Pineapple fusariosis in Brazil : an overview.

A.P. de MATOS*

LA FUSARIOSE DE L'ANANAS AU BRESIL.
A. P. de MATOS.
Fruits, Jul.-aug. 1987, vol. 42, n° 7-8, p. 417-422.

RESUME - *Fusarium monoliforme* var. *subglutinans* provoque la plus grave maladie de l'ananas au Brésil. Ce pathogène peut affecter toutes les parties du plant provoquant une exsudation de gomme caractéristique. Sa capacité à toucher les parties utilisées pour la multiplication accroît l'importance de la maladie. Les pertes dues à l'incidence de la fusariose varient selon les régions et l'époque de récolte ; on fait état de pertes, en fruits commercialisables, de 80 %. Le présent document aborde quelques aspects relatifs aux symptômes induits par le pathogène, à l'épidémiologie, aux méthodes de lutte et aux variétés résistantes.

Ce document n'a pu être présenté comme initialement prévu par l'auteur lors du dernier symposium ananas qui s'est tenu à Montpellier en septembre 1986. Nous jugeons très utile de publier ici cette synthèse consacrée à la maladie causée par Fusarium moniliforme *var.* subglutinans, *et considérée depuis plusieurs années comme le facteur limitant de cette culture au Brésil. Limitée géographiquement, elle représente une menace permanente pour les autres pays producteurs. Ce danger s'est intensifié, récemment, avec la mise en service d'une ligne aérienne avec la Côte d'Ivoire, premier producteur d'ananas en Afrique. D'importants progrès ont été obtenus dans la compréhension de cette maladie qui, par certains aspects, présente des analogies (notamment au cours des phases précoces du processus infectieux des fleurs puis des fruits) avec la maladie des taches noires (Fruitlet core rot) causée par* Penicillium funiculosum.

Le Service de Phytopathologie de l'IRFA

INTRODUCTION

The pineapple fusariosis, caused by *Fusarium moniliforme* Sheld. var. *subglutinans* WR. and RG., is the most serious disease of this crop in Brazil, where it was first reported in 1964 causing fruit rot on the cultivar Smooth Cayenne (KIMATI and TOKESHI, 1964). Currently the disease is widespread in the country.

The incidence of fusariosis in pineapple orchards varies from one producing area to another, depending upon the inoculum potential. In a same pineapple producing area the disease incidence varies as a function of the harvest time (MATOS *et al.*, 1981 b). The losses of marketable pineapple fruits, due to *F. moniliforme* var. *subglutinans*, may be as high as 80 % (ROBBS *et al.*, 1965). Besides causing high loss of marketable pineapple fruit, the pathogen infects approximately 40 % of the asexual propagative parts and kills about 20 % of the plants prior to harvest (AGUILAR, 1981).

SYMPTOMS

F. moniliforme var. *subglutinans* is able to infect all parts of the pineapple plant causing the exsudation of a gum like substance from the infected tissue. Besides the characteristic gum exsudation, one infected plant can show one or more of the following alterations : bending of the stem, usually to the side where the lesion is located ; changing of the phyllotaxis, increasing the number of leaves per spiral ; changing of the plant architecture, looking like a funnel ; shortening of the leaves ; reduction of the plant development ; death of the apical meristem ; chlorosis (PISSARRA *et al.*, 1979). As a consequence of the disease

* - Research plant pathologist, Empresa Brasileira de Pesquisa Agropecuarias (EMBRAPA), Centro Nacional de Pesquisa de Mandioca e Fruticultura (CNPMF), Caixa postal 007, CRUZ DAS ALMAS, Bahia, Brazil.

development in the stem and base of the leaves the water flow is reduced, the plant stops growing and the leaves show a reddish color. In a later stage the plant wilts and finally dies. Figure 1 shows an infected slip. On the fruits the symptoms are characterized by the gum exsudation from the infected fruitlet ; in a latter stage the infected fruitlet changes to a reddish brown color and, as a consequence of the exhaustion of the tissues, it remains in a lower level than the healthy ones (Figure 2).

SURVIVAL

F. moniliforme var. *subglutinans* is not able to survive for long periods in the soil because it has no resistant structures (MATOS and CUNHA, 1980). This indicates that contaminated soils play no important role on the fusariosis dissemination.

