Enfermedades fúngicas exóticas que amenazan a la citricultura española

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❑ MANCHA NEGRA 'CITRUS BLACK SPOT'

- ***Phyllosticta citricarpa*** (McAlpine) van der Aa

- *Guignardia citricarpa* Kiely
- *Phyllostictina citricarpa* (McAlpine) Petr.
- *Phoma citricarpa* McAlpine

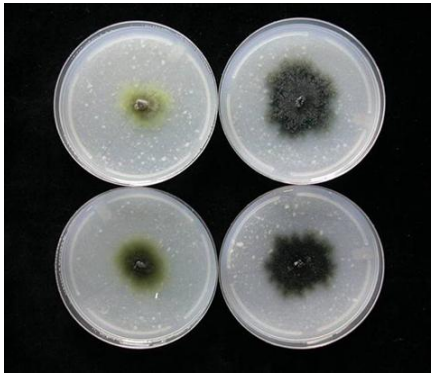
Food and Agriculture Organization of the United Nations

International Plant Protection Convention
Protecting the world's plant resources from pests

DP 5:
Phyllosticta citricarpa
(McAlpine) Aa on fruit

ISPM 27
ANNEX 5

ENG



CITRUS BLACK SPOT (*Phyllosticta citricarpa*) **DISTRIBUCIÓN GEOGRÁFRICA**

CITRUS BLACK SPOT (*Phyllosticta citricarpa*) **SÍNTOMAS**

CITRUS BLACK SPOT (*Phyllosticta citricarpa*) **SÍNTOMAS**

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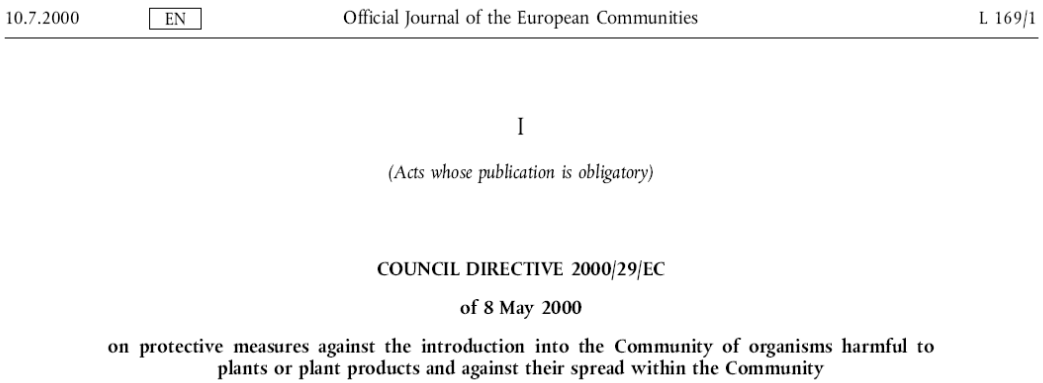
CITRUS BLACK SPOT (*Phyllosticta citricarpa*) **SÍNTOMAS**

CITRUS BLACK SPOT (*Phyllosticta citricarpa*) **SÍNTOMAS**

- La importación de **plantas de cítricos** está **prohibida** en la mayoría de países
- **EE.UU. prohibe** la importación de **frutos cítricos** de zonas afectadas por **CBS**
  - En fase de revisión tras la detección del CBS en Florida en 2010 !!
- La **UE permite** la importación de **frutos cítricos** de zonas afectadas por **CBS**
  - Deben cumplir unas medidas fitosanitarias específicas
    - En las parcelas se han aplicado tratamientos adecuados para el control del CBS
    - No se observan síntomas de CBS en la cosecha en inspecciones oficiales



10.7.2000 EN Official Journal of the European Communities L 169/1

I

(Acts whose publication is obligatory)

COUNCIL DIRECTIVE 2000/29/EC

of 8 May 2000

on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community

LA SANIDAD VEGETAL EN LA UE

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY

ANÁLISIS DE RIESGOS

GESTIÓN DE RIESGOS

efsa
European Food Safety Authority

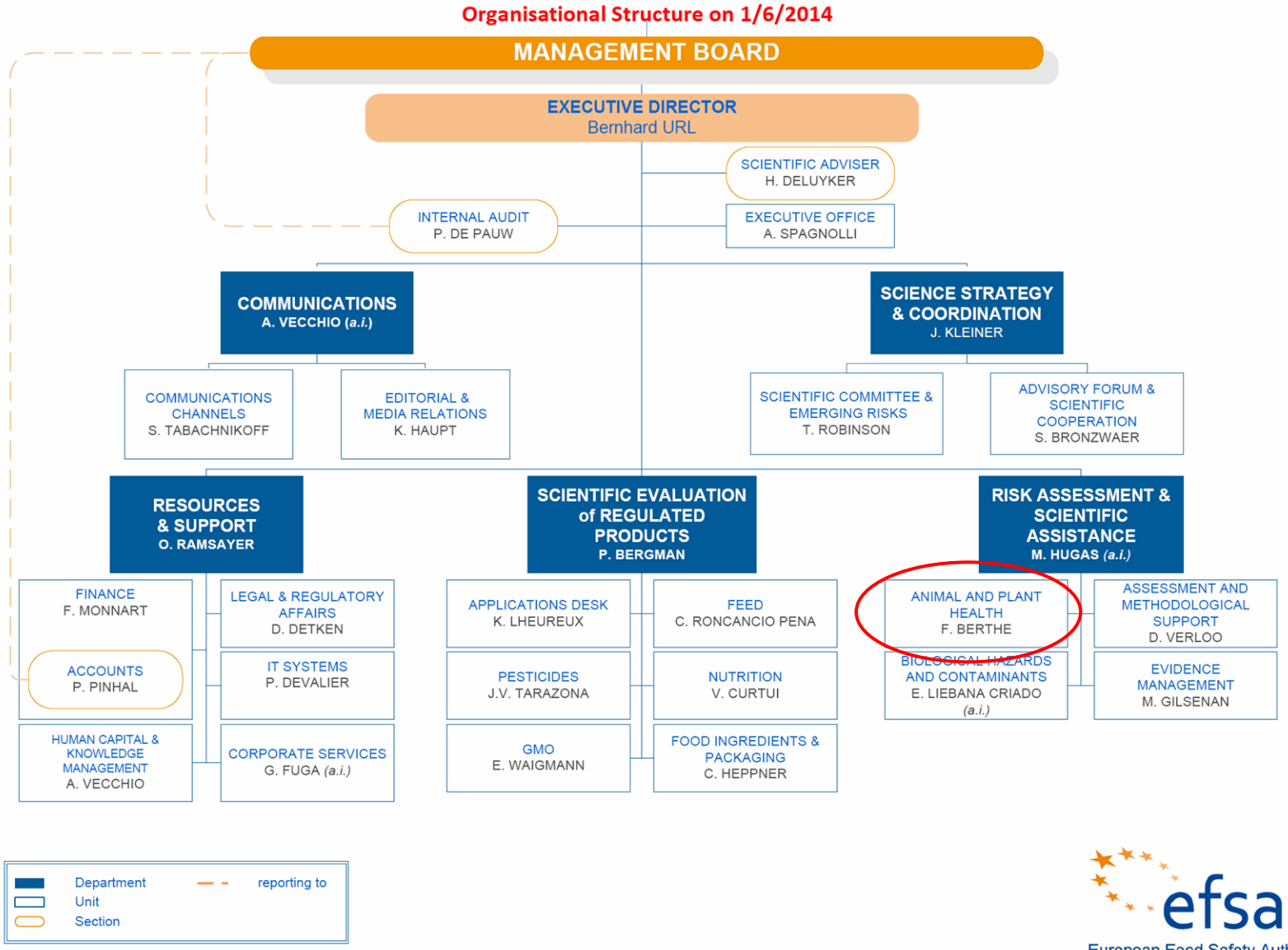
COMITÉ PERMANENTE DE SANIDAD VEGETAL

Estados miembros

MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

Paneles científicos independientes

Legislación fitosanitaria



European Food Safety Authority

How are **applicants assessed**?

efsa
European Food Safety Authority

As well as meeting the basic selection criteria related to factors such as education, language skills and citizenship, applicants are evaluated against the following criteria:

- experience in carrying out scientific risk assessment and/or providing scientific advice in fields relevant to EFSA's remit;
- proven excellence in one or more fields linked to the area covered by the Scientific Panel or Committee;
- experience in peer reviewing scientific work and publications;
- ability to analyse complex information and dossiers, and preparing scientific opinions and reports;
- professional experience in a multidisciplinary environment, preferably in an international context;
- experience in project management related to scientific matters;
- experience in communication, based on teaching experience, public presentations, participation in meetings, publications.

