Comments on: EFSA Panel on Plant Health, 2013. Draft Scientific Opinion on the risk of *Phyllosticta citricarpa* (*Guignardia citricarpa*) for the EU territory with identification and evaluation of risk reduction options

CBS Expert Panel

11 September 2013

BACKGROUND

EFSA placed a draft of its scientific opinion on the risk of *Phyllosticta citricarpa* (*Guignardia citricarpa*) for the EU territory on its website and announced (31 July 2013) an open invitation for public consultation. Comments were invited from the scientific community and stakeholders, to be submitted by 12 September 2013. The EFSA coordinator was advised of the intention to consolidate the responses of a panel of experts. EFSA acknowledged this and advised that the panel may submit its comments as a document to a nominated email address. Panels of relevant experts, with research and/or field experience of CBS, were formed in South Africa, United States of America (USA), Brazil, Argentina and Australia. The comments from the regional panels were consolidated into this document in a workshop held in Florida, USA on 29-30 August 2013. This document represents the collective comments of an extensive international panel of experts, referred to as the CBS Expert Panel (the Panel). The document is structured in accordance with the EFSA (2013) draft.

Suggested citation
CBS Expert Panel, 2013. Response to EFSA Panel on Plant Health, 2013 - Draft Scientific Opinion on the risk of *Phyllosticta citricarpa* (*Guignardia citricarpa*) for the EU territory with identification and evaluation of risk reduction options.

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SUMMARY

The CBS Expert Panel (the Panel) has applied its collective scientific expertise to evaluating EFSA (2013). It has captured its comments in this document for provision to EFSA in response to the invitation for public comment. The Panel has identified factual errors, omissions and differences in assessment within EFSA (2013) which result in strong overall disagreement with the outcome of the assessment. The Panel considers the following points to be central to appropriately assessing the risk of CBS:

1. CBS has never been reported to spread to new areas with fruit (without leaves) as the pathway and accordingly citrus fruit has never been demonstrated to be a pathway for the entry, establishment and spread of CBS.
2. CBS has a wide global distribution, but is only known to occur in summer rainfall citrus production areas and nowhere in the world in areas with a Mediterranean climate.

3. The only recorded mechanism by which CBS has been spread to new areas is through the movement of infected propagation material into areas where both the host is grown and the climate is suitable for establishment.
4. Despite over 100 years of unregulated movement of citrus fruit and citrus plant material within Australia, over 50 years of unregulated movement of citrus plants and 84 years of unregulated movement of citrus fruit from CBS endemic areas to non-endemic areas in South Africa and over 20 years of large scale citrus fruit exports from CBS-endemic countries to citrus producing regions in southern Europe (with as much as 84 years of such exports with smaller volumes), CBS has not establishment in any of these areas with a Mediterranean climate.
5. EFSA (2013) has not placed the CBS disease in proper perspective.
6. CBS is primarily a cosmetic disease, causing fruit rind blemish.
7. Fungicide spray programmes are very effective in controlling CBS.
8. CBS is only a serious disease under highly suitable climatic conditions in combination with the absence of general Good Agricultural Practices of commercial citrus production. It is only under such conditions that the level of blemish and premature fruit drop may have an economic impact and be associated with yield reduction.
9. CBS symptoms have never been reported (naturally or experimentally) on Tahiti lime.
10. The EFSA (2013) analytical methodology is exclusively qualitative and excludes key quantitative research and entire biological events making it fundamentally flawed.
11. The detection of the CBS causal agent on or in fruit does not automatically indicate that it represents a threat for infection or establishment and spread in a new location. Before the disease may become endemic, a pathogen must be viable, mature, sporulate, disseminate, infect a susceptible host, establish disease and climatic conditions must be suitable to sustain a polyetic epidemic. All of these components need to be considered sequentially.
12. A sequence of unlikely events would have to occur for there to be any prospect of imported citrus fruit giving rise to infection of citrus plants in the EU. Even if an infection event was to occur, it is our considered opinion that there is no risk of establishment and spread under EU climate conditions.
13. Relative to EFSA (2013)'s own assessment of marginal climatic suitability of a few fragmented areas in the southern extremes of the PRA area, CBS cannot be considered a potential pest of economic importance in the EU.
14. Relative to EFSA (2013)'s own assessment of the risk, we consider the current EU CBS measures to be inappropriately restrictive, especially considering that these regulations curtail citrus fruit exports from large parts of the world to the vast majority of the EU member states to provide protection to a proportionately very small part of the EU.
15. Relative to EFSA (2013)'s own assessment of the risk, we do not agree with their assessment of and recommendations for risk reduction options, since they are disproportionately restrictive and more suitable alternatives are available and feasible.
16. However, we do not agree with the EFSA (2013)'s assessment of risk and we consider suitable expert opinion and scientific information to weigh strongly in favour of the no-risk assessment.
17. We do not consider retention of the current EU CBS Regulations to be scientifically justified or proportionate to the risk.
18. Whereas EFSA (2013) attaches high levels of uncertainty to its assessments, the Panel's collective experience (768 years), with 545 years specific to CBS, gives us a high level of confidence in our assessments.
19. **In conclusion, we are in agreement with earlier PRAs, conducted by South Africa and USA, in which it was concluded that fruit is not a realistic pathway for CBS to enter, establish, spread and have significant economic impact within the PRA area (EU).**

COMMENTS

The comments are structured according to the sectional titles, sectional numbers, page numbers and line numbers as in the EFSA (2013) document provided.

Abstract and Summary

The comments made in this document in relation to the relevant sections of EFSA (2013) detail numerous serious concerns that the Panel has with EFSA (2013). Cognisance of these comments by EFSA will necessitate a comprehensive revision of the Abstract and Summary sections in EFSA (2013). Accordingly the Panel made no attempt to edit the Abstract and Summary wording itself, but trusts that EFSA will transpose the Panel's comments into an appropriate revision of the Abstract and Summary sections. The Panel has the following additional specific comments on these sections:

Pg 2 - line 56

It is unclear why the removal of current requirements, that may be found in the PRA to be unnecessary, should be viewed as a "worst case scenario". This gives the impression that the analysis is conducted with a bias towards defending the current measures and brings into question the scientific objectivity of the analysis.

2. Methodology and data

2.1. Methodology

2.1.1. The guidance documents

Pg 11 - 2.1.2. Methods used for conducting the risk assessment

Whereas the PRA is conducted by EFSA (2013) as if there were no *P. citricarpa* specific phytosanitary EU import regulations, it is our understanding that various other regulations would remain in place and are of relevance. For example product marking requirements, product traceability requirements, phytosanitary inspection and certification requirements, quality standards and the prohibition of leaves in association with imported citrus fruit.

The EFSA (2013) assessment was conducted with initial transmission and infection combined within the "entry" step. The Panel has a concern that whereas EFSA (2013) has considered “entry” up to and including transfer from the pathway to the host in the PRA area, specific attention has not been given to the subsequently required infection step, before concluding on the entry section. An associated concern is that by combining events of greater likelihood (for example infected fruit entering the risk area) and high unlikelihood (successful transmission and infection) into a single section, a higher likelihood is assigned to the group of events (entry) than is appropriate for one or more of the critical components (e.g. transmission or initial infection). We consider that this results in an inappropriately exagerated overall risk rating.

Both qualitative and quantitative approaches have their place in pest risk assessments, but no assessment can lean entirely in one direction. In EFSA (2013) there is bias toward the qualitative approach which discounts or dismisses attributes of the quantitative approach. The quantitative approach informs the holistic process (an overview) of the biology (process of establishment) which is very useful. EFSA (2013) is predominantly qualitative and in isolation does not capture a holistic overview. Excluding key quantitative research and entire events is a flawed approach.

Pg 11 - 2.1.4. Level of uncertainty

The way EFSA (2013) has used uncertainty is cumbersome and misleading. It provides a mechanism that avoids taking certain relevant aspects into appropriate consideration in the probability assessment, and instead relegates them to the uncertainty section. This approach means important aspects are not ignored, but at the same time are not appropriately considered in the PRA.

The levels of uncertainty are open to interpretation, subjective, and non-quantitative. EFSA (2013) pulls out parts of the Entry and Establishment sections to make each section seem more uncertain than it is in reality, ignoring the larger body of information. Their uncertainty ratings are based on information they do not have or are simple natural variation within the data, yet there is much about this pathosystem that is not included in their discussion of uncertainty.

3. Pest risk assessment
3.1. Pest categorization
3.1.1. Identity of pest
3.1.1.1. Taxonomic position
Pg 14 - Lines 459-469
In this paragraph, it is accurately stated that *P. citriasiana* and *P. chinaensis* have not been "proven" or confirmed to be pathogenic to citrus. However, both of these new *Phyllosticta* species are (apparently) associated with a disease (tan spot) and with leaf and fruit spots on citrus. Therefore, these two fungi can cause non-CBS fruit spot symptoms that may easily be confused with CBS symptoms.

Pg 14 - 3.1.1.2. Biology and life cycles
We draw attention to the following concerns about this section as they are relevant to subsequent sections in the assessment.

Pg 15 - lines 497-501
Fungicide spray programmes in South Africa have been optimised through field trials over many years (Kellerman, 1976; Schutte, 2002, 2006; Schutte et al., 2012). Petal fall (end of blossom) occurs at the end of September or in October (depending on the region). The critical CBS infection period occurs in spring, with fungicidal protection of young fruit commencing at the onset of spore release (ascospores) and conditions that are conducive to infection, occurring mostly around mid- to late-October (Kotzé, 1996). It is standard practice under normal Good Agricultural Practices for the application of protective fungicidal sprays to terminate at the end of January due to fruit becoming resistant to infection, reflecting a 4 to 5 month fruit susceptibility period (Kotzé, 1981, 1996). The situation is similar in Australia and Argentina (Mayers and Owen-Turner, 1987; Fogliata et al., 2011).

In subsequent sections of the assessment, this fruit susceptibility period is disregarded and a period of 6 to 7 months is assumed on the basis of reference to Reis et al. (2003), Baldassari et al. (2006) and Brentu et al. (2012). These papers refer to situations in Brazil and Ghana. These regions are characterised by sub-tropical and tropical conditions, with consistently high temperatures, high rainfall and high humidity. These are markedly different from conditions experienced in South Africa, Argentina, and Australia and anywhere in the EU, making them inappropriate for an assessment of risk in the EU.

Brentu et al. (2012) indicated the occurrence of overlapping fruiting cycles in Ghana. The extent of blossom synchrony was not specifically reported by the authors, but it is common under such climatic conditions for a low level of blossom synchrony to occur due to the difficulty of tightly controlling the cropping cycles (Krajewski & Rabe, 1995; Davenport, 1990; Reuther, 1973). Nonetheless, Brentu et al. (2012) reported evidence of fruit resistance 4 months after petal fall in one of the cropping cycles and 7 months after petal fall in the other (overlapping) cycle. They reported the occurrence of background infection in the protected control fruit and indicated that this may have been in part due to temporary breakage of bags protecting fruit from infections. They caution that these findings should be validated through further study. It is inappropriate for EFSA (2013) to dismiss the well-researched, tried and tested situation in South Africa, Argentina and Australia on the basis of this information. EFSA should rely on data that are closer to the climatic conditions found in the EU, which would be Argentina, South Africa, and Australia.

Pg 15 - line 511

The following critically important information must be included in order to provide a comprehensive discussion of the available relevant information and should be taken into consideration in subsequent sections of the assessment. Both the South African CBS PRA (2000-2009) and the USA CBS PRA (2010) articulate the importance of a minimum temperature threshold for ascospore release and infection under field conditions. Kotzé (2009) and Fourie et al. (2009), within the South African CBS PRA (2000-2009), as well as Fourie et al. (2013), indicate that 18°C is an appropriate minimum threshold. Fourie et al. (2013) showed that 95% of spore releases only occurred above 17.8°C.

Pg 15 - lines 512-527

The following needs to be included as it has an important bearing on the subsequent assessment, namely the potential transfer of pycnidiospores from introduced fruit to susceptible host material within the risk area. <u>Infected fruit may give rise to the production of waterborne pycnidiospores in a gelatinous mass, but not ascospores.</u> The presence of pycnidiospores is also not associated with all types of fruit lesions (OEPP/EPPO, 2009) nor are all CBS lesions viable (Korf et al. 2001). Consequently, it cannot be assumed that all interceptions of symptomatic fruit are indicative of a viable spore inoculum source.

The need for exposure of symptomatic fruit to suitable incubation conditions before pycnidiospores may be released has been highlighted in the South African CBS PRA (2000-2009) and the USA CBS PRA (2010). Dry symptomatic fruit are not a source of infection without prior exposure to such conditions and have been shown not to result in infection when placed in contact with other fruit (Korf et al., 2001). Surface washing of such fruit also did not provide viable inoculum (Kiely, 1948).

Pycnidiospores once exuded do not retain viability for long periods (Kiely, 1948). Pycnidiospores in a gelatinous mass can be washed off by rain from infected fruit to susceptible fruit and leaves <u>below</u>. However, pycnidiospores have not been shown in any field trials to be splash dispersed upwards from the soil surface into a tree (Spósito et al., 2011; Truter et al., 2007; Whiteside, 1967). EFSA (2013) fails to recognise this. <u>This is an important error that occurs widely in the EFSA assessment and is a key concern</u>.

Pg 15 - lines 516-518

Whiteside (1967 - from data collected in the early 1960s) is quoted as having recognised the role of pycnidiospores in CBS epidemics. However, McOnie (1964) indicated that Whiteside (based on his early 1960s data) had confused *P. capitalensis* (syn. *G. mangiferae*) with *P. citricarpa* (syn. *G. citricarpa*). The South African CBS PRA (2000-2009) has previously brought this to the attention of the EU CBS PRA Working Groups and EFSA.

Pg 15 - lines 524-527

Reference is made to Spósito et al. (2007, 2008, 2011) demonstrating the importance of "rain-dispersed" pycnidiospores in CBS infection levels. However, these publications do not demonstrate splash dispersal, but rather wash down from rainfall. Furthermore, the field conditions that these authors refer to, in Brazil, entail overlapping cropping cycles in combination with very high rainfall and very high relative humidity, vastly different climatic conditions from those occurring anywhere in the EU.

Spósito et al. (2011) highlighted the fact that conditions for infection differ between São Paulo State where pycnidiospores are important and South Africa and Australia where the disease is seen as monocyclic and ascospores are the principal source of infection. The fact that differences between Brazilian climatic conditions and conditions in South Africa and Australia give rise to such a diminished importance of pycnidiospores in South Africa and Australia, indicates that under EU conditions, even more different from Brazil than the South African and Australian conditions, it can be expected that pycnidiospores would be even more irrelevant than in South Africa and Australia.

Pg 15 - lines 528-530

EFSA (2013) refer to an "incubation period" in fruit and erroneously state that "the duration of the incubation period is affected by environmental factors". Symptom expression is dependent on fruit ripening and is not indicative of fruit infection periods. This misunderstanding by EFSA (2013) is reflected in other parts of the assessment, where they erroneously attribute high susceptibility of Valencia oranges (which happen to be later maturing) to a longer period of exposure to infections. This is incorrect (as also commented above for lines 497-501) and has a profound effect on EFSA (2013)'s erroneous assessment of risk, evident in subsequent stages of the assessment. The infection period of early and late maturing citrus types is similar (Spósito et al., 2004). It is defined by a period of susceptibility following petal drop, before the onset of age-related fruit resistance (Kotzé, 1981), and requires overlap with exposure to inoculum under suitable environmental conditions. This is supported by Kiely (1948) who attributed symptom development to the physiological condition of the maturing rind (rather than date of infection) at the onset of hot weather.

Pg 16 - lines 547-549

C. Kellerman (unpublished) observed the presence CBS causing disease symptoms in the Eastern Cape in 1974. Kotzé (2009) in the SA CBS PRA (2000-2009) refers to the introduction of CBS into the Eastern Cape "more than 50 years ago when CBS-positive nursery plants were introduced from the Transvaal". The EFSA (2013) comment "more recently" is misleading and should be deleted.

Pg 16 - 3.1.1.3. Detection and identification

Contrary to the title, EFSA (2013) does not include a comprehensive discussion on Detection and Identification in this section.

PCR methods are required for accurate identification of *P. citricarpa*. There are no data presented in the PRA to indicate that PCR is used at every port of entry to identify *P. citricarpa.* Such PCR techniques were not available prior to 2002. There is a plethora of benign fruit spots of unknown origin that could be confused with *P. citricarpa* unless a validated PCR technique is used and therefore the actual number of reliable *P. citricarpa* identifications in the historic records of interceptions is unknown.

Pycnidia are not known to be associated with some CBS lesion types (OEPP/EPPO, 2009). PCR tests do not prove viability. Only axenic culture would provide confirmation of viability. Also see further comments made under Section 3.2.2, line 846-857.

3.1.1.4. Citrus taxonomy and host range of *P. citricarpa*

Pg 17 - line 607

The reference to Schubert et al. should read 2012, not 2010.

Pg 18 - Lines 612-614 (also applicable to lines 823-826)
The document refers to confusion regarding the host status of *C. maxima* fruit to *P. citricarpa*. The document refers to *C. maxima* not being affected by *P. citricarpa*, as is the experience in Australia. Surveys of *C. maxima* in Australia have failed to find CBS symptoms in various locations where other citrus occur and do have symptoms of CBS (Miles et al., 2013). Earlier reports of CBS on *C. maxima* (see Table 4 and Figure 10) pre-date knowledge of *P. citriasiana* and therefore may not have been caused by *P. citricarpa*.