According to MAFFIA (1980), the survival ability of *F. moniliforme* var. *subglutinans*, on artificially inoculated pineapple leaves, buried under field conditions, decreased gradually, reaching the lowest level eight months later. This indicates that, infected crop debris may not function as important source of inoculum for developing inflorescence, in the same planting, since the flowering induction treatment is usually performed, at least, ten months after planting. This source of inoculum probably has no significant role on the fusariosis dissemination, since the pathogen depends upon a wound in order to infect the basal part of a pineapple plant (MATOS, 1978).

F. moniliforme var. *subglutinans* survives on pineapple asexual propagative parts (suckers, slips and crown), which are infected while adhered to the mother plant (MATOS, 1986). Infected propagative parts, mainly those with incipient lesion, that are not detected during the preplanting selection, are brought to the orchard, thus constituting the initial inoculum for the subsequent crop.

F. moniliforme var. *subglutinans* has also been reported to be able to infect corn and sugar cane (AGUILAR, 1982). It is important to mention that these two crops are usually grown on areas which are traditionally planted with pineapple in Brazil. This suggests that sugar cane and corn may function as source of inoculum to pineapple plants. Due to that, these crops should not be included in crop rotation and inter-croping programs, since the inoculum potential may be increased and, as a result, the incidence of fusariosis may increase on the pineapple fields.

DISSEMINATION

The man is the most efficient dissemination agent of the pineapple fusariosis, by moving asexual propagative parts from one producing area to another. Once the disease is introduced in a producing area, on infected propagative parts, several agents act as disseminators of the pathogen inside the producing area. Among these agents, rain splash and wind (MATOS *et al.*, 1981 a ; MATOS and CALDAS, 1986) and insects, such as *Trigona spinipes* (AGUILAR and SANCHES, 1982), *Lagria villosa* (VENTURA and MAFFIA, 1980), *Bitoma* sp. (ROSSETTO *et al.*, 1976) and *Thecla basalides* (CHALFOUN and CUNHA, 1984), play

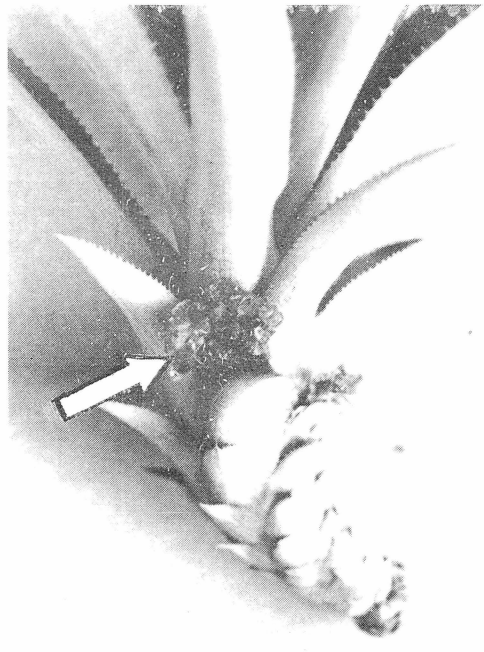

Figure 1 - Pineapple slip, cultivar Perola, infected by *Fusarium moniliforme* Sheld. var. *subglutinans* WR. and RG., showing the characteristic gum exsudation.

Figure 2 - Pineapple fruit, cultivar Smooth Cayenne, infected by *Fusarium moniliforme* Sheld. var. *subglutinans* WR. and RG., showing the characteristic gum exsudation from the infected fruitlet.

important role on the fusariosis dissemination. The association of these insects with the fusariosis causal agent has been shown on inflorescences. *T. basalides*, besides being a vector of *F. moniliforme* var. *subglutinans*, is also a pest of pineapple inflorescence. It is possible that other insects, which are attracted to the pineapple inflorescence, also function as vectors of the pathogen.

It is well known that *Steneotarsonemus ananas*, *Brevipalpus obovatus* and *Rhinoseius braziliensis* are mites found inside pineapple flowers (SANCHES and FLECHTMANN, 1982). This suggests that mites may be involved on the fusariosis dissemination.

INFECTION OF INFLORESCENCE AND ASEXUAL PROPAGATIVE MATERIAL

The most susceptible period of the pineapple inflorescence to *F. moniliforme* var. *subglutinans* occurs from the 4th to the 10th weeks after forcing (MATOS and SOUTO, 1985 ; VENTURA *et al.*, 1981), and the opened flowers constitute the infection sites for the pathogen (BOLKAN *et al.*, 1979). Insect injuries and natural growth cracks, which occur during fruit development, also constitute infection sites for the fusariosis agent.

