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RESEARCH ARTICLE

PHYTOSANITARY SURVEY IN CITRUS PRODUCTION UNITS IN THE MUNICIPALITIES OF APORÁ, INHAMBUPE, AND SÁTIRO DIAS

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Abstract

Citrus cultivation is an agricultural activity of great socioeconomic relevance in the state of Bahia, particularly within the Litoral Norte and Agreste Baiano (LNAB) territories. This study aimed to conduct a phytosanitary survey across 137 Citrus Production Units (PUs) located in the municipalities of Aporá, Inhambupe, and Sátiro Dias to identify and characterize the main pests present in the region. The adopted methodology relied on technical protocols for phytosanitary monitoring featuring systematic field inspections of plants. The results demonstrate d that the predominant crops are sweet orange, Tahiti acid lime, and mandarin, with significant participation from family farming. Non-quarantine pests were identified such as snow scale, citrus leafminer, citrus blackfly, citrus orthezia, aphid, anthracnose, greasy spot,and gum mosis showing frequency variations among municipalities. Regulated quarantine pests, such as citrus canker and Greening (HLB), were not detected, underscoring the importance of continuous monitoring to maintain Bahia's phytosanitary status. The findings contribute to planning integrated pest management strategies and strengthening regional citrus farming.

Introduction: -

Contemporary commercial fruit production requires a high level of professionalization, as access to international markets depends on compliance with a complex regulatory framework established by importing countries, which is often expressed through non-tariff barriers. According to the FAO (2024), approximately 933 million tons of fruit were produced worldwide in 2022. China is the world's largest fruit producer, with production concentrated in crops such as apples, citrus, melons, pears, and watermelons, while India ranks second, with banana, mango, orange, and papaya as its main fruit crops. In Brazil, citrus production plays a strategic role, not only because of its contribution to foreign exchange earnings but also due to the high concentration of orange production. The sector is geographically concentrated, with the state of São Paulo accounting for approximately 63% of the cultivated area and 77% of the national orange production (BNB, 2024). In the state of Bahia, citrus production is diversified, with the predominance of the 'Pera' orange, as well as the cultivation of 'Tahiti' acid lime and 'Ponkan' mandarin. The citrus sector in Bahia is characterized by the coexistence of small scale producers with lower technological levels

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and large, highly mechanized commercial operations focused on export markets. Production is mainly concentrated in the Northern Coast and the Recôncavo regions, with Juazeiro standing out as an important production center for Tahiti acid lime, making Bahia the largest citrus-producing state in the North and Northeast regions of Brazil (IBGE, 2023). Citrus production in Bahia is estimated to occupy approximately 70,000 hectares, including orange, mandarin, Persian lime, and Tahiti acid lime orchards destined for both fresh consumption and the concentrated juice industry. Approximately 70% of this production is carried out by family farmers, although the largest cultivated areas belong to medium- and large-scale producers (GIRARDI et al., 2015; ADAB, 2024).

Brazilian citrus production faces significant challenges related to the occurrence of pests, which have intensified the use of pesticides, increasing production costs and reducing productivity. According to the Brazilian Ministry of Agriculture and Livestock (MAPA, 2018), in accordance with the International Plant Protection Convention (IPPC), the term pest encompasses not only insects and animals but also plant pathogens capable of causing damage to plants and plant products. Therefore, plant diseases are also classified as pests because of the economic losses they cause. Official classification distinguishes Quarantine Pests, which are absent or restricted to specific areas under official control but pose a potential economic threat, from Regulated Non Quarantine Pests, which are already established within the national territory but require special attention in plant propagation materials (MAPA, 2006). In this context, the present study aims not only to conduct a phytosanitary survey in citrus production units located in the municipalities of Aporá, Inhambupe, and Sátiro Dias, but also to contribute to the development of effective strategies for the prevention, control, and, where feasible, eradication of pests that affect or threaten regional citrus production.

Materials and Methods: -

The survey was conducted across 137 Production Units (PUs) located in the municipalities of Aporá, Inhambupe, and Sátiro Dias, which belong to Identity Territory 18 – Litoral Norte and Agreste Baiano (Figure 1). Field activities were carried out between May and August 2025, a period selected as it coincides with the peak of production intensity and pest occurrence in the orchards, thereby allowing for a more representative characterization of the regional phytosanitary status.

