowa*, *G. dulcis*, *G. malaccensis*, *G. mangostana*, *G. rostrata* and *G. vilersiana* have nucleotide additivity (2 different nucleotides at the same nucleotide position) at several sites in the ITS region. The occurrence of these species might be related to hybridization with ancestors, but the genomic compositions, even chromosome numbers, of these species are still unknown.

Author E. O. Farombi, M. Hansen, G. Ravn-Haren, P. Mller and L. O. Dragsted
Title Commonly consumed and naturally occurring dietary substances affect biomarker
Year 2004
Source title Food and Chemical Toxicology
Reference 42(8): 1315-1322

Abstract

The influence of black currant juice, Bowman-Birk protease inhibitor (BBI), kolaviron (a biflavonoid fraction of *Garcinia kola* seed), sugars, vitamin C and tert-butyl hydroperoxide on a wide range of biomarkers for oxidative stress, DNA damage and sugar or lipid metabolism has been investigated in male F 344 rats. The selected pro-oxidant control, tert-butyl hydroperoxide, significantly increased plasma and liver 2-amino-adipic semialdehyde (AAS), a marker of protein oxidation ($p < 0.05$) whereas lipid oxidation assessed as malon dialdehyde (MDA) and DNA oxidation were not significantly increased. Feeding BBI also increased the level of oxidized protein in plasma and liver at the higher dose level (0.5%). No effect was observed at the lower dose level (0.25%), which even decreased lipid oxidation in plasma. BBI did not affect background levels of DNA strand breaks or oxidation (comets). In rats exposed to black currant juice, a statistically significant decrease in liver AAS and MDA was observed. This effect could not be explained by its content of sugars or of the known redox active constituent, vitamin C. The lowering effect of black currant juice on protein and lipid oxidation was similar in magnitude to that of the known liver protectant, kolaviron. In rats treated with kolaviron (200 mg/kg body weight), background AAS levels were significantly reduced in both plasma and liver whereas the effect on MDA only reached statistical significance in plasma. Kolaviron was the only extract tested which decreased oxidative damage to DNA in the liver. The erythrocyte antioxidant enzyme activities, catalase and glutathione peroxidase were decreased in rats treated with tert-butyl hydroperoxide ($p < 0.05$) but were not affected by the other treatments. Black currant juice and sugars increased plasma triglyceride levels and black currant juice increased plasma cholesterol but neither of them nor any other treatment affected blood glucose, erythrocyte HbA1c or fructosamine. We conclude that markers of oxidative stress may be modified by several mechanisms after feeding rats with complex dietary factors and that both pro- and antioxidant effects may consequently be observed simultaneously after short-term feeding of antioxidant-rich foods, herb medicines, or known pro- and antioxidants.

Author E. O. Farombi, P. Mller and L. O. Dragsted
Title Ex-vivo and in vitro protective effects of kolaviron against oxygen-derived radical
Year 2004
Source title Cell Biology and Toxicology
Reference 20(2): 71-82

Abstract

The present study reports the protective effects of kolaviron, a Garcinia biflavonoid from the seeds of *Garcinia kola* widely consumed in some West African countries against oxidative damage to molecular targets ex-vivo and in vitro. Treatment with hydrogen peroxide (H₂O₂) at a concentration of 100 micro mol/L increased the levels of DNA strand breaks and oxidized purine (formamidopyrimidine glycosylase (FPG)) and pyrimidine (endonuclease III (ENDO III) sites) bases in both human lymphocytes and rat liver cells using alkaline single cell gel electrophoresis (the comet assay). Kolaviron was protective at concentrations between 30-90 micro mol/L and decreased H₂O₂-induced DNA strand breaks and oxidized bases. Neither alpha -tocopherol nor curcumin decreased H₂O₂-induced DNA damage in this assay. In lymphocytes incubated with Fe³⁺/GSH, Fe³⁺ was reduced to Fe²⁺ by GSH initiating a free radical generating reaction which induced 11.7, 6.3, and 4.9 fold increase respectively in strand breaks, ENDO III and FPG sensitive sites compared with control levels. Deferoxamine (2 mmol/L), an established iron chelator significantly inhibited GSH/Fe³⁺-induced strand breaks and oxidized base damage. Similarly, kolaviron at 30 and 90 micro mol/L significantly attenuated GSH/Fe³⁺-induced strand breaks as well as base oxidation. Kolaviron (100 mg/kg bw) administered to rats for one week protected rat liver cells against H₂O₂-induced formation of strand breaks, ENDO III, and FPG sensitive sites, Fe³⁺/EDTA/ascorbate-induced malondialdehyde formation and protein oxidation using gamma -glutamyl semialdehyde (GGS) and 2-amino-adipic semialdehyde (AAS) as biomarkers of oxidative damage to proteins. We suggest that kolaviron exhibits protective effects against oxidative damage to molecular targets via scavenging of free radicals and iron binding. Kolaviron may therefore be relevant in the chemoprevention of oxidant-induced genotoxicity and possibly human carcinogenesis.

Author F. Abe, S. Nagafuji, H. Okabe, H. Akahane, E. Estrada-Muniz, M. Huerta-Reyes a
Title Trypanocidal constituents in plants 3. Leaves of *Garcinia intermedia* and heartwo
Year 2004
Source title Biological & Pharmaceutical Bulletin
Reference 27(1): 141-143

Abstract

The constituents of the leaves of *G. intermedia* (collected in 1998 from Mendoza, Veracruz, Mexico) and heartwood of *C. brasiliense* (from Mexico City) were tesetd for their trypanocidal activity against epimastigotes of *Trypanosoma cruzi*, the aetiologic agent of Chagas' disease. Gossypol, berberine chloride and harmine were used for comparison. As the active components, the polyisoprenylated benzophenone derivative, guttiferone A, and the xanthone, 8-desoxygartanin, were isolated along with the biflavonoids podocarpusflavone A and amentoflavone, and friedelin from the former. Three xanthenes, jacareubin, 6-deoxyjacareubin, and 1,3,5,6-tetrahydroxy-2-(3-methyl-2-butenyl)xanthone, from the latter showed significant trypanocidal activity. The bioflavanoiods s h o w e d n o a c t i v i t y .

Author G. C. Onunkwo, H. C. Egeonu, M. U. Adikwu, J. E. Ojile and A. K. Olowosulu
Title Some physical properties of tabletted seed of *Garcinia kola* (Heckel).
Year 2004
Source title Chemical & Pharmaceutical Bulletin
Reference 52(6): 649-653

Abstract

The formulation of *Garcinia kola* seeds into tablet dosage form and evaluation of some physical properties of the tablets are presented. A chemical assay was conducted on the dry, powdered seeds and the crude aqueous extract of the seeds. The dry powdered seeds contain 0.003% flavonoids while the crude extract contained 0.007% flavonoids based on rutin, used as the standard. The powdered material (50 mg) and crude extract (10 mg) were formulated into tablets using the wet granulation method. Named binders were evaluated in these formulations. The various tablet parameters, weight variation, thickness and diameter, hardness, friability, disintegration time, dissolution profile and content uniformity were evaluated. The results indicated that the tablets had good disintegration time, dissolution and hardness/friability profiles. Tablets formulated with starch had the best disintegration properties but were consequently very friable. Tablets formulated from 10 mg of the crude extract needed a larger proportion of diluents, which affected the tablet properties.

Author H. G. Preuss, D. Bagchi, M. Bagchi, C. V. S. Rao, D. K. Dey and S. Satyanarayan
Title Effects of a natural extract of (-)-hydroxycitric acid (HCA-SX) and a combination
Year 2004
Source title Diabetes, Obesity and Metabolism
Reference 6(3): 171-180

Abstract

Aim: The efficacy of optimal doses of highly bioavailable (-)-hydroxycitric acid (HCA-SX) alone and in combination with niacin-bound chromium (NBC) and a standardized *Gymnema sylvestre* extract (GSE) on weight loss in moderately obese subjects was evaluated by monitoring changes in body weight, body mass index (BMI), appetite, lipid profiles, serum leptin and excretion of urinary fat metabolites. HCA-SX has been shown to reduce appetite, inhibit fat synthesis and decrease body weight without stimulating the central nervous system. NBC has demonstrated its ability to maintain healthy insulin levels, while GSE has been shown to regulate weight loss and blood sugar levels. **Methods:** A randomized, double-blind, placebo-controlled human study was conducted in Elluru, India for 8 weeks in 60 moderately obese subjects (ages 21-50, BMI>26 kg/m²). Subjects were randomly divided into three groups. Group A was administered HCA-SX 4667 mg, group B was administered a combination of HCA-SX 4667 mg, NBC 4 mg and GSE 400 mg, while group C was given placebo daily in three equally divided doses 30-60 min before meals. All subjects received a 2000 kcal diet/day and participated in supervised walking. **Results:** At the end of 8 weeks, body weight and BMI decreased by 5-6% in both groups A and B. Food intake, total cholesterol, low-density lipoproteins, triglycerides and serum leptin levels were significantly reduced in both groups, while high-density lipoprotein levels and excretion of urinary fat metabolites increased in both groups. A marginal or non-significant effect was observed in all parameters in group C. **Conclusion:** The present study shows that optimal doses of HCA-SX and, to a greater degree, the combination of HCA-SX, NBC and GSE can serve as an effective and safe weight-loss formula that can facilitate a reduction in excess body weight and BMI, while promoting healthy blood lipid levels.

Author H. G. Preuss, D. Bagchi, M. Bagchi, C. V. S. Rao, S. Satyanarayana and D. K. De
Title Efficacy of a novel, natural extract of (-)-hydroxycitric acid (HCA-SX) and a com
Year 2004
Source title Nutrition Research
Reference 24(1): 45-58

Abstract

In this pilot study, the efficacy of a novel, natural extract of a highly bioavailable, calcium-potassium salt of (-)-hydroxycitric acid (HCA-SX) alone and in combination with a niacin-bound chromium (NBC) and *Gymnema sylvestra* extract (GSE) was evaluated for weight loss in moderately obese subjects by monitoring changes in body weight, body mass index (BMI), appetite, lipid profiles, serum leptin and serotonin levels, and enhanced excretion of urinary fat metabolites. *Garcinia cambogia*-derived (-)-hydroxycitric acid (HCA) has been shown to reduce appetite, inhibit fat synthesis and decrease body weight without stimulating the central nervous system. NBC has shown the ability to restore insulin function, metabolize fat, turn protein into muscle, and convert sugar into energy, which plays a role in appetite regulation and facilitates weight loss. *Gymnema sylvestre* is a traditional herb that helps to promote weight loss possibly through its ability to reduce cravings for sweets and control blood sugar levels. A randomized, double-blind, placebo-controlled human clinical study was conducted in thirty obese subjects (ages 21-50, BMI>26 kg/m²) for eight weeks in Elluru, India. The subjects were randomly divided into three groups (10 subjects/group) and given HCA-SX 4,667 mg (60% HCA providing 2,800 mg HCA/day) (Group A), a combination of HCA-SX 4,667 mg, NBC 4 mg (providing 400 micro g elemental Cr) and GSE 400 mg (providing 100 mg gymnemic acid) (Group B), or placebo (Group C) daily in 3 equally divided doses 30-60 min before each meal. This HCA-SX dose was extrapolated from previously conducted in vitro and in vivo studies. In addition, subjects received 2,000 kcal diet/day and underwent a 30 min/day supervised walking program, 5 days/week. At the end of 8 weeks, body weight and BMI decreased by 6.3%, respectively, in Group A. Food intake was reduced by 4%. Total cholesterol, LDL and triglycerides levels were reduced by 6.3%, 12.3% and 8.6%, respectively, while HDL and serotonin levels increased by 10.7% and 40%, respectively. Serum leptin levels were decreased by 36.6%, and the enhanced excretion of urinary fat metabolites, including malondialdehyde (MDA), acetaldehyde (ACT), formaldehyde (FA) and acetone (ACON), increased by 125-258%. Under these same conditions, Group B reduced body weight and BMI by 7.8% and 7.9%, respectively. Food intake was reduced by 14.1%. Total cholesterol, LDL and triglyceride levels were reduced by 9.1%, 17.9% and 18.1%, respectively, while HDL and serotonin levels increased by 20.7% and 50%, respectively. Serum leptin levels decreased by 40.5% and enhanced excretion of urinary fat metabolites increased by 146-281%. Group C reduced body weight and BMI by only 1.6% and 1.7%, respectively, food intake was increased by 2.8%, and LDL, triglycerides and total cholesterol decreased by 0.8%, 0.2% and 0.8%, respectively. HDL were reduced by 4.1% while serum leptin levels were increased by 0.3%, and excretion of urinary fat metabolites did not change in MDA, ACT and FA, and marginally increased in the case of ACON. No adverse effects were observed. Results demonstrate that HCA-SX and, to a greater degree, the combination of HCA-SX, NBC and GSE can serve as safe weight management supplements.

Author I. F. Obuekwe and N. D. Onwukaeme
Title Phytochemical analyses and anti-microbial activities of the leaf and stem bark extr
Year 2004
Source title Pakistan Journal of Scientific and Industrial Research
Reference 47(2): 160-162

Abstract

A study was conducted to analysed the chemical constituents of the stem bark and leaves of *G. kola* and to evaluate the antimicrobial activity of their extracts (at 100, 150 and 200 mg/ml) against *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Aspergillus niger* and *Geotrichum sp.* The fresh leaves were collected from Okodobor village, near Benin City, while the stem bark was collected from Iyowa village close to Okada town, Benin City, Nigeria. Phytochemical tests on the leaves revealed the presence of glycosides, saponins, flavonoids, alkaloids and tannins. Thin layer chromatography on silica gel using different solvent systems showed the alkaloids to be both of salt and basic forms. The stem bark also revealed the presence of glycosides, flavonoids and tannins. Alkaloids were absent. The aqueous extract of stem bark only had inhibitory activity against *S. aureus* at all concentrations (with minimum inhibitory concentration (MIC) of 100 mg/ml), while there was no activity on the other organisms. For the leaf extract, the result only showed inhibitory activity on *S. aureus* using methanolic solvents, with MIC

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Author J. Royer and B. Dostie
Title Host plant and seasonal abundance of *Bactrocera visenda* (Hardy) (Diptera: Tephro
Year 2004
Source title Australian Entomologist
Reference 31(1): 25-27

Abstract

Host plant records from northern Queensland, Australia suggest that *B. visenda* is monophagous on *Garcinia warrenii* (native mangosteen). Populations of *B. visenda* increased markedly from November to February annually, which correlates well with the fruiting period of *G. warrenii*. Almost all *G. warrenii* fruits collected produced *B. visenda*, which was not reliably reared from any other host. A record from *G. gibbsiae* remains unconfirmed. *B. visenda* was not reared from cultivated mangosteen (*G. mangostana*) and is unlikely to become an economic pest of cultivated

f r u i t i n t h i s r e g i o n .

Author L. Chiang, H. Cheng, M. Liu, W. Chiang and C. Lin
Title In vitro evaluation of antileukemic activity of 17 commonly used fruits and vegeta
Year 2004
Source title Lebensmittel-Wissenschaft und -Technologie
Reference 37(5): 539-544

Abstract

The aim of this study was to investigate the in vitro antileukemic activity of hot water (HW) or juice extracts of 17 frequently used fruits and vegetables in Taiwan. The cytotoxic effect against K562, P3HR1, Raji, and U937 leukemia cells was evaluated by the colorimetric XTT assay. Results showed that only HW extract of the fruit rind of *Garcinia mangostana* exhibited potent antileukemic activity. *G. mangostana* showed a significant cytotoxic effect against K562 and Raji cells ($P < 0.05$) with IC_{50} 's of 61.0 ± 9.9 and 159.2 ± 12.1 micro g/mL, respectively. It also possessed moderate anti-U937 activity, but was less effective against P3HR1 cells. The selectivity indices of *G. mangostana* on K562, U937, and Raji cells were higher than that of *Catharanthus roseus*, a reference compound. The other 16 tested samples were moderate, mild or less in their antileukemic activity. In conclusion, the promising and encouraging antileukemic activity of *G. mangostana* merit further investigation on its active component(s) and underlying mechanism(s) of action.

Author L. Tona, R. K. Cimanga, K. Mesia, C. T. Musuamba, T. d. Bruyne, S. Apers, N. H
Title In vitro antiplasmodial activity of extracts and fractions from seven medicinal pla
Year 2004
Source title Journal of Ethnopharmacology
Reference 93(1): 27-32

Abstract

The in vitro antiplasmodial activity of seven EtOH extracts and twenty fractions from the partition of the initial ethanolic extracts from seven African medicinal plants used in the Democratic Republic of Congo (DR Congo) for the treatment of malaria was evaluated. The most active EtOH extracts ($IC_{50} < 3$ micro g/ml) were those from *Cassia occidentalis* leaves, *Euphorbia hirta* whole plant, *Garcinia kola* stem bark and *Phyllanthus niruri* whole plant. Their respective petroleum ether soluble fractions also exhibited an antiplasmodial activity with $IC_{50} < 3$ micro g/ml. EtOH extracts from *Vernonia amygdalina* leaves ($5 < IC_{50} < 10$ micro g/ml), *Tetracera poggei* leaves ($10 < IC_{50} < 50$ micro g/ml) and *Morinda morindoides* leaves ($50 < IC_{50} < 100$ micro g/ml) were less active, but their petroleum ether fractions exhibited a pronounced antiplasmodial activity ($IC_{50} < 3$ micro g/ml). The same observation could also be made for the petroleum ether fraction from *Cassia occidentalis*, *Euphorbia hirta*, *Garcinia kola* and *Phyllanthus niruri*. Isoamyl alcohol fractions from *Euphorbia hirta*, *Phyllanthus niruri* and *Vernonia amygdalina* showed IC_{50} values less than 3 micro g/ml, and from *Cassia occidentalis*, *Garcinia kola*, *Morinda morindoides* and *Tetracera poggei* between 10 and 50 micro g/ml. The observed antiplasmodial activity may be related to the presence of terpenes, steroids, coumarins, flavonoids, phenolic acids, lignans, xanthenes and anthraquinones.

Author L. Zhao, Q. Guo, Q. You, Z. Wu and H. Gu
Title Gambogic acid induces apoptosis and regulates expressions of bax and Bcl-2 prot
Year 2004
Source title Biological & Pharmaceutical Bulletin
Reference 27(7): 998-1003

Abstract

The selective induction of apoptosis of gambogic acid (GA; the main active constituent of gamboge, the dry resin from *Garcinia hanburryi*) on MGC-803 cells and its probable molecular mechanism were studied. GA greatly inhibited (24, 48, 72 h) the growth of MGC-803 cells (by MTT); the IC50 value was 0.96 micro g/ml at 48 h. Meanwhile, no influence was observed on body weight, number of white blood cells in blood or karyote in marrow of rats after GA was injected intravenously. We conclude that GA does not affect normal cells, but that it can induce apoptosis in tumour cells selectively and there were marked morphological changes. A great quantity of apoptotic cells and increasing G2/M phase cells were observed by flow cytometry, and a significant percentage of early apoptotic cells were observed by Annexin-V/PI double staining assay. The increase of bax gene and the decrease of bc1-2 gene expressions were detected by immunohistochemistry. Activation of bax and suppression of bc1-2 may contribute to the apoptosis mechanism.

