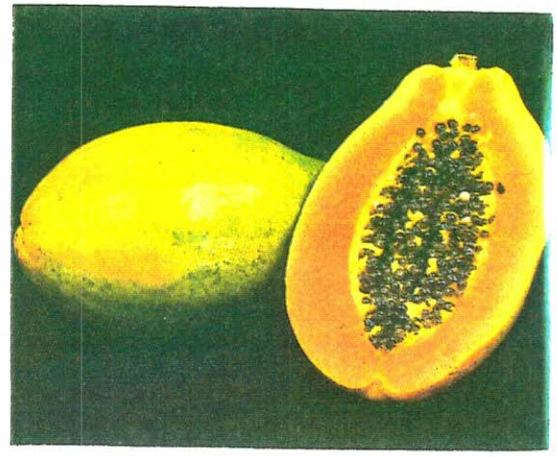
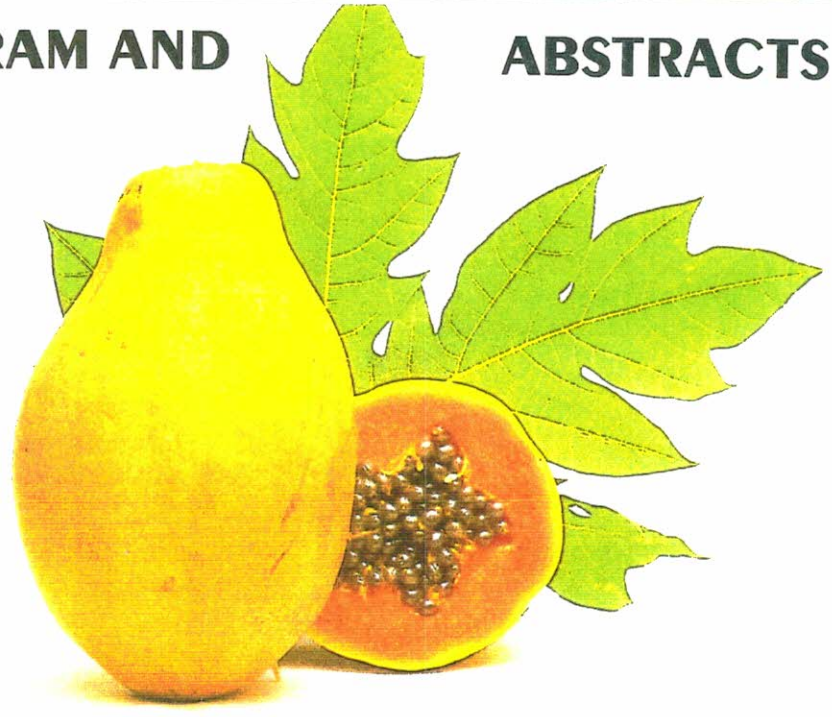
INTERNATIONAL SYMPOSIUM ON TROPICAL FRUITS

THEME: IMPROVING THE QUALITY OF TROPICAL FRUITS

NOVEMBER 07-12, 1993
VITÓRIA, ESPÍRITO SANTO STATE, BRAZIL



PROGRAM AND ABSTRACTS



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November 07-12, 1993
Vitória, Espírito Santo State, Brazil

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1. Tropical Fruits - Symposium. I. Empresa Capixaba de Pesquisa Agropecuária. II. Título. III. Série.

MENSAGEM DO GOVERNADOR

O Espírito Santo realiza o Simpósio Internacional sobre Frutas Tropicais agraciado pelo êxito dos experimentos já implantados em nosso território. A diversificação supera o anacronismo da monocultura, que, por décadas, atrelou o nosso Estado aos altos e baixos da produção e comercialização do café.

Avançamos numa nova frente e podemos constatar o contágio laborioso que se alastra na área rural, privilegiando o plantio de frutas tropicais. A vocação capixaba está plenamente inserida nesse novo rumo: otimizar o uso do solo e o aporte de recursos. O elenco de benefícios advindo dessa primeira fase consolida o vetor de investimentos e sinaliza a precisão da alternativa encontrada.

O Simpósio é o momento de agregação de resultados, análise dos embaraços e plenário de estoque de soluções criativas. O balanço da experiência, oportunizado pelo Simpósio, sem dúvida enriquece o patrimônio do produtor rural capixaba e subsidia a fixação de metas das agências governamentais.

Albuino Cunha de Azeredo
Governador do Estado do Espírito Santo

MENSAGEM DO SECRETÁRIO DE ESTADO DA AGRICULTURA

Nas economias onde predomina a iniciativa privada e a ação governamental procura intervir no setor de produção de maneira indireta, em especial nos setores requerentes de incentivos, pode-se observar um salto no curto prazo, indicando perspectivas alentadoras para os investidores engajados no processo em curso.

A perspectiva do Espírito Santo como produtor de frutas tropicais de qualidade encontra uma nova fase, respaldada na atenção que o Governo Estadual dedica à diversificação de culturas. A fruticultura tropical contempla o produtor rural com o imediato aumento da renda, exige o aprimoramento da capacidade técnica e gerencial de gerar novos plantios e sua comercialização, introduz a renovação tecnológica, enfim, compõe um leque de saldos benéficos que, paulatinamente, se incorpora a realidade localizada das unidades de produção.

A comercialização da nova cultura, sinalizadora do aumento da renda do produtor rural, conduz ao aprendizado do manejo da exportação, ofertando ao produtor capixaba a oportunidade de reter a chave das operações internacionais. Por tudo que instala de positivo no campo da produção agrícola do Espírito Santo, o Programa de Fruticultura Tropical é um sucesso que deve ser cultivado com carinho pela sociedade capixaba, um fruto gerador da fartura plantado para esta e para as próximas gerações.

Luiz Paulo Vellozo Lucas
Secretário de Estado da Agricultura

THE EMCAPA

The Capixaba Enterprise for Agricultural Research-EMCAPA was founded at 1973 by the government of the Espírito Santo State aiming the generation and adaptation of agricultural technologies for rural development. Through a constant improvment process, EMCAPA became abble to attend the demands of more and more exigent farmers and of all society.

Between the most significant results achieved by scientific research attemped by EMCAPA, the tropical crop fruit is outstanding.

The interest of EMCAPA on organizing the International Symposium on Tropical Fruits was based first on proportioning an interchanging of knowledgies between researchers of different countries aiming to improve quality and productivity of tropical fruits. Another reason was to show the results twenty year (1973-1993) of EMCAPA research on this area.

The board of directors wishes that this event provide solutions for increase of quality of life humain society wich leads the actions of researchers and research institutions.

Board of Directors

A EMCAPA

A Empresa Capixaba de Pesquisa Agropecuária-EMCAPA é uma empresa pública, de direito privado, criada em 1973 pelo Governo do Estado do Espírito Santo com a finalidade de gerar tecnologias destinadas ao aperfeiçoamento dos sistemas produtivos rurais e, conseqüentemente, à promoção do desenvolvimento do Estado. Através de um processo constante de evolução, ela vem-se capacitando para atender às demandas de uma sociedade cada vez mais exigente em qualidade e, hoje, dispõe de uma boa infra- estrutura física e de recursos humanos treinados que lhe coferem uma reconhecida participação nos constantes aumentos de produtividade do setor agrícola estadual, em especial na fruticultura que, nos últimos anos, tem gerado excedente exportáveis tanto para o mercado nacional quanto internacional.

Foram dois os principais motivos que levaram a Empresa Capixaba de Pesquisa Agropecuária a organizar este Simpósio Internacional de Fruticultura Tropical. Em primeiro lugar, pela oportunidade ímpar de proporcionar um amplo debate, envolvendo técnicos renomados de diversos países, sobre uma atividade - a FRUTICULTURA - cuja importância para a economia do Estado é crescente face à expansão que vem experimentando, com significativos incrementos na produção e na geração de novas divisas e empregos no setor agrícola capixaba. Em segundo lugar, com um evento desta envergadura, pretende-se registrar, de forma marcante, a passagem dos vinte anos de criação da EMCAPA, através do testemunho de seus pesquisadores acerca do amplo estoque de tecnologias geradas nessa área, nesse período.

Espera-se que a troca de conhecimentos proporcionada por este evento se traduza na melhoria de qualidade da pesquisa e dos processos produtivos e, por conseqüência, de produtividade e qualidade dos produtos ofertados à sociedade, que é, em última análise, a norteadora das ações dos pesquisadores e das instituições públicas de pesquisa.

A DIRETORIA

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WELCOME TO THE INTERNATIONAL SYMPOSIUM ON TROPICAL FRUITS

We would like to give our hearty welcome to all of you. We are very pleased, during the current severe economic situation, to have so many distinguished guests and participants. We believe this is strong evidence of the importance of this Symposium.

The year of 1993 is a very special year for the Symposium. It is part of the twenty years EMCAPA jubilee celebrations. Three years ago, at the Brazilian Congress of Fruit Crops in Petrolina, it was decided for the EMCAPA and Espírito Santo to host this International Symposium in Vitória-ES. Since then, we, the Organizing Committee, have made every effort for the Symposium to be a great success.

Quality is the theme of the Symposium. As the result ofintensive discussion, the Organizing Committee has prepared a program consisting of seven plenary lectures and three panel discussion. This program has three distinctive features: panel discussion on Papaya Ringspot Virus (PRV), Papaya Harvest and Postharvest, and Macadamia Nut Quality and Yield. Technical tours is other important activity of the event, with visits to different farms and fruit enterprises in the northern region of the Espírito Santo State. This Symposium will contribute to the progress not only of tropical fruits, but also of other related sciences, especially biotechnology.

As you may know, Vitória is an old city of Brazil, and is blessed with beautiful scenery and historical monuments. We are sure that you and your families will enjoy to stay in Vitória during the Symposium, and visit our beautiful and hospitable State.

We have pleasure in ackowleging the colleagues who have helped to organize the Symposium and our major sponsors. We also wish to thank companies and institutions, both local and overseas, that have shouwn their support by sending delegates.

Again, to the participants, gathered from all parts of the world, we bid a warm welcome to the International Symposium on Tropical Fruits.

José Antônio Gomes
President

José Aires Ventura
Vice-President

SCIENTIFIC PROGRAM

Monday, November 8 - Morning

08:00 - 08:45h	□ Palestra / *Plenary lecture*
	Perspectivas do Espírito Santo para a produção de frutas tropicais de qualidade / *Prospects for Espírito Santo State to produce commercial quality tropical fruits.*
	Dr. Flávio de Lima Alves - EMCAPA / Espírito Santo
08:45 - 09:15h	□ Debate / *Discussion*
09:15 - 09:30h	□ Intervalo / *Coffee break*
09:30 - 10:15h	□ Palestra / *Plenary lecture*
	Potencial do Brasil para exportar mamão e macadâmia / *Potentialities for Brazil to export papaya fruits and macadamia nuts.*
	Dr. Celso Monnerat de Araújo - SIMAB S.A. / Rio de Janeiro
10:15 - 10:45h	□ Debate / *Discussion*
10:45 - 11:00h	□ Intervalo / *Coffee break*
11:00 - 11:45h	□ Palestra / *Plenary lecture*
	Fruteiras exóticas do Brasil / *Exotic fruits native in Brazil.*
	Prof. Luiz Carlos Donadio - FCAV-UNESP / São Paulo
11:45 - 12:15h	□ Debate / *Discussion*
12:15 - 14:00h	□ Almoço / *Lunch*

Monday, November 8 - Afternoon

Painel / *Panel discussion*

Virose do mamoeiro / *Papaya ringspot virus (PRV)*

14:00 - 14:50h	□ Proteção do mamoeiro contra o PRV, através de 'capa protéica'/ *Coat protein-mediated protection to control papaya ringspot - virus in papaya.*
	Prof. Dennis Gonsalves - Cornell University/New York
14:50 - 15:30h	□ Alternativas para controle integrado do vírus do mosaico do mamoeiro / *Alternatives for integrated control of papaya ringspot virus .*
	Prof. Jorge Alberto M. Rezende - ESALQ / São Paulo
15:30 - 16:00h	□ Intervalo / Coffee break
16:00 - 16:50h	□ Melhoramento do mamoeiro para resistência ao PRV / *Papaya breeding for PRV resistance.*
	Richard Manshardt - University of Hawaii at Manoa/Hawaii
16:50 - 18:00h	□ Debate / *Discussion*

Tuesday, November 9 - Morning

08:00 - 08:45h □ **Palestra / *Plenary lecture***

Evolução da Pesquisa da fusariose do abacaxizeiro no Brasil / *Recent research progress on the control of pineapple fusariosis in Brazil.*

Dr. José Aires Ventura - EMCAPA/Espírito Santo

08:45 - 09:15h □ **Debate / *Discussion***

09:15 - 09:30h □ **Intervalo / *Coffee break***

09:30 - 10:15h □ **Palestra / *Plenary lecture***

Princípios ecológicos para o manejo integrado de pragas de fruteiras tropicais / *Ecological principles for tropical fruits. Integrated pest management.*

Prof.Santin Gravena - UNESP/São Paulo

10:15 - 10:45h □ **Debate / *Discussion***

10:45 - 11:00h □ **Intervalo / *Coffee break***

11:00 - 11:45h □ **Palestra / *Plenary lecture***

Sigatoka negra: potencial e estratégias de controle / *Black sigatoka: potential and control strategies.*

Dr. Zilton Maciel Cordeiro - EMBRAPA-CNPMF/Bahia

11:45 - 12:15h □ **Debate / *Discussion***

12:15 - 14:00h □ **Almoço / *Lunch***

Tuesday, November 9 - Afternoon

Painel / Panel discussion:

Colheita e pós-colheita do mamão / *Papaya harvest and postharvest.*

14:00 - 14:50h □ A colheita e a qualidade do mamão do grupo Solo / The harvest and quality of papaya *group Solo.*

Dr. Sérgio Lúcio David Marin - AVERROA-BATIA/Espírito Santo

14:50 - 15:30h □ Efeitos dos tratamentos do mamão com vapor e água quente na qualidade do fruto e incidência de doenças / *Effect of hot-air and hot-water treatments of papaya fruits on fruit quality and incidence of diseases.*

Dr.Wayne T.Nishijima - University of Hawaii at Manoa/Hawaii

15:30 - 16:00h □ **Intervalo / *Coffee break***

16:00 - 18:00h □ **Debate / *Discussion***

Wednesday, November 10 - *Durante Todo o Dia* / Full Day

Excursões Técnicas / *Technical Tours*

Tour A

Sistemas Agroflorestais da Reserva da Cia. Vale do Rio Doce, no município de Linhares, a 160 km de Vitória
Cia. Vale do Rio Doce Agroforest Reserve, Linhares, 160 km from Vitória.
Esta reserva constitui-se no maior remanescente de Mata Atlântica do Brasil em ecossistema de Tabuleiro, com uma área de 22.000 ha. No local, o visitante irá conhecer o maior centro de produção de mudas de espécies tropicais da América Latina e muitos exemplares da fauna silvestre da região. Também serão mostrados trabalhos de recuperação de áreas degradadas, com espécies tropicais, e de sistemas agroflorestais, envolvendo inclusive espécies frutícolas.

The Farming and Forestation Reserve operated by the Valley of the Rio Doce Company (CVRD) located 160 km (100 miles) north of Vitória in the municipality of Linhares.
This reserve, in the Tabuleiro geographical region, forms the largest remaining tropical forest ecological system along the Atlantic coast of Brazil and encompasses an area of 22,000 ha (54,362. acres).
At this location, the visitor can familiarize himself with the largest reproduction center for tropical species seedling in Latin America, and, in addition, can perceive many exotic sylvan faune existing in the region. Also, here one can see the results of the successfull efforts to recuperate the once eroded areas which were replanted under the Farming and Forestation Programs, included tropical plants species.

Tour B

Cultura da macadâmia da Vale Verde Agroindustrial (VAVERSA) no município de São Mateus a 220 km de Vitória .
No Estado do Espírito Santo estão sendo cultivados cerca de 1500 ha de macadâmia, com predomínio das variedades Kau 344 e Keaau 660. Deste total, somente a VAVERSA é responsável pelo plantio de 450 ha em ecossistema de Tabuleiro Litorâneo. Esta empresa possui aproximadamente 100 ha de macadâmia com seis anos de plantio, produzindo quase 150t de nozes. Além disso, em seu viveiro foram produzidas todas as mudas plantadas no Estado até o momento.

The privately-owned VAVERSA macadâmia nut farm located in the municipality of São Mateus, 220 km (167 miles) north Vitória.
In the State of Espírito Santo, there are some 1,500 ha (3,707 acres) devoted to the cultivation of macadamia nuts, predominantly two varieties, Kau 344 and Keaau 660.
Of this total, the VAVERSA Enterprise is responsible for the planting of 450 ha (1,104 acres) in the ecological system comprising the Tabuleiro geographical region. This enterprise possesses approximately 100 ha (247 acres) of macadamia trees planted some six years ago and which are now producing about 150 metric tons (165 short tons) of nuts annually. Not only that, its plant nursery grew all the macadamia seedling planted in the entire State up to this moment.

Tour C

Produtores e casa de embalagem de mamão para exportação no município de Linhares a 170 km de Vitória.
O município de Linhares está localizado na região do Estado do Espírito Santo, onde são cultivados cerca de 4.350 ha de mamão, sendo 90% do grupo 'Solo'. Nesta região, o mamão é cultivado com sucesso há mais de quinze anos, sendo que, no momento, responde pela produção de grande parte do mamão exportado pelo Brasil e de toda semente e frutos exportados pelo Espírito Santo. Também estão instaladas na região cinco casas de embalagem para tratamento, dos frutos, pós-colheita.

Private papaya growers and papaya packing for export, Linhares, 170 km (106 miles) from Vitória.
The municipality of Linhares is located in the northern region of the State of Espírito Santo, where some 4,350 ha (10,749 acres) of papaya trees are under cultivation, 90 per cent is cultivated with papaya Solo group. In this region, the papaya has been cultivated with great success for more than fifteen (15) years and at the moment, the greatest part of the papaya seeds and fruit harvest are grown and exported by the State of Espírito Santo. Also in this region, five (5) packing houses, including postharvest fruit treatment facilities, have been installed for export packing of the papaya.

Toda as excursões técnicas estão com vagas limitadas.

All of the technical tours have a limited number of available accommodations.

Thursday, November 11 - Morning

Painel / *Panel discussion*:

Produção e qualidade da macadâmia / *Macadamia nut quality and yield*

08:00 - 08:40h	□ **Cultivares de macadâmia e qualidade da noz/ *Relationship of hawaiian macadamia cultivars and kernel quality.***
	Dr. Philip J. Ito - University of Hawaii at Manoa/Hawaii
08:40 - 09:20h	□ **Práticas culturais e a qualidade da noz / *Effects of cultural practices on macadamia nut quality.***
	Dr. Tim Trochoulias - Agprobe/Austrália
09:20 - 09:40h	□ **Intervalo / *Coffee break***
09:40 - 10:20h	□ **Como manter a qualidade no processamento e embalagem da macadâmia/*Problem: how to maitain quality in the* *Processing and packing of macadamia.***
	Dr. John McIntyre - McIntyre Precision Machinery/Austrália
10:20 - 10:40h	□ **Debate / *Discussion***
10:40 - 11:00h	□ **Intervalo / *Coffe break***
11:00 - 12:00h	□ **Debate / *Discussion***
12:00 - 14:00h	□ **Almoço / *Lunch***

Thursday, November 11 - Afternoon

14:00 - 18:00h

Sessão de poster / *Poster session*

1. **Poster session will be held from the afternoon (14:00h) of November 8, to midday (12:30h) of November 12, except November 10, when all scientific programs are recessed for the one-day excursions.**
2. **Presenters should put up their own posters on panels in the Flamingo-room during the morning of November 8. Each panel will be designated by an index number which is marked on each abstract or author's name in the index.**
3. **Tapes, pins and other materials for mounting posters will be provided at a desk located at the Flamingo-room.**
4. **Authors are obliged to present their own posters in front of their panels at the scheduled time, from 14:00 to 18:00h, Thursday, November 11.**
5. **All posters should be taken down in the afternoon of November 12, from 12:30h to 14:00h.**

Friday, November 12 - Morning

08:00 - 08:40h □ Palestra/ *Plenary lecture:*

Potencialidade da biotecnologia no melhoramento de fruteiras tropicais/ *Biotechnological techniques for the improvement of tropical fruits.*

Dr. Laércio Zambolim - Universidade Federal de Viçosa/MG.

08:40 09:15h □ Debate/ *Discussion*

09:15 - 09:30h □ Intervalo/ *Coffee break*

09:30 - 10:45h □ SALA A:

Grupo de discussão sobre o potencial do Brasil para produzir frutas tropicais/ *Discussion group about potentialities for Brazil to produce commercial quality tropical fruits.*

09:30 - 10:45h □ SALA B:

Grupo de discussão sobre fisiologia e nutrição de fruteiras tropicais/ *Discussion group about tropical fruit crops physiology and nutrition.*

10:45 - 11:00h □ Intervalo/ *Coffee break*

11:00 - 12:15h □ SALA A:

Grupo de discussão sobre melhoramento genético de fruteiras tropicais/ *Discussion group about tropical fruit crops breeding.*

11:00 - 12:15 □ SALA B:

Grupo de discussão sobre propagação de fruteiras tropicais/ *Discussion group about tropical fruit crops propagation.*

12:15 - 14:00h □ Almoço/*Lunch*

Friday, November 12 - Afternoon

14:00 - 16:00h Grupo de discussão sobre cultivo de fruteiras tropicais em sistemas agroecológicos/ *Discussion group about tropical fruit crops in agroecological systems.*

CONTENTS

BIOTECHNOLOGY AND TISSUE CULTURE

001

COAT PROTEIN-MEDIATED PROTECTION TO CONTROL PAPAYA RINGSPOT VIRUS IN PAPAYA.

D. GONSALVES[1]; M. FITCH[4]; P. TENNANT[1]; S. LIUS[3]; C. GONSALVES[1]; R. MANSHARDT[3]; J. SANFORD[2] & J. L. SLIGHTOM[5]

[1]Dept. of Plant Pathology and [2]Dept. of Horticulture, Cornell University, Geneva, NY 14456; [3]Dept. of Horticulture, University of Hawaii, Honolulu, HI 96822; [4]Hawaiian Sugar Planters Association, Aiea, HI 96701; and [5]The Upjohn Company, Kalamazoo, MI 49007

Papaya ringspot virus (PRV) causes economic losses to papaya production worldwide. Efforts to control the disease by development of resistant varieties, management practices, and cross protection have had limited success. Currently, tolerant varieties are available but their generally poor fruit quality and the loss of tolerance if these varieties are backcrossed to susceptible germplasm limit their usefulness. Management practices can contribute to economic production where the disease pressure is low or if new areas are available to expand the papaya plantations. Unfortunately, these conditions are usually not available in many papaya growing regions. Cross protection, which is the use of a mild strain to control damage by the severe strain, has been used in Hawaii to control PRV in certain areas of the state. However, this mild strain, which was derived from a severe Hawaiin PRV strain, has limited usefulness because it gives protection against a narrow range of severe strains. For example, while the mild Hawaiian strain provides moderate protection in Taiwan, it is not effective in Thailand. since 1986, reports have shown that transgenic plants with the coat protein gene of a virus do show resistance against the virus and closely related strains. this phenomenon is Known as coat protein-mediated protection. We recently developed transgenic "Solo" papaya expressing the coat protein of the Hawaiian strain of PRV and showed that a transgenic line was highly resistant to the severe Hawaiian strain. A continuing field trial in Hawaii is showing similar results under field conditions. However, like cross protection, we have found that these transgenic plants provide resistance to only a narrow range of PRV strains. For example, the resistance is overcome by strains from Brazil, Ecuador, and Thailand. Thus, the next challenge is to develop transgenic papaya that have a broader range of resistance. One obvious way is to transform papaya with coat protein genes of PRV strains from various parts of the world. Futhermore, how can this technology or transgenic germplasm be transferred to countries that need it? Possible approaches will be discussed.