Figure 1: Map of Identity Territory 18 – Litoral Norte e Agreste Baiano, showing the municipalities covered by the study. Source: BAHIA. State Secretariat of Culture of Bahia, adapted.

Crop characteristics of citrus orchards in the Litoral Norte and Agreste Baiano:-

To characterize citrus production in the Litoral Norte and Agreste Baiano (LNAB) region, secondary data were obtained from the Municipal Agricultural Production Permanent Crops database, made available by the Brazilian Institute of Geography and Statistics (IBGE, 2024). The choice of this database is justified by its scope, reliability, and widespread use in regional agricultural and economic studies, enabling consistent and comparable analyses across different municipalities. Based on the collected information, three fundamental variables were analyzed: harvested area, production quantity, and average yield (t/ha) for the main citrus species cultivated in the region, with emphasis on sweet orange, Tahiti acid lime, and mandarin. Data were organized by municipality, allowing for the identification of production patterns, performance differences, and the synthesis of relevant observations to understand citrus dynamics in the LNAB.

Phytosanitary survey:-

The phytosanitary survey was conducted based on methodologies proposed in reference manuals from Embrapa and partner institutions, including Identificação e Monitoramento de Pragas e Doenças Regulamentadas, Quarentenárias e Seus Inimigos Naturais na Cultura dos Citros no Amazonas (Nascimento et al., 2006; Santos Filho et al., 2015) and Practical Manual for Monitoring and Pest Control in Tahiti Acid Lime (Embrapa, 2009). The methodologies were adapted to the edaphoclimatic conditions of the Litoral Norte and Agreste Baiano, ensuring standardization of observations and reliability of results. Evaluations were conducted across Citrus Production Units (PUs), with two visits per property scheduled between 7:00 AM–11:00 AM and 3:00 PM–5:00 PM. These time intervals are recommended by Embrapa for field inspections due to higher insect activity and improved visibility of plant structures. The inspection route followed a zig-zag pattern, entering and exiting on opposite sides of the plot and returning in the reverse direction to ensure representative sampling (Figure 2). In each plot, 20 plants were randomly selected in accordance with technical recommendations, allowing for systematic observation of pest symptoms and signs (Figure 3 e 4). Data were recorded in a pest monitoring datasheet (Figure 5).