3.1.1.5. Reports of impact in the area of current distribution
Pg 18 - lines 616-617
No reference is provided to substantiate that CBS results in severe quality losses. In South Africa, under normal commercial production situations with the adoption of Good Agricultural Practices, this is not evident (Kotzé, 1981, 2000) and similarly in Argentina, Australia, and Brazil (Mayers and Owen-Turner 1987; Reis et al. 2003; Miles et al. 2008; Fogliata et al. 2011; Vinhas 2011). In Queensland, Australia, where CBS has been present since at least 1900 (Simmonds 1966), Mayers and Owen-Turner (1987) stated that "in terms of damage to the citrus tree, black spot is not a vicious disease like Phytophthora root rot and trunk canker, but rather a weak disease primarily causing cosmetic damage to the fruit rind without affecting productivity or internal fruit quality".

Pg 18 - lines 618-619
See comment on lines 547-549.

Pg 18 - lines 622-623
Reis et al. (2006) did not report that fruit drop occurs in other parts of the world and EFSA (2013) has made an unsubstantiated extrapolation. At least in South Africa, Argentina and Australia extensive fruit drop does not occur under normal Good Agricultural Practice conditions (Kotzé 1981, 2000; Mayers and Owen-Turner 1987; Fogliata et al. 2011).

3.1.2. Current distribution
Pg 19 - Table 4
Inclusion of the following clarifications is required: North West - present, restricted distribution. Reference to CBS presence in New Zealand is erroneous (Everett and Rees-George, 2006). For Swaziland, the authors state in the Reports column that *P. citricarpa* is absent, but Swaziland is referred to in the caption to Fig. 5 as a country where CBS occurs and presence is also indicated by Stammler et al. (2013) who is cited elsewhere in the PRA and.

Pg 20 - 3.1.3. Regulatory status in the EU
Imports since 1993 is not an insignificant period, but CBS remains absent from the EU citrus producing regions, because the import of fresh citrus fruit does not provide a pathway for disease establishment and the climate is unsuitable for establishment.

Pg. 21 - lines 690-692
EFSA (2013) appears to have skewed data in this section to make their point that not much fruit had been imported into the EU. The data for 2002 to 2011 is not presented until Table 19 in Appendix B which clearly shows there have been plenty of opportunities for introductions due to the high numbers of imports in past years. If all of the trade data were presented, this sentence would read "Therefore, the argument that European citrus-growing areas are not suitable for the introduction of CBS because there have been plenty of opportunities for introduction due to the decades of massive citrus fruit imports into such areas from CBS-affected regions, **is supported** by the trade data". Some of the current imports into the EU are from heavily CBS-infected areas, with no establishment of the

pathogen within the citrus-growing regions of the EU over many years of trade. EFSA (2013) themselves contradict their conclusions in this section when on page 30 they state "the volume of citrus fruit imported into the PRA area from Third Countries where the pest is present is massive, with low uncertainty."

Pg 22 - Figure 5.
A near exponential increase over time is shown here for imports from countries with CBS. Without showing the data up to the present year, it is not a far reach to assume this exponential increase trend has continued and currently there are numerous imports from countries with CBS. This further supports the factual nature of statements that affirm past fruit imports should have resulted in CBS establishment and epidemics in the EU if the pathway was viable and climate conditions were suitable.

Pg 23 - Figure 6.
EFSA (2013) indicated a five-fold increase in imports for Italy was found between 1991 and 2001, but the increase in imports for Italy and other countries since 2001 is not given. EFSA (2013) should not neglect data that shows there has been considerable trade from which non-suitability of the pathway and climate for *P. citricarpa* can be inferred.

Pg 23 - 3.1.3.3. Current EU regulatory status
To provide appropriate context when discussing existing measures, it is necessary to indicate that the technical justification of the current measures as they pertain to *P. citricarpa* has been contested for many years (since 1992) as reflected in the South African CBS PRA (2000-2009). Furthermore, this unresolved objection was more recently (2010) taken to IPPC dispute resolution procedures and a trade concern was lodged with the WTO SPS Committee on 27 June 2013 (South Africa Department of Agriculture Forestry and Fisheries, personal communication).

Pg 23 - line 721
The host status of Kumquat is uncertain.

3.1.4. Regulatory status in Third Countries
Pg 24 - lines 766-767
In referring to the regulatory status of CBS in USA, it is necessary for appropriate context to refer to the recent granting of access for citrus fruit imports into the USA from Uruguay, without the attachment of specific CBS risk management procedures (USA Federal Register - 78 FR 41259, July 10 2013). In the USA PRA conducted on citrus fruit imports from Uruguay, APHIS indicates that in accordance with the USA CBS PRA (2010) "<u>citrus fruit is not epidemiologically significant as a pathway for the introduction of *G. citricarpa* or establishment of CBS disease</u>". Importantly, this assessment pertains to the whole USA and includes areas that would be suitable for establishment, such as the states of Texas and Florida (Magarey et al., 2011).

Pg 24 - 3.1.5. Potential for establishment and spread in the pest risk assessment area
It would be appropriate here to also qualify that host plants are only present in a small proportion of EU Member States and thus a very small part of the PRA area. It is stated that EFSA (2008) did not agree with the peer-reviewed paper of Paul et al. (2005) that climate in EU is unsuitable, which was supported by other modelling studies (Magarey et al., 2011; Fourie et al., 2013; Yonow et al., 2013). However, the EFSA (2008) opinion was not subjected to peer review and was strongly criticized by peers (South African CBS Expert Working Group Response, 2009 in the South African CBS PRA, 2000-2009). For EFSA (2013) to conclude "that there is a potential of establishment" is done on the basis of the non-peer reviewed EFSA (2008) opinion.

EFSA (2013) has not shown the climate is suitable for the establishment of *P. citricarpa*. As this section is designed to provide justification for continuing with the risk assessment, the authors should have presented information to support their position that CBS could establish and spread in the risk assessment area.

Establishment from imported fruit (without leaves) and imported plant material needs to be taken into consideration separately. Clearly importation of foliage is many times more dangerous than fruit and implying equivalence is highly inappropriate.

Pg 25 - 3.1.7. Conclusion of pest categorization
The Panel disagrees with the conclusion of the pest categorisation. To conclude that the pest "has a potential for establishment" is not substantiated by any scientific references. All available peer reviewed references indicate that there is no risk of establishment.

If EFSA is of the opinion that the climate is suitable for CBS, and considering their perceived risk of the massive amount of imports and passenger traffic, and the EU examination of foreign baggage for citrus and other plants is essentially non-existent, why have they not provided the relevant survey data to support their area freedom claims? Therefore, the conclusion should be that the apparent absence of CBS in the EU, provides an indication that the climate is unsuitable for *P. citricarpa* establishment and spread.

3.2. Probability of entry
3.2.1. Identification of pathways
Pg 25 - lines 803-806
We agree that seed is not a pathway, but do not agree that there would be any realistic prospect of seed being contaminated as a result of fruit rotting. As stated, there is no research to support or even indicate this hypothetical claim that seeds can be infected by *P. citricarpa*. Therefore, why is it even being mentioned in the PRA? It should be removed as it is a non-issue.

Pg 25 - 3.2.2. Entry pathway I: citrus fruit commercial trade
A general oversight in this section is a lack of clarification regarding whether interception data was of CBS lesions with or without pycnidia, and the expected difference in epidemiological significance between forms of CBS lesions with and without pycnidia. A number of forms of CBS lesions do not readily form any fruiting structures within the lesions, but it may be possible to identify *P. citricarpa* within the lesions through isolations or molecular methods. In Australia it has been observed numerous times that when mature fruit from orchards where CBS occurs are incubated under ideal conditions to break latency of *P. citricarpa* [(27°C, 80% relative humidity and 24 hour lighting for 3 weeks (Brodrick and Rabie, 1970; Korf, 1998; Timossi et al., 2003)], CBS lesions will be expressed, but not all lesions will produce pycnidia (Miles et al., 2010). EFSA (2013) often cites interception data to support arguments regarding the frequency of introduction, but the document does not clarify what was actually intercepted and the EFSA perceived epidemiological significance of what forms of CBS were found.

Pg 25 - line 849
The statement “During 1999-2012 there were <u>963</u> interceptions of *P. citricarpa* on citrus fruit consignments from Third Countries to the EU” does not seem to be consistent with the statement (Figure 8) “Distribution by EU country of: (left-hand panel) the <u>961</u> *Phyllosticta citricarpa* EU interceptions on citrus fruit consignments imported from Third Countries (1999-2012),…”.

Pg. 25 - lines 864-865

How are inspections conducted in each of the member states? If by visual confirmation, the fruit spots may not have been CBS (as stated elsewhere in the PRA) as there are numerous causes for fruit spots indistinguishable from viable *P. citricarpa* spots. Prior to 2002, when *P. citricarpa* and *P. mangiferae* were separated into separate species, there would have been no differentiation of interceptions of the two species. See also comments made under Line 846 and Section 3.1.1.3.

Pg 26 - Figure 7

The pathway from packinghouse to cull fruit to waste to pycnidiospores simply should not be occurring if waste from culled fruit were properly handled according to Good Agricultural Practices instead of thrown back into the orchard (as indicated elsewhere in the PRA).

Pg 26 - 823-826 and Figure 10 (see also comments made in relation to lines 612-614)

EFSA (2013) is unsure as to whether pomelo can be affected by *P. citricarpa.* See also comments on lines 612-614 regarding Miles et al. (2013). However, according to Figure 10, the second largest proportion of interceptions in the EU is due to CBS on pomelo. This calls into question the reliability of past "inspections" in the EU, if non-CBS infected fruit is declared infected and intercepted.

Pg 27 - lines 844-845

The Panel is concerned that EFSA (2013) assesses the probability of entry in the absence of current EU regulations - see comments made under 2.1.2.

Pg 27 - lines 846-857

EFSA (2013) states that "Living stages of *P. citricarpa* are frequently found on imported citrus fruit during border inspections at the EU points of entry (see Figure 8)". However, considering Table 19, it is apparent that the number of interceptions is low relative to volume of citrus fruit traded (refer to comments on lines 999-1001). Considering Figure 12, it is evident that these interceptions mostly occur in the later part of the EU summer and autumn. There is also a level of uncertainty about the accuracy of identifications of *P. citricarpa* with these interceptions, especially in the earlier years when molecular techniques were not regularly used. Identification based on morphology and culture characteristics are not reliable (Glienke et al., 2011; Meyer et al., 2012).

Actual interceptions of *P. citricarpa*, and living stages thereof, could be fewer than indicated in the report. The comments made previously about uncertainty surrounding the viability of *P. citricarpa* associated with the interceptions, applies here as well. Molecular detection indicates the presence of the DNA, but does not indicate if the fungus is alive or not. One would need to isolate the living fungus, and identify it with molecular techniques to justify the statement that "Living stages of *P. citricarpa* are frequently found on imported citrus fruit during border inspections at the EU points of entry (see Figure 8)". Furthermore, the viability state of fungi does not equate with pathogenic virulence and being alive is not the only requirement for a pathogen to give rise to an infection.

Pg 28 - Figure 9

Why resort to a log-log transformation here? Was there no statistical relationship between numbers of imported fruit and interceptions when using the raw non-transformed data?

Pg 28 - lines 871-876

As indicated in our comments on lines 528-530, EFSA (2013) ascribes differential CBS fruit sensitivity of various citrus types to duration of exposure to inoculum. This relationship seems to be inferred because no supportive evidence is cited and the Panel considers this erroneous. Kotzé (1981) is cited by EFSA (2013) in support of the first part of the sentence, but then EFSA seems to draw their own conclusion in the second half of the sentence, which is different from what Kotzé reports in the same paper quoted.

Pg 29 - lines 892-893

The conclusion drawn by EFSA (2013) is incorrect. Under normal commercial citrus production conditions where Good Agricultural Practices are applied, such as maintenance of tree condition, crop cycle management, use of appropriate spray equipment, application of appropriate spray volumes and appropriate timing of spray applications, fruit infection levels will be negligible. This is evident in the levels of control achieved in some of the spray trials quoted, for example Table 9. An analysis of 67 South African cases of 2-4 spray programmes (as referred to in Table 9 and unpublished results) showed a mean of 94% control (clean fruit). Similarly, a survey of commercial citrus orchards in Queensland, Australia, where CBS has been present since at least 1900 (Simmonds 1966), showed that the vast majority of the blocks surveyed (20 out of 22) were achieving 95% or greater control of CBS using protectant fungicide applications (Miles et al. 2008). In regions that are suitable for CBS in South Africa and Australia, control measures are applied on a preventative basis starting before the onset of ascospore infection, applying a series of full cover sprays to provide continuous protection of the fruit until it becomes resistant to infection 4 months after petal fall. Similar levels of control have been reported from trials in Argentina and Brazil (Fogliata, 2011; Vinhas, 2011).

Assuming EFSA (2013)'s analysis was properly conducted, Table 11 and Figure 40 (pg 98-99) show low levels of infected fruit after fungicide treatments and this does not accord with EFSA's description of “negligible levels”? Furthermore, what is the exact proportion of infected fruit needed to be considered “negligible”?

Pg 29 - lines 912-914

EFSA (2013) does not provide a description of their use of the probability ratings used in this section, as they do in Appendix A, Table 18, for some other sections. Therefore it is difficult to comment on their choice of rating for this section. Nonetheless, it would seem inappropriate to rate it as "likely" given the very small proportion (by volume) of imported fruit that does get intercepted for CBS.

Pg 30 - lines 929-930

It would be appropriate to differentiate between volumes going into the greater 28 Member State EU and the few areas where citrus is produced in the EU. Figure 11 indicates numbers of interceptions, whereas it seems the statement relates to volumes of fruit entering the PRA area. This needs clarification.

We agree with EFSA (2013) that the volume of citrus fruit imported into the PRA area up to 2012 is massive, with low uncertainty. This is directly contradictory to the statement made on Page 22, lines 690-693 (“Therefore, the argument that European citrus-growing areas are not suitable for the introduction of CBS because there have been plenty of opportunities for introduction due to decades of **massive citrus fruit imports** into such areas from CBS-affected regions (Kotzé, 2000) is not supported by the trade data.”)

Pg 32 - lines 961-963

EFSA (2013) applied medium uncertainty to the frequency of citrus fruit import into the PRA area. However, there is low uncertainty (high certainty) that citrus fruit is imported into the PRA area. The seasonal variation in imports is known from shipping and trade data. However, these data were not investigated by EFSA (2013).

Pg 32 - lines 964-969

EFSA (2013) concludes “the probability of association of *P. citricarpa* with the commercial fruit pathway at origin is rated as likely”. We disagree as EFSA (2013) have materially misjudged the efficacy of fungicide spray programmes and postharvest measures and as is reflected in the very low proportion of import interceptions relative to the volume of citrus fruit traded. Using the EFSA (2013) qualitative approach to assigning likelihood, we assess the likelihood of association as “moderately likely” at most.

There is low uncertainty regarding the probability of entry (i.e. crosses the EU border). EFSA (2013) gives a reason for its rating of medium uncertainty as "difficulties in ensuring fruit is disease-free if it originates from countries where the disease is endemic" (line 967). However, the massive amounts of historical imports should provide certainty (low uncertainty) that entry into the EU has previously occurred (but CBS has not established).

3.2.2.2. Probability of survival during transport or storage

Pg 32 - lines 976-979 and 986-990

The reference to the findings of Korf et al. (2001) should be corrected. They reported that pycnidiospore viability was reduced to zero after 3 weeks of storage, but pycnidia could subsequently still produce pycnidiospores. They also reported that all the packing house treatments tested rendered pycnidiospores present at the time of treatment non-viable and demonstrated a 3 to 7 fold reduction in the viability of *P. citricarpa* in lesions after standard packing house treatments and cold storage at 4.5 and 10°C.

Pg 32 - lines 991-994

It is incorrect to categorize survival of pycnidiospores as "very likely". The South African CBS PRA (2000-2009) refers to Korf et al. (2001) where it was demonstrated that standard citrus packing house treatments have a high level of efficacy in killing pycnidiospores present on the fruit at the time of packing house treatment. See also comments made on lines 976-979 and 986-990.

Pg 32 - lines 997-998

Information on shipping times is easily obtained from shipping companies. Lack of information gathering by EFSA (2013) does not equal true uncertainty.

Pg 32 - lines 999-1001

EFSA (2013) states that there is no information available on incidence and severity of CBS on imported fruit that is intercepted for the presence of CBS. Nonetheless, it would be appropriate to here also indicate the extremely low proportion of imported product represented by the reported interceptions. By way of illustration, in 2012 South Africa exported approximately 14 127 consignments of citrus fruit to the EU (South Africa Department of Agriculture Forestry and Fisheries, personal communication). EFSA (2013) indicated that in 2012, 32 consignments from SA were intercepted for CBS, equating to 0.2% of exported consignments. It can further be expected that the incidence and severity of CBS on fruit in intercepted consignments is typically very low considering the zero tolerance for CBS and if considered on a per fruit basis, where it may be a single infected fruit that results in an interception, these interceptions may represent a minute proportion of the number of fruit imported.

3.2.2.3. Probability of surviving existing pest management procedures

Pg 33 - lines 1019-1021

We agree with EFSA (2013) that symptoms can be confused, but this supports the contention that some of the reported interceptions may be erroneous, especially those reported from earlier years and where the routine use of PCR techniques is not supported by evidence. Furthermore, how exactly are imports inspected to determine there are living stages of *P. citricarpa*? Is every suspicious lesion cultured and the resulting fungal growth confirmed to be *P. citricarpa*? As indicated previously, it is misleading to equate interceptions with living stages.

Pg 33 - lines 1024-1027
It is difficult to assess the use of the categorization without a description. Nonetheless, it would be appropriate to qualify the categorization as being only applicable to a small proportion of the fruit entering the PRA area. Furthermore EFSA (2013) disregarded the efficacy of the pre- and postharvest treatments (as indicated above), indicating that a lower rating (moderately likely) would be appropriate.