002

BIOTECHNOLOGICAL TECHNIQUES FOR THE IMPROVEMENT OF TROPICAL FRUITS

L. ZAMBOLIM[1] AND J. A. VENTURA[2].

[1]Departamento de Fitopatologia da UFV, CEP. 36570-000, Viçosa-MG and [2]EMCAPA, C.P. 391, Vitória-ES, 29010-901, Brasil.

There are many ways in which we can make the best use of biotechnology research in appropriate fashion specially with tropical fruit crops, to solve problems related to quality, diseases and insects that can great affect crop productivity.

Papaya ringspot virus (PRV) is present in all papaya growing areas of the world, and commercial cultivars are highly susceptible to PRV. Moderate genetic resistance has been found in papaya germplasm in wild **Carica** species. A new disease of papaya called "meleira" believed to be caused by virus affecting directly yield and fruit quality is now present in some papaya growing areas in Brazil.

Pineapple fusariosis (**F. subglutinans** f. sp. **ananas**) can cause yield loss of about 30-40% if integrated control measures area not followed.

Mealybug wilt of pineapple associated with a virus is one of the biggest concern in some pineapple growing areas of the world.

Bananas also are susceptible to several important diseases such as Panama disease, black and yellow Sigatoka, bacterial wilt and banana bunchy top virus.

Another concern is fruit flies which is responsable for great yield loss on guava, mango, citrus, passionfruit, papaya, etc.
The best approach to work out these problems is through plant breeding, once the tropical areas of the world have most of the genes needed. The new biotechnological techniques can be a usefull tool for the breeding programs because it could decrease the time of the genetic improvement. Besides that most of the important tropical fruit plants can be cultivated **"in vitro"**. Although plant biotechnology can be used in tropical fruit crops, very few biotechnological research programs have been dealing with them. The main biotechnological techniques with great potential for the tropical fruit crops to improve quality should envolve: (1) **"in vitro"** micrografting; (2) cell and tissue culture; (3) somaclonal variations; (4) protoplast extration and fusion; (5) Genetically engineered plants; (6) Restriction Fragment Lenght Polymorphism (RFLP) and Random Amplified Polymorphic DNA (RAPD), for the analysis of the plant genomes and isolates of the pathogens.

003

BIOTECHNOLOGY OF MUSA (BANANA, PLANTAIN, COOKING BANANA)

F. J. NOVAK†; N. ROUX; R. AFTZA; R. MORPURGO; H. BRUNNER; M. VAN DUREN.

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Edible **Musa** species are sterile and mostly parthenocarpic polyploids with an extremely difficult reproductive system which has made breeding slow and tedious. the current breeding method using crossing of sterile triploids with semi-wild diploids has resulted in a few acceptable clones with limited export value. Production of bananas and plantains is under serious threat by several diseases caused by pathogenic fungi (**Mycosphaerella, Fusarium**), bacteria (**Pseudomonas**) viruses (esp. banana bunchy top virus, BBTV) and nematodes. Thus, more support for breeding is required to foster the development and production of resistant cultivars for sustaining the yield potential. The new breeding strategy for disease resistance could include the implementation of various biotechnological approaches.
The salient points of our research activities in major areas of **Musa** biotechnology are: (1) development of **in vitro** mutation system in shoot-tip culture; (2) field testing of a mutant clone with superior performance over the original Cavendish type "Grand Naine"; (3) somatic embryogenesis of **Musa**; (4) the study of somaclonal variation for the genetic improvement of banana; (5) polyploidy induction; (6) selection techniques and **in vitro** screening for fungal disease resistance breeding of **Musa**, and (7) oligonucleotide and DNA amplification fingerprinting for the analysis of genomes of different **Musa** clones and isolates of **Fusarium**.
Future opportunities for the utilization culture and molecular biology techniques in **Musa** improvement are discussed as well as the transfer of these technologies to developing Member States.

†The late

004

IDENTIFICATION OF CASHEW (*Anacardium occidentale* L.) SEEDLINGS WITH RAPD MARKERS

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An evaluation was made of the use of "random amplified polymorphic DNA" (RAPD) as a genetic marker system in cashew (**Anacardium occidentale** L.). DNA was extracted from young leaves of seedlings of 4 cashew clones (CPO6, CPO9, CP76 and CP1001). Polymerase Chain Reaction (PCR) was carried out in an ASTEC PC 700 thermal cycler, programmed for 60 cycles of 1 minute at 94 C, 1 minute at 36 C and 2 minutes at 72 C. After the last cycle, samples were kept at 72 C for 5 minutes and then coolet to 4 C.

Samples were analysed by electrophoresis on a 1.5% agarose gel and amplified products were detected by staining whit ethidium bromide. RAPD markers generated by 6 arbitrary 10-mer primers (OPA-2, OPA-4, OPA-8, OPA-16, OPB-6 and OPB-10) were evaluated. Although the large number of polymorphisms obtained with the six 10-mer primers we tested, only the markers generated by OPB-6 were sufficient to separate the cashew seedlings included in the present study. Thus, the ability of this technique to detect extensive polymorphisms, simplicity and rapidity make feasible the use of RAPD technique as a new and efficient tool for germplasm analysis and characterization in cashew.

005

EFFECT OF CYTOKININS ON THE *In Vitro* ESTABLISHMENT IN CASHEW (*Anacardium occidentale* L.)

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The effects of the cytokinins 6-benzilaminopurine (BAP), kinetin (KIN), 6-dimethylallylaminopurine (2iP), zeatin and 4-PU were tested on the **in vitro** culture of axillary buds in cashew (**Anacardium occidentale** L.) Young shoots (5-7 cm) from seedlings of cashew clone "CPO9" grown in greenhouse for 60 days were surface sterilized with EtOH 70% for 2 minutes and NaOCl 2% for 15 minutes. Axyllary buds (3-5 mm) were extracted into a solution of ascorbic acid 100 mg/l. Explants were established on Woody Plant Medium (WPM), suplemented with sucrose 3%, naphthaleneacetic acid 0.5 mg/l, agar 0.7%, pH 5.7, and 15 different concentrations of cytokinins: BAP (0.1, 1.0 and 5.0 mg/l), KIN (0.1, 1.0 and 5.0 mg/l), 2iP (0.1, 1.0 and 10.0 mg/l), zeatin (0.01, 0.1 and 1.0 mg/l), 4-PU (0.01, 0.1 and 1.0 mg/l) and a blank treatment without cytokinin, with 30 replications. After 25 days in culture, it was verifyed that 2iP 0.1 mg/l was the treatment which promoted the best survival rate in this fase, while KIN and 4-PU increased the oxidation rate. Then, explants were tested for 2 subcultures on same concentrations of 2iP and BAP, and it was observed that BAP 1.0 mg/l was the most effective treatment in promoting the development of buds to shoots. Moreover this concentration of BAP promoted multiple shoots in some replications.

006

MICROPROPAGATION OF 'CRAVO' AND 'TRIFOLIATA' *CITRUS* ROOTSTOCKS IN MS MEDIUM WITH DIFFERENT CONCENTRATIONS OF SUCROSE AND SALTS.

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The objective of this work was to study the sprouting rate of nodal segments on **Citrus** rootstocks of 'Trifoliata' and 'Cravo'. It was used MS (Murashigee and Skoog) medium with five salt concentrations (0; 25; 50; 75 and 100%) and six sucrose concentrations (0; 1.5; 3.0; 4.5; 6.0 and 7.5%) of original MS concentration. The explants were incubated at 25°C with 3000 lux and the experiments were arranged in a completely randomized design with four replications, in a factorial 5 x 6. The 'Trifoliata' produced the highest number of sprouts on the 1.5% sucrose and 100% of the salts of MS. The best sprouting of 'Cravo' was in the 100% and 3.0% of the salt and sucrose respectively. It was observed that in the medium without sucrose both genotypes produced buds. When no salt was present in the medium no sprouts were produced by rootstocks.

007

IN VITRO GROWTH OF ENCAPSULATED SHOOT TIPS IN BANANA (*Musa* sp).

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In order to establish a large-scale and low cost propagation method of banana (Musa sp), the synthetic-seed construction was attempted using in vitro propagated multiple shoots. The synthetic seeds, i.e. encapsulated propagules by calcium alginate gel, were constructed by immersing the shoot tips into 3% sodium alginate solution and dropping then into 68 mM calcium chloride solution. nutrient components and plant growth regulators were added to the synthetic seeds during the encapsulation and the seeds were transplanted on liquid media for germination.
When the capsules contained a medium with 6% or higher concentrations of sucrose, synthetic seeds grew on the germination medium without sucrose. However, when the capsules had the medium with only 4% or lower concentrations, the sucrose in germination medium was indispensable to make the synthetic seeds grow. After one month of conservation (25°C, dark), all synthetic seeds developed shoots, when both the encapsulation medium and the germination medium were supplemented with 2% sucrose. Although further studies are needed, these results indicate the possibility of synthetic seed construction in banana.

008

CLONAL PROPAGATION OF MATURE GUAVA TREES THROUGH *IN VITRO* TECHNIQUE

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Shoot - tip and nodal explants from mature seedy guava trees were efficiency sterilized by using 0.1% mercuric chloride ($HgCl_2$) for 1 and 2 min. respectively, followed by sodium hypochlorite (NaOCl) at 0.5% for 30 min. Nodal explants gave multiple shoots on Musashige and Skoog (MS) basal medium containing various combinations and concentrations of indole butyric acid (IBA) and benzyl amino purine (BAP). The highest number of shoots per explants was obtained on medium supplemented with 1 mg/l BAP onaly. The high rooting efficiency (81%) was achieved on half - strength MS medium supplied with 1 g/l activated charcoal and 0.5 mg/l IBA. Plantlets were successfully established in Soil.

009

INFLUENCE OF NAA ON ROOTING OF TAHITI LIME (*Citrus latifolia* TAN.) CUTTINGS.

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The present research was carried out at Universidade Estadual do Sudoeste da Bahia, Vitória da Conquista, Bahia, Brazil, from March to June, 1993, in order to verify the effects of different concentrations of NAA on Tahiti lime (**Citrus latifolia** Tan.) cuttings rooting production. Cuttings were obtained from three- year old plants, whose lengths were 20 cm. They were treated with NAA 0, 100, 200 and 400 ppm solution for 24 hours, and planted in a sandy bed covered with transparent plastic. After 60 days, it was observed that rooting percentage were 64.0% (test.), 82.0% (100 ppm), 96.0% (200 ppm) and 98.0% (400 ppm). No differences ocurred among treatments with NAA. It was also verified that cuttings treated with NAA, promoted higher root volume compared to test.

010

CULTURE VESSELS AND KIND OF CAP ON SHOOT ELONGATION IN MICROPROPAGATION OF BANANA

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Single shoots (10-15 mm) of banana (**Musa paradisiaca**) cv.Grand Nain obtained from the fourth passage were excised and cultured onto fresh elongation medium formed by MS medium suplemented with 30 g/l sucrose, 0.25 mg/l naphthaleneacetic acid, 1.0 mg/l 6- benzilaminopurine, gellum-gum 0.2% and pH 5.8, using two types of glass vessels (200 ml and 300 ml) of volume. The vessels of culture were closed by hermetic metal cap or by transparent polyvinyl chloride (PVC) film, resulting in 4 tratments with 30 replications. The explants were cultured at 25 (±2°C) under 16 hours of ligth (2000 lux) provided by cool-white flourescent tubes, and 25 days after transference the evaluation was made. No significant difference was detected among shoots cultured in different vessels. However, shoots cultured in vessels closed by transparent PVC film were superior to those closed by hermethic metal cap in relation to elongation rate, number of roots and color of leaves. Moreover, in case of vessels closed by hermethic cap, leaves appeared to be hyperhydric, and often new buds grew from shoot base.

011

In vitro STUDIES IN *Grewia subnaequalis* D. C.

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Cell and tissue culture followed by subsequent plantlet regeneration pave the pathway for the application of genetic engineering technology for crop improvement. With the foresaid view, the callus culture studies were undertaken for **Grewia sp**. Of the various explants taken from mature plant, petals were most responsive in inducing callus. Profuce callussing was obtained after 7 days on MS medium suplemented with 2, 4-D, 2 mg l^{-1} + BAP 0.5 mg l^{-1}. On exposure to ligth (3000 lux) the callus turned green but when cultured in dark, it turned brown. Plantlet like structures could be obtained after 6-8 weeks when the callus were transferred on the regeneration medium supplemented with BAP 2.0 mg l^{-1} + IAA 0.5 mg l^{-1} under 16 hour photoperiod.

BREEDING AND SELETION

012

PAPAYA BREEDING FOR PRV RESISTENCE

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species, and interspecific hybrids have been obtained through embryo rescue in Venezuela, India, the USA, and Taiwan. In Hawaii, several F1 interspecific hybrids were vigorous and showed good field resistance to PRV. However, the F1's were quite sterile, and backcrossing has produced only infertile sesquidiploids (2 copies of the **C. papaya** genome and 1 genome of the wild species) from unreduced megaspores. Cross-protection, the deliberate systemic infection of a crop with a mild virus strain to prevent subsequent infection by more damaging virulent strains, has been economically successful in Hawaii, where the local PRV strain is closely related to the mild protective strain, but this approach has been less useful elsewhere. In the USA, genetically engineered papaya plants have exhibited coat protein-mediated PRV resistance, ranging in different clones from a sligth delay in the onset of symptoms to apparent immunity. Resistant plants transmit the resistance gene to their progenies as a simple Medelian factor, demonstrating stable chromosomal incorporation of the gene construct. In a field trial in Hawaii, one R_0 transgenic clone has remained free of PRV symptoms and ELISA negative for one year following manual or aphid-vectored inoculation with the virus.

013

QUALITY OF MACADAMIA CULTIVARS AND SELECTIONS IN SUBTROPICAL NATAL

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Hawaiian cultivars of **Macadamia intergrifolia** have become the most important, commercially, in all macadamia producing countries. However, due to the greater diurnal and seasonal variations in temperature in subtropical areas, the quality and production of the Hawaiian cultivars has not been as good in these areas compared with tropical Hawaai. In Natal, South Africa, it is mainly in the warm (2 800° day heat units > 12.8°C) humid coastal area near Richards Bay, that the Hawaiian cultivars produce nuts approaching the high Hawaiian standards of quality. For the original Hawaiian cultivars, the cooler the area (down to 1 600 heat units), the lower the % n° 1 kernels as well as kernel %, and nuts tend to be smaller. However some of the recent Hawaiian releases and some hybrid cultivars appear to be adapted to a wider range of climatic conditions. Various selections of **M. tetraphylla** from Natal, selected according to Hawaiian criteria, have been grown at Pietermar itzburg (2 100 heat units), but their quality has been lower in this cooler area, although a few still show promise. Seedlings of **M. intergrifolia** cultivars 'Keauhou', from Hawaii, and 'Faulkner', from California, have been grown at Pietermaritzburg. Several promising preliminary selections have been made which are producing nuts with quality approaching that of the high Hawaiian standards, e. g. on average 42% kernel, 98% N° 1 kernel and kernel mass of 2.3 g, which is outstanding for the cooler Pietermaritzburg conditions.

014

RELATIONSHIP OF HAWAIIAN MACADAMIA CULTIVARS AND KERNEL QUALITY

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Quality of hawaiian Macadamia cultivars grown in various parts of the world depends on the cultivar and environment. Since they have been selected for specific locations in Hawaii, they cannot be expected to perform as well in other areas of the world where environmental conditions are different. Cultivars from good locations produce over 35 percent of recoverable No. 1 kernels while poor locations have less than 25 percent. However, most locations produce commercially acceptable kernel size of 2-3 grams.

015

COMPORTAMENTO DA PITANGUEIRA, *Eugenia uniflora* L. PERNAMBUCO. I - PLANTAS JUVENIS.

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Durante quatro anos se estudou o comportamento de 122 seedlings de pitangueira em solo Podzólico Vermelho Amarelo da Estação Experimental de Itambé- IPA, localizada na Mata - Seca de Pernambuco. A região apresenta uma precipitação pluvial média anual de 1000mm, distribuída de março a agosto, com uma temperatura média de 24°C e Umidade Relativa do ar de 80%. A altura das plantas variou de 1,2 a 2,9m com média de 1,9m. A produção média das plantas variou de 5,4 kg a 0,7g de frutos. Algumas matrizes vêm se mostrando muito produtivas no terceiro ano de colheita, como a IPA-1.1; IPA-2.2; IPA-3.1. e 3.2 e IPA- 6.3 com produções acima de 9 kg de frutos. As pitangueiras vêm apresentando 2 ou 3 ciclos de produção com pico da colheita nos meses de setembro e outubro. O percentual de polpa dos frutos nas 10 melhores matrizes tem variado de 65,3 a 83,1% e a relação Brix/Acidez de 3,3 a 6,8.

016

SELF-INCOMPATIBILITY IN PASSION FRUIT (*Passiflora edulis* Sims).

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Self-incompatibility was studied in plants of passion fruit, randomly selected and crossed. Two generation progenies were obtained. No fruit setting was obtained by self-pollination at anthesis. Bud-selfing resulted in 14,8% fruit set, indicating that self-fertilization is possible. Reciprocal diallel crosses made in two full sib cross progenies with one common parent, showed two self incompatible groups in one progeny (progeny 300) and three groups the other one (progeny 400). Progeny 414.414 - obtained by bud-selfing of a plant from progeny 400 - yielded to two groups. Three phenotypes, S_1, S_2 and S_3, were identified by intercrossing these seven self-incompatible groups. Five backcrosses were incompatible with the male and 12 with the female parents,supporting the sporophytic homomorphic incompatibility hypothesis. S_1 and S_2 plants obtained by selfing a S_2 plant showed S_2 allele dominance over S_1. S_3 plants derived by crossing S_2 x S_2 plants demonstrated the S_2 dominance over S_3. Dominance relationships between the tested alleles seem to be the same in the stigma and pollen. These results fit a S-single- locus hypothesis.

017

EVALUATION OF MANGO (*Mangifera indica* L.) PROGENIES OPEN POLLINATED

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The mango crop in Brazil, despite of it's vigor, present some serious problems, mainly related to it's varieties. The objective of this research was to select superior plants with purpose to obtain new brazilian varieties. The work was development in Jaboticabal, São Paulo State (Brazil) where was established 210 plants, propagated through the seeds open pollinated, of 11 varieties. Were evaluated 6 characteristics of plant, 5 of inflorescence through flower and 27 of fruit. The mango propagation through the seeds promoted a great genetic variability; in some fruit features, the progenies exceeded the female progenitor or the standard varieties. It was possible select 11 plants, with the majority of the main characteristics similar or superior to 'Tommy Atkins' and 'Haden 2H'.

018

IMPROVEMENT OF HYBRIDIZATION TECHNIQUES ON MANGO TREE (*Mangifera indica* L.) IN THE REGIONS OF BRAZILIAN CERRADOS

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An intervarietal hybridization study was started at EMBRAPA/CPAC in 1980 with the objective to obtain a dwarf cultivar with high yield and fruit quality. However, the techniques used nowadays are inefficient and expensive. A technique from Indian Agriculture Research Institute (IARI) which requires few flowers per panicle and many plant shown reduced success in the percentage of hybrid fruits (1.45%). The improvement of IARI's technique using the selection of flowers in the panicle, the anther opening, the control of humidity and also the fungus attack promoted an increase in the success of hybrid fruits for 8.2%. A new technique using top-working on dwarf genotypes and confining then in small cages with pollinator flies, may increase the efficiency and decrease the cost of this research.

019

BANANA GENETIC IMPROVEMENT PROGRAMME IN EXECUTION AT THE CNPMF/EMBRAPA - RESULTS OBTAINED

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The principal problems affecting the Brazilian banana crop include low productivity of the cultivars in use (less than 15 t/ha), their lack of drought tolerance, the tall stature of some of them and the presence of diseases and pests. Aiming at solutions, the National Centre for Research in Cassava and Tropical Fruit Crops (CMPMF) of the Brazilian Enterprise for Agricultural Research (EMBRAPA), in Cruz das Almas-BA, started in November 1982 a programme of genetic improvement for bananas. This paper treats of the main advances achieved during the development of the work, with mention of the present necessities for research and support of the programme, as well as of the priority targets for the biennium 1993/94. Within this general context there are presented information and results concerning the research projects

conducted by the CNPMF, withing the National Research Programme for tropical Fruit Crop Research (PNPFCT). They include two items belonging to the National Programme for Genetic Resources Research, responsability for which lies with the National Centre for Genetic Resources and Biotechnology (CENARGEN), besides a technical cooperation project entered into between EMBRAPA/Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)/International Network for the Improvement of Banana and Plantain (INIPAB).

020

COMPORTAMENTO DE VARIEDADES DE BANANEIRAS, NA REGIÃO DE SELVIRIA, M. S.

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Foi estudado o comportamento de dez variedades de bananeiras, em experimento instalado em 1991 em Selvíria, M. S. numa área cuja vegetação anterior era Cerrado. Para plantio, foram utilizados rizomas de aproximadamente 1.5 kg e as plantas, cultivadas com irrigação. Foram utilizadas as seguintes Variedades: Nanica, Nanicão, Prata, Lacatan, Maçã, Ouro, Gros-Michel, Figo, Marmelo e Pai Antonio. Em função dos resultados pode-se constatar que:

a) O tempo entre o plantio e a colheita do 1° cacho variou, sendo as mais precoces as bananeiras Ouro, Nanicão, Figo, Maçã e Prata;
b) O tempo entre o plantio e a colheita do 2° cacho variou, nas mais precoces as bananeiras Ouro, Nanicão e Prata;
c) O peso médio do 2° cacho, bem como das pencas, foram maiores que o do 1° cacho em todas as variedades, exceto para Nanica e Nanicão;
d) O diâmetro médio dos frutos do 2° cacho, foram menores que o do 1° cacho em todas as variedades, exceto para a Ouro;
e) As variedades estudadas apresentaram valores de peso do cacho, peso das pencas, número de pencas, número de frutos por penca e diâmetro dos frutos, semelhantes aos obtidos para as mesmas regiões de cultivo do estado de São Paulo, o que indica a possibilidade de cultivo nesta região.

