


CGA CBS MEETING**Malelane: 1 October 2002****Letsitele: 2 October 2002**

Two meetings were held to discuss CBS related issues, one at Malelane and one at Letsitele. The meetings were conducted by Mike Holtzhausen (Directorate Plant Health & Quality) and Justin Chadwick (Citrus Growers Association). It was requested at the meetings that producers should read the "Guide to Auditing a Good Agricultural Practices System for Management and Control of Citrus Black Spot (CBS / *Guignardia citricarpa*)" (Annexure B). Growers are to respond with comments to Hennie le Roux before 19 October 2002, Email: hlr@cri.co.za. These comments will be forwarded to DPHQ.

 National Department of Agriculture Directorate: Plant Health & Quality	Doc No. 14/2/1 RSA
	Revision No.: Draft 2
	Prepared by: CBS Systems Approach WG
	Approved by: DPHQ; CGA
GUIDE TO AUDITING A GOOD AGRICULTURAL PRACTICES SYSTEM FOR MANAGEMENT & CONTROL OF CITRUS BLACK SPOT (CBS / <i>GUIGNARDIA CITRICARPA</i>)	
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REVISION NO.:	DATE APPROVED:
NATURE OF REVISION:	
PREPARED BY:	

GUIDE TO AUDITING THE GOOD AGRICULTURAL PRACTICES SYSTEM FOR MANAGEMENT & CONTROL OF CITRUS BLACK SPOT (CBS / *GUIGNARDIA CITRICARPA*)

1 PURPOSE

*The Good Agricultural Practices System for Management and Control of Citrus Black Spot (CBS / *Guignardia citricarpa*) is intended as a practical tool for Citrus producers in South Africa. It was prepared by a Working Group comprising nominees from local industry and research circles (Appendix 1), under the auspices of the National Department of Agriculture: Directorate Plant Health and Quality.*

Its aim is to safeguard access to CBS-sensitive citrus export markets by providing a means of verifying the management status of individual production units. To achieve this, compliance is measured against specified, technically justifiable requirements. This is seen as an effective means of helping producers ensure that their Citrus fruit complies with the import requirements of markets for which CBS is regarded either as a quarantine pest or a regulated pest.

A questionnaire (Appendix 2) that addresses the critical control points in Citrus production forms the backbone of the system. Some of the answers to this are straightforward and self-evident. Others require that specific details be used for their evaluation, and this guide provides the relevant information.

2 SCOPE

Official inspectors as well as independent assessors or producers may use this guide to monitor the effectiveness of CBS control systems in terms of accepted norms, standards and good agricultural practices. From a technical viewpoint, it is based on the principles of the HACCP (Hazard Analysis Critical Control Point) systems approach, which entails

- 1. Analysis of the risks in the production chain;*
- 2. Identification of*
 - 2.1 The critical control points for instituting control measures,*
 - 2.2 Control measures and criteria to ensure effective control, and*
 - 2.3 Ways of monitoring these critical control points; and then*
- 3. Determination of the appropriate corrective actions;*
- 4. Setting of record-keeping procedures and documentation requirements, and*

5. *Procedures to audit and verify that the system is functioning effectively.*

Where no single control measure can effectively ensure protection against a pathogen, as is the case with CBS, an alternative line of attack is to develop a system to safeguard against disease risks. Such a systems approach is defined as "The integration of different pest risk management measures, at least two of which act independently, and which cumulatively achieve the appropriate level of phytosanitary protection (see References: "The use of integrated measures in a systems approach for pest risk management": ISPM No. 14, 2002). Accordingly, this requires the combination of different control procedures - at least two of which act separately - which have a cumulative effect. Where two measures are independent of each other, both must fail for the whole system to fail. In other words, the probability of failure is the product of the failure of all the independent measures. In contrast, regarding dependent measures the probability of failure is approximately additive.

This approach provides an opportunity to combine the pre-and post harvest procedures that may contribute to effective management of the risks associated with the pest in question. Any number of measures that are dependent on each other may be included. An added advantage of the systems approach is that it presents an opportunity to deal with uncertainties through modifying the number and the strength of measures that are included until the appropriate levels of protection and confidence can be met.