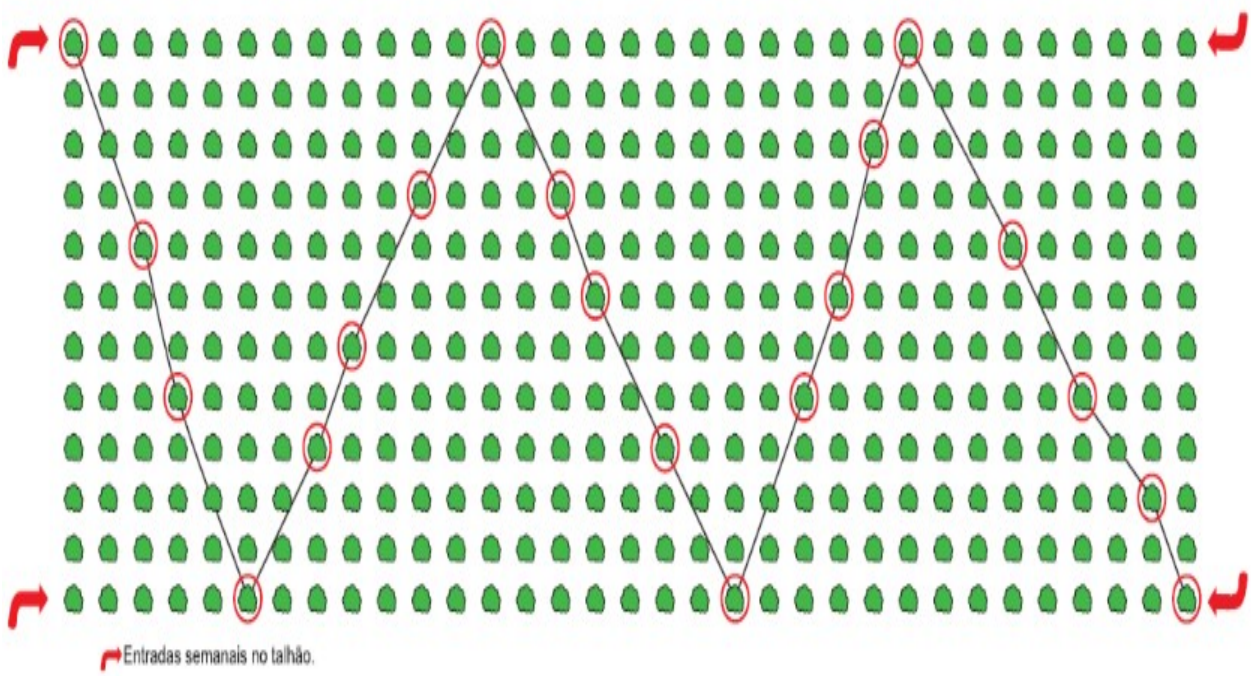

Figure 2: Pest monitoring procedures and route layout. Source: NASCIMENTO et al., 2006 and SANTOS FILHO et al., 2015

Figure 3 e 4: Pest monitoring. Source: JESUS, 2025

PHYTOSANITARY DIAGNOSTIC SHEET

1. Identification of the Production Unit surveyed

Municipality:	**Community:**	
Crop:	**Date:**	

2. Phytosanitary monitoring – pests identified

			NUMBER OF PLANTS INSPECTED (marking in zigzag along the row)																		
2.1 MITES	**INFESTATION LEVEL**	**NUMBER OF FRUITS**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
FALSE SPIDER MITE	2 ác/cm²	FRUIT 1																				
		FRUIT 2																				
		FRUIT 3																				
WHITE MITE	2 ác/cm²	FRUIT 1																				
		FRUIT 2																				
		FRUIT 3																				
LEPROSE MITE	2 ác/cm²	FRUIT 1																				
		FRUIT 2																				
		FRUIT 3																				
2.2 BACTERIA			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CVC – "bacterium"																						
Citrus canker																						
HLB or Greening																						
2.3 COCHONILIAS			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Scale insect																						
Parlatoria scale																						
Orthezia scale																						
2.4 PHYSIOLOGICAL DISORDERS			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Stylar-end breakdown																						
2.5 FUNGI			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Anthracnose (gummosis)																						
Citrus greasy spot																						
Sooty mold																						
Black spot																						
2.6 INSECTS AND PROMOTERS OF MECHANICAL DAMAGE			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Citrus blackfly																						
Leaf miner																						
Aphids																						
Termites																						
Stem borer																						
2.7 VECTORS			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Cigarrinhas (psyllids)																						
Thrips																						
Phorid fly (*Drosophila spp.*)																						
2.8 VIRUSES AND VIROIDS			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Citrus leprosis virus																						
Exocortis viroid																						

Figure 5: Pest monitoring datasheet. Source: JESUS, 2025.

During the inspections, auxiliary equipment was used to ensure accuracy and reliability of the observations, including a hand lens for the identification of mites and scale insects, entomological forceps for insect collection, perforated plastic containers for holding live specimens, paper bags and labels for plant sample identification, a pest monitoring form (Figure 5), and a digital camera (smartphone) for photographic documentation of symptoms and field observations. For mites and insect pests, fruits, leaves, and branches were inspected for characteristic symptoms such as silvering, rusting, leaf mines, and the presence of scale insects or fruit flies. For bacterial and viral diseases, including Citrus Canker (Xanthomonas citri subsp. citri) and Huanglongbing (HLB) (Candidatus Liberibacter spp.), typical symptoms were assessed on leaves and fruits, including corky lesions, blotchy mottling, and shoots bearing yellowed leaves. Visual inspections followed sampling protocols established by ADAB and Embrapa. Fungal diseases were monitored through the inspection of flowers, fruits, and trunks, with particular attention to post-bloom fruit drop (Colletotrichum spp.), gummosis (Phytophthora spp.), and citrus scab (Elsinoë spp.). Evaluated symptoms included necrotic lesions, flower abortion, gum exudation, and raised lesions on fruits.