021

RENDIMENTO DE CLONES DE TANGERINAS E TANGORES, ENXERTADOS SOBRE LIMÃO "CRAVO" *Citrus limonia* OSBECK, EM TRÊS REGIÕES ECOLÓGICAS DO ESPÍRITO SANTO

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Com o objetivo de viabilizar a expansão da cultura de tangerinas no Espírito Santo, avaliou-se o rendimento de diferentes clones de tangerinas: 'Ponkan' (2), 'Dancy' (2), 'Cravo' (2), **C. reticulata** Blanco, 'Satsuma' (2), **C. unshiu** Marcovich, 'Mexerica' (1), **C. deliciosa** Tenore; e 'Tangor Murcott' (2) [**C. sinenses** (L. Osbeck) x **C. reticulata** Blanco] enxertados sobre o porta-enxerto limão 'Cravo' **Citrus limonia** Osbeck. Os experimentos foram instalados em três distintas regiões ecológicas do Estado, no espaçamento 7 x 6m, em 1981. Foi utilizado o delineamento blocos ao acaso com seis repetições e três plantas/parcela. Em Santa Maria de Jetibá, clima Cfb, solo Latossolo Vermelho Amarelo, a 750m de altitude, o clone mais produtivo foi 'Mexerica' precoce EMCAPA 7051 (26.51 t/ha), seguido por 'Dancy' EMCAPA 7012 (14.51 t/ha), 'Murcott' EMCAPA 7045 (13.99 t/ha) e 'Ponkan' EMCAPA 7041 (13.67 t/ha). Em Viana, clima Am, solo Latossolo Vermelho Amarelo, a 20m de altitude, o clone mais produtivo foi 'Dancy' EMCAPA 7012 (17.56 t/ha), seguido por 'Satsuma' EMCAPA 7014 (16.92 t/ha), 'Ponkan' EMCAPA 7041 (15.68 t/ha), 'Ponkan' EMCAPA 7011 (14.06 t/ha) e 'Mexerica' Precoce EMCAPA 7051 (13.89 t/ha). Em Linhares, clima Aw, solo Latossolo

Vermelho Amarelo, e 28m de altitude, o clone mais produtivo foi 'Mexerica' precoce EMCAPA 7051 (12.04 t/ha).

022

PRODUCTION OF FOUR CULTIVARS AND TWO SELECTIONS OF GUAVA (*Psidium guajava* L.) IN PORTO LUCENA, RS, HARVEST 1991 AND 1992

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This research aimed to evaluated the production of four cultivars and two selections of guava on fourth and fifth years of production, in Porto Lucena, RS. Cultivars Riverside Vermelha, Pirassununga Vermelha, IAC-4 and Brune Vermelha and selections RBS-1 and RBS-2 were evaluated. Guavas showed only on date of harvesting in the years, between January and March. The production of Pirassununga Vermelha, Riverside Vermelha, IAC-4 and Brune Vermelha, concentred February and RBS-1 and RBS-2 in March. Pirassununga Vermelha, Brune Vermelha and IAC-4 cultivars showed more productive for number of fruits in the two years. The fruit weight per plant and per hectare increased from the fourth to the fifth year for all cultivars and selections, except for RBS-2 selection, which that maintaineted stable; the number of fruits per plant and per hectare increased only for Pirassununga Vermelha and IAC-4 cultivars.

023

YIELD AND DROUGHT RESISTANCE OF THE 'PERA', ORANGE ON TEN ROOTSTOCKS, IN THE STATE OF SERGIPE, BRAZIL

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More than 90 percent of the 160 million trees estimated to exist in the brazilian citrus area, are grafted on rangpur lime **Citrus limonia**, Osb. This high utilization is related to the fact that rangpur lime has among other advantages, a high drougth tolerance which is a remarkable factor considered by citrus growers in Brazil. Sergipe State, in Northeast Brazil has the second largest citrus area in the country with 45,000 hectares where the rangpur lime and Florida's rough lemon **C. jambhiri**, Lush. are the main rootstocks with 55% and 45% preference, respectively. A completely randomized block design experiment, with five replications, was started in 1976. The aim of this study was to study the best Pera sweet orange scion/rootstock combination at local conditions. Each plot had 3 trees and the spacing was 7 x 7m. The following rootstocks were grafted on the Pera D_6 clone (95% of all plantings): red rough lemon; Sunki x Swingle trifoliate; Swingle citrumelo; Cleopatra x Swingle trifoliate; Schaub lemon; Sunki x English trifoliate; Rangpur lime; Trifoliate orange; Kharna lemon and Volkamer lemon. The data taken from 1979 to 1986 permited the following conclusions: For the fruit yield, the best ones were Schaub lemon and Red rough lemon (Averages: 31 tons/yr and 30 tons/yr respectively). The standard rangpur lime reached only about 18 tons a year. In 1983 there was a strong rainfall shortage, causing severe harvest reduction all over the citrus area and in the experiment. The Red rough lemon presented the best behavior showing the smallest fruit losses.

024

PHENOTIPIC VARIABILITY OF SOME CHARACTERES IN PAPAYA (*Carica papaya* L.)

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With the objective of evaluating the available germplasm for a papaya breeding program, ten horticultural characteres of sixteen accessions cultivated in Tietê, SP were studied. Variability, repeatability and correlation studies were carried out. The variance analysis showed great differences among genotypes, specially in fruit weight, fruit volume, cavity volume, seed number and seed weight. These data show genetic variability among the accessions. Fruit lengt, fruit weight and fruit volume showed to be the characters less influenced by the environment, with repeatability indexes (R) of 0.96; 0.93 and 0.93, respectively. The most correlated characters were, fruit weigth with fruit volume (r= 0.9892) and cavity volume (r= 0.9257), and fruit volume with cavity volume (r= 0.9612). Total soluble solids showed low correlations indexes with the others characteres.

025

OBTENÇÃO DE HÍBRIDOS INTERVARIETAIS DE ABACAXI (*Ananas comosus* L.) VISANDO A RESISTÊNCIA À FUSARIOSE; AVALIAÇÃO FENOTÍPICA PRELIMINAR DE PROGÊNIES SEGREGANTES

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Os cultivares comerciais de abacaxi mais plantados (Pérola e Smooth Cayene) são altamente suscetíveis à fusariose. Existem, entretanto, diversas introduções e/ou variedades locais com níveis variáveis de resistência. Assim, é altamente prioritária a seleção de novos genótipos, com características agronômicas e de qualidade de produto desejáveis e resistentes ao fungo causador da doença. Realizaram-se diversos cruzamentos envolvendo materiais resistentes e suscetíveis, sendo analisados 11 progênies originárias de cruzamentos dirigidos e 5 de cruzamentos ao acaso. Foram avaliadas as características espinhosidade e coloração de folha. Utilizou-se a germinação asséptica **in vitro** com o objetivo de aumento de freqüência de plântulas obtidas. A avaliação dos caracteres acima foi realizada 90 dias após o transplante das plântulas obtidas **in vitro** para laminados plásticos. A preferência atual dos produtores de abacaxi é para cultivares sem espinhos nas folhas. Nas progênies segregantes observou-se elevada variabilidade para o caráter, a ausência de espinhos oscilando desde 92.9% (Roxo de Tefé x Manahuara Inerme) até 0.0% (Roxo de Tefé x Pérola; Turi Verde x Roxo de Tefé), com alguns casos intermediários - 47.3% e 60.3% (Guiana x Perolera e Roxo de Tefé x Perolera, respectivamente). Para o caráter coloração constatou-se, também, ampla variabilidade dentro das progênies, com presença de plantas com folhas verdes, roxas e os diversos matizes entre elas. Estão atualmente em andamento os testes de resistência à fusariose, com inoculação artificial do patógeno.

ENTOMOLOGY

026

ECOLOGICAL PRINCIPLES FOR TROPICAL FRUITS INTEGRATED PEST MANAGEMENT

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The tropical fruits, with few exceptions, are still exploited in little extension in Brazil. In these conditions, the attack of arthropod pests is incipient, do not requiring great interventions of man to their control. For the same reason the application of the IPM-Integrated Pest Management general principles, is greatly facilitated, due to the fact that, such fruit ecosystems are not too much disrupted in their ecological estability, up to the point that economical loss does not occur. The use of insecticide in tropical fruits may cause undesirable side effects upon beneficial insects and mites in general, and on pollinators wasps and nitidulids which occur in passiflora and annonaces, respectively. Three ecological principles can be applied in commercial tropical fruits:(1) the use of the principle that the plants may tolerate the attack of pests up to a certain level of infestation allowing the establishment of pragmactic action levels for control;(2) the consideration of the presence of native natural enemies:(3) the environmental manipulation for pest control based on the conservation of green cover between the rows for natural enemies breeding through alternative food like preys, hosts, pollen and nectar, beside the providing an extra habitat for them. Also according to the philosophy of IPM it is possible to determine the key pests, natural enemies and tactics in each fruit crop, as a first step for the adoption of IPM by the growers. Meanwhile, the research about the IPM systems should be planned and made either at the level of public institutions or private companies of tropical fruit production.

027

EFFECTS OF INSECTICIDAL ATMOSPHERES ON THE MORTALITY OF FRUIT FLIES IN MANGO.

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Mango fruits (var. Kent and Haden) were infested with the fruit fly (**Anastrefa serpentina**) for 3 days and were then stored in a modified atmosphere (MA) with very low O_2concentration and very high CO_2 concentration for 1 to 5 days at 25°C. The initial MA concentrations were 0.25, 0.5 and 2.0% O_2combined with 50 and 70% CO_2. The AM was applied in 4L glass jars in which a flow of 250 ml/min of gas was passed for one hour, afterwhich the jars were sealed. After storage in MA fruits were kept in air for 10 days before larvas were counted. It has been found that in fruits infected with eggs a 100% mortality was achieved in 3 days. A 100% mortality was achieved in 3 days with an atmosphere of 0.25% O_2 + 70% CO_2, 0.5% O_2 + 70% CO_2 or 0.25% O_2 + 50% CO_2, and in 4 days with an atmosphere of 2.0% O_2 + 50% CO_2 or 2.0% O_2 + 70% CO_2.

028

ENHANCED ACTIVITY OF *Beauveria bassiana* ASSOCIATED WITH MINERAL OIL AGAINST *Cosmopolites sordidus* ADULTS

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Interactions between **Beauveria bassiana** (Bals.) Vuill. and mineral oil were evaluated in **Cosmopolites sordidus** adults, in laboratory biossay. Four treatments were replicated five times with 100 adults per replicate, in a completely randomized design. The treatments were **B. bassiana** (strains CB-66; 5 x 10^6 spores/ml), 3% mineral oil (emulsifiable concentrate), **B. bassiana** + 3% mineral oil, and control. Insects were collected from banana plantation cultivar "Nanica" at Miracatu County, São Paulo State. Obervations for mortality were made at 4, 8, 12, 16 and 20 days after application, and insects were considered dead in they did not move when disturbed or they were prostrate and incapable of righting themselves. Also, the fungus development was examined in the dead insects. At 4 days, resulted no signicant reductions. Afterwards the combined action of **B. bassiana** and mineral oil has significantly increased mortality (Tukey's Test) and reduced lethal times in comparison with the action of the either agent alone. At 8 days, there were 88.0% of mortality (Abbott's 1925 formula) for the mixture (synergistic effect), 16.0% for mineral oil only and 14.0% for **B. bassiana**. At 20 days, there were additive effect, 98.0% of mortality for the mixture, 33.0% for mineral oil and 70.0% for **B. bassiana**.

029

INSETOS ASSOCIADOS A CULTURA DA NOZ MACADAMIA NO NORTE DO ESTADO DO ESPÍRITO SANTO.

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Tendo em vista a importância da macadâmia para o Estado do Espírito Santo e para o Brasil e ainda o aspecto internacional do comércio de nozes, o conhecimento das pragas da cultura assume papel de fundamental importância, pois além do aspecto do dano e prejuízo está envolvido o fator qualidade das nozes e a possibilidade de introdução de pragas. Neste trabalho são apresentadas as pricipais espécies de insetos associadas à macadâmia no Norte do Estado que podem ser classificadas como pragas-chaves ou secundárias. Os insetos foram agrupados de acordo com a parte atacada da planta e do "status" como pragas da cultura atualmente.

FOLHAS:

Dalcera n. sp. (?) (LEPIDOPTERA: DALCERIDAE) - "lagarta gelatinosa" ; **Trigona** sp. (HYMENOPTERA: APIDAE) - "abelha cachorro" ; **Atta** sp. (HYMENOPTERA FORMICIDAE) - "formiga cortadeira ou saúva".

RAMOS E TRONCO:

Antiteuchus mixtus (HEMIPTERA: PENTATOMIDAE) - "percevejo fedorento" ; **Enchenopa** sp. (HEMIPTERA: MENBRACIDAE) - "soldadinho e membracídeo".

BROTOS:

Enchenopa sp. e **Aethalium reticulatum** (HEMIPTERA: AETHALIONIDAE) - "cigarrinha das frutíferas".

INFLORESCÊNCIAS:

"pulgão preto" - espécie ainda não identificada; **Aethalium reticulatum** - "cigarrinha das frutíferas" .

FRUTOS:

Tripes - espécie ainda não identificada; **Gymmandrosoma aurantianum** (LEPIDOPTERA: TORTRICIDADAE);

Ectomyelois muriscis (LEPIDOPTERA: PYRALIDAE); Stenoma (?) **ocellea** (LEPIDOPTERA: DECOPHORIDAE); **Hypothenemus obscurus** (COLEOPTERA: SCOLYTIDAE).

As três espécies de microlepidopteros **G. aurantianum, E. muriscis** e **S. ocellea** e o coleóptero **H. obscurus** são conhecidas como broca das nozes ou broca da macadâmia e este complexo de espécies constitui o principal problema de pragas da cultura no momento. Foram observadas larvas em vários estágios de desenvolvimento mesmo nas nozes secas; o que indica um ataque contínuo das nozes, havendo emergência de adultos em nozes secas colocadas em gaiolas teladas. Exceto as brocas das nozes, as outras espécies de insetos são consideradas como pragas secundárias da cultura no momento.

030

SURVEY OF FRUIT FLIES (DIPTERA: TEPHRITIDAE) IN CITRUS ORCHARD AT PRESIDENTE PRUDENTE COUNTY, SÃO PAULO STATE

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From January 1990 to December 1991 a survey of **Ceratitis capitata** (Wied.) and **Anastrepha** species was realized in citrus (**Citrus sinensis**) orchard variety "Pera Rio", at Presidente Prudente County (22°11'34"S, 51°23'11"W, 424.29m), São Paulo State, Brazil. Adult fruit flies were captured weekly by modified traps of "Valenciano" type, using a mixture of 3% orange juice and 7% sugar syrup in water. A total of 14,091 specimens was captured, being 13,330(94.60%) of **C. capitata** (38.02% males and 61.98% females) and 761(5.40%) of **Anastrepha** spp. (45.99% males and 54.01% females). Nine species of **Anastrepha** (from 411 females) were identified: **A. fraterculus** (Wied.) (358), **A. barbielinii** Costa Lima(22), **A. montei** Costa Lima(13), **A. sororcula** Zucchi (8), **A. obliqua** (Macquart)(5), **A. leptozona** Hendel(2), **A. dissimilis** Stone(1), **A. distincta** Greene(1) and **A. elegans** Blanchard(1). Adults were collected all year long, with higher population occurring from July to November. Data of fluctuation showed a negative correlation with relative humidity(RH) for **C. capitata** and RH, rainfall, minimum temperature and average temperature for **Anastrepha** spp.

031

CONTROLE QUÍMICO DO ÁCARO BRANCO - *Polyphagotarsonemus latus* (ACARI:TARSONEMIDAE) EM MAMOEIRO.

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O ácaro branco é uma praga relativamente recente nos pomares de mamão, no Espírito Santo, pois em um trabalho de 1987 não foi sequer mencionado como praga da cultura no Estado (MARIN **et al.**, 1987). Atualmente, junto com o ácaro rajado, constitui uma das pragas que mais demandam medidas de controle químico. Uma das dificuldades no controle dos ácaros que atacam o mamoeiro é a falta de inseticidas/acaricidas registrados para a cultura, além do problema da sensibilidade das plantas (fitotoxidade) aos agrotóxicos. Em relação ao ácaro branco, os produtos com registro para mamão são à base de enxofre. Partindo-se de produtos utilizados pelos produtores da região Norte do Espírito Santo, de produtos de baixa fitotoxidade e de produtos recomendados para o controle do ácaro branco em outras culturas, foram testados os seguintes inseticidas/acaricidas, nas dosagens especificadas para 100 litros d'água: 1 - abamectin (Vertimec 18 CE) - 30ml; 2 - quinometionato (Morestan 700) - 50g; 3 - Enxofre (Kumulus-S 80) - 500g; 4 - Tokuthion - 300ml; 5 - óxido de fenbutatin (Torque 500 SC) - 60ml; 5 -

azocyclotin (Peropal 250 PM) - 100g; 7 - fenpropatrin (Daninem 300 CE) - 40ml; 8 - mistura de endossulfan + tetradifon (Thiodan 350 CE + Tedion 80 CE) - 150ml + 150ml e 9 - testemunha. O ensaio foi desenvolvido na Fazenda Experimental de Sooretama/EMCAPA. Marcaram-se 5 plantas com presença de ácaros nos ponteiros, por tratamento, e, no mesmo dia, procedeu-se à aplicação dos produtos com um pulverizador costal de pressão constante. A aplicação foi efetuada em 18 de novembro/92 e as avaliações de eficiência, após 24 horas e 3 DAP. Foram contados o número de ninfas e de adultos em dez discos de folha de 1,50cm de diâmetro, em ambas as avaliações, sendo a eficiência determinada através da fórmula de Abbott. Os inseticidas/acaricidas mais eficientes e menos fitotóxicos foram: Vertimec 18 CE, Kumulus - S 80, Morestan 700, Peropal 250 PM e a mistura Thiodan + Tedion. O Lorsban e o Tokuthion foram extremamente fitotóxicos, enquanto o Torque e o Danimen, apesar de não-fitotóxicos, foram ineficientes para controle do ácaro.

032

OBSERVAÇÕES SOBRE ATAQUE DE BROCAS DAS NOZES DE MACADÂMIA

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O complexo de espécies de insetos que broqueiam as nozes de macadâmia constitui as pragas-chaves da cultura no Espírito Santo. Na colheita da safra 91/92, observaram-se os primeiros ataques de broca das nozes de macadâmia na VAVERSA - São Mateus- ES. Foram identificadas três espécies de microlepidópteros e um coleóptero, denominados "broca das nozes de macadâmia", **Gymmandrosoma aurantianum** (Lepidoptera:TORTRICIDAE); **Ectomyelois muriscis** (Lepidoptera:PYRALIDAE); **Stenoma** (?) **ocellea** (Lepidoptera:OECOPHORIDAE) e **Hypothenemus obscurus** (COLEOPTERA:SCOLYTIDAE). Amostras de frutos verdes revelaram que, além da coroa os frutos apresentaram até três orifícios externos, com até três lagartas por fruto. Em frutos refugados no processo de seleção, observou-se o ataque dos lepidópteros em 1200 nozes, 322 das quais não tinham orifícios externos, 760 com um orifício, 126 com dois orifícios, 13 com três orifícios e apenas uma noz apresentou quatro orifícios. Quanto à localização dos orifícios na noz, 7,0% localizaram-se na parte superior; 27,3 na parte lateral e 52,8% na parte inferior. Isto indica que a coroa existente nas nozes de macadâmia é o local preferido para a emergência dos adultos das mariposas, seguido de alguma parte mais fina, na casca dura, na lateral dos frutos. Foram encontradas 88 lagartas nos 1200 frutos secos analisados, com o número de lagartas por noz variando de um a sete. Isto mostra que o inseto pode passar de uma safra para outra, em restos de cultura no campo, ou completar seu desenvolvimento durante o armazenamento e processamento das nozes. Das 1200 nozes avaliadas, 536 apresentaram-se normais, sem dano nas amêndoas, 467 apresentavam galerias nas amêndoas e 219 estavam completamente destruídas. As amêndoas com galerias efetuadas pelas larvas apresentavam grande quantidade de teia, presença de fungos e de ácaros secundários.

033

NÍVEL DE CONTROLE PARA BROCA-DA-BANANEIRA - *Cosmopolites sordidus* (germ., 1824), NO ESPÍRITO SANTO.

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O presente trabalho foi realizado no município de Alfredo Chaves, Estado do Espírito Santo-Brasil, no período compreendido entre 1978 e 1982, objetivando determinar o nível de controle da broca-da-bananeira **Cosmopolites sordidus** (Germ., 1824) e, também, selecionar substitutos para o inseticida Aldrin. Utilizaram-se mudas tipo chifrinho da cultivar Prata, espaçamento de 3m x 3m, 48 plantas/parcela (24 úteis), em encosta, testando os seguintes produtos: Aldrin (2g i.a.); Carbofuran (1,25 e 2,5g i.a.); Fensulfathion (2,5g i.a.); Carbaryl (3g i.a.), além da testemunha. Os produtos foram aplicados em torno das

touceiras, semestralmente, em delineamento de blocos ao acaso, com 4 repetições. A população de adultos foi avaliada através de iscas de pseudocaule, obtidas do primeiro metro da planta colhida, a partir do nível do solo, distribuindo-se uma isca por parcela, mensalmente. De acordo com os resultados, verificou-se que o Aldrin 5% foi o mais eficiente no controle da praga, não havendo efeito significativo para peso do cacho e ciclo da produção, sendo que os demais tratamentos não diferiram entre si ao nível de 5% de probabilidade, pelo Teste de Duncan. Assim, as maiores médias obtidas podem ser adotadas como níveis de controle, sendo 1,97; 3,77 e 5,17 adultos/isca/mês, para planta matriz, primeiro e segundo seguidores, respectivamente.

034

FITOTOXIDEZ DE INSETICIDA/ACARICIDA NA CULTURA DO MAMOEIRO (*Carica papaya* L.) GRUPO 'SOLO'.

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Um problema de grande importância para esta cultura refere-se à sensibilidade das plantas à ação fitotóxica dos inseticidas/acaricidas. O trabalho foi realizado no município de Cachoeiro de Itapemirim, no período de maio a outubro/92, com o objetivo de estudar a toxicidade de inseticidas/acaricidas para o mamoeiro, visando proceder à seleção para uma possível utilização dos mesmos na cultura. O delineamento foi em blocos ao acaso com quatro repetições, cada parcela sendo constituída de quatro plantas em linha, sendo as duas centrais consideradas úteis. A pulverização foi feita no início do florescimento (setembro/92) até o ponto de escorrimento, com os seguintes produtos (dosagem expressa em gramas de ingrediente ativo/100l de água): Azocyclotin - 7,5 (Peropal 250 PM), Diethion - 75 (Ethion 500), Tetradifon - 24 (Tedion 80), Bromopropylate - 37,5 (Neoron 500 EC) Cartap - 60 (Thiobel 500), Dicofol - 32 + Tetradifon - 12 (Carbax), Fenibutatin - 30 (Torque 500 SC), Hexythiazox - 1,5 (Savey PM), Endosulfan - 70 (Thiodan CE), Propargite PM - 5,4 (Omite 300 PM), Triazophos - 40 (Hostathion 400 BR), Monocrotophos - 40 (Nuvacron 400), Propargite EC - 72 (Omite 720CE BR), Dimethoate - 60 (Dimexion), Enxofre - 480 (Thiovit), Fenpopathrin-150 (Meothrin), Cyhexatin - 25 (Cyhexatin 500), Vamidothion - 30 (Kilval 300), Clofentezine - 25 (Acaristop 500 SC), além de água pura e água + espalhante adesivo Extravon (20ml). Foram realizadas três leituras de fitotoxidez aos 5, 20 e 28 dias após a pulverização. Não apresentaram fitotoxidez as plantas tratadas com Enxofre, Endosulfan, Clofentezine e Hexythiazox. Os mais fitotóxicos ao mamoeiro foram Propargite EC, Triazophos, Diethion, Propargite PM e Azocyclotin. Os demais se comportaram intermediariamente. O Diethion e Triazophos provocaram queda das folhas e redução no desenvolvimento das plantas, tanto em diâmetro de caule quanto em altura.