3 RESPONSIBILITY

Full producer support is needed for this system to be effective. In the accompanying questionnaire, "you" or "your" refers to the producer who is responsible and accountable for the relevant Production Unit (PU). This is the person who must ensure

- That the management status of the PU is regularly reviewed,*
- That management procedures are amended according to performance, and*
- That all indicated records are complete, up to date and available on request.*

The Directorate Plant Health and Quality of the National Department of Agriculture (DPHQ-NDA) is responsible for ensuring compliance with the import requirements of South Africa's trading partners. In South Africa, official national agricultural policy and legislation is based on this country's signatory membership of various multilateral trade agreements and international standard-setting bodies. These are primarily

- 1) The WTO-SPS (World Trade Organization - Agreement on Application of Sanitary and Phytosanitary Measures), and the relevant*
- 2) International standard setting bodies, known as the "3 sisters", namely*
 - The IPPC - International Plant Protection Convention;*
 - CODEX - Codex Alimentarius Commission, and*
 - The OIE - Office International des Epizooties / World Animal Health Organisation, for veterinary issues.*

In accordance with its WTO and IPPC obligations, South Africa must

- *Provide a National Plant Protection Organisation (NPPO) - for SA this is NDA-DPHQ - and*
- *Conduct import and export of plants and plant products according to accepted international principles and standards in order to*
 - *Enhance free trade while simultaneously*
 - *Protecting the health and life of the plants, animals and humans within its borders against the entry of foreign pests and diseases on imported goods.*

Endorsement

This management tool is supported by the NDA-DPHQ and the Citrus Growers' Association of Southern Africa (CGA) as a means of assisting Industry to comply with the import requirements of CBS-sensitive markets.

Review and amendment

Management systems should be subject to periodic review and amendment. This system is to be reviewed annually or as required by the CBS Systems Approach Working Group, and updated and improved as necessary.

Stakeholders must ensure that they use the current edition. The intention is that this will be available on the NDA website (www.nda.agric.za).

4 REFERENCES & DEFINITIONS

- *Glossary of phytosanitary terms, 2001. ISPM Pub. No. 5, FAO, Rome.*
- *New Revised Text of the International Plant Protection Convention, 1997. FAO, Rome.*
- *Export Certification System, 1997. ISPM Pub. No. 7, FAO, Rome.*
- *The use of integrated measures in a systems approach for pest risk management. 2002. ISPM Pub. No. 14, FAO, Rome.*

*Terms, abbreviations and acronyms in this document are used in accordance with the above **Glossary**.*

The above and other useful publications are available on the IPPC website (<http://www.fao.org/waicent/faoinfo/agricult/agp/agpp/pq/En/Publ/ISPM/ispm.htm>).

5 MANAGEMENT REQUIREMENTS: QUESTIONS & ANSWERS

**QUESTIONNAIRE:
GOOD AGRICULTURAL PRACTICES FOR CITRUS BLACK SPOT
(CBS / GUIGNARDIA CITRICARPA) MANAGEMENT AND CONTROL**

Please answer these CBS management questions by ticking the appropriate block. You must maintain the indicated records and be able to provide them on request.

(Note: “you” or “your” refers to the producer responsible for the production unit in question;
Y = Yes, N = No, NA = Not applicable.)

QUESTION NO.	QUESTION	ANSWER (√)		
		<u>Y</u>	<u>N</u>	<u>NA</u>
1	CBS status of production area			
1.1	Is the production unit situated in an area that is officially declared CBS free? If 'Yes', state its magisterial district: and sign this document.			
1.2	If 'no', please complete the remainder of the questionnaire.			

ANSWER / RESPONSE:

For the current officially declared CBS Pest Free Area in the Western Cape, the relevant magisterial districts are as follows (in alphabetical order - see map in Appendix 3):

- Bredasdorp
- Caledon
- Clanwilliam
- Heidelberg
- Hermanus
- Ladismith
- Montagu
- Paarl
- Piketberg
- Robertson
- Somerset-West
- Stellenbosch
- Strand
- Swellendam
- Wellington
- Worcester

Question 2 - Monitoring

		Y	N	NA
2	Monitoring			
2.1	Are your orchards monitored for CBS by means of any kind of prediction service for CBS?			
2.2	If so, which of the following do you use:			
	a) Visual inspections?			
	b) Ethrel dip test?			
	c) Prediction modelling (from August 2002)?			
	d) Pre-harvest surveys?			