Author M. G. Soni, G. A. Burdock, H. G. Preuss, S. J. Stohs, S. E. Ohia and D. Bagchi
Title Safety assessment of (-)-hydroxycitric acid and Super CitriMaxReg., a novel calci
Year 2004
Source title Food and Chemical Toxicology
Reference 42(9): 1513-1529

Abstract

(-)-Hydroxycitric acid (HCA) is a principle constituent (10-30%) of the dried fruit rind of *Garcinia cambogia*, a plant native to Southeastern Asia. The dried rind has been used for centuries throughout Southeast Asia as a food preservative, flavoring agent and carminative. Extensive experimental studies show that HCA inhibits fat synthesis and reduces food intake. The objective of this review is to systematically review the available safety/toxicity literature on HCA to determine its safety in use. The primary mechanism of action of HCA appears to be related to its ability to act as a competitive inhibitor of the enzyme ATP-citrate lyase, which catalyzes the conversion of citrate and coenzyme A to oxaloacetate and acetyl coenzyme A (acetyl-CoA), primary building blocks of fatty acid and cholesterol synthesis. Super CitriMaxReg., a novel calcium/potassium-HCA extract (HCA-SX), is considerably more soluble and bioavailable than calcium-based HCA ingredients. Acute oral toxicity studies in animals demonstrate that CitriMax (50% HCA as calcium salt) has a low acute oral toxicity. In a subchronic study in rats, the gavage administration of HCA-SX at doses up to 2500 mg/kg/day for a period of 90 days caused a significant decrease in body weight and reduction in feed consumption without any adverse effects. The structure, mechanism of action, long history of use of HCA and other toxicity studies indicate that HCA-SX is unlikely to cause reproductive or developmental effects. HCA-SX was not mutagenic in the presence or absence of metabolic activation in Ames genotoxicity assays in strains TA98 and TA102. HCA-SX-induced increases in number of revertants in other strains (TA100 and TA1535 in the absence of metabolic activation and in strain TA1537 in the presence of metabolic activation) but these were not considered as biologically indicative of a mutagenic effect. In several, placebo-controlled, double-blind trials employing up to 2800 mg/day HCA, no treatment-related adverse effects were reported. There is sufficient qualitative and quantitative scientific evidence, including animal and human data suggesting that intake of HCA at levels up to 2800 mg/day is safe for human consumption.

Author M. H. Pittler and E. Ernst
Title Dietary supplements for body-weight reduction: a systematic review.
Year 2004
Source title American Journal of Clinical Nutrition
Reference 79(4): 529-536

Abstract

Background: Compliance with conventional weight-management programs is notoriously poor, and a plethora of over-the-counter slimming aids are sold with claims of effectiveness. Objective: The objective of the study was to assess the evidence from rigorous clinical trials, systematic reviews, and meta-analyses on the effectiveness of dietary supplements in reducing body weight. Design: The study was a systematic review. Literature searches were conducted on Medline, Embase, Amed, Cinahl, and the Cochrane Library until March 2003. Hand searches of medical journals, the authors' own files, and bibliographies of identified articles were conducted. There were no restrictions regarding the language of publication. The screening of studies, selection, validation, data extraction, and the assessment of methodologic quality were performed independently by the 2 reviewers. To be included, trials were required to be randomized and double-blind. Systematic reviews and meta-analyses of dietary supplements were included if they were based on the results of randomized, double-blind trials. Results: Five systematic reviews and meta-analyses and 25 additional trials were included and reviewed. Data on the following dietary supplements were identified: chitosan, chromium picolinate, Ephedra sinica, Garcinia cambogia, glucomannan, guar gum, hydroxy-methylbutyrate, plantago psyllium, pyruvate, yerba mate, and yohimbe. The reviewed studies provide some encouraging data but no evidence beyond a reasonable doubt that any specific dietary supplement is effective for reducing body weight. The only exceptions are E. sinica- and ephedrine-containing supplements, which have been associated with an increased risk of adverse events. Conclusions: The evidence for most dietary supplements as aids in reducing body weight is not convincing. None of the reviewed dietary supplements can be recommended for over-the-counter

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Author M. S. Gawankar, D. V. Shingre, V. V. Sagvekar and B. P. Patil
Title Evaluation of early performing Kokum (*Garcinia indica* Choisy) genotypes.
Year 2004
Source title Indian Journal of Arecanut, Spices and Medicinal Plants
Reference 6(1): 13-15

Abstract

Fifteen grafts of 14 promising genotypes of Kokum (*G. indica*) were planted in 1996 in Sindhudurg, Maharashtra, India, and evaluated for earliness, growth and yield performance after 6 years. Each entry was designated as MLDK (Mulde kokum) with relative selection numbers. Observations were recorded for plant height, stem girth, plant volume, fruit weight and yield. The study show that MLDK-5, MLDK-2, MLDK-3, MLDK-10 and MLDK-4 are precocious genotypes and needs further evaluation to confirm their consistency and stability in performance with regard to early ripening, yield and quality parameters before considering them for release as new cultivars.

Author M. Shara, S. E. Ohia, R. E. Schmidt, T. Yasmin, A. Zardetto-Smith, A. Kincaid,
Title Physico-chemical properties of a novel (-)-hydroxycitric acid extract and its effect
Year 2004
Source title Molecular and Cellular Biochemistry
Reference 260(1/2): 171-186

Abstract

Garcinia cambogia-derived (-)-hydroxycitric acid (HCA) is a popular and natural supplement for weight management. HCA is a competitive inhibitor of the enzyme ATP citrate lyase, which catalyzes the conversion of citrate and coenzyme A to oxaloacetate and acetyl coenzyme A (acetyl CoA) in the cytosol. Acetyl CoA is used in the synthesis of fatty acids, cholesterol and triglycerides, and in the synthesis of acetylcholine in the central nervous system. Studies have demonstrated the efficacy of a novel 60% calcium-potassium salt of HCA derived from *Garcinia cambogia* (HCA-SX, Super CitriMax) in weight management. Results have shown that HCA-SX promotes fat oxidation, enhances serotonin release and availability in the brain cortex, normalizes lipid profiles, and lowers serum leptin levels in obese subjects. Acute oral, acute dermal, primary dermal irritation and primary eye irritation toxicity, as well as Ames bacterial reverse mutation studies and mouse lymphoma tests have demonstrated the safety of HCA-SX. However, no detailed long-term safety of HCA-SX or any other HCA extract has been previously assessed. We evaluated the dose- and time-dependent effects of HCA-SX in Sprague-Dawley rats on body weight, selected organ weights, hepatic lipid peroxidation and DNA fragmentation, hematology and clinical chemistry over a period of 90 days. Furthermore, a 90-day histopathological evaluation was conducted. The animals were treated with 0, 0.2, 2.0 and 5.0% HCA-SX of feed intake and were sacrificed on 30, 60 or 90 days of treatment. The body weight and selected organ weights were assessed and correlated as a % of body weight and brain weight at 90 days of treatment. A significant reduction in body weight was observed in treated rats as compared to control animals. An advancing age-induced marginal increase in hepatic lipid peroxidation was observed in both male and female rats, while no such difference in hepatic DNA fragmentation was observed as compared to the control animals. Furthermore, selected organ weights individually and as a % of body weight and brain weight at 90 days of treatment exhibited no significant difference between the groups. No difference was observed in hematology and clinical chemistry or the histopathological evaluation. Taken together, these results show that 90 day treatment of HCA-SX results in a reduction in body weight, and does not cause any changes in major organs or in hematology, clinical chemistry, and histopathology.

Author P. A. Mathew, J. Rema and B. Krishnamurthy
Title A note on interspecific grafting in garcinias.
Year 2004
Source title Indian Journal of Arecanut, Spices and Medicinal Plants
Reference 6(2): 55-58

Abstract

Grafting trials on *Garcinia* spp. were conducted from 2000 to 2003 in Calicut, Kerala, India, to induce adaptability to marshy or wet soils. For kokum (*Garcinia indica*), the rootstocks used were seedlings of its own, of kodampuli (*G. gummi-gutta*), and of *G. cowa*. Scions were non-precured shoots with 2-4 leaves. In *G. gummi-gutta*, scions were leafy shoots and precured green shoots. In mangosteen (*G. mangostana*), grafting was done on its own seedlings, *G. tinctoria*, *G. hombrioniana*, *G. cowa* and *G. gummi-gutta*. *G. gummi-gutta* and *G. cowa* were considered good alternate rootstocks for *G. indica*. Meanwhile, for *G. gummi-gutta*, aside from its own seedlings, *G. hombrioniana* was considered a good rootstock. For *G. mangostana*, however, *G. tinctoria*, *G. hombrioniana*, *G. gummi-gutta* and *G. cowa* were not suitable rootstocks; hence, new combinations need to be developed to induce faster growth and early bearing since grafts on its own seedlings
g r e w v e r y s l o w l y .

Author P. Moongkarndi, N. Kosem, O. Luanratana, S. Jongsomboonkusol and N. Pongpa
Title Antiproliferative activity of Thai medicinal plant extracts on human breast adenoc
Year 2004
Source title Fitoterapia
Reference 75(3/4): 375-377

Abstract

The ethanolic extracts of 9 Thai medicinal plants (*Garcinia mangostana* pericarp, *Phyllanthus amarus* [*P. niruri*] whole plant, *Passiflora foetida* aerial part, *Ardisia elliptica* fruit, *Morinda citrifolia* fruit, *Aegle marmelos* fruit, *Heliotropium indicum* whole plant, *Stephania venosa* [*Stephania rotunda*] bulb and *Thunbergia laurifolia* leaf) were tested for antiproliferative activity against SKBR3 human breast adenocarcinoma cell line using MTT assay. *G. mangostana* showed the most potent activity, with IC50 value of 15.45+or-0.50 micro g/ml. However, all the plant extracts showed activity in potential range for further investigation on cancer cells.

Author P. Moongkarndi, N. Kosem, S. Kaslungka, O. Luanratana, N. Pongpan and N. Ne
Title Antiproliferation, antioxidation and induction of apoptosis by *Garcinia mangostana*
Year 2004
Source title Journal of Ethnopharmacology
Reference 90(1): 161-166

Abstract

This study was designed to determine the antiproliferative, apoptotic and antioxidative properties of crude methanolic extract (CME) from the pericarp of *Garcinia mangostana* (family Guttiferae) using human breast cancer (SKBR3) cell line as a model system. SKBR3 cells were cultured in the presence of CME at various concentrations (0-50 micro g/ml) for 48 h and the percentage of cell viability was evaluated by 3-(4,5-dimethylthiazol-2-yl)-2,5-di phenyl tetrazolium bromide (MTT) assay. CME showed a dose-dependent inhibition of cell proliferation with ED50 of 9.25+or-0.64 micro g/ml. We found that antiproliferative effect of CME was associated with apoptosis on breast cancer cell line by determinations of morphological changes and oligonucleosomal DNA fragments. In addition, CME at various concentrations and incubation times were also found to inhibit ROS production. These investigations suggested that the methanolic extract from the pericarp of *Garcinia mangostana* had strong antiproliferation, potent antioxidation and induction of apoptosis. Thus, it indicates that this substance can show different activities and has potential for cancer chemoprevention which were dose dependent as well as exposure time dependent.

Author P. S. K. Pathirana and T. R. Herat
Title Comparative vegetative anatomical study of the genus *Garcinia* L. (Clusiaceae/Gu
Year 2004
Source title Ceylon Journal of Science, Biological Sciences
Reference 32(39-66)

Abstract

A detailed anatomical investigation of lamina, petiole, young stem and wood of 10 *Garcinia* spp. grown in Sri Lanka was carried out and the results were analysed by statistical methods. The results revealed that the boundaries between the Sri Lankan species could be successfully established based on the vegetative anatomy. The results also suggest that there are possible evolutionary relationships between the non-endemic and endemic taxa. On this basis, the non-endemic species, *G. mangostana*, *G. spicata* and *G. xanthochymus* centering *G. morella*, form the basic stock from which two lines of specialization have arisen. The doubtful endemic *G. echinocarpa* could be considered as the most specialized species and the two endemics, *G. quaesita* and *G. terpnophylla* could be the coupling group between the basic group and *G. echinocarpa*. The endemic *G. zeylanica* is observed to be an offshoot of *G. quaesita*. The exotic species *G. xanthochymus* could be interpolated between the basic group and the group which includes the two endemics *G. thwaitesii* and *G. hermonii*. Further, based on the overall anatomical data, results of statistical analysis and ecological distribution with respect to the degree of specialization, it could be suggested that the most specialized species, *G. echinocarpa*, is endemic to Sri Lanka.

Author P. S. Negi and G. K. Jayaprakasha
Title Control of foodborne pathogenic and spoilage bacteria by garcinol and *Garcinia* in
Year 2004
Source title Journal of Food Science
Reference 69(3): FMS61-FMS65

Abstract

Spent rinds of *G. indica* were extracted with hexane and benzene using a Soxhlet extractor for 4 h. The major compound present in both extracts was found to be garcinol, as confirmed by fractionation and spectroscopic studies. The minimum inhibitory concentrations of hexane and benzene extracts, and garcinol against a few Gram-positive and Gram-negative bacteria were in the range of 15-1000, 20-1250, and 1.5-500 ppm, respectively. Furthermore, the antioxidant activity of these fractions at 25 ppm was 63.2%, 61.7%, and 92.4%, respectively, as evaluated by the 1,1-diphenyl-2-picrylhydrazyl method. The hexane and benzene extracts, and garcinol showed 1027, 985.5, and 1195.9 micro mol/g of ascorbic acid equivalents, respectively, at 100 ppm concentration using the phosphomolybdenum method. These findings may be useful for possible application of the previously described fractions as biopreservatives.

Author Q. Guo, L. Zhao, Q. You, Z. Wu and H. Gu
Title Gambogic acid-inducing apoptosis in human gastric adenocarcinoma SGC-7901 c
Year 2004
Source title Chinese Journal of Natural Medicines
Reference 2(2): 106-110

Abstract

The apoptosis-inducing activity of gambogic acid (GA; obtained from the dry resin of *Garcinia hanburyi*) was evaluated on human gastric adenocarcinoma SGC-7901 cells. The inhibition of cell proliferation after 24, 48 and 72 h of incubation with GA at various concentrations was evaluated by colorimetric MTT (3-[4,5-dimethyl thiazol-2-yl]-2,5-diphenyltetrazolium bromide) assay. The IC₅₀ value for a 48-h incubation period was 1.47 micro mol/litre. After incubation of SGC-7901 cells with 1.6 micro mol GA/litre, marked morphological changes and increased amount of apoptotic cells were observed; the rates of apoptosis after 24, 48 and 72 h of incubation were 40.55, 60.67 and 68.99%, respectively. GA also increased the proportion of cells at the G₂/M phase. The expression of bax increased, whereas that of bc 1-2 decreased. The activation of bax and the suppression of bc 1-2 may have contributed to the apoptotic mechanism of GA.

Author Q. Guo, Q. You, Z. Wu, S. Yuan and L. Zhao
Title General gambogic acids inhibited growth of human hepatoma SMMC-7721 cells i
Year 2004
Source title Acta Pharmacologica Sinica
Reference 25(6): 769-774

Abstract

AIM: An experiment was conducted to study the inhibitory effect of general gambogic acids (GGA), extracted from *Garcinia hanburyi*, on transplantation tumour SMMC-7721 in an experimental animal model and SMMC-7721 cells in vitro. **METHODS:** The anti-tumor activity of GGA in the experimental transplantation tumour SMMC-7721 was evaluated by the relative tumour growth ratio. Cell morphology was observed with an inverted microscope and electron microscope. Cell proliferation was measured by the MTT assay and the telomerase activity was determined by PCR. **RESULTS:** The In vivo study indicated that GGA (2, 4, and 8 mg/kg, iv, 3 times per week for 3 weeks) displayed an inhibitory effect on the growth of the transplantation tumour SMMC-7721 in nude mice compared with the normal saline group ($P < 0.01$). At the concentrations of 0.625-5.0 mg/litre, GGA remarkably inhibited the proliferation of SMMC-7721 cells in vitro. GGA 2 mg/litre dramatically changed the morphology of SMMC-7721 cells and inhibited the telomerase activity in SMMC-7721 cells. **CONCLUSION:** GGA had inhibitory effects on the growth of SMMC-7721, which might be related to its inhibition of telomerase activity.

Author R. Garcia-Villacorta and B. E. Hammel
Title A noteworthy new species of *Tovomita* (Clusiaceae) from Amazonian white sand
Year 2004
Source title *Brittonia*
Reference 56(2): 132-135

Abstract

Tovomita calophyllophylla, from white sand forests of the Amazonian lowlands of Colombia and Peru, is described. The species is unique by its leaves and petioles which somewhat resemble those of two other genera of Clusiaceae, *Calophyllum* and *Garcinia*.

Author S. Aiba, K. Kitayama and M. Takyu
Title Habitat associations with topography and canopy structure of tree species in a trop
Year 2004
Source title *Plant Ecology*
Reference 174(1): 147-161

Abstract

Habitat associations with topography and canopy structure of 42 abundant tree species were studied in a 2.74-ha plot of tropical montane forest on Mount Kinabalu, Borneo. Many of these species belong to the same higher taxa including eight families and four genera. Analysis of intraspecific spatial distributions for stems ≥ 10 cm diameter revealed that 28 species (including all six species of Fagaceae) showed aggregated distributions at the 100-m² and/or 400-m² scales, and that 20 species showed habitat associations with topography by torus-translation tests; 17 species showed both characteristics. Species' associations with the local canopy structure were characterized by crown position index (CPI), which was defined relative to neighbour trees. The CPI differed greatly among individual stems at 10-40 cm diameter, and 19 species showed significantly different frequencies of crowns exposed vertically versus those shaded beneath the canopy. Mean growth rates at 10-40 cm diameter and size distributions of species were not related to topographic associations, but were explained by the associations with canopy structure; species with more exposed crowns grew faster and had less positively skewed distributions. Diversity in habitat associations was manifest between two genera (*Syzygium* and *Tristania*) in the family Myrtaceae and among species in these genera, but was less evident in other families and two genera (*Garcinia* and *Lithocarpus*).