035

OCURRENCE OF *Stethorus fractus* (COLEOPTERA:COCCINELLIDAE), PREDATOR OF TWO SPOTTED SPIDER MITE-*Tetranychus urticae* IN PAPAYA ORCHARDS

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In integrated pest management systems, the identification of pest natural enemies in a crop and their impact on the ecosystem is very important in sampling and control tactics to be used. Among the main predators of the two spider mite attacking papaya at northern Espirito Santo State are the coccinellids. Insect specimens were collected in several plantations of Linhares country and at Vale Verde Agroindustrial-VAVERSA in São Mateus, since June 1992. The adults were send to a specialist in this family who identificate them as: **Stethorus fractus** Gordon & Chapin, 1940 (COLEOPTERA: COCCINELLIDAE). All **Stethorus** species are specialist predators of mite pests and are found all over the world. This species was described from an only specimen encoutered in Pernambuco State. Considering the frequency that occurs

in the papaya orchards, this predator seems to have some scape mechanism against the high number of pesticide applications on the crop. Studies about its biology and pesticide selectivity are being conducted.

036

CHEMICAL CONTROL OF THE AVOCADO FRUIT BORER

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The avocado (**Persea americana** Mill.) is mainly planted in the highland region of the Espírito Santo State where the orchards number increased since 1980. The fruit borer, **Stenoma catenifer**, is the most important avocado pest and yield loss reaches 50%. To control this pest were tested on an orchard with the regional cultivar Falchetto, in 1988 and 1989 at Venda Nova do Imigrante/ES (650m), the chemicals: deltamethrin (10g a.i./ha), methilic parathion (600g a.i./ha), abamectin (11g a.i./ha), trichlorfon (1500g a.i./ha), diazinon (1200g a.i./ha), malathion (1000g a.i./ha), fenitrothion (750g a.i./ha) and biological insecticide (**Bacillus thuringiensis**) Dipel PM^{R} (500g c.p./ha). The experiment was carried out in a randomized complet block design with four replicates per treatment. Eight sprays were made from January to August and sprayed 9 *l* solution per plant. **B. thuringiensis** was applied 16 times. Efficient control was obtained with deltamethrin (95.9%) and fenitrothion (85.2%).

037

BIOLOGIA DE *TROPIDACRIS COLLARIS* (ORTOPTERA: ACRIDIDAE) EM CONDIÇÕES DE LABORATÓRIO[1].

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Na tentativa de minorar os problemas acarretados pelos gafanhotos, no Nordeste, e particularmente no Rio Grande do Norte, estão sendo estudadas várias espécies de gafanhotos. Dentre elas se destaca o **Tropidacris colaris**. Esta espécie causa danos econômicos em cajueiros, mangueiras e em algumas plantas em áreas irrigadas. Este trabalho objetiva obter conhecimentos dos aspectos biológicos para subsidiar programas de monitoramento inseridos na luta integrada de combate aos gafanhotos na região. A pesquisa está sendo desenvolvida em condições de laboratório: temperatura 27+2°C, U.R. 70+5% e fotofase de 12h. Os ovos foram coletados no campo e incubados em substrato contendo vermiculita e areia. Foram registrados 72 ovos por ooteca, período de incubação de 46 dias e a viabilidade de ovos em torno de 96%. Os espécimens foram criados em gaiolas teladas com as seguintes dimensões: 50 x 50 x 70 cm. A dieta natural usada foi ramos de mangueira. Foram constatados sete ínstares, com as seguintes durações: I = 14; II = 14; III = 10; IV = 10; V = 12 ; VI = 14 e VII = 20 dias.

1. Pesquisa financeira pela FAO.

038

ASPECTOS BIOECOLÓGICOS DE ESPÉCIES DE GAFANHOTOS NO RIO GRANDE DO NORTE[1].

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Dentre as espécies de gafanhotos de importância econômica associadas às culturas no Rio Grande do Norte, destacam-se o gafanhoto nordestino (**Schistocerca pallens**), o mané-magro (**Stiphra robusta**) e o tucurão (**Tropidacris collaris**). O primeiro tem provocado sérios danos às culturas de subsistência bem como pastagens nativas e implantadas. No período da entressafra, esta espécie tem se mantido sobre cajueiro (**Anacardium occidentale**), pinhão branco, burra leiteira ou pinhão bravo (**Euphorbia** sp) e malva branca ou malva melabode (**Herissantia nemoralis**). O **S. robusta** tem danificado culturas de cajueiro, algarobeira (**Prosopis** sp) e goiabeira (**Psidium guayava**), enquanto **I. collaris** danifica principalmente mangueira (**Mangifera indica**) e coqueiro (**Cocus nucifera**). Os ovos são colocados no solo, em forma de ootecas a uma profundidade variável, dependendo da espécie. A eclosão está estritamente relacionada com a umidade do solo. Sob condições adversas de alimentação e clima, os gafanhotos mantêm- se em diapausa (quiescência) por tempo variável. O **S. pallens** apresenta, nas condições do sertão, apenas uma geração/ano, ficando em diapausa na forma adulta por mais de seis meses. Pode-se associar os surtos de **S. pallens** a anos chuvosos seguidos de seca.

1 - Pesquisa financeira pela FAO.

039

ASPECTOS BIOLÓGICOS DO MANÉ-MAGRO, *Stiphra robusta* (ORTOPTERA:PROSCOPIIDAE)[1].

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O mané-magro (**Stiphra robusta**) tem sido considerado uma das principais espécies de gafanhoto de importância enconômica que infestam as culturas do Nordeste Brasileiro. Ocorre praticamente todos os anos nas diferentes regiões que cultivam o cajueiro (**Anacardium occidentale**), algaroba (**Prosopis** sp) e goiabeira (**Psidium guayava**). Buscando-se subsídios à implementação do manejo de pragas, desenvolveu-se trabalho de pesquisa sobre a biologia de **Stiphra robusta** em condições controladas de temperatura (27±2°C), fotofase de 12h e umidade relativa(70±5%). Os insetos foram criados em gaiolas teladas de 50x50x70 cm. Os mesmos foram separados em grupos e mantidos em folhas de goiabeira. Os parâmetros observados foram os seguintes: nº de ovos/ooteca, períodos de incubação, ninfal e longevidade, viabilidade dos ovos e ciclo total. Verificou-se um número de 74,5 ovos/ooteca, incubação média de 33 dias e viabilidade dos ovos de 90%. O ciclo total médio é de 103,5 dias com cinco ínstares tendo as seguintes durações: I= 11,8; II= 10,8; III= 8,3; IV= 9,0; e V= 8,3 dias. A longevidade média foi de 56,4 e 54,4 dias para fêmeas e machos respectivamente.

1- Pesquisa financiada pela FAO.

040

PREFERÊNCIA ALIMENTAR DE *Stiphra robusta* (ORTOPTERA:PROSCOPIIDAE) EM CONDIÇÕES DE LABORATÓRIO[1].

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No Nordeste brasileiro, a espécie de gafanhoto **Stiphra robusta** (Mané-magro) infestou, no ano de 1992, uma área de aproximadamente 10.000 ha, atacando culturas de algaroba e cajueiro, principalmente. Tentando minimizar os problemas causados pelos gafanhotos na região, foi feito estudo da bioecologia do inseto para subsidiar programas de controle biológico da praga. Um ensaio desenvolvido, foi o da preferência alimentar de **S. robusta** em condições de laboratório:temperatura 28±2°C, U.R. 75±5% e fotofase de 12h. Foram testados quatro hospedeiros: mangueira (**Mangifera indica**), algaroba (**Prosopis** sp), goiabeira (**Psidium guayava**) e cajueiro (**Anacardium occidentale**). Os espécimes foram postos em uma arena. Nela foram colocados equidistantemente, dezesseis vidros, contendo, cada qual, água e um dos substratos a serem testados, colocados de forma alternada. Foram feitas observações a intervalos de 1h (8h por dia) durante dois dias. Findo o período de observação, constatou-se que o hospedeiro preferido por **S. robusta** foi a goiabeira.

1- Pesquisa financiada pela FAO

041

DETERMINATION OF PAPAYA SOLO STATUS AS FRUIT FLIES (*Tephritidae*) HOST IN ESPÍRITO SANTO STATE WITH QUARANTINE OBJECTIVES

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Espírito Santo State is among the main producers of papayas in Brazil and the leader in exporting these fruits to Europe countries. Papayas is a host of fruit flies (**Tephritidae**) and this condition is the main obstacle in expanding the market of brazilian papayas to the United States and Japan. A research project was prepared and its objective is to serve as a solid basis of an effective quarantine program in the production area, so the papayas could be exported without any postharvest treatment. Four major experiments were designed as follow: a) monitoring of 6 farms covering all area to determine the population density and fluctuation of **Ceratitis capitata** and **Anastrepha** spp., the target species of the project. Jackson traps with trimedlure wicks and McPhail traps baited with protein hydrolysate are used for the species. b) survey of field infestation of papayas. A total of 100,000 papayas at 5 ripeness stages from 6 farms will be harvested weekly during 18 months and analysed in terms of fruit fly infestation. c) forced infestation in field cages. A set of two papayas trees will be caged and 200 sexually mature flies, laboratory-reared, will be releases into the cage. Some days later, the fruits will be harvested, weighed and hold individually for larvae or pupae recovery. d) forced infestation in laboratory cages. All papayas ripeness stages will be tested in lab cages with known number of mature flies wiil be tested in terms of susceptibility and survivalship. The data collecting was iniciated in July 1993 and until now 15,389 fruits were cut into halves and searched for fruit flies larvae and none were encountered. The McPhail traps have captured 1,276 individuals of **Anastrepha** spp. and the Jackson traps captured only one individual of **C. capitata**.

ORCHARD MANAGEMENT

042

EFFECTS OF CULTURAL PRACTICES ON MACADAMIA NUT QUALITY

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Macadamia nut quality is related to the content and composition of oil formed in the kernel. Commercially quality is assessed by kernel recovery (total weight of kernel) expressed as a percentage of the total nut in shell weight) and first grade kernel (the percentage by weight of kernel which float in tap water). Cultural practices can have considerable impact on nut quality:

IRRIGATION: Necessary in dry climates but can have an adverse effect in a high rainfall area.
FERTILISATION: Nitrogen, phosphorus and boron can exert a major impact on productivity and nut quality.
PEST & DISEASE CONTROL: Lack of pest and disease control can lower both kernel recovery and first grade kernel.
SOIL MANAGEMENT: Some evidence that fallen nuts exposed to sunlight can suffer quality loss. Cover cropping elevates organic matter and reduces erosion.
PRUNING: Pruning of advanced trees reduces macadamia productivity and quality.
ROOTSTOCK/SCION: Rootstock imparts vigour while the scion affects quality.
TREE SPACING: Overcrowded trees produce low yields of poor quality kernel.
CROSS POLLINATION: There is increasing evidence that cross pollination improves nuts size, yield and kernel recovery.

043

EFFECT OF ORGANIC MATTER SOURCES AND AMOUNTS IN THE PARENT PLANT, FIRST AND SECOND FOLLOWERS OF THE BANANA CV. PRATA, IN ESPIRITO SANTO, STATE, BRAZIL

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A banana experiment was carried out with cv. Prata, under the ecological conditions of the Espirito Santo State. The effect of alternative sources of organic matter on growth and bunch weight of the parent plant, first and second followers was studied on a cambissolic soil (Inceptisols) with mean declivity 50%, organic matter level 1%, pH 4.8, K 90 ppm, P 1 ppm, Ca, Mg and Al 0.9, 0.6 and 1 me/100g, respectively. A randomized block design with ten treatments (nine organic matter sources and one control) and three replications was used. The organic matter sources were: straw (Coffee beans straw); stalk (banana bunch stalk) and Bioterra (trade name of brazilian organic fertilizer). The treatments were as follows (per banana plant): straw (10 litre and 20 litre); stalk (10 litre and 20 litre); "Bioterra" (0.5 and 1 kg); straw (10 litre) + stalk (10 litre); straw (10 litre) + "Bioterra" (0.5 kg); stalk (10 l) + "Bioterra" (0.5 kg). The data were analised statistically and compared by Duncan test at the 5% level. Results showed that there were no a significative difference among the treatments and the following conclusion was drawn: under the experimental condition the amount of organic matter sources studied are not recomended for cv. Prata.

044

STUDIES ON WATER AND NUTRITIONAL REQUIREMENTS OF BANANA

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This study was carried out in the Experimental Farm, Faculty of Agriculture, Ain Shams University, Cairo, Egypt to study the effect of three levels of irrigation with three levels of nitrogen fertilization on Hindi banana growth, leaf analysis, yield, together with both physical and fruit chemical properties and the water consumptive use. This study was conducted on the second ratoon. The vigorous growth expressed in lenght and circumference of pseudostem, number of green leaves, heaviest bunches, with the greatest number of fingers per bunch, longer finger length, heavier finger weight, wider pulp diameter and thicker peel were obtained under the higher irrigation level (irrigation at 75% available water) followed in a decreasing order, by irrigation at 50% and 25% of the available soil water respectively. High irrigation level increased leaf carbohydrates, C/N ratio, nitrogen, phosphorus and potassium contents. Significant increases were detected in June sampling (Just before flowering).
Increasing the rate of nitrogen fertilization from 100 up to 200 g. N/stool/year increased all the plant measurements. Any addition of nitrogen fertilization did not detect any significant increase.
The amount of water consumed by Hindi banana strating from the time the ratoon selected till harvesting (nearly 18 months) were 8000, 1000 and 11000 cubic/meters/feddan and the frequency of the three irrigation levels were 28, 56 and 126 singil irrigation for the low, medium and high level respectively.
The seasonal empirical crop coefficient (K) are 0.67, 0.84 and 0.96 under the three irrigation levels.

045

GREENHOUSE PRODUCTION OF BANANA IN LIBYA

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Libya is located in North Africa with a mediterranean type of climate, which is too cold in winter time for growing banana in the field, but certain cultivars of the Cavendish group are grown on small scale. In 1990, the greenhouse production of banana was introduced to the country. The project consists of 100 units of one hectare each. The basic greenhouse used for banana production is a structure of 6 meters high covered with plastic sheets, and the plastic house is equiped with automatic heater, mist and drip irrigation systems. In this report, a full detail of establishing the greenhouse, site selection, cultivars, planting distances and time of planting, flowering and time of fruit maturity are reported. Evaluation of cultural practices such as amount of irrigation water required, fertilization, disease and pest control, was also conducted. The production of 40 Tons per hectare is considered highly profitable except for the large quantities of good water consumed.

046

THE INFLUENCE OF THE NUMBERS OF SUCKER, PERIOD OF SELECTION AND IRRIGATION UPON THE PRODUCTION OF THE 1st CYCLE OF BANANA PLANT CV. NANICÃO IN THE REGION OF JABOTICABAL, SP, BRAZIL

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It was been studied the influence of number of sucker upon the production of Bananas Plants cv. Nanicão in random blocks, with 7 treatments and 7 repetitions in a dark red latosol, sand phase in the FCAV/UNESP campus.
The treatments consisted in: a) the origin plant, b) the origin plant and a 4 months sucker, c) origin plant and a 6 months sucker, d) the origin plant and a 8 months sucker, e) the origin plant and a 4 and 6 months sucker, f) the origin plant and a 6 and 8 a months sucker. Two of the four blocks received suplementary irrigation of 100 mm monthly.
The numbers of sucker and the period of selection didn't influence the production of fruits yield.
The production and the quantity of fingers and hands per bunch anevered with the irrigation. The Banana Plant answers significantly the irrigation increasing the production in an average of 25% over.

047

CROP COEFICIENT TO IRRIGATION IN BANANA PLANT

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This work was carried out at the Centro Nacional de Pesquisa de Mandioca e Fruticultura Tropical/EMBRAPA, Cruz das Almas, BA. The method used was drip irrigation a watering frequency of two days, studying four water levels based on class 'A' evaporation tank. Different crop coefficients (0.60; 0.80; 1.00 and 1.20) were considered as treatments plus the control (without irrigation). The experimental design used was 5 x 5 latin square, with 45 total plants per plot and 24 buffer plants. The results showed that irrigation increased in 41% the production of banana fruits by plants watered according to the crop coefficient of 0.60.

048

PROPAGATION OF 'HONEY GOLD' PAPAYAS BY CUTTINGS

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To overcome variability in sex type ; productivity; fruit size, shape and quality; disease tolerance; etc., the female clone of 'Honey Gold' papayas has been propagated by leafy cuttings for the past 30 years. Induction of lateral bud burst on the strongly apically dominant stems of 1-2 years old plants has been promoted by the application, through injection or direct application on the stems, of various synthetic cytokinin/gibberellic acid mixtures. Removal of the terminal growing points is essential to promote development of the lateral buds, while retention of leaves promotes growth. Repeated removal of strongly

developing, thick growing points in the leaf axils promotes even development of many thinner, vigorous lateral shoots, lower on the stems, that are ideal for cuttings. Repeated topping of stems also results in side shoot development but fewer cuttings are produced. By leaving stubs of the side stems, when cuttings with pen sized stems are taken, further growth of new shoots is obtained and cuttings can be harvested monthly, provided adequate leaf canopy is left on the parent plant. Cuttings are trimmed to leave 3-4 small leaves, immersed in a fungicidal bath of suitable concentration to prevent phytotoxicity and ensure leaf retention during rooting of the cuttings in sterile media, under intermittent mist with botton heat of 25-30° C, after basal IBA treatment. The use of containerized trays to produce cuttings with tapering root 'plugs' about 9 x 9 x 15 cm, will reduce production costs.

049

EFFECTS OF THREE DIFFERENT SUBSTRACTS ON DEVELOPMENT OF PAPAYA (*C. papaya L.*) SEEDLINGS

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The present research was carried out at Universidade Estadual do Sudoeste da Bahia, Vitória da Conquista-BA, Brazil, from March to June, 1993, in order to verify the effects of three substracts on growth (seedlings height) and root volume of **Carica papaya L.** seedlings. The substracts tested were: powdered charcoal, fermented manure and plantmax (a commercial substract based on vermiculite). Substracts were put into plastic tubes. Seeds were sown in March, 1993 and after 50 days seedlings were evaluated. From the obtained results some conclusions were drawn: 1) fermented manure promoted the best development (vigour characteristics), compared to plantmax and charcoal; 2) seedlings grown on fermented manure showed better visual apparence than those others, which leaves showed normally defficiency symptoms.

050

AVALIAÇÃO DA GERMINAÇÃO DE SEMENTES DE NOGUEIRA MACADÂMIA NO NORTE DO ESPÍRITO SANTO

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O presente trabalho foi realizado com o objetivo de avaliar a percentagem de germinação de sementes de macadâmia das cultivares HAES 333 (Ikaika), HAES 800 (Makai), HAES 660 (Keaau), HAES 741 (Mauka), HAES 344 (Kau) e HAES 508 (Kakea), na VAVERSA, município de São Mateus-ES. Foram utilizados dois tipos de substratos: solo argilo-arenoso acondicionado em recipiente de polietileno com capacidade de 3 kg e leito de areia lavada, ambos a pleno sol. A percentagem de germinação, avaliada aos 100 dias após a semeadura foi, de modo geral, superior em leito de areia, embora tenham, sido verificadas diferenças significativas entre as diferentes cultivares estudadas. A maior percentagem de germinação em leito de areia foi observada para a cultivar Ikaika (61.9%). A cultivar Kakea apresentou uma germinação de apenas 15.8%.

051

ÉPOCA DE PRODUÇÃO E QUALIDADE DE FRUTOS DE CUPUAÇU (*Theobroma grandiflorum*) NO SUDESTE DA BAHIA

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O cupuaçuzeiro (**Theobroma grandiflorum**) é uma árvore frutífera da família **Sterculiaceae**, originária da região amazônica, que vem sendo cultivada na Bahia. O fruto é uma baga drupácea cuja polpa é utilizada na confecção de sucos, sorvetes, compotas, néctar, geléia e licores. As sementes servem para fabricação de chocolate branco. Durante o período de 1986 a 1990 foi efetuado o controle de produção de frutos de cupuaçuzeiros plantados em 1975 em uma propriedade rural situada no município de Ituberá, região sudeste da Bahia. Os frutos foram colhidos semanalmente, efetuando-se a seguir o despolpamento e pesagem da polpa, sem as sementes. O período de colheita de frutos estendeu-se de fevereiro a outubro sendo que os meses de maior produção, março e abril, renderam juntos 66% e 50,7% da produção anual de polpa em 1988 e 1989, respectivamente, e, 31,3% na média dos cinco anos. A produção anual de polpa por hectare variou de 3.505 kg em 1986 a 5.853 kg em 1987, ficando a média dos cinco anos em 4.713 kg. Uma amostra de frutos foi coletada em 1989 para análises físicas e químicas, encontrando-se os seguintes resultados médios: peso do fruto 1295 g (878 a 1665 g); rendimento de polpa, 40% (24,2 a 48,9%); acidez total, 3,2%; brix 9,5%; vitamina C, 23,6 mg/100 g e proteína 16,2%.

052

INFLUENCE OF FOUR SUBSTRACTS ON GROWTH AND VIGOUR OF PASSION FRUIT (*P. edulis* Sims f. *flavicarpa* Deg.) SEEDLINGS

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The present study was conducted at Universidade Estadual do Sudoeste da Bahia, Vitória da Conquista, Bahia State, Brasil, from March to May, 1993. The purposes were investigating the effects of the substracts: powdered charcoal, plantmax (a commercial substracts based on vermiculite), fermented manure, and a mixture of 50% of charcoal/fermented manure. Seeds were sown in March/93 and after 50 days seedlings were evaluated. It was observed that fermented manure presented the highest seedling development (measured by root volume dry matter and seedling height) followed by the mixture of fermented manure/charcoal, plantmax and charcoal.

053

CLONAGEM DE TIPOS PROMISSORES DE JAQUEIRA (*Artocarpus heterophyllus* Lam. ATRAVÉS DA ENXERTIA, EM PERNAMBUCO

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A seleção de "seedlings" de jaqueira com características superiores e a sua perpetuação como clones constitui parte do programa de melhoramento que a Empresa IPA vem desenvolvendo com algumas fruteiras nativas e exóticas em Pernambuco. A enxertia feita em porta-enxertos da própria jaqueira com 8 e 12 meses de idade, sob condições de viveiro, foi testada nas condições climáticas da Zona da Mata,

utilizando-se 02 métodos de borbulhia (T Normal e em placa em janela aberta) e 02 outros de garfagem (Topo e lateral). A idade dos cavalos não exerceu qualquer influência, porém, diferenças para os tipos de enxertia ocorreram, havendo superioridade do processo de borbulhia em janela (77,4%) sobre os demais tratamentos (abaixo de 45%). Recomenda-se proceder à enxertia da jaqueira em porta-enxertos com 8 meses de idade.