ANSWER / RESPONSE:

2.1 **Self-explanatory**

2.2 a) **Self-explanatory**

b) **Ethrel dip test for CBS on Citrus fruit
(method provided by Dr Tian Schutte, CRI, Nelspruit)**

Steps:

1. Randomly collect a sample made up of one (1) lug box of fruit / ha from the northern side of trees. (As the test is done as early as February, it is done on green fruit. If CBS infection is present, it tends to be worse on the trees' hotter, sunny side).
2. Dip the whole lug box in a mixture of 8 ml of Ethrel / 1 water for 5 minutes.
3. Leave dipped fruit for +5 days at room temperature.
4. Inspect the dipped fruit: CBS lesions will show up red.

c) **Prediction modelling (information available in August 2002)**

d) **Self-explanatory**

3 Spray program

		Y	N	NA
3	Spray program			
3.1	Do you follow a recognised disease control program for CBS?			
3.2	Do you calibrate the chemical application equipment used?			
3.3	Is the calibration sufficient to ensure that the correct amount of chemicals is applied, and to ensure total coverage of the fruit?			
3.4	Do you follow an approved resistance management program?			
3.5	<i>Have your orchards been tested for resistance?</i>			
3.6	Is spore trapping used to improve the timing of your spray programme?			

ANSWER / RESPONSE:

3.1 **See Appendix 4: REGISTERED CBS SPRAY PROGRAMMES**

3.2 - 3.6 **Self-explanatory**

4 Orchard selection

		Y	N	NA
4	Orchard selection Do you only select orchards for export to CBS-sensitive markets in which CBS does not occur?			

ANSWER / RESPONSE: Self-explanatory

5 Orchard sanitation

		Y	N	NA
5	Orchard sanitation Are CBS-infected plant residues (leaves, fruit) in your orchards			
5.1	a) Removed by means of an effective orchard sanitation program? a)			
5.2	b) Rendered non-infective through a chemical treatment or cultural practice? b)			

ANSWER / RESPONSE:

5.1 Self-explanatory

5.2 Mulching or burning, or spraying with urea, may assist in reducing the infectivity of infected fallen leaves by speeding up decomposition.

In areas where the climate is conducive for the pathogenic fungus to complete its life cycle, spore-producing sexual fruiting bodies (perithecia) develop on leaves from CBS-infected trees on the orchard floor. Ripe spores (ascospores) released at a stage when the live leaves and fruits are susceptible to infection result in the disease perpetuating itself. New orchards can become infected by airborne ascospores from nearby infected orchards. Enhancement of leaf decomposition may prevent the development of perithecia and stop the progress of the pathogen. Application of a product such as urea hastens decomposition.

6 Pack house

		Y	N	NA
6	Pack house			
6.1	Have the graders in your pack house been trained to identify CBS?			
6.2	Do you monitor packing lines and packed cartons to ensure that CBS has been effectively eliminated?			
6.3	Do you decrease the speed of the packing lines in the pack house to improve inspections by graders?			

ANSWER / RESPONSE: Self-explanatory

7 Traceability

		Y	N	NA
7	Traceability			
	Is your final packed product traceable to the correct orchard?			

ANSWER / RESPONSE:

- To provide for plant health certification needs, the International Plant Protection Convention's *Export Certification System (ISPM No 7, 1997)*, requires that consignments and their certificates must be traceable through all stages of production, handling and transport to the point of export.
- Traceability is vital because the NDA-DPHQ - the National Plant Protection Organisation for South Africa - must issue a guarantee to the importing country in the form of a phytosanitary certificate that each exported consignment complies with the importing country's plant health requirements.

- Accordingly, each production unit (= farm) must have a unique Production Unit Code (PUC) issued by the NDA (currently DPHQ subdirectorate Plant Health), and Pack houses need a pack house code, also issued by DPHQ.
- To ensure traceability to orchard level or as appropriate, the person responsible for the PU must keep records of the relevant subunits within the PU.