Results and Discussion:-

Crop characteristics of citrus orchards in the Litoral Norte and Agreste Baiano:-

Data published by the Brazilian Institute of Geography and Statistics (IBGE, 2024) indicate that, in the Northern Coast and Agreste region of Bahia (LNAB), citrus production continues to play a prominent role among regional agricultural activities, establishing itself as one of the main sources of agricultural income (Table 1). Orange remains the predominant citrus crop, followed by lemon, including the Tahiti acid lime variety, and mandarin (Figure 6).

Table 1: Key citrus production results in Identity Territory 18 – LNAB

Municipalities	Harvested area (ha)			Quantity produced (ton)			Average yield (Kg.ha^{-1})		
	Orange	Tahiti acid lime	Tangerine	Orange	Tahiti acid lime	Tangerine	Orange	Tahiti acid lime	Tangerine
Bahia	**48.924**	**6.884**	**1.521**	**14.765**	**4.404**	**1.224**	**604.534**	**87.314**	**15.734**
Acajutiba	1.111	3	-	10.199	34	-	9.180	11.333	-
Alagoinhas	918	10	10	21.120	153	250	23.007	15.300	25.000
Aporá	475	-	-	5.140	-	-	10.821	-	-
Araçás	69	-	-	947	-	-	13.725	-	-
Aramari	69	-	-	1.257	-	-	18.217	-	-
Cardeal da Silva	35	-	-	520	-	-	14.857	-	-
Catu	44	21	-	323	216	-	7.341	10.286	-
Conde	371	-	-	4.325	-	-	11.658	-	-
Crisópolis	190	-	-	1.347	-	-	7.089	-	-
Entre Rios	714	20	-	10.924	218	-	15.300	10.900	-
Esplanada	4.120	20	-	45.629	111	-	11.075	5.550	-
Inhambupe	9.000	433	45	114.048	7616	441	12.672	17.589	9.800
Itanagra	-	-	-	-	-	-	-	-	-
Itapicuru	3.920	-	-	41.282	-	-	10.531	-	-
Jandaíra	1.224	-	-	11.236	-	-	9.180	-	-
Olindina	21	-	-	23	-	-	1.095	-	-
Ouriçangas	10	-	-	52	-	-	5.200	-	-

Pedrão	5	-	-	47	-	-	9.400	-	-
Rio Real	16.830	194	51	241.443	2517	607	14.346	12.974	11.902
Sátiro Dias	143	561	4	2.042	16421	41	14.280	29.271	10.250

Source: IBGE – Agricultural Production in Bahia, 2024. Accessed on October 22, 2025; adapted