❑ Declaración de Intereses (DoI) de los últimos cinco años:

- ↘ Miembro de **organismos reguladores**
- ↘ Miembro de **comités científicos asesores**
- ↘ **Relación laboral**
- ↘ **Actividades de consultoría**
- ↘ **Financiación I+D+i**
- ↘ Derechos de la propiedad intelectual
- ↘ Intereses familiares
- ↘ Otros

Posible conflicto de intereses !!

European Food Safety Authority EFSA Journal 2014;12(2):3557

SCIENTIFIC OPINION

Scientific Opinion on the risk of *Phyllosticta citricarpa* (*Guignardia citricarpa*) for the EU territory with identification and evaluation of risk reduction options[1]

EFSA Panel on Plant Health (PLH) [2,3]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

The Panel conducted a risk assessment of *Phyllosticta citricarpa* for the EU. *P. citricarpa* causes citrus black spot (CBS) and is absent from the EU. Under the scenario of absence of specific risk reduction options against *P. citricarpa*, the risk of entry of *P. citricarpa* was rated as likely for citrus plants for planting and citrus fruit with leaves, moderately likely for citrus fruit without leaves, unlikely for citrus leaves for cooking and very unlikely for Tahiti lime fruit without leaves. Establishment was rated as moderately likely because susceptible hosts are widely available and environmental conditions in many EU citrus-growing areas are suitable (with high uncertainty) for *P. citricarpa* ascospore production, dispersal and infection. Current fungicide treatments will not prevent establishment. Environmental favourability is increased by the use of sprinkler and micro-sprinkler irrigation in some EU citrus-growing locations. Spread with trade was rated as moderately likely. Model results indicate that CBS epidemics are most likely to develop in EU citrus-growing areas in late summer to early autumn and in some locations also in late spring to early summer. CBS is expected to affect mainly lemons and late-maturing sweet orange and mandarin varieties, with moderate negative consequences for the production of fresh fruit, but with environmental impact of additional fungicide treatments. Negative consequences would be minor for early-maturing citrus varieties and minimal for citrus for processing. Uncertainty concerning the consequences is high, mainly because of the lack of data on critical climate response parameters for the pathogen but also because information on impact in areas at the limits of the current distribution is scarce. Since eradication and containment are difficult, phytosanitary measures should focus on preventing entry. Current phytosanitary measures are evaluated to be effective, with the exception of pest-free production sites.

KEY WORDS

Phyllosticta citricarpa, *Guignardia citricarpa*, citrus black spot, European Union, pest risk assessment, risk reduction options

[1] On request from the European Commission, Question No EFSA-Q-2013-00334, adopted on 30 January 2014.

[2] Panel members: Richard Baker, Claude Bragard, Thierry Candresse, Gianni Gilioli, Jean-Claude Grégoire, Imre Holb, Michael John Jeger, Olia Evtimova Karadjova, Christer Magnusson, David Makowski, Charles Manceau, Maria Navajas, Trond Rafoss, Vittorio Rossi, Jan Schans, Gritta Schrader, Gregor Urek, Johan Coert van Lenteren, Irene Vloutoglou, Stephan Winter and Wopke van der Werf. Correspondence: alpha@efsa.europa.eu

[3] Acknowledgement: The Panel wishes to thank: Richard Baker, Andrew Hart, Diego Intrigliolo, David Makowski, Marco Pautasso, Trond Rafoss, Jan Schans, Wopke van der Werf and Antonio Vicent for the preparatory work on this scientific opinion, the hearing expert Eduardo Primo Millo and EFSA staff: Giuseppe Stancanelli, Olaf Mosbach Schulz, Francesca Riolo, Jose Cortinas Abrahantes, Ewelina Czwienczek, Tilemachos Goumperis and Marilia Ioannou, for the support provided to this scientific opinion.

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), 2014. Scientific Opinion on the risk of *Phyllosticta citricarpa* (*Guignardia citricarpa*) for the EU territory with identification and evaluation of risk reduction options. EFSA Journal 2014;12(2):3557, 243 pp. doi:10.2903/j.efsa.2014.3557

Available online: www.efsa.europa.eu/efsajournal

INTRODUCCIÓN

ENTRADA

↓

ESTABLECIMIENTO

↓

DISPERSIÓN

↓

IMPACTO

❑ POSIBLES VÍAS DE ENTRADA EN LA UE

- Importación comercial de material de plantación
- Importación comercial de material de plantación de lima Tahiti
- Importación no comercial de material de plantación (pasajeros)
- Importación comercial de frutos (sin hojas ni pedúnculos)
- Importación comercial de frutos con hojas
- Importación comercial de frutos de lima Tahiti
- Importación no comercial de frutos cítricos (pasajeros)
- Importación de otros materiales cítricos (hojas)

EFSA Journal 2014;12(2):3557

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EFSA Journal 2014;12(2):3557

MATERIAL DE PLANTACIÓN

- El material de plantación infectado está considerado como la principal vía de entrada del CBS
- **Sin embargo, se desconoce el origen exacto de las introducción del CBS a nivel mundial**

❑ POSIBLES VÍAS DE ENTRADA EN LA UE

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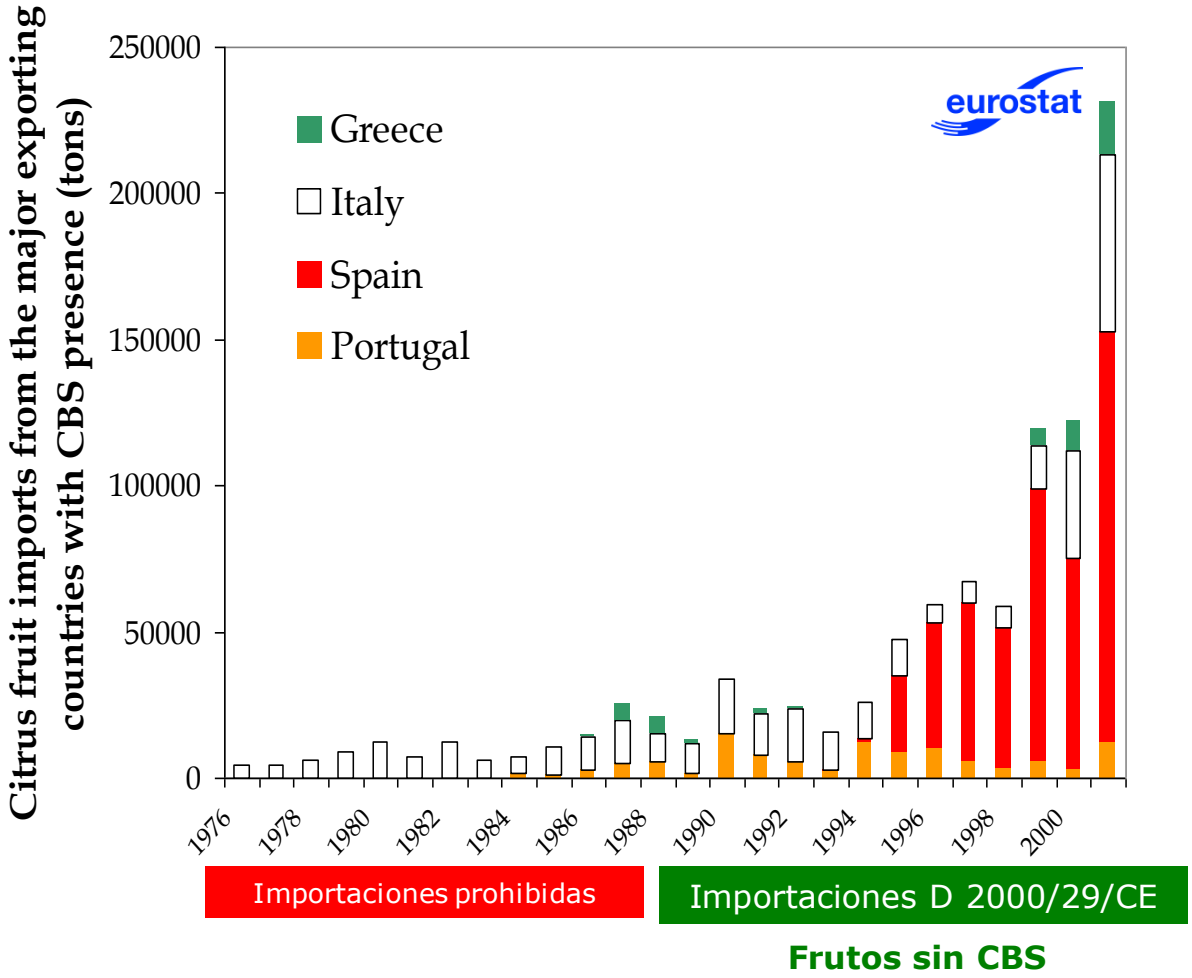
EFSA Journal 2014;12(2):3557

- IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS

IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS

FRUTOS PROCEDENTES DE PAÍSES AFECTADOS POR CBS



EFSA Journal 2014;12(2):3557

- IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS

Mercado al aire libre

Wageningen (Holanda)

- IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS
  - RIESGOS ASOCIADOS AL TRANSPORTE

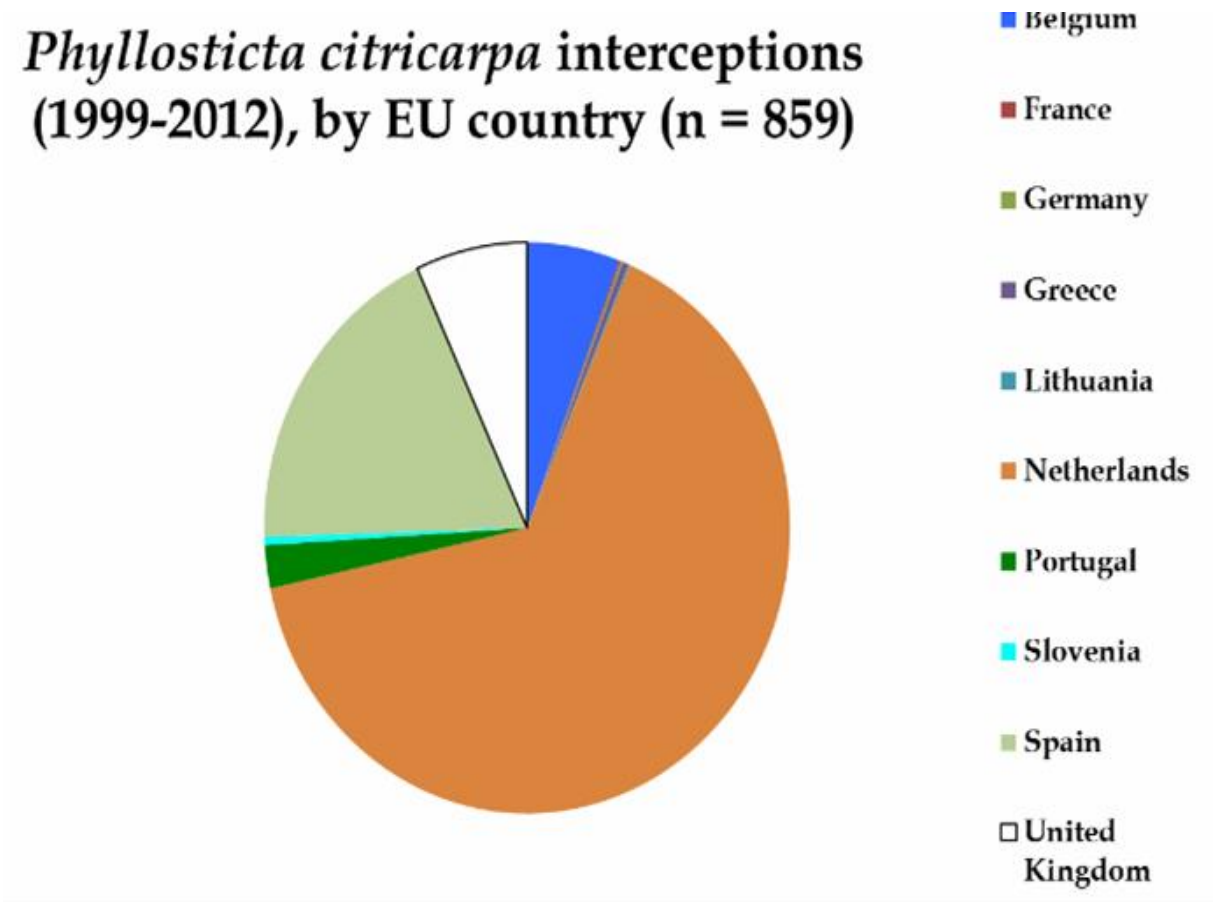
- IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS

EFSA Journal 2014;12(2):3557

- IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS

EFSA Journal 2014;12(2):3557

- IMPORTACIÓN COMERCIAL DE FRUTOS CÍTRICOS
  - INTERCEPTACIONES DE CBS EN LAS FRONTERAS DE LA UE



EFSA Journal 2014;12(2):3557

- LAS ESPORAS DE LOS FRUTOS INFECTADOS PUEDEN DISEMINAR EL CBS

OPEN

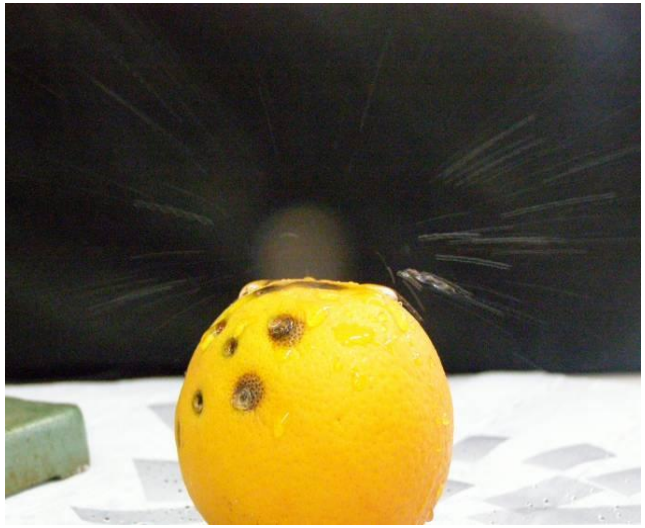
SUBJECT AREAS:
PATHOGENS
FUNGAL BIOLOGY
APPLIED MICROBIOLOGY

Splash dispersal of *Phyllosticta citricarpa* conidia from infected citrus fruit

S. A. M. Perryman[1], S. J. Clark[2] & J. S. West[1]

[1]Plant Biology and Crop Science Dept. Rothamsted Research, Harpenden, Herts., AL5 2JQ, UK, [2]Computational and Systems Biology Dept. Rothamsted Research, Harpenden, Herts., AL5 2JQ, UK.