8 Inspections

		Y	N	NA
8	Inspections If CBS is found during inspections, is there a system in place to ensure that the fruit does not go to a CBS sensitive market? (See 8.11 and 8.12 below)			

ANSWER / RESPONSE

- When a PPECB inspector finds any signs of CBS during inspection of a consignment of citrus fruit destined for export, the relevant consignment note accompanying such fruit must be prominently endorsed with the expression **Blackspot found --- not for the EU**.
- When a producer or packhouse manager suspects that a specific consignment of citrus fruit may develop CBS during the transport thereof to the EU he/she must bring it to the attention of the inspector and also ensure that the relevant consignment note is endorsed accordingly to prevent fruit with CBS to enter this market.
- It is the responsibility of the producer/packhouse to pertinently inform the export agent of any consignments of citrus fruit that is infected with CBS.
- The export agent must then ensure that such fruit is send to less sensitive markets.

9 Records

		Y	N	NA
9	Records Do you certify that the following records are kept in good order and are available at all times for inspection on request: 9.1 (etc)			

ANSWER / RESPONSE: All - Self-explanatory

6 APPENDICES:

APPENDIX 1 - CBS SYSTEMS-APPROACH WORKING GROUP

APPENDIX 2 - QUESTIONNAIRE / VRAELYS

APPENDIX 3 – MAP OF OFFICIAL WESTERN CAPE PEST FREE AREA FOR CBS:
MAGISTERIAL DISTRICTS

APPENDIX 4 – REGISTERED CBS SPRAY PROGRAMMES

APPENDIX 1 – CBS SYSTEMS-APPROACH WORKING GROUP: BACKGROUND & PARTICIPANTS

1. On 18/11/1999, the National Department of Agriculture's Directorate Plant Health & Quality (NDA-DPHQ) held a workshop with Industry and Researchers. Its aim was to seek solutions for the CBS issue relating to market access to the European Union (EU). One of the major decisions from the floor was to form two working groups: one
 - i) To pursue the Pest Risk Analysis (PRA) route for convincing the EU to change their CBS pest status, as a medium- to long-term strategy; coordinating group: Mike Holtzhausen, Eben Rademeyer, Alice Baxter, Dr Vaughan Hattingh (coordinator), Dr Tian Schutte, and Prof. Kotzé.), and one
 - ii) To investigate a "producer accreditation system" as a short-term approach.

2. The participants nominated for the "producer accreditation system" (point 1-ii) were
 - Ms Alice Baxter NDA (coordinator)
 - Mr P Broere NDA (re 'accreditation' procedures)
 - Mr Justin Chadwick Citrus Growers Association
 - Mr Bruce Cook Capespan
 - Mr André de Vries SAFE
 - Prof. BJ Kotze Private consultant
 - Mr David Lötter Citrus Growers Association (CGA)
 - Dr Vaughan Hattingh Citrus Research International (CRI)
 - Dr Tian Schutte CRI, and
 - Mr Frikkie van Tiddens Perishable Products Export Control Board (PPECB), plus Mr Philip de Bruyn (NDA) co-opted to deal with the minutes.

3. On 14/01/2000 the 'accreditation' Working Group met and formulated a questionnaire. On 31/03/2000, DPHQ called a meeting including members of both CBS working groups (see point 1) as the EU evidently intended stepping up actions on CBS due to a high interception rate. The Meeting decided to use this questionnaire with some modifications, noting that it is a 'self-monitoring' system: 'accreditation' implies approval by SANAS (the South African National Accreditation System). For additional user-friendliness, Johan Labuschagne of Capespan translated it into Afrikaans.

4. On 29/05/2001 DPHQ submitted a PRA document (see point 1-i) to the EU. The European Commission instituted a Technical Working Group to evaluate this and sent feedback in mid-December 2001. On 4/02/2002 DPHQ called a meeting with technical specialists and other role players to determine how to move forward regarding the PRA. At the subsequent DPHQ Market Access meeting on 5/02/2002, it was decided
 - i) That the 'systems approach' Working Group should continue its activities;
 - ii) That two new members should be added, namely Ms Jantje Moen (NDA) and Dr Hennie le Roux (CRI), and that the

- iii) Fresh Produce Exporters' Forum (Stuart Symington) would be asked to nominate a replacement for Bruce Cook, who was no longer available. [Nominees received April 2002: Dr Kevin Chambers (Capespan), Mr Lammie van Vreeden (Lona).]
5. On 4/03/2002 the available members of the 'systems approach' WG (plus Ms Corné Hattingh, NDA, co-opted to deal with the minutes) met to update the questionnaire and assign responsibilities and timeframes regarding the completion of a User Guide to accompany the questionnaire as part of the management tool.