The period of high susceptibility of the slips to *F. moniliforme* var. *subglutinans* occurs from the 1st to the 4th weeks after forcing, decreasing gradually until the 13th week, the longest investigated period (MATOS, 1986). It has been already shown that the pathogen depends upon a wound on the host surface in order to infect asexual propagative material, stem and base of leaves of a pineapple plant (MATOS, 1978). Since the pathogen is not able to infect undamaged tissues, the infection of slips and suckers probably occurs through natural growth cracks and insect injuries. Wounds, originated from handling and other cultural practices, constitute also infection sites for the pathogen on asexual propagative material.

ASPECTS FAVORING FUSARIOSIS EPIDEMICS

In Brazil the pineapple industry is composed by the cultivars Perola, Jupi and Smooth Cayenne, all of them susceptible to *F. moniliforme* var. *subglutinans*. This genetic uniformity for susceptibility to the pathogen is one of the most important factors enhancing the development of fusariosis epidemics.

The incidence of fusariosis in pineapple orchards varies from one producing area to another, depending upon the inoculum potential ; in a same pineapple producing area the disease incidence varies as a function of the harvest time, indicating the environmental effect.

In the State of Bahia, Brazil, as shown in the Figure 3, heavy losses of marketable pineapple fruit, due to fusariosis, occur from June to October ; the highest losses occur in September (MATOS *et al.*, in press). In the State of Paraiba, Brazil, the heaviest losses of marketable pineapple fruit occur in October (CHOAIRY and AGUILAR, 1980) and in the State of Minas Gerais, Brazil, it occurs in January (CHALFOUN and LEITE, 1985). In all of these studies it was shown that there is a significant positive correlation between rain fall during inflorescence development and percentage of infected fruit at harvest time.

Even though little is known about the source of primary inoculum, most infections of *F. moniliforme* var. *subglutinans* in pineapple originate probably from nearby sources

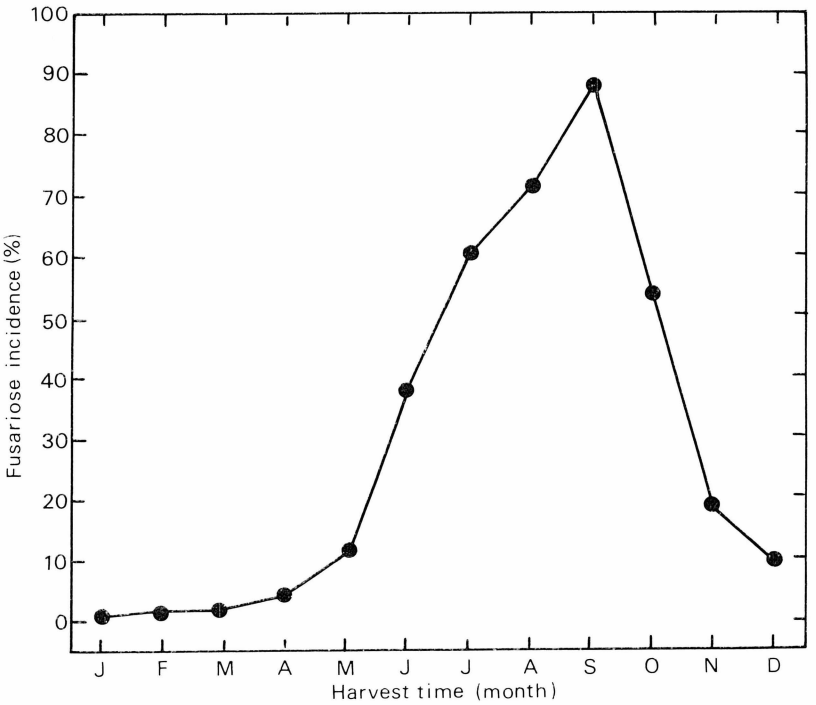

FIG. 3 • INCIDENCE OF PINEAPPLE FUSARIOSIS IN CORAÇÃO DE MARIA, BAHIA. DATAS ARE AVERAGE OF THREE YEAR EVALUATION PERIOD.

of inoculum, such as infected pineapple fields and, in a less extention, crop debris.