Pg 33 - 37, 3.2.2.4. Probability of transfer to a suitable host
In general, this section is very problematic in that it is highly speculative and subjective, with many major deficiencies. It presents a negligently improbable situation as "moderately likely". It elevates unsubstantiated, untested and dubious assumptions above the available scientific evidence and draws illogical conclusions that are in disagreement with other risk assessments and the opinions of an extensive body of international scientific expertise. This section describes a most improbable series of events and unlikely assumptions. The sequence of events, some of which are highly unlikely and must all occur for an infection event to potentially take place, was expounded in the SA CBS PRA (2000-2009) and the USA CBS PRA (2010), culminating in a very unlikely probability (to the point of being negligible), but EFSA (2013) has seemingly disregarded many of these relevant considerations. EFSA (2013) illogically derives an assessment of "moderately likely" for transfer to a suitable host. We strongly disagree with EFSA's conclusions of this section.

Pg 33 - lines 1029-1039
Instead of generalised statements that large quantities [“massive quantities” in other sections of EFSA (2013)] of fruit enter the EU and fruit is widely traded within the EU, it would be appropriate to include details of the relatively small proportions of imported citrus fruit entering the parts of the EU where citrus is grown. This information is reflected to an extent in EFSA (2013), Appendix B, pages 157 and 158, but not adequately brought into consideration throughout the assessment. It should be included in this section (lines 1029-1039) to provide appropriate perspective regarding how much imported fruit may come into close proximity of host plants in the EU.

Pg 33 - lines 1040-1041
The fruit may be widely distributed, but with a strong concentration outside of the area deemed by EFSA (2013) to be at potential risk. Failure to include this detail and making the general statement, as presently is the case, detracts from assessing both risk and risk management appropriately and compromises the credibility of the assessment. The "very widely" distribution of the fruit referred to here is irrelevant to the areas that are appropriate for risk assessment.

Pg 33 - lines 1045-1049
EFSA (2013) makes specific reference to imports in the period September-October (autumn) and portrays that as indicative of risk. However, as indicated in the SA CBS PRA (2000-2009) and again highlighted in our comments on this aspect in subsequent sections of this assessment, a focus of attention on this time period is inappropriate when considering the risk of infection by pycnidiospores associated with imported citrus fruit. It is, therefore, inappropriate to highlight it in this section as a period of particular concern. Furthermore, specific reference to April - May is also inappropriate in light of the scarcity of imports and CBS interceptions at that time.

Pg 33 - lines 1051-1053

The statement should be qualified in relation to the relatively minor portion of the product that enters the relevant portion of the PRA area.

EFSA (2013) should have considered that conditions suitable for infection does not equal conditions necessary for establishment. Infection leading to an endemic situation requires very different climatic conditions. Nonetheless, The occurrence of environmental factors in the EU that would favour or facilitate pycnidiospore dispersal and infection when susceptible citrus host tissue is available for infection is not supported by peer reviewed literature.

Pg 34 - lines 1072-1114

Pathogen transfer is a critical step in the pathway, and is perceived by EFSA (2013) as a real risk, largely due to the proximity of packing houses, processing plants or landfills to citrus orchards.

The USA CBS PRA (2010) refers to low viability of spores washed from fruit (Kiely, 1948) and based on the information by Agostini et al. (2006) and Kotzé (2000) indicates that there is a low likelihood that water contaminated with pycnidiospores from infected fruit will be brought into contact with a susceptible host in a susceptible stage.

Waste fruit typically disposed from packing houses and fresh fruit markets are highly likely to be approaching a state of decay, and/or will be treated in a way likely to further accelerate decay (e.g. no cool storage, no careful handling to prevent physical damage). These progressive decays and their associated fungal and bacterial agents of decay should greatly reduce the chance of CBS lesions to develop pycnidia that will mature to exude spores before being completely decayed. Fruit with unacceptable levels of blemishes or lesions are typically used for processing. Waste from processing is typically citrus pulp residues, but there is no evidence whatsoever of survival of pycnidia on such substrates, or pycnidiospore transmission from such substrates, and this is viewed by the Panel as highly improbable. The proportion of infected fruit/peel (relative to the total volume of citrus entering the citrus growing MSs) discarded in close proximity to citrus trees must be miniscule. Regarding EFSA's uncertainty about "the time taken for discarded asymptomatic whole fruit or peel to produce pycnidiospores before their decomposition", we refer EFSA to the South African CBS Working Group (2009, pg. 21 in the South African CBS PRA, 2000-2009) reference to "Korf H.J.G. (unpublished MSc study under JM Kotzé at Pretoria University) who found that pycnidiospore production on peel exposed to sunlight was limited to a maximum of 4 hours" (Korf, 1998).

EFSA (2013) makes reference to fruit processing and fruit waste as a potential pathway link for transmission of pycnidiospores to susceptible host. However, no data is provided on any sampling to demonstrate that firstly infected peel does occur at such sites and secondly that any viable pycnidiospores can be found. The photographs supplied cannot be a substitute for relevant data required to support the hypothesis that this may be a viable sub-pathway. Even if some imported and infected fruit were to find its way to such a site, given the specific conditions required prior to and at the time of potential transmission, it is clearly a completely negligible probability. That does not even take into consideration the highly unlikely prospect of some means of conveying that inoculum from such a situation into contact with susceptible host material.

Whereas the wash-<u>down</u> of mucilaginous conidia has been reported in the literature (Spósito et al. 2011), we could find no publication where it has reliably been established that CBS infection does readily take place through <u>upward</u> splash dispersal as contemplated by EFSA (2013). Drip-splash cannot conceivably transfer spores from fruit discarded "near to" citrus plants. The probability of drip-splash dispersal from overhead or micro-sprinkler irrigation or drip-splash following fog, mist or dew combined with subsequent infection (needing 15 hours wetness) is highly unlikely. EFSA (2013) considers splash dispersal to be a potential mechanism for transfer up to 50 cm. However, no upward dispersal was found by Spósito et al. (2011), and lateral dispersal was less than 20 cm. EFSA (2013) sketches a situation where fruit handling facilities occur in the same area as citrus plantings. However, this does not put fruit into contact, or very nearly so, with citrus trees and transfer must surely be an improbable event. See also comments on lines 1125-1140.

Pg 34 - lines 1090-1091

The figure of 500 000 tonnes presented by EFSA (2013) for the amount of fruit waste in Spain and Italy gives no indication on the proportion of waste attributed to domestically produced fruit versus imported (from CBS and non-CBS third countries) fruit waste.

Pg 34 - lines 1094-1097

First, there are no references for the statements made here, and the premise that market and household waste would end up near citrus orchard is pure conjecture. Second, "the vicinity of" is misleading given the absence of any evidence of feasible "transfer" over any distance.

Pg 34 - lines 1103-1105

It should be noted here that the probability of a fruit with live infections being placed in very close proximity (<50cm according to EFSA, 2013) to a susceptible host with weather conditions at that exact location being favourable for pycnidium and pycnidiospore development, splash-dissemination, and subsequent infection onto the lower parts of the canopy is infinitesimally low.

Pg 35 - lines 1125-1140

As noted in the USA CBS PRA (2010), as well as the South African CBS PRA (2000-2009), in the absence of suitable conditions (both at the time and preceding the event), there is no prospect of transmission of spores from the infected fruit to the host plant. Pycnidia need to be ripened before, and at a sufficiently ripened stage must be exposed to water, before pycnidiospores may be exuded in a gelatinous mass. Free water is required to dissolve the gelatinous mass, before potential transmission to host material. In the absence of such predisposing conditions, only 1% of pycnidiospores recovered from washing of the surface of the fruit germinated (Kiely, 1948).

We refer EFSA to a recent study on splash dispersal of pycnidiospores of *Leptosphaeria maculans* on oilseed rape (Travadon et al., 2007). The impact of simulated incident drops on Phoma leaf spots resulted in the dispersal of *L. maculans* pycnidiospores within splash droplets. Estimation of the travel distances demonstrated that most of the pycnidiospores were collected very close to the source: the 50% (half-distance) and 90%-dispersal distances did not exceed 4 cm and 14 cm, respectively. These distances were similar to the travel distances reported for other splash-borne fungi (as referenced in their paper). Longer distance spread was attributed to larger splash droplets as produced by the impact of large natural raindrops (Huber et al., 1996). Irrigation and dew droplets will lack the kinetic energy required for effective dispersal. This was also the conclusion of a recent review of dispersal of fungal spores by rain-splash by Huber et al. (2006): “Because the spore-carrying droplets of greatest importance are the large ones travelling close to the source, splash dispersal is a short-range phenomenon”.

With CBS, Spósito et al. (2011) found that under field conditions the distance of CBS disease spread was less than 80 cm (from dead twigs) and less than 56 cm (from fruit), **in a downward direction due to wash-down. <u>Lateral dispersal did not exceed 20 cm and there was zero upward dispersal</u>**.

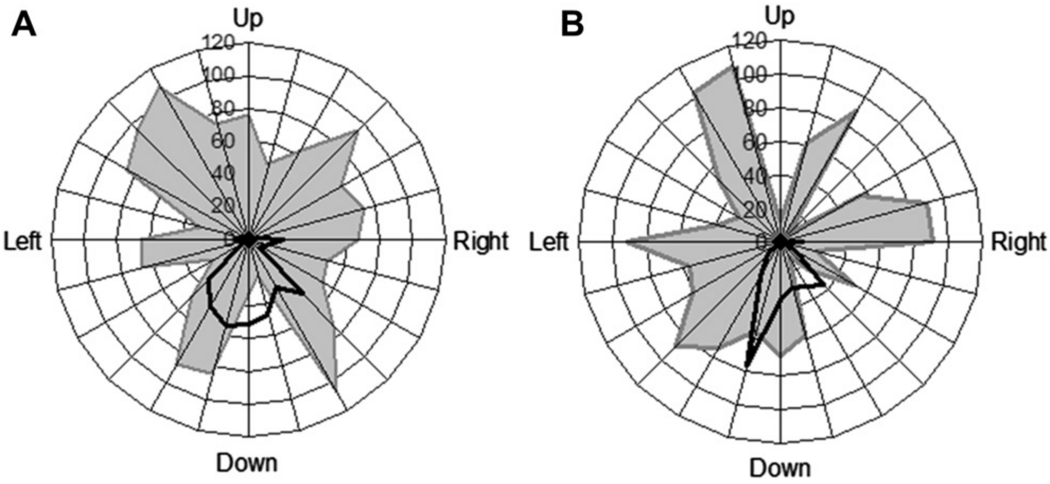

Fig. 1. Maximum distances (cm) in each direction of fruit without (grey area) and with (black bold perimeter) citrus black spot symptoms in relation to the position (graph centre) of symptomatic fruit (A) and dead twigs (B) with *P. citricarpa* conidia inoculum sources. (Spósito et al., 2011).

Windborne aerosol dispersal might theoretically be possible, but mostly relates to dispersal of bacterial pathogens (Hurano and Upper, 1983; Fitt et al. 1989). For bacterial splash dispersal, Hurano and Upper (1983) concluded that "Since the net transport during rain is very strongly downward, the opportunity for movement of bacteria for long distances by rain-generated aerosols or particles is very small. These mechanisms are probably most effective for redistributing bacteria within a given canopy, or for removing bacteria from leaves and delivering them to the ground". Therefore, the success rate of this dispersal mechanism for the mucilaginous conidia from pycnidia in small black spot lesions (single lesions on fruit as can be expected on fresh fruit meeting export quality standards) would be highly unlikely. The proportion of spores dispersed (spore concentration per droplet as well as proportion of droplets containing spores) from a liquid spore suspension (not a lesion on a round fruit) declined with decreasing droplet size (Huber et al., 1996). The chance of viable aerosol dispersed spores hitting and adhering to susceptible host substrate and the substrate then remaining wet for a period sufficient for infection is extremely remote.

In EFSA (2013) unreported work in progress is quoted. In particular, mention of "artificially infected orange fruit" is of concern and there is no indication if the "splashed droplets" contained any pycnidia. In the absence of data or a literature reference, it is impossible to evaluate the work that has been undertaken.

In their own attempts to investigate the feasibility of splash dispersal using naturally infected fruit, Schutte and co-workers (Schutte, personal communication) found that it was difficult to induce pycnidia to exude spores and subsequent attempts at splash dispersal of spores failed. Moreover, given the round shape of citrus fruit, the majority of droplets (number and volume) were deflected outward and downward. The preliminary findings confirm the understanding of CBS epidemiology of experts with field experience of this disease: spores from pycnidia are predominantly dispersed by means of wash-down, and upward splash-dispersal is not known to occur. According to Spósito et al. (2011), symptomatic fruit placed underneath the canopy as a source of inoculum did not contribute to disease spread. No fruit above the inoculum sources, regardless whether the sources were on the ground or in the tree, were infected in the experimental plots. According to Spósito (personal communication) the trial sites included trees with low hanging branches and fruit (Figure 2) as described in EFSA (2013), pg. 1118-1124.

Figure 2. An example of low hanging fruit and foliage included in the trials of Spósito et al. (2011).

Pg 35 - lines 1138-1140
These are speculative statements with no supporting data.

Pg 35 - lines 1143-1146
These are speculative statements with no supporting data.

Pg 35 - lines 1147-1148
Despite the above, EFSA (2013) concludes that “the pest is **moderately likely** to transfer from the fruit pathway to a suitable host or habitat, with a **medium** level of uncertainty”. With its knowledge of CBS under field conditions, as well as knowledge of published literature on splash dispersal of mucilaginous conidia from pycnidia (those listed as well as other review papers and case studies), we regard the possibility of transfer as **very unlikely** at most, with a **low** level of uncertainty.

Pg 36 - lines 1166-1169
In light of the above, EFSA (2013) then makes the following astounding statement (underlining added for emphasis): "the pathogen is <u>likely</u> to be transferred by natural means (rain or irrigation water, <u>insect, birds etc</u>.) and <u>infect</u> susceptible plant tissues". In the absence of any evidence of this being a possibility, this statement in its totality is dismissed as being without basis, substance and technical merit.

This statement by EFSA (2013) is in stark contrast with previous assessments, for example, "<u>Citrus fruit is not epidemiologically significant as a pathway for the introduction of *P. citricarpa* (*G. citricarpa*) or establishment of CBS disease</u>", as concluded in the evaluation made by the Plant Epidemiology and Risk Analysis Laboratory of the Center for Plant Health Science and Technology, of the Plant Protection and Quarantine (PPQ), of the Animal and Plant Health Inspection Service (APHIS), of the United States Department of Agriculture (USDA), in response to the document "*Risk Assessment for the Importation of Fresh Lemon (Citrus limon (L.) Burm. f.) fruit from Northwest Argentina into the Continental United States*". This evaluation was made considering lemon fruits as a potential pathway for the introduction of the pathogen in USA. Even with lemons that are most susceptible to the CBS pathogen, the final conclusion of the evaluation made by the USDA was: "*in the event that infected fruit enter a CBS-free area with susceptible hosts, the transmission of the* *pathogen and the establishment of the disease via this pathway require a combination of conditions that are unlikely to occur*".

There is no report of introduction of CBS into a new area or country that has been attributed to contaminated fruit. All CBS introduction reports in Argentina, Brazil, South Africa and USA were attributed to vegetative material (plants and nursery trees) containing the pathogen, further dispersed by ascospores produced in fallen leaves. Therefore the introduction of CBS into new areas is ascribed to ascospore spread. For example, in the orchard of the first report of CBS in Immokalee Florida, USA, the symptoms were observed in adult trees around 6-year old reset plants in a randomized distribution in the grove area. If CBS were introduced by contaminated fruit the distribution pattern would be very aggregated, as was demonstrated by Spósito et al. (2011).

Pg 35-37 - lines 1147-1148, 1166-1169, 1170-1172 and 1178-1180
In light of the comments above, we disagree with the assessment that the pest is "moderately likely" or "likely" to transfer (which in EFSA (2013) implies inclusion of infection) from the fruit pathway to a suitable host and considers this to be without scientific merit. If it were moderately likely, with the massive amount of fruit imports, the EU should have CBS already (at least infection). Our considered opinion, in accordance with relevant scientific information and in agreement with the conclusions of other CBS PRAs (the South African CBS PRA, 2000-2009 and the USA CBS PRA, 2010), concludes that the risk of transmission and infection is very unlikely (negligible).

Pg 36 - lines 1166-1169
These are speculative statements with no supporting data.

In accordance with the South African CBS PRA (2000-2009), the USA CBS PRA (2010) and in accordance with IPPC Guidelines, ISPM 2 and ISPM 11 (FAO, 2007; 2013), the PRA should terminate at this stage.

Pg 37 - 3.2.3. Entry pathway II: Tahiti lime fruit (*Citrus latifolia*) commercial trade (without leaves and peduncles)
The production and the exportation of Tahiti lime fruit are very important for some Third Countries, such as Brazil.

Pg 38 - lines 1202-1209
Tahiti lime fruit do not produce symptoms of CBS, and therefore are not a source of pycnidia or pycnidiospores. There is very low likelihood of finding the pathogen in this pathway. There is no documented evidence that fruit devoid of lesions, and therefore devoid of fructifications, can spread *P. citricarpa*.

EFSA (2013) rated the probability of entry for Tahiti lime (*Citrus latifolia*) fruits without leaves as very unlikely with high uncertainty. EFSA (2013) also concluded that "***Current EU measures are overall judged to be effective in preventing the introduction of P. citricarpa"* in the EU territory"**. Current EU measures do not include specific requirements for Tahiti lime fruits without leaves to enter in the EU territory. Although EFSA (2013) considered that "*the probability of survival of the pathogen during transport or storage of Tahiti lime fruit is rated as very likely, with high uncertainty due to lack of evidence*", we consider Tahiti lime fruits without leaves to not be a pathway for the introduction of *P. citricarpa* or establishment of CBS disease in the EU territory and, therefore, that CBS regulatory measures are not required for the shipments of fresh fruits without leaves of this host.