APPENDIX 2 - QUESTIONNAIRE / VRAELYS

**QUESTIONNAIRE:
GOOD AGRICULTURAL PRACTICES FOR CITRUS BLACK SPOT
(CBS / GUIGNARDIA CITRICARPA) MANAGEMENT AND CONTROL**

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(Note: "you" or "your" refers to the producer responsible for the production unit in question;
Y = Yes, N = No, NA = Not applicable.)

QUESTION NO.	QUESTION	ANSWER (√)		
		<u>Y</u>	<u>N</u>	<u>NA</u>
1	CBS status of production area			
1.1	Is the production unit situated in an area that is officially declared CBS free? If 'Yes', state its magisterial district: and sign this document.			
1.2	If 'no', please complete the remainder of the questionnaire.			
2	Monitoring			
2.1	Are your orchards monitored for CBS by means of any kind of prediction service for CBS?			
2.2	If so, which of the following do you use:			
	a) Visual inspections? a)			
	b) Ethrel dip test? b)			
	c) Prediction modelling (from August 2002)? c)			
	d) Pre-harvest surveys? d)			
3	Spray program			

3.1	Do you follow a recognised disease control program for CBS?			
3.2	Do you calibrate the chemical application equipment used?			
3.3	Is the calibration sufficient to ensure that the correct amount of chemicals is applied, and to ensure total coverage of the fruit?			
3.4	Do you follow an approved resistance management program?			
3.5	<i>Have your orchards been tested for resistance?</i>			
3.6	Is spore trapping used to improve the timing of your spray programme?			
4	Orchard selection Do you only select orchards for export to CBS-sensitive markets in which CBS does not occur?			
5	Orchard sanitation Are CBS-infected plant residues (leaves, fruit) in your orchards			
5.1	a) Removed by means of an effective orchard sanitation program? a)			
5.2	b) Rendered non-infective through a chemical treatment or cultural practice? b)			
6	Pack house 6.1 Have the graders in your pack house been trained to identify CBS? 6.2 Do you monitor packing lines and packed cartons to ensure that CBS has been effectively eliminated? 6.3 Do you decrease the speed of the packing lines in the pack house to improve inspections by graders?			
7	Traceability Is your final packed product traceable to the correct orchard?			
8	Inspections If CBS is found during inspections, is there a system in place to ensure that the fruit does not go to a CBS sensitive market? (See 8.11 and 8.12 below)			
9	Records Do you certify that the following records are kept in good order and are available at all times for inspection on request:			
9.1	Production records – List of orchards?			
9.2	– Scouting (monitoring) / Pre-harvest survey records?			
9.3	– Pest management program (including spray program)?			

9.4	- Calibration records for fungicide spray equipment?			
9.5	- Fungicide stock records?			
9.6	- Harvesting records?			
9.7	- Orchard sanitation records?			
9.8	- Laboratory test report regarding resistance?			
	Pack house records:			
9.9	- Training of graders to identify CBS symptoms?			
9.10	- Orchard cull analysis (CBS fruit selected and discarded)?			
9.11	- Pack house fruit grading records (reasons for culling)?			
9.12	- Traceability system?			
9.13	- Inspection results?			
9.14	- Consignment records?			

FORM COMPLETED BY:

NAME (PRINT)

SIGNATURE

DATE

FROM (ORGANISATION): _____

Appendix 2 – Questionnaire / Vraelys

VRAELYS: GOEIE LANDBOUPRAKTYKE VIR SITRUS SWARTVLEK (SSV / GUIGNARDIA CITRICARPA) BESTUUR EN BEHEER

Beantwoord asseblief al hierdie vrae oor die bestuur van SSV deur die gepaste blokkie af te merk (√).
U moet die aangeduide rekords byhou en dit op aanvraag kan verskaf.

