As is the case globally and the rest of sub Saharan Africa, citrus fruits in East Africa are highly ranked as important crop for household consumption and as cash crop with great economic potential. Over the last decade, the amount of citrus fruits produced has been on the decline due to attack by pest and diseases. The annual production has been below demand with smallholders producing around 4-10t/ha, far below the expected 50-75t/ha. The local requirement for citrus fruits in Kenya and Tanzania is so high that 5 - 21% of it is currently supplemented by imports from South Africa and Egypt.

*Trioza erytreae* pest presents a major threat to citrus production in East Africa and beyond. It transmits devastating bacteria ‘Candidatus Liberibacter africanus’, causing citrus greening disease (CGD). Other recent reports on presence of Diaphorina *citri* and potential of *T.erytreae* transmitting *Candidatus Liberibacter asiaticus* in East Africa (unpublished report) indicates that the two vectors and greening pathogens could be quickly spreading and adapting to new environments that were not reported in the past. The study objective was to assess incidence, severity and distribution patterns of CGD in Kenya and Tanzania and to characterize potential circulating pathogens through sequencing and phylogenetic analyses of 16SrDNA and rpIJ genes.

Incidence and severity varied considerably across the different surveyed regions (P<0.05). CGD was absent in some regions, but the disease had widely spread in most of the highlands and midland regions. When compared with members of the genus Liberibacter, sequence obtained from symptomatic citrus samples linked to *CLaf. Subsp. clausena (KX770998)* and *Ca. L africanus (GU120044)*with the given accession numbers in the gene Bank. Occurrence of *CLaf. Subsp. clausena* previously reported on indigenous rutaceous plants and now on citrus plants suggests that they can act as alternative sources of *CLaf* infection to citrus orchards. These findings help understand the possible economic and environmental impact other liberibacter subspecies may have on citrus crops and provide valuable insights into understanding and controlling CGD by putting in place stringent phytosanitary measures and internal quarantine system to avoid the spread of the disease to new areas.

As is the case globally and in the rest of sub Saharan Africa (SSA), citrus fruits in East Africa are highly ranked as an important crop for household consumption and as a cash crop with great economic potential. Over the last decade, the amount of citrus fruits produced has been on the decline due to attack by pest and diseases. The annual production of sweet oranges, the most widely grown citrus has been below demand with smallholders producing around 4-10 tonnes per hectare, far below the expected 50-75 tonnes per hectare. The local requirement for citrus fruits in Kenya and Tanzania is so high that 5 - 21% of it is currently supplemented by imports from South Africa and Egypt. There is however immense potential for citrus produce from the two countries in lucrative export markets like the European Union.

*Trioza erytreae* one of the most serious citrus pest presents a major threat to citrus production in East Africa and beyond. It transmits devastating bacteria known as Candidatus Liberibacter africanus, responsible for the citrus greening or Huanglongbing disease. Furthermore, The recent reports of presence of D. citri vector and potential of T.erytreae transmitting CLas in East Africa (unpublished report) indicates that the vectors and greening pathogen could be quickly spreading and adapting to new environments that were not reported in the past, this may further negatively impact on citrus production. The study objective was to assess the incidence, severity and distribution patterns of CGD across different altitudinal gradients and to characterize potential circulating pathogens through sequencing and phylogenetic analyses of 16SrDNA and rpIJ genes.

Incidence and severity of CGD varied considerably among the different surveyed regions (P<0.05). Though CGD was absent in some regions like Makueni and Kitui, we found that the disease had widely spread in most of the highlands and midland regions. When compared with members of the genus Liberibacter, sequence obtained from symptomatic citrus samples linked to *CLaf. Subsp. clausena (KX770998)* and *Ca. L africanus (GU120044)*with the given accession numbers in the gene Bank*.* The occurrence of CLaf subspecies clausena previously reported on indigenous rutaceous plants and now on citrus plants suggests that they can act as alternative sources of CLaf infection to citrus orchards. These findings help understand the possible economic and environmental impact that other liberibacter subspecies may have on commercial citrus crops and provide valuable insights into understanding, predicting and controlling CGD by putting in place stringent phytosanitary measures and internal quarantine system to avoid the spread of the disease in to new areas.