Author S. Kondo, A. Jitratham, M. Kittikorn and S. Kanlayanarat
Title Relationships between jasmonates and chilling injury in mangosteens are affected
Year 2004
Source title HortScience
Reference 39(6): 1346-1348

Abstract

Effects of low temperature and chilling injury (CI) on jasmonic acid (JA) and methyl jasmonate concentrations were investigated in mangosteens (*Garcinia mangostana*). JA concentrations in the skin of fruit stored at 7 degrees C increased significantly compared with that of those stored at 13 degrees C, but JA decreased with the occurrence of visible symptoms of CI. Neither an increase in JA nor CI was detected in pulp of fruit stored at 7 degrees C. JA concentrations in the skin of fruit treated with spermine (Spm) and stored at 7 degrees C also increased, but at a lesser extent than in untreated fruit. Thus, the response of JA to low temperatures appears to be limited to chill-susceptible parts of the fruit. The decrease of JA and the onset of CI was delayed in fruit treated with Spm kept at 7 degrees C compared with untreated control fruit. Exogenous application of n-propyl dihydrojasmonate, which is a jasmonic acid derivative, effectively decreased CI. These results suggest that low temperature-induced JA accumulation may play a protective role against CI. The application of jasmonates may increase chill-resistance in fruit.

Author Subeki, H. Matsuura, M. Yamasaki, O. Yamato, Y. Maede, K. Katakura, M. Suzu
Title Effects of Central Kalimantan plant extracts on intraerythrocytic *Babesia gibsoni*
Year 2004
Source title Journal of Veterinary Medical Science
Reference 66(7): 871-874

Abstract

The inhibitory effects of 45 plant extracts selected from Central Kalimantan, Indonesia on *Babesia gibsoni* in vitro and their acute toxicity to mice were evaluated. Out of these plant extracts studied, *Arcangelisia flava*, *Curcuma zedoaria*, *Garcinia benthamiana*, *Lansium domesticum* and *Peronema canescens* were found to have appreciable antibabesial activity with IC50 values from 5.3 to 49.3 micro g/ml without acute toxicity in mice at the intraperitoneal dose of 0.7 g/kg of body weight.

Author W. Fatma Sri, L. T. Byrne, Dachriyanus, R. Dianita, J. Junuary, N. H. Lajis and
Title A new ring-reduced tetraprenyltoluquinone and a prenylated xanthone from Garcinia
Year 2004
Source title Australian Journal of Chemistry
Reference 57(3): 223-226

Abstract

The methanolic extract of the stem bark of *Garcinia cowa* Roxb. (Guttiferae) yielded (2E,6E,10E)-(+)-4 beta -hydroxy-3-methyl-5 beta -(3,7,11,15-tetramethylhexadeca-2,6,10,14-tetraenyl)cyclohex-2-en-1-one 1, 4-(1,1-dimethyl-prop-2-enyl)-1,5,6-trihydroxy-3-methoxy-2-(3-methylbut-2-enyl)xanthen-9(9H)-one 2, and the known compound rubraxanthone 3. The structural conclusions are based on spectroscopic data.

Author Guedje, N. M., J. Lejoly, B. A. Nkongmeneck and W. B. Jonkers
Title Population dynamics of *Garcinia lucida* (Clusiaceae) in Cameroonian atlantic for
Year 2003
Source title Forest Ecology and Management
Reference 177(1-3): 231-241

Abstract

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Author Hayamizu, K., H. Hirakawa, D. Oikawa, T. Nakanishi, T. Takagi, T. Tachibana and
Title Effect of *Garcinia cambogia* extract on serum leptin and insulin in mice
Year 2003
Source title Fitoterapia
Reference 74(3): 267-273

Abstract

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Author Ito, C., M. Itoigawa, T. Takakura, N. Ruangrunsi, F. Enjo, H. Tokuda, H. Nishin
Title Chemical constituents of *Garcinia fusca*: Structure elucidation of eight new xanth
Year 2003
Source title Journal of Natural Products
Reference 66(2): 200-205
Abstract

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Author Ito, C., M. Itoigawa, Y. Miyamoto, S. Onoda, K. S. Rao, T. Mukainaka, H. Tokud
Title Polyprenylated benzophenones from *garcinia assigu* and their potential cancer che
Year 2003
Source title Journal of Natural Products
Reference 66(2): 206-209
Abstract

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Author Matsumoto K; Akao Y; Kobayashi E; Ito T; Ohguchi K; Tanaka T; Inuma M; No
Title Cytotoxic benzophenone derivatives from *Garcinia* species display a strong apopt
Year 2003
Source title Biological and Pharmaceutical Bulletin
Reference 26(4): 569-571
Abstract

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Author Permana D; Lajis NH; Shaari K; Ali AM; Mackeen MM; Kitajima M; Takayama
Title A new prenylated hydroquinone from the roots of *Garcinia atroviridis* Griff ex T.
Year 2003
Source title Zeitschrift Fur Naturforschung B
Reference 58(4): 332-335
Abstract -

Author Selvi AT; Joseph GS; Jayaprakasha GK
Title Inhibition of growth and aflatoxin production in *Aspergillus flavus* by *Garcinia* in
Year 2003
Source title Food Microbiology
Reference 20(4): 455-460
Abstract -

Author Weng JR; Lin CN; Tsao LT; Wang JP
Title Novel and anti-inflammatory constituents of *Garcinia subelliptica*
Year 2003
Source title Chemistry
Reference 9(9): 1958-1963
Abstract -

Author Addai PK; Nuamah IK; Parkins GE
Title Brief chewing of Garcinia manii stick reverses reduced saliva ph after a glucose ri
Year 2002
Source title Medical Science Monitor
Reference 8(11): CR746-750
Abstract

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Author Anilkumar, C., K. P. Babu and P. N. Krishnan
Title Dormancy mechanism and effects of treatments on the germination of Garcinia gu
Year 2002
Source title Journal of Tropical Forest Science
Reference 14(3): 322-328
Abstract

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Author Esimone, C. O., M. U. Adikwu, E. C. Ibezim, S. I. Ofoefule, S. V. Nwafor and O.
Title Potential application of Garcinia kola seed as a natural antidote for the manageme
Year 2002
Source title Acta Pharmaceutica
Reference 52(3): 219-226
Abstract

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Author Esimone, C. O., S. V. Nwafor, C. O. Okoli, K. F. Chah, D. B. Uzuegbu, C. Chibun
Title In vivo evaluation of interaction between aqueous seed extract of *Garcinia kola* he
Year 2002
Source title American Journal of Therapeutics
Reference 9(4): 275-280
Abstract -

Author Farombi, E. O., O. O. Akanni and G. O. Emerole
Title Antioxidant and scavenging activities of flavonoid extract (kolaviron) of *Garcinia*
Year 2002
Source title Pharmaceutical Biology
Reference 40(2): 107-116
Abstract -

Author Guedje, N. M., B. A. Nkongmeneck and J. Lejoly
Title Floristic composition and structure of *Garcinia lucida* stands in the bipindi-akom i
Year 2002
Source title Acta Botanica Gallica
Reference 149(2): 157-178
Abstract -

Author Harrison, L. J.
Title Xanthones from the heartwood of *Garcinia mangostana*
Year 2002
Source title Phytochemistry
Reference 60(5): 541-548
Abstract

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Author Hayamizu, K., Y. Ishii, I. Kaneko, M. Shen, Y. Okuhara, H. Sakaguchi, N. Shige
Title No-observed-adverse-effect level (noael) and sequential-high-doses administration
Year 2002
Source title Journal of Oleo Science
Reference 51(5): 365-369
Abstract

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Author Jantan, I., M. M. Pizar, M. S. Idris, M. Taher and R. M. Aii
Title In vitro inhibitory effect of rubraxanthone isolated from *Garcinia parvifolia* on pla
Year 2002
Source title Planta Medica
Reference 68(12): 1133-1134
Abstract

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Author Jayaprakasha, G. K. and K. K. Sakariah
Title Determination of organic acids in leaves and rinds of *Garcinia indica* (Desr.) by lc
Year 2002
Source title Journal of Pharmaceutical and Biomedical Analysis
Reference 28(2): 379 - 384
Abstract

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Author Jena, B. S., G. K. Jayaprakasha and K. K. Sakariah
Title Organic acids from leaves, fruits, and rinds of *Darcinia cowa*
Year 2002
Source title Journal of Agricultural and Food Chemistry
Reference 50(12): 3431-3434
Abstract

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Author Jena, B. S., G. K. Jayaprakasha, R. P. Singh and K. K. Sakariah
Title Chemistry and biochemistry of (-)-hydroxycitric acid from *Darcinia*
Year 2002
Source title Journal of Agricultural and Food Chemistry
Reference 50(1): 10-22
Abstract

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Author Lakshmi C; Kumar KA; Dennis TJ
Title Polyprenylated benzophenones from *Garcinia indica*
Year 2002
Source title Journal of the Indian Chemical Society
Reference 79(12): 968-969

Abstract

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Author Leong LP; Shui G
Title An investigation of antioxidant capacity of fruits in Singapore markets
Year 2002
Source title Food Chemistry
Reference 76(1): 69-75. 34 ref.

Abstract

The antioxidant capacity of a group of fruits obtained in the Singapore markets was investigated. A total of 27 fruit pulps were tested for their general antioxidant capacity based on their ability to scavenge 2,2'-azino-bis-(3-ethylbenzthiazoline-6-sulfonic acid) (ABTS) free radical. The contribution of L-ascorbic acid (AA) to the total antioxidant activity of fruits was investigated by using RP-HPLC. The antioxidant capacity of the fruit pulp was measured by monitoring the change of absorbance of the free radical solution at 414 nm in the test reaction mixture following addition of the fruit extract, as compared with AA. The results were expressed as mg of AA equivalents per 100 g, i.e. the quantity of AA required to produce the same scavenging activity as the extract in 100 g of sample (L-ascorbic acid equivalent antioxidant capacity, AEAC). Total antioxidant capacities of AA acid, trolox, hydroquinone, pyrogallol and several fruits were also evaluated based on its ability to scavenge the 1,1-diphenyl-2-picryl-hydrazyl (DPPH) radical. Results obtained were compared with those of ABTS assay. Every mole of AA, trolox or hydroquinone, was found to reduce about 2 mol of ABTS⁺ or DPPH. However, 4 moles of DPPH or 7 moles of ABTS⁺ were scavenged by every mole of pyrogallol. A good correlation of AEAC was observed between the two methods. Both methods have been recommended to be useful tools to evaluate antioxidant capacities of fruits. According to the AEAC value of binary extract solution of fruits in the ABTS model, ciku shows the highest antioxidant capacity, followed by strawberry, plum, star fruit, guava, seedless grape, salak, mangosteen, avocado, orange, solo papaya, mango, kiwi fruit, cempedak, pomelo, lemon, pineapple, apple, foot long papaya, rambutan, rambutan king, banana, coconut pulp, tomato, rockmelon, honeydew, watermelon and coconut water. The AA contribution to AEAC of fruits varied greatly among species, from 0.06% in ciku to 70.2% in rambutan.

Author Mackeen MM; Ali AM; Lajis NH; Kawazu K; Kikuzaki H; Nakatani N
Title Antifungal Garcinia acid esters from the fruits of *Garcinia atroviridis*
Year 2002
Source title Zeitschrift Fur Naturforschung C
Reference 57(3/4): 291-295

Abstract

Two new garcinia acid derivatives, 2-(butoxycarbonylmethyl)-3-butoxycarbonyl-2-hydroxy-3-propanolide and 1',1''-dibutyl methyl hydroxycitrate, were isolated from the fruits of *Garcinia atroviridis* guided by TLC bioautography against the fungus *Cladosporium herbarum*. The structures of these compounds were established by spectral analysis. The former compound represents a unique beta -lactone structure and the latter compound is most likely an artefact of garcinia acid (=hydroxycitric acid). Both compounds showed selective antifungal activity comparable to that of cycloheximide (MID: 0.5 micro g/spot) only against *C. herbarum* at the MIDs of 0.4 and 0.8 micro g/spot but were inactive against bacteria (*Bacillus subtilis*, methicillin-resistant *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*), other fungi (*Alternaria* sp., *Fusarium moniliforme* and *Aspergillus ochraceus*) including the yeast *Candida albicans*.

Author Mahendran P; Sabitha KE; Devi CSS
Title Prevention of hcl-ethanol induced gastric mucosal injury in rats by *Garcinia camb*
Year 2002
Source title Indian Journal of Experimental Biology
Reference 40(1): 58-62

Abstract

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Author Mahendran P; Vanisree A; Devi CS
Title The antiulcer activity of *Garcinia cambogia* extract against indomethacin induced
Year 2002
Source title Phytotherapy Research
Reference 16(1): 80-83

Abstract

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Author Nakatani K; Nakahata N; Arakawa T; Yasuda H; Ohizumi Y
Title Inhibition of cyclooxygenase and prostaglandin E2 synthesis by gamma -mangosti
Year 2002
Source title Biochemical Pharmacology
Reference 63(1): 73-79. 34 ref.

Abstract

The fruit hull of mangosteen, *Garcinia mangostana*, has been used for many years as a medicine for treatment of skin infection, wounds, and diarrhoea in Southeast Asia. In the present study, we examined the effect of gamma -mangostin, a tetraoxygenated diprenylated xanthone contained in mangosteen, on arachidonic acid (AA) cascade in C6 rat glioma cells. gamma -mangostin had a potent inhibitory activity of prostaglandin E2 (PGE2) release induced by A23187, a Ca²⁺ ionophore. The inhibition was concentration-dependent, with the IC₅₀ value of about 5 micro M. gamma -mangostin had no inhibitory effect on A23187-induced phosphorylation of p42/p44 extracellular signal regulated kinase/mitogen-activated protein kinase or on the liberation of [14C]-AA from the cells labelled with [14C]-AA. However, gamma -mangostin concentration-dependently inhibited the conversion of AA to PGE2 in microsomal preparations, showing its possible inhibition of cyclooxygenase (COX). In enzyme assay in vitro, gamma -mangostin inhibited the activities of both constitutive COX (COX-1) and inducible COX (COX-2) in a concentration-dependent manner, with the IC₅₀ values of about 0.8 and 2 micro M, respectively. Lineweaver-Burk plot analysis indicated that gamma -mangostin competitively inhibited the activities of both COX-1 and -2. This study is the first demonstration that gamma -mangostin, a xanthone derivative, directly inhibits COX activity.

Author Okunji CO; Ware TA; Hicks RP; Iwu MM; Skanchy DJ
Title Capillary electrophoresis determination of biflavanones from *Garcinia kola* in three
Year 2002
Source title *Planta Medica*
Reference 68(5): 440-444

Abstract

Author Poerwanto R
Title Nurse stock plant - a new technique to enhance mangosteen (*Garcinia mangostana*)
Year 2002
Source title Acta Horticulturae
Reference 2: 751-756
Abstract

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Author Sdoodee S; Limpun-Udom S
Title Effect of excess water on the incidence of translucent flesh disorder in mangosteen
Year 2002
Source title Acta Horticulturae
Reference 2: 813-820
Abstract

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Author Suksamrarn S; Suwannapoch N; Ratananukul P; Aroonlerk N; Suksamrarn A
Title Xanthenes from the green fruit hulls of *Garcinia mangostana*
Year 2002
Source title Journal of Natural Products
Reference 65(5): 761-763
Abstract

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Author Terashima K; Takaya Y; Niwa M
Title Powerful antioxidative agents based on garcinoic acid from *Garcinia kola*
Year 2002
Source title Bioorganic and Medicinal Chemistry
Reference 10(5): 1619-1625
Abstract

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Author Thadhani VM; Jansz ER; Peiris H
Title Effect of exogenous histidine and *Garcinia cambogia* on histamine formation in sk
Year 2002
Source title International Journal of Food Sciences and Nutrition
Reference 53(1): 29-34
Abstract

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Author Tisdale EJ; Chowdhury C; Vong BG; Li H; Theodorakis EA
Title Regioselective synthesis of the bridged tricyclic core of *Garcinia* natural products
Year 2002
Source title Organic Letters
Reference 4(6): 909-912
Abstract

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Author Yapwattanaphun C; Subhadrabandhu S; Sugiura A; Yonemori K; Utsunomiya N
Title Utilization of some Garcinia species in Thailand
Year 2002
Source title Acta Horticulturae
Reference 2: 563-570

Abstract

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Author Anabesa MS; Capirig TS; Regulacion AT; Esguerra EB; Lizada MCC
Title Modified atmosphere packaging of mangosteen (*Garcinia mangostana* L.)
Year 2001
Source title Philippine Agriculturist
Reference 84(3): 241-244. 15 ref.

Abstract

A study on the response of mangosteen to film wrapping was carried out. Mangosteen fruits were harvested from Davao, Philippines, at different times after anthesis, representing different commercial harvest maturities and defined further by the extent of purple coloration of the pericarp. At each harvest maturity, 40 fruits (weight ranging from 90 to 95 g) were individually wrapped in commercially available cling wrap. Another 40 unwrapped fruits served as the control. The film provided an effective barrier to moisture loss. After 5 days under ambient conditions, weight loss of fruits was 4.04-5.64% compared to 10.77-13.14% of the control fruits. Maturity stage did not affect weight loss of the fruits whether they were wrapped or not. Alleviation of water stress by the use of cling wrap retarded the physiological deterioration of fruits, extending their shelf life by 3 to 6 days over that of the control. Wrapping significantly increased shelf life of fruits at all maturity stages compared to the control fruits. The longest shelf life (13 days) occurred when the fruits were harvested when they were still green. Regardless of the maturity stage of the fruits, the film wrap significantly delayed hardening of the pericarp by 3 to 5 days. The total soluble solid values of the fruits at earlier maturity stages were significantly lower than those of the control but not at later maturity stages.