In Brazil, during harvest time, the peduncle is usually cut about half way down in order to keep the slips attached to it ; these slips will function as protectors for the pineapple fruit during handling and transport. The disadvantage of this practice is that a large amount of healthy slips is moved out of the orchard, thus resulting in a reduction on the number of available healthy asexual propagative parts necessary to plant new areas. Additionally, a large amount of infected slips can not be detected during the pre-planting selection and, as a consequence, a variable percentage of infected asexual propagative material is brought to the field. According to VENTURA and KUSHALAPPA (1982), 61 % of the infected asexual propagative material brought to the field dies before flowering, 28 % dies before harvest time and 11 % remains alive during the hole cycle of the pineapple plant. This leads to the conclusion that there is always a source of inoculum in the field.

CONTROL MEASURES

Efficient control of the pineapple fusariosis can be achieved by combining several practices. The first control measure is to use pathogen free propagative material to establish new orchards. As mentioned before, a large amount of infected propagative material is not discarded during the pre-planting selection and is brought to the field, constituting the source of initial inoculum. In order to overcome this problem it is recommended to produce pathogen free plantlets by sectioning the stem and planting the pieces in a nursery. This method has the advantage of allowing the detection and, the discard of infected stems when they are cut opened. As a result the incidence of fusariosis on the propagative materiel obtained by this method is very low (REINHARDT and CUNHA, 1981), decreasing the source of initial inoculum.

In order to keep the inoculum potential under low level it is necessary to inspect the orchard periodically and to erradicate the plants, which show symptoms of the disease during the vegetative growth. After the flowering induction treatment it is necessary to spray the developing inflorescence, from appearing in the growing point to the closed flower stage, with a fungicide and insecticide mixture. Benomyl and carbaryl are the recommended chemicals (CHOAIRY *et al.*, 1984). Benomyl can be replaced by captafol, which is also active against the pathogen (MATOS and CALDAS, 1978), thus reducing the risk of developing fungicide resistance by *F. moniliforme* var. *subglutinans*. The fungicide should be applied at the concentration of 0.1 to 0.15 % a.i., and the spraying should be repeated every seven to fifteen days. Such a spraying program allows approximately a three month period from the last spraying to harvest.

Another control measure is to protect the developing inflorescence by placing a paper bag on it (MATOS and CABRAL, 1985). Inhibiting the anthesis by spraying the 2-chloro-ethyl-phosphonic acid, 1,000 ppm, at weekly interval, during flowering, also reduces the incidence of fusariosis on pineapple fruit (CUNHA and MATOS, in press).

A disease scape program for the pineapple fusariosis can be achieved by performing the flowering induction treatment in a period which allows the inflorescence development under environmental conditions unfavourable to the fusariosis development. It has already been shown that the incidence of *F. moniliforme* var. *subglutinans* is high on fruit originated from inflorescence which developed during the raining season (CHALFOUN and LEITE, 1985 ; CHOAIRY and AGUILAR, 1980 ; MATOS *et al.*, 1981 b).

RESISTANCE TO FUSARIOSIS ON PINEAPPLE VARIETIES

The first report on pineapple varieties showing resistant reaction to *F. moniliforme* var. *subglutinans* was based on observations carried out under field conditions in a collection of pineapple varieties (GIACOMELLI *et al.*, 1969). More recently, working under artificial inoculation, SOUTO and MATOS (1978) were able to detect resistance to fusariosis on pineapple varieties, namely Ananas São Bento, Alto Turi, Huitota and Roxo de Tefé. Other varieties, such as Perolera, Piña Negra, Rondon, Tapiracanga, Amapá, Amarelo-de-uaupés, Cabezona, Turi Verde and Ver-o-peso, showed resistant reaction to *F. moniliforme* var. *subglutinans*, under field conditions, during two growing seasons (GIACOMELLI and TEOFILO SOBRINHO, 1984). This study confirmed also the resistance of the varieties Huitota and Roxo de Tefé as reported by SOUTO and MATOS (1978). Working with the artificial inoculation technique CABRAL *et al.* (1985) identified the varieties Fernando Costa, Inerme CM, BGA-6 and Perolera as resistant to the pathogen. Perolera and BGA-6 are varieties that can be commercially grown since they have desirable qualities, such as spineless leaves (piping type), cylindrical fruit, flat and big fruitlets, yellow shell at harvest time, and total soluble solid : acidity ratio close to those of 'Smooth Cayenne' and 'Perola', respectively.