**Keywords**: Trioza erytreae, Candidatus Liberibacter africanus (CLaf), Citrus greening disease (CGD)

As is the case globally and in the rest of sub Saharan Africa (SSA), citrus fruits in East Africa are highly ranked as an important crop for household consumption, and as a cash crop with great economic potential. However, over the last decade, the amount of citrus fruits produced in Kenya and Tanzania has been on the decline due to attack by pest and diseases. The annual production of sweet oranges, the most widely grown citrus, has been below demand, with smallholders producing around 4-10 tonnes per hectare, far below the expected 50-75 tonnes per hectare. The local requirement for citrus fruits in Kenya and Tanzania is so high that 5 - 21% of it is currently supplemented by imports from South Africa and Egypt. There is however immense potential for citrus produce from the two countries in lucrative export markets like the European Union.

*Trioza erytreae* is one of the most serious pest of citrus that transmits devastating bacteria known as Candidatus Liberibacter africanus (CLaf), responsible for the citrus greening or Huanglongbing (HLB) disease. Furthermore, there are recent accumulating evidence/reports on presence of CLas, D. citri vector and potential of T.erytreae transmitting CLas in East Africa (unpublished report). This indicates that the vector and greening pathogen could be quickly spreading and adapting to new environments that were not reported in the past, this may further negatively impact on citrus production. The study objective was to assess the incidence, severity and distribution patterns of CGD across different altitudinal gradients and to characterize potential circulating pathogens through sequencing and phylogenetic analyses of 16SrDNA and rpIJ genes.

Incidence and severity levels were statistically significant (P<0.05) across the 105 sites in 13 surveyed regions with no cases of incidence or severity reported in some regions like Makueni and Kitui. When compared with members of the genus Liberibacter, sequence obtained from symptomatic citrus samples linked to *CLaf. Subsp. clausena (KX770998)* and *Ca. L africanus (GU120044)*with the given accession numbers in the gene Bank, with majority of the samples clustering with *CLaf. Subsp. Clausena.* The occurrence of a CLaf related-liberibacter ‘CLaf subspecies clausena’ previously reported on indigenous rutaceous plants and now on citrus plants suggests that they can act as alternative sources of CLaf infection to citrus orchards. This findings help understand the possible economic and environmental impact that other liberibacter subspecies may have on commercial citrus crops and give further insights into the divergence of these liberibacters help guide on management decision and control strategies for reducing CGD transmission. It is also a clear indication for the need for continuous monitoring, and putting in place an internal quarantine system to avoid the spread of the disease in to new areas in order to improve citrus production.

**Keywords**: Trioza erytreae, Candidatus Liberibacter africanus (CLaf), Citrus greening disease (CGD).

Sequence analysis showed that samples were analogous to Ca. L. africanus subsp. Clausenae and *Ca*. L. africanus PTASPY species with 95%-99% sequence homology to known (LAF) species in NCBI GenBank./ of the surveyed regions, majority of the samples gave 99% sequence homology to Ca. L. africanus subsp. Clausenae and the rest (samples) were identical to *Ca*. L. africanus PTASPY species. The survey covered 105 sites across 13 regions,50 sites were positive for LAF. Base The observation that majority of farmers did not know the cause of citrus greening and did not use any disease control method, may explain the wide geographical distribution of the disease observed during the survey.d on 16s RNA and A2J5 sequence analysis, samples were identical to known CLAF bacteria; twenty one belonged to species LAF, the rest were in subspecies Laf Clausena. but 16s RNA gene gave ≥ 99 % sequence homology to known species in NCBI GenBank, and may have given better species identification. There was congruence in phylogenetic grouping of rhizobial isolates in both 16s RNA and recA trees. However, incongruence in species identification of three isolates was observed in sequence analyses of both genes. One isolate may represent a novel species in the genus Rhizobium. Forty three endophytic plant growth promoting bacteria were also isolated, and 84 % were strains of Bacillus megaterium and Bacillus aryabhattai. Among the seven geographic regions, Nyakach central had the highest species diversity of 2.15 on Shannon’s index.

The observation that majority of farmers did not know the cause of citrus greening and did not use any disease control method, may explain the wide geographical distribution of the disease observed during the survey.

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This poses further/the risk of D. citri associating with CLas and becoming an imminent threat for warmer citrus-growing areas of Kenya that are less favourable for CLaf and T. erytreae. with the accumulating evidence of D. Citri presence in coastal lowlands (Roberts et al., 2017; Rwomushana et al., 2017),.