Author Anabesa, M. S., T. S. Capirig, A. T. Regulacion, E. B. Esguerra and M. C. C. Liza
Title Research note: Modified atmosphere packaging of mangosteen (*Garcinia mangost*
Year 2001
Source title Philippine Agricultural Scientist
Reference 84(3): 241-244
Abstract

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Author Cuesta-Rubio, O., A. Padron, H. V. Castro, C. Pizza and L. Rastrelli
Title Aristophenones a and b. A new tautomeric pair of polyisoprenylated benzophenon
Year 2001
Source title Journal of Natural Products
Reference 64(7): 973-975
Abstract

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Author Hasegawa, N.
Title *Garcinia* extract inhibits lipid droplet accumulation without affecting adipose con
Year 2001
Source title Phytotherapy Research
Reference 15(2): 172-173
Abstract

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Author Hayamizu, K., Y. Ishii, I. Kaneko, M. Shen, H. Sakaguchi, Y. Okuhara, N. Shige
Title Effects of long-term administration of Garcinia cambogia extract on visceral fat ac
Year 2001
Source title Journal of Oleo Science
Reference 50(10): 805-812
Abstract

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Author Huang, Y. L., C. C. Chen, Y. J. Chen, R. L. Huang and B. J. Shieh
Title Three xanthenes and a benzophenone from Garcinia mangostana
Year 2001
Source title Journal of Natural Products
Reference 64(7): 903-906
Abstract

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Author Ito, C., M. Itoigawa, Y. Mishina, H. Tomiyasu, M. Litaudon, J. P. Cosson, T. Muk
Title Cancer chemopreventive agents. New depsidones from Garcinia plants
Year 2001
Source title Journal of Natural Products
Reference 64(2): 147-150
Abstract

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Author Koshy AS; Anila L; Vijayalakshmi NR
Title Flavonoids from Garcinia cambogia lower lipid levels in hypercholesterolemic rat
Year 2001
Source title Food Chemistry
Reference 72(3): 289-294
Abstract -

Author Koshy AS; Vijayalakshmi NR
Title Impact of certain flavonoids on lipid profiles-potential action of Garcinia cambogi
Year 2001
Source title Phytotherapy Research
Reference 15(5): 395-400
Abstract -

Author Kuruvishetty, M. S., L. Hegde and R. Thimmaraju
Title Variability in kokum (Garcinia indica Choisy) in western Ghats
Year 2001
Source title Conservation and utilization of medicinal and aromatic plants, Bhubaneswar, Indi
Reference Allied Publishers, 225-229 pp
Abstract -

Author Mahendran P; Devi CSS
Title The modulating effect of Garcinia cambogia extract on ethanol induced peroxidati
Year 2001
Source title Indian Journal of Pharmacology
Reference 33(2): 87-91

Abstract

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Author Mahendran P; Devi CSS
Title Effect of garcinia cambogia extract on lipids and lipoprotein composition in dexa
Year 2001
Source title Indian Journal of Physiology and Pharmacology
Reference 45(3): 345-350

Abstract

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Author Nascimento WMO; do Tome AT; Carvalho JEU de; Muller CH
Title Physiological behaviour of seeds of mangosteen (*Garcinia mangostana* L.) submitt
Year 2001
Source title Revista Brasileira de Fruticultura
Reference 23(3): 735-737. 11 ref.

Abstract

The effect of different fermentation times on germination of seeds of mangosteen was studied, with 0, 24, 48, 72 and 96 h fermentation in water. Seeds were evaluated on the basis of: germination; emergence rate; and average germination time. The number of normal seedlings was assessed daily. Fermentation of seeds for 48 h gave significantly better germination (86%) than the other treatments.

Author Nzezbule E; Mbakwe R
Title Effect of pre-sowing and incubation treatment on germination of *Garcinia kola* (H
Year 2001
Source title Fruits (Paris)
Reference 56(6): 437-442

Abstract

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Author Permana D; Lajis NH; Mackeen MM; Ali AM; Aimi N; Kitajima M; Takayama H
Title Isolation and bioactivities of constituents of the roots of *Garcinia atroviridis*
Year 2001
Source title Journal of Natural Products
Reference 64(7): 976-979

Abstract

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Author Setiawan B; Ahmad Sulaeman; Giraud DW; Driskell JA
Title Carotenoid content of selected Indonesian fruits
Year 2001
Source title Journal of Food Composition and Analysis
Reference 14(2): 169-176. 26 ref.

Abstract

The carotenoid content of 18 fruits consumed over a 3 day period by 77 third-grade children in Bogor, West Java, Indonesia (apple, banana, guava, jackfruit, kedondong, kemang, mango, mangosteen, orange, papaya, pineapple, rambutan, salak, sawo, starfruit, tangerine, red watermelon and yellow watermelon) was determined using reversed-phase HPLC. The carotenoids found in the fruits were cryptoxanthin, lycopene and beta -carotene. The levels of cryptoxanthin (micro g/100 g) were highest in kedondong (309), pawpaw (180), mango (137), sawo (119), orange (114) and apple (106). Lycopene levels (micro g/100 g), on the other hand, were highest in red watermelon (11 389), pawpaw (5750), kemang (1805), sawo (1386), guava (1150) and salak (1130). The highest beta -carotene content (micro g/100 g) were found in salak (2997), guava (984) and red watermelon (592). The lowest levels of cryptoxanthin, lycopene and beta -carotene (micro g/100 g) were found in banana (3), jackfruit (37) ! an! d starfruit (42), respectively.

Author Uko OJ; Usman A; Alaja AM
Title Some biological activities of *Garcinia kola* in growing rats
Year 2001
Source title Veterinarski Arhiv
Reference 71(5): 287-298
Abstract

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Author Wu J; Xu YJ; Cheng XF; Harrison LJ; Sim KY; Goh SH
Title A highly rearranged tetraprenylxanthonoid from *Garcinia gaudichaudii* (Guttifera)
Year 2001
Source title Tetrahedron Letters
Reference 42(4): 727-730
Abstract

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Author Xu YJ; Lai YH; Imiyabir Z; Goh SH
Title Xanthones from *Garcinia parvifolia*
Year 2001
Source title Journal of Natural Products
Reference 64(9): 1191-1195
Abstract

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Author Ali, S., R. Goundar, S. Sotheeswaran, C. Beaulieu and C. Spino
Title Benzophenones of *Garcinia pseudoguttifera* (Clusiaceae)
Year 2000
Source title Phytochemistry
Reference 53(2): 281-284
Abstract

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Author Arogba, S. S.
Title Comparative analyses of the moisture isotherms, proximate compositions, physica
Year 2000
Source title Journal of Food Composition and Analysis
Reference 13(2): 139-148
Abstract

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Author Balaji, K., P. S. Reddy and R. Rajasekharan
Title Lipid biosynthesis in seed-derived embryogenic callus of kokum (*Garcinia indica*)
Year 2000
Source title Journal of Plant Biology (New Delhi)
Reference 27(3): 283-290
Abstract

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Author Farombi, E. O., J. G. Tahnteng, A. O. Agboola, J. O. Nwankwo and G. O. Emerol
Title Chemoprevention of 2-acetylaminofluorene-induced hepatotoxicity and lipid pero
Year 2000
Source title Food and Chemical Toxicology
Reference 38(6): 535-541
Abstract -

Author Fondoun, J. M. and T. T. Manga
Title Farmers indigenous practices for conserving *Garcinia kola* and *Gnetum africanum*
Year 2000
Source title Agroforestry Systems
Reference 48(3): 289-302
Abstract -

Author Gopalakrishnan, G. and B. Balaganesan
Title Two novel xanthenes from *Garcinia mangostana*
Year 2000
Source title Fitoterapia
Reference 71(5): 603-605
Abstract -

Author Grubben GJH
Title BIOREES: experiences with a north-south co-operative research programme
Year 2000
Source title Acta Horticulturae
Reference 524: 281-285

Abstract

A joint research cooperative programme between Indonesia and the Netherlands, on Biotechnology, Plant Breeding and Seed Technology Research for Horticulture (BIOBREES) started in 1994 with research projects on vegetable crops (Capsicum pepper, shallot), ornamental plants (rose, chrysanthemum, gladiolus) and fruit (mangosteen). This paper evaluates this new type of cooperative research as an example for a better approach for knowledge transfer between developed and developing countries. The overall goal of BIOBREES is bilateral cooperation with matching financing, for fundamental and development-oriented research of mutual interest. Specific objectives are training of junior researchers of both parties in biotechnology research and advanced plant breeding; production of breeding material with valuable characters e.g. pest and disease resistance; and participation of the private sector (seed and plant propagation companies) in the research projects. Evaluation of the results in 1998 shows that the programme fulfilled the objectives, with benefits for both parties. A prolongation is in preparation. The main problems at the Indonesian side were delays in timely availability of funding, a limited number of research staff with experience in plant breeding and biotechnology, and the absence of plant variety protection. Indonesia benefited most in building-up biotechnological know how and exposure of staff to a modern research and communication environment. A problem at the Dutch side was the lack of research staff with international experience. Spin-offs for the Netherlands are the increase of international experience in research cooperation and new linkages of Dutch companies with the Indonesian horticultural sector.

Author Guedje, N. M. and R. Fankap
Title Traditional utilisation of *Garcinia lucida* and *Garcinia kola* (Clusiaceae) in Camer
Year 2000
Source title AETFAT; Plant systematics and phytogeography for the understanding of African
Reference National Botanic Garden, 747-758 pp

Abstract

Author Huang LiChun; Huang BauLiang; Wang ChiuHui; Kuo ChingI; Murashige T
Title Developing an improved in vitro propagation system for slow-growing species usi
Year 2000
Source title In Vitro Cellular and Developmental Biology-Plant
Reference 36(6): 501-504. 15 ref.

Abstract

This investigation disclosed that evaluation of tissue culture parameters of slowly developing species (e.g. *G. mangostana*) requires monitoring of treatments through two or more successive, relatively long passages. Two 8-week passages were necessary to observe differences in phytohormone effects. Photoperiod and temperature effects were not clearly evident until tissues had been cultured through three passages; the optimal photoperiod and temperature for shoot proliferation could not be established until after the fifth passage. Our investigation revealed that no auxin supplementation was necessary for bud primordium differentiation in cotyledon explants or proliferation of regenerated shoots. The optimum N6-benzyladenine concentration for primordium differentiation was 13.3 micro M, and for shoot proliferation ranged from 4.4 to 13.3 micro M. Continuous culturing in an 8-h photoperiod at 30 deg C resulted in progressively intensified degeneration of shoots after three passages. In contrast, successive passages in a 16-h photoperiod/26 deg C regimen enabled sustained regeneration of shoots. The shoots rooted at a rate of 85% when precultured for 3 days in a medium containing 4921.3 micro M indole-3-butyric acid, or 10 days at 492.1 micro M, then cultured for two 8-week passages in phytohormone-free medium. Following acclimatization by gradually lowering the relative humidity in the growth chamber, rooted shoots survived transfer to the greenhouse at a rate of 95%.

Author Jayaprakasha, G. K. and K. K. Sakariah
Title Determination of (-) hydroxycitric acid in commercial samples of *Garcinia cambogia*
Year 2000
Source title Journal of Liquid Chromatography and Related Technologies
Reference 23(6): 915-924

Abstract

Author Kosela S; Li-Hong H; Rachmatia T; Hanafi M; Keng-Yeow S
Title Dulxanthones f-h, three new pyranoxanthones from *Garcinia dulcis*
Year 2000
Source title Journal of Natural Products
Reference 63(3): 406-407
Abstract -

Author Mackeen MM; Ali AM; Lajis NH; Kawazu K; Hassan Z; Amran M; Habsah M;
Title Antimicrobial, antioxidant, antitumour-promoting and cytotoxic activities of diffe
Year 2000
Source title Journal of Ethnopharmacology
Reference 72(3): 395-402
Abstract -

Author Nguyen LHD; Harrison LJ
Title Xanthones and triterpenoids from the bark of *Garcinia vilersiana*
Year 2000
Source title Phytochemistry
Reference 53(1): 111-114
Abstract -

Author Normah MN
Title In vitro techniques for multiplication and conservation of *Garcinia mangostana*, L
Year 2000
Source title Agro Food Industry Hi Tech
Reference 11(4) 2-5
Abstract

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Author Okudaira C; Ikeda Y; Kondo S; Furuya S; Hirabayashi Y; Koyano T; Saito Y; Um
Title Inhibition of acidic sphingomyelinase by xanthone compounds isolated from *Garc*
Year 2000
Source title Journal of Enzyme Inhibition
Reference 15(2): 129-138
Abstract

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Author Poerwanto R
Title Nurse stock plant - a new technique to enhance mangosteen (*Garcinia mangostana*)
Year 2000
Source title Tropical and subtropical fruits, Cairns, Australia
Reference Ishs, 751-756 pp
Abstract

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Author Roux D; Hadi HA; Thoret S; Guenard D; Thoison O; Pais M; Sevenet T
Title Structure-activity relationship of polyisoprenyl benzophenones from *Garcinia pyri*
Year 2000
Source title Journal of Natural Products
Reference 63(8): 1070-1076
Abstract -

Author Rukachaisirikul V; Adair A; Dampawan P; Taylor WC; Turner PC
Title Lanostanes and friedolanostanes from the pericarp of *Garcinia hombroniana*
Year 2000
Source title Phytochemistry
Reference 55(2): 183-188
Abstract -

Author Rukachaisirikul V; Kaewnok W; Koysomboon S; Phongpaichit S; Taylor WC
Title Caged-tetraprenylated xanthenes from *Garcinia scortechinii*
Year 2000
Source title Tetrahedron
Reference 56(43): 8539-8543
Abstract -

Author Sdoodee S; Limpun-Udom S
Title Effect of excess water on the incidence of translucent flesh disorder in mangostee
Year 2000
Source title Tropical and subtropical fruits, Cairns, Australia
Reference Ishs, 813-820 pp
Abstract

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Author Te chato S
Title Random amplified polymorphic DNA (RAPD) markers for genetic analysis in so
Year 2000
Source title Thai Journal of Agricultural Science
Reference 33(3/4): 137-145. 15 ref.

Abstract

RAPD markers were employed to assess the genetic variation of 20 meristematic nodular callus lines and 8 somaclones from a single regenerated mangosteen leaf. The first two leaves of in vitro somaclone (approx equal to 20 mg) and 20 mg of callus tissue were able to provide 5 to 30 ng DNA/micro l. Eight arbitrary 10-mer primers were successfully used to amplify DNA from those samples. The best conditions resulting in amplification of DNA was 3 ng/ micro l of DNA template with annealing temperature of 41 deg C. The eight primers tested showed no polymorphisms from each somaclone. A total of 5 to 15 monomorphisms were common among those somaclones. These results showed that RAPD markers can be used to identify genetic variability of nodular calluses and somaclones obtained from culturing young leaves. Furthermore, this technique can be used to rapidly point out genetic similarities or dissimilarities in micropropagation systems.

Author Te-chato S; Lim M
Title Improvement of mangosteen micropropagation through meristematic nodular callu
Year 2000
Source title Scientia Horticulturae
Reference 86(4): 291-298. 13 ref.

Abstract

A four-step procedure was used for plant regeneration from leaf explants (5-15 mm long) excised from in vitro grown plantlets of mangosteen. Leaf explants formed callus (66.8%) on Murashige and Skoog medium (MS) with 2.22 micro M benzyladenine (BA) and 2.25 micro M thidiazuron (TDZ) at 3 weeks of culture. The mean number of nodules in the calluses on this medium after four serial subcultures was 4.45 nodules per explant. A mean number of 9.3 shoots per explant were induced on woody plant medium (WPM) supplemented with 0.44 micro M BA. Shoot elongation (5-6 shoots per explant) at 80-90% was obtained by transferring shoot to the same medium overlain with half strength liquid MS with 0.32 micro M NAA and 0.13 micro M BA. Shoots were successfully rooted at 68.2% on WPM with 1.11 micro M BA plus 0.25% activated charcoal. The plantlets were successfully established in soil in pots after acclimatization.

Author Thoison O; Fahy J; Dumontet V; Chiaroni A; Riche C; Van Tri M; Sevenet T
Title Cytotoxic prenylxanthenes from *Garcinia bracteata*
Year 2000
Source title Journal of Natural Products
Reference 63(4): 441-446

Abstract

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Author Verghese S; Thomas J
Title *Garcinia tinctoria* - a lesser-known, evergreen tree of multiple uses
Year 2000
Source title Indian Horticulture
Reference 45(2): 21

Abstract

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Author Wu XH; Tan BKH; Cao SG; Sim KY; Goh SH
Title Two minor, cytotoxic caged xanthonoids from *Garcinia gaudichaudii*
Year 2000
Source title Natural Product Letters
Reference 14(6): 453-458
Abstract -

Author Xu YJ; Chiang PY; Lai YH; Vittal JJ; Wu XH; Tan BKH; Imiyabir Z; Goh SH
Title Cytotoxic prenylated depsidones from *Garcinia parvifolia*
Year 2000
Source title Journal of Natural Products
Reference 63(10): 1361-1363
Abstract -

Author Xu YJ; Yip SC; Kosela S; Fitri E; Hana M; Goh SH; Sim KY
Title Novel cytotoxic, polyprenylated heptacyclic xanthonoids from Indonesian *Garcinia*
Year 2000
Source title Organic Letters
Reference 2(24): 3945-3948
Abstract -

Author Yamaguchi F; Ariga T; Yoshimura Y; Nakazawa H
Title Antioxidative and anti-glycation activity of garcinol from *Garcinia indica* fruit rind
Year 2000
Source title Journal of Agricultural and Food Chemistry
Reference 48(2): 180-185
Abstract

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Author Yamaguchi F; Saito M; Ariga T; Yoshimura Y; Nakazawa H
Title Free radical scavenging activity and antiulcer activity of garcinol from *Garcinia indica* fruit rind
Year 2000
Source title Journal of Agricultural and Food Chemistry
Reference 48(6): 2320-2325
Abstract

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Author Yapwattanaphun C; Subhadrabandhu S; Sugiura A; Yonemori K; Utsunomiya N
Title Utilization of some *Garcinia* species in Thailand
Year 2000
Source title Tropical and subtropical fruits, Cairns, Australia
Reference Ishikawa, 563-570 pp
Abstract

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Author Ali, S., R. Goundar, S. Sotheeswaran and C. Spino
Title Phytochemicals from *Garcinia sessilis* and *Garcinia vitiensis* (Clusiaceae)
Year 1999
Source title Acgc Chemical Research Communications
Reference 9: 31-38

Abstract

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Author Deshpand, R. S., S. S. Chavan and B. L. Dhonukshe
Title In vitro shoot regeneration in kokum (*Garcinia indica* L.)
Year 1999
Source title Annals of Plant Physiology
Reference 13(1): 31-34

Abstract

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Author Hills MJ
Title Improving oil functionality by tuning catalysis of thioesterase
Year 1999
Source title Trends in Plant Science
Reference 4(11): 421-422. 13 ref.

Abstract

Mangosteen (*Garcinia mangostana*) acyl-carrier protein (ACP) thioesterases (TE) uses 18:1-ACP threefold more efficiently than 18:0-ACP. Sequencing of ACP thioesterases (TE) of >30 plant species showed that there are two types, namely FatA and FatB. Mangosteen TE is in the FatA group, which normally acts on 18:1-ACP, but sequence comparison showed that mangosteen TE differs from all others in 6 normally conserved amino acid residues. One mutation in particular increases activity towards 18:0 ACP manyfold. When expressed in oilseed rape, significant enrichment of 18:0 in the seed oil was reported.