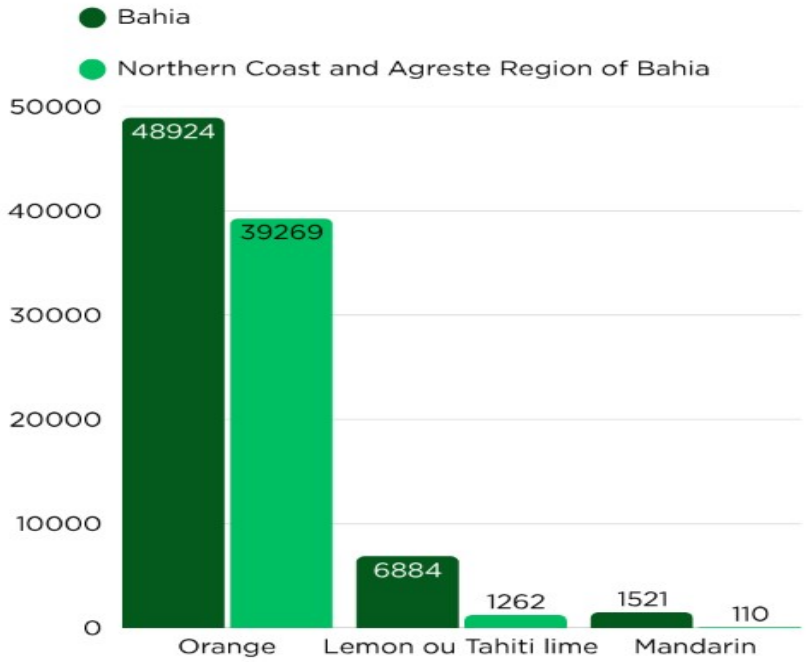

Figure 6. Production of the main citrus crops (tons) in the State of Bahia and the Northern Coast and Agreste Region of Bahia (LNAB). Source: Brazilian Institute of Geography and Statistics (IBGE) – Agricultural Production in Bahia, 2024. Accessed on October 22, 2025. Adapted.

This predominance reflects both the adaptation of citrus species to the local edaphoclimatic conditions and the well-established production tradition developed over the past decades. Furthermore, the distribution of cultivated areas demonstrates the diversified nature of citrus production in the region, combining family-based farming systems with medium-sized commercial operations supplying local and regional markets. The analysis of data on the areas allocated to orange, lemon, and mandarin cultivation reveals important aspects of citrus production in the Northern Coast and Agreste region of Bahia (LNAB). Although orange is the species with the largest cultivated area and production in the state (39,269 ha), only about 24.5% of this area is located within the municipalities of the study region, placing it third in the local production hierarchy. This pattern highlights not only the diversity of the regional citrus production system but also the influence of market forces and production organization on crop distribution. The observed production hierarchy reflects the preferences of regional, national, and international markets, which have driven the expansion of certain citrus species, particularly Tahiti acid lime, due to increasing export opportunities and growing domestic demand. In addition, the high adaptability of citrus species to the prevailing edaphoclimatic conditions characterized by well-drained soils and a humid tropical climate further strengthens the region's competitiveness in citrus production.

The importance of citrus cultivation in the region is directly associated with the combination of favorable agronomic conditions and key socioeconomic factors. Among the agronomic factors, natural soil fertility, water availability, and climatic suitability for the development of the main citrus varieties are particularly noteworthy. From a socioeconomic perspective, regional citrus production is driven by market demand, a long-standing agricultural tradition, and the predominance of family farming systems, which help sustain the activity even under fluctuating

market prices. This analysis indicates that, although orange remains the dominant citrus crop in terms of total cultivated area, its relative importance within the LNAB is lower than that of lemon and mandarin, suggesting an ongoing regional restructuring of citrus production (Figure 8). This trend may be associated both with the search for specialized market niches and with the greater economic resilience of alternative citrus species, which can satisfy different consumer demands while reducing the risks associated with production concentration.

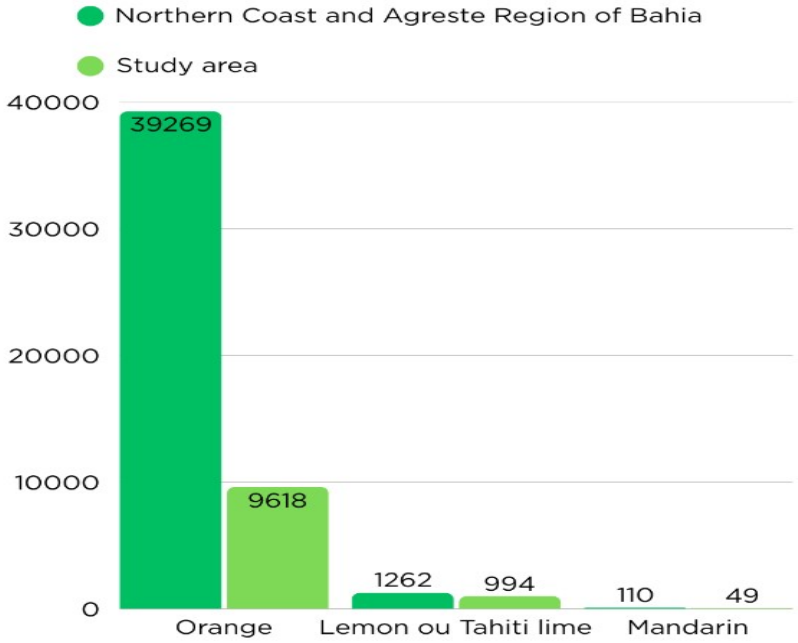

Figure 8. Production of the main citrus crops (tons) in the Northern Coast and Agreste Region of Bahia (LNAB) and the study area. Source: Brazilian Institute of Geography and Statistics (IBGE) – Agricultural Production in Bahia, 2024. Accessed on October 22, 2025. Adapted.