Tahiti lime fruits are reported to not develop CBS symptoms under field conditions in Brazil and Australia, even in areas with high inoculum pressure by *P. citricarpa* (Aguilar-Vildoso et al., 2002;

Baldassari et al., 2008; A Miles, P Barkley and N Donovan, personal communication). CBS symptoms were not observed in Tahiti lime fruits in a 2-year experiment performed in the APTA Citrus Center at Cordeirópolis-SP, Brazil (Centro de Citricultura "Sylvio Moreira"), in which plants of the Citrus Germplasm Collection (over than 1,700 accessions) were evaluated for incidence and severity of the disease, under field conditions of high inoculum pressure by the pathogen (Aguilar-Vildoso et al., 2002). Similarly, a survey conducted in Australia within a germplasm collection in a high CBS-pressure area failed to identify CBS on Tahiti lime (Donovan et al., 2009).

Dispersal of *P. citricarpa* from asymptomatic Tahiti lime fruit is not possible due to the absence of pycnidia. Nevertheless, EFSA (2013) rated this probability as very likely with high uncertainty. There are no reports of symptom development or reproduction of *P. citricarpa* on Tahiti lime fruits. Rather, Baldassari et al. (2008) demonstrated that symptom development and reproductive structures *DO NOT* occur on Tahiti lime fruit. Reproduction of the pathogen on Tahiti lime fruits without leaves is impossible. The only report of sporulation of this pathogen in Tahiti lime is on leaves by the production of ascospores (Baldassari et al., 2008), and not in fruits without leaves and peduncles.

Pg 39 - Line 1223
Baldassari et al. (2009) should be 2008.

3.2.4. Entry pathway III: citrus fruit import by passenger traffic
Pg 39 - line 1241
We do not agree with EFSA (2013). This is the most likely route for entry (excluding the transfer and infection steps) of infected fruit, especially in the absence of inspection and control of potential introduction by the passenger traffic pathway and this material would probably not have been subjected to Good Agricultural Practices. However, this is of no consequence because fruit is not a pathway for CBS disease establishment.

Pg 41 - 3.2.4.3. Probability of survival to existing pest management procedures
EFSA (2013) should use EU specific data.

Pg 41 - 3.2.4.4. Probability of transfer to a suitable host
Recent modelling (as cited in EFSA, 2013) shows climate conditions are not conducive to infection and establishment. The same improbability for transmission (such as splash dispersal) and infection from this pathway exist as has been indicated in previous comments. We disagree with EFSA (2013) continually ignoring such relevant studies. The proportion of passengers that discard citrus peel and fruit in proximity to a citrus tree is speculative with no supporting data.

Pg 43 - 3.2.5. Entry pathway IV: citrus fruit with leaves and peduncles in commercial trade
This pathway is illegal. Why consider it here?

Pg 45 - 3.2.5.4. Probability of transfer to a suitable host
The same concerns exist about the fruit component of this section as were detailed for the fruit pathway. There are similar and additional concerns pertaining to the leaf component. The specific and protracted occurrence of conditions required for pseudothecium maturation, and then ascospore release (Kiely, 1948; Kotzé, 1981; Fourie et al., 2013), further compounds the improbability of occurrence. We strongly disagree with the conclusion that the pathogen is "likely" to transfer and consider it so extremely unlikely that it is negligible. Furthermore, it is our understanding that importation of leaves is prohibited, regardless of their potential as a CBS pathway, and hence this poses no contributory risk.

Pg 46 - 3.2.6. Entry pathway V: citrus plants for planting

The introduction of citrus plants into the EU from countries endemic with CBS is prohibited, therefore this pathway should not be considered. Nonetheless, we agree that in the absence of regulation the probability of entry of *P. citricarpa* in the risk area by means of citrus plants for planting is very likely, but disagree that transfer to a suitable host or habitat would be very likely. Kotzé (1981) noted that fruit is not regarded as a pathway and that plants for planting present the most effective means of CBS spread to new areas. However, the prerequisite for transfer to a suitable host and for infection to take place, requires a suitably conducive climate. The absence of CBS establishment in the Western Cape province of South Africa, despite earlier trade in citrus plants for planting from CBS-present areas (McOnie 1964, 1965; Carstens et al. 2012; Yonow et al. 2013), is proof of this fact. This information was previously shared with EFSA (the South African CBS PRA, 2000-2009), but EFSA (2013) seems to disregard this information. These comments are also relevant to the pathways discussed in 3.2.7. and 3.2.8.

Pg 46, 48-49 - lines 1406, 1483, 1498-1499 and 1502

The role of pycnidiospores is insignificant and this is inappropriately overstated by EFSA (2013). Additionally, the role of splash dispersal is inappropriately overstated, as highlighted in the comments on the fruit pathway section.

3.2.6.1. Probability of association with the pathway at origin

Pg 47 - lines 1424-1428

It is illogical to assume the absence of prohibition would lead to higher plant imports into the EU. If current markets in the EU are able to supply the 7.5% tree renewal, then it is unlikely that this market would be replaced wholly with imported plantings. Prohibition of import of citrus plants is in any case currently necessitated as a control measure for citrus graft transmissible diseases.

3.2.6.4. Probability of transfer to a suitable host

Pg 48 - lines 1470-1472

Propagation material from this pathway would be narrowly distributed. It would be imported for a specific purpose and in a specific area.

Pg 49 - lines 1504-1505

Transfer from the pathway to a suitable host in a suitable habitat (including infection as in accordance with the EFSA 2013 approach) is dependent on suitable conditions and several necessary events that must be successfully completed, but are not discussed in section 3.2.6.4. Inclusion of these critical steps will reduce the risk assessment to very unlikely (negligible).

Pg 50 - 3.2.7.4. Probability of transfer to a suitable host

Studies on this are not available, as they would serve no scientific purpose.

Pg 50 - lines 1553-1554

Ascospores are recorded to disseminate up to 25m from the source material (Spósito et al. 2007), which does not support the statement that ascospores are disseminated relatively long distances.

Pg 51 - 3.2.8.4. Probability of transfer to a suitable host

The same deficiencies regarding transfer exist here as we have commented on previously and apply to this section.

3.2.9.4. Probability of transfer to a suitable host

Pg 53 - lines 1639-1640

The role of pycnidiospores is insignificant.

Pg 53 - line 1646

This should be given a rating of very unlikely.

3.2.10. Conclusion on the probability of entry

Pg 54 - Table 5. Ratings

With regard to Pathway 1, citrus fruit trade, the Panel strongly disagrees with all the probability ratings. They are all overestimated, with some of them grossly and excessively overstated, without proven scientific or technical merit. Taking into consideration the descriptions attached to the ratings in Appendix A, Table 18, 1.1 for entry, we strongly disagree with an overall rating of "moderately likely" and, based on proven scientific and technical merit, we are confident that very unlikely (negligible) is appropriate.

Other components' ratings should be as follows: association = moderately likely, survival during transport = moderately likely, survival of existing procedures = moderately likely, transfer = very unlikely (negligible).

As indicated in earlier comments, we find it unacceptable that the risk of initial infection is not specifically considered as a step. EFSA (2013) considers the probability of transfer and then seems to take infection (a highly improbable step) as a given.

Pg 55 - Table 6. Justification for ratings

We disagree with the majority of the justifications provided for the reasons given in the comments made on each relevant section. The qualitative approach used in EFSA (2013) is inadequate to capture the complexities of each pathway. There are many more discrete components to each pathway than presented by EFSA (2013). At a very minimum, the following 14 discrete steps in each pathway should be considered.

EFSA (2013) categories	Step	Panel recommended minimum steps	Description (quantitative)
Entry	1	Origin	Probability of pest association with the pathway at origin; including the mitigating effects of control.
	2	Grading and Inspection	Probability of excluding contaminated plant parts (e.g., packhouse procedures and plant inspection); including the mitigating effects of control.
	3	Transport and Storage	Probability of pest survival during transport or storage; including the mitigating effects of control.
	4	Port of arrival inspection	Probability of exclusion of infected plant material from entering the PRA area.
	5	Proximity	Probability of suitable proximity of infective propagules to susceptible hosts in the PRA area.
	6	Sporulation	Probability of sporulation on fruit/leaves.
	7	Dissemination	Probability of physical transfer to host – dissemination.
	8	Host susceptibility	Probability of host susceptibility to infection.
	9	Germination	Probability of suitable conditions for germination.
	10	Survival	Probability of survival of existing control measures

			in PRA area
	11	Infection	Probability of suitable conditions for Infection/appressoria formation/colonization.
Establishment	12	Incubation	Probability of suitable conditions for incubation and symptom expression.
	13	Reproduction	Probability of completing life-cycle/reproduction.
	14	Epidemic Establishment	Probability of establishing polyetic epidemic.

Each of these steps should be numerically weighted to represent the relative "Risk" associated with each step in the pathway and thereby the importance of each step to lead to disease establishment. The resulting overall weighted probability will allow EFSA to differentiate and compare the relative risk of each pathway. We contend that in many cases individual steps will result in a zero probability, which would indicate an end-point to the pathway and overall absence of establishment.

Pg 57 - 3.2.11. Uncertainties on the probability of entry

Our concerns about the way EFSA (2013) uses uncertainty have been expressed in other comments.

Pg 58 - 3.2.12. Comparison of entry conclusions with other PRAs

It is incorrect for EFSA (2013) to state that their assessment of CBS following the fruit pathway is in general agreement with the USA CBS PRA (2010). EFSA (2013) considers transfer of pycnidiospores from the imported fruit to susceptible host material as part of the entry step. EFSA (2013) considers this to be a "moderately likely" event and the overall probability of entry through the fruit pathway to be "moderately likely". In stark contrast, the USA CBS PRA (2010) clearly articulates why this is a highly unlikely event and consequently negligible risk, and in agreement with the findings of the South African CBS PRA (2000-2009), concludes as follows: "**citrus fruit is not epidemiologically significant as a pathway for the introduction of *G. citricarpa* or establishment of CBS disease**".

In the South African CBS PRA (2000-2009) the inputs from the EU CBS Working Group and EFSA were criticised for failing to make appropriate distinction between realistic probability and theoretical possibility. EFSA (2013) seems to perpetuate this mistake as is evident in their dismissal of effectiveness of pre- and post-harvest treatments because they find that "such treatments do not completely eliminate the pathogen" and similarly, regarding the incidence of the pathogen on exported fruit, EFSA finds it to be "non-negligible".

The above-mentioned concerns about the EFSA (2013) approach to risk assessment is further evident in the continued failure to consider the compounding effect of a sequence of unlikely events, all of which must occur for there to be any possibility of an endpoint occurrence. The relevance of the sequential hurdle approach as followed in the South African CBS PRA (2000-2009) was supported when the USA CBS PRA (2010) assessed the sequential hurdle consideration in a similar way. In the SA CBS PRA (2000-2009) attention was focussed on this shortcoming in earlier EU CBS Working Group and EFSA (2008) assessments, but no cognisance thereof seems to have been taken in EFSA (2013). In accordance with IPPC guidelines (ISPM 2 & 11 - FAO 2007, 2013) for conducting PRAs and in line with the SA and USA PRAs the EFSA PRA should terminate at this point. We nonetheless comment on the remainder of the EFSA (2013) document as provided for in the EFSA invitation for comment.

3.3. Probability of establishment

Pg 58 - 3.3.1. Availability of suitable hosts in the risk assessment area

EFSA (2013) emphasises the extent of citrus production in the EU. They should likewise highlight the disparity between the extent of the PRA area, being the greater 28 Member State EU, and the highly constrained (by comparison) occurrence of citrus production in parts of Mediterranean region. This is further compounded by the vast majority of EU imported citrus going to non-citrus producing northern Member States and this should be referred to in this section to provide appropriate perspective.

3.3.1.1. Periods of susceptibility of citrus leaves and fruits in the risk assessment area
Pg 59 - lines 1691-1699
As in the entry section the duration of fruit susceptibility after blossom is inappropriately assessed. As indicated previously, it is erroneously stated that fruit are susceptible in the PRA area in the September-October period. This equates to March-April in South Africa, Argentina and Australia, and is outside of the window of fruit susceptibility, with protective fungicide sprays normally applied up to the end of January in South Africa, Australia and Argentina (Kiely 1948; Schutte, 2002, 2006, 2009; Schutte et al., 2012; Nel et al., 2003; Miles et al. 2004; Fogliata et al. 2011). EFSA (2013) perpetuates this miscalculation of the fruit susceptibility window throughout the rest of the assessment, thereby inappropriately over-estimating the risk.

Pg 59 - line 1716
It should be noted that pycnidiospores on twigs and leaf litter are an insignificant source of potential infection (Kotzé, 1981), with the exception of production under high rainfall tropical and sub-tropical conditions where wash-down was reported (Spósito et al., 2011).

The degradation of leaf litter as an inoculum source is not limited to warm and moist conditions. It should be noted that the substrate degrades under field conditions and more rapidly so when conditions are conducive to rapid decomposition, rapid desiccation and the flourishing of competing saprophytes (Kotzé, 2009 in the SA CBS PRA, 2000-2009). Such conditions may be warm and wet, very hot and dry as well as cool and wet. Truter (2010) found that conditions for artificial wilting of green leaves to promote pseudothecium formation and ascospore dispersal were highly specific, requiring a combination of light, moisture and heat. Exposure of latently infected green leaves to 30°C at low humidity or to direct sunlight in summer for more than 3 hours did not result in pseudothecium maturation or ascospore dispersal.

Pg 59 - lines 1726-1727
EFSA (2013) makes the statement that "ascospores are released when temperatures are between 5 and 25°C (Kotzé, 1963)". However, this was a report on a laboratory trial. Kotzé (2009) in the SA CBS PRA (2000-2009) states as follows: "A significant observation was made repeatedly for years by three independent operators in completely different areas in South Africa: Ascospores are not observed in spore traps when the air temperature is below 17.5°C. This implies that spore germination studies below 17.5°C are of academic value only. This point must be noted in CLIMEX studies" and "In the Western Cape where repeated surveys confirmed that CBS is absent, the autumn, winter and spring temperatures are too low to stimulate the production of ascospores or the completion of the cycle". Likewise, Fourie et al. (2013) reported that the mean first and fifth percentiles for minimum temperatures at which ascospores were trapped were 15.9°C and 17.8°C, respectively. This clearly indicates that the vast majority (>95%) of ascospore release events occurred at temperatures ≥18°C. Such critically important information cannot be ignored in a balanced assessment.

Pg 60 - lines 1734-1736
Reference is made to the infection modelling conducted by Fourie et al. (2013). However, no mention is made of the findings that ascospore dispersal mostly occurred at temperatures above 18°C.

Pg 61 - lines 1752-1754
EFSA (2013) states: "pycnidiospores are mainly disseminated by rain-splash (Whiteside, 1967)". As indicated previously (in both this document and in the SA CBS PRA, 2000-2009 - see pages 5 and 6 of South Africa, 2009), Whiteside confused the identity of *P. citricarpa* and *P. capitalensis*. Furthermore, Whiteside (1967) did not demonstrate splash dispersal at all, but rather wash-down of pycnidiospores as was also shown by Spósito et al. (2011). A more appropriate discussion of the role of water in the dispersal of pycnidiospores and the relevance of pycnidiospores was provided at an earlier point in the entry section of this document, and should also be considered here.

3.3.2.2. Review of the different methods used to assess the climatic suitability of the EU for *P. citricarpa*

3.3.2.2. (i) Qualitative assessment based on the literature and expert judgement with or without model outputs

Pg 61 - lines 1762-1763
Whereas we acknowledge that EFSA (2013) reflects expert judgment with regard to various scientific disciplines, it is also apparent that the authors did not include experts with proven field experience with CBS, nor did EFSA in its 2008 opinion, nor in the MacLeod (2012) study to which this PRA often makes reference. Nonetheless, throughout EFSA (2013) they make subjective qualitative risk assessments, often based on erroneous interpretation of the published work of CBS researchers, or erroneous assumptions of CBS pathogenesis (for example insect transmission and *P. citricarpa* occurrence on seed or pulp). We contend that these subjective assumptions should be disregarded in the absence of any scientific proof.

If the quantitative data is available, it is accepted practice to use a quantitative approach. If not available, then use expert opinion. For CBS, there are data, and a quantitative approach is appropriate. The biology and climate are defined. Research on each part of the disease cycle is fairly consistent among publications. The models predict accurately where CBS does exist and the distribution in regions where it does exist. The EFSA (2013) PRA builds in a bias toward categorical and subjective interpretations, rather than quantitative interpretation. A different group of experts constructing the EFSA PRA would likely have a different opinion, as is reflected in the comments of the Panel.

Pg 61 - line 1784
We disagree that there is a clear summary of risk and uncertainty when using expert opinion.

Pg 61 - line 1785
Literature review and expert opinion is subjective depending on personal bias.

EFSA (2013) refers to a Prima phacie project (2011), but does not list this reference. We regret that we were not provided with the opportunity to study this reference. In particular, we are curious to understand how the Prima phacie project (2011) studied the question of “How similar are the climatic conditions that would affect pest establishment, in the risk assessment area and in the current area of distribution?” to come up with the answer that the “risk was rated as moderately similar, with an uncertainty score of medium”. Information supplied to EFSA prior to conclusion of this PRA (SA WG, 2009 in the South African CBS PRA, 2000-2009) clearly showed that there are significant differences in climate (daily temperatures and rainfall) between citrus growing EU Member States and areas where CBS does occur. For a study to conclude that a Mediterranean winter rainfall climate is "moderately similar" to summer rainfall climates, at least should have an uncertainty level of extremely high, and a confidence level of extremely low.

Pg 61 - 3.3.2.2. (ii) Climate matching and correlative models

We regret not being able to study the Dupin et al. (2011) document, not being included in the EFSA (2013) reference list. In line 1843, EFSA remarks that "there are many examples of adaptation of invasive organisms to novel environments", but fails to provide any scientific references. We are curious whether any of these examples have demonstrated adaptation of a fungal pathogen as dramatic as would be required for *P. citricarpa*, known to occur in summer rainfall areas only, to adapt to a Mediterranean winter rainfall climate. In fact, the potential for this adaptation in *P. citricarpa* has been tested over time, and CBS has not established in winter rainfall regions of South Africa and Australia despite planting CBS infected trees in those areas. We agree that "In the case of *P. citricarpa*, there is very little information for diversity in ecophysiological traits, and its propensity for adaptation". In fact we are not aware of <u>any</u> information, and regret that EFSA does not make reference to the <u>little</u> information known to them.