Author Jeyarani, T. and S. Y. Reddy
Title Heat-resistant cocoa butter extenders from mahau (*Madhuca latifolia*) and kokum
Year 1999
Source title Journal of the American Oil Chemists Society
Reference 76(12): 1431-1436
Abstract

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Author Kosela S; Cao SG; Wu XH; Vittal JJ, T. Sukri, Masdianto, Goh SH; Sim KY
Title Lateriflorone, a cytotoxic spiroxalactone with a novel skeleton, from *Garcinia late*
Year 1999
Source title Tetrahedron Letters
Reference 40(1): 157-160
Abstract

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Author Kosela S; Hu LH; Yip SC; Rachmatia T; Sukri T Daulay TS; Tan GK; Vittal JJ; S
Title Dulxanthone e: A pyranoxanthone from the leaves of *Garcinia dulcis*
Year 1999
Source title Phytochemistry
Reference 52(7): 1375-1377
Abstract

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Author Lean LP; Mohamed S
Title Antioxidative and antimycotic effects of turmeric, lemon-grass, betel leaves, clove
Year 1999
Source title Journal of the Science of Food and Agriculture
Reference 79(13): 1817-1822

Abstract

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Author Masri M; Azizah H; Razi IM; Mamat AS
Title Physiological responses of mycorrhizal and uninoculated seedlings of mangosteen
Year 1999
Source title Journal of Tropical Agriculture and Food Science
Reference 27(1): 17-26

Abstract

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Author Ogawa K
Title Chemical components in tropical fruits
Year 1999
Source title Bulletin of the National Institute of Fruit Tree Science
Reference 32: 1-13. 63 ref.

Abstract

Chemical constituents of 16 tropical fruits (avocado, guava, carambolas, sapodilla, Java plum (*Syzygium cumini*), *Spondias cytherea* [*S. dulcis*], durian, passion fruit, pawpaws, breadfruit, custard apple (*Annona squamosa*), mango, mangosteen, langsat (*Lansium domesticum*), longan and Litchi), are listed and discussed. Classes of compound listed include hydrocarbons, phenolic compounds, alkaloids, polysaccharides, alcohols, glycosides, organic sulfur compounds, volatile compounds, flavonoids and terpenoids, among others.

Author Te-chato S; Lim M
Title Plant regeneration of mangosteen via nodular callus formation
Year 1999
Source title Plant Cell Tissue and Organ Culture
Reference 59(2): 89-93. 19 ref.

Abstract

Nodular callus was induced at a high frequency on young purple red, 5-15 mm long laminae taken from in vitro grown plants of mangosteen (*Garcinia mangostana*). The optimal medium was composed of MS nutrients supplemented with 2.22 micro M benzyladenine (BA), 2.25 micro M thidiazuron (TDZ), 500 mg polyvinylpyrrolidone (PVP 360 000)/litre and 3% sucrose. A multiplication rate of 2-3 was obtained by subculture of the nodular callus at 3-4-week intervals. Plantlet regeneration from the nodules was achieved by transfer to woody plant medium (WPM) with 500 mg PVP/litre, 0.4 micro M BA and 3% sucrose and overlaying with half strength liquid MS containing 0.32 micro M NAA, 0.13 micro M BA and 3% sucrose. Elongated shoots were rooted to 100% when wounded at the base of shoot, dipped in 4.4 mM IBA solution in the dark for 15 min and cultured on WPM supplemented with 1.11 micro M BA, 0.25% activated charcoal, 34.5 micro M p h l o r o g l u c i n o l (P G) a n d 3 % s u c r o s e .

Author Terashima K; Kondo Y; Aqil M; Niwa M
Title A new xanthone from the stems of *Garcinia kola*
Year 1999
Source title Natural Product Letters
Reference 14(2): 91-98

Abstract

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Author Terashima K; Kondo Y; Aqil M; Waziri M; Niwa M
Title A study of biflavanones from the stems of *Garcinia kola* (Guttiferae)
Year 1999
Source title Heterocycles
Reference 50(1): 283-290

Abstract

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Author Adegoke GO; Kumar MV; Sambaiah K; Lokesh BR
Title Inhibitory effect of Garcinia kola on lipid peroxidation in rat liver homogenate
Year 1998
Source title Indian Journal of Experimental Biology
Reference 36(9): 907-910
Abstract

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Author Akande, J. A. and Y. Hayashi
Title Potency of extract contents from selected tropical chewing sticks against Staphylo
Year 1998
Source title World Journal of Microbiology and Biotechnology
Reference 14(2): 235-238
Abstract

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Author Antony, J. I. X., P. D. Josan and M. L. Shankaranarayana
Title Quantitative analysis of (-) hydroxy citric acid and (-) hydroxy citric acid lactone i
Year 1998
Source title Journal of Food Science and Technology
Reference 35(5): 399-402
Abstract

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Author Cao SG; Wu XH; Sim KY; Tan BKH; Pereira JT; Wong WH; Hew NF; Goh SH
Title Cytotoxic caged tetraprenylated xanthonoids from *Garcinia gaudichaudii* (Guttifer)
Year 1998
Source title Tetrahedron Letters
Reference 39(20): 3353-3356
Abstract

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Author Cao, S. G., V. H. L. Sng, X. H. Wu, K. Y. Sim, B. H. K. Tan, J. T. Pereira and S.
Title Novel cytotoxic polyprenylated xanthonoids from *Garcinia gaudichaudii* (Guttifer)
Year 1998
Source title Tetrahedron
Reference 54(36): 10915-10924
Abstract

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Author Chairungsrilerd, N., K. I. Furukawa, T. Ohta, S. Nozoe and Y. Ohizumi
Title Gamma-mangostin, a novel type of 5-hydroxytryptamine 2a receptor antagonist
Year 1998
Source title Naunyn Schmiedeburgs Archives of Pharmacology
Reference 357(1): 25-31
Abstract

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Author Chairungsrilerd, N., K. I. Furukawa, T. Tadano, K. Kisara and Y. Ohizumi
Title Effect of gamma-mangostin through the inhibition of 5-hydroxytryptamine~2~a re
Year 1998
Source title British Journal of Pharmacology
Reference 123(5): 855-862
Abstract -

Author Chung, M. I., H. J. Su and C. Lin
Title A novel triterpenoid of Garcinia subelliptica
Year 1998
Source title Journal of Natural Products
Reference 61(8): 1015-1016
Abstract -

Author Fukuyama, Y., H. Minami and A. Kuwayama
Title Garsubellins, polyisoprenylated phloroglucinol derivatives from Garcinia subellip
Year 1998
Source title Phytochemistry
Reference 49(3): 853-857
Abstract -

Author Hasegawa, N.
Title Inhibition of lipogenesis and stimulation of lipolysis in 3t3 11 cells by a Garcinia e
Year 1998
Source title Journal of Home Economics of Japan
Reference 49(8): 889-892

Abstract

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Author Hawkins DJ; Kridl JC
Title Characterization of acyl-ACP thioesterases of mangosteen (*Garcinia mangostana*)
Year 1998
Source title Plant Journal
Reference 13(6): 743-752. 30 ref.

Abstract

Acyl-acyl-carrier protein (ACP) thioesterases are, at least in part, responsible for the fatty acyl chain length composition of seed storage oils. Acyl-ACP thioesterases with specificity for each of the saturated acyl-ACP substrates from 8:0 to 16:0 have been cloned, with the exception of 18:0, and are members of the FatB class of thioesterases. The tropical tree species mangosteen (*Garcinia mangostana*) stores 18:0 (stearate) in its seed oil in amounts of up to 56% by weight. Acyl-ACP thioesterase activity as measured in crude mangosteen seed extracts showed a preference for 18:1-ACP substrates, but had significant activity with 18:0 relative to that with 16:0-ACP, suggesting a thioesterase might be involved in the production of stearate. Three distinct acyl-ACP thioesterases were cloned from mangosteen seed cDNA, two representative of the FatA class and one representative of the FatB class. When expressed in vitro, the enzyme encoded by one of the FatAs (Garm FatA1), which preferring 18:1-ACP, showed relatively low activity with 16:0-ACP as compared to 18:0-ACP, similar to the substrate preferences shown by the crude seed extract. Expression of Garm FatA1 in Brassica seeds led to the accumulation of up to 22% stearate in seed oil. These results suggest that Garm FatA1 is at least partially responsible for determining the high stearate composition of mangosteen seed oil and that FatA as well as FatB thioesterases have evolved for specialized roles. Nucleotide sequence data for the 3 acyl-ACP thioesterase cDNAs have been submitted to the GenBank database under the accession numbers U92876, U92877 and U92878.

Author Heymsfield, S. B., D. B. Allison, J. R. Vasselli, A. Pietrobelli, D. Greenfield and
Title Garcinia cambogia (hydroxycitric acid) as a potential antiobesity agent: A random
Year 1998
Source title Journal of the American Medical Association
Reference 280(18): 1596-1600
Abstract

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Author Iinuma, M., T. Ito, R. Miyake, H. Tosa, T. Tanaka and V. Chellakurai
Title A xanthone from Garcinia cambogia
Year 1998
Source title Phytochemistry
Reference 47(6): 1169-1170
Abstract

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Author Jayaprakasha, G. K. and K. K. Sakariah
Title Determination of organic acids in Garcinia cambogia (desr.) by high-performance
Year 1998
Source title Journal of Chromatography A
Reference 806(2): 337-339
Abstract

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Author Ketsa S; Atantee S
Title Phenolics, lignin, peroxidase activity and increased firmness of damaged pericarp
Year 1998
Source title Postharvest Biology and Technology
Reference 14(1): 117-124. 29 ref.

Abstract

Mangosteen fruits harvested at commercial maturity were dropped from a height of 80 cm and subsequently held under ambient conditions (approx equal to 29 deg C, 76% RH). Some fruits were held in a desiccator in which the air was removed under vacuum and replaced with nitrogen, in order to test the effect of oxygen on the response to impact. The firmness of damaged pericarp increased rapidly after impact in air. Under nitrogen, however, damaged pericarp was less firm and had lower lignin contents, with more total phenolics than fruits in air. Peroxidase activity in damaged pericarp was greater than that in undamaged pericarp after impact. Damaged pericarp infiltrated with cycloheximide was less firm and had lower lignin and higher total phenolic contents than those of damaged pericarp without cycloheximide. Total phenolics in undamaged and damaged pericarp, separated by thin layer chromatography, showed no difference in patterns of distribution in Rf values. Five Rf values (0.00, 0.03, 0.06, 0.30 and 0.46) of phenolics in damaged pericarp had lower absorbance at 190-400 nm, while three Rf values (0.63, 0.77 and 0.88) did not change. The results suggest that impact enhances incorporation of phenolics into lignin and that there is involvement of peroxidase activity in increased firmness of damaged pericarp.

Author Kosin J; Ruangrunsi N; Ito C; Furukawa H
Title A xanthone from *Garcinia atroviridis*
Year 1998
Source title Phytochemistry
Reference 47(6): 1167-1168

Abstract

Author Lichitwitayawuid K; Phadungcharoen T; Krungkrai J

Title Antimalarial xanthonenes from *Garcinia cowa*

Year 1998

Source title *Planta Medica*

Reference 64(1): 70-72

Abstract

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Author Likhitwitayawuid K; Chanmahasathien W; Ruangrunsi N; Krungkrai J

Title Xanthonenes with antimalarial activity from *Garcinia dulcis*

Year 1998

Source title *Planta Medica*

Reference 64(3): 281-282

Abstract

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Author Lim Poh L; Mohamed S

Title Antioxidative and antimycotic effects of turmeric, lemon grass, betel leaves, clove

Year 1998

Source title *Biological oxidants and antioxidants: molecular mechanisms and health effects*

Reference *Champaign Il.*, 112-118 pp

Abstract

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Author Masri M; Azizah H
Title Root alterations and nutrient uptake of mangosteen (*Garcinia mangostana* L.) seed
Year 1998
Source title Journal of Tropical Agriculture and Food Science
Reference 26(2): 119-126
Abstract

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Author Masri M; Azizah H; Razi IM; Mamat AS
Title Arbuscular mycorrhiza enhances growth and reduces nursery period of mangoste
Year 1998
Source title Journal of Tropical Agriculture and Food Science
Reference 26(1): 7-16
Abstract

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Author Minamima H; Hamaguchi K; Kubo M; Fukuyama Y
Title A benzophenone and a xanthone from *Garcinia subelliptica*
Year 1998
Source title Phytochemistry
Reference 49(6): 1783-1786
Abstract

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Author Noumi E
Title Transition forest with *Garcinia* spp. on the Nkolobot Hills (Yaounde, Cameroon)
Year 1998
Source title Belgian Journal of Botany
Reference 130(2): 198-220

Abstract

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Author Onayade OA; Looman AMG; Scheffer JJC; Gbile ZO
Title Lavender lactone and other volatile constituents of the oleoresin from seeds of *Ga*
Year 1998
Source title Flavour and Fragrance Journal
Reference 13(6): 409-412

Abstract

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Author Possingham JV
Title The production of horticultural crops in Australia
Year 1998
Source title Journal of the Korean Society for Horticultural Science
Reference 39(2): 227-232. 1 ref.

Abstract

The history of fruit and vegetable production in Australia is described with reference to population and city growth leading to the loss of good horticultural land. Most horticultural production now takes place on inland areas which require irrigation. Significant quantities of pome fruits are grown in cool elevated areas in most states of Australia, especially in Tasmania. Prior to the UK joining the EEC, Australia's exports of temperate horticultural produce were mainly sent to the UK where they enjoyed a preferential tariff. Tropical fruit crops are produced for local consumption and for export to Asia, including pineapple, banana, mango, litchi, mangosteen, macadamia and cashew. Many crops, including asparagus, melons and table grapes, can be produced for most months of the year. There is an increasing production of Asian vegetables for use by the local community and for export. The viticultural industry is briefly described with reference to table grapes, raisins and ! wi! ne production. Tabulated data on vegetable, fruit and nut production for 1994-95, and citrus production and grape, raisin and wine production in 1996 are presented.

Author Prasertsan S; Peeraprasompong C; Thamaratwasik P
Title Impact damage in mangosteens (*Garcinia mangostana* L.)
Year 1998
Source title International Journal of Food Properties
Reference 1(3): 243-254

Abstract

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Author Xu YJ; Cao SG; Wu XH; Lai YH; Tan BHK; Pereira JT; Goh SH; Venkatraman
Title Griffipavixanthone, a novel cytotoxic bixanthone from *Garcinia griffithii* and *G. p*
Year 1998
Source title Tetrahedron Letters
Reference 39(49): 9103-9106

Abstract

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Author Yantarasri T; Sornsrivichai J; Chen P
Title X-ray and NMR for nondestructive internal quality evaluation of durian and mang
Year 1998
Source title Acta Horticulturae
Reference 464: 97-101. 17 ref.

Abstract

Images obtained by X-ray CT and NMR showed that both methods were suitable for detecting differences between immature, mature and overripe durians (cv. Murray) and detecting damage, internal disorders and rotten pulp in both durian and mangosteen fruits. NMR imaging was able to identify water core in durians and translucent pulp disorder in mangosteens.

Author Chacko, K. C. and P. K. Chandrasekhara Pillai
Title Seed characteristics and germination of *Garcinia gummi-gutta* (L.) Robs
Year 1997
Source title Indian Forester
Reference 123(2): 123-126

Abstract

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Author Chanarat, P., N. Chanarat, M. Fujihara and T. Nagumo
Title Immunopharmacological activity of polyaccharide from the pericarb of mangostee
Year 1997
Source title Journal of the Medical Association of Thailand
Reference 80(Supp/1): 149-154

Abstract

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Author Fan ChangTeng; Su JengDe
Title Antioxidative mechanism of isolated components from methanol extract of fruit h
Year 1997
Source title Journal of the Chinese Agricultural Chemical Society
Reference 35(5): 540-551. 26 ref.

Abstract

The methanol extract of mangosteen fruit hulls was fractionated using various chromatographic procedures to obtain 2 compounds which were identified as alpha -mangostin and gamma -mangostin. Using the ferric thiocyanate method, the antioxidant efficiency of the isolated compounds was in the order gamma -mangostin > BHA > alpha -tocopherol > alpha -mangostin > control. gamma -Mangostin showed strong activities in all the assays, but especially in the superoxide anion scavenging assay. alpha -Mangostin had a weak antioxidative activity in the ferric thiocyanate assay and a low hydrogen peroxide-scavenging effect but showed no activity in other assays. Because the only difference between the structures of the 2 isolated compounds was the methyl group, it is presumed that the adjacent hydroxy groups on C-6 and C-7 of the xanthone contributed to the strong antioxidant activity .

Author Fan, C. T. and J. D. Su
Title Antioxidative mechanism of isolated componentss from methanol extract of fruit
Year 1997
Source title Journal of the Chinese Agricultural Chemical Society
Reference 35(5): 540-551

Abstract

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Author Fukuyama, Y., A. Kuwayama and H. Minami
Title Garsubellin a, a novel polyprenylated phloroglucin derivative, increasing choline
Year 1997
Source title Chemical and Pharmaceutical Bulletin
Reference 45(5): 947-949

Abstract

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Author Fukuyama, Y., H. Minami, M. Kinoshita and E. Takahashi
Title Chemical constituents of Garcinia subelliptica and their biological activities
Year 1997
Source title Chemistry of Natural Products, Sapporo, Japan
Reference Hokkaido University, 577-582 pp

Abstract

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Author Fukuyama, Y., H. Minami, M. Kinoshita, E. Takahashi, A. Kuwayama, H. Takaha
Title Chemical constituents of *Garcinia subelliptica* and their biological activities
Year 1997
Source title Symposium on the Chemistry of Natural Products
Reference 39: 577-582
Abstract

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Author Gopalakrishnan, G., B. Banumathi and G. Suresh
Title Evaluation of the antifungal activity of natural xanthenes from *Garcinia mangosta*
Year 1997
Source title Journal of Natural Products
Reference 60(5): 519-524
Abstract

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Author Ibronke, G. F., S. B. Olaleye, O. Balogun and A. Aremu
Title Effects of diets containing seeds of *Garcinia kola* (Heckel) on gastric acidity and e
Year 1997
Source title Phytotherapy Research
Reference 11(4): 312-313
Abstract

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Author Itharattana K
Title Market prospects for upland crops in Thailand
Year 1997
Source title Palawija News
Reference 14(3): 1-9

Abstract

This study of prospects for upland crops in Thailand begins with an analysis of recent changes in dietary and consumption patterns which have resulted from increases in population, income and urbanization. Changes in the domestic demand and external trade performance of maize, soyabeans, cassava and rice are summarized. A report of studies involving some non-traditional commodities which are considered to have good market potential (longan, durian, mangosteen and baby corn) is included. Successful and unsuccessful attempts to stimulate production and marketing of upland crops and products are examined as a series of case studies, including broilers, tomatoes, onions, mangos, cashew nuts and cotton. Policies and measures to improve Thailand's market prospects and which adopt a progressive stance are discussed.