054

ESTUDO DO DESENVOLVIMENTO DO ABACAXI '*SMOOTH CAYENNE*' PLANTADO SOB CONDIÇÕES DE SECA, NO CERRADO MATOGROSSENSE

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Este trabalho foi conduzido na região Médio Norte Matogrossense, que apresenta um clima tropical e estação chuvosa bem definida, de setembro a maio, e solo areno-argiloso, classificado como latossolo vermelho-amarelo. Estudaram-se 3 épocas de plantio (março, maio e julho) e 5 idades de indução floral artificial (8, 10, 12, 14 e 16 meses), com o objetivo de buscar informações a respeito do seu ciclo, melhorar a qualidade e favorecer a comercialização. Os resultados mostraram que há uma interação significativa entre a época de plantio e a idade da planta no momento da indução floral artificial. Os tratamentos cuja indução floral coincidiu com os meses de maio e julho atrasaram o aparecimento da inflorescência, mas somente as plantas induzidas em março sofreram um atraso no ciclo.

055

ESTUDO DA PRODUÇÃO DO ABACAXI 'SMOOTH CAYENNE' PLANTADO SOB CONDIÇÕES DE SECA NO CERRADO MATOGROSSENSE

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Este trabalho foi conduzido no Campo Experimental da EMPAER/MT em Lucas do Rio Verde, região de cerrado do Médio Norte Matogrossense, que apresenta um clima tropical e estação chuvosa bem definida, de setembro a maio. Estudaram-se 3 épocas de plantio (março, maio e julho) e 5 idades para indução floral artificial (8, 10, 12, 14 e 16 meses após o plantio) com o objetivo de determinar a viabilidade da produção nestas condições. Os resultados mostraram que o plantio de julho, induzido aos 12, 14 e 16 meses, apresentaram um peso médio dos frutos com coroa significativamente superiores. O plantio de março, não alterou o peso dos frutos com e sem coroa.

056

CONTROL OF FLOWERING IN 'TAHITI' LIME BY GROWTH REGULATORS AND MANUAL FRUIT STRIPPING

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Experiments were performed at the CNPMF/EMBRAPA in Cruz das Almas, Bahia, Brazil, on the use of growth regulators and the manual stripping of fruits in an attempt to shift the harvest time of 'Tahiti' lime (C.

latifolia Tanaka), to the season between normal production peaks. The plants used were three years old, grafted on 'Rangpur' lime (**C. limonia** Osbeck) and at spacings of 6.00 m x 2.00 m. The experimental layout was totally randomized with five replication and each plot consisted of two plants. Both types of treatments led to abscission of leaves, flowers and fruits. After a period of recuperation, which varied between treatments, the plants under strees emitted new shoots and flowers, thus permitting the harvest of fruits at different times. The best results for the dislocation of production to the intercrop season were achieved with manual stripping, followed by the use of ethephon 250 ppm + urea 1%.

057

DENSITY PLANTING FOR 'PERA' SWEET ORANGE (*Citrus sinensis* L. Osbeck) GRAFTED ON 'CLEÓPATRA' MANDARIN (*C. reshni*, HORT)

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It was settled in 1986 at 'Citrus Experimental Station of Bebedouro', an experiment for study different densities using the combination 'Pera' sweet orange on "Cleópatra' mandarin.
Five spacing rows: 2, 3, 4, 5 and 6 by 7 m between rows were studied.
A randomized block design was used as a experimental statistic model consisting of 5 treatments and 5 repetitions. Each plot was composed by 8 plants disposed in two lines of 4 plants, wich totalized 180 working plants.
Through estatistical analysis of results fill 1992, the treatment 7 x 2 m showed the highest production per area and the least one per plant.
The spacing 7 x 2 m showed the least vegetative development such as trunck diameter and along with the spacing 7 x 3 m showed the least canopy volume.
Under the qualitative analysis, the spacing 7 x 2 m showed the least fruit weight and diameter. No differences were found among the treatments in relation to another fruit caracteristics.

058

THE EFFECT OF FIVE CITRUS ROOTSTOCKS ON FRUITS OF VALANCIA LATE ORANGES

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Trees of valancia late oranges were budded in 1972 on five citrus rootstocks namely: Troyercitrange, Sour orange, Rangpurlime, Rough lemon, and Cleopatra mandarin. The trees were planted at the Research Experimental Farm of the Faculty of Agriculture at Tripoli, Libya. The influence of the five rooststocks on fruit physical, chemical qualities and on fruit maturity were studied.
The results of fruit analysis for three growing seasons indicated the trend of greater influence of Cleopatra mandarin and Troyer citrange on fruit weight, diameter, juice content, total soluble solids and acidity. The results indicated the influence of the studied rootstocks on fruit maturity, and it was concluded that valancia fruits could not be harvested before April under the enviromental conditions of Tripoli.

059

PERSPECTIVAS DO ESTADO DO ESPÍRITO SANTO PARA A PRODUÇÃO DE FRUTAS TROPICAIS DE QUALIDADE

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A expansão da fruticultura de clima tropical no Espírito Santo ocorre não só em função de suas reais potencialidades ecológicas como da adequada infra-estrutura existente (energia, água, transporte, sistema portuário e comunicação), e através dos investimentos em tecnologia. O estoque tecnológico disponível, se incorporado ao processo produtivo, poderá promover, nos próximos anos, um incremento médio de 15% na produtividade das principais espécies exploradas. Além disso, novas áreas estarão sendo ocupadas com fruticultura tropical. Prevê-se que até 1995 mais 5.000ha serão acrescidos aos 40.476 ha atuais destinados à atividade. Esta área representa pouco mais de 1% do total da que está sendo utilizada para plantios e pastagens em todo o Estado. A produção, no entanto, corresponde a mais de 11,5% do valor bruto da produção agropecuária, gerando recursos da ordem de US$70 milhões. A importância da fruticultura tropical para o Espírito Santo se fundamenta na proximidade de um mercado consumidor com cerca de 60 milhões de pessoas, num raio inferior a 1000 km, representando, no Estado, um volume de negócios de mais de US$140 milhões e gerando, em conseqüência, aproximadamente, 30.000 empregos diretos. A expressiva comercialização interna, e o grande volume de frutos exportados para outros estados da federação e países da América do Sul, Europa, Ásia e América do Norte, comprova a qualidade das frutas produzidas no Estado e referencia a decisão política na definição da Fruticultura de Clima Tropical como uma atividade agrícola prioritária, ao desenvolvimento do Espírito Santo.

MARKETING

060

POTENTIALITIES FOR BRAZIL TO EXPORT PAPAYA FRUITS AND MACADAMIA NUTS

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This theme could be presented by two different ways; the first one, simple and more commonly adopted, would deal, fundamentaly, with the country capacity evaluation to produce papaya fruits and macadamia nuts, in a good enough quality level to attain the foreign markets requirements. Such evaluation would consist in the production system design, in its component variables identification and, in the case of detecting local conditions for their support we would be concluding for the existence of a real potentiality for exporting the products. The second manner, that is the option of our choice, would be a more realistic approach; we should try to define, in terms of quality and quantity the existing foreign market demand, and from that definition our potentiality would be measured by the capacity for effectivelÿ supplying and expanding it. We could take as granted that starting from a profitable commercialization, the other factors would turn readily available. Since land and climate are not limitant and that all the technologies already exist, here or abroad, we just need to pay for it. And, with no doubt, the certainty of profits would make of it a safe investment.

061

A COLHEITA E A QUALIDADE DO MAMÃO DO GRUPO SOLO

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O mamoeiro do grupo Solo, introduzido no Estado do Espírito Santo em 1976, ocupa atualmente uma área estimada em 4.700 ha e produz cerca de 168.000t de frutos. Pretende-se apresentar o resultado de experiências adquiridas com seu cultivo, neste período, inerentes às fases de pré-colheita e colheita. A qualidade do mamão está diretamente relacionada com o sistema de produção e o manejo durante e após a colheita, devendo-se considerar: 1 - Época de colheita: inicia-se de 9 a 10 meses após transplantio; 85% dos frutos são colhidos de setembro a abril e, em relação ao padrão, apresentam menor peso médio e tamanho, casca mais lisa e brilhante, polpa menos consistente e mais saborosa. A colheita dos demais 15% ocorre de maio a agosto quando o tamanho e peso médio dos frutos aumenta, a casca torna-se mais áspera e sem brilho e a polpa mais consistente e menos saborosa; 2 - Ponto de colheita; deve-se considerar os estágios de 0 até 3, em função da época de colheita, da distância e exigência do mercado consumidor; 3 - Método de colheita: de forma manual com auxílio de baldes plásticos e plataforma; é realizada com certa facilidade até 24 meses após o transplantio. 4 - Tratamentos fitossanitários: recomendam-se pulverizações preventivas e curativas no intervalo de 7 a 15 dias (nas "águas") e de 15 a 30 dias (na "seca"), bem como a catação manual dos frutos que caem ao solo.

062

"EXOTIC" FRUITS NATIVE IN BRAZIL.

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As "exotic" fruits here it is understood some tropical not well known fruits from São Paulo State and other brazilian regions taken in relation the ecological condition of this state. The data discussed in this work are based on the information obtained at the FCAV-UNESP in Jaboticabal, SP, which maintain a germplasm in colaboration with EMBRAPA and at the literature. There are commented information on flowering, fruit set, production and fruit quality of some fruits as araçá-boi (**Eugenia stipitata**), mapati (**Pouroma cecropiaefolia**), sapota (**Matisia cordata**), abiu gigante (**Pouteria cainito**), biriba (**Rollinia mucosa**), cainito (**Chrysophyllum cainito**), abricó (**Manea americana**), uvaia (**Eugenia pyriformis**), rio grande cherry (**E. agregata**), mangaba (**Hancornia speciosa**), jabuticaba (**Myrciaria** spp.), camu-camu (**Myrciaria dubia**), murici (**Byrsomina** spp.), pitomba (**E, luchsnatiana**), guabiroba (**Campomanesia** spp.), cabeludinha (**Eugenia tomentosa**), marolo (**Annona cariacea**), bacuri (**Platonia insignis**), cambucá (**Plinia edulis**)., cambuci (**Paivoea langsdorffii**), grumixama (**E. brasilensis**), cupuaçu (**Theobroma grandiflorum**).

063

THE MACADAMIA NUT IN THE WORID CONTEXT OF THE NUT TREES

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This work aimed to localize the world growing areas for macadamia nuts with related exportation volumes and values in the last two year of prodution 90/91 and 91/92. It was done a characterization of the preferencial form of consuption and volumes with a search of the utilized marketing strategies for divulgation of the macadamia nuts and its sub-products in the United States, Japan and Australia. Parallely are pointed strategies that can be used by the national macadamia industry to start a process of product introduction in the local masked as an way to provent a total dependency of the international market.

064

A FRUTICULTURA NO ESTADO DE GOIÁS

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Os cerrados, que constituem a grande maioria do território goiano, possuem enorme potencial para o cultivo de fruteiras, pois as condições ecológicas que definem essa região, apresentam excelentes perspectivas para o desenvolvimento da fruticultura. Por outro lado, o mercado regional de frutas, com base em dados da CEASA-GO, é bastante atrativo e demonstra uma demanda insastifeita em relação à quantidade e qualidade do produto, tendo em vista que 71.2% das frutas nacionais comercializadas são importadas de outros Estados. As condições favoráveis ao cultivo de fruteiras, a alta dependência de outros Estados em frutas para comercialização e a localização estratégica do Estado de Goiás, são fatores relevantes para o desenvolvimento da fruticultura goiana, com perspectivas promissoras.

065

EFEITO DA ÉPOCA DE OFERTA E CLASSIFICAÇÃO, NA QUALIDADE DE FRUTOS DE MANGUEIRA (*Mangifera indica* L. cv. 'TOMMY ATKINS')

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O objetivo deste estudo foi verificar a influência da época de oferta e da classificação comercial sobre a qualidade de mangas `Tommy Atkins' comercializadas no Entreposto Terminal da Companhia de Entrepostos e Armazéns Gerais de São Paulo-CEAGESP. Foram analisadas 11 das principais características físico- químicas de frutos de 3 épocas distintas em caixa de 12 frutos, caixas de 15 frutos e caixas com frutos não padronizados. Os frutos comercializados no início da estação apresentaram menores rendimentos de polpa (74,9%), valores de pH menos elevados (4,24), menores teores de SST (14,5) e menor relação Brix/acidez (52,9). Os frutos não padronizados apresentaram menores teores de SST (14,2), menores teores de açúcares totais (9,5), menor relação brix/acidez (52,2) e valores de pH menos elevados (4,23).

066

POTENTIAL FOR PLANTING EXOTIC FRUITS

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As exotic fruits here it is understood some tropical fruits from other countries or areas not well known in São Paulo State, taken in relation the ecological condition of this state. The data discussed in this work are based on the information obtained at the FCAV-UNESP in Jaboticabal, SP, which maintain a germoplasm in colaboration with EMBRAPA. There are commented information on flowering, fruit set, production and fruit quality of some fruit as araçá boi (**Eugenia stipitata**), mapati (**Pouroma cecropiaefolia**), sapota (**Matisia cordata**), abiu gigante (**Pouteria cainito**), biriba (**Rollinia mucosa**), cainito (**Chrysophyllum cainito**), abricó (**Manea americana**), mamey (**Colocarpum sapota**), canistel (**Pouteria campechiana**), governor's plum (**Flacortia indica**), **Spondias mangifera**, carambola (**Averrhoa carambola**), litchi (**Litchi chinensis**), longan (**Euphoria longana**), wampi (**Clausena lansium**), Costa Rica guava (**Psidium friedrichstalianum**), atemoya (**A. squamosa x A. cherimola**), Dovialis hybrid, black sapota (**Diospyrus ebenaster**), mabolo (**Diospyrus discolor**), jujuba (**Ziziphus jujuba**). Other exotic fruit are commented based on general information.

067

COCONUT AS FRESH FRUIT

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In the tropical countries where it grows, the coconut palm has many uses. Immature coconut fruit, known as tender nuts, are often harvested to drink the sweet water that fills the cavity of the nut. They are selected just at the stage when the fruit has reached full size and the endosperm has begun to develop as a thin jelly lining the shell. The coconut palm flowers and fruits throughout the year and tender nuts can be continuously harvested. Harvesting tender nuts reduces or eliminates production of mature nuts but increases yield, in terms of nut number by as much as twenty-five percent. Edible husked coconuts are

known in Asia and the Pacific. Other sorts, which have endosperm which remain jelly-like and fills the cavity at maturity have an established market. Dwarf varieties, varieties with very many small fruit and varieties with brightly coloured fruit are all known. Agriculturally, these coconuts are as easy to grow as existing varieties. Standard selection and breeding techniques can be used to produce varieties suited to fresh fruit production. Embryo culture methods are available and tissue culture and bioengineering techniques are being researched. The additive-free coconut water, has a sugar and inorganic salt content comparable to stamina augmenting artificial drinks promoted by athletes. The oil content and fatty acid composition of the tender nut presents no problems for the cholesterol anxious. The coconut flavour is well known and liked. There should be no health hazards from a plant that has been associated with human diet for hundreds of thousands of years.

068

THE AVOCADO CROP IN THE HIGHLANDS OF THE ESPIRITO SANTO STATE, BRAZIL.

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The avocado (**Persea americana** Mill) is a relatively new fruit crop in the Espírito Santo State, Brazil. It was mainly planted in home gardens since the last century.The crop diffusion in highlands of the State was made by italian immigrants and initially it was planted in small orchards for the soap industry. At this time the growers did not graft the plants and this created a great phenotypical variability. It allowed to obtain high yield plants with good agronomic traits. The high quality fruits were searched by farmers and propagated in the region after 1950. In local selections the most important are the cultivars Fortuna and Primavera with yield about 30t/ha, and are responsible for more than 40% of the actual production in the state. Currently the orchards in the highlands of the Espírito Santo, are cultivated in the altitudes from 600 to 1.550m, with average annual temperature higher than 18° and rainfall of 1.200mm per year. The hybrids of 'Antilian', 'Guatemalan' and 'Mexican' races are widespread in commercial orchards. The 'Antilian hybrids have been cultivated for home markets, 'in natura'. The harvesting time is from March to November. The avocado fruits produced out of the main season March-June are often marketed at higher prices. The most damaging pest is the fruit borer **Stenoma catenifer** that can cause yield loss of about 60% if control measures are not followed. **Sphaceloma perseae** is the most important pathogen that reduces the commercial value of the fruits. **Phytophthora** root rot is other important disease on soils with poor drainage.

069

RENDIMENTO E QUALIDADE DOS FRUTOS DE MAMÃO (*Carica papaya* L.) DO GRUPO SOLO E FORMOSA NA REGIÃO NORTE DO ESPÍRITO SANTO.

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A grande expansão do plantio de mamão verificada nos últimos anos no Espírito Santo suscitou a introdução de novos materiais genéticos e a conseqüente necessidade de caracterizar e avaliar os seus padrões produtivos e qualitativos de forma prevenir a difusão de genótipos de mamão com baixa capacidade de adaptação, pouco produtivos, com frutos de baixa qualidade e com menor tolerância às doenças e pragas. Em função disso, em junho de 1985, a EMCAPA instalou um experimento na região Norte do Estado, principal região produtora da cultura, onde foram avaliadas a produção e a qualidade dos frutos, entre outros parâmetros, de onze genótipos de mamão. O experimento foi instalado na Fazenda Experimental de Cricaré, município de São Mateus, situada em região de clima (Aw) e solo Latossolo Vermelho Amarelo (LVd_{11}). O ensaio foi instalado no delineamento experimental blocos ao acaso, com três repetições e 18 plantas por parcela. Dos quatro genótipos de mamão do grupo 'Solo' analisados, o

'Waimanalo' foi o de maior produção (69,2t/ha), maior peso médio de fruto (696,5 g) e maior espessura de polpa (2,18 cm). Dentre os de polpa vermelho-alaranjada, destacou-se o 'Sunrise Solo' com 66,5 t/ha. O 'Sunrise Solo' Line 72/12, foi o que apresentou maior concentração média e sólidos solúveis totais (14,1° Brix). Dos onze genótipos de mamão do grupo Formosa avaliados, o 'Tainung- 01' foi o mais produtivo (261,0 t/ha), seguido do 'Tailândia-ATK' (139 t/ha) e do 'Tainung-03' (128,5 t/ha). O peso médio de seus frutos foi superior a 1200 g, enquanto a concentração média de sólidos solúveis variou entre 11,2 e 12,9 °Brix.

070

EVALUATION OF THE NUTRITIONAL STATUS OF PAPAYA (*Carica papaya* L. IN ESPÍRITO ANTO STATE USING THE DRIS PROCEDURE.

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The objective of this paper was to assess the nutritional status of papaya (**Carica papaya** L.) by examining its leaf petiole and blade. The DRIS procedure was employed to identify the levels of the nutrients and to assess eventual deficiency and excess of N, P, K, Ca, Mg, S, Fe, Zn, Mn, B and Cu. The levels of each element were converted into indices by the DRIS. The indices estimated varied considerably among the nutrientes. The regression analysis between foliar levels as independent variable and the DRIS's indices as dependent variable, showed a strong causal relationship, where the quadratic function form presented the best fit to the data. Based on the signs of the regression coefficient, in general, the increase in the foliar concentration causes the indices to go up but at a decreasing rate, i.e., the quadratic equations were concave. This behavior implies that as one element varies and reaches a certain level, the constraints of the other elements bind. The DRIS provided information the lead to the existence of nutritional imbalances of the nutrients in the samples studied.

071

ADUBAÇÃO VERDE NA CULTURA DO MAMOEIRO

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Objetivando estudar algumas leguminosas para adubação verde na cultura do mamoeiro, instalou-se um experimento no Município de Umbaúba, SE, em solo PVA., em região com pluviosidade e temperatura média anuais de 1200mm e 25°C, respectivamente Foram instalados cinco tratamentos, nos quais, o mamoeiro 'Sunrise Solo' foi consorciado com as leguminosas feijão-de-corda, feijão-de-porco, mucuna-preta e lab-lab, além do cultivo solteiro (testemunha). Os mamoeiros consorciados receberam adubações de manutenção apenas à base de fósforo e as leguminosas, adubação fosfatada (60 kg/ha) no plantio. Na testemunha, utilizou-se adubação convencional à base de N e P. Na tabela abaixo, verifica-se que a mucuna-preta e o feijão-de-porco se destacaram em % de cobertura do solo e produção de matéria verde na parte aérea (média de dois plantios). Quanto à produtividade dos mamoeiros, não houve diferença estatística entre os tratamentos, embora tenha havido destaque para a testemunha e os tratamentos mucuna-preta e feijão-de-porco.

Tratamento	% de cobertura do solo (legum.)	Peso Verde t/ha (legum)	Produtividade t/ha/ano (mam.)
TESTEMUNHA	-	-	65,8
MUCUNA	100,0	21,8	61,9
F.PORCO	90,0	27,9	60,4
LAB-LAB	72,5	16,7	43,8
F.CORDA	56,2	12,9	41,8

A adubação verde proporcionou produtividade em mamoeiro equivalente ao cultivo adubado convencionalmente, além de oferecer proteção ao solo.

072

AVALIAÇÃO DO ESTADO NUTRICIONAL DA BANANEIRA CULTIVADA NO RIO GRANDE DO NORTE.

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A bananeira é uma planta herbácea com ciclo de desenvolvimento independente da estação do ano. No aspecto da nutrição mineral a cultura imobiliza uma das mais elevadas quantidades de elementos minerais, por hectare, mas pouco se conhece da composição mineral da planta na condição em que é cultivada no Estado. Neste estudo coletou-se a folha situada na 3ª posição do pseudo-caule, a contar do ápice, quando as plantas estavam emitindo a inflorescência. As plantações analisadas são cultivadas nas microrregiões do Agreste, Litoral Ocidental e Mossoroense, cujos solos das duas primeiras são originados da formação Barreiras e caracterizados pela granulometria de argila, silte, areia e conglomerados. São de textura arenosa ou média, profundos e de baixa fertilidade. Na microrregião Mossoroense ocorrem os sedimentos de aluvião e as várzeas, alototocne, formando no helocentro, que foram transportados da formação calcário e do cristalino. São solos de alta fertilidade com perfil não estratificado na sequência pedogênese. A parte da folha analisada corresponde a uma porção do limbo foliar, seguindo-se a recomendação da amostra internacional de referência (AIR), cujas concentrações foram tomadas como padrão na comparação dos valores encontrados nas folhas analisadas para as concentrações de nitrogênio, fósforo, potássio, cálcio e magnésio. Na avaliação verificou-se que as plantações apresentam um estado de desnutrição mineral, principalmente em relação ao nitrogênio. A melhor condição foi encontrada nas populações cultivadas em solo de aluvião, o qual é bem suprido em potássio, cálcio e magnésio e com pH próximo à neutralidade.

073

PINEAPPLE PLANTS DEVELOPMENT AND YIELD AS AFFECTER BY LEAVE AND SOIL POTASSIUM FERTILIZATION

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Potassium choloride was applied to the soil and sprayed to the pineapple leaves, and the dry matter and the leaf area were estimated throughout the plant cycle as well as the final fruit yield. Leaf dry matter yield up to 120 days after planting was not affected by potassium choloride fertilization. The maximum relative leaf area attained at 300 days after planting. By the time the leaf area and the leaf area index at the 240 ou 300 days after planting, became significative, the potassium fertilization was also effective in the stem dry matter accumulation. Potassium chloride sprayed to the leaves at the rate of 15g/plant, splitted 10 times, combined with 18g/plant dressing applied to the soil, splitted 3 times, gave de maximun fertilizer economial efficiency and promoted fruit crown fresh weight of about 2178g.