Phytosanitary survey:-

The phytosanitary survey was conducted in 137 citrus Production Units distributed across the three municipalities within the study area (Figure 9).

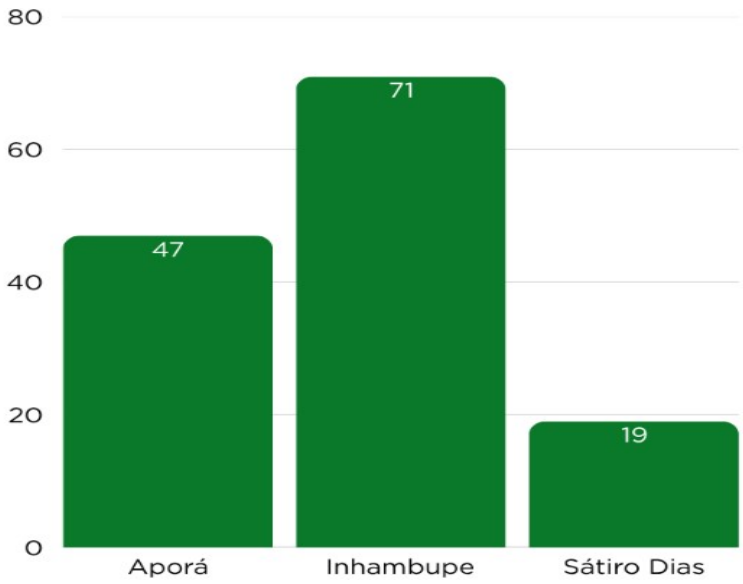

Figure 9. Distribution of the citrus Production Units surveyed in the Northern Coast and Agreste Region of Bahia (LNAB) and the study area. Source: JESUS 2025.

The phytosanitary survey identified the occurrence of the following pests and diseases in the evaluated citrus orchards: citrus snow scale (Unaspis citri), citrus leafminer (Phyllocnistis citrella), citrus blackfly (Aleurocanthus woglumi), woolly whitefly (Aleurothrixus floccosus), orthezia scale (Orthezia praelonga), brown citrus aphid (Toxoptera citricidus), anthracnose or post-bloom fruit drop (Colletotrichum spp.), greasy spot (Mycosphaerella citri), and gummosis (Phytophthora spp.). All of these pests and diseases were recorded in the three municipalities included in the study area, although with different levels of occurrence and infestation or disease incidence (Figures 10, 11, and 12). The presence of these organisms indicates that, despite the absence of quarantine pests, the orchards are exposed to the occurrence of several Regulated Non-Quarantine Pests (RNQPs), which may impair plant development, reduce productivity, and compromise fruit quality if not properly managed.

In the present study, no characteristic symptoms of Citrus Variegated Chlorosis (CVC) were observed in the evaluated orchards, indicating the absence of visual evidence of the disease during the phytosanitary survey period. This finding is particularly relevant because CVC, caused by the bacterium Xylella fastidiosa, is considered one of the most important RNQPs affecting Brazilian citrus production due to the significant economic losses associated with reduced yield, fruit quality depreciation, and shortened orchard lifespan. The introduction of this bacterium into commercial orchards highlights the importance of implementing preventive measures based on the use of certified nursery trees, strict inspection of plant material movement, monitoring of insect vectors, and the removal of plants with high bacterial loads. The production of healthy nursery stock in protected nurseries, combined with phytosanitary testing, represents one of the main strategies for reducing the spread of CVC and other propagation material-associated diseases, thereby contributing to the management of RNQPs and the protection of the citrus production chain (FUNDECITRUS, 2022; MAPA, 2022). In this context, the results reinforce the importance of continuous phytosanitary monitoring as a key tool for the early detection and management of these pests, enabling the implementation of integrated control measures and minimizing their economic impact on citrus production. Furthermore, the widespread occurrence of these RNQPs in the surveyed municipalities highlights the need for the use of certified nursery trees, the adoption of appropriate orchard management practices, and continuous technical support to minimize the spread of these organisms and ensure the sustainability of citrus production.