CONCLUDING REMARKS

Fusariosis is the most serious pineapple disease in Brazil, causing heavy losses of marketable fruits.

The disease is wide-spread all over the country, in all pineapple growing area.

Fusarium moniliforme var. *subglutinans* is able to infect all parts of a pineapple plant, causing the exsudation of a gum like substance from the infected tissue.

The period of high susceptibility of the pineapple inflorescence to *F. moniliforme* var. *subglutinans* occurs from the 4th to the 10th weeks after forcing. In the case of the slips this period occurs from the 1st to the 4th weeks after forcing.

The persistence of *F. moniliforme* var. *subglutinans* in contaminated soil is very short, since the pathogen has no resistant structures ; in crop debris it survives for periods shorter than 10 months.

The man is the most important fusariosis dissemination agent ; rain splash, wind and insects are also involved on

the fusariosis dissemination ; mites seem to play a role on the fusariosis dissemination too.

Control of the disease can be achieved by : planting pathogen free asexual propagative material ; erradicating infected plants during the vegetative growth ; spraying the developing inflorescence with a mixture of insecticide (carbaryl) and fungicide (benomyl or captafol), from appearing in the growing point to the closed flowers stage.

Control can also be achieved by performing the flowering treatment in periods which allow the inflorescence development under environmental conditions unfavourable to the fusariosis development.

Protecting the developing inflorescence with a paper bag constitutes also an efficient control measure.

Inhibiting the anthesis, by spraying the 2-chloro-ethyl-phosphonic acid, 1,000 ppm, at weekly interval during flowering, also reduces the fusariosis incidence on pineapple fruits.

Pineapple varieties, such as Perolera and BGA-6, have been identified as resistant to *F. moniliforme* var. *subglutinans*, thus growing these varieties constitute a control measure.

LITERATUR CITED

AGUILAR (J.A.E.).
Fusariose do abacaxizeiro.
Cruz das Almas, EMPRAPA-CNPMF, 1981, 5 p.
(EMBRAPA-CNPMF. Comunicado Técnico, 6).

AGUILAR (J.A.E.).
Determinacão de hospedeiro de *Fusarium moniliforme* var. *subglutinans* do abacaxizeiro.
Pesq. agropec. bras., Brasília, 17 (5), 709-714, 1982.

AGUILAR (J.A.E.) and SANCHES (N.F.).
Disseminação de *Fusarium moniliforme* var. *subglutinans* no abacaxizeiro pela *Trigona spinipes* (Fabr. 1793) (Hymenoptera : Apidae).
Cruz das Almas, EMBRAPA-CNPMF, 182, 4 p.
(EMBRAPA-CNPMF. Comunicado Técnico, 2).

BOLKAN (H.A.), DIANESE (J.C.) and CUPERTINO (F.P.).
Flowers as principal infection sites for *Fusarium moniliforme* var. *subglutinans*.
Plant. Dis. Rept., Beltsville, 63 (8), 655-657, 1979.

CABRAL (J.R.S.), MATOS (A.P.) de and SOUTO (G.F.).
Reação de germoplasma de abacaxi à inoculação com *Fusarium moniliforme* var. *subglutinans*.
Pesq. agropec. bras., Brasília, 20 (7), 787-791, 1985.

CHALFOUN (S.M.) and CUNHA (G.A.P.) da.
Relação entre a incidência da broca-do-fruto e fusariose do abacaxi.
Pesq. agropec. bras., Brasília, 19 (4), 423-426, 1984.

CHALFOUN (S.M.) and LEITE (I.P.).
Controle da fusariose.
Inf. Agropec., Belo Horizonte, 11 (130), 50-53, 1985.

CHOAIRY (S.A.) and AGUILAR (J.A.E.).
Relações entre precipitação, incidência de fusariose e broca-do-fruto do abacaxizeiro.
Cruz das Almas, EMBRAPA - CNPMF, 1980, 5 p.
(EMBRAPA-CNPMF. Comunicado Técnico, 13).

CHOAIRY (S.A.), OLIVEIRA (E.F.) and MATOS (A.P.) de.
Controle químico da broca e fusariose no fruto de abacaxizeiro.
Rev. bras. frutic. Cruz das Almas, 6, 29-32, 1984.