Author Ito, C., Y. Miyamoto, M. Nakayama, Y. Kawai, K. S. Rao and H. Furukawa
Title A novel depsidone and some new xanthenes from Garcinia species
Year 1997
Source title Chemical and Pharmaceutical Bulletin
Reference 45(9): 1403-1413

Abstract

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Author Jin Goh, C., S. Keng Ng, P. Lakshmanan and C. Shiong Loh
Title The role of ethylene on direct shoot bud regeneration from mangosteen (Garcinia
Year 1997
Source title Plant Science
Reference 124(2): 193-202

Abstract

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Author Kong L and et al.
Title Influence of different processing methods on mutagenicity of gamboge tree (Garci
Year 1997
Source title Chinese Traditional and Herbal Drugs
Reference 28(1): 35-36
Abstract

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Author Likhitwitayawuid K; Phadungcharoen T; Mahidol C; Ruchirawat S
Title 7-o-methylgarcinone e from Garcinia cowa
Year 1997
Source title Phytochemistry
Reference 45(6): 1299-1301
Abstract

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Author Lin YM; Anderson H; Flavin MT; Pai YHS; Mata-Greenwood E; Pengsuparp T;
Title In vitro anti-hiv activity of biflavonoids isolated from Rhus succedanea and Garci
Year 1997
Source title Journal of Natural Products
Reference 60(9): 884-888
Abstract

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Author Normah MN; Ramiya SD; Gintangga M
Title Desiccation sensitivity of recalcitrant seeds-a study on tropical fruit species
Year 1997
Source title Seed Science Research
Reference 7(2): 179-183. 19 ref.

Abstract

Desiccation sensitivity of seeds was studied in mangosteen (*Garcinia mangostana*), rambai (*Baccaurea motleyana*) and jelentik (*Baccaurea polyneura*), tropical fruit species believed to have recalcitrant seeds. The seeds showed no dormancy; they germinated easily. At harvest, the mean moisture contents (fresh weight basis) were 53.54, 51.20 and 44.90% for *G. mangostana*, *B. motleyana* and *B. polyneura*, respectively. *G. mangostana* seeds lost viability when their moisture content fell to about 24% while *B. motleyana* seeds lost viability below 35.5% moisture content. However, for *B. polyneura*, the seeds could be dried to low moisture content with high survival. The viability was still high when the moisture content was reduced to 13.46%. At this moisture content, the percentage germination was 91.76% and it was found that the seeds survived cryopreservation with 8.3% viability. For *B. motleyana* axes, the loss of viability occurred when their moisture content fell to about 36% (15% ! vi! ability with predominantly callus formation) while for *B. polyneura* axes, viability was reduced to 33-67% when the moisture was 27-30%. At various moisture contents, the seeds of the fruit species studied were exposed for 48 h to 7 and -4 deg C. *G. mangostana* seeds did not survive either temperature. *Baccaurea* seeds survived 7 deg but failed to survive -4 deg . No axes from *B. motleyana* seeds at various moisture contents survived cryopreservation. However, some viability (20-30%) was observed in *B. polyneura* axes cryopreserved at a moisture content of about 27%. At this moisture content no normal growth was obtained; callus formation was observed. It appears that the seeds vary in the degree of desiccation sensitivity. They also vary in size. Seeds of *G. mangostana* are larger than *Baccaurea* seeds and thus, more sensitive to desiccation. Seed and embryonic axis structure may also play a role in desiccation s e n s i t i v i t y .

Author Pino JA
Title The volatile constituents of tropical fruits. IV. Kiwifruit, carambola and mangoste
Year 1997
Source title Alimentaria
Reference 35(286): 47-50. 20 ref.

Abstract

Studies on the isolation and identification of the volatile constituents of kiwifruits, carambolas and mangosteens are reviewed. The volatile constituents identified in fruits of each of the above species a r e l i s t e d .

Author Prakash Lakshmanan; Ng SiewKeng; Loh ChiangShiong; Goh ChongJin
Title Auxin, cytokinin and ethylene differentially regulate specific developmental states
Year 1997
Source title Plant and Cell Physiology
Reference 38(1): 59-64. 36 ref.

Abstract

Hormonal regulation of de novo shoot bud formation in mangosteen leaf explants was studied from a developmental perspective. Shoots were regenerated on shoot regeneration medium (woody plant medium containing 20 g sucrose and 2.5 g phytigel/litre, supplemented with 20 micro M BA [benzyladenine]). At least 3 discrete, experimentally distinguishable developmental states, namely, morphogenic competence, caulogenic determination and organ differentiation, were expressed during shoot bud morphogenesis. The state of morphogenic competence in leaf tissues was expressed maximally between days 10 and 12 of leaf development. Competent cells in explants required a minimum of 6 days of BA treatment (20 micro M) to become caulogenically determined. Such cells continued shoot organogenesis on medium devoid of growth regulators. Delaying BA exposure for as little as 2 days caused a dramatic decline in tissue competence. The state of competence and the process of caulogenic determination ! we! re adversely affected by IAA, but were insensitive to ethylene or its precursor, ACC. Shoot bud differentiation was greatly enhanced by BA, but selectively delayed by ethylene. IAA also showed an inhibitory effect on shoot bud differentiation, but this was not mediated through ethylene. The distinct roles of auxin, cytokinin and ethylene on the regulation of shoot bud development in mangosteen leaf explants are discussed on the basis of the current understanding of the concept of tissue competence, determination and differentiation.

Author Sawada H; Tomi H; Tamura K; Anno T
Title Effects of liquid Garcinia extract and soluble garcinia powder on body weight cha
Year 1997
Source title Journal of the Japan Oil Chemists Society
Reference 46(12): 1467-1474

Abstract

Author Terashima K; Shimamura T; Tanabayashi M; Aqil M; Akinniyi JA; Niwa M
Title Constituents of the seeds of *Garcinia kola*: Two new antioxidants, garcinoic acid a
Year 1997
Source title Heterocycles
Reference 45(8): 1559-1566
Abstract

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Author Adegoke GO; Olojede F; Engelhardt G; Wallnoefer PR
Title Inhibition of growth and aflatoxin production in *Aspergillus parasiticus* nr1 2999
Year 1996
Source title Advances in Food Sciences
Reference 18(3/4): 84-86
Abstract

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Author Asano, J., K. Chiba, M. Tada and T. Yoshii
Title Cytotoxic xanthenes from *Garcinia hanburyi*
Year 1996
Source title Phytochemistry
Reference 41(3): 815-820
Abstract

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Author Chairungsrilerd, N., K. I. Furukawa, T. Ohta, S. Nozoe and Y. Ohizumi
Title Histaminergic and serotonergic receptor blocking substances from the medicinal p
Year 1996
Source title Planta Medica
Reference 62(5): 471-472
Abstract

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Author Chairungsrilerd, N., K. Takeuchi, Y. Ohizumi, S. Nozoe and T. Ohta
Title Mangostanol, a prenyl xanthone from *Garcinia mangostana*
Year 1996
Source title Phytochemistry
Reference 43(5): 1099-1102
Abstract

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Author Chen, S. X., M. Wan and B. N. Loh
Title Active constituents against hiv-1 protease from *Garcinia mangostana*
Year 1996
Source title Planta Medica
Reference 62(4): 381-382
Abstract

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Author Furukawa, K. I., K. Shibusawa, N. Chairungsrilerd, T. Ohta, S. Nozoe and Y. Ohi
Title The mode of inhibitory action of ϵ -mangostin, a novel inhibitor, on the sarcoplas
Year 1996
Source title Japanese Journal of Pharmacology
Reference 71(4): 337-340
Abstract

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Author Girola, M., M. De Bernardi, S. Contos, S. Tripodi, P. Ventura, C. Guarino and M.
Title Dose effect in lipid-lowering activity of a new dietary integrator (chitosan, garcini
Year 1996
Source title Acta Toxicologica Et Therapeutica
Reference 17(1): 25-40
Abstract

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Author Hirata, E., I. Asato, R. Terazono, M. Aramoto and G. Zhou
Title Studies on improvement of stand structure of evergreen broadleaved forest in okin
Year 1996
Source title Science Bulletin- College of Agriculture University of the Ryukyus
Reference 131-142
Abstract

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Author Iinuma, M., H. Tosa, T. Ito, T. Tanaka and S. Riswan
Title Three new benzophenone-xanthone dimers from the root of *Garcinia dulcis*
Year 1996
Source title Chemical and Pharmaceutical Bulletin
Reference 44(9): 1744-1747
Abstract

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Author Iinuma, M., H. Tosa, T. Ito, T. Tanaka and S. Riswan
Title Garciduols a and b, new benzophenone-xanthone dimers, from *Garcinia dulcis*
Year 1996
Source title Heterocycles
Reference 43(3): 535-544
Abstract

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Author Iinuma, M., H. Tosa, T. Tanaka and S. Riswan
Title Three new xanthones from the bark of *Garcinia dioica*
Year 1996
Source title Chemical and Pharmaceutical Bulletin
Reference 44(1): 232-234
Abstract

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Author Iinuma, M., H. Tosa, T. Tanaka, F. Asai, Y. Kobayashi, R. Shimano and K. I. Miy
Title Antibacterial activity of xanthenes from Guttiferaeous plants against methicillin-r
Year 1996
Source title Journal of Pharmacy and Pharmacology
Reference 48(8): 861-865
Abstract

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Author Iinuma, M., T. Ito, H. Tosa, T. Tanaka and S. Riswan
Title Five new xanthenes from *Garcinia dulcis*
Year 1996
Source title Journal of Natural Products
Reference 59(5): 472-475
Abstract

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Author Krajewski D; Toth G; Schreier P
Title 2-ethyl-3-methylmaleimide n- β -d-glucopyranoside from the leaves of mangosteen
Year 1996
Source title Phytochemistry
Reference 43(1): 141-143
Abstract

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Author Krajewski D; Toth G; Schreier P
Title 2-Ethyl-3-methylmaleimide N- beta -D-glucopyranoside from the leaves of mango
Year 1996
Source title Phytochemistry
Reference 43(1): 141-143. 22 ref.

Abstract

From a methanolic extract of mangosteen leaves (collected from Colombia), a new flavour compound, 2-ethyl-3-methylmaleimide N- beta -D-glucopyranoside was isolated by adsorption chromatography on XAD resin followed by rotation locular countercurrent chromatography. After acetylation, separation was performed by column chromatography on silica gel and preparative HPLC on RP-18 phase. Identification was carried out by MS and NMR. Assignment of the quaternary carbon resonances was achieved by HMBC experiments.

Author Lin CN; Kiang CW; Lu CM; Wu RR; Lee KH
Title Garcinielliptin oxide, a triterpenoid with a novel skeleton, isolated from Garcinia
Year 1996
Source title Chemical Communications- Chemical Society
Reference (11): 1315-1316

Abstract

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Author Masri M
Title Phase change in mangosteen (*Garcinia mangostana* L.) and its relationship to tree
Year 1996
Source title Mardi Research Journal
Reference 24(1): 27-30

Abstract

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Author Minami H; Kuwayama A; Yoshizawa T; Fukuyama Y
Title Novel prenylated xanthenes with antioxidant property from the wood of *Garcinia*
Year 1996
Source title Chemical and Pharmaceutical Bulletin
Reference 44(11): 2103-2106

Abstract

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Author Minami H; Takahashi E; Kodama M; Fukuyama Y
Title Three xanthenes from *Garcinia subelliptica*
Year 1996
Source title Phytochemistry
Reference 41(2): 629-633

Abstract

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Author Pankasemsuk T; Garner JO; Jr. Matta FB; Silva JL
Title Translucent flesh disorder of mangosteen fruit (*Garcinia mangostana* L.)
Year 1996
Source title Hortscience
Reference 31(1): 112-113. 9 ref.

Abstract

Characteristics of mangosteen fruits with normal and translucent flesh were determined. Fruits exhibiting translucent flesh disorder had significantly higher rind (65%) and flesh (82%) water contents than fruits with normal flesh (63 and 80% in the rind and flesh, respectively). Specific gravity of translucent flesh fruit was >1 and that of normal flesh fruit was <1. Fruit specific gravity and natural transverse rind cracking were used to separate translucent-fleshed fruits from normal fruits. Translucent-fleshed fruits had a lower soluble solids concentration and titratable acid percentage than normal fruits. Translucent flesh was induced in normal fruits following water infiltration at 39 kPa for 5 minutes.

Author Ye D.....and et al.
Title Selection of technology for processing steamed *Garcinia hunburyi* with high press
Year 1996
Source title China Journal of Chinese Materia Medica
Reference 21(8): 472-473
Abstract

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Author Aliudin, R. and M. N. Normah
Title In vitro propagation of mangosteen (*Garcinia mangostana* L.) from shoot cultures
Year 1995
Source title In Vitro Cellular and Developmental Biology A
Reference 31(3/Pt2), P-1138
Abstract

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Author Asai, F., H. Tosa, T. Tanaka and M. Iinuma
Title A xanthone from pericarps of *Garcinia mangostana*
Year 1995
Source title Phytochemistry
Reference 39(4): 943
Abstract

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Author Atawodi, S. E., P. Mende, B. Pfundstein and R. Preussmann
Title Nitrosatable amines and nitrosamide formation in natural stimulants: Cola acumin
Year 1995
Source title Food and Chemical Toxicology
Reference 33(8): 625
Abstract -

Author Dosunmu, M. I. and E. C. Johnson
Title Chemical evaluation of the nutritive value and changes in ascorbic acid content du
Year 1995
Source title Food Chemistry
Reference 54(1): 67
Abstract -

Author Iinuma, M., H. Tosa, T. Tanaka and F. Asai
Title Two xanthenes with a 1,1-dimethylallyl group in root bark of Garcinia subelliptic
Year 1995
Source title Phytochemistry
Reference 39(4): 945
Abstract -

Author Iinuma, M., H. Tosa, T. Tanaka and F. Asai
Title Three xanthenes from root bark of *Garcinia subelliptica*
Year 1995
Source title *Phytochemistry*
Reference 38(1): 247
Abstract

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Author Iinuma, M., H. Tosa, T. Tanaka and F. Asai
Title Two new xanthenes from the root bark of *Garcinia subelliptica*
Year 1995
Source title *Heterocycles*
Reference 40(1): 279
Abstract

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Author Jarimopas B; Phoetiniyom K; Sukharomana S
Title Development of mangosteen cutting machine
Year 1995
Source title The Kasetsart Journal: Natural Sciences
Reference 29(2): 205-218. 5 ref.

Abstract

Work was carried out to design, construct, test, and evaluate Mangosteen Cutting Machines (MCM) for the frozen mangosteen (*Garcinia mangostana*) export industry. MCMs were developed: the manually operated type comprised of a steel cylindrical base, cylindrical rubber support (with hemispherical hole to hold the fruit firmly during cutting), and knife with horizontal and vertical screw control; and the semi-automatic type comprised of a 220 V, 50 Hz, 1-phase, 1/4 hp driving motor, 1:20 gear reducer, gearing system, cutting knife (2 cm wide and 6 cm long) and a replaceable rubber seat according to fruit size. Testing of the manually-operated MCM revealed that the machine could cut small (S), medium (M), and large (L) mangosteens at the rate of 109, 107 and 101 fruits/h, respectively, and 100% of cuts were smooth. Less than 20% of fruit samples were not cut in a continuous loop. Two prototypes of semi-automatic MCMs with similar principal components were developed. The rubber seat of the first MCM was built to hold the mangosteen stationary during cutting while the second MCM needed the operator to use a hand to do so. Cutting experiments with 50 newly harvested mangosteens of 3 different sizes showed that the first MCM could cut mangosteens at the capacity of 237, 214 and 216 fruits/h for S, M, and L sizes respectively. All fruits were easy to open, 80% of the cuts were complete loops and 92% had smooth cuts. The second MCM could cut fruits of a lower quality than the first, and its capacity was 413, 363 and 377 fruits/h for S, M and L fruits. All fruits could be opened but larger fruits were more difficult. Materials and labour costs to construct an MCM were 7130 baht, and the cost of cutting 100 mangosteens was less than or equal to 7.50 baht.

Author Madubunyi II
Title Antimicrobial activities of the constituents of *Garcinia kola* seeds
Year 1995
Source title International Journal of Pharmacognosy
Reference 33(3): 232

Abstract

Author McCarty MF
Title Inhibition of citrate lyase may aid aerobic endurance
Year 1995
Source title Medical Hypotheses
Reference 45(3): 247

Abstract

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Author Minami H; Takahashi E; Fukuyama Y; Kodama M
Title Novel xanthenes with superoxide scavenging activity from *Garcinia subelliptica*
Year 1995
Source title Chemical and Pharmaceutical Bulletin
Reference 43(2): 347

Abstract

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Author Normah MN; Nor-Azza AB; Aliudin R
Title Factors affecting in vitro shoot proliferation and ex vitro establishment of mangos
Year 1995
Source title Plant Cell Tissue and Organ Culture
Reference 43(3): 291-294. 11 ref.

Abstract

Shoot proliferation was achieved in mangosteen (*Garcinia mangostana*) using seed explants. The highest mean number of shoots per explant (16.8) was obtained from cultures on MS medium supplemented with 40 mM benzyladenine and 25 mM NAA, and these were maintained at 30 deg C with an 8-h photoperiod. Cultures on the same medium but supplemented with 2 g activated charcoal/litre produced fewer shoots. However, growth of these shoots was more organized and 75% rooting was obtained. Woody Plant Medium was not a suitable medium for shoot proliferation.

Author Ogu EO; Agu RC
Title A comparison of some chemical properties of *Garcinia kola* and hops for assessm
Year 1995
Source title Bioresource Technology
Reference 54(1): 1-4
Abstract

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Author Spino C; Lal J; Sotheeswaran S; Aalbersberg W
Title Three prenylated phenolic benzophenones from *Garcinia myrtifolia*
Year 1995
Source title Phytochemistry
Reference 38(1): 233
Abstract

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Author Terashima K; Aqil M; Niwa M
Title Garcinianin, a novel biflavonoid from the roots of *Garcinia kola*
Year 1995
Source title Heterocycles
Reference 41(10): 2245-2250
Abstract

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Author Wiebel J; Chacko EK; Downton WJS; Loveys BR; Ludders P
Title Carbohydrate levels and assimilate translocation in mangosteen (*Garcinia mangos*
Year 1995
Source title Gartenbauwissenschaft
Reference 60(2): 90-94. 27 ref.