(**Let wel:** "U" verwys na die produsent wat vir die betrokke produksie-eenheid verantwoordelik is;
J = Ja; N = Nee; NVT = Nie van toepassing)

VRAAG NR.	VRAAG	ANTWOORD (√)		
		J	N	NVT
1	SSV-status van produksiegebied			
1.1	Is die produksie-eenheid in 'n amptelik verklaarde SSV-vrye area geleë? Indien 'Ja', meld die betrokke landdrosdistrik: en teken hierdie dokument.			
1.2	Indien 'nee', voltooi asseblief die res van hierdie vraelys			
2	Monitering			
2.1	Word u boorde by wyse van enige voorspellingsdienste vir SSV gemonitor?			
2.2	Indien wel, watter van die volgende gebruik u:			
	a) Visuele inspeksies? a)			
	b) Ethrel doop-toets? b)			
	c) Voorspellingsmodellering (vanaf Augustus 2002)? c)			
	d) Vooroes-opnames? d)			
3	Spuitprogram			
3.1	Volg u 'n erkende siektebeheerprogram vir SSV?			
3.2	Kalibreer u die spuitmasjiene wat u gebruik?			
3.3	Is die kalibrasie voldoende om te verseker dat die korrekte hoeveelheid middels toegedien is, en om volledige bedekking van die vrugte te verseker?			
3.4	Volg u 'n aanvaarde program teen weerstandbiedendheid?			
3.5	Is u boorde al vir weerstandbiedendheid getoets?			
3.6	Word spoorvalle gebruik om die tydsberekening van u spuitprogram te verbeter?			

4	Boordseleksie Selekteer u slegs boorde wat SSV-vry is vir uitvoer na SSV-sensitiewe markte?			
5	Boordsanitasie Word SSV-besmette plantreste (blare, vrugte) in u boorde by wyse van			
5.1	a) 'n Doeltreffende boordsanitasieprogram verwyder? a)			
5.2	b) 'n Chemiese behandeling of verbouingspratyk onbesmetlik gemaak? b)			
6	Pakhuis			
6.1	Is die gradeerders in u pakhuis opgelei om SSV te identifiseer?			
6.2	Moniteer u paklyne en verpakte kartonne om te bepaal of SSV effektief geëlimineer is?			
6.3	Verminder u die spoed van paklyne om inspeksies deur gradeerders te bevorder?			
7	Naspoorbaarheid ("Traceability") Is u finale verpakte produk terugspoorbaar na die regte boord?			
8	Inspeksies Is daar 'n stelsel in plek om te verseker dat vrugte nie na 'n SSV-sensitiewe mark gaan nie indien swartvlek gedurende inspeksies gevind word? (Sien 9.13 en 9.14 hieronder)			
9	Rekords Verklaar u dat u die volgende rekords byhou en dit enige tyd kan voorlê op versoek:			
	Produksierekords			
9.1	– Lys van boorde?			
9.2	– Rekords van vooroes boord monitering ?			
9.3	– Pesbeheerprogram (insluitende spuitprogram)?			
9.4	– Kalibrasierekords van spuitmasjiene vir swamdoders?			
9.5	- Swamdoderspuitstof-voorraadrekords?			
9.6	– Oesrekords?			
9.7	– Boordsanitasierekords ?			

9.8	– Laboratoriumverslag oor weerstandbiedendheid?			
9.9	<i>Pakhuisrekords</i> - Opleiding van gradeerders om SSV-simptome te identifiseer?			
9.10	– Boord-uitskotrekords (SSV-vrugte reeds in die boord verwyder)?			
9.11	– Graderingsrekords (redes vir uitskot in pakhuis)?			
9.12	- Nasporingstelsel (“Traceability system”)?			
9.13	– Inspeksieresultate?			
9.14	– Besending rekords ?			

VORM VOLTOOI DEUR:

NAAM (DRUKSKRIF)