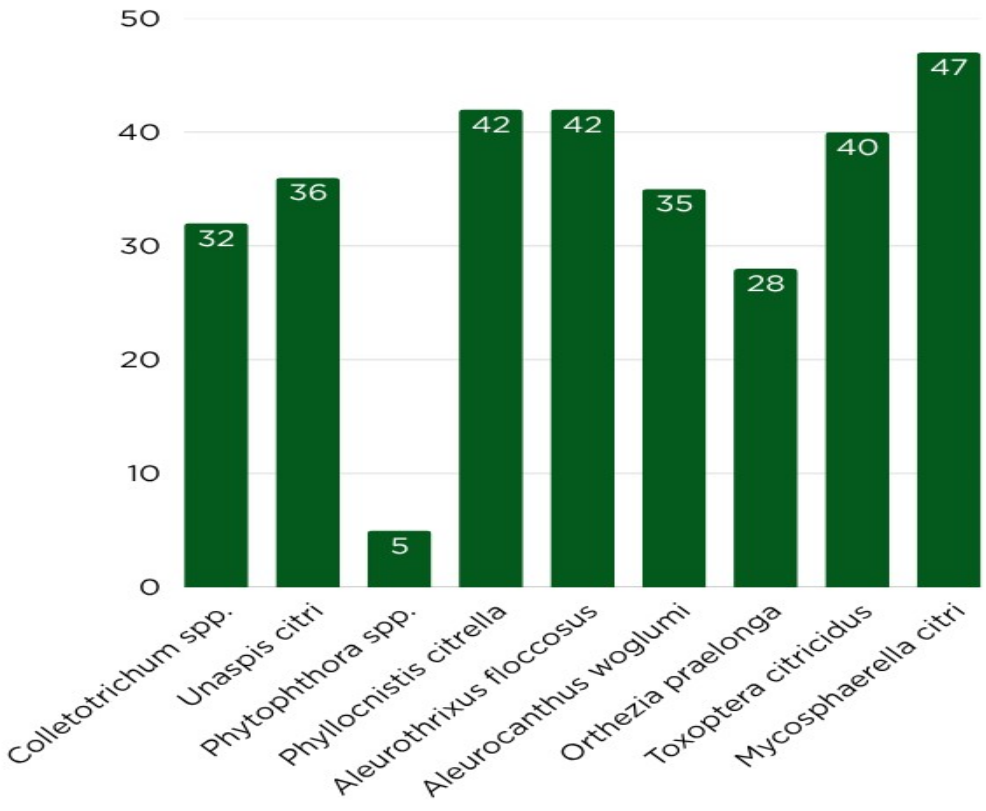

Figure 10: Main pests surveyed in Aporá. Source: JESUS, 2025.