For many years, Trioza erytreae (Del Guercio) (Hemiptera: Triozidae) was known to be the main vector of the African citrus greening disease caused by Candidatus Liberibacter africanus (CLaf), but the recent arrival of D. citri on the continent adds to the dynamics of infection and spread of both diseases on mainland Africa. Following the recent report of the presence of D. citri in Tanzania, an additional delimiting survey was carried out in the region, focusing on Kenya, mainland Tanzania and Zanzibar to detect the presence and ascertain the extent of spread of D. citri. to put into place phytosanitary measures to minimize the impact and spread of D. citri on mainland Africa. D. citri presents a major threat to citrus production in East Africa and beyond. In addition, further studies are needed to urgently unravel the epidemiology of the Liberibacters causing African citrus greening and HLB and the distribution and host range of D. citri in Africa.

However, with the accumulating evidence of D. Citri presence in coastal lowlands (Roberts et al., 2017; Rwomushana et al., 2017), the probability of the greening pathogen adapting to these environments in the near future is quite high and this may further negatively impact on citrus production. This indicates that the vector could be quickly spreading and adapting to new geographical areas that were not reported to have the disease in the past.

We further identified CGD in Tanga region next to the Kenyan border at the coastal region, these Findings also further suggests that the disease could be gradually spreading to the neighboring low coastal in Kenya that have similar warm humid temperatures. This is a clear indication for the need for continuous monitoring, and putting in place an internal quarantine system to avoid the spread of the disease in to new areas. More intensified sample collection and screening for spatial distribution patterns of the disease in these areas should also be conducted. The observation that majority of farmers did not know the cause of citrus greening and did not use any disease control method, may explain the wide geographical distribution of the disease observed during the survey.

HLB is most significant, especially in the highlands where it has caused yield losses between 25% - 100%, and is implicated in the collapse of the citrus industry in such/certain regions in Kenya.

/ This is despite the immense potential to export the produce to the European Union. The major constraints to citrus production are insect pests and the diseases they transmit. the citrus fruit is an important crop in East Africa/ In fact, many farmers in the region have also been unable to export their fruit to the European Union because of the increase in pests and diseases that target citrus fruits. Whenever such diseases and pests are detected, for example, a whole consignment destined for Europe can be rejected, resulting in heavy losses for farmers.

**Abstract**

**Background**: Globally, citrus greening disease (CGD) is recognized as the worst disease of citrus caused by vectored pathogens. The disease has posed threat to citrus industries with considerable loss in production, particularly in East Africa. The dynamics, epidemiology, and molecular characteristics of CGD are poorly understood. Our study aimed to assess the incidence, severity and distribution patterns of CGD since no such detailed studies have been conducted in Kenya and Tanzania. This will help guide on management decision and control strategies for reducing CGD transmission.

**Methods**: Surveys were carried out between December 2015 to November 2016 in citrus production areas of Kenya and Tanzania. A total of one hundred and five citrus backyards and orchards were assessed in thirteen regions representing low, mid and high altitudes areas. In each farm, trees were randomly selected and rated for visual symptoms of CGD then leaves and insect samples collected for analysis of Candidatus Liberibacter africanus (CLaf), the presumptive causal agent of CGD in Africa. Incidence and severity data was subjected to Analysis of Variance (ANOVA) and the means separated using Student-Newman-Keuls test. Endpoint PCR, partial sequencing and molecular phylogenetic tools were employed to confirm the identity of potential circulating pathogens.

**Results**: Incidence and severity of CGD varied considerably among the different regions (P<0.05).Though CGD was absent in some regions, we found that the disease had widely spread in most of the highlands and midland regions. Despite the preference of the pathogen for cooler climates, we further observed the presence of CGD symptoms and Trioza erytreae vector in some warm and humid environments indicating the likelihood of this pathogen and vector invading and adapting to similar environments in the lowland regions. Molecular characterization identified *‘Ca.* L africanus subsp. Clausena’ as the main causal agent of CGD in most of the citrus plants*.*

**Conclusion**: These findings provide valuable insights into understanding, predicting and controlling CGD by employing stringent and early disease detection tools to curb the spread of the disease.