CUNHA (G.A.P.) da and MATOS (A.P.) de.
Inhibition of flower opening and its relation to fusariosis on pineapple fruit (in press).

GIACOMELLI (E.J.), ROESSING (C.) and TEÓFILO SOBRINHO (J.).
Incidência de gomose numa coleção de ananás e pseudo-ananás.
Brangatia, 28, XXVII-XXXII, 1969.

GIACOMELLI (E.J.) and TEÓFILO SOBRINHO (J.).
Seleção preliminar de algumas cultivares de abacaxizeiro resistentes à fusariose.
in : *Congresso Brasileiro de Fruticultura, 7, Florianópolis, 1984. Anais. Florianópolis, 1984*, p. 145-161.

KIMATI (H.) and TOKESHI (H.).
Nota sobre a ocorrência de *Fusarium* sp. causando resinose em abacaxi.
Revista de Agricultura, Piracicaba, 39 (3), 131-133, 1964.

LAVILLE (E.).
La fusariose de l'ananas au Brésil.
I.- Synthèse des connaissances actuelles.
Fruits, Paris, 35 (2), 101-113, 1980.

MAFFIA (L.A.).
Sobrevivência de *Fusarium moniliforme* Sheld. var. *sunglutinans* WR. and RG. no solo e em restos culturais e sua erradicação de mudas de abacaxi [*Ananas comosus* (L.). Merril] através de tratamento térmico.
Fruits, Paris, 35 (4), 217-243, 1980.

MATOS (A.P.) de.
Métodos de inoculação com *Fusarium moniliforme* Sheld. var. *subglutinans* WR. and RG. em abacaxizeiro 'Perola'.
Rev. bras. frutic., 1 (1), 37-41, 1978.

MATOS (A.P.) de.
Indução de fusariose em mudas tipo filhote de abacaxi 'Perola', em condições de campo.
Fitopatologia Brasileira, Brasília, 11 (2), 322, 1986 (Resumo).

MATOS (A.P.) de , AGUILAR (J.A.E.) and NEIVA (L.P.A.).
Método para determinar a disseminação de *Fusarium moniliforme* var. *subglutinans* no abacaxizeiro.
Pesq. agropec. bras., Brasília, 16 (3), 337-339, 1981 a.

MATOS (A.P.) de and CABRAL (J.R.S.).
Controle de fusariose do abacaxi através de proteção mecânica da inflorescência.
Fitopatologia Brasileira, Brasília, 19 (2), 294, 1985 (Resumo).

MATOS (A.P.) de and CALDAS (R.C.).
Comportamento de fungicidas no controle da fusariose do abacaxi causada por *Fusarium moniliforme* var. *subglutinans*.
Rev. bras. frutic., Cruz das Almas, 1 (3), 59-69, 1978.

MATOS (A.P.) de and CALDAS (R.C.).
Avaliação da dispersão de *Fusarium moniliforme* var. *subglutinans* em plantio de abacaxi.
In : *Congresso Brasileiro de Fruticultura, 8 Brasília, 1986. Anais. Brasília*, 1986, p. 25-28.

MATOS (A.P.) de and CUNHA (G.A.P.) da.
Persistência e capacidade infectante de *Fusarium moniliforme* no solo.
Pesq. agropec. bras., Brasília, 15 (2), 163-165, 1980.

MATOS (A.P.) de, SANCHES (N.F.) and AGUILAR (J.A.E.).
A fusariose do abacaxizeiro em função da época de produção (in press).

MATOS (A.P.) de, SANCHES (N.F.), CUNHA (G.A.P.) da and REINHARDT (D.H.R.C.).
Fusariose do abacaxizeiro incidência no fruto em função da época de produção.
Pesq. agropec. bras., Brasília, 16 (2), 205-207, 1981 b.

MATOS (A.P.) de and SOUTO (G.F.).
Reaction of pineapple, cultivars Pérola and Smooth Cayenne, to inoculation with *Fusarium moniliforme* Sheld. var. *subglutinans* WR. and RG.
Fruits, 40 (10), 641-645, 1985.

PERRIOT (J.).
La fusariose de l'ananas au Brésil.

II.- Pathologie et caractéristiques de diverses races et formes spéciales au sein de l'espèce *Fusarium moniliforme* var. *subglutinans*.
Fruits, 35 (6), 335-354, 1980.