nature scientific reports (2014) 4:1-8



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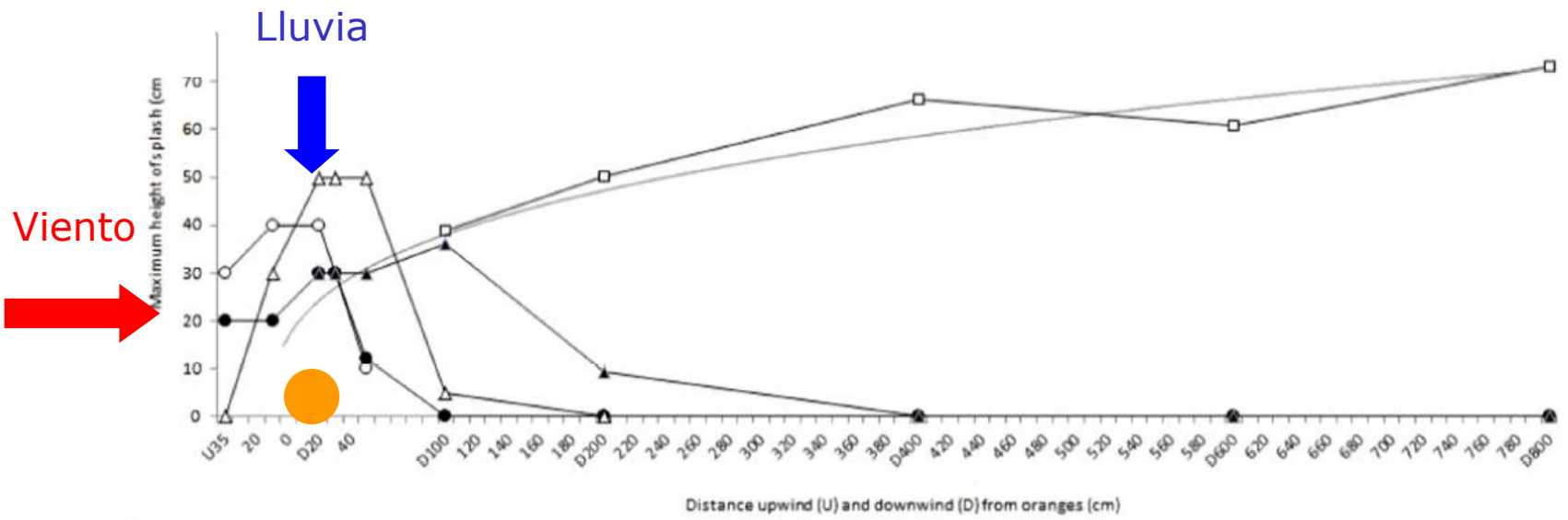
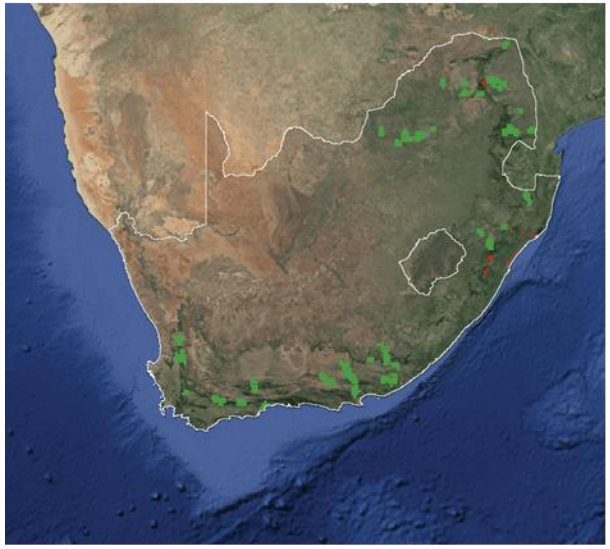


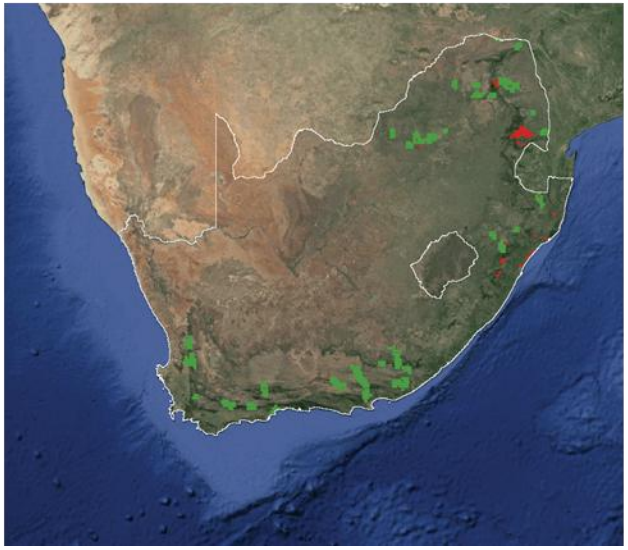
CONDICIONES CLIMÁTICAS FAVORABLES PARA EL CBS

- ¿Distribución geográfica del CBS restringida por el clima?

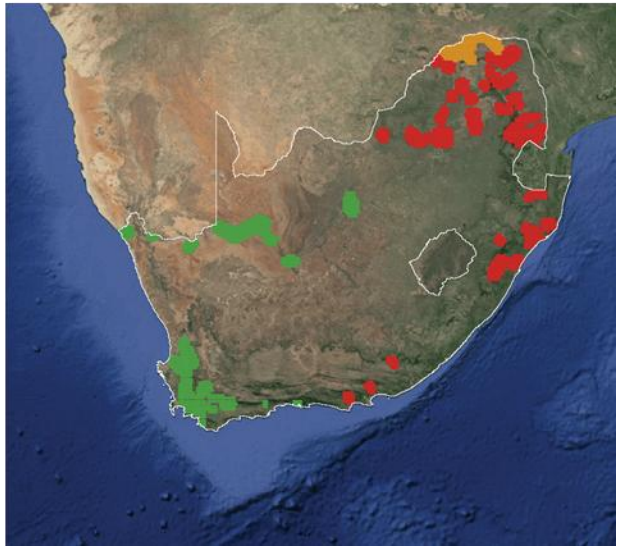
1945



1950



2014



Eur J Plant Pathol (2015) 143:69–83
DOI 10.1007/s10658-015-0666-z

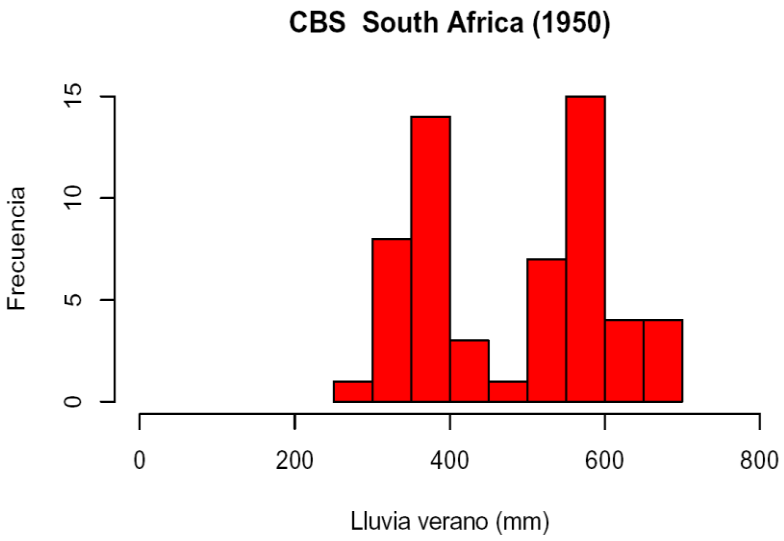
Climatic distribution of citrus black spot caused by *Phyllosticta citricarpa*. A historical analysis of disease spread in South Africa

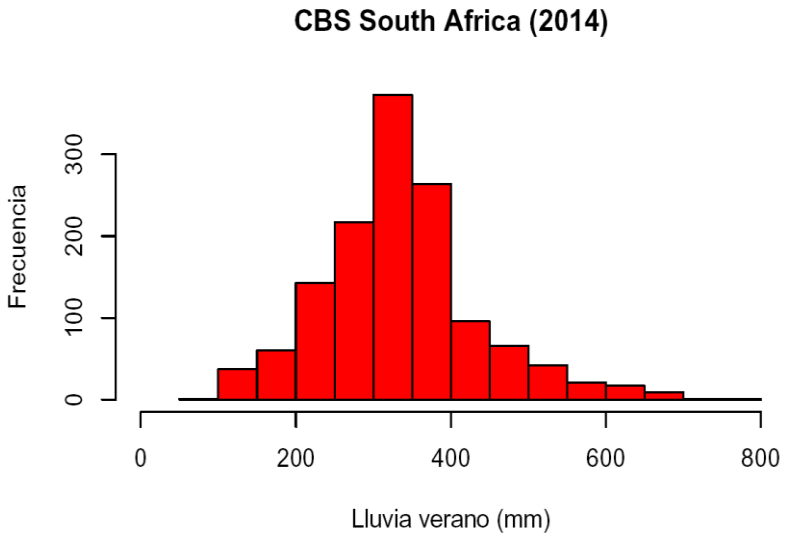
Joaquín Martínez-Minaya · David Conesa · Antonio López-Quílez · Antonio Vicent