Lines 1838-1841

EFSA (2013) states that a disadvantage of the CLIMEX Match Climates method is that the method's accuracy depends on the assumptions regarding various traits of the organism in question (*P. citricarpa* in this case). However, the Match Climates method is purely intended to compare the similarity of climates in different locations. The method has no intention to draw conclusions about the traits of a particular organism or the suitability of an organism to any particular climate. Therefore EFSA (2013)'s statement regarding this perceived disadvantage is erroneous and should be removed.

Pg 63 - lines 1851-1858

EFSA (2013) states that there are many examples of adaptation of invasive organisms to novel environments. However, when applied to the global distribution of CBS this statement is challenged by the lack of establishment of CBS in southern production regions of Australia, where the inland, winter rainfall areas have recognised area freedom status (The Commission of the European Communities, 1998 – European Union, 1998). This is despite the presence of the disease in Queensland and coastal regions of NSW for at least 100 years (Benson 1895; Simmonds 1966). For the vast majority of the time CBS has been present in Australia there have been no restrictions on the movement of citrus propagating material from CBS to non-CBS areas, nor restrictions on fruit movement. It is therefore quite reasonable to assume that CBS has not established in the southern production areas because the climate is not suitable, as shown by CLIMEX modelling (Paul et al. 2005; Yonow et al. 2013). This situation still remains the case more than 15 years after Broadbent (1995) raised the possibility of adaptation. EFSA (2013) quotes an extract from Broadbent (1995) in support of the contention that "diversity and adaptation in the pathogen" is a risk. However, the situation described by Broadbent (1995) is not evidence of adaptation or diversity, but rather the result of introduction into new areas, with some being climatically unsuitable for establishment.

Pg 63 - lines 1863-1865

We cannot agree with EFSA that there is a "paucity of representative location data" as reliable, long-term location data and associated occurrence of CBS has been known to EFSA (see EFSA, 2008 and references therein).

Pg 63 - 3.3.2.2. (iii) Models combining correlative and deductive elements

We note the defensive manner in which EFSA appears to discuss the advantages of CLIMEX as applied by Yonow et al. (2013) and published in a peer reviewed journal. In lines 1925-1936, EFSA appears to defend its sceptical position of the CLIMEX study of Yonow et al. (2013), by rightly noting that "For successful establishment, suitable hourly temperature and leaf wetness conditions required for infection to take place need to coincide with the availability of inoculum (i.e. spore presence) and host phenology (i.e. citrus hosts in a susceptible phenological stage)", but then recommending to rather use models developed by Fourie et al. (2013) and Magarey et al. (2005). However, Fourie et al. (2013), as well as the NAPPFAST study by Magarey et al. (2011) [which used the Magarey et al. (2005) models] concluded that the climatic conditions in the EU are not suitable for CBS. Both these studies validate and support the findings by Yonow et al. (2013).

EFSA (2013) regards "discrepancies between the pathogen and host's climatic responses" as found by Yonow et al. (2013) as a disadvantage of the CLIMEX approach. We fail to see how this can be regarded as a disadvantage, as Yonow et al. (2013) logically did take "host distribution into account when assessing the area of potential establishment".

EFSA (2013) makes the statement that "the successful use of CLIMEX in predicting the potential distribution of pathogens is subjective and has never been properly analysed". They note that "the volume, quality and spatial distribution of locations where the pest is known to be present and the extent to which the pests is known to have high/low incidence at these locations are also important" and later that "The distribution of citrus and therefore CBS in South Africa and Australia is highly disjunct and is also affected by major geographical features (principally the sea) and irrigation". We contend that this information is well known in South Africa and Australia, as was considered in Yonow et al. (2013) as well as Magarey et al. (2011), and recently also by Carstens et al. (2012).

In lines 2008-2033, EFSA criticises Yonow et al. (2013) for selecting a lower temperature threshold of 20°C, but failed to recognize that this threshold is supported by recent finding that >95% of ascospores were dispersed at >18°C (Fourie et al., 2013) and other field observations (Kotzé, 2009 in the South African CBS PRA, 2000-2009). The threshold to be used in modelling does not necessarily need to be exactly the same as that shown by Fourie et al. (2013) considering the cumulative temperature requirement response. In the life-cycle of CBS the maturation of the pseudothecia requires alternate wetting and drying of leaf litter and sufficient temperature (warmth) to mature (Truter, 2010). So the climatic modelling takes processes like that into consideration. See also comments made regarding lower temperature thresholds in the entry section of the fruit pathway in this document.

Pg 64 - lines 1929-1932

EFSA (2013) states that "for successful establishment, suitable hourly temperature and leaf wetness conditions required for infection to take place need to coincide with the availability of inoculum (i.e. spore presence) and host phenology (i.e. citrus hosts in a susceptible phenological stage)." However, establishment actually requires much longer time frames, i.e. such as annually, as at any point during the year if climate leads to mortality of any part of the disease cycle the establishment process will be halted. Hourly measures are more appropriate for considering the likelihood of initial infection, but not the likelihood of establishment.

Pg 65 - lines 1957-1958

EFSA (2013) concludes that CLIMEX is subjective and its successful use never properly analysed. However, CLIMEX modelling by Paul et al. (2005) predicted the suitability of the climate in Florida (USA), Bahia (Brazil), Uganda and Ghana to support the establishment of CBS prior to the detection of CBS in these areas (Reeder et al. 2009; Schubert et al. 2012; Silva et al. 2012; Brentu et al. 2012). Later modelling by Yonow et al. (2013) reaffirms this. Furthermore, other authors (Kriticos et al., 2012) have noted that: "CLIMEX is a semi-mechanistic climatic niche modelling programme that has more than 300 journal publications and has been used to estimate the potential geographic distribution and climate suitability for a wide range of pests (Sutherst et al., 2007). It has been shown to be well adapted to exploring questions relating to novel climates such as those that are central to weed and pest risk assessment (Baker et al., 2000, Kriticos & Randall, 2001, Webber et al., 2011)". Moreover it has been used in PRAs by EFSA themselves, for example, for *Gibberella circinata* causing pitch canker.

Most CLIMEX models are tested with geographically independent distribution data. For example:

- *Uraba lugens* in Australia (Kriticos et al. (2007).
- *B. microplus* – modelled suitable in northern Tanzania and western Africa and showed up there subsequently (Sutherst et al. 2009).
- *Acacia nilotica* – modelled as suitable in Northern Territory in Australia and subsequently showed up there (Kriticos et al., 2003).
- *Puccinia psidii* – Australia, China and Japan modelled as suitable before it showed up there (Kriticos et al. 2008; Kriticos et al. 2013).
- Australian Acacias in South Africa and elsewhere – CLIMEX performed very well in South Africa and was the best performing model in the global projections (Webber et al. 2011).
- Western corn rootworm in Europe (Kriticos et al., 2012).
- *Nassella neesiana* in New Zealand (Bourdôt et al. 2012). The potential distribution model was developed when the plant was located in only a few places in NZ. It has subsequently spread widely in areas the model projected to be suitable.

Pg 65 - line 1976

EFSA (2013) fails to recognize that until fairly recently nursery stock with latent CBS leaf infections was sent from areas where CBS was endemic to areas which have continued to remain CBS-free in Australia (Barkley, personal communication) and similarly in South Africa (Carstens et al., 2012; Yonow et al., 2013).

Pg 65 lines 1981 - 1982

EFSA (2013) criticises the classification of EI values into categories of "marginal", "suitable" and "optimal". However, this form of classification is common practice, for example EFSA (2010) in their risk assessment of *Gibberella circinata* where CLIMEX was applied state "In the present risk assessment the classification of EI into marginal (EI = 1-5), suitable (EI = 6-25) and optimal (EI > 25) categories follows Kriticos et al. (2003a,b)". In the case of CBS, these classifications were based on the observed trends that areas where CBS is known to be successful have high EI values, while areas where CBS is known to be absent or only present at very low levels have low EI values. For example, southern Australia (no CBS and low EI) vs. east coast Australia (CBS present and high EI). It is also noteworthy that EFSA (2013) readily uses qualitative classifications such as "massive", "minimal", "likely" and "unlikely", which could also be criticised for being difficult and species (scenario) specific.

Pg 66 - lines 2019-2033

EFSA (2013) expresses concern that the Tmin value selected by Yonow et al. (2013) for CLIMEX modelling differed markedly from some published conditions observed under laboratory conditions, without indication that requirements under field conditions are different from those reported under laboratory conditions. We dismiss the criticism in that the Tmin conditions in the publications cited by EFSA (2013) relate to germination under laboratory conditions and not to infection under field conditions. Furthermore, there are strong indications that the appropriate field conditions are considerably different (higher Tmin) from the reported laboratory figures (Kotzé, 2009 in the SA CBS PRA, 2000-2009 and Fourie et al., 2013). See also earlier comments on minimum temperature thresholds (including line 1726).

Pg 66 - lines 2034-2039

We do not agree with this conclusion by EFSA (2013) and note that their conclusion is not supported by the arguments presented. EFSA (2013) concludes that CLIMEX Compare Locations can provide misleading results for *P. citricarpa.* However, when CLIMEX was appropriately used, the models have to date shown quite the opposite, with correct predictions for known population distributions in Australia and South Africa, as well predicted potential for establishment in Florida, Brazil, Uganda and Ghana. Furthermore, EFSA (2013) refers to lifecycle events over a short time scale, but establishment requires analysis over long time scales in order to predict the potential for survival of the pathogen between seasons.

Pg 67 - 3.3.2.3. Analyses of climate suitability done by the Panel

We find it curious that EFSA does not regard CLIMEX as a complementary model to the Fourie and Magarey models, which EFSA (2013) regards as more suitable. In fact, previous studies using these models (Paul et al., 2005; Magarey et al., 2011; Fourie et al., 2013; Yonow et al., 2013 - with all except the Magarey report being peer reviewed papers) all agreed that the climate in EU is not suitable for CBS.

Pg 67 - 3.3.2.4. Simulations of pseudothecium maturation and ascospore release

We note that EFSA (2013) opted to use the Temperature/Moisture (T/M) model only (termed by EFSA as Model 1), and not the Temperature (T) model for pseudothecium maturation. As indicated below, the Temperature/Moisture model has recently been shown to be inaccurate in validation studies. Of the probability thresholds proposed by Fourie et al. (2013), EFSA used the lower more stringent threshold of 0.5 (corresponding to the mean 1st percentile release in Fourie et al. 2013), and did not present the results of the 0.7 threshold, which corresponded with the mean 5th percentile release in Fourie et al. (2013). EFSA compounded the stringency of the 0.5 threshold modelling by presenting only the 5th and not the 50th percentile results in Fig. 22. The 5th percentile is an over-estimation and indicates the earliest (1 in 20 years) predicted onset of ascospore release. It would be appropriate to also show the results for the 50th percentile, as this should indicate more accurately the general predicted period for pseudothecium maturation and onset of ascospore release. Presentation of the 5th percentile rather than the 50th percentile masks the important delayed pseudothecium maturation dates for Mediterranean climates compared with CBS endemic localities. EFSA briefly refers to 50th percentile results by remarking that May as the "dominant period" occurred in Cyprus, Malta, some of the islands in Greece and some areas in southern Spain. However, they fail to present these results and report only vaguely about the exact position of these locations. We regret that EFSA (2013) did not specifically present these results as it would have defined the areas perceived to be at risk better and it would have allowed the interrogation of climate suitability of these specific locations by means of other models.

EFSA (2013) also fails to include any positive or proven negative controls in their study. Fourie et al. (2013), using the Temperature model on long term monthly datasets at a probability threshold of 0.5 (using northern hemisphere months), indicated that pseudothecium maturation in areas where CBS occurs (positive controls) would occur early-mid March (for moderate CBS sites) to early in April (for low CBS sites). For selected European sites the predicted onset of ascospore release was 4 to 6 weeks later than predicted for low CBS Eastern Cape sites. The inclusion of true negative sites (Stellenbosch and Citrusdal in South Africa) indicated that pseudothecium maturation was predicted later than positive sites, but earlier than for EU sites (that is the difference between the EU sites and the positive controls was greater than the difference between the negative controls and the positive controls).

EFSA (2013)'s failure to include positive and negative controls in their modelling studies is a significant shortcoming that has been highlighted previously (SA WG, 2009 in the South African CBS PRA, 2000-2009). Inclusion of positive and negative controls is a standard scientific principle. The disregard for this principle in EFSA (2013), in light of the clear differences between positive sites and those of EU locations in previous studies (Paul et al., 2005; EFSA, 2008; Magarey et al., 2011; Fourie et al., 2013; Yonow et al., 2013) seriously impairs the credibility of the assessment.

Pg 69 - 3.3.2.5. Infection simulations with the generic infection model of Magarey et al. (2005)
EFSA (2013) indicates they used the Magarey et al. (2005) model, but that over predicts ascospore infection and there are two more recent models by Magarey et al. available. These new models are more accurate and show far less susceptible areas in the EU, but these were ignored by the EFSA panel. Why? The results shown here (EFSA, 2013) are an over prediction and irrelevant for the fruit pathway.

EFSA (2013) highlights that the sensitivity analysis carried out by EFSA (2008) indicated that model uncertainty was mainly due to the parameters D_{50} and T_{min}. EFSA (2008) used a T_{min} of 15°C, as was also used by Magarey et al. (2011). Findings from Fourie et al. (2013) provide empirical support and reduce uncertainty for the use of this T_{min} value as 95% of ascospores were trapped at a daily T_{min} of 17.8°C and 99% at a daily T_{min} of 15.1°C. However, no scientific evidence exists to suggest a realistic D_{50} value. Whereas EFSA (2008) elected to use a D_{50} of 0, 3 and 14 hours, EFSA (2013) used a D_{50} of 3 hours only. EFSA (2008) found the following for predicted ascospore infection at selected EU localities: "According to the model simulations, climate is generally unsuitable for infection from June to August for all D_{50} values (data not shown). The month of April shows almost no potential infection because temperatures are limiting, whereas May infections are limited by leaf wetness. September is, on average, the most favourable month followed by October. October offers a greater opportunity than September in terms of leaf wetness, but infection can be limited by temperature during this month. Even using the most conservative value of D_{50} (0 hours) to estimate infections, potential infection events are still predicted to occur in the EU. When results from both the EU and other areas are taken into account it is clear that: (a) the procedure used is sensitive to year by year variation; (b) the risk of infection is always noticeably positive for sites where CBS is endemic and (c) EU sites show a smaller number of potential infections and some sites show a number of potential infection events either equal or close to zero." Clearly EFSA's own findings, albeit subjectively presented, highlight the significant difference between CBS localities and the selected EU sites, as well as the general unsuitability of the EU climate for infection.

EFSA (2013) elected to use a D_{50} of 3 hours, and based this on "the literature as being a generally acceptable period of leaf wetness interruption". However, from the references used it is clear that this D_{50} of 3 hours is not a general value, but one specifically used for *Venturia inaequalis*, which requires significantly lower temperature parameters for infection (7-24°C) than *P. citricarpa* (Magarey et al., 2005). The D_{50} value will be markedly lower at the higher temperatures at which *P. citricarpa* ascospore infection occurs.

Pg 69 - line 2166
We disagree with this statement. The use of similar figures, without any additional justification for their use, does not "validate" the figures, it simply means somebody else used similar figures and does not imply that they are appropriate or accurate.

Pg 71 - line 2194
Regarding the issue of temperature in leaf litter versus air temperature, meteorological data have to be collected to a standard, as EFSA (2013) note, and it is true that this standard will not be "exactly" what the pest in question experiences. However, any differences in leaf litter temperature versus air temperature at a given height will very likely be different in the same manner in Location 1 or Location 2. Leaf litter will always be a bit warmer, but it will always be a bit warmer by about the same amount. It won't be warmer in one place and cooler in another. So the fact that one uses a "proxy" measurement is irrelevant and a model that is correct in one place using the proxy is likely to be correct in another if the same proxy measurement is used.

Throughout the document, EFSA (2013) seems to have an inconsistent view regarding the modelling. They either consider that the models use data that are too imprecise (e.g., they suggest that CLIMEX is on too large a scale, not looking at short enough time frames, not considering small-scale issues like leaf wetness, using air temperatures instead of leaf litter temperatures) or they consider that the models need to use data that are generally unavailable (they critique the Magarey et al. (2005) model because it requires very specific data that is not easy to obtain). In other words, EFSA (2013) are criticising any modelling approach at all, except where EFSA themselves have used modelling. All things considered, using readily available data has a distinct advantage because it means that the model will be applicable, and able to be scrutinised, in more situations.

Pg 71 - 3.3.2.6. Conclusions derived from the models by Fourie et al. 2013. (Model 1 and 2) and by EFSA (2008) results from applying the model by Magarey et al. (2005)
Again an outdated Magarey model is being used here. Nonetheless, EFSA (2013) states that there is significant between-year variability and seasonal ascospore release, which reflects a lack of regularly recurring climatic conditions required to sustain a CBS epidemic.