PISSARRA (T.B.), CHAVES (G.M.) and VENTURA (J.A.).
Sintomatologia da fusariose (*Fusarium moniliforme* Sheld. var. *subglutinans* WR. and REINK.) do abacaxizeiro.
Fitopatologia Brasileira, Brasília, 4 (2), 255-263, 1979.

REINHARDT (D.H.R.C.) and CUNHA (G.A.P.) da.
Métodos de produção de mudas de abacaxi livres de fusariose. I.- Comportamento de sementeira e viveiro.
in : *Congresso Brasileiro de Fruticultura, 6 Recife, 1981. Anais, Recife*, 1981, p. 173-192.

ROBBS (C.F.), AMARAL (M.) and DIANESE (J.C.).
A resinose fungica do abacaxi (*Ananas sativas* SCHULT) e sua occorência nos estados de São Paulo e Minas Gerais.
in : *Reunião de Fitossanitaristas do Brasil, Rio de Janeiro, 1965. Anais. Rio de Janeiro, Ministério da Agricultura*, 1965, p. 71-78.

ROSSETTO (C.J.), GIACOMELLI (E.J.) and PARADELA FILHO (O.).
Bitoma sp. (Coleoptera, bitomidae) espécie nociva ao abacaxi no Brasil.
In : *Reunião anual da SBPC, 28 Brasília, DF, 1976. Resumos, Brasília, SBPC*, 1976, p. 775.

SANCHES (N.F.) and FLECHTMANN (C.H.W.).
Acarofauna do abacaxizeiro da Bahia.
Anais da Sociedade Entomologica do Brasil, Jaboticabal, 11 (1), 147-155, 1982.

SOUTO (G.F.) and MATOS (A.P.) de.
Métodos para avaliar resistência a *Fusarium moniliforme* var. *subglutinans* em abacaxi.
Rev. bras. frutic., 1 (2), 23-30, 1978.

VENTURA (J.A.) and KUSHALAPPA (A.C.).
Transmissão e distribuição da fusariose do abacaxizeiro.
Fitopatologia Brasileira, Brasília 7 (3), 486, 1982 (Resumo).

VENTURA (J.A.) and MAFFIA (L.A.).
Associação de *Fusarium moniliforme* var. *subglutinans* com adulto de *Lagria villosa* Fab., 1983 (Coleoptera-Lagriidae).
Fitopatologia Brasileira, Brasília, 5 (3), 463, 1980 (Resumo).

VENTURA (J.A.), MAFFIA (L.A.) and CHAVES (G.M.).
Field induction of fusariosis in pineapple fruit with *Fusarium moniliforme* Sheld. var. *subglutinans* WR. and RG.
Fruits, Paris, 36 (11), 707-710, 1981.

ROOTSTOCKS FOR FRUIT CROPS

ROY C. ROM et ROBERT F. CARLSON

Il est maintenant couramment admis par les spécialistes fruitiers qu'une connaissance approfondie de la nature et de l'utilisation des porte-greffe est essentielle pour des systèmes productifs. ROOTSTOCKS FOR FRUIT CROPS fournit tous les renseignements nécessaires pour comprendre l'importance de cet aspect aussi bien pour les espèces tempérées que pour les agrumes.

Traitant des caractéristiques spécifiques de chaque porte-greffe ROOTSTOCKS FOR FRUIT CROPS dispense l'information la plus récente sur le fonctionnement du système racinaire en général, les méthodes de multiplication, les compatibilités et les interactions porte-greffe/greffon. Pour chaque utilisation envisagée sont soulignés avantages et inconvénients pour les productions considérées.

ROOTSTOCKS FOR FRUIT CROPS contient 14 exposés couvrant aspects généraux et propres à chaque fruit rédigés par les auteurs les plus autorisés en la matière pour pommier, poirier, pêcher, cerisier, amandier, abricotier, prunier, agrumes, pacanier, noyer et vigne ; des tableaux résument brièvement les caractéristiques clés des porte-greffe abordés.

ROOTSTOCKS FOR FRUIT CROPS apparaît comme une lecture essentielle pour toute personne impliquée dans l'horticulture et la pomologie.

JOHN WILEY & SONS LIMITED, Baffins Lane, Chichester, West Sussex, England PO19 1UD
Prix : 72,70 livres sterling