**Keywords**: Incidence, Severity, Trioza erytreae, Candidatus Liberibacter africanus (CLaf), Citrus greening disease (CGD), Polymerase chain reaction (PCR)

There is inadequate scientific knowledge on the pests and diseases in Kenya and Tanzania, especially their geographical distribution and the seasons when they are most abundant, to help contain their spread. The outcome/findings will help scientists work with farmers towards better management of citrus orchards to sanitise them against pest breeding. In addition, SCIPM will conduct research to assess clean disease-free citrus planting materials and provide information on locations in Kenya and Tanzania that are less prone to diseases, where insect-proof nurseries can be established. The seedlings from insect-proof nurseries will be made available to citrus growers in the two countries.

Though the citrus fruit is an important crop in East Africa, its production has been on the decline due to pests and diseases. This is despite the immense potential to export the produce to the European Union.

Two of the most serious pests associated with the decline in production are the African citrus triozid (ACT) and the false codling moth (FCM). These diseases have resulted in losses of between 25 per cent and 100 per cent, mainly in the highland areas, and are responsible for the collapse of the citrus industry in certain regions in Kenya. The annual production of sweet oranges, the most widely grown citrus fruit, has been below demand, with smallholder farmers producing around four to 10 tonnes per hectare — far below the expected 50 to 75 tonnes per hectare. “The local demand for citrus fruits in Kenya and Tanzania is so high that five per cent to 21 per cent of it is currently supplemented by imports from South Africa and Egypt,” Two of the most serious pests associated with the decline in production are the African citrus triozid (ACT) and the false codling moth (FCM). ACT transmits a deadly bacteria known as Candidatus Liberibacter africanus (CLaf), which is responsible for the greening of citrus.

Citrus is an important fruit crop in Kenya and ranks fourth after bananas, pineapples and mangoes.[MOA,2007].About 10000 hectares are planted with sweet orange,Lemons,Tangerines and Grapefruits that produce a total of 87000 metric tons valued at Ksh 1.7 billion[MOA,2008].The highest production is in the Coast ,Eastern, and Rift valley provinces. However, production does not met the local demand [MOA, 2003] necessitating importation of large qualities of citrus fruits and products. There is therefore scope for improving the production and quality of local Citrus.

Some of the varieties grown in Kenya are; Sweet oranges (Citrus sinensis); Limes (C. aurantifolia); Grapefruits (C. paradisi); Lemons (C. limon); Mandarins (C. reticulata).

These diseases have resulted in losses of between 25 per cent and 100 per cent, mainly in the highland areas, and are responsible for the collapse of the citrus industry in certain regions in Kenya.

The scientists involved in the SCIPM project will also help develop control strategies that are less reliant on harmful pesticides. “The project will identify, develop and test the use of several non-synthetic-chemical alternatives, for instance natural enemies, natural attractants and repellents and will also promote intercropping citrus with guava,” said Dr Ekesi. In an effort to control the pests, farmers have resorted to widespread and unguided use of pesticides that are not only expensive but also often highly toxic, resulting in serious negative effects on people and the environment. In addition, the indiscriminate use of pesticides not only kills potentially useful natural enemies, but also leads to insect resistance, rendering the chemicals largely ineffective. “SCIPM is aware that these activities will only be successful if there is participation and awareness among key stakeholders. Therefore, we intend to collaborate with beneficiaries, including farmers and exporters and others along the value chain, from the earliest stage possible. Our goal is to ensure that the stakeholders have the capacity to use the strategies that will be developed,” said Dr Ekesi. Local institutions that will be involved in the project are the Kenya Plant Health Inspectorate Service; Kenya Agricultural and Livestock Research Organisation; University of Nairobi; Tanzania’s Ministry of Agriculture, Food Security and Co-operatives and Mikocheni Agricultural Research Institute and smallholder citrus farmers.

Though the citrus fruit is an important crop in East Africa, its production has been on the decline due to pests and diseases. This is despite the immense potential to export the produce to the European Union. / Pests and pathogens pose a significant threat to food production accounting globally for almost 20 % of losses to agricultural production.

Cereals are main contributors of growth of Ethiopia’s agriculture based economy. Despite high cereals biomass potential and yield gaps, achieving food security, however, remains a challenge.