Accepted: 27 April 2015 / Published online: 20 June 2015

CONDICIONES CLIMÁTICAS FAVORABLES PARA EL CBS

- Expansión a zonas áridas

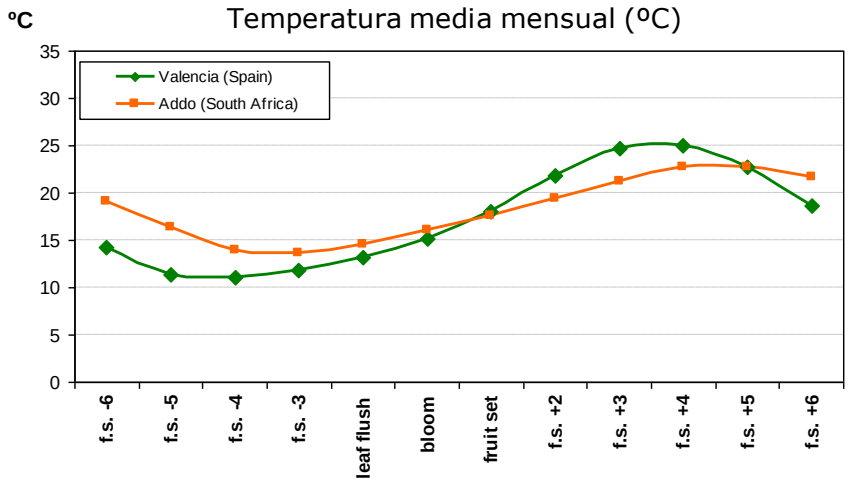


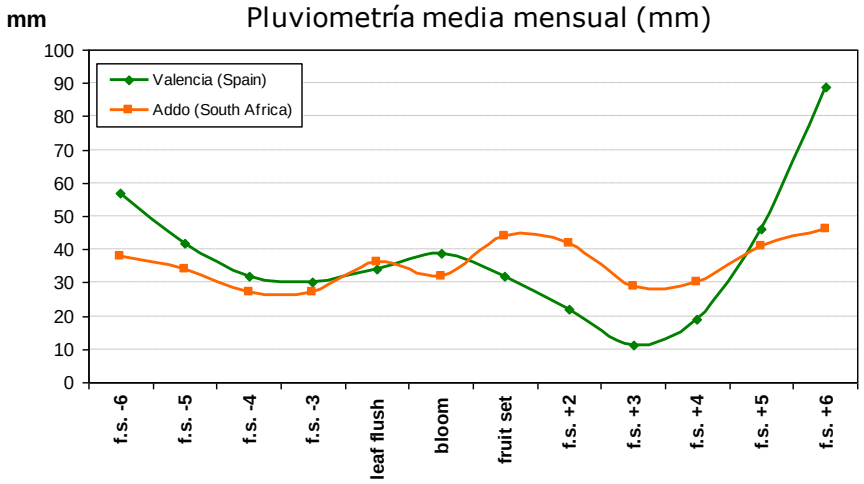


Martínez-Minaya *et al*. (2015)
Eur. J. Plant Pathol. 143:69-83

CONDICIONES CLIMÁTICAS FAVORABLES PARA EL CBS

- Regiones del Mediterráneo con un **clima idéntico** al de las zonas de Sudáfrica donde está presente el CBS





EFSA Journal (2008) 925, 1-108

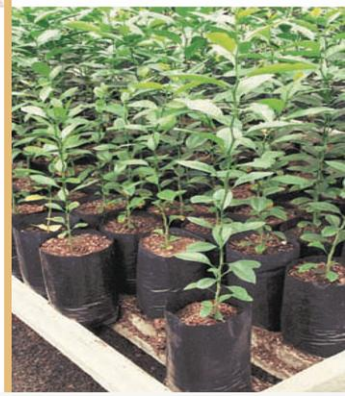
- CONDICIONES CLIMÁTICAS FAVORABLES PARA EL CBS

CONTROL MEDIANTE PRÁCTICAS AGRONÓMICAS

Medidas de prevenção

Nutrição e sanidade do pomar - como as plantas debilitadas e doentes são mais vulneráveis à infecção pelo fungo da pinta preta, estas devem ser mantidas em boas condições de nutrição e sanidade. Plantas severamente afetadas por pragas e doença devem ser removidas do pomar.

Mudas sadias - a aquisição de mudas deve ser feita em viveiros certificados. As mudas são o meio mais importante de disseminação da doença a longas distâncias. Folhas sem sintomas podem estar infectadas com o fungo.



Trânsito no pomar - desinfestação e retirada de restos de material vegetal de veículos, máquinas agrícolas, materiais de colheita e outros equipamentos, antes de entrar no pomar. A instalação de bins na entrada da propriedade, auxilia na diminuição do trânsito de veículos no interior dos pomares.

FUNDECITRUS
FUNDO DE DEFESA DA CITRICULTURA

Scaloppi (2010)

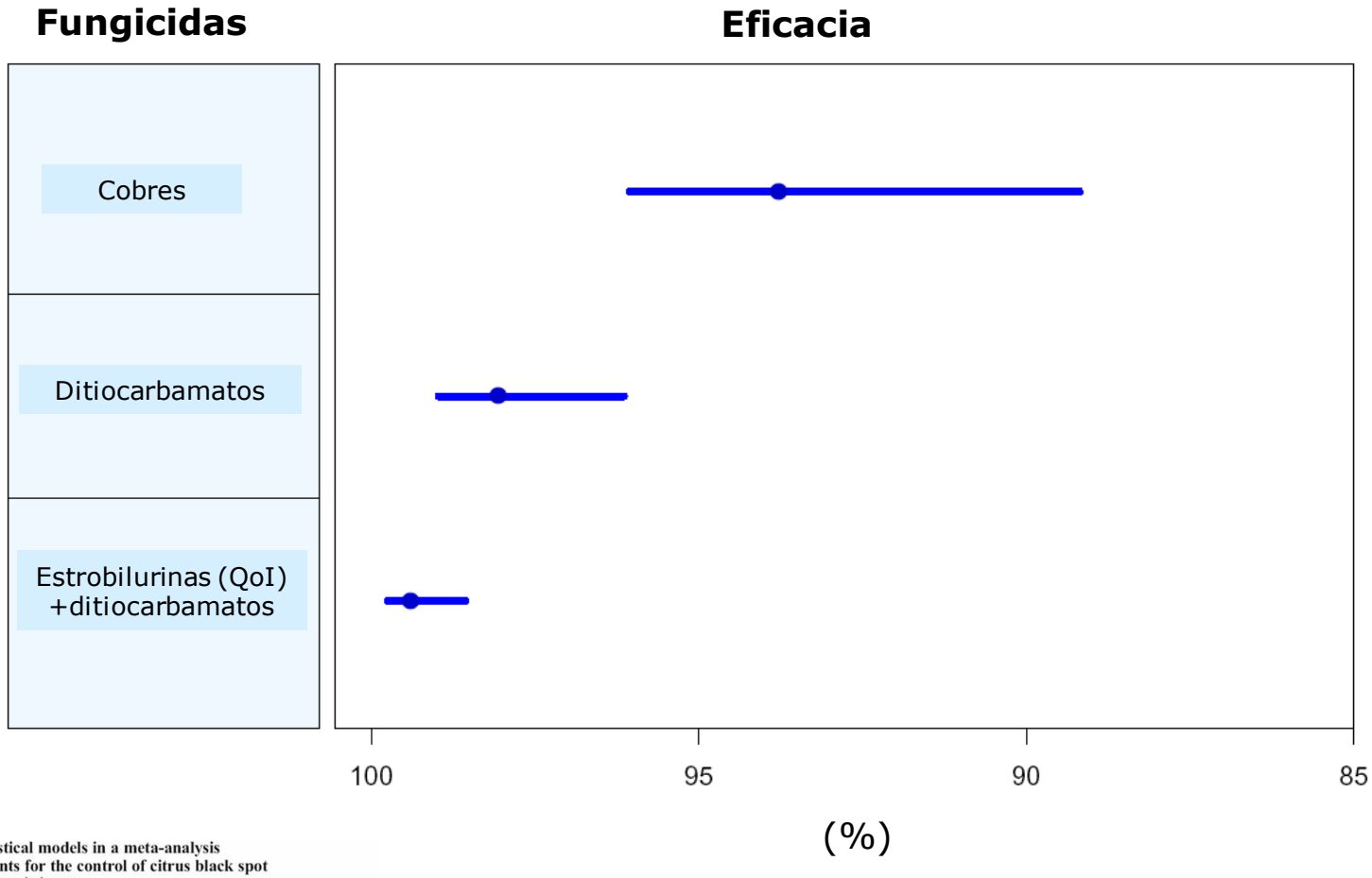
A

Controle do mato - utilização de herbicidas pós-emergentes e de roçadeiras, que proporcionem uma cobertura morta sob a copa das plantas. Essa cobertura acelera a decomposição das folhas de citros, onde são formados os esporos do fungo. Ela dificulta, também, a dispersão desses esporos pelo vento, por formar uma barreira física sobre as folhas.