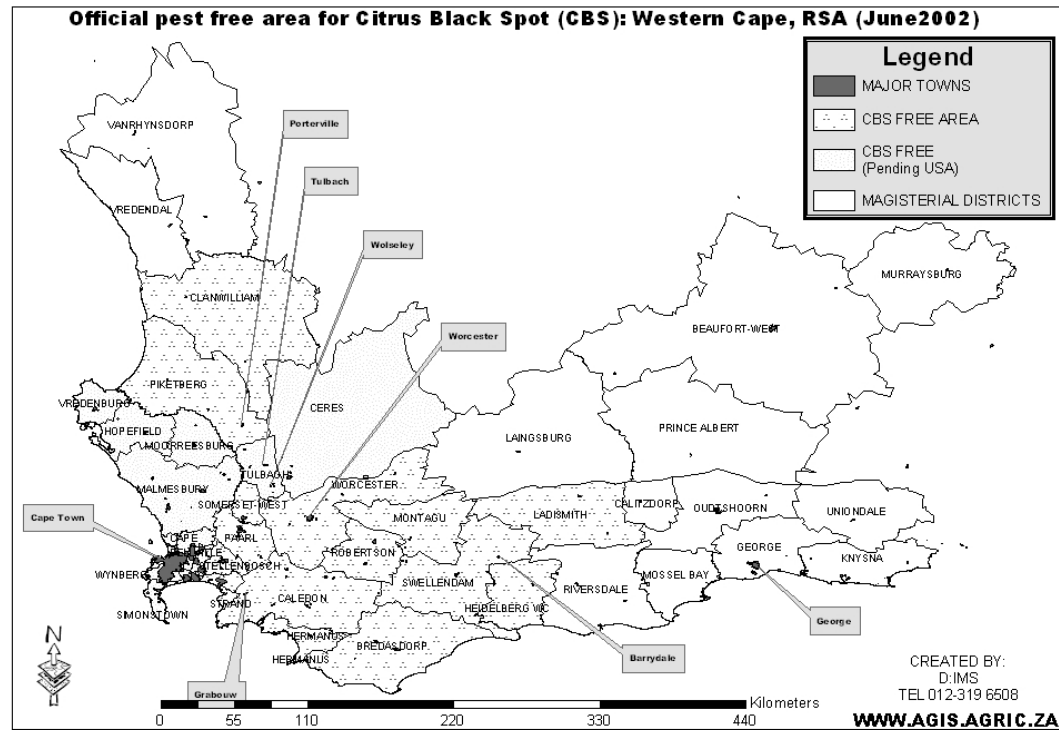
HANDTEKENING

DATUM

VAN (ORGANISASIE): _____

APPENDIX 3 – MAP OF OFFICIAL WESTERN CAPE PEST FREE AREA FOR CBS: MAGISTERIAL DISTRICTS

[Note: This map is inserted here from an electronic file, "CBS WCape.jpg". To print it out either in A4 format or, for better differentiation, a larger format (A3 - which can be folded double in the printed Guide): 1) save the file on disk or diskette; 2) insert it into a Power Point Presentation according to the relevant instructions for inserting a picture from a file, and then 3) make the required print selections (A3 / A4).]



APPENDIX 4 – REGISTERED CBS SPRAY PROGRAMMES

CITRUS BLACK SPOT: Preventative spray programmes

[Note: Information on correct and safe application of appropriate remedies is included in the National Department of Agriculture's guides for controlling plant pests and diseases. Compiled by Technical Advisers to the Registrar of Act No. 36 of 1947, these are available through the Director Resource Centre: Directorate Communication, Private Bag X144, Pretoria 0001, Tel (012) 319 7141 or 319 7085, Fax 319 7260. A list of publications and an order form are also available on the departmental website: www.nda.agric.za]

Table 1. Preventive Citrus Black Spot control programmes (for dry years)

Weather conditions	Fungicide	Dosage/100 litres water	Application date/Interval
Wet season	Mancozeb*	200 g*	First application after 100% petal fall in early October. Follow up with a further 4 applications at 25 day intervals
	Copper oxychloride or copper hydroxide	200 g	4 applications at 30-35 day intervals commencing in early October
	Zineb	200 g	6-7 applications at 19-21 day intervals commencing in early October
	Maneb/ZnO	200 ml	5 applications at 28 day intervals commencing in early October
Normal season	Mancozeb*	200 g*	4 applications at 25 day intervals commencing during the 3 rd week in October
	Copper oxychloride or copper hydroxide	200 g	3 applications at 30-35 day intervals commencing during the 3 rd week in October
	Zineb	200 g	5 applications at 19-21 day intervals, commencing during the 3 rd week in October
	Maneb/ZnO	200 ml	4 applications at 28 day intervals commencing in early October
Normal and wet seasons	Azoxystrobin + mancozeb + mineral oil	20-30 ml + 150 g + 0.5%	15-30 Nov and 1-7 Jan. Wet season: 30 ml Normal season: 20 ml
	Trifloxystrobin + mancozeb + mineral oil	10 g + 150 g + 0.5%	15-30 Nov and 1-7 Jan. An additional application of mancozeb early in October and again in February will improve control under conditions conducive to heavy infection pressure
	Pyraclostrobin + mancozeb + mineral oil	10 g + 150g + 0.5%	15-30 Nov and 1-7 Jan. An additional application of mancozeb early in October and again in February will improve control under conditions conducive to heavy infection pressure
	Kresoxim-methyl + mancozeb + mineral oil	20 g + 150g + 0.5%	Valencia ONLY. Apply from 15-30 Nov and 1-7 Jan.