EFSA (2013) concludes "After the successful transfer of *P. citricarpa* to susceptible citrus leaves and fruit in the PRA area, the pathogen may then reproduce through ascospores in infected leaves and pycnidiospores in infected fruit, twigs and leaves. Since ascospores can be disseminated at relatively long distances by air currents (Kotzé, 1981), a potential epidemic development of CBS in the EU citrus-growing areas would mainly be driven by the duration and efficiency of ascospore infection, their reproduction and dissemination rate and the host availability and environmental conditions that allow symptoms to develop on the fruit.". We regard this paragraph as theoretical and an unrealistic assessment of the probable situation in EU. EFSA's <u>acceptance</u> of successful transfer and therewith automatically infection is inappropriate, especially in light of the earlier criticisms (see relevant comments above). <u>Disregard for the requirement for successful pycnidiospore infection after successful transfer of viable inoculum to a susceptible host, is highly problematic as it disregards a critical step.</u> Furthermore, the assumption that the very low levels of predicted infections will result in epidemic development of CBS is completely unjustified, considering the relatively insignificant number of predicted infections, the relatively insignificant duration of the period of synchrony between ascospore availability and conditions suitable for infections. The inclusion of true positive and true negative control sites would demonstrate this aspect clearly.

Regardless of the climate data used in any of the models, simply meeting the necessary climate conditions for infection does not indicate establishment. The conditions need to be continuously met. In epidemiological terms, the rate of the epidemic needs to exceed 1 (i.e., $R_0 > 1$). If R_0 is less than one, the epidemic will die out and the pathogen will become extinct in the host population.

Pg 71 - lines 2208-2213
As indicated previously, EFSA (2013) here repeats the erroneous references to the relevance of pycnidiospores.

EFSA (2013) also concludes that "The extensive use of irrigation in the EU citrus-growing areas (Section 3.3.3.1) will add to the suitability of the environment since it lengthens the periods of leaf wetness aiding infection". However, higher temperatures and precipitation accelerate leaf decomposition (Zhang et al., 2008), and will limit the survival of leaves from late-winter until the predicted suitable period for ascospore infection in autumn. Consequently, the potential inoculum load for autumn infections will be diminished, as was shown with a similar citrus pathosystem, greasy spot (Mondal & Timmer, 2002).

The assumption that irrigation will lengthen periods of leaf wetness aiding infection is also an exaggerated and baseless conclusion, especially considering minimum wetness periods for *P. citricarpa* of 15 hours and that irrigation mostly occurs in the hot and dry Mediterranean summer. Furthermore, according to EFSA (2013), the minority of irrigation systems in EU citrus growing regions are systems that will result in canopy wetness (sprinkler irrigation, and to a much lesser extent under-canopy micro-sprinklers). For example in Spain, the largest grower of citrus in EU, only 1% of production makes use of micro-sprinkler irrigation, while the remainder use either drip or flood irrigation with no canopy wetting. In Sicily, irrigation is mostly (84%) by under-canopy micro-sprinkler and only 6% by overhead sprinklers. In Portugal, only 8% of orchards are irrigated using under canopy micro-sprinklers, and the remainder drip and flood irrigation. In Greece, it is mostly under canopy micro-sprinkler irrigation (90%), and the remainder flood and drip. In Malta, it is flood or drip only, and Corsica 43% overhead sprinklers, and 29% under canopy micro-sprinkler.

Pg 71 - lines 2214-2219

As indicated previously, EFSA (2013) here again fails to recognise the range of conditions (warm and wet, cold and wet, hot and dry) that each are detrimental to leaf litter as a substrate for ascospore inoculum over a long period.

Pg 71 - lines 2224-2243

EFSA (2013) described monthly prediction for ascospore dispersal and infection based on the Fourie and Magarey models (using stringent thresholds and a D_{50} of 3 hours). We consider the likelihood that leaves following leaf drop in late-winter (when the majority of drop occurs) will remain intact throughout spring and summer until autumn to sustain pseudothecium maturation and ascospore dispersal as very small, when considering the effects of 8 months of weathering and decomposition and highly specific conditions required for leaf conditioning, pseudothecium formation, maturation and ascospore dispersal (Truter, 2010). The Fourie-model predicts proportional seasonal ascospore release and does not take this important variable, i.e. availability of fallen and infected leaves in a suitable condition, into account and following any reduction in leaf matter, CBS inoculum potential will likewise decrease.

EFSA (2013) concludes that "The graphs indicate that there is generally an overlap between potential ascospore release and the weather conducive to infection with peaks in September and October". However, a study of the graphs presented in Appendix C indicates that in none of the 56 cases studied (7 years and 8 locations in Italy) were there any overlaps in April or May, while overlaps in September and October occurred in 18% and 27% of the 56 cases, respectively and in these cases the suitable hours for infection was often very low (<10%). Synchrony of ascospore availability and favourable infection period once every 4 to 5 years can surely not be regarded as a general overlap and such claims impair the credibility of the analysis.

We can therefore not agree with the following EFSA (2013) statement: "it can be concluded that the climate in the risk assessment area would sustain the reproduction, dissemination and infection of *P.*

citricarpa, at least at some European locations". The arguments presented by EFSA (2013) are clearly not reconcilable with CBS epidemiology as described and experienced elsewhere in the world, and we contend that inclusion of positive and negative controls would have indicated this.

Pg 71 - lines 2231-2232

EFSA (2013) reports, using the Fourie ascospore maturation and release models, that "it was observed that a <u>minor</u> proportion of the spores would not mature within one growing season". We estimated the proportion of spores released by end-October (being the end of the Sept – Oct period contemplated by EFSA (2013) as possibly being suitable for ascospore infection) from Figures 49 to 56 and note that this ranged from 3% to 49%. The predicted proportion of ascospores released by end-October exceeded 25% in only 5 of the 56 cases presented. We contend that EFSA's report of the results should be amended to read "it was observed that <u>the major</u> proportion of the spores would not mature within one growing season". In stark contrast, Fourie et al. (2013) reported 100% of spore release by end-April (equivalent to end-October in southern hemisphere) for 3 SA localities (21 cases) where CBS does occur. Their findings were based on actual ascospore trappings and on a true biofix for the release model, providing even more credibility to their findings. The results reported by EFSA (2013) indicate that the predicted ascospore maturation and release for chosen sites in the EU is significantly different from that experienced in South Africa where CBS does occur.

EFSA (2013) elected to use the T/M model ("model 1") to predict the onset of ascospore release (Fourie et al., 2013). However, further validation studies (Fourie et al., work in progress) have indicated that prediction by the T model was superior to that of the T/M model. In fact, the T/M model predicted unrealistically delayed onset of ascospore release in certain cases (moist seasons); up to 111 days later compared with the T-model (Appendix B). These predictions are clearly not supported by actual ascospore trap data (Appendix B), and the T/M model should either be refined or disregarded. On the basis of ongoing validation studies, ascospore trap data from other localities support the T-model predictions and this model should rather be used. The use of the T/M model will result in spurious predictions as demonstrated by its failure to accurately reflect the trapped ascospore release in Nelspruit, South Africa.

Preliminary comparison of T and release model outputs [predicted onset of ascospore release, predicted day when proportional ascospore release (PAT) will be 50% (temporal mid-point in release pattern), and PAT at day 304 (end-April and end-October for SA and EU localities, respectively), Appendix B] indicated a significant and very clear distinction between localities in South Africa where CBS does occur (Portsgate, Mahela, Letaba-Oranje, Nelspruit and Kirkwood) and those where is was proven over time that it cannot establish (Stellenbosch and Citrusdal in the Western Cape province) as well as selected EU localities (San Lucar, Murcia Beniel, Valencia Moncado, San Raphael del Rio). This distinction was clear for all output parameters evaluated and the onset of ascospore release, even in the true negative sites in South Africa, was predicted significantly sooner than the EU localities.

These results, as well as those reported by EFSA (2013), indicate that the predicted ascospore maturation and release in EU sites is significantly different from that experienced in South Africa where CBS does occur.

Pg 74 - lines 2279-2298

EFSA (2013) presents additional modelling results, with very low thresholds for the onset of ascospore dispersal, which indicates that "in May, infection could probably occur only at a limited number of locations, due to the production of limited quantities of ascospores in most parts of the EU". We advocate that EFSA use more realistic thresholds, and validate with positive and negative controls which will clearly indicate complete unsuitability of May as a realistic dispersal and infection period.

For September and October, EFSA (2013) found that “In September, the percentage of ascospore release simulated by the Fourie 2 model was found to be higher than 1% in most areas where the percentage of hours with suitable climatic conditions was greater than zero. Conditions were slightly less favourable for infection in October but, overall, the percentage of ascospore release was also higher than 1% in most areas with climatic conditions suitable for infection during this month”. This qualitative representation of quantitative data is vague and misleading as sites with only 1 suitable hour in a month, combined with only 1.1% of proportional ascospore release (by all accounts this should be regarded as unsuitable) have been considered by EFSA (2013) as suitable! This is clearly unrealistically stringent. Whereas this is somewhat acknowledged in lines 2296 and 2297 and qualified as being a "worst case scenario", EFSA (2013) concludes "that infection cannot be excluded". A later assessment of this "worst case scenario" using unrealistically stringent criteria (and a questionable D_{50} value) somehow gets transposed into justification for concluding that there is realistic risk.

We regard the evidence presented as indicative of the EU climate’s unsuitability, a fact that will be highlighted by the inclusion of positive and true negative controls. Regarding this particular period of perceived climate suitability (autumn), we also refer EFSA to the comments made previously, to the effect that in South Africa, Argentina and Australia fruit (in these more favourable climates) does not need to be protected by fungicide sprays during this period given the onset of fruit resistance.

Pg 74 - lines 2296-2298

Considering the criticisms raised above, this conclusion is not realistic and is unacceptably subjective.

Pg 74 - Lines 2299-2348

EFSA (2013) questions the 10°C base temperature selected by Fourie et al. (2013), as opposed to the 0°C base selected by Rossi et al. (2009) for *Venturia pirina*. Lovell et al. (2007) stated that the base temperature should be indicative of the temperature when growth in the system ceases and hence at which accumulation of thermal time should stop. Based on this principle, it is clear that a base of 10°C is not only realistic for *P. citricarpa* modelling, but conservative given the higher T_{min} values used in other modelling approaches.

EFSA (2013) highlights the lack of new experimental data to support the infection criteria, particularly the dry period tolerance and T_{min} requirement for infection. We point EFSA to the findings of EFSA (2008) where dry periods of 0, 3 and 14 hours were studied. These indeed made significant impacts on the number of potential infection events predicted, but when considered across the number of sites modelled, results were relatively similar; i.e. when compared with positive controls. Unfortunately, in their 2008 study EFSA also did not include negative control sites. With regard to the supposed uncertainty around the T_{min} value of 15°C, new evidence indicates that this value is realistic when considering the ascospore dispersal dynamics (>95% of spores trapped >18°C; Fourie et al., 2013).

3.3.2.7. CLIMEX model parameterized to model the potential global distribution of the citrus black spot disease by Yonow et al. (2013)

Pg 76 - lines 2365-2377

EFSA (2013) makes several fundamental errors here. A CLIMEX model that has been parameterised for a particular data set cannot be automatically applied to another dataset and different resolution without first having to re-parameterise the model. Consequently, the results obtained by EFSA (2013) are irrelevant and do not reflect in any way on the results reported by Yonow et al. (2013).

EFSA (2013) present an alternative CLIMEX scenario, whereby the spatial resolution was altered and a new climate dataset applied, but the same pathogen parameters of Yonow et al. (2013) used. CLIMEX models developed using one climate surface (spatial resolution and climate data set) are dependent on the assumed relationships between the climatic variables in that particular surface, as well as the scale of the climate surface. Running the same pathogen parameter values with a different climate database will always produce different results. The altered model in the document would need to be re-parameterised for the new climate dataset. It is therefore not surprising that running the Yonow et al. (2013) parameters on entirely new datasets at very different spatial resolution has given different results. The error is clearly demonstrated by the failure to predict climate suitability in Addo and Kirkwood (Figure 58 in Appendix D; EFSA, 2013). The JRC dataset (no citation provided in EFSA, 2013) is presumably specific to Europe, and therefore prevents the altered model from being applied to a global grid in order to compare predicted distributions to observed distributions. Without being able to validate the altered model against observed populations and considering the procedural errors in the way EFSA (2013) has applied the technique, the EFSA (2013) conclusions drawn from the altered model cannot be considered to be of any value or relevance to the study conducted by Paul et al. (2005) and Yonow et al. (2013). Likewise, we comment (Appendix C) on the similarly erroneous application of the technique in a recent study by Er et al. (2013).

Pg 79 - lines 2415-2420

It is logical that if the model is altered sufficiently, without any comparison of predicted global distributions with observed distributions, it is possible to develop a model that will predict the climate in the EU is suitable for CBS establishment. However, the flawed technique deployed by EFSA (2013) renders the output of no value.

Pg 79 - 3.3.3.1. Irrigation

EFSA (2013) presents data which shows that the outdated practice of overhead sprinkler irrigation is not widely used and is limited to parts of Sicily and Corsica. The principal forms of irrigation are drippers and micro-sprinklers. The impact of irrigation on CBS epidemiology was discussed above. It has been shown that micro-sprinkler irrigation reduces later season inoculum pressure (see earlier comments). The irrelevance of irrigation for infection in light of the 15 hour leaf wetness duration required was also commented on previously in this document. It is without justification and incorrect for EFSA (2013) to assess that the use of micro-sprinklers increases the risk of establishment.

Pg 79 - Lines 2434-2435

The manuscript cited (Dewdney et al. 2011) does not discuss irrigation, making this an invalid argument.

3.3.5. Conclusions on the probability of establishment

Pg 82 - Table 7

In general, the various inputs made above, require edits throughout the table and in its current form the table is misleading. In addition to the general edits required, we have the following specific comments:

- The suitability of conditions for initial infection arising from the introduction pathway has not been adequately considered, either at the end of the entry or beginning of the establishment sections.

- "Availability of suitable hosts - widely available". This is not accurate since the availability of suitable hosts is greatly restricted within the broader PRA area, being the 28 Member State European Union.
- "Similarity of climatic conditions - slightly similar". This is incorrect, since as shown previously in the SA CBS PRA (2000-2009), conditions in European citrus producing regions are more different from areas where CBS occurs than areas where CBS has failed to establish due to climate unsuitability, such as the Western Cape province in South Africa; this fact was also demonstrated by Vicent and García-Jiménez (2008). The Eastern Cape is not similar to European citrus growing areas, the Western Cape is, but CBS has not established in the Western Cape. EFSA (2013) has again disregarded this. To acknowledge this, EFSA would have to accept that there is no prospect of CBS establishing in Europe. <u>Nowhere in the world has CBS become established under Mediterranean climatic conditions.</u>
- There are problematic errors in the EFSA (2013) assessment of the role of splash dispersal and irrigation.
- There is neither literature nor substantial evidence to support the claim that “Small populations are likely to become established” particularly under Mediterranean conditions.
- We strongly disagree with the ranking of "Overall probability of establishment - moderately likely". This is both in terms of general assessment and because of the multiple concerns raised in the preceding steps, above. We are in agreement with the SA CBS PRA (2000-2009) and the USA CBS PRA (2010) that the <u>commercial citrus trade pathway does not constitute CBS risk for the EU, including the EU citrus producing areas</u>.

Kotzé (2009) in the SA CBS PRA (2000-2009), when discussing germination, infection and establishment, stated the following: "One cannot single out contributing factors and thereby elevate their importance. An epidemic model of CBS is an interaction of many complex factors. The message from the EU models is that some areas in the EU are conducive to CBS. The evidence shows only germination and infection models. No data in the establishment of CBS is utilised. This is misleading."; and "In plant pathology terms, the organism must establish. Establishment means that the pathogen must be able to complete the full life cycle in a sustainable way. There is no evidence that these stages of CBS establishment occur in Europe or in the Western Cape province. It is my considered opinion that the hypothetical arguments about the pycnidiospore threat from imported citrus fruit be dropped"; and "The fact that CBS does not occur under Mediterranean climatic conditions outweighs all hypothetical speculations about possible splash infections during rain and whatever is supposed to follow".

Pg 84 - 3.3.6. Uncertainties on the probability of establishment

We do not agree with the EFSA (2013) assessment of uncertainty: "Overall probability for establishment - High". CBS has a wide global distribution and has been well studied in many citrus producing counties around the world for a very long time. Citrus is one of the most widely and actively traded fresh produce commodities in the world. By EFSA’s (2013) own assessment, the imports are massive. Nonetheless, CBS has never been recorded to establish in new regions through the movement of fruit. CBS has never established in a winter rainfall, Mediterranean type climate, anywhere in the world, despite such regions having been challenged for long periods. Uncertainty about the highly unlikely probability (negligible) of establishment in the EU must be ranked as low.

Pg 85 - 3.4. Probability of spread after establishment

<u>Whereas this stage of the assessment is irrelevant because the PRA should have ended at an earlier stage, given that fruit is not a pathway and the PRA area is not suitable for establishment of CBS</u>, we nonetheless comment on a few aspects of this section. In this section the same misunderstandings regarding splash dispersal, the role of pycnidiospores and extrapolation to the EU from observations

made under Brazilian conditions, as indicated previously, are perpetuated. Likewise inadequate consideration is again given to differentiation between the greater EU, the citrus producing regions within the EU and much smaller area considered by EFSA (2013) to be at potential risk. EFSA (2013) indicates that it is difficult to contain the disease, but there are no relevant case studies of containment in areas with a Mediterranean climate comparable to the EU because CBS has never established under such conditions anywhere in the world. We do not agree with the rating of "moderately likely" for spread. The findings presented in EFSA (2013) do not support their conclusion: given the very unlikely risk of transfer to and infection of a suitable host in the fruit and even plant pathway, and the unsuitability of climate, the rating for spread should be very unlikely, and given the overwhelming body of evidence supporting this rating, the uncertainty should be low.

3.4.1. Spread by natural means
Pg 85 - line 2605
There is no evidence that ascospores travel several kilometres. According to Spósito et al. (2007), ascospores travel less than 25m from the source.

3.4.2. Spread by human assistance: fruit trade
Pg 87 - Figures 30 and 31
The majority of shipments are to non-citrus growing countries within the EU. This is shown again in Figure 37. All of the figures and data presented in this section are a reiteration of trade data presented in other forms in other portions of EFSA (2013). However, EFSA (2013) still fails to draw meaningful links on how the movement of fruit throughout the EU would lead to the establishment of CBS.