Irrigação - reduz a queda excessiva de folhas, evitando a proliferação do fungo. Propicia floradas mais uniformes, melhorando e facilitanto o controle químico da doença.

Colheita - antecipação da colheita nos talhões em que a doença esteja presente. Os frutos sintomáticos podem cair reduzindo a produtividade das plantas.

- LA APLICACIÓN DE FÚNGICIDAS ES NECESARIA PARA EL CONTROL DEL CBS



Eur J Plant Pathol (2014) 139:79-
DOI 10.1007/s10658-013-0365-6

Comparison of statistical models in a meta-analysis of fungicide treatments for the control of citrus black spot caused by *Phyllosticta citricarpa*

D. Makowski · A. Vicent · M. Pautasso · G. Stancanelli · T. Rafoss

Accepted: 11 December 2013 / Published online: 4 January 2014

CITRUS BLACK SPOT (*Phyllosticta citricarpa*) **IMPACTO**

available online at www.studiesinmycology.org

STUDIES IN MYCOLOGY 87: 161–185 (2017).

First report of *Phyllosticta citricarpa* and description of two new species, *P. paracapitalensis* and *P. paracitricarpa*, from citrus in Europe

V. Guarnaccia[1*], J.Z. Groenewald[1], H. Li[2], C. Glienke[3], E. Carstens[4,5], V. Hattingh[4,6], P.H. Fourie[4,5], and P.W. Crous[1,7*]

[1]*Westerdijk Fungal Biodiversity Institute, Uppsalalaan 8, 3584 CT, Utrecht, the Netherlands;* [2]*Institute of Biotechnology, Zhejiang University, Hangzhou, 310058, China;* [3]*Federal University of Paraná, Department of Genetics, Curitiba, Paraná, Brazil;* [4]*Citrus Research International, P.O. Box 28, Nelspruit, 1200, South Africa;* [5]*Department of Plant Pathology, Stellenbosch University, P. Bag X1, Stellenbosch, 7602, South Africa;* [6]*Department of Horticultural Science, Stellenbosch University, P. Bag X1, Stellenbosch, 7602, South Africa;* [7]*Department of Microbiology and Plant Pathology, Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, P. Bag X20, Pretoria 0028, South Africa*

*Correspondence: Vladimiro Guarnaccia, v.guarnaccia@westerdijkinstitute.nl; Pedro W. Crous, p.crous@westerdijkinstitute.nl

Abstract: The genus *Phyllosticta* occurs worldwide, and contains numerous plant pathogenic, endophytic and saprobic species. *Phyllosticta citricarpa* is the causal agent of Citrus Black Spot disease (CBS), affecting fruits and leaves of several citrus hosts (*Rutaceae*), and can also be isolated from asymptomatic citrus tissues. Citrus Black Spot occurs in citrus-growing regions with warm summer rainfall climates, but is absent in countries of the European Union (EU). *Phyllosticta capitalensis* is morphologically similar to *P. citricarpa*, but is a non-pathogenic endophyte, commonly isolated from citrus leaves and fruits and a wide range of other hosts, and is known to occur in Europe. To determine which *Phyllosticta* spp. occur within citrus growing regions of EU countries, several surveys were conducted (2015–2017) in the major citrus production areas of Greece, Italy, Malta, Portugal and Spain to collect both living plant material and leaf litter in commercial nurseries, orchards, gardens, backyards and plant collections. A total of 64 *Phyllosticta* isolates were obtained from citrus in Europe, of which 52 were included in a multi-locus (ITS, *actA*, *tef1*, *gapdh*, LSU and *rpb2* genes) DNA dataset. Two isolates from Florida (USA), three isolates from China, and several reference strains from Australia, South Africa and South America were included in the overall 99 isolate dataset. Based on the data obtained, two known species were identified, namely *P. capitalensis* (from asymptomatic living leaves of *Citrus* spp.) in Greece, Italy, Malta, Portugal and Spain, and *P. citricarpa* (from leaf litter of *C. sinensis* and *C. limon*) in Italy, Malta and Portugal. Moreover, two new species were described, namely *P. paracapitalensis* (from asymptomatic living leaves of *Citrus* spp.) in Italy and Spain, and *P. paracitricarpa* (from leaf litter of *C. limon*) in Greece. On a genotypic level, isolates of *P. citricarpa* populations from Italy and Malta (MAT1-2-1) represented a single clone, and those from Portugal (MAT1-1-1) another. Isolates of *P. citricarpa* and *P. paracitricarpa* were able to induce atypical lesions (necrosis) in artificially inoculated mature sweet orange fruit, while *P. capitalensis* and *P. paracapitalensis* induced no lesions. The *Phyllosticta* species recovered were not found to be widespread, and were not associated with disease symptoms, indicating that the fungi persisted over time, but did not cause disease.

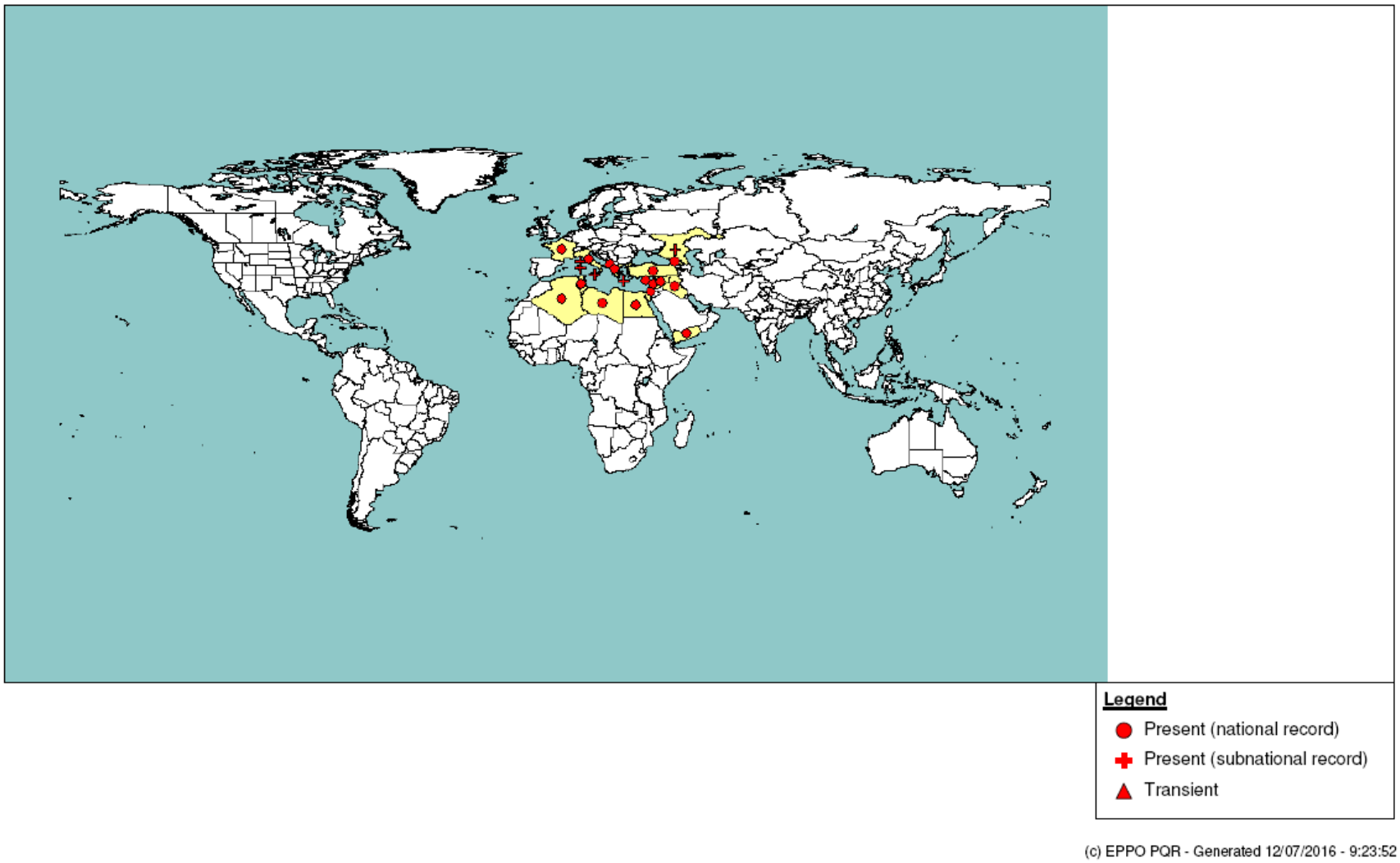
Key words: *Citrus*, *Guignardia*, Multi-locus sequence typing, Systematics.
Taxonomic novelties: *Phyllosticta paracapitalensis* Guarnaccia & Crous, sp. nov., *P. paracitricarpa* Guarnaccia & Crous, sp. nov.