* If mixed with 0.5% or more narrow range mineral oil the mancozeb dosage may be reduced to 150 g per 100 litres water.

Table 2 Preventive black spot control programmes (for wet years)

Weather conditions	Fungicide	Dosage/100 litres water	Application date/Interval
Wet season	Mancozeb*	200 g *	First application after 100 % petal fall in early October. Follow up with a further 4 applications at 25 day intervals
	Copper oxychloride or copper hydroxide	200 g	4 applications at 30-35 day intervals commencing in early October
	Zineb	200 g	6-7 applications at 19-21 day intervals commencing in early October
	Maneb/ZnO	200 ml	5 applications at 28 day intervals commencing in early October
Normal season	Mancozeb*	200 g *	4 applications at 25 day intervals commencing during the 3 rd week in October
	Copper oxychloride or copper hydroxide	200 g	3 applications at 30-35 day intervals commencing during the 3 rd week in October
	Zineb	200 g	5 applications at 19-21 day intervals, commencing during the 3 rd week in October
	Maneb/ZnO	200 ml	4 applications at 28 day intervals commencing in early October

* If mixed with 0.5% or more narrow range mineral oil the mancozeb dosage may be reduced to 150 g per 100 litres water.

Corrective control of Citrus Black Spot with systemic fungicides

Systemic fungicides are capable of penetrating the epidermis and the cuticle, and killing the mycelium present. Existing lesions can also heal once the infection is eliminated. Except for Mikal M, all the systemic fungicides belong to the benzimidazole group of fungicides. The addition of oil to these fungicides is essential to ensure their penetration into the rind (Table 3).

Table 3 Corrective Citrus Black Spot control programmes

Tree condition/age	Fungicide	Dosage/100 litres water	Application date/Interval
Late cultivars; trees younger than 20 years which are growing vigorously	Benomyl + mancozeb + mineral oil*	50 g + 200 g + 0.5 %	1-20 Dec
	Split applications are also registered**	25 g + 200 g + 0.5 %	15-30 Nov and 1-7 Jan
	Carbendazim + mancozeb + mineral oil* Split applications are also registered**	55 ml + 200 g + 0.5 %	1-20 Dec
		27.5 ml + 200 g + 0.5 %	15-30 Nov and 1-7 Jan
Old neglected trees with a history of high susceptibility	Benomyl + mancozeb + mineral oil*	75 g + 200 g + 0.5 %	1-20 Dec
	Carbendazim + mancozeb + mineral oil*	82.5 ml + 200 g + 0.5 %	1-20 Dec
Lemons	Benlate + Dithane + mineral oil*	50 g + 200 g + 0.5 %	1-20 Dec and 1-15 Jan
Early cultivars	Benomyl + mancozeb + mineral oil*	50 g + 200 g + 0.5 %	1-20 Dec
	Split applications are also registered**	25 g + 200g + 0.5 %	1-14 Nov and 1-7 Jan
Valencias under 20 years, grapefruit, navels and mid-season oranges	Thiophanate-methyl + mancozeb + mineral oil*	50 g + 200 g + 0.5 %	15-30 Nov and 14-21 Jan
Valencias over 20 years	Thiophanate-methyl + mancozeb + mineral oil*	70 g + 200 g + 0.5 %	15-30 Nov and 14-21 Jan
All cultivars irrespective of tree condition	Mikal M	450 g	The first application to be sprayed just after the first flush has hardened followed by a second spray 50 days later

* The oil component in the treatment may have a detrimental effect on yield.

** These options are not recommended due to the increased likelihood of the development of resistance.