As is the case globally and in the rest of sub Saharan Africa (SSA), citrus fruits are highly ranked in Kenya and Tanzania (East Africa) for household consumption, and as a cash crop with great economic potential. However, over the last decade, the amount of citrus fruits produced in the two countries has been on the decline. The annual production of sweet oranges, the most widely grown citrus, has been below demand, with smallholders producing just around 4-10 tonnes per hectare, far below the expected 50-75 tonnes per hectare. Indeed, The local requirement for citrus fruits in Kenya and Tanzania is so high that 5 - 21% of it is currently supplemented by imports from South Africa and Egypt. In addition, there is immense potential for citrus produce from the two countries in lucrative export markets. The major constraints to citrus production are insect pests and the diseases they transmit. One of the most serious pests is the African citrus triozid (ACT), In addition to other damages, ACT transmits a devastating bacteria known as Candidatus Liberibacter africanus (CLaf), which is responsible for the citrus greening or Huanglongbing (HLB) disease. HLB is most significant, especially in the highlands where it has caused yield losses between 25% - 100%, and is infact, implicated in the collapse of the citrus industry in such regions in Kenya.

In an effort to control these pest, farmers have resorted to widespread and unguided use of pesticides, which are not only expensive, but also often highly toxic with serious negative effects on people and environment. Moreover, such indiscriminate use of pesticides not only kills potentially useful natural enemies, but also leads to insect resistance, rendering the chemicals largely ineffective. Some of the pesticides used are listed as persistent organic pollutants (POPs), leading to rejection of produce in export markets.

“Based on these issues, thorough and innovative strategic research is required to control ACT and the citrus greening disease, as well as the FCM problems in Kenya and Tanzania. SCIPM intends to develop an integrated pest management programme, also known as IPM, which encompasses various control techniques in Kenya and Tanzania, and beyond,” says Dr. Ekesi.