‘MAL SECCO’

- ***Plenodomus tracheiphilus*** (Petri) Gruyter, Aveskamp & Verkley

- *Deuterophoma tracheiphila* Petri
- *Bakerophoma tracheiphila* (Petri) Cif.
- *Phoma tracheiphila* (Petri) L.A. Kantsch. & Gikaschvili

MAL SECCO (*Plenodomus tracheiphilus*)



MAL SECCO (*Plenodomus tracheiphilus*)

Fig. 9. Geographical distribution of citriculture in southern Italy (shaded areas) indicating the date of first reports of mal secco disease in different lemon-growing areas.

doi:10.1094/PDIS-93-9-0852

MAL SECCO (*Plenodomus tracheiphilus*)

http://www.mapama.gob.es/es/agricultura/temas/sanidad-vegetal/phoma_mal_secco/

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Fig. 4. Top: Withered twig of lemon with pycnidia of *Phoma tracheiphila*. Note the ash appearance of the dried apical portion of the twig on which pycnidia appear as scattered black spots. Bottom: Tangential section of a withered twig of lemon showing pycnidia of *P. tracheiphila* immersed in the cortex under the epidermis (optical micrograph). Note the necks of pycnidia emerging through the epidermis. (Courtesy S. Grasso.)

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SARNAS O ROÑAS

- ***Elsinoë australis*** Bitanc. & Jenkins
- *Sphaceloma australis* Bitanc. & Jenkins

- ***Elsinoë fawcettii*** Bitanc. & Jenkins
- *Sphaceloma fawcettii* Bitanc. & Jenkins