Pg 91 - 3.4.3. Spread by human assistance: trade in citrus plants for planting
CBS was introduced into Argentina through the movement of citrus propagation material (Marchionatto, 1928).

Pg 92 - 3.4.5. Conclusion on the probability of spread
Conclusions for fruit and plant material must be made separately. These are two different portions of the disease cycle. They cannot be combined into one overall conclusion.

Pg 93 - 3.5. Conclusions regarding endangered areas
Conditions for ascospore infection are irrelevant to the fruit pathway with the potential for the presence of only pycnidiospores. The mistakes made previously with regard to relevant infection periods are repeated here.

3.6 Assessment of consequences
3.6.1 Direct pest effects
Pg 93 - lines 2815-2816
This sentence is exaggerated to the point of being false. Within the distribution range of CBS a wide range of disease levels are evident. From a purely cosmetic pest perspective, CBS can easily be managed at quality levels below that which would have a market impact. South Africa used to export citrus to the EU under a cosmetic quality standard where a tolerance of 3 lesions per fruit applied (SACCE, 1990). Reference to a single lesion being an unacceptable cosmetic quality is inappropriate.

A decline of CBS incidence has been achieved in Florida. This is a manageable disease, under good practices. Even poorly managed groves can be revived when proper management is instituted.

As stated previously: in Queensland, Australia, where CBS has been present since at least 1900 (Simmonds 1966), Mayers and Owen-Turner (1987) stated that “in terms of damage to the citrus tree, black spot is not a vicious disease like Phytophthora root rot and trunk canker, but rather a weak disease primarily causing cosmetic damage to the fruit rind without affecting productivity or internal fruit quality”.

Pg 94 - Table 9

In addition to previous comments on the incorrect interpretation of the fungicide control potential, it is important to note that fungicide trials are often undertaken with smaller, hand-held application equipment which is not necessarily able to match the efficacy of the equipment used commercially. As EFSA (2013) correctly points out, “fungicide evaluation trials are optimised towards displaying treatment effects”, which is achievable with hand-held equipment.

Pg 94 - lines 2857-2858

This statement should be qualified as follows: "...can be reached in countries where climatic conditions that are highly conducive to CBS occur and controls are deficient".

Pg 99 - 3.6.1.2. Pest effects on citrus crops in the risk assessment area

The same deficiencies as previously indicated for infection periods persist in this section. In this section the main concern is attached to the prediction of ascospore release in September - October. However, in the equivalent period in South Africa and Australia, it is not even necessary to apply protective fungicide sprays in those regions most suitable for CBS because fruit has become resistant to infection (Kotzé, 1981; Miles et al. 2004). Regardless of the improbability of establishment, this results in a great over-estimate of risk.

We agree with EFSA regarding its conclusion of the relevance of pycnidiospore infection, but disagree on the predicted epidemics in spring and autumn. As discussed previously, ascospore availability (at very low levels) as well as (perceived as) conducive weather conditions (applying unrealistically stringent requirements) are synchronous at only a low frequency (once in every 4 to 5 years for the Italian locations modelled) in autumn and even less frequently in spring. The very unlikely event of transfer to a suitable host following pest entry via the fruit pathway, as well as the low frequency of synchronous ascospore and infection events, makes pest establishment and CBS epidemics highly unlikely. Pest effects will therefore be irrelevant.

Pg 99 - Middle of first paragraph

There is no documented evidence that the first infection point and subsequent establishment has ever resulted from pycnidiospores on fruit. There is no indication in the literature to suggest this idea has credibility.

Pg 100 - first, second and third paragraphs

This paragraph reflects a lack of understanding of the CBS disease. Some of the errors previously commented on are repeated here. Reference to Aguiar et al. (2012) is irrelevant since this work was not conducted under natural conditions. EFSA is advised to consult Kotzé (2009) in the South African CBS PRA (2000-2009) to gain a better understanding of the importance of fruit age for infection, latency and symptom expression.

3.6.2 Control

Pg 101 - first paragraph

It is incorrect to conclude that copper fungicides are not effective, they can be highly effective if applied correctly (Fogliata et al. 2011; Schutte et al. 2012).

Pg 101 - last paragraph
It is not necessary to apply protective sprays in the September - October fruit cycle period, as discussed earlier.

Pg 102 - first paragraph
Non-EU exporting countries with CBS have to comply with the same MRL requirements in their export markets and this does not prevent them from effective CBS control with fungicides.

3.6.4 Indirect pest effects
Pg 102 - last paragraph
There is no substance to the concern that EFSA (2013) attaches to potential disruption of their exports. None of the five EU export markets highlighted as receiving any appreciable volumes of citrus from the EU have CBS import restrictions. This is understandable, since fruit is not a pathway and none of them have a climate suitable for establishment of CBS. To provide appropriate perspective on the potential impact on exports, reference should also be made to exports to the EU's biggest export market, the USA, where CBS occurrence is limited to a very small area, but USA does not consider fruit to be pathway for CBS.

Pg 103 - 3.6.5. Conclusion of the assessment of consequences
It is inappropriate to rate the potential impact as moderate for late maturing fresh fruit, given that there is firstly no risk of establishment and secondly EFSA's assessment of fruit susceptibility periods were erroneous.

Pg 104 - 3.6.6. Uncertainties on the assessment of consequences
By taking cognisance of the inputs made to earlier sections, there should be no appreciable level of uncertainty. It is inappropriate for EFSA (2013) to refer to the Eastern Cape when it is the Western Cape that they should be considering, given climatic similarities, as discussed earlier.

Pg 104 - 3.7. Conclusions and uncertainties of the pest risk assessment
Considering that in the EFSA (2013) assessment, "entry" includes transfer of pycnidiospores to susceptible host material and infection, we do not agree with the "moderately likely" assessment of entry risk and "moderately likely" for establishment. In light of the inputs provided on the earlier sections of this document, there is no justification for EFSA's rating of these risks. Whereas EFSA (2013) attaches a high level of uncertainty to their rating of risk for establishment, given the abundance of evidence we would assign a low level of uncertainty that the risk of establishment is very unlikely (negligible). We are in agreement with both the SA CBS PRA (2000-2009) and the USA CBS PRA (2010), to the effect that commercially traded citrus fruit is not a pathway that constitutes realistic risk of establishment of CBS in the EU.

Page 104 to 105 - bullet points in the Establishment section
Bullet 1: The host is not widely available throughout the EU.
Bullet 3: Fungicides greatly reduce CBS (Figure 40)
Bullet 4: There is no evidence that minimum number of hours of wetness needed for release, infection, and sporulation can be achieved by irrigation alone.
Bullet 5: Using an outdated model for conclusions.

Pg 105 & 106 - Spread, endangered area and consequences
The same errors as highlighted previously are repeated here and corrections from the earlier sections should be carried over into these sections.

Spread section

The current accepted estimate of long distance spread by ascospores is less than 25 metres (Spósito et al. 2007).

Endangered Area section

Conclusions here are based on an outdated model and are for only a small portion of land area within the EU.

4. Identification of risk reduction options and evaluation of their effect on the level of risk and of their technical feasibility

Pg 110 - 4.1.1.7 Restrictions on end use, distribution and periods of entry

We do not agree with the EFSA (2013) assessment of risk that commercial citrus fruit export poses to the EU. The reasons for disagreement have been provided in comments on earlier parts of the assessment. Given the improbability of establishment ensuing from the import of fresh citrus fruit there is no need to apply specific CBS phytosanitary restrictions to the fruit pathway.

In the EU, the summer citrus season is predominantly supplied with fresh citrus fruit from production outside of the EU and the majority of this fruit originates from countries where CBS occurs. Some of these countries, such as South Africa, have been commercially exporting citrus fruit to Europe for over 100 years (Justin Chadwick, Citrus Growers Association of Southern Africa, personal communication). South African exports to Europe rose from 3 000 wooden cases in 1906 to 65 868 cases in 1916 and 1 077 248 cases in 1929 (Powell, 1930). The traditional export markets have been the northern Member States of the EU, with some citrus types from some exporting countries going almost exclusively to these regions (EFSA 2013). EFSA (2013) conducts the PRA for the EU consisting of 28 Member States. Commercial citrus production in the EU is limited to the southern MS in regions bordering the Mediterranean Sea. EFSA (2013) assesses risk to be limited to a relatively small sub-set of these regions and EFSA (2008) suggested that regulations should be better aligned with the geographical spread of their perceived risk. Current EU CBS phytosanitary regulations apply equally to all 28 EU Member States. These regulations are accordingly disproportionate relative to the risk (both as considered by EFSA (2013) and the Panel). Current measures therefore cannot be deemed to be appropriate.

EFSA (2013) identifies citrus waste disposal from packing houses and processing plants as a concentration of risk as some such facilities are located in close proximity to commercial citrus production. EFSA (2013) proposes strict waste disposal protocols and waste processing measures as highly effective to prevent the spread of *P. citricarpa*. However, they dismiss this apparently pragmatic solution as having low feasibility. Regulation of waste disposal from processing plants and packing houses must surely be one of the easiest activities to cover with regulation and we do not agree with the EFSA opinion that this has low feasibility.

4.1.1. RRPs to reduce entry along the citrus fruit commercial trade (pathways I, II and IV)

Pg 113 - C. Options ensuring that the area, place or site of production at the place of origin remains free from the pest

All of these options are effective and feasible for CBS. Area freedom is the easiest to maintain, as has been done by South Africa for the Western and Northern Cape provinces (Carstens et al., 2012). EFSA (2013) suggests that restricting movement of fruit into such areas should form part of the maintenance thereof, but we strongly disagree. Fruit is not a pathway for the spread of CBS and these areas have been maintained as pest free in South Africa despite the absence of restriction on the movement of fruit. Furthermore, the climate in most of these areas is unsuitable for the establishment of CBS and therefore even though movement of propagation material was not regulated until fairly recently (1980s) in South Africa, these areas have remained CBS free (Carstens et al., 2012). This is also the case in Australia where there has been long-term and frequent movement of citrus plant material from some CBS to non-CBS areas without subsequent pest establishment. Due to the low rate of spread of CBS, it is also feasible to maintain CBS pest free places of production, especially within areas of low pest prevalence.

However, despite the feasibility of maintaining CBS pest free areas and CBS pest free places of production, they are not feasible as the primary means of regulating citrus imports into the EU. Such areas constitute only a small proportion of the fruit supply from exporting countries where CBS occurs. For example, the Western Cape and Northern Cape provinces in South Africa together only produce approximately 15% of the crop in total and only <1%, 8% and 11% of the grapefruit, Valencia orange and lemon crops, respectively (Justin Chadwick, Citrus Growers Association of Southern Africa, personal communication). Furthermore, the timing of production in these areas is not well aligned with the European import market demand.

Pg 114 - 4.1.1.15. Systems approaches integrating individual RROs
We disagree with the EFSA (2013) assessment of risk. EFSA (2013) has not provided scientific evidence to support their assessment of the risk and have disregarded available scientific information. We consider the available scientific information to strongly support a no-risk assessment. Therefore we consider it inappropriate for EFSA (2013) to suggest that a systems approach should be considered to mitigate risk of CBS becoming established in the EU.

Pg 115 - Table 14
Ratings should be revised in accordance with the inputs made on each section. We disagree with the EFSA (2013) assessment of risk associated with the introduction and establishment of CBS. Therefore the regulatory measures are excessive.

Pg 129 to 135 - 4.2, 4.3, 4.4 & 4.5
Edits are required to align this text with changes required by inputs made to earlier sections of the document.

Pg 130 - last paragraph
Expansion of distribution is not "relentless": it stops at the boundaries of regions with climatic conditions suitable for establishment. CBS has never established in an area with a Mediterranean climate, so eradication from such regions has never been necessary.

Pg 132 - 4.4. Evaluation of the current phytosanitary measures to prevent the introduction and spread of *P. citricarpa.*
If EFSA (2013) is indeed of the opinion that the climate in parts of the EU is suitable for the establishment of *P. citricarpa*, and massive volumes of fruit (considered a pathway by EFSA) have entered that part of the PRA area that EFSA considers to be at risk, and there is no proper control of the passenger traffic (generally the most risky pathway for most biosecurity incursions), it is surprising that EFSA (2013) did not provide any data on pest surveys as technical justification for retention of its pest free status.

Pg 133 - second last paragraph
EFSA (2013) failed to mention that the EU recognised the Western Cape province of South Africa and certain regions of Australia as CBS free in Commission Decision 98/83/EC of 08 January 1998 (98/83/EC) (European Union, 1998). Carstens et al. (2012) recently justified pest freedom for the Northern Cape and Free State provinces.

Pg 134 - second paragraph, last sentence
The phytosanitary certificate accompanying every consignment of citrus entering the EU indicates which section of the current regulation applies to that consignment. Therefore reference by EFSA (2013) to the absence of such information reflects on the non-inclusion of such information in their own databases, despite the availability of the information.

Pg 136 - Conclusions
In addition to the need for extensive revision in accordance with the inputs made to earlier sections of the document, the following additional specific comments apply.

We do not agree with the assessment of risk of entry and establishment should the existing CBS measures be lifted in that:

- Fruit does not constitute a pathway of realistic risk for entry (inclusive of infection in accordance with the EFSA approach) and we thus consider the risk of entry as highly unlikely (negligible).
- The risk of establishment, evaluated both on its own and in combination with entry, is highly unlikely (negligible).
- In light of available scientific information supporting the view that there is no risk to the EU, it is inappropriate for EFSA (2013) to recommend retention of current (unjustified) measures and invoke uncertainty about survival under EU conditions as justification when it disregards the available scientific information and CBS expert opinion.
- Given the sequential hurdles for successful transfer, initial infection, subsequent seasonal infections and establishment under the predominantly unsuitable EU climate, we regard this as **highly unlikely (negligible)**.
- A risk of spread is highly unlikely.
- The endangered area and consequences assessments are greatly overstated due to several technical and judgmental errors as commented on in earlier sections.

We do not agree with the risk reduction options as stated in the comments made on that section and maintenance of the current regulations as seemingly suggested by EFSA (2013) is not an option since:

- EFSA (2013), by its own assessment, considers the "worst case" risk area to be restricted to a few parts of some of the EU citrus growing Member States, but the vast majority of citrus imports goes to areas outside of this perceived risk area, and therefore the current measures are unduly restrictive,
- alternative risk management measures that better align with the geographical occurrence of risk (according to the EFSA 2013 assessment) are available and seemingly would be effective and feasible,
- the waste management regulations contemplated by EFSA (2013) could feasibly be implemented by the EU,
- the need for CBS specific phytosanitary regulations is not, and has never been, technically justified as defined by IPPC, i.e. not scientifically supported.

Pg 139 - References
The following publications were cited in the EFSA (2013) text, but not included in the References list:
Agusti (2012)
Chiu (1955)
Cutuli et al. (1985)
Dupin et al. (2011)

Fitt et al. (1989)
New et al. (2002)
Perryman & Jones (2013)
Prima phacie (2011)
Timossi et al. (2003)
Truter et al. (2007)
Whiteside (1965)

Pg 149 - Appendix A. Rating descriptors
The definitions of the ratings are subjective, as are the ratings provided throughout the PRA. There is a preponderance of categories that are pre-proximity, but after the pathogen comes into proximity with the host, there are several factors that are left out of the discussion. These ignored factors are necessary to determine the establishment, reproduction, and self-sustaining probabilities associated with the disease. The rankings for uncertainty are highly subjective, making a subjective statement of risk even more subjective.