074

NUTRITIONAL DISTURBS IN KIWI FRUIT (*Actinidia deliciosa* Chev.) CULTURED IN NUTRIENTS SOLUTIONS.

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Plants were grown in pots containing pure quartz. Two times a day, they were irrigated by percolation with nutrientes solutions. The treatments were: Complete, -N, -P, -K, -Ca, -Mg, -S, -B, -Cu, -Fe, -Mn and -Zn. The plants showed deficiency symptoms and there were proven by chemical analysis of the plants. The levels found expressed in dry matter to "normal" plant and "deficient" plant, were: Nitrogen 3.14% - 2.01%, Phosphorus 0.43% - 0.23%; Potassium 3.48 - 1.88%; Calcium 0.89% - 0.23%; Magnesium 0.49% - 0.19%; Sulphur 0.31% - 0.16%; Boron 76ppm - 11ppm; Cooper 5ppm - 4ppm; Iron 205ppm - 177ppm; Manganese 17ppm - 17ppm and Zinc 36ppm - 32 ppm.

075

CONCENTRAÇÃO FOLIAR DE NUTRIENTES EM QUATRO ESPÉCIES FRUTÍFERAS NATIVAS DO CERRADO.

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Com o objetivo de conhecer as concentrações foliares de nutrientes de quatro espécies nativas da região do cerrado, estudou-se, em três condições diferentes de vegetação cerrado (MS), cerradão (MS) e cultivo comercial (coleção UNESP de Ilha Solteira), as espécies mangabeira (**Hancornia speciosa**); pequizeiro (**Caryocar brasiliensis**); pitangueira (**Eugenia** sp) e o marmeleiro do campo (**Alibertia sessil**). Para tanto, folhas colhidas nos quatros pontos cardeais na altura mediana da planta, foram analisadas quanto aos teores de N, P, K, Ca, Mg e S. Os resultados permitiram concluir que: no pequizeiro, apenas os nutrientes fósforo e cálcio apresentam concentrações diferentes em função das condições de vegetação. Na pitangueira, todos os nutrientes estudados apresentam maiores teores no tipo de vegetação cerrado, sendo iguais nas condições de cerradão e cultivo comercial. No marmeleiro do campo, apenas o teor de fósforo é menor na condição de cerrado e, na mangabeira, apenas os teores de fósforo e potássio apresentam diferenças significativas em função do tipo vegetação.

076

EFFECTS OF NPK FERTILIZERS ON THE NUT QUALITY OF CASHEW GROWING ON A FERRALLITIC SOIL

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The effects of eight combinations of NPK fertilizer treatments and a control were comparatively evaluated on mean cashew nut weight, percent kernel and shell components of nut, percent incidence of empty kernel cavities and percent incidence of kernel dry rot. This study has shown that while mean nut weight decreased significantly ($P < 0.01$) with fertilizing, from increased per unit yield, no adverse effects were observed on nut grade ratings. Differences between the treatments for percent kernel yield were significant ($P < 0.01$), with kernel yield increasing with fertilizer treatment to a maximum of about eight percent. Gain

in kernel yield was found to be inversely related to the incidence of empty kernel cavities. Differences in percent shell yield, on the other hand, was similar but showed an inverse trend to kernel yield above. However incidence of dry rot in the cashew kernel may not be nutrition-related. Levels of P and K fertilizing were seen to show good relationship with high nut quality. Incorporating a kernel/nut index into grading raw cashew nuts appears desirable.

PLANT PATHOLOGY

077

ALTERNATIVES FOR INTEGRATED CONTROL OF PAPAYA RINGSPOT .

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Papaya ringspot virus - type P(PRSV-P) causes a limiting disease for growing papaya (**Carica papaya**). Scientists from different countries have made efforts to establish permanent methods to control the disease, but it is still the major problem in many regions. The roguing of diseased papaya plants has been practiced successfully in Hawaii and in the State of Espírito Santo, Brazil. Although roguing program is not considered a permanent solution, it should be recommended especially for areas with partial geographic isolation and low aphids population, as they were found in the Ribeira Valley, São Paulo State, Brazil. Planting papaya under screenhouses is another alternative to be considered, especially for areas with high disease pressure and sensitive varieties. This strategy has been successfully used by many growers in Taiwan (personal observation by the first author). The selection of resistant or tolerant varieties is another alternative to reduce the damage caused by PRSV-P. Resistance or tolerance, when characterized by low concentration of virus in the plant, can also offer some field resistance. In association with a roguing program it can reduce the eradication rate of diseased plants. The smallest amount of virus in the plant can affect the transmission by the aphids. The use of cross protection with mild strains has helped papaya growers to produce a fruitful crop in Hawaii and Taiwan, in spite of some drawbacks of this control measure. In Brazil, the use of cross protection is still dependent on finding stable mild strains that will remain unchanged during the growth and bearing period of the crop. Integration of cross protection with tolerant varieties may be a way to overcome the problem due to the instability of the mild strain.

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078

EFFECT OF HOT-AIR AND HOT-WATER TREATMENTS OF PAPAYA FRUITS ON FRUIT QUALITY AND INCIDENCE OF DISEASES

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Various heat treatments have been used for disinfestation of fruit flies and the control of postharvest diseases on papaya since 1939. The U.S. Department of Agriculture currently allows only papaya treated with the forced air dry heat (FADH) or vapor heat (VH) to be shipped from fruit fly infested areas to the U.S. mainland. Both treatments take about 6 hours of gradually increasing temperatures and are completed when the fruit internal temperature reaches 47.2° C. Vapor heat differs from FADH only the 100% relative humidity during the last phase of treatment. Neither of the treatments were designed for controlling diseases although both provide some level of disease control. Vapor heat has demonstrated to be slightly better in disease control than FADH and fruit quality are comparable. The double hot-water dip (42°C for 30 min followed by 49°C for 20 min) quarantine treatment used in Hawaii from 1984 to 1992 also controlled postharvest diseases well but fruit quality suffered because fruit were required to be harvested at a mature green stage and the severe stress created by the treatment. Double-dipped fruits often had hard flesh, irregular ripening, scald and infection by **Guignardia** sp. and other fungi. The single hot-water dip (49°C for 15 min) is the optimum heat treatment for disease control of papaya diseases with minimal detrimental impact on fruit quality. The additional disease control provided by a single hot-water dip before or after FADH or VH is a about the same level provided by postharvest applications of the fungicide

thiabendazole applied to FADH or VH treated papaya.

079

RECENT RESEARCH PROGRESS ON THE CONTROL OF PINEAPPLE FUSARIOSIS IN BRAZIL

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Pineapple fusariosis caused by **Fusarium subglutinans**, is widespread in all growing areas in Brazil and the disease can limit the pineapple production. Yield loss of about 30-40% is common in the pineapple growing areas of the country. Current efforts to reduce losses rely mainly on the use of an integrated disease management with the cultural chemical and genetic controle methods. The use of pathogen free propagative material is very important to establish new orchards. Inoculum of **F. subglutinans** can be reduced by sanitation measures such as removal of crops debris and eradication of disease plants. Climatic conditions have a strong influence on the disease severity and the most susceptible period for infection of pineapple inflorescence occurs from forcing to the end of anthesis. Chemical control with benomyl fungicide at 0.05% a.i. is recomended to protect the inflorescences after forcing. New fungicide formulations have been evaluated under lab and field conditions and recomendation for the growers is to limit the number of sprays and to alternate benomyl with new sterol biosynthesis inhibitors fungicides. Biological control method is not currently used by the growers, because it was not proved to be efficient. The identified source of resistance have been inserted into cultivars with other desirable agronomic traits. Resistant cultivars Perolera and Primavera, and their hybrids with 'Smooth Cayenne' and 'Pérola' have been evaluated under greenhouse and field conditions and some of them could be readily adopted by farmers as new cultivars.

080

SIGATOKA NEGRA: POTENCIAL E ESTRATÉGIAS DE CONTROLE

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A sigatoka negra, causada por **Mycosphaerella fijiensis**, constitui-se no principal problema da bananicultura mundial, apesar de não estar presente em todos os países produtores, a exemplo do Brasil. Entretanto, a experiência vivida por países da América Central, principalmente Honduras e Costa Rica, onde a doença é endêmica, tem mostrado maior agressividade da sigatoka negra em relação à amarela, dificultando enormemente o controle. A disseminação da doença para outras regiões tem sido rápida e a sua constatação em países vizinhos, como Venezuela e Colômbia, representa uma constante ameaça à bananicultura brasileira, exigindo a definição e implementação de estratégias capazes de enfrentar o iminente problema. Quanto a isto, duas ações básicas poderão ser colocadas em prática: a) Controle químico - não pode ser descartado como alternativa, porém, pelas características da exploração da cultura da banana no país, somente seria exeqüível em áreas restritas de cultivo de modo a não comprometer o sucesso do método; b) Controle genético - para um país de bananicultura extensiva e de baixo nível tecnológico, esta é atualmente a única opção viável, considerando-se que os diversos estratos de produtores poderão ter acesso à tecnologia gerada, ou seja, aos genótipos resistentes. Este tipo de controle pode ter aplicabilidade imediata, visto que já existem no Brasil algumas variedades e híbridos produzidos pelo CNPMF/EMBRAPA resistentes à sigatoka negra, conforme avaliações realizadas em Turrialba, Costa Rica, mediante convênio firmado entre EMBRAPA/CATIE/INIBAP. A distribuição destas variedades e híbridos deverá ser iniciada estrategicamente pela Região Norte, onde há maior probabilidade de penetração da doença. Uma população de plantas resistentes, nesta região, funcionaria como barreira fitopatológica, retardando a chegada da doença nas regiões onde a bananicultura apresenta maior expressão econômica.

081

EVIDENCE THAT MYCOPLASMA-LIKE ORGANISMS ARE NOT ASSOCIATED WITH PAPAYA BUNCHY TOP DISEASE

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Mycoplasma-like organisms (MLO) have been reported to be associated with papaya bunchy top (PBT) disease. In the present study, all attemps to clone DNA of the putative MLO failed using several procedures used successfully to clone DNA of other MLO. Also, MLO were nor detected in hybridization assays using a DNA probe for a rRNA gene of MLO provided by B.C.Kirkpatrick. More evidence that MLO are not associated with PBT was obtained by application of polymerase chain reaction (PCR) technology for detection of MLOs. Total DNA was extracted from PBT-affected papaya tissues obtained from Puerto Rico, Costa Rica, Ecuador and Jamaica. Deng and Hiruki's primers, P1 and P6, were used as the standard Mollicute generic primers. Several other PCR primers for MLO DNA were also used. In all cases and under all conditions of stringency, buffer composition and PCR schedules, all positive control amplifications produced appropriately sized amplimers and all negative controls produced no correctly sized amplimers. No MLO DNA was detectable in diseased papaya samples. To further substantiate all the negative results for MLO DNA in PBT- affected papaya, petiole tissue from highly symptomatic plants from Puerto Rico, St.Croix and Costa Rica were examined using transmission electron microscopy. MLOs were not observed in any sample. Considering the results obtained in this study, the causative agent of PBT is probably not an MLO or a closely related Mollicute. Further studies are in progress on the etiology of PBT.

082

EFFECTIVE CONTROL OF PAPAYA RINGSPOT VIRUS THROUGH THE USE OF CROSS-PROTECTION, CLEAR ZONE AND ROUGHING OF SOLO PAPAYA IN THE BAHAMAS

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The PRV virus study was carried out on Eluthra island in the Bahamas. A mild nitrous acid-induced mutant (PRV HA 5-1) of papaya ringspot virus (PRV) was used in the inoculation of 15 ha of Solo Sunrise papaya. Seedlings were grown at the arm in a greenhouse using commercial cultural practices. The 4 to 5 leaf stage of papaya seedling was infected by applying inocula with a spray gun equipped with a 1.2 mm diameter nozzle, using pressure of 8 kg/cm at a distance of 20 cm. Each batch, enough plants for a 0.4 hectare planting, was inoculated twice before transplanting. From the 22.500 plants transplanted only 1.3% escapes were rouged with severe PRV. Papaya Ring Spot virus pressure was reduced by destroying diseased papaya plants within an 8.0 km radius from the farm.

083

FRUIT SET AND YIELD OF PAPAYA (*Carica papaya* L.) UNDER INTEGRATED MANAGEMENT TO REDUCE RINGSPOT VIRUSES EFFECTS

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The main limiting problem of papaya cultivation in Mexico is the papaya ringspot virus (PRV). This disease reduces yield and fruit quality. In looking for control alternatives measures several methods have been tested. Up to now the more effective one has resulted a combinations of integrated management practices. The objectives of this study were: to determine fruit set, to register PRV incidence and to evaluate fruit yield. Treatment tested were: integrated management practices (IMP), intensive management (In M) and control (C). Papaya plants responded best to IMP with the greatest: fruit set (19 fruits/plant); plant height (2.15 m) and stem diameter (8.02 cm). Plants in such treatment showed a delay on the onset of PRV during the first five months of plant growth; this was show also as the greatest fruit yield (28.5 ton/ha) as compared to the control treatment (17.8 ton/ha).

084

INTEGRATED MANAGEMENT OF PAPAYA IN MEXICO

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Isolated control measures have been ineffective for papaya ringspot virus (PRV) in Mexico, so the following actions were integrated (IPM) to attempt PRV control: 1) Seedbeds covered with an insect proof polypropylene mesh; 2) High density papaya plantings (4444 plants/ha) allowed roguing of diseased plants (however, cooperating growers were reluctant to follow this measure); 3) Foliar and soil nutrients to improve plant vigor (nutrient excess caused an overgrowth of IPM plants which became more severely attacked in the later part of the crop cycle); 4) Poisoned plant barrier (two lines of corn (**Zea mays**) and two of **Hibiscus sabdariffa** L.); 5) Two plastic strip, 5 cm wide and with a gray-metallic color above each papaya row of plants; 6) Biweekly sprays with 1.5% mineral oil (**Mexican citrolina**). Disease incidence was low in 1991 and very high in 1992 in the area where the plots were established. Severity was assayed with an arbitrary scale in which 1= healthy plant; 2= initial mosaic symptoms; 3= definite mosaic symptoms; 4= mosaic and leaf distortion symptoms; 5= defoliated plants with some young diseased leaves and 6= dead plants. Non prarametric analysis showed a median of 1 in IPM versus 3 in control plots five months after transplanting. Two months later control plants had a new flush of leaves with mild mosaic which gave a lower median (2) than the first evaluation (3). Two months later control plants had a median of 4. Severity increased in IPM plants in the following two evaluations to 4 and 5 respectively. Despite the overgrowth of plants and the deficiency in roguing yields in IPM and control plots were 28 and 17 Ton/ha respectively. Aphid populations were similar in both plots.

085

EFFECT OF PAPAYA RINGSPOT VIRUS IN THE PHYSIOLOGY OF PAPAYA IN MEXICO

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Papaya ringspot virus (PRV) is the main limiting factor in the productivity of papaya in Mexico. Disease symptoms consist of mosaic, distortion and yellowing of leaves. The effect of PRV in the plant was measured in two crop cycles (1991-92) in 9 months- old plants in the State of Veracruz. Gas interchange was measured in leaves located at five levels in the plant canopy (youngest and oldest leaves in levels 1 and 5 respectively) at four times during the day (9:00, 11:30, 14:30 and 17:00 h) with a portable photosyntesis equipment (LI-6200, LI-COR, Inc). Healthy leaves at levels 2 and 3 had the highest photosynthetic rate (PHOTO) (16.3 and 13.6 µmol CO_2 m^{-2} s^{-1}), transpiration rate (7.5 and 6.7 µmol H_2O m^{-2} s^{-1}) and stomatic conductance (0.58 and 0.51 cm s^{-1}). Healthy leaves in the youngest (level 1) and oldest level (5) had the lowest PHOTO. Yellow leaves had the lowest PHOTO (0.057), followed by distorted leaves (11.3) and by leaves with mosaic symptoms (13.6). Highest photosynthetic activity was registered from 9:00 to 14:30 h, and was nil at 5:00 in all plant levels. PHOTO differences between levels were minimized in diseased leaves because the most active leaves (2 and 3) reduced their PHOTO in 25% and the least active (1 and 5) increased it in 40%.

086

PAPAYA DISEASES IN THE ESPIRITO SANTO STATE, BRAZIL

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The papaya (**Carica papaya** L.), 'Solo' e 'Formosa' groups, are grown in the Espírito Santo State, with about 5,000 ha. Orchard and postharvest diseases are very important in reducing yield and market quality of papaya fruits. Papaya ringspot potyvirus (PRV) is present in all growing areas. The weekly roguing associated with the erradication of old and improductive orchards are recomended; The 'meleira' (sticky disease) is other limiting problem for papaya growers. The disease is characterized by intense exudation of a fluid latex from the fruits, which darken when oxidized. The disease is associated with isometric viruslike particles restricted to laticifers. **Corynespora** sp. and **Mycosphaerella** sp. [Anam: **Phoma caricae - papayae** (**Ascochyta caricae - papayae**] and **Asperisporium caricae** are present in all orchards but only the two latest pathogens have been causing important losses. Other minor diseases are damping-off (**Rhizoctonia** sp.), root rot (**Phytophthora** sp.), and powdery mildew. The fruit diseases are of threre general types: surface rots, stem-end rots and internal fruit infection. The first includes the diseases usually iniciated in the field at early stages of the fruit development (anthracnose and chocolate spot, both caused by **Colletotrichum gloeosporioides**, which are the principal postharvest diseases). Other surface and stem-end rots are caused by fungi that infect fruits through wounds (**Mycosphaerella**, **Phomopsis**, **Fusarium**, **Botryodiplodia**, **Phytophthora**, **Alternaria** and **Rhizopus**). Internal fruit infections are caused by **Fusarium** sp. (internal smut), and **Erwinia** sp. (Purple-stain).

087

OCCURRENCE OF FRUIT AND STEM ROT OF PAPAYA CAUSED BY *Phytophthora palmivora* IN THE ESPIRITO SANTO STATE, BRAZIL

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Fruit and stem rot of papaya (**Carica papaya** L.) was observed in Linhares county, in november 1992. An Oomycetes was recovered from lesions on fruit. Koch's rules were completed and the fungus reproduced the symptoms observed in the field and also root rot when inoculated in the root system. The pathogenic isolate was identified initially as **Phytophthora** sp., showing in carrot-agar media (CA) papillate, ovoid, ovoid-obpyriform, ellipsoid and caducous (in water) sporangia [55 x 27 µm (34-68 x 20-37 µm)] with 2:1 length-breadth ratio, pedicel lenght: 3,0 µm and papilla: 6,0 x 9,0 µm (height x breadth). it is heterothallic (A_2 mating type) and when paired with **P. capsici** A_1, few sexual structures were produced. It showed amphigynous antheridia, X = 16,2 x 13,7 µm (11,5 - 23,5 x 11,3 - 14,8 µm); Oogônio X = 25,7 µm (23,4 - 29,2 µm); hyaline and plerotic oospores with thick wall [diameter: 22,7 µm (21,1 24,2 µm)]. in despite of the pathogenic isolate did not produce chlamydospores in water neither in old cultures in CA, it produced chlamydospores on inoculated fruits. Detached fruits were wounded and inoculated by micelial-discs, showing after two days lesions and after three to five days, the pathogen produced sporangia and minor quantity of chamydospores [diameter 23,1 µm (18,4-28,6 µm), with wall thickeness, 1,7 µm], wich were predominantly terminal and rarely intercalary. The pathogen was identified as **P. palmivora**. The occurrence of this disease is restrict and it did not cause important losses. This appers to be the first report of the disease in Brazil.

088

QUALITY AND INCIDENCE OF POSTHARVEST DISEASES OF MARKETED PAPAYA FRUITS IN THE SUBMÉDIO SÃO FRANCISCO REGION, BRAZIL

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Fresh papaya fruits from several supermaket chains of the Submédio São Francisco region were sampled during wet and dry months of the years 1992 and 1993. Type of fruits, skin and pulp color, total weight, placenta + seed weight, pulp and skin percentage, fruit length and diameter, pulp thickness, soluble solids (SS), acidity, SS/acidity ratio, and pH were analysed. Sensorial evaluations were conducted. Marketed papaya fruits rots caused by fungi were studied in order to identify the aetiology. Fungi identified included: **Alternaria altenata**, **Aspergillus** spp., **Botryodiplodia theobromae**, **Curvularia** sp., **Fusarium** sp., **Penicillium** sp., **Phoma caricae-papayae**, **Rhizophus** sp. and **Stemphylium** sp. The differences in fruit quality bettween wet and dry months were described.

089

PINEAPPLE BREEDING FOR RESISTANCE TO FUSARIOSE IN BRAZIL; RESULTS OBTAINED

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The Brazilian Enterprise for Agricultural Research through its National Research Center for Cassava and Tropical Fruit Crops, has been carrying on a pineapple breeding program aiming to obtain cultivars showing resistance to fusariose, a disease caused by the fungus **Fusarium subglutinans**, which is the main problem in the pineapple cultivation in Brazil, causing yield losses of about 30%. Perolera and Primavera, resistant to fusariose, have been crossed with Smooth Cayenne and Perola, susceptible to the pathogen, in order to obtain segregating populations. The evaluations for resistance have been carried out in seedlings by wounding them in the base and dipping them in an inoculum, 10^5 conidia/ml, for 3 minutes. Genotypes showing resistance to fusariose have been transferred to field where other horticultural characteristics were evaluated. The evaluation of 11,739 hybrids, during the sexual cycle, made it possible to select 19 genotypes, that showed total solid soluble equal or higher than 14°, titrable acidity from 5.5 to 10 meq/ml, among other desirable characteristics. The genotypes which keep those characteristics during the clonal evaluation will be recommended as cultivars resistant to the pineapple fusariose.

090

PERFORMANCE OF PINEAPPLE FUSARIOSIS-RESISTANT GENOTYPES

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The most appropriate method to control the pineapple fusariosis (**Fusarium subglutinans** f. sp. **ananas**) is to plant resistant cultivars. The strategy to control the disease in Brazil targeting the genetic incorporation of host resistance, was initiated by EMBRAPA/CNPMF and EMCAPA. Screening for fusariosis resistance on vegetative plant parts and fruits were performed under greenhouse conditions, during 1989-1993 on the 11 cultivars and 16 hybrids obtained from crosses of cv. Smooth Cayenne (susceptible) and cv. Perolera (resistant). The wounded plants were inoculated at the vegetative stage by immersing the base of the slips in a inoculum suspension (10^5 conidia ml^{-1}) for 3 minutes and, at the flowering stage with 100µl of the inoculum into the inflorescence. Cultivars Pérola and Smooth Cayenne were used as suscetible control. Many genotypes that showed resistance in the vegetative stage were susceptible in the inflorescence stage. Hybrids displayed variation in disease reaction, qualitative morphological traits and yield parameters. Mean disease severity scores for disease were ranged from 0 (zero) to 100% over different pineapple genotypes. Resistance was found when the cultivars Perolera, Primavera, Alto Turi and Amarelo Ueapés were inoculated in the fruits. Among the early selected 16 hybrids for their increased fusariosis resistance in the vegetative stage, 11 were resistant to fruit rot. Promising breeding materials are currently undergoing trials in several environments in order to assess their yield stability and disease resistance. Improved **Fusarium** resistant genotypes could be readily adopted by the farmers as new cultivars.