Abstract

The very slow growth of mangosteen seedlings usually results in a non-cropping, juvenile phase of 10 years or more, making commercial development unattractive. Diurnal variations in soluble sugar and starch levels in mature leaves of 2-year-old seedlings with immature, semi-mature and mature terminal flushes were studied. Glucose, fructose, sucrose and starch concentrations in leaf extracts increased significantly after midday, reaching a maximum at 18.00 h, regardless of the ontogenic stage of the terminal flush. A time-course study of ¹⁴C-assimilate translocation and distribution in unbranched seedlings with semi-mature terminal flushes showed that >49% of ¹⁴C activity was exported from the source (pulsed) leaf within 1 day, with <16% remaining in the source leaf after 8 days. Immature flushes attracted >75% of ¹⁴C within 3 days. When the shoot system was non-flushing, 53% of the total ¹⁴C remained in the source leaf after 3 days, with stems and roots exhibiting the strongest sink activity. High translocation rates in flushing and non-flushing seedlings observed in this study suggest that assimilate production rather than translocation may be a major factor limiting the growth of mangosteen seedlings.

Author Yaacob O; Tindall HD
Title Mangosteen cultivation
Year 1995
Source title FAO Plant Production and Protection Paper
Reference 129: 100. 8 pp. of ref.

Abstract

This technical manual, one of a series on promising minor tropical fruit crops, comprises 10 chapters. An introductory section considers the distribution, economic importance, nutritional value and uses of *Garcinia mangostana*. The remainder deals with the species' botanical, physiological and genetic characteristics and its ecology. Technical guidelines for propagation and cultivation (including pest and disease control, harvesting and postharvest technology) are presented. The manual is aimed at researchers, horticultural technicians and growers.

Author Alahakoon PW; Brown AE
Title Host range of *Colletotrichum gloeosporioides* on tropical fruit crops in Sri Lanka
Year 1994
Source title International Journal of Pest Management
Reference 40(1): 23-26. 14 ref.

Abstract

C. gloeosporioides [*Glomerella cingulata*] was isolated from 23 fruits crops in Sri Lanka. This is the first record of *G. cingulata* on durian, mangosteen, pini jambu (*Syzygium jambos*), rambutan and 11 other less economically important fruit trees in Sri Lanka. Symptoms of infection by *G. cingulata* on fruit tree seedlings, especially mango and rambutan, which can cause up to 40% loss of planting stock, were previously believed to be a physiological disorder. It is recommended that these seedlings should be protected from major sources of *G. cingulata* inoculum.

Author Alahakoon PW; Brown AE; Sreenivasaprasad S
Title Cross-infection potential of genetic groups of *Colletotrichum gloeosporioides* on t
Year 1994
Source title Physiological and Molecular Plant Pathology
Reference 44(2): 93-103. 18 ref.

Abstract

Cross-inoculation experiments demonstrated variation in the level of host preference among *C. gloeosporioides* [*Glomerella cingulata*] isolates from 7 tropical fruit crops and also variation in the susceptibility of the hosts. In general, isolates were much more pathogenic on leaves of the original host than on those of alternative crops. Isolates from avocado, durian (*Durio zibethinus*) and mango showed the greatest degree of host preference while isolates from mangosteen (*Garcinia mangosteen* [*G. mangostana*]) and pini jambu (*Syzygium jambos*) were the most pathogenic on alternative crops. Avocado, mango and rambutan (*Nephelium lappaceum*) were the most susceptible and mangosteen and pini jambu were the least susceptible to *G. cingulata* isolates from the other crops. The extent of cross-infection appeared dependent on inoculum density. Molecular markers based on restriction fragment length polymorphisms (RFLPs) in ribosomal DNA (rDNA), mitochondrial DNA (mtDNA) and random amplified polymorphic DNA (RAPD) enabled genetic grouping of the *G. cingulata* isolates. In some instances, isolates from different hosts, e.g. 2 of the avocado isolates, all 3 durian isolates and 1 rambutan isolate, had identical rDNA and very similar mtDNA banding patterns (category 3) indicating a common ancestry, but differed in their host preference, implying adaptation to different crops.

Author Australia, West Australian Nut and Tree Crop Association (Inc.).
Title WANATCA yearbook
Year 1994
Source title Wanatca Yearbook
Reference 18: 80. many ref.

Abstract

This volume contains 9 papers by various authors. Their titles are as follows: Underexploited fruits and nuts of Russia; The world trade in persimmons; Native fruit and nut bearing species of the Kimberleys; The future for almonds in Australasia; The versatile kaya [*Torreya* spp.] trees of Japan and China; Introduction and domestication of rare and wild fruit and nut trees for desert areas; The mangosteen and related species; The canistel [*Pouteria campechiana*]; and Australian essential oils.

Author Barrett OW
Title The mangosteen and related species
Year 1994
Source title Wanatca Yearbook
Reference 18: 54-63. 4 ref.

Abstract

This paper is reprinted from the author's book *The tropical crops* (1928), published by Macmillan, New York. It surveys cultivated and promising species of *Garcinia*, 47 of which are described in addition to *G. mangostana*, and also the related *Mammea americana* and various *Rheedia* [*Garcinia*].

Author Bell F; Irvine T
Title Australian mangosteens
Year 1994
Source title Australian Plants
Reference 17(138): 274-275.

Abstract

Seven *Garcinia* species native to Australia are described. All except *G. warrenii*, which is the most common, have restricted distributions and all bear edible, but not necessarily palatable, fruits. In some species the skin and flesh of the fruit may be edible, but usually the edible part is the fleshy aril surrounding the seed. The fruit of *G. mestonii* is very similar in size and shape to that of the Indonesian / Malaysian mangosteen.

Author Camarotto C; Bourke RM
Title Potential for exporting fruit from Papua New Guinea to overseas markets during t
Year 1994
Source title Papua New Guinea Journal of Agriculture Forestry and Fisheries
Reference 37(2): 2-13. 29 ref.

Abstract

This study is an initial identification of fruit crops that could be exported from Papua New Guinea to nearby overseas markets during their off-seasons. The period of plentiful supply of 57 fruit and five nut species in Papua New Guinea is compared with that in two other Southern Hemisphere countries (Australia and Indonesia) and two nearby Northern Hemisphere countries (the Philippines and Thailand). Four basic patterns occur for the crops examined. Firstly, there are clear consistent differences between the main production periods in the Northern and Southern Hemispheres for some species, such as durian, rambutan and mandarin. For other species, such as avocado and watermelon, the production periods overlap in the two hemispheres. A few crops, such as bananas and coconut, are non-seasonal in all locations. The fourth pattern is displayed by other species including guava, pawpaw and lime, for which production is non-seasonal in certain environments and seasonal in others. The best prospects for exporting fresh fruit from Papua New Guinea are for durian, langsung [*Lansium domesticum*], mangosteen, pulasan [*Nephelium mutabile*] and rambutan to certain Asian markets during the Northern Hemisphere non-production period. There is potential for other fruit exports to both Northern Hemisphere Asian markets and Southern Hemisphere markets in Australia, but this is limited by other factors including quarantine restrictions, the highly perishable nature of some fruit, limited demand and the poor quality cultivars grown in Papua New Guinea. Fruit in this category includes avocado, grapefruit, lime, mandarin, mango, pomelo, raspberry and strawberry.

Author Donnelly, D. M. X., B. M. Fitzpatrick, S. M. Ryan and J. P. Finet
Title Aryllead triacetates as synthons for the synthesis of biflavonoids. Part 2. Synthesis
Year 1994
Source title Journal of the Chemical Society Perkin Transactions 1
Reference (13): 1797

Abstract

Author Goh CJ; Lakshmanan P; Loh CS
Title High frequency direct shoot bud regeneration from excised leaves of mangosteen (
Year 1994
Source title Plant Science (Limerick)
Reference 101(2): 173-180. 21 ref.

Abstract

An improved procedure for direct shoot bud regeneration from young leaves was developed. Regeneration was achieved by culturing 3-mm transverse sections of 10-day-old leaves on woody plant medium supplemented with 20 micro M benzyladenine (BA), 20 g sucrose and 2.5 g Phytigel/litre. A wound response in the presence of BA at the time of culture was essential for shoot bud induction. Explant size, concentration of BA in the medium, timing of BA addition to the medium as well as the time of wounding of explant significantly influenced shoot bud regeneration. Leaves from field-grown seedlings produced an average of 45 shoot buds/leaf after 50 days of culture, compared with 8 shoot buds/leaf from in vitro-grown shoots. Regenerated shoots (5-6 mm tall) excised from the explants required BA (5 micro M) for further growth. Rooting was induced with IBA when the shoots reached 10-15 mm and were established in vermiculite/sand mixture in p o t s .

Author Iinuma, M., H. Tosa, T. Tanaka and R. Shimano
Title Two xanthonenes from root bark of *Garcinia subelliptica*
Year 1994
Source title Phytochemistry
Reference 35(5): 1355

Abstract

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Author Ilyas, M., M. Kamil, M. Parveen and M. S. Khan
Title Isoflavones from *Garcinia nervosa*
Year 1994
Source title Phytochemistry
Reference 36(3): 807

Abstract

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Author Kapadia GJ; Oguntimein B; Shukla YN
Title High-speed counter-current chromatographic separation of biflavanoids from Garc
Year 1994
Source title Journal of Chromatography A
Reference 673(1): 142

Abstract

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Author Kusumo S; Verheij EWM
Title Mangosteen, the queen of tropical fruits: problems and suggested research in Indo
Year 1994
Source title Indonesian Agricultural Research and Development Journal
Reference 16(3): 33-36. 20 ref.

Abstract

Mangosteens are recognised as having great potential as an export crop in Indonesia. Problems which need to be overcome to allow large-scale production are discussed under the following headings: Propagation, Genetic variation, Growth stimulation, Tissue culture techniques and Postharvest handling. Particular areas requiring further research include breeding, shortening the juvenile phase and developing a protocol for dormant bud culture in vitro.

Author Minami H; Kinoshita M; Fukuyama Y; Kodama M
Title Antioxidant xanthenes from *Garcinia subelliptica*
Year 1994
Source title Phytochemistry
Reference 36(2): 501

Abstract

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Author Nazeema KK; Mathew L; Sarah K; George T; Krishnan S
Title Double grafting in *Garcinia combogia* (kydumpuli)
Year 1994
Source title South Indian Horticulture
Reference 42(6): 379-380
Abstract

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Author Niwa M; Ito J; Terashima K; Aqil M
Title Garcipyran, a novel 6-aryl-1,2-benzopyran derivative from *Garcinia kola*
Year 1994
Source title Heterocycles
Reference 38(8): 1927
Abstract

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Author Niwa M; Terashima K; Ito J; Aqil M
Title Two novel arylbenzofurans, garcifuran-a and garcifuran-b from *Garcinia kola*
Year 1994
Source title Heterocycles
Reference 38(5): 1071
Abstract

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Author Parveen N; Singh MP; Khan NU; Logani MK
Title Flavonoidic constituents of Garcinia xanthochymus leaves
Year 1994
Source title Fitoterapia
Reference 65(1): 89
Abstract

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Author Pattalung P; Thongtheeraparp W; Wiriyachitra P; Taylor WC
Title Xanthones of Garcinia cowa
Year 1994
Source title Planta Medica
Reference 60(4): 365
Abstract

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Author Singhai M; Kumar AB
Title Investigation on Garcinia indica seed oil
Year 1994
Source title Asian Journal of Chemistry
Reference 6(3): 720
Abstract

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Author Srivastava SK
Title *Garcinia dhanikhariensis* (Clusiaceae), a new species from Andaman Islands, Indi
Year 1994
Source title Nordic Journal of Botany
Reference 14(1): 51

Abstract

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Author Wiebel J; Chacko EK; Downton WJS; Ludders P
Title Influence of irradiance on photosynthesis, morphology and growth of mangosteen
Year 1994
Source title Tree Physiology
Reference 14(3): 263-274. 34 ref.

Abstract

The influence of shading intensity on growth, morphology and leaf gas exchange of mangosteen seedlings in the nursery was investigated over a 2-year period. Diurnal gas exchange studies revealed significantly higher carbon gain for leaves grown in 20 or 50% shade than for leaves grown in 80% shade. Seedlings grown in 20 or 50% shade accumulated significantly more DW than those in 80% shade during the 2-year study period. Seedlings grown in decreased shade showed decreased leaf size, increased leaf thickness, lower specific leaf area (SLA) and higher stomatal frequency. Less shaded seedlings also allocated relatively more dry matter to roots than shaded seedlings and exhibited a significant reduction in leaf area relative to total plant DW (leaf area ratio). Increased leaf number, enhanced branching and shorter internodes resulted in less shaded seedlings having a more compact appearance. Irrespective of light conditions, mangosteen seedlings exhibited inherently slow growth because of low photosynthetic rates per unit leaf area, low SLA, low leaf area ratios and inefficient root systems.

Author Yoshikawa M; Harada E; Miki A; Tsukamoto K
Title Antioxidant constituents from the fruit hulls of mangosteen (*Garcinia mangostana*)
Year 1994
Source title Journal of the Pharmaceutical Society of Japan
Reference 114(2): 129

Abstract

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Author Yoshikawa M; Harada E; Miki A; Tsukamoto K; Liang SQ; Yamahara J; Muraka
Title Antioxidant constituents from the fruit hulls of mangosteen (*Garcinia mangostana*)
Year 1994
Source title Yakugaku Zasshi - Journal of the Pharmaceutical Society of Japan
Reference 114(2): 129-133. 16 ref.

Abstract

In the course of a search for natural antioxidants, the methanol extract of the fruit hulls of mangosteen (*Garcinia mangostana* L.) originating in Vietnam was found to exhibit a potent radical scavenging effect. By monitoring this radical scavenging effect, two xanthenes, alpha - and gamma - mangostins, were isolated, together with (-)-epicatechin and procyanidins A-2 and B-2, as active principles. The antioxidant activity of the two xanthenes was measured by the ferric thiocyanate method; gamma -mangostin was more active than butylhydroxyanisol and alpha -tocopherol.

Author Braide, V. B.
Title Antiinflammatory effect of kolaviron, a biflavonoid extract of *Garcinia kola*
Year 1993
Source title Fitoterapia
Reference 64(5): 433

Abstract

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Author Fukuyama, Y., A. Kaneshi, N. Tani and M. Kodama
Title Subellinone, a polyisoprenylated phloroglucinol derivative from *Garcinia subellip*
Year 1993
Source title Phytochemistry
Reference 33(2): 483

Abstract

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Author Haefner, A. and A. W. Frahm
Title Biflavonoids from the heartwood of *Garcinia schomburgkiana* and their structural
Year 1993
Source title *Planta Medica*
Reference 59(7): A 604

Abstract

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Author Harrison, L. J., L. S. Leong, G. L. Sia and K. Y. Sim
Title Xanthones from *Garcinia forbesii*
Year 1993
Source title *Phytochemistry*
Reference 33(3): 727

Abstract

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Author Jarimopas B; A-sai K; Maneewatanaset V
Title Mechanism of mangosteen shearing
Year 1993
Source title *The Kasetsart Journal: Natural Sciences*
Reference 27(4): 474-479. 4 ref.

Abstract

Research was carried out to develop a method of cutting a mangosteen fruit mechanically. The mechanism uses a rotating knife to shear the correctly positioned and graded mangosteens. Results of tests with 5 different designs of blade are presented. Two designs produced 90-100% perfect cuts.

Author Ketsa S; Koolpluksee M
Title Some physical and biochemical characteristics of damaged pericarp of mangostee
Year 1993
Source title Postharvest Biology and Technology
Reference 2(3): 209-215. 13 ref.

Abstract

Unripe and half-ripe (maturity stage 3) mangosteen fruits were dropped from various heights (20-100 cm) onto a concrete floor. Damage to the pericarp increased as drop height increased. The effect on half-ripe fruits was greater than that on unripe samples when dropped from identical heights. Impact had only a slight effect on fruit respiration rate, but the rate of ethylene production was reduced in damaged fruits, although not significantly so, during the first 3 h after impact. In general, the total phenolic content of damaged fruit tissue was lower than that of control samples 1-6 h after impact; the reduction was significant for fruits at the half-ripe stage. Some damaged fruits were dipped in 0.1 mM cycloheximide for 10 min immediately after impact. Cycloheximide treatment reduced fruit firmness slightly and slightly increased total phenolic content. However, the firmness and total phenolic content of control fruits were significantly less and greater, respectively, than comparable values for damaged fruits, whether treated with cycloheximide or not. The results suggest that the increase in firmness of damaged fruits may be associated with enhanced phenolic

Author Lin LJ; Lin LZ; Pezzuto JM; Cordell GA
Title Isogambogic acid and isomorellinol from *Garcinia hanburyi*
Year 1993
Source title Magnetic Resonance in Chemistry
Reference 31(4): 340

Abstract

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Author Nichols M; Christie B
Title Less well known tropical fruits
Year 1993
Source title Agribusiness Worldwide
Reference 15(4): 6-12

Abstract

Many of the minor tropical fruits are completely unknown to consumers living in temperate climates. With the interest in exotic and unusual products growing in the more developed countries, real potential exists to cultivate an export market based on the production of tropical fruits. This paper examines five important topics which must be addressed both separately and concomitantly in order to build a successful export industry: (i) genetic resources; (ii) nursery production; (iii) production systems; (iv) postharvest; (v) marketing. The paper goes on to look at production of a selection of tropical fruits: lychee, rambutan, mangosteen, longan, carambola, and durian.

Author Niwa M; Terashima K; Aqil M
Title Garcinol, a novel arylbenzofuran derivative from *Garcinia kola*
Year 1993
Source title Heterocycles
Reference 36(4): 671

Abstract

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Author Orie NN; Ekon EUA
Title The bronchodilator effect of *Garcinia kola*
Year 1993
Source title East African Medical Journal
Reference 70(3): 143

Abstract

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Author Wiebel J; Eamus D; Chacko EK; Downton WJS; Ludders P
Title Gas exchange characteristics of mangosteen (*Garcinia mangostana* L.) leaves
Year 1993
Source title Tree Physiology
Reference 13(1): 55-69. 40 ref.