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APPENDIX A

Members of the Panel of CBS experts (Panel) that commented on EFSA (2013)

Country	Name	Professional affiliation	Relevant expertise (years experience)*
South Africa	Vaughan Hattingh	Citrus Research International (CRI) - Stellenbosch University	Coordinator of citrus research programmes of SPS relevance, with CBS research and control experience (21 years)
	Paul H Fourie	CRI - Stellenbosch University	Plant pathology researcher (14 years); Citrus pathology research coordinator, with CBS research, field control and packinghouse management experience (7 years)
	Gerhardus C Schutte	CRI - Nelspruit	Citrus plant pathologist, with specialist CBS research and field control experience (22 years)
	Hendrik F le Roux	CRI - Nelspruit	Plant pathology researcher and field extension manager, with CBS research and field experience (30 years)
	Elma Carstens	CRI - Stellenbosch University	Plant pathologist with CBS research and field experience (7 years)
	Mariette Truter	Agricultural Research Council	Plant pathologist with CBS research and field control experience (13 years)
	Christiaan R Kellerman	Professional Citrus Production Consultant	Plant pathologist with CBS research and field control experience (46 years)
	Stephanus H Swart	Syngenta	Plant pathologist with CBS research and field control experience (20 years)
	Jakobus J Serfontein	QMS AgriScience	Plant pathologist with CBS research and field control experience (13 years)
	Alice P Baxter	South African Department of Agriculture Forestry and Fisheries Directorate Plant Health (SA DAFF, DPH)	Plant pathologist with experience in international plant health, phytosanitary and WTO-SPS CBS related matters (14 years)
	Mashudu Silimela	SA DAFF, DPH	Plant health regulator with experience in international plant health matters, WTO-SPS matters (including CBS) and phytosanitary import and export regulation (9 years)
	Michael A Holtzhausen	Professional Citrus Export Regulation Consultant	Plant pathologist with experience in international plant health, phytosanitary and WTO-SPS (including CBS) related matters (25 years)
	Johannes M Kotzé	Professional Citrus Pathology Consultant	Citrus plant pathologist, with specialist CBS research and field control experience (56 years)
	Ida Paul	ExperiCo - Agri Research Solutions	Plant pathologist with CBS research and field control experience (13 years)
	Lise Korsten	University of Pretoria	Plant pathologist with CBS research, field control and packing house management experience (20 years)
USA	Tim R Gottwald	USDA, Agricultural Research Service, Ft.	Research Leader of Plant Pathology Research Unit, with specialist experience

		Pierce, FL	in Epidemiology of tree crop diseases (37 years) and research on epidemiology of citrus diseases (28 years)
	James H Graham	Citrus Research and Education Center, University of Florida	Citrus pathologist with citrus research experience in soil borne and foliar diseases (32 years) and CBS (15 years)
	Megan M Dewdney	Citrus Research and Education Center, University of Florida	Plant Pathologist with research experience in citrus foliar diseases (5 years) and CBS (4 years)
	Timothy Schubert	Florida Department of Agriculture and Consumer Services Division of Plant Industry	Administrator of the Plant Pathology Section with experience in diagnosis and management of citrus diseases (29 years)
	Michael Irey	United States Sugar Corporation/Southern Gardens Citrus	Director of Research with experience in citrus nursery tree production (disease free), management of fungal and bacterial diseases, disease detection, and epidemiology (27 years)
	Edwin L Civerolo	USDA-ARS (retired); Citrus Research Board (California)	Research Plant Pathologist with experience in epidemiology and management of bacterial and virus diseases of citrus, and other fruits and nut crops; pathogen characterization and detection and disease diagnosis (47 years)
	Timothy D Riley	USDA APHIS PPQ Florida Citrus Health Response Program	Plant pathologist with experience in research and regulatory issues related to citrus health (26 years)
	Stephen M Garnsey	USDA-ARS (retired) now - Visiting Scientist at Citrus Research and Education Center, University of Florida ,	Research Plant Pathologist with research experience related to characterization, epidemiology and management of virus and other graft-transmissible diseases of citrus (50 years)
Brazil	Geraldo José Silva Junior	Fundecitrus, Araraquara, Brazil	Plant pathologist and coordinator of fungal disease researchers at Fundecitrus, with CBS epidemiology and field management experience (4 years)
	Renato Beozzo Bassanezi	Fundecitrus, Araraquara, Brazil	Plant pathologist and coordinator of epidemiology research at Fundecitrus, with CBS research experience (13 years)
	Eduardo Feichtenberger	São Paulo Agency of Agricultural Technology (APTA), Sorocaba, Brazil Brazil	Plant pathologist and coordinator of citrus disease studies at São Paulo State Department of Agriculture, with CBS research and field management experience (20 years)
	Marcel Bellato Spósito	University of São Paulo, Piracicaba, Brazil	Plant pathologist with specialist CBS research and field control experience (15 years)
	Armando Bergamin Filho	University of São Paulo, Piracicaba, Brazil	Plant pathologist with specialist citrus disease (including CBS) epidemiology experience (10 years)
Australia	Andrew K Miles	Research and Development for Primary Industries Pty Ltd / Department of	Citrus plant pathologist with specialist CBS research and field control experience (12 years)

		Agriculture, Fisheries and Forestry Queensland	
	Pat Barkley	Retired formerly Citrus Australia Limited, New South Wales Department of Primary Industries	Citrus plant pathologist (49 years)
	Nerida J Donovan	New South Wales Department of Primary Industries	Citrus plant pathologist (14 years)
	Tania Yonow	HarvestChoice, InSTePP-University of Minnesota	Ecologist with pest modelling experience (24 years)
	David Daniels	Citrus Australia Ltd	Manager of Market Access Research and Development with experience in phytosanitary trade regulations (10 years)
Argentina	Daniel Ploper	Estación Experimental Agroindustrial Obispo Colombres (EEAOC)	Plant pathologist responsible citrus disease projects including CBS (17 years)
	Gabriela M Fogliata	Estación Experimental Agroindustrial Obispo Colombres (EEAOC)	Plant pathologist with specialist experience in citrus disease (including CBS) etiology, epidemiology and control (17 years)
	Fernando Carrera	Phytosanitary Association for the Argentinan North West Region (AFINOA)	Agricultural scientist, managing a 4000 hectare lemon plantation with CBS field control experience (17 years) and Member of the Technical Committee of AFINOA (7 years).
	Hernan Salas	Estación Experimental Agroindustrial Obispo Colombres (EEAOC)	Coordinator EEAOC Citrus Research Program including CBS (6 years)

*Total of 768 years, including 545 years of CBS experience

Appendix B

Comparison of Fourie et al. (2013) model outputs for South African and European citrus growing localities: preliminary results

Table 1. Onset of *Phyllosticta* ascospore release and subsequent proportional ascospore release (PAT) as respectively predicted by the Temperature model (onset predicted at P = 0.5) and ascospore release model as described by Fourie et al. (2013).

		Day from biofix[v]					
Category	Datasets	T-model: P = 0.5		Release model: PAT = 0.5		PAT at day 304	
Portsgate[w]	2	86.0	g	180.5	e	-	
Mahela[w]	2	91.0	fg	169.0	de	-	
Letaba-Oranje[w]	3	91.7	fg	174.0	de	-	
Nelspruit[x]	6	98.2	f	155.7	de	98.2	a
Kirkwood[x]	6	126.8	e	184.0	d	98.5	a
Citrusdal[x]	8	140.8	d	363.7	a	21.9	d
Stellenbosch[x]	6	146.4	d	328.6	b	36.8	c
SanLucar[y]	7	156.9	c	363.7	a	21.2	d
Murcia Beniel[y]	7	163.1	bc	319.3	b	44.3	c
Valencia Moncado[y]	8	163.8	b	291.0	c	59.3	b
San Raphael del Rio[y]	7	179.3	a	291.8	c	62.7	b
Fisher (LSD)		$P < 0.0001$		$P < 0.0001$		$P < 0.0001$	

[v]Biofix for southern hemisphere locations was 1 July and for northern hemisphere locations 1 January
[w]Data as used in Fourie et al. (2013)
[x]Data sourced from ARC Institute for Soil, Climate and Water, Agromet, Stellenbosch, South Africa
[y]Data sourced from http://eportal.magrama.gob.es/websiar/SeleccionParametrosMap.aspx?dst=1

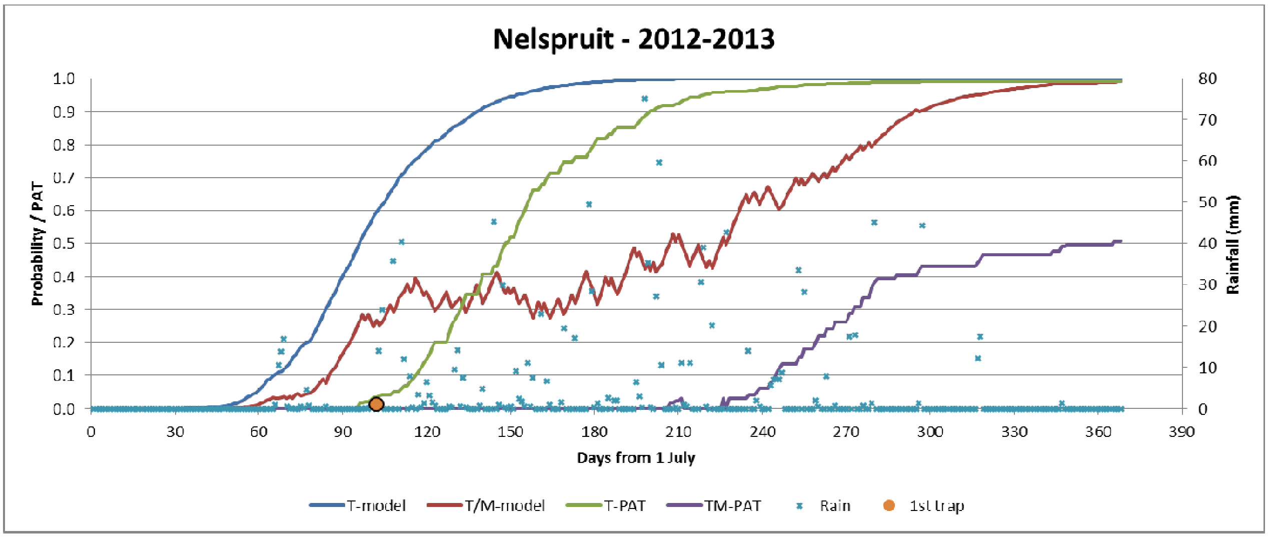
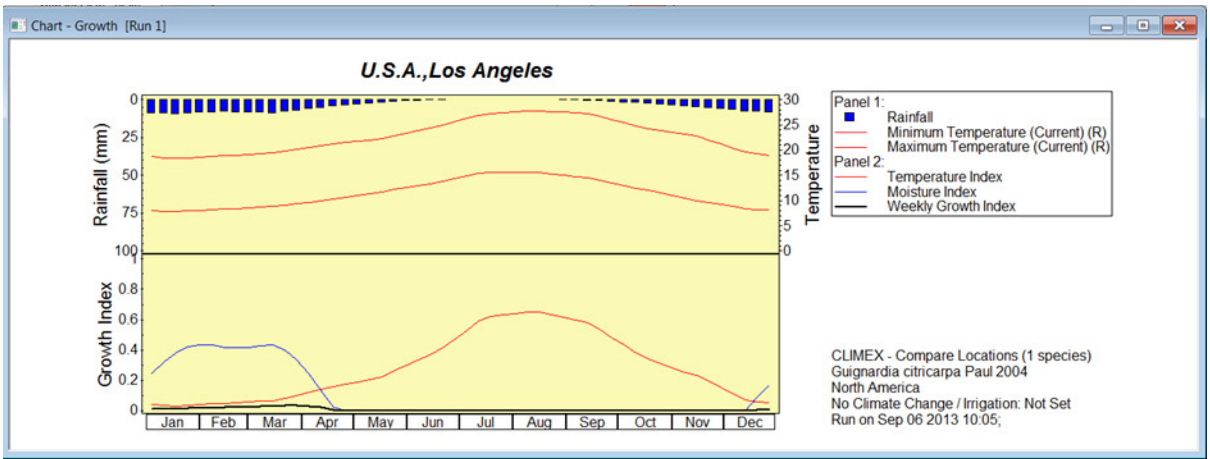


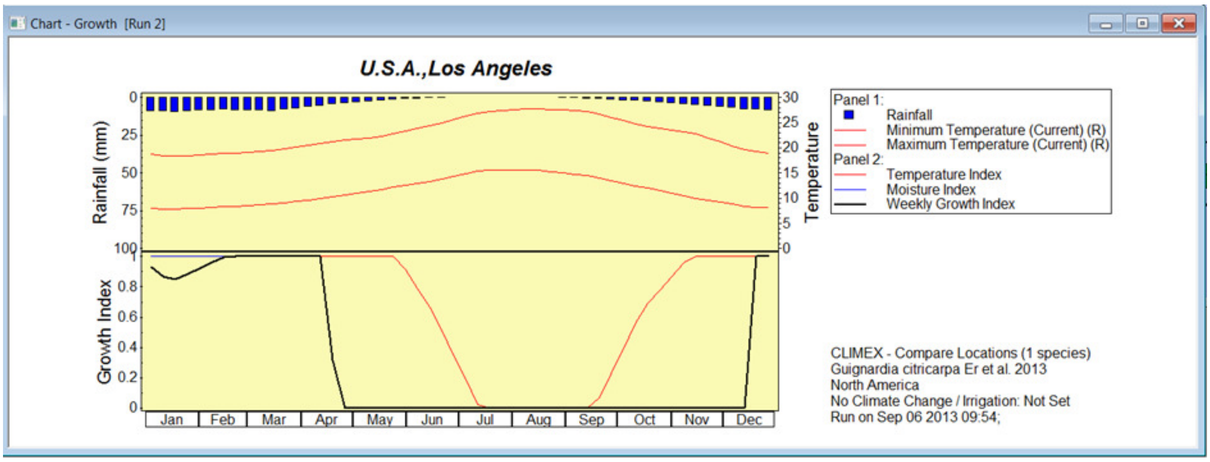
Figure 1. Graphical illustration of the Temperature model ((T model; blue lines) and Temperature/Moisture model (T/M model; red lines) predictions for the 2012-2013 season in Nelspruit. The release model predictions are plotted from the predicted onset of ascospore release at a probability of 0.5 by the T-model and T/M-model (green and purple lines, respectively). Daily rainfall totals (blue crosses) and the first day on which ascospores were trapped are indicated (orange dot) are indicated.

APPENDIX C
Commentary on Er et al. (2013)

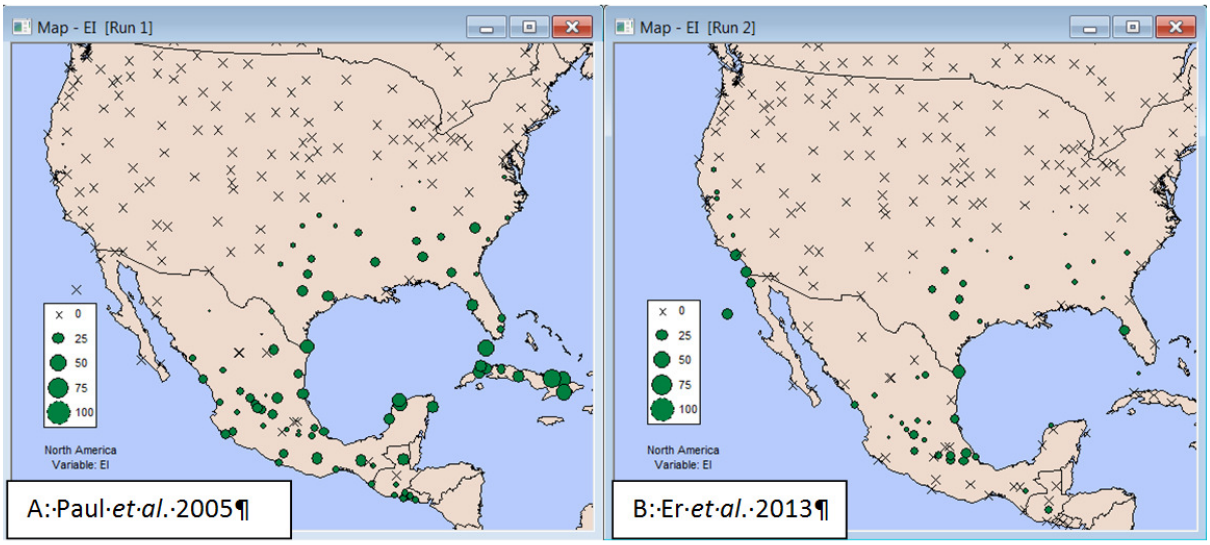
The Panel notes the recent publication by Er et al. (2013) with the following significant shortcomings:

1. Er et al. (2013) based their study on the pathogen parameters defined by Paul et al. (2005), which were superseded by those defined by Yonow et al. (2013).
2. Er et al. (2013) have attempted to use CLIMEX to model short term conditions suitable for infection. However, CLIMEX is not intended to be used in this way. CLIMEX is intended to describe the annual range of conditions suitable for establishment, establishment being distinct from infection.
3. It is incorrect to have separate models describing different aspects of a lifecycle at different times of the year using CLIMEX, as CLIMEX integrates the climatic responses of a species to the conditions that prevail over the course of a year. By having a "summer" (Paul et al. 1995) and "winter" (Er et al. 2013) model for the one species, the authors overlook that CLIMEX integrates the year-round conditions that are suitable for a species to establish in a location. Therefore, the authors are effectively trying to model different (seasonal) aspects of a lifecycle by using two separate models but running each of these on an annual basis.
4. Apart from Er et al. (2013) using a superseded set of parameters for CBS defined by Paul et al. (2005), under the Paul et al. (2005) set of parameters, Los Angeles in California is unsuitable for the establishment of CBS. This is due to a mismatch of the temperature and moisture indices: when temperature is suitable, moisture is unavailable (mid-April to mid-December), and when moisture is available, temperature is unsuitable (mid-December to mid-April: see growth charts for Los Angeles below), i.e. conditions typical of a Mediterranean climate. Using Er et al. (2013)'s adjusted parameters, Los Angeles becomes the most suitable location in CA, with a new EI value of 24. This is because the soil moisture index is now optimal from mid-December to mid-April, and the temperature index is now suitable from October to July, providing the possibility of growth over 4.5 months. In other words, the Er et al. (2013) model now erroneously makes winter in CA suitable for CBS.





5. Er et al. (2013) conclude that California is suitable for CBS. However, the authors fail to acknowledge the predictions of their model for the suitability in Florida for CBS (see Figs A and B below). In the CLIMEX met data set, Miami and West Palm Beach are the nearest locations to Immakolee, where CBS now occurs (Er et al. 2013). The EI in Miami falls from 12 (Paul et al. 2005 parameters) to 1 (Er et al. 2013 parameters), and the EI in West Palm Beach falls from 14 (Paul et al. 2005 parameters) to 0 (El et al. 2013 parameters). Thus, the "winter" model (Er et al. 2013) makes Los Angeles (EI = 24) more suitable than either Miami (EI = 12) or West Palm Beach (EI = 14) under the "summer" model (Paul et al. 2005), and it greatly decreases the suitability of both of the Florida locations. This result is clearly incorrect, and in contrast to previous models (Paul et al. 2005; Magarey et al. 2011; Yonow et al. 2013). To accept the findings of Er et al. 2013, one must consider CBS to be more likely to establish in a Mediterranean climate (such as California), than a more tropical climate (such as Florida). This is clearly nonsensical and counter to all that is known about the conditions required for CBS to establish.



A: Paul *et al.* 2005

B: Er *et al.* 2013

6. Er et al. (2013) suggest that CLIMEX is likely to underestimate the potential distribution of a pest. However, CLIMEX is rarely accused of under-predicting ranges of species, because it only considers climate as a restricting factor. In practice, other factors further decrease the potential range: host availability, dispersal, landscape topology and topography for example.

The erroneous application of the CLIMEX technique by Er et al. (2013) makes this output null and void.