* In general, there is little, if any scientific knowledge on ACT and the citrus greening disease, and FCM in Kenya and Tanzania. For this reason, a key goal of SCIPM is to improve knowledge about the factors that influence the populations dynamics of the two pests, their geographical distribution and the seasons when they are most abundant, to determine disease spread and assess losses.
* Another objective of SCIPM is to develop control strategies that are less reliant on harmful pesticides. Therefore, the partners will identify, develop and test the use of several non-synthetic-chemical alternatives (alone or in rotation with ‘softer’ pesticides), for instance natural enemies, natural attractants and repellents, ‘attract-and-kill’ options, bio-rationals (e.g. petroleum oils, botanicals, biopesticide), and intercropping citrus with guava. The partners will also work with farmers towards better management of citrus orchards to sanitize them against pest breeding.
* Further, SCIPM will conduct research to assess clean disease-free citrus planting materials and provide information on locations in Kenya and Tanzania that are less prone to HLB infections, where insect-proof nurseries can be established. The project will collaborate with private sector partners to commercialize and promote, making them available to citrus growers across the two countries.
* “SCIPM is highly aware that these activities will only be successful if there is participation and awareness among key stakeholders. Therefore, we intend to collaborate with beneficiaries, including farmers and exporters and others along the value chain, from the earliest stage possible. Our goal is to ensure that the stakeholders will have the capacity to use the strategies that will be developed,” says Dr. Ekesi.
* He notes that, SCIPM will pay particular attention to creating a level playing ground for women, who make up 50-91% of horticultural labour supply, and who are most often disadvantaged in the sector.
* “The overall goal of SCIPM is to increase food self-sufficiency, nutritional security, and income of farming communities. Therefore, we will work with social scientists to ensure that these aspects are assessed throughout the project”, concludes Dr Ekesi.
* Kenya and Tanzania will benefit from a 1.2 million euro ($1.34 million) project to tackle insect pests and diseases constraining the production of citrus fruits in the two countries.
* The project, dubbed “Strengthening citrus production systems through the introduction of IPM measures for pests and diseases in Kenya and Tanzania” (SCIPM), intends to develop an integrated pest management programme that encompasses various control techniques.
* The project is funded by the German Ministry of Economic Development and Co-operation (BMZ) and will be implemented by the International Centre for Insect Physiology and Ecology (ICIPE), the Centre for Development Research (ZEF) at the University of Bonn, Germany; Texas A&M University, Kingsville, USA and Citrus Research International, South Africa.
* Though the citrus fruit is an important crop in East Africa, its production has been on the decline due to pests and diseases. This is despite the immense potential to export the produce to the European Union.
* According to Sunday Ekesi, a principal scientist and head of plant health division at ICIPE, the annual production of sweet oranges, the most widely grown citrus fruit, has been below demand, with smallholder farmers producing around four to 10 tonnes per hectare — far below the expected 50 to 75 tonnes per hectare.
* “The local demand for citrus fruits in Kenya and Tanzania is so high that five per cent to 21 per cent of it is currently supplemented by imports from South Africa and Egypt,” said Dr Ekesi.
* Two of the most serious pests associated with the decline in production are the African citrus triozid (ACT) and the false codling moth (FCM). ACT transmits a deadly bacteria known as Candidatus Liberibacter africanus (CLaf), which is responsible for the greening of citrus, while FCM damages the fruit by boring into it, causing it to drop prematurely.
* “The poor quality fruits that remain on the trees are inedible and prone to bacterial and fungal infections,” said Dr Ekesi.
* These diseases have resulted in losses of between 25 per cent and 100 per cent, mainly in the highland areas, and are responsible for the collapse of the citrus industry in certain regions in Kenya.
* In fact, many farmers in the region have also been unable to export their fruit to the European Union because of the increase in pests and diseases that target citrus fruits. Whenever such diseases and pests are detected, for example, a whole consignment destined for Europe can be rejected, resulting in heavy losses for farmers.
* Dr Ekesi expressed concern about the inadequate scientific knowledge on the pests and diseases in Kenya and Tanzania, adding that the key goal of the SCIPM project is to improve awareness about them, especially their geographical distribution and the seasons when they are most abundant, to help contain their spread.
* The scientists involved in the SCIPM project will also help develop control strategies that are less reliant on harmful pesticides. “The project will identify, develop and test the use of several non-synthetic-chemical alternatives, for instance natural enemies, natural attractants and repellents and will also promote intercropping citrus with guava,” said Dr Ekesi.
* The scientists will work with farmers towards better management of citrus orchards to sanitise them against pest breeding. In addition, SCIPM will conduct research to assess clean disease-free citrus planting materials and provide information on locations in Kenya and Tanzania that are less prone to diseases, where insect-proof nurseries can be established. The seedlings from insect-proof nurseries will be made available to citrus growers in the two countries.
* In an effort to control the pests, farmers have resorted to widespread and unguided use of pesticides that are not only expensive but also often highly toxic, resulting in serious negative effects on people and the environment.  
  In addition, the indiscriminate use of pesticides not only kills potentially useful natural enemies, but also leads to insect resistance, rendering the chemicals largely ineffective.   
  “SCIPM is aware that these activities will only be successful if there is participation and awareness among key stakeholders. Therefore, we intend to collaborate with beneficiaries, including farmers and exporters and others along the value chain, from the earliest stage possible. Our goal is to ensure that the stakeholders have the capacity to use the strategies that will be developed,” said Dr Ekesi.
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* African citrus triozid (ACT): *Trioza erytreae* is one of the most serious pest of citrus that transmits devastating bacteria known as Candidatus Liberibacter africanus (CLaf), responsible for the citrus greening or Huanglongbing (HLB) disease. Furthermore, there are recent accumulating (evidence on) reports on presence of CLas, D. citri vector and potential of T.erytreae transmitting CLas in East Africa (unpublished report). This indicates that the vector and greening pathogen could be quickly spreading and adapting to new (geographical areas) environments that were not reported in the past.
* Surveys were carried out on citrus production areas and backyards and orchards in low, mid and high altitudes areas. Trees in each orchard were randomly selected and rated for visual symptoms of CGD then leaves and insect samples collected for analysis of Candidatus Liberibacter africanus (CLaf), the presumptive causal agent of CGD in Africa. Incidence and severity data was subjected to Analysis of Variance (ANOVA) and the means separated using Student-Newman-Keuls test. Endpoint PCR, partial sequencing and molecular phylogenetic tools were employed to confirm the identity of potential circulating pathogens.
* Molecular analysis showed that DNA extracts from collected samples, were infected with either *Ca*. L. africanus PTASPY or Ca. L. africanus subsp. Clausenae. However, Ca. L. africanus subsp. Clausenae positive samples were detected throughout most of the surveyed regions. The occurrence of a CLaf related-liberibacter ‘CLaf subspecies clausena’ previously reported on indigenous rutaceous plants and now on citrus plants suggests that they can act as alternative sources of CLaf infection to citrus orchards. This findings help understand the possible economic and environmental impact that other liberibacter subspecies may have on commercial citrus crops and give further insights into the divergence of these liberibacters help guide on management decision and control strategies for reducing CGD transmission. It is also a clear indication for the need for continuous monitoring, and putting in place an internal quarantine system to avoid the spread of the disease in to new areas in order to improve citrus production.