Abstract

Two-year-old mangosteen seedlings were grown in 20, 50 or 80% shade. Maximal photosynthetic rate ($P_{n(max)}$) per unit leaf area at light saturation did not differ significantly among plants grown in the different shade treatments despite significant morphological differences. Light compensation point ($9-15 \mu\text{mol m}^{-2} \text{s}^{-1}$) and quantum yield (0.022-0.023) did not differ significantly between treatments, whereas light saturation point was significantly higher for leaves grown in 20% shade than for leaves grown in 50 or 80% shade (951, 645 and 555 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively). Shade treatments significantly affected assimilation responses to varying CO_2 concentrations. At 600-1000 $\mu\text{mol CO}_2/\text{mol}$, leaves from the 20% shade treatment recorded higher P_n (6.44 $\mu\text{mol m}^{-2} \text{s}^{-1}$) than leaves from the 80% shade treatment (4.57 $\mu\text{mol m}^{-2} \text{s}^{-1}$). Stomatal conductance (g_s) decreased with increasing CO_2 concentrations. Vapour pressure deficits (VPDs) higher than 2.5 kPa significantly decreased P_n and g_s , whereas P_n remained steady over a 24-33 deg C temperature range in leaves in 80% shade and over a 27-36 deg range in leaves in 20 and 50% shade. The highest carbon gain during a 12-hour photoperiod was observed for leaves grown in 50% shade. It was concluded that mangosteen is a shade-tolerant, lower canopy tree adapted to humid tropical lowlands and that providing low VPD in the nursery may result in maximal growth.

Author Wiebel J; Ludders P
Title Mangosteen (*Garcinia mangostana* L.) - a new fruit crop for tropical Australia
Year 1993
Source title Erwerbsobstbau
Reference 35(8): 216-219. 14 ref.

Abstract

The botany and cultivation of mangosteen, and its potential as a new crop for tropical northern Australia, are discussed.

Author Chong, S. T.
Title Vegetative propagation of mangosteen (*Garcinia mangostana* L.)
Year 1992
Source title Discrete Applied Mathematics
Reference 73:
Abstract

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Author Gustafson, K. R., J. W. Blunt, M. H. G. Munro and R. W. Fuller
Title The guttiferones. Hiv-inhibitory benzophenones from *Symphonia globulifera*, Gar
Year 1992
Source title Tetrahedron
Reference 48(46): 10093
Abstract

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Author Jarimopas B; Phoetiniyom K; Goto Y
Title Development of spherical fruit packing machine
Year 1992
Source title The Kasetsart Journal: Natural Sciences
Reference 26(Suppl.): 75-78. 12 ref.
Abstract

Development of a machine to pack spherical fruit, consisting of a conveyor, feeder and packer, is described. The inclined feeder has a capacity of 100 kg of spherical fruit. Results of performance tests show that the prototype can pack tangerine and mangosteen fruits at rates of 1.84 and 1.34 t/h respectively. No mechanical damage to fruits was observed.

Author Jinsart W; Ternai B; Buddhasukh D; Polya GM
Title Inhibition of wheat embryo calcium-dependent protein kinase and other kinases b
Year 1992
Source title Phytochemistry
Reference 31(11): 3711-3713. 19 ref.

Abstract

The hull of the fruit of the mangosteen tree (*Garcinia mangostana*) is used in Thai indigenous medicine to treat skin infections, wounds and diarrhoea. The MeOH extract of the hull contained 4 inhibitors of plant Ca⁽²⁺⁾-dependent protein kinase; 2 of which were purified and identified as the xanthenes 1,3,6-trihydroxy-7-methoxy-2,8-bis(3-methyl-2-butenyl)-9H-xanthen-9-one (mangostin) and 1,3,6,7-tetrahydroxy-2,8-bis(3-methyl-2-butenyl)-9H-xanthen-9-one (gamma-mangostin). Both xanthenes also inhibited avian myosin light chain kinase and rat liver cyclic AMP-dependent protein kinase. This is the first report of inhibition of plant and animal second messenger-regulated protein kinases by plant-derived xanthenes.

Author Normah MN; Rosnah H; Noor-Azza AB
Title Multiple shoots and callus formation from seeds of mangosteen (*Garcinia mangos*
Year 1992
Source title Acta Horticulturae
Reference 292: 87-91. 15 ref.

Abstract

Mature mangosteen seeds (which are apomictic) were sterilized, segmented and cultured on MS or modified MS (macroelements at half strength) medium supplemented with 0 or 2.5 μ M NAA and 0, 30, 40 or 50 μ M BA. Seeds cut into 6 pieces produced more shoots than seeds cut into 3 pieces. Cultures under an 8-h photoperiod produced more shoots than those under a 12-h photoperiod. Combinations of BA at 40 or 50 μ M and 0 or 2.5 μ M NAA were best for multiple shoot production. Shoots were rooted in MS medium supplemented with 20-30 μ M IBA and the plantlets formed were successfully transplanted into a vermiculite and sand mixture. In another experiment, callus formation was most successful in segmented seed cultures supplemented with 30 mg 2,4-D/litre and maintained under a 12-h photoperiod.

Author Pietrzyk JZ
Title Biotechnology in South East Asia and opportunities for foreign investment
Year 1992
Source title Biotech Forum Europe
Reference 9(10): 655-659. 17 ref.

Abstract

It is suggested that countries in South East Asia can offer contract R&D at a fraction of the cost if undertaken in Europe or the USA, and other economic incentives for investment are highlighted. Biotechnology developments of local application are stressed. In Thailand, agricultural biotechnology includes virus-free propagation of strawberries, potatoes and orchids, and embryo transfer in cattle. Weak university-industry links are hampering commercialization of research. The National Science and Technology Development Agency seeks to rectify this. In Malaysia there is little commercial activity in biotechnology but research institutes must be 30% self-sufficient by 1995 (60% by 2000) putting pressure on for commercialization. Micropropagation techniques and establishing cDNA libraries of crops such as rubber, oilpalm, cocoa, rice, ornamental flowers, durian, chili and mangosteen are key targets. Malaysia's plant genetic resources are being evaluated for useful agents, and in vitro conservation techniques are being developed. The Malaysian Agricultural Research and Development Institute is aiming to produce virus-resistant rice varieties, microbes to degrade wastes, biopesticides and monoclonal antibodies for identifying plant disease. The work of other institutes is mentioned. Singapore has several biotechnology companies, some aimed at plant agriculture. University interests in agricultural biotechnology are highlighted.

Author Ramlan MF; Mahmud TMM; Hasan BM; Karim MZ
Title Studies on photosynthesis in young mangosteen plants grown under several growth
Year 1992
Source title Acta Horticulturae
Reference 321: 482-489. 9 ref.

Abstract

Eight-month-old plants, in polyethylene bags, were grown under different levels of light intensity (0, 200, 500, 700, 900 or 1400 $\mu\text{E m}^{-2} \text{s}^{-1}$), and levels of CO_2 (200-1100 p.p.m. at 50-p.p.m. intervals) and were subjected to waterlogging for 0, 24, 48 or 72 h. The rate of photosynthesis increased with increasing CO_2 levels and did not reach saturation level even at 1100 p.p.m. Stomatal conductance tended to increase with increasing CO_2 level. Light saturation occurred at 700 $\mu\text{E m}^{-2} \text{s}^{-1}$ where the rate of photosynthesis was 1.81 $\text{mg CO}_2 \text{ dm}^{-2} \text{ h}^{-1}$. Flooding for only 24 h reduced photosynthesis compared with controls but there were no significant differences in the photosynthetic rate with increasing duration of flooding. However, stomatal conductance decreased significantly with each increase in duration of flooding.

Author Rukayah A; Zabedah M
Title Studies on early growth of mangosteen (*Garcinia mangostana* L.)
Year 1992
Source title Acta Horticulturae
Reference 292: 93-100. 7 ref.

Abstract

The growth of mangosteen seedlings was monitored over 24 months and the effects of mixtures of sand:soil:cow manure (3:2:1, 1:1:2 or 1:1:4) and container size (polyethylene bags 22 x 30 or 30 x 38 cm) on growth were studied. Seedling growth was slow for the first 12 months but then increased at a faster rate. There was a marked increase in the number of tertiary roots compared with secondary roots between months 6 and 14. After that, the weight of the tertiary roots increased markedly but the growth of secondary and tap roots was slower. The DW shoot:root ratio was high during the first 18 months but fell to 4.94 after 24 months. The best seedling growth was obtained with a 3:2:1 sand:soil:manure mixture. Increasing the organic content reduced growth. Container size had no effect on growth. It was concluded that seedlings should be grown in the nursery for at least 2 years before transplanting.

Author Sardar MG; Subramanian K
Title Kokum (*Garcinia indica*) cultivation in konkan areas of Maharashtra
Year 1992
Source title Promotion of non-wood forest produce through social forestry, Poona; India
Reference Poona India, 114-117 pp

Abstract

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Author Teo CKH
Title In vitro culture of the mangosteen seed
Year 1992
Source title Acta Horticulturae
Reference 292: 81-85. 2 ref.

Abstract

When intact mangosteen seeds (which are apomictic) were germinated under continuous light at 23 deg C in MS medium supplemented with various concentrations of BA and NAA, a shoot and a root were produced at opposite ends of the seed. When seeds were cut into halves or slices, portions either produced a shoot or a root suggesting the presence of an embryonic axis in the seed. When slices of seeds were cultured in the presence of BA at 5-10 p.p.m, multiple shoots were produced. NAA at 2.0 p.p.m. produced loose callus but normal shoot and root development.

Author Wiebel J; Chacko EK; Downton WJS
Title Mangosteen (*Garcinia mangostana* L.): A potential crop for tropical northern Aust
Year 1992
Source title Acta Horticulturae
Reference 132:

Abstract

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Author Wiebel J; Chacko EK; Downton WJS
Title Influence of applied plant growth regulators on bud dormancy and growth of man
Year 1992
Source title Scientia Horticulturae
Reference 52(1/2): 27

Abstract

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Author Wiebel J; Downton WJS; Chacko EK
Title Influence of applied growth regulators on bud dormancy and growth of mangostee
Year 1992
Source title Scientia Horticulturae
Reference 52(1-2): 27-35. 12 ref.

Abstract

The influence of GA₍₃₎, GA₍₄₎, GA₍₄₊₇₎, BA, NAA and GA₍₄₊₇₎ + BA on bud dormancy and growth of 1- to 3-year-old mangosteen seedlings (at the nursery stage) and 4-year-old orchard trees (growing at Berry Springs, NT) was examined. A range of concentrations was used in each case. All treatments with gibberellins were effective in overcoming bud dormancy, but only when application was made directly to the bud. GA₍₄₊₇₎ + BA gave the best results (100% bud break within a week) on both branched and unbranched seedlings. However, BA was effective only on seedlings which had not begun to branch (less than 1-year-old). NAA was ineffective. GA₍₄₊₇₎ + BA applied (at 1 micro g + 1 micro g/10 mg) in lanolin to buds on 4-year-old field-grown trees significantly increased the number of new growth flushes as well as leaf

Author Wieble J; Chacko EK; Downton WJS
Title Mangosteen (*Garcinia mangostana* L.) - a potential crop for tropical northern Aust
Year 1992
Source title Acta Horticulturae
Reference 321: 132-137. 17 ref.

Abstract

Mangosteen is still a minor commercial crop in N. Australia. It has a long juvenile phase, is difficult to propagate and has an unreliable cropping pattern. Research into enhancing seedling growth by using appropriate growing media, shade, CO₍₂₎ enrichment and the application of growth regulators is discussed. Physiological studies are aimed at understanding the low rate of carbon fixation by the leaves and subsequent distribution of photosynthates. The establishment of mangosteen orchards in Queensland and the Northern Territory is described.

Author Burikam I; Sarnthoy O; Charensom K
Title A probit analysis of the disinfestation of mangosteens by cold treatment against th
Year 1991
Source title The Kasetsart Journal: Natural Sciences
Reference 25(2): 251-255. 7 ref.

Abstract

As a quarantine measure in export fruit in Thailand, fruits of mangosteen (*Garcinia mangostana*) infested with 3rd-instar larvae of *Bactrocera dorsalis* were held at 5, 6 and 7 deg C for up to 20 days. Probit regression lines were fitted to the data for exposure time against insect mortality, and the exposure times for 99.9968% mortality were calculated to be 19.4, 24.9 and 24.9 days for treatment a t t h e 3 t e m p e r a t u r e s , r e s p .

Author Serudin H; Tinggal DSH
Title *Garcinia hombrioniana*: A potential fruit and an industrial crop
Year 1991
Source title New crops (Indianapolis)
Reference New York, 472-474 pp

Abstract

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Author Wiebel J; Chacko EK; Downton WJS
Title The mangosteen (*Garcinia mangostana* L.). A potential crop for tropical northern
Year 1991
Source title Fruits (Paris)
Reference 46(6): 685-688. 17 ref.

Abstract

Research carried out on mangosteens in Australia is reviewed. The slow growth of seedlings is a major problem in the establishment of plantations, but potting plants in a porous substrate increased growth and application of GA stimulated growth of dormant buds. Shade was necessary for satisfactory growth and the rate of photosynthesis could be increased by increasing the CO₂ concentration. Plantations at Darwin, Northern Australia and Cairns, Queensland showed that the present cultivation practices were not adequate for a commercially viable crop.

Author Wiebel J; Chacko EK; Downton WJS
Title Mangosteen (*Garcinia mangostana* L.): A potential crop for tropical northern Aust
Year 1991
Source title Frontier in Tropical Fruit Research, Pattaya City; Thailand
Reference Ishs, 132-137 pp

Abstract

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Author Downton WJS; Grant WJR; Chacko EK
Title Effect of elevated carbon dioxide on the photosynthesis and early growth of mang
Year 1990
Source title Scientia Horticulturae
Reference 44(3-4): 215-225. 20 ref.

Abstract

Mangosteen is a potentially important new crop for tropical northern Australia if its long establishment time can be substantially reduced. The effect of enriching the atmosphere with up to 1000 micro bar CO₂ on the growth and photosynthesis of mangosteen seedlings was examined over the course of a year in an attempt to accelerate early plant development. It was initially necessary to reduce photon irradiance from 450 to 200 micro mol photons m⁻² s⁻¹ (400-700 nm) to overcome photoinhibition of photosynthesis, and to reduce CO₂ concentration from 1000 to 800 micro bar to encourage greening of newly formed leaves. A major effect of CO₂ enrichment was to stimulate earlier lateral branching which accelerated the development of leaf area and plant carbon gain. Photosynthetic rates of mangosteen leaves were very low and the 800- micro bar CO₂ atmosphere increased CO₂ fixation by 40-60% compared with control leaves measured at 400 micro bar CO₂. As a result, total plant DW increased by 77%. The stimulatory effect of CO₂ was greatest on root and stem DW, which doubled. Although a smaller proportion of DW was partitioned into leaves compared with the control plants, CO₂ enrichment increased average leaf size by approximately 10%, specific leaf DW by 17% and total leaf area by 28%. By comparison, plants from the same apomictic seedling population grown under shadehouse conditions in Darwin, Australia, developed more slowly, consistent with descriptions in the literature. They were substantially smaller and lower in DW compared with the plants grown under controlled conditions, even in the absence of CO₂ enrichment, and had not developed lateral branches by harvest time. Reasons for this difference are suggested which may enable growers to accelerate the early growth of mangosteen plants under field nursery conditions.

Author Ito PJ; Hamilton RA
Title Fruits and nuts for the tropics with potential for improvement and increased impor
Year 1990
Source title Acta Horticulturae
Reference 269: 113-117. 4 ref.

Abstract

Ten fruit and nut crops with potential for increasing their share of the market are described. The species were considered mainly for their general acceptability as fresh fruits and/or processed products, and their adaptability and marketability. The list comprises: carambola (*Averrhoa carambola*), durian (*Durio zibethinus*), lansone (*Lansium domesticum*), mangosteen (*Garcinia mangostana*), peach palm (*Bactris gasipaes*), pili nut (*Canarium ovatum*), pulasan (*Nephelium mutabile*), rambutan (*Nephelium lappaceum*), sapodilla (*Manilkara zapota*) and soursop (*Annona muricata*).

Author Proctor FJ
Title The European Community market for tropical fruit and factors limiting growth
Year 1990
Source title Acta Horticulturae
Reference 269: 29-39. 9 ref.

Abstract

The EC market for tropical fruit has grown rapidly over the past five years. For the major fruit, namely pineapple, avocado, mango and pawpaw, growth has been over twofold, since 1983 to a total of 387 675 t (1987). The market share for each of the EC member countries differs, as do their specific demands for fruit type and quality. This reflects population, historical linkages with particular sources of supply, ethnic minority groups and their size and market structure. Whilst the greatest growth potential exists for these major tropical fruits, minor tropical fruits such as lychee, carambola, passion fruit, guava, mangosteen and physalis are attracting considerable interest at the retail and consumer levels. Key characteristics of 'new' tropical fruit are identified. Factors influencing the demand for tropical fruit include the growth of market share in retail distribution by multiples, consumer purchasing power, product promotion, consumer education and above all the increased availability of, and access to, well presented quality fruit. Tropical fruit industries are characterized as using developing countries as sources, and requiring a large number of countries of origin due to seasonality of availability, for example of mango. Aspects relating to factors limiting growth, in particular, investment risk against size and dynamics of the market, are considered. The need for vertical integration in the industry both in commercial market terms and from the postharvest management viewpoint is emphasized. The extent to which tropical fruit can be ripened at the market level and offered to the consumer ready-to-eat is limited by technical factors, including lack of knowledge, as well as constraints at the retail distribution level. The establishment of a strong research and development base is a key contributory factor influencing the success of a tropical fruit industry. Areas of priority should include genetic resource evaluation, extension of the season of production, reduction of production costs and the development of optimal postharvest processing.

Author Redhead J
Title Utilization of tropical foods: fruits and leaves
Year 1990
Source title FAO Food and Nutrition Paper
Reference 47: 7. 60 pp.

Abstract

Nutritional aspects, utilization and processing of various fruits and leaves are described. Fruits covered include avocado, mango, papaya, pineapple, custard apples, rose apples, starfruit, \

Author Richards AJ
Title Studies in Garcinia, dioecious tropical fruit trees: the origin of the mangosteen (G.
Year 1990
Source title Botanical Journal of the Linnean Society
Reference 103(4): 301-308. 18 ref.

Abstract

Mangosteen does not grow in the wild state. Plants are said to be invariable, and almost all are female. Mangosteen ($2n = ? 88-90$), an obligate agamosperm, has only two close relatives, *G. hombroniana* ($2n = 48$) and *G. malaccensis* ($2n = ?42$), which are facultative agamosperms. For the 13 main characters by which they differ, mangosteen takes an intermediate morphological position for five characters, and resembles each of the other species for four of the remainder. It is suggested that mangosteen is an allopolyploid derivative of these species which arose as a female from a single hybridization event in cultivation, and which has since reproduced asexually. To overcome difficulties in propagation and establishment that mangosteen presents, attempts should be made to graft and hybridize mangosteen with its presumptive parents.