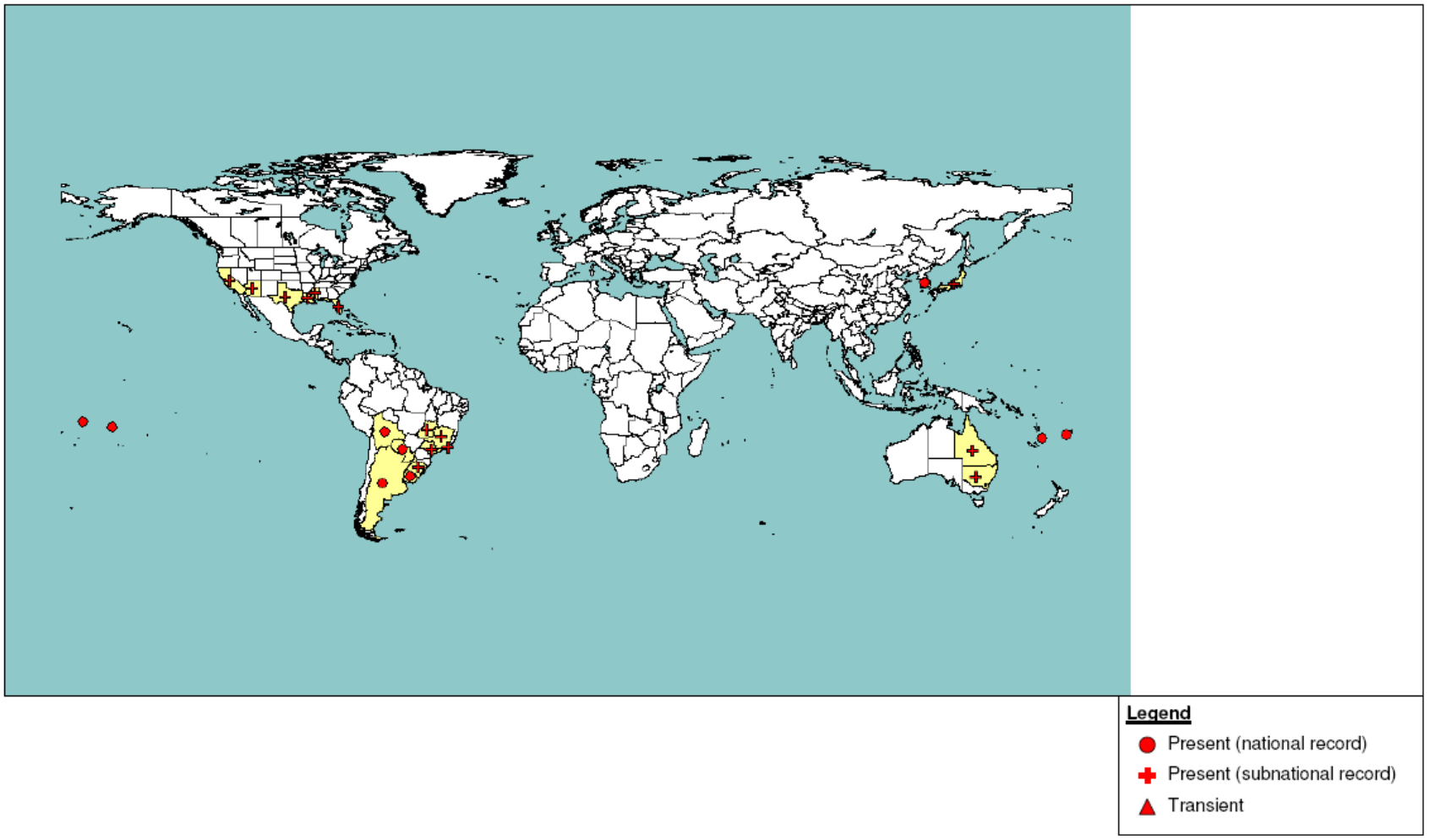
Agente causal

* ***Elsinoë australis*** **"sweet orange scab"**

* ***Elsinoë fawcettii*** **"citrus scab"**

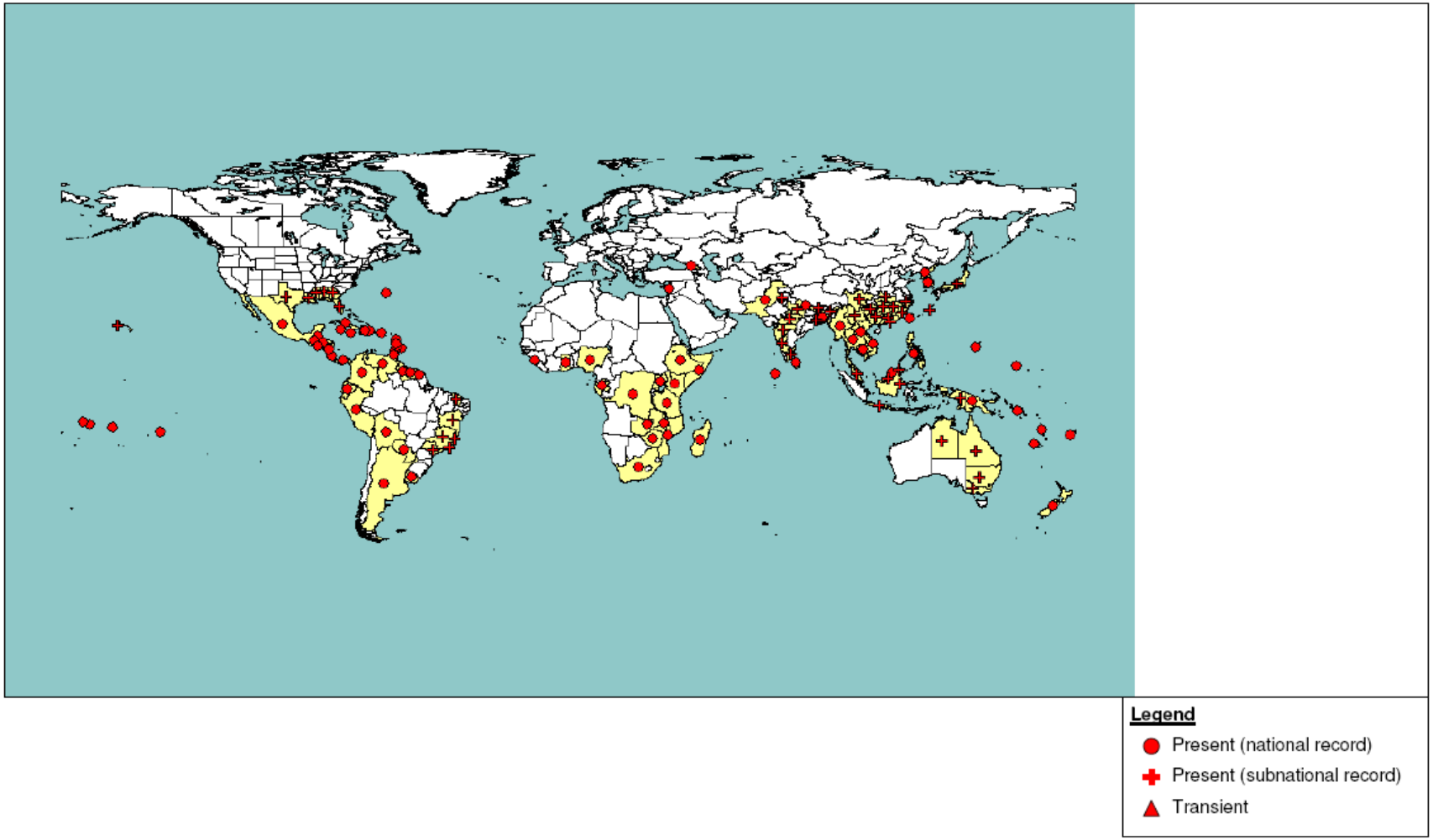
Elsinoe australis

EPPO Code : ELSIAU



Elsinoe fawcettii

EPPO Code : ELSIFA



SARNAS (*Elsinoë* spp.)

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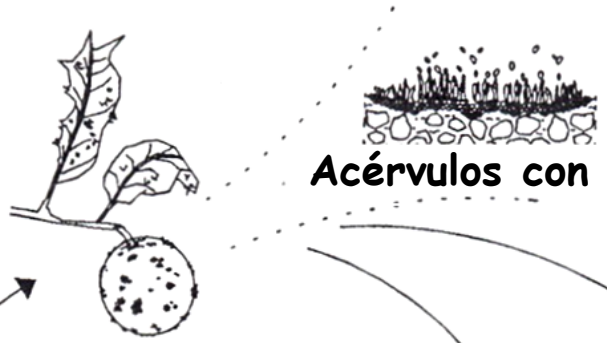

Acérvulos con conidios

Diseminación por salpicaduras de lluvia

Conidios hialinos

Diseminación por el viento

Conidios pigmentados

Síntomas (6-7 días)

Infección

* 23-27°C
* 5-6 horas de agua libre

* Frutos < 2 meses
* Hojas tiernas

Adaptado de: Citrus Health Management (Timmer, 1999)

Patotipos de *Elsinoë fawcettii*

Patotipos	Material vegetal					Zonas Geográficas
	Hojas				Frutos	
	Limón rugoso	Naranjo amargo	Mandarina Cleopatra	Pomelo	Naranjo dulce	
Florida broad host range	+[2]	+	+	+	+	Argentina, Corea del Sur, EE.UU.
Florida narrow host range	+	-	+	+	-	Corea del Sur, EE.UU.
Tryon's	+	-	+	-	-	Australia
Lemon	+	-	-	-	-	Argentina, Australia

Control

- Eliminación de frutos afectados antes de la brotación / cuajado
- Fungicidas de contacto: compuestos cúpricos, etc.
- Fungicidas penetrantes: benzimidazoles, triazoles, estrobirulinas (QoI), etc.

❑ CERCOSPORIOSIS

- ***Pseudocercospora angolensis*** (T. Carvalho & O. Mendes) Crous & U. Braun

- ***Cercospora angolensis*** T. Carvalho & O. Mendes
- ***Phaeoramularia angolensis*** (T. Carvalho & O. Mendes) P.M. Kirk
- ***Pseudophaeoramularia angolensis*** (T. Carvalho & O. Mendes) U. Braun

CERCOSPORIOSIS (*Pseudocercospora angolensis*)

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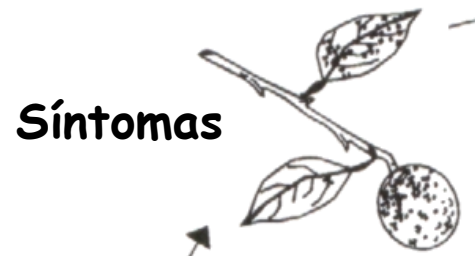
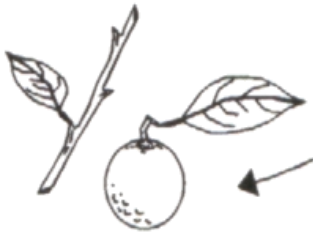


Síntomas

Esporulación

Diseminación



Infección

15-30°C (óptimo 25°C)

Hojas: 4-6 días con alta humedad

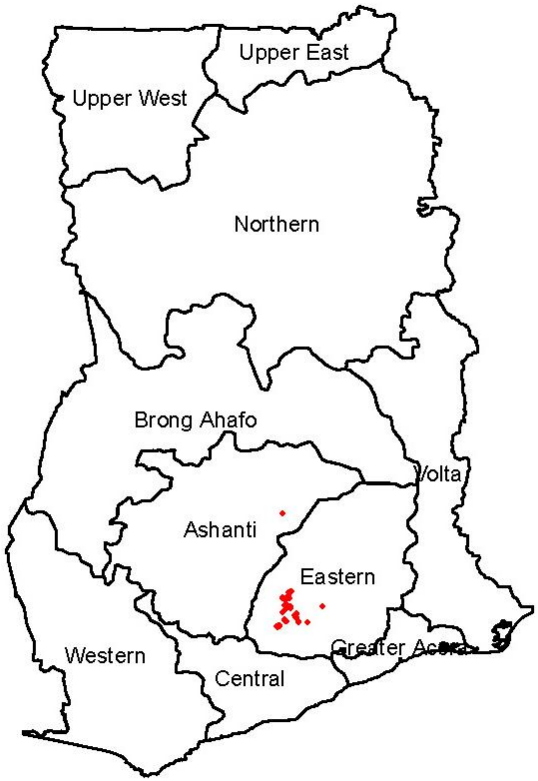
Frutos: 3 – 48 h de agua libre

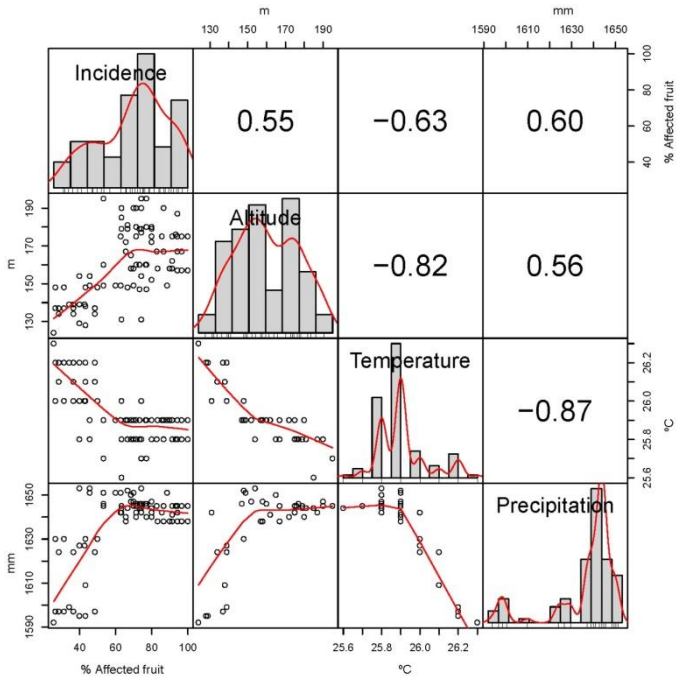
Hojas jóvenes

Frutos < 4 cm de diámetro

Adaptado de: Citrus Health Management (Timmer, 1999)

CERCOSPORIOSIS (*Pseudocercospora angolensis*)





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Crop loss and control of Pseudocercospora fruit and leaf spot of citrus in Ghana

Lawrence E. V. Lawson · Francis C. Brentu · Eric W. Cornelius · Kwadwo A. Oduro · María E. Sedano · Antonio Vicent

Control

- 5-7 tratamientos cada 15 días en la época de lluvias
- Aplicaciones alternas de benomilo y compuestos cúpricos
- Otros productos: propineb, clortalonil, flusilazol, etc.


GRACIAS POR SU
ATENCIÓN