091

PHYTOSANITARY TREATMENT ON SOURSOP (*Annona muricata* L.)

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This research had as its purpose the identification of an efficient phytosanitary treatment in the elimination of fungi and that does not interfere in soursop quality. The fruits harvested at the mature stage were submitted to different sanitizing conditions: water at 55°C for 5 minutes, water at 50°C for 10 minutes, acetic acid solution at 2.0% for 20 minutes, active iodine solution at 50 ppm for 20 minutes and active chlorine at 100 ppm for 20 minutes. Next the fruits were dryed and stored, without any package, at ambient temperature (27°C) and relative humidity of 85%. The control group received only the common procedure to all samples, washing with filtered current water and later drying and storage. Acetic acid, chlorine and iodine were inefficient to desinfect this fruit, according to the microbiological control (counting of moulds and yeasts) and visual observations (color, flavor and texture), when the fruits reached the full ripe stage. However, all the procedures promoted an aroma decline which resulted the least positive aspect. Considering these results, the treatment using water at 55°C for 5 minutes was elected as the preferential one, for beyond its fungicide efficiency and edible quality maintenance, represented a greater agility and economy in the storage process of soursop harvest.

092

PRELIMINARY EPIDEMIOLOGICS STUDIES OF 'WHITE SPOT' (*Cercospora* sp.) AND 'ZONE SPOT' (*Sclerotium caffeicola*) IN SOURSORP IN RIO BRANCO-ACRE, BRAZIL

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The incidence and severity of 'White Spot' (**Cercospora** sp.) and 'Zone Spot' (**Sclerotium caffeicola**) were evaluated in 3 varieties of soursop (**Annona muricata** L.): Colombiana, IPA and RBR, at the Center of Agroflorestry Research of Acre (CPAF-ACRE/EMBRAPA). The incidence and estimated severity percentage were obtained with the visual evaluation the samples of 10 leaves collected of 53 trees and with the determination the number of leaves and leaf area attacked, alike methodology of LARGE (1969) and ROYOS & ZARATE (1985). The incidence percentage of 'White Spot' in the varieties Colombiana, IPA and RBR was 100% and the estimated severity were 56%; 68% and 56%, respectivily. These results indicate that this disease, for affect more than 50% of leaf area, promoting a heavy defoliation of the trees, necessiting the estudies for the development efficacious methods of control. The 'Zone Spot', obtained 77%; 25% and 46% of the incidence, and 24%; 6% and 7%; of severity, respectivily for the 3 varieties. The Colombiana variety obtained major incidence and severity as percentage, and the RBR variety, is spite of, exhibit high relative incidence, obtained a smaller severity, behaving as a tolerant variety.

093

EVALUATION OF MIXTURES OF FUNGICIDE WITH MINERAL OIL TO CONTROL BANANA YELLOW SIGATOKA (*Mycosphaerella musicola*)

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Between November 92 and June 93 a field experiment was carried out in order to test several mixtures of mineral oils with fungicides and emulsifiers to control yellow Sigatoka. Treatments were performed on a 15-year-old plantation of the Cv. Nanica in Miracatu region SP, Brazil, and comprised the following dosages in l/ha: 1- mineral oil (M. O.) + propiconazole CE 25% (12 to 15 l + 0.4 l), 2- emulsifiable mineral oil (E. M. O.) + propiconazole CE 25% + H_2O (2 l + 0.4 l + 18 l), 3- E. M. O. + propiconazole CE 25% + H_2O (2 l + 0.4 l + 18 l), 4- E. M. O. + tebuconazole CE 25% + H_2O (2 l + 0.5 l + 18 l), 5- M. O. + tebuconazole CE 25% (12 to 15 l + 0.5 l), 6- M. O. + pyrazophos CE 30% (12 to 15 l + 1.5 l), 7- M. O. + carbendazim SC 50% + E. M. O. (12 to 15 l + 0.5 l + 0.6 l), 8- chlorothalonil SC 50% + H_2O (2 l + 18 l), 9- M. O. + bromuconazole CE 20% (12 to 15 l + 0.625 l), 10- M. O. + methyl thiophanate SC 50% + E. M. O. (12 to 15 l + 0.8 l + 0.6 l), 11- M. O. + epoxiconazol CE 12.5% + E. M. O. (12 to 15 l + 0.24 l + 0.6 l), 12- M. O. (12 to 15 l). The treatments 1 to 12 were apllied in blocks of 2,000 to 3,000 m^2. Spraying was performed at intervals of 3.5 to 5 weeks by using a back - back power-sprayer. The evaluation for each treatment was done in June, at random, considering 10 plants with bunches ready to harvest, and 10 plants in blooming stage. For analysis and interpretation of the efficiency of the tested combinations, the Martinez's system was used. In this system, the exception of treatments 12, all the remaining treatments ranked in the degree 5 (efficiency between 90% and 99%), indicating a very good control of the yellow Sigatoka.

094

SELEÇÃO DE PORTA-ENXERTOS DE MANGUEIRA (*Mangifera indica* L.) RESISTENTES AO FUNGO *Ceratocystis fimbriata* ELL. & HALST AGENTE CAUSADOR DA SECA

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A cultura da mangueira apresentou um extraordinário desenvolvimento em nossas condições nos últimos anos. Juntamente com este crescimento da cultura aumentou o risco da incidência em caráter epidêmico da seca da mangueira causada por **Ceratocystis fimbriata** Ell. & Halst. Foi estudada a variabilidade patogênica de **C. fimbriata** através da inoculação de 41 isolados do patógeno, obtidos de diferentes hospedeiros, em plantas de mangueira ' Alda', 'Vitória', "Itaparica",'Coquinho' e 'Jasmim'. A reação de resistência ou suscetibilidade apresentada pelas plantas inoculadas permitiu agrupar os isolados em 9 classes. Plantas resistentes a **C. fimbriata** foram selecionadas pela inoculação de isolados das classes 1 e 9, através do método rega do solo, sendo que os materiais 'Carabao', 'Manga d'água' e 'Pico' mostraram alto nível de resistência.

PLANT PHYSIOLOGY AND BIOCHEMISTRY

095

PRELIMINARY STUDY OF PACLOBUTRAZOL (PP333) EFFECTS ON GREENHOUSE PAPAYA (*Carica papaya* L.) IN THE CANARY ISLANDS.

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When cultivated in greenhouse in the Canary Islands, the papaya (**Carica papaya L.**) cultivar Sunrise experiences rapid growth with sidely separated internodes. First flowering occurs at a greater plant height, with reduced fruit production. Foliar (PF) and soil (PS) applications of paclobutrazol were applied twice to plants of 25-30 cm in height, at a dosage of 1000 ppm, to study its retardant effect; vegetative and production development were monitored over a 20-month period. Results show that soul application significantly delays flower initiation and reduces both overall plant height and the height at which first flowers are emitted, although it does not affect the moment at which production begins. No significant differences in yearly fruit production are found for either PF or PS treatments. Hermaphrodite fruits of treated plants (PF and PS) show higher than usual total soluble solids (TSS) content, although female fruit register the highest TSS percentages.

096

CHANGES IN THE CONCENTRATION OF TOTAL VITAMIN C DURING MATURATION AND RIPENING OF CAMU-CAMU (*Myrciaria dubia* (H.B.K.) McVaugh) FRUITS CULTIVATED IN THE UPLAND OF BRAZILIAN CENTRAL AMAZON

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The Amazon has a great number of exotic fruit species in wild state. Among these species, outstand camu-camu (**Myrciaria dubia** (H.B.K.) McVaugh), which occurs as a wild species in areas subject to periodical flooding, and which cultivation in the upland has been recently initiated. Aiming at contributing to the knowledge of its quality as food in the Amazon itself, camu-camu fruits from plants in adaptation to the soil climatic conditions of upland kept in the Tropical Fruits Experimental Station of National Amazon Research Institute, were evaluated at 56, 71, 85, 95, 104 and 113 days after anthesis. Analysis of variance (F test at 1% level) showed a highly significant effect of maturation and ripening stages on fruit composition. Pulp content increased from 79.75 (56 days) to 83.16% (113 days). Total vitamin C increased from 2489.33 (56 days) to 3133.06 mg/100 g of flesh pulp at 113 days after anthesis.

097

OCORRÊNCIA DE "BROTAÇÃO DE RADÍCULA" E "COLAPSO INTERNO" EM MANGA 'PARVIN', 'KEITT' E 'TOMMY ATKINS', NA REGIÃO DE JABOTICABAL-SP.

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Verificou-se em mangas 'Parvin', 'Keitt' e 'Tommy Atkins', durante 1991/1992 e 1992/93 a incidência de desordens fisiológicas. Na manga 'Parvin' em 1991/92, a incidência de brotação de radícula da semente foi de 25,9 à 47,6% e de 12,5 à 37,0% de 'colapso interno', quando os frutos foram armazenados sob condições ambientais (27,2±1,44°C; 71,5±6,20% UR) ou de 5,5 a 28,6% de 'brotação de radícula' e 8,3 a 27,8% de 'colapso interno', quando armazenados sob refrigeração (14,0°C; 56,0% UR), por 21 dias antes de serem levados ao ambiente (29,0±0,65°C; 58,8±2,68% UR). Na safra 1992/93 a manga 'Parvin', apresentou incidência de 'brotação de radícula', de 23,5 a 66,7%, quando armazenada sob condições ambientais (25,4°C; 78,7% UR). A 'Keitt' mostrou na safra 1991/92 'brotação de radícula' de 13,3 a 20,0% e 13,3% de 'colapso interno', sob condições ambientais de armazenamento (27,8±19,4°C; 64,6±2,07% UR), ou de 0,0% de 'brotação de radícula' e 8,3% de 'colapso interno' do fruto, quando sob refrigeração (14,0°C; 56,0% UR), antes de serem levadas ao ambiente (26,7±1,15°C; 68,8±5,09% UR). Para a 'Tommy Atkins', na safra 1992/93, a incidência da 'brotacão de radícula' nos dois ambientes foi 0,0% enquanto que o 'colapso interno' variou de 5,3 a 20,0% nas condições ambientais de armazenamento (25,6±1,13°C; 77,0±5,47% UR) ou de 7,1 à 9,1% quando sob refrigeração (13,3°C, 61,5% UR), antes de serem levadas ao ambiente (24,7± 0,92°C; 81,5±3,48% UR).

098

QUALITY OF MANGOES (*Mangifera indica* L.) cv. 'Tommy Atkins' UNDER THE INFLUENCE OF PREHARVEST Ca AND B SPRAYING ON FRUITS

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Mangoes cv. 'Tommy Atkins' were sprayed with Ca and B solutions (40000 and 3000 ppm respectively) sixty days after anthesis. Fruits were harvested green mature and kept at 27°C and 70-85% RH. The pH, soluble solids, titrable acidity, sugars, vitamin C, pectins and minerals results were tabulated. Pre-application of Ca on fruits increased content of this mineral in pericarp and mesocarp. Application of B increased this mineral content only in pericarp. Application of these minerals does not alter pH, total titrable acidity, and reducing sugars. At the beginning of maturation, Ca retards the increase total soluble solids, total sugars and soluble pectin, besides enhancing ascorbic acid content.

099

DRY MATTER PRODUCTION AND DISTRIBUTION IN PLANTS OF "INGÁ" (*Inga vera* Wild.) AND "AÇAI" (*Euterpe oleracea* Mart.) GROWN UNDER ROOT SYSTEM FLOODED CONDITIONS

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This work was developed in Lavras-MG and the treatments consisted of two levels of oxygen in the flooded substrat. After 55 stress days the accumulation of dry matter was decreased about 10% in the whole açai

plants; 26% in the leaves and 8.3% in the stem + petiole while the accumulation in the root increased 21%. In ingá plants, the shoot and root dry matter accumulation decreased 25% and 76% respectively; the effects of inundation increased the partition of photosynthate to the development of adventitious roots, it permitted ingá plants survive in these conditions. Flooding of root system did not change significantly the açai growth rate and therefore this species is more recomended to be grown in enviroment subject to periodic inundations.

100

DIFFERENT SEQUENCE EFFECT OF SOME GROWTH REGULATORS ON THE BUD BURST OF 'Starkimson' APPLE TREES GROWN IN EASTERN LIBYA, ÁFRICA.

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Similar and even-aged 'Starkimson' apple trees grown in a orchard at Al-Marj, Eastern Libya; were sprayed in March once or twice in 1987 and 1988 with Sandolin-A (4%), GA3 (500ppm), Thiourea (2%), Potassium nitrate (7%) and Ethylene-chlorohydrine (50 ppm) in different sequence combinations, in addition to a control treatment consisting of distilled water. The proportion of bursted buds from total initial present buds, that were previously counted and tagged, was significantly higher under double spray treatments than under single chemical application, whether measurements were taken two or four weeks after first bud bursts were noticed. Moreover, trees sprayed the second time with Sandolin-A in two consecutive years had significantly higher bud openings than those sprayed in other sequence combinations. Thiourea + Sandolin-A treatment was most effective with 65.7% bud bursts, followed by Ethylene-chlorohydrine: 60.6%, two weeks after initial bud bursts. However, all single sprays showed significant inhibitory effects since they caused significantly less bud opening than under sprayed distilled water. This fact combined with results obtained from two-spray treatments suggested a carryover effect of apparently less effective chemicals onto the second year.

101

MANGO FLOWER INDUCTION BY KNO_3 AND ETHEFON SPRAYING

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In 1991 and 1992 year crops it was studied the effect of four spraying of potassium nitrate at 2,3 and 4% and ethefon at 0,1% alone and in combination weekly in April each year, 3 months before the normal flowering time in the 'Tommy Atkins' mango trees, having in view to antecipate the flowering. The eleven treatments were replicated 3 times with 3 trees each parcel. The results did not show differences in order to antecipate the flowering, nor the picking time. It was observed a phytotoxic effect of the KNO_3 at 3 and 4% in leaves, burning the apical parts. The flowering occurred in sprouts of different age and show no related to the age of the stem.

POSTHARVEST HANDLING AND STORAGE

102

PROBLEM: HOW TO MAINTAIN QUALITY IN THE PROCESSING AND PACKING OF MACADAMIA

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Solutions: Quality in Quality Out - Rubbish in Rubbish Out Outline:
Growing and Harvesting: Dictates the quality of the macadamia to be processed. All efforts must be made to ensure the highest quality nut is delivered to processor. Harvesting should take place once fortnightly or once weekly in wet periods. **Dehusking and Inspection:** Should eliminate reject nut in shell and all trash and husk for efficient drying. On farm aerated wet in shell storage should be used to hold product. **Drying and Storage:** Can control the amount of deterioration of macadamia before processing. capacity of dryers should be linked to harvesting. **Processing:** Cracking - Should cause minimum amount of damage to kernel. Cracker should be of high quality but only dictates the outcome to a point. Separation - Should be as gentle as possible. Dry separation only should be used. Inspection - Trained staff should be utilised. Most skilled staff should conduct final inspection. **Packing:** Quality of equipment is essential. Quality of packing material is essential. **Laboratory:** Should monitor all processes to ensure quality is meeting standards set. **General:** Hygiene of incoming product to receival station should be kept high. Hygiene of all equipment is essential. hygiene of everybody or re-entering the factory is essential. **Summary:** The system for dehusking of nut in husk through to packing of kernel should be well planned for present and future developments and should be as continuos a process as possible. The entire processing system should be of high quality and efficienty in the passing of nut in shell to packing in a minimum of time. Quality kernel is produced on the tree, that quality has to be maintained throughout the complete process.

103

INFLUENCE OF WAXING ON THE QUALITY OF PAPAYA FRUIT DURING STORAGE.

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The effect of waxing on quality of papaya fruit during storage at room temperature (20-25°C) and at 10°C and 85%±5%RH was determined. Fruits were harvested at the color break stage and treated within 24 hours by immersion into hot water bath (20 min at 47-49°C). Fruits were then dipped for 2 minutes into various Stafresh wax dilution ratios: 1:0, 1:2 and 1:4 (wax: water). Weight loss was determined by weighing four fruits; skin color were evaluated for "L", "a" and "b" Hunterlab values at the equatorial portion fruit; deformation force was measured by a texture analyser fitted with a 5mm probe during storage. Flavour was evaluated by Duo-trio test at the edible stage. There was a linear rate in weight loss of papaya during storage at 10°C and at room temperature. Waxing significantly reduce weight loss. Waxing reduce the rate of degreening and delayed skin softening at room temperature. Off-flavour was noticed in fruit waxed with 1:0 dilution. No off - flavour was noticed with the other dilutions.

104

POST HARVEST CONSERVATION OF FRUITS OF *Carica papaya* L. CV. IMPROVED SUNRISE SOLO LINE 72/12 WITH THE USE OF PROTECTOR FILM AND WAX UNDER AMBIENT CONDITIONS.

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Fruits of **Carica Papaya** L. cv. Improved Sunrise Solo Line 72/12 were treated with heat (49°C; 20 minutes) and cooled in suspension of benomyl 500ppm (20°C; 5minutes). After this procedure, these fruits were submitted to the following treatments for postharvest conservation: packing-sheet of stretchable PVC ("Vitafilm polivinyl e chloride); plastic bag under partial vacuum (poliethylene 60-micra); immersion in "Sta Fresh" wax at the dilution of 3:7; immersion in wax (3:7) + benomyl 500 ppm. "Vitafilm promoted fruit conservation for a longer period (15 days), so as a slower weight loss and a good development of the external color without disadvantage as to fruit quality. The plastic bags stopped weight loss and color evolution without irreversible damage to the ripening (13 days). The use of wax did not affect fruit conservation. The fruit contents of epicarp, pulp and water were not affected by the treatments, so as the titratable acidity and the contents of total and soluble carbohydrates.

105

POSTHARVEST CONSERVATION OF FRUITS OF *Carica papaya* L. CV. IMPROVED SUNRISE SOLO LINE 72/12 WITH THE USE OF PLASTIC BAG UNDER PARTIAL VACUUM, ASSOCIATION THE REFRIGERATION.

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Fruits of **Carica Papaya** L. cv. Improved Sunrise Solo Line 72/12 were treated with heat (49°C; 20 minutes) and cooled, in suspension of benomyl 500ppm (20°C; 5 minutes). In this experiment, the association between the modified atmosphere by means a plastic bag (polietileno, 60 micra) under parcial vacuum, under different periods of refrigeration (12°C; 85-90% UR). The plastic protection retains the loss of weight and external color evolution, but these process normaly occured after the fruits were taken, from the plastic protection. The percentual of polp, epicarp and water were not affected by the tratments. The contents of total soluble solids, acidy and total carboydrates were affected by the treatments. The association between a plastic bag under partial vacuum and cooling allowed a gain in the useful life of fruits, in other words from 12-10 days to 26-29 days, withoud any considerable damage, to the metabolism or to their quality.

106

POST HARVEST CONSERVATION OF FRUITS OF CARICA PAPAYA L. CV. IMPROVED SUNRISE SOLO LINE 72/12 WITH THE USE OF STRETCHALE PVC, ASSOCIATION THE REFRIGERATION.

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Fruits of Carica Papaya L. cv. Improved Sunrise Solo Line 72/12 were treated with heat (49°C; 20 minutes) and cooled in suspension of benomyl 500ppm (20°C; 5minutes). Diferent periods of refrigeration (12°C; 85-

90% UR), covering the fruits with packing-sheet of stretchable PVC ("Vitafilm" - polovinyl choride). The association increase the useful life of papaya to 5 and 8-11 days, related to the fruits kept under refrigeration 10 or 20 days respectively, when compared to other fruits kept under enviromental conditions (11 days).

107

DETERMINATION OF MACADAMIA NUTS MECHANICAL CHARACTERISTICS

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This is a preliminary investigation of macadamia nuts mechanical characteristics looking for obtain elements for the project of mechanisms to the shell rupture and separation of shell kernels. The nuts utilized, variety 660, stored for one year, were with moisture content average of 10,64%. Through a compression test between parallel plain dishes, were determined for the longitudinal direction with the deformation velocity of 0.3 m/s, the rupture maximun force, correspondent deformation and the total deformation applied. The four longitudinal diameters selected were of 20, 21, 22 and 23mm and presented, respectively for 10 repetitions, the following medium values:
Rupture maximum force - 183.97 kgf; 161.81 kgf; 200.53 kgf and 170.99 kgf.
Deformation in maximum force - 1.512mm; 1.368mm and 1.32mm
Total deformation - 3.066mm; 3.276mm; 3.078mm and 3.38mm
It was also obtained, a proporcional yield for the analysed diameters of:
20mm - 50% holes, 50% halves;
21mm - 40% holes, 40% halves, 20% insect damage;
22mm - 50% holes, 40% halves, 10% insect damage;
23mm - 50% holes, 30% halves, 20% insect damage.

108

DETERMINATION OF THE PHYSICS PROPERTIES OF MACADAMIA NUTS

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This work was realized with macadamia nuts of different comercial varieties. For determination of some physical properties as preliminar analisys for machinery and equipaments project for processing and storage of the nuts. The nuts utilized were moisture content of 12% and for the tests were obtained the following results, average of 5 repetitions:
Specific gravity = 0,582 g/ml
Porosity (in soybean oil) - 25 nuts = 38,15%
- individual nut = 26,16%
Porosity (in distilled water) - 25 nuts = 46,60%
- individual nut = 26,16%
Angle of repose = 29,05°; tangent = 0,555
Internal friction - coefficient of friction = 0,7017
Surface friction - wood = 0,3681
- galvanized steel = 0,3165
- plywood = 0,2335

109

QUALIDADE DE NOZES, DE CINCO CULTIVARES DE MACADAMIA, PRODUZIDAS NOS ESTADOS DA BAHIA E ESPÍRITO SANTO.

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Foram analisadas nozes de macadamia, dos cultivares 344 (kau), 508 (Kakea), 660 (Keaau), 741 (Mauka) e 800 (Makai) produzidas em duas fazendas situadas nos munícipios de Taperoá e São Mateus, estados da Bahia e Espírito Santo, respectivamente. Amostras de três kg de nozes de cada cultivar foram colocadas em estufa de circulação forçada de ar à temperatura máxima de 45°C até alcançar umidade de 1,5%. Três sub-amostras de 100 nozes de cada cultivar foram pesadas individualmente e quebradas manualmente. Avaliou-se o peso médio e rendimento de amêndoa, percentagem de amêndoa grau 1 (> 75% de óleo) e recuperação de amêndoa (produto do rendimento de amêndoa e amêndoa grau 1). Os cultivares apresentaram amêndoas com algumas características diferentes nos dois locais. O peso médio das amêndoas variou de 1,54 (cv.741) a 2,54 (cv. 344) na Bahia e de 1,52 (cv. 660) a 2,06 (cv. 800) no Espírito Santo. O maior rendimento de amêndoa na Bahia foi obtido pelo cv. 508 (34,44%) e no Espírito Santo pelos cultivares 741 e 800 (33,95% e 33,40% respectivamente). Os cultivares 344, 508 e 800 na Bahia e, 508 e 800 no Espírito Santo apresentaram percentagens de amêndoas grau 1 superior a 95%. O cv. 741 apresentou o menor valor de amêndoas grau 1 tanto na Bahia (69,37%) como no Espírito Santo (88,16%). Na Bahia o maior valor de recuperação de amêndoa grau 1 (33,91%) foi do cv. 508 e o menor para o cv. 741 (20,14%) enquanto no Espírito Santo o cv. 344 obteve o resultado mais baixo (26,10%) diferindo dos demais cultivares que apresentam valores em torno de 30.

110

POSTHARVEST CONSERVATION OF CUPUASSU FRUITS (*THEOBROMA GRANDIFLORUM*) (WILLDENOW EX. SPRENGEL) SCHUMANN) IN NORMAL ENVIRONMENTAL CONDITIONS.

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During the storage in environmental conditions (temperature 27±3°C and relative humidity of 86 +/- 5%) the following parameters were evaluated in cupuassu fruits: spoilling degree, pH, lost of weight, densidity, moisture content, total accidity, soluble solids, Brix accidity ratio and sensorial analysis. The spoilling of the pulp started at the 5th day. At the 15th all fruits already showed deterioration. The weight of fruits fall until 31% at the 15th day and the densidity decreased was followed by decrease of the weight of the fruits. The moisture content and pH of the pulp increased while the total accidity and soluble solids decreased during the period. The sensorial analysis showed the normal acceptance of the fruit juice quality until the 13th day. It was concluded that to mantain the quality and avoid the loss of the fruits, the utilization of fruits should happen in a period no longer than five days after harvesting, when storage was under normal environmental conditions.

111

POSTHARVEST CONSERVATION OF CUPUASSU FRUITS (*THEOBROMA GRANDIFLORUM*) (WILLDENOW EX. SPRENGEL) SCHUMANN) IN LOW TEMPERATURE CONDITIONS.

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During the storage in low temperature conditions (temperature 10±2°C and relative humidity of 65±3%) the following paramenters were evaluated in cupuassu fruits: spoilling degree, lost of weight, densidity, moisture content, pH, total accidity, soluble solids, Brix/acidity ratio and sensorial analysis. The deterioration of the pulp started only in the 15th day. At the 30th all fruits have showed spoiled pulp. The loss of weight reached 32% at the 30th and the densidity decreased during the storage. There was increase in the pulp pH and in the Brix/accidity ratio and a decrease in the total accidity. The juice sensorial analysis showed a drop in acceptance of the tasters, starting from the 15th day of storage after harvesting. It was concluded that to maintain the quality and avoid the loss of fruits, the utilization of fruits should happen in a period no longer than 15th days after harvest, under the temperature conditions studed.

112

CONSERVATION OF CUPUASSU (*THEOBROMA GRANDIFLORUM*) PULP UNDER COLD TEMPERATURE CONDITIONS.

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The botanical species **Theobroma grandiflorum** Schum is frequently know as cupuassu, is emerging as great potential in the food industry, of which the pulp is consumed in various ways. The present study was conducted with the objective to observe the most adequate storage pulp conservation without the pasteurization or chemicals preserves utilization. Amongst the temperatures to which the pulp was exposed, the one which gave the best results, bath microbiologically and bromatologically, was that - - 12°C, which is the one recomended for storing the pulp between the harvests.

113

CONSERVAÇÃO "*IN NATURA*" DE MANGAS 'PARVIN' COM USO DE COBERTURAS, EM CONDIÇÕES AMBIENTAIS E SOB REFRIGERAÇÃO.

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Frutos de manga 'Parvin', foram colhidas em 1992/93 no estágio "de vez". Divididos em dois lotes de 200 frutos e submetidos a 5 tratamentos de 40 frutos cada, foram mantidos em dois ambientes. O 1° lote sob condições ambientais (27,2±1,44°C; 71,5±6,2% UR) e o 2° lote sob refrigeração (14,0°C; 56% UR) foi mantido, durante 21 dias antes de ser levado ao ambiente (29,0±0,65°C; 58,8±2,68% UR). Os tratamentos foram: TA e TG = testemunhas; THA e THG = testemunhas com hipoclorito; TTA e TTG = tratamento térmico em TBZ a 1000 mg/litro; TTVA e TTVG = tratamento térmico e protegido com plástico sob vácuo parcial e TTCA e TTCG = tratamento térmico seguido de imersão em cera. As letras A e G indicam se os frutos foram mantidos ao ambiente (A) ou sob refrigeração (G). Os parâmetros avaliados foram evolução da

perda de peso, coloração externa e da polpa, presença de doenças, aparência, colapso interno do fruto, porcentagem de casca, semente e polpa. Assim como, o conteúdo de sólidos solúveis totais (°Brix), a acidez titulável, o índice de maturação e carboidratos solúveis e insolúveis. Os frutos sob condições ambientais apresentaram vida útil de 10 dias nos tratamentos TA, THA e TTA, enquanto no TTCA foi de 12 dias e no TTVA de 19 dias. Sob refrigeração, a vida útil foi de até 18 dias para os tratamentos TG, THG e TTG, enquanto no TTCG foi de 21 dias, e no TTVG foi de até 27 dias. Constatou-se que as podridões se constituiram no principal fator responsável pela redução da vida útil das mangas.

114

HOT WATER TREATMENT AND REFRIGERATION FOR MANGOES "TOMMY ATKINS".

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Mangoes were treated by immersion in hot water for 5 min. at temperature of 48, 52 e 55°C followed by 5 min. of cooling in a thiabendazole (1000 mg/l) suspension dip at 12°C. Another approach consisted of immersion of mangoes in a heated thiabendazole (1000 mg/l) suspension for 5 min. at temperatures of 48, 52 e 55°C followed by 5 min. of cooling water dip at 12°C. Fruits were stored for 21 days at 12±1°C and 85-90%RH, then were maintained under local environmental conditions (27±3°C e 80-85%RH). These treatments did not affected the evolution of the biochemical changes during storage. The cooling treatments with fungicide suspension delayed the development of the anthracnose (**Colletotrichum gloeosporioides**). Within these treatments, the 52°C temperature resulted in the lowest fruit weight loss, and therefor, it was the most suitable for the preservation of mangoes.

115

RIPENING AND QUALITY OF MANGO FRUIT AS AFFECTED BY COATING WITH "SEMPERFRESH"

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Mango fruit has a relatively short storage life of 2 to 3 weeks at 13°C. In order to prolong the storage life of the varieties "Haden" and Keitt the fruits were coated wich 3 concentrations of the edible film "Semperfresh" and then were stored at 13°C. Fruits of the variety "Keitt" were treated with hot water at 46°C for 90 min before they were coated. Fruits were then evaluated for °Brix, pH, titratable acidity, firmness, color of the skin, weight loss and vitamin C. All 3 concentrations applied to the variety "Haden" (0.8, 1.6 and 2.4%) affected fruit ripening. Titratable acidity, firmness and green color were higher in treated fruits. Weight loss, °Brix and pH were lower in treated fruits. The concentrations applied to the variety "Keitt" (0.7, 1.4 and 2.1%) had no effect on fruit firmness, weight loss or vitamin C. "Semperfresh" had no effect on decay development.

116

EFEITO DA ASSOCIAÇÃO DE DIFERENTES TRATAMENTOS TÉRMICOS, COM ARMAZENAMENTO REFRIGERADO, NA VIDA ÚTIL DE MANGAS (*Mangifera indica*, L.).

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Procurou-se estudar a aplicação de diferentes tratamentos térmicos (49°C, 52°C, 55°C por 5 minutos), associados ao thiabendazole 1000 ppm, no controle das podridões que limitam a vida útil das mangas 'Tommy Atkins', armazenadas sob refrigeração (12°C; 85-90% UR), por 21 dias, e depois sob condições ambientais (28,5°C; 64,3% UR). A perda do peso foi progressiva ao longo do tempo, para os frutos de todos os tratamentos, mas com intensidades diferentes. Os frutos tratados termicamente a 55°C, apresentaram as maiores perdas de peso e a evolução da coloração atrasada. O aparecimento e evolução das podridões (Antracnose e podridão peduncular) foram retardadas pelo tratamento térmico e a eficiência deste tratamento, foi melhorada quando ele foi seguido de resfriamento na suspensão do fungicida. O rendimento em polpa, casca e caroço, assim como as relações polpa/casca e polpa/caroço não foram afetadas pelos tratamentos. A relação polpa/casca, mostrou tendência à estabilidade, apesar de aumento na umidade da polpa e de diminuição na % da casca. A qualidade dos frutos (sólidos solúveis totais, acidez titulável e teor de carboidratos, totais e solúveis) também não foi afetada pelos tratamentos, mas a relação sol.sol./acidez (I.M.) aumentou com o tempo de armazenamento, assim como o conteúdo de carboidratos solúveis. Concluiu-se que o tratamento a 52°C/5 min. com posterior imersão em thiabendazole foi o que possibilitou os resultados mais interessantes à conservação dos frutos de manga 'Tommy Atkins'.

117

CONTROLE DE PODRIDÕES E MUDANÇAS BIOQUÍMICAS EM CONDIÇÕES DE PÓS COLHEITA DE FRUTOS DE MANGA (*Mangifera indica* L.) CV. HADEN

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Frutos de manga do cultivar Haden foram colhidos em 2 estádios de maturação: "de vez" e em início de amadurecimento. Os frutos "de vez" foram submetidos a tratamento térmico (55°C por 5 minutos), químico (imersão, por 5 minutos, em thiabendazole ou iminoctadine) ou a associação de ambos. Os frutos em início de amadurecimento foram submetidos apenas ao tratamento químico. Todos foram mantidos em condições ambientais (26,1°C; 74% UR). Verificou-se a pouca influência dos tratamentos utilizados no controle das podridões e nenhuma influência dos mesmos sobre as mudanças bioquímicas (rendimento em polpa, sólidos solúveis, acidez titulável), que foram verificadas no decorrer do período de armazenamento. Os estádios de maturação tiveram pouca influência no controle de podridões, sendo que as mudanças bioquímicas foram influenciadas somente quanto ao tempo necessário para as suas ocorrências. Um gênero de fungo (**Diplodina** sp) aparentemente não relatado em frutos de manga, foi observado causando podridões.

118

THE OXYGEN AFFINITY OF THE ETHYLENE FORMING ENZYME IN BANANA PULP AND SKIN TISSUE

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The oxygen affinity of ethylene production by banana pulp and skin tissue was estimated in early climacteric fruit. The rates of respiration, ethylene production and ACC content were measured at different oxygen levels. The apparent KmO_2 of ethylene production of banana pulp and skin tissues were found to be similar at about 1.4% O_2. This similarity suggests that the apparent KmO_2 for ethylene production by different tissues may be a constant value. This would indicate that ethylene production by ripening fruits such as banana could generally be successfuly reduced by low oxygen atmosphere storage.

119

EFFECT OF CHILLING TEMPERATURE ON ETHYLENE PRODUCTION, ACC CONTENT AND RESPIRATION IN BANANAS.

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The affect of exposing banana to chilling inducing temperature (5°C) for 24 and 48 hours on the oxygen affinity for ethylene production was studied using early climateric fruit or ripe fruit floatd on ACC solution. The rate of CO_2, C_2H_4 production and ACC content of the tissue were estimated at different O_2 levels. Exposure of bananas to chilling temperature has no significant effect on the apparent KmO_2 for ethylene production, which was found to be about 1.4% O_2. Chilling did, however greatly reduce respiration and ethylene production particularly in early climacteric tissue. Supplying exogenous ACC to tissue at chilling temperature increased the tissue's ACC content to a point at shich ethylene production could be measured and apparent KmO_2 values were obtained. It seems that these values are independent of tissue's ACC content.

120

POSTHARVEST PHYSIOLOGY OF ACEROLA FRUITS. I - MATURATION CHANGES

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Acerola (**Malpighia emarginata** D.C.) fruits were harvested in the Active Genebank of Tropical and Subtropical Fruits of the FCAV/UNESP, Jaboticabal, São Paulo State, Brazil, on March/1991, to study maturation changes. The fruits were separated at six stages by color peel: green, yellow green, pink, light red, red and dark red. Weight, diameters, chlorophyll, carotenoids, soluble solids, pH, sugars, titrable acidity and vitamin C were analysed. Increases on the carotenoids, soluble solids and sugars, and decreases on the chlorophyll, titrable acidity and vitamin C contents were observed during maturation. These changes were similar to majority of tropical fruits studied. The higher vitamin C loss (33%) was observed until pink stage and reached 45% at dark red.

121

POSTHARVEST PHYSIOLOGY OF ACEROLA FRUITS II - RESPIRATORY ACTIVITY AND CHEMICAL CHANGES

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Acerola (**Malpighia emarginata** D.C.) fruits at yellow green and pink stages were harvested in the Active Genebank of Tropical and Subtropical Fruits of the FCAV/UNESP, Jaboticabal, São Paulo State, Brazil on March/1991. Respiratory activity and the following characteristics: chlorophyll, carotenoids, soluble solids, pH, sugars, titrable acidity and vitamin C were analysed in fruits maintened in maturation chambers (±23°C). The CO_2 behavior displayed fruits at yellow green and pink stages suggested a climateric pattern. Normal maturation happened when the fruits were harvested at pink stage with at least 6.5% of soluble solids.

122

POSTHARVEST PHYSIOLOGY OF ACEROLA FRUITS III - REFRIGERATED STORAGE AT AMBIENT AND MODIFIED ATMOSPHERE

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Acerola (**Malpighia emarginata** D.C.) fruits at pink stage were harvested in the Active Genebank of Tropical and Subtropical Fruits of the FCAV/UNESP, Jaboticabal, São Paulo State, Brazil, on November/1991, to study the conservation potential. The fruits were packed with Polivinil Chloride (PVC) film or not on plastic traies and storaged at room temperature, 27°C and 70-75% relative humidity and under refrigeration 8°C and 85-90% relative humidity and 13°C and 90-95% relative humidity. Weight loss, juice yield, soluble solids, pH, sugars, titrable acidity and vitamin C were analysed. Pink fruits storaged at room temperature maintened the quality for two or three days when PVC overspread. Storage at 8°C with PVC increase the shelf life for a week, although haven't affected the vitamin C losses.

123

EFEITO DO NÍVEL DE CO_2 NA ATMOSFERA SOBRE A CONSERVAÇÃO DE CHERIMÓIA (*Annona cherimola*,Mill).

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A Cherimóia é uma Annonacea originária do Peru e cultivada em diversas partes do mundo, tendo entre outras características o baixo potencial de conservação. A presente investigação teve por objetivo avaliar o efeito de diversas concentrações de CO_2, na atmosfera de conservação, visando o prolongamento da vida útil dos frutos de Cherimoia (**Annona cherimola**, Mill). Os ensaios foram conduzidos em amostras de 25 frutos conservados em atmosferas (3)O, (3)3 e (3)6 à temperatura de 9°C e 95% de UR. As atmosferas foram obtidas de misturas de gases previamente preparadas e acondicionadas em cilindros sob pressão. Os experimentos foram realizados em uma instalação de fluxo capilar contínuo. O efeito do nível de CO_2 foi avaliado mediante as determinações de CO_2 e C_2H_4 produzidos, açúcares, ácidos orgânicos e firmeza. Os resultados indicaram que o CO_2 reduz a respiração na razão direta da proporção de CO_2 a partir da metade

do período de conservação. Observou-se que o CO_2 exerce forte influência na síntese de etileno ao se passar da concentração de O para 3% de CO_2, porém este efeito é praticamente inexistente entre as concentrações de 3 e 6% de CO_2. Quanto aos açúcares solúveis totais se verificou que o CO_2 não modifica o metabolismo global dos açúcares solúveis, porém, qualitativamente afetou a síntese de sacarose. Ficou evidenciada a redução no acúmulo de ácidos orgânicos totais. Qualitativamente, a síntese de ácido cítrico foi estimulada no início da conservação, enquanto houve uma diminuição na acumulação de ácido málico. Os resultados também indicaram que os elevados níveis de CO_2 retardaram o amolecimento da polpa dos frutos.

124

CARACTERÍSTICAS FISICAS E QUIMICAS DE FRUTOS DE TRÊS ESPECIES NATIVAS DO CERRADO.

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Com o propósito de estudar algumas características físicas e químicas de frutos de três frutíferas nativas da região do cerrado, utilizou-se as espécies pequizeiro (**Caryocar brasiliensis**); marmeleiro do-campo (**Alibertia sessi**) e pitangueira (**Eugenia sp**), todas de ocorrência natural em quase todo o cerrado. Para tanto, plantas marcadas aleatoriamente na reserva de cerrado da Fazenda de Ensino e Pesquisa da UNESP de Ilha Solteira, foram empregadas para a coleta de frutos os quais foram analisados quanto a: tamanho, diametro e comprimento; espessura da casca; rendimento da polpa; tamanho e número de sementes; acidez; brix; teor de óleo e concentração de N, P, K, Ca, Mg e S. Os resultados permitiram concluir que: com relação ao marmeleiro, o rendimento de polpa é a característica mais variável, cujo valor médio é da ordem de 36%. Com relação ao fruto do pequizeiro, a característica mais marcante é a grande variação no número de sementes por fruto, enquanto que na pitangueira, o comprimento do fruto é a característica mais variável. Relativo às características químicas, os frutos de marmeleiro apresentaram 23,4 de brix e 2,64 de acidez, os frutos de pitangueira 8,33 de brix e 1,87 de acidez; enquanto que o teor de óleo do fruto de pequizeiro foi de 30%. As concentrações de nutrientes nos frutos foram das seguintes ordens: pequi e pitanga: N>K>Ca>P>Mg>S; marmelo; K>N>Ca>Mg>P>S.

125

EFFECT OF STORAGE ATMOSPHERE ON THE CONSERVATION OF CASHEW APPLE: MODICATIONS OF THE CHEMICALS CHARACTERISTICS

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The scope of this research was to study the behaviour of cashew apple(**Anacardium occidentale** L.) under refrigerated temperature and modified atmosphere. Some attributes related to quality for commercializing in nature were quantified. The modified atmosphere in conditions refrigerated (5°C) was effective in reducing the senescence process. The fruits stored at modified and ambient atmosphere and cold room showed low acidity, with higher total soluble solid during storage time in case of ambient atmosphere. There was no influence of atmosphere type on reducing sugars and total vitamin C content. Decreasing vitamin C content during storage was observed.

126

CHILLING INJURY IN RELATION TO CHANGES IN ASCORBIC ACID, CHLOROGENIC ACID, AND PROLINE IN HAMLIN ORANGE FRUIT PEELS.

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Hamlin orange fruits were harvested from College of Agriculture Research, Tripoli, Libya. The fruits were stored at 1° and 5°C to study incidence of chilling injury (CI) in relation to changes in Ascorbic Acid (ASA), Chlorogenic Acid (CGA) and Proline content in fruit peels. Observation for CI and chemical analysis were made periodically every 3 days until appearance of CI symptoms. CI occurred after 4 weeks of storage at both 1° and 5°C. The safe storage temperature for Hamlin was higher than 5°C. CGA and ASA showed a reciprocal relationship. However, the relationship was more obvious at 1°C than at 5°C. The maximum and minimum levels of CGA and ASA respectively, occurred after 16 days of storage at 1°C and after 28 days of storage at 5°C. Proline changes during storage at 1°C and 5°C were about similar except that proline was always higher at 1°C and precede that at 5°C. CI onset occurred about 10 days after CGA reached a maximum and ASA and Proline reached a minimum levels.

127

NON-DESTRUCTIVE TESTS TO EVALUATE POSTHARVEST MATURITY IN AVOCADOS.

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A comparative study of the mechanical parameters resulting of controlled impacts and flesh firmness, a traditional index used in the evaluation of maturity in 'Hass' avocados has been made. A computer assisted impact-testing device with an impacter of 49.29 g and a drop height of 4 cm was used. Two groups of fruits were selected. One of them had no ethylene absorber and the other had a sepiolite absorber which had been smeared with $KMnO_4$, in a dose of 9.5 g/kg of fruit. Impacts proved to be non-destructive on these conditions, therefore they can be used to determine the ripening stage in these fruits. The results are similar for both groups, though the one treated with the ethylene absorber shows a delay, making clear its effect on retarding the process of full ripening in fruits.

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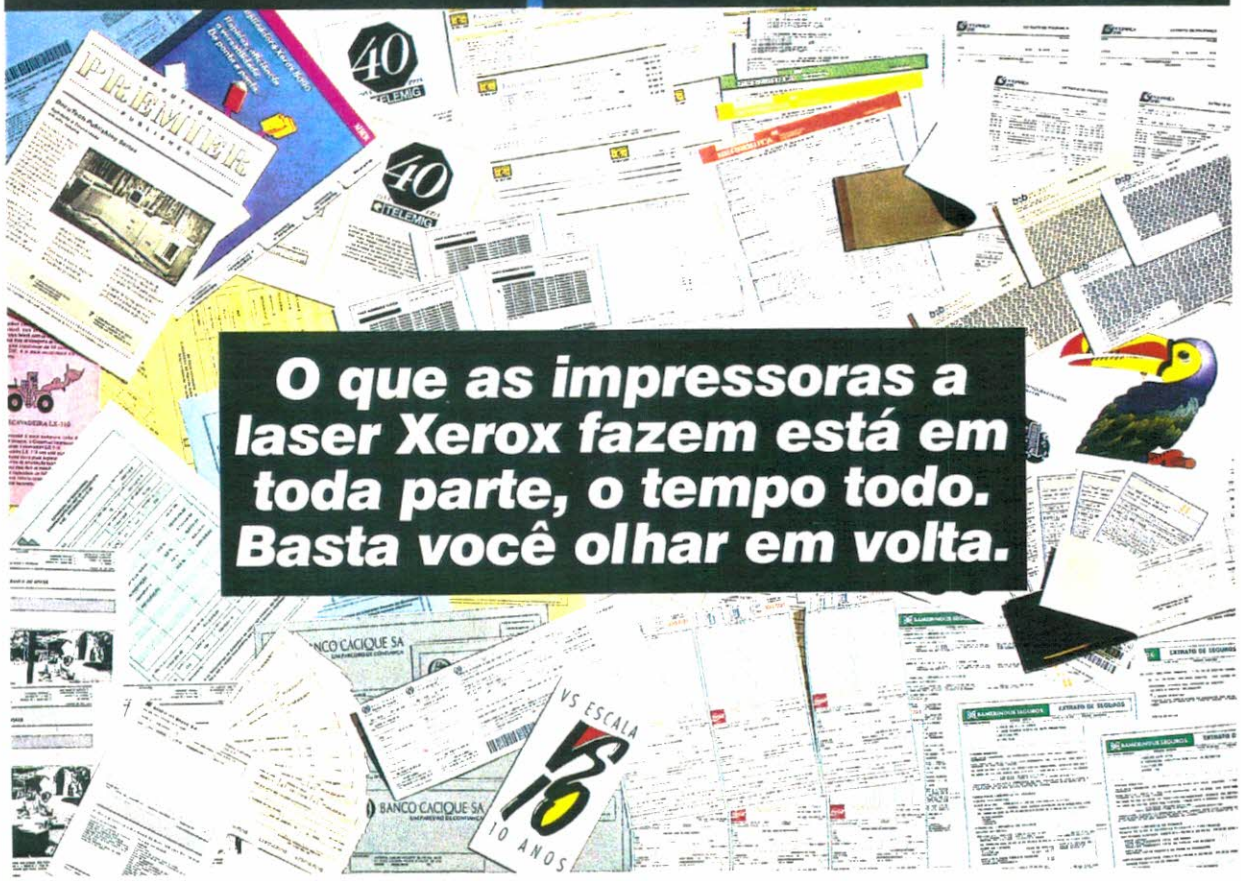

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