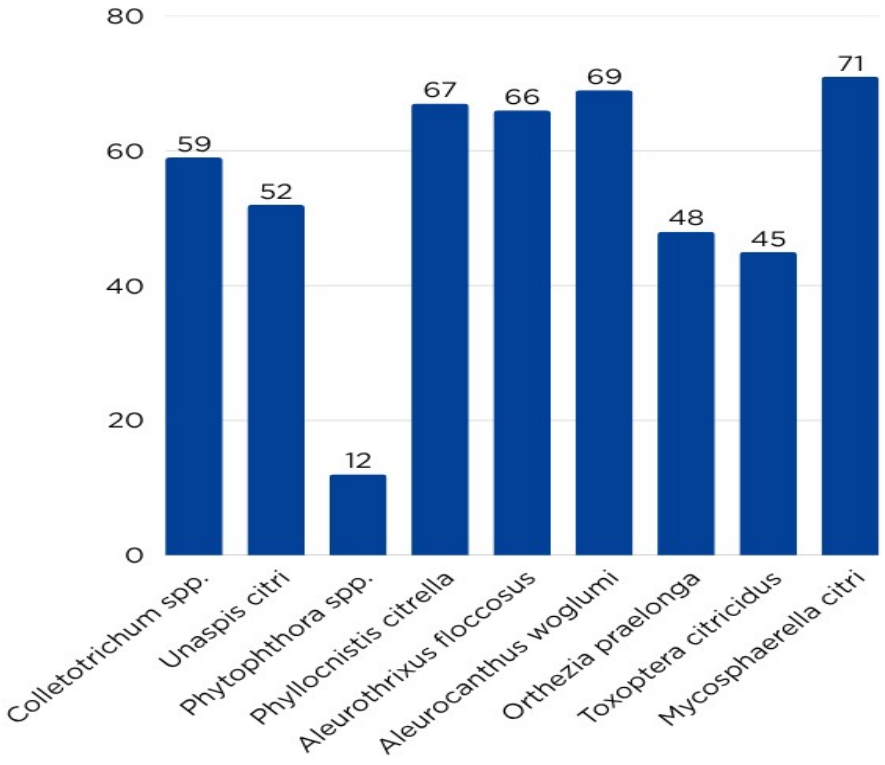

Figure 11: Main pests surveyed in Inhambupe. Source: JESUS, 2025.

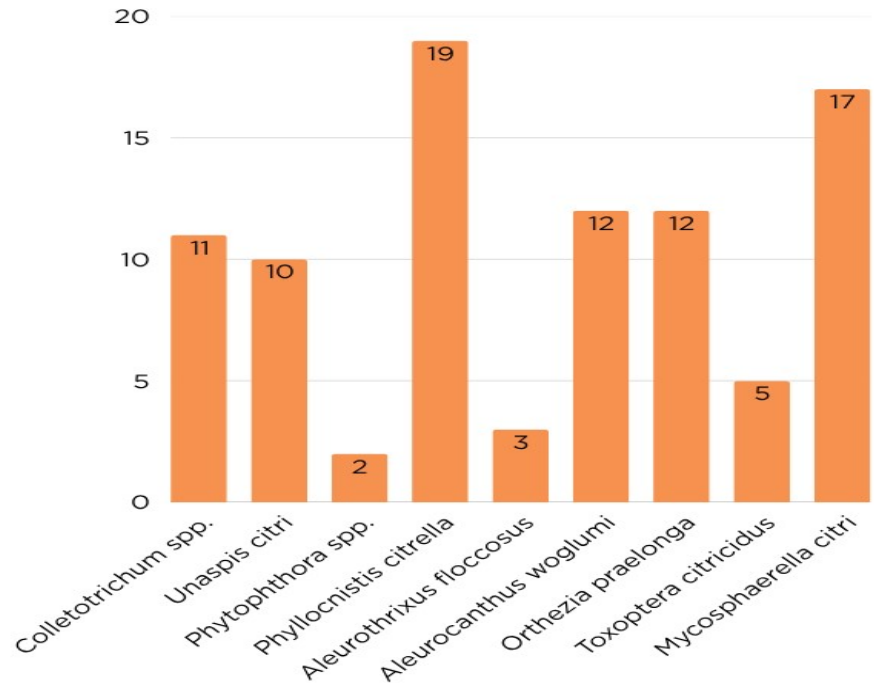

Figure 12: Main pests surveyed in Sátiro Dias. Source: JESUS, 2025.

It is important to emphasize that the results of the phytosanitary survey demonstrated the absence of high-impact quarantine pests, such as Citrus Canker (Xanthomonas citri subsp. citri) and Huanglongbing (HLB) (Candidatus

Liberibacter spp.), in the citrus production units evaluated across the surveyed municipalities. This favorable phytosanitary condition reinforces the importance of maintaining continuous surveillance, monitoring, and inspection activities conducted by the official plant protection services, since the absence of these pests represents a valuable phytosanitary asset that must be continuously preserved.

In this context, the Brazilian Ministry of Agriculture and Livestock established the National Huanglongbing Prevention and Control Program (PNCHLB) in 2021, defining guidelines and procedures for the prevention, monitoring, and containment of the disease throughout the country. The program strengthens coordinated actions between federal and state plant protection agencies to reduce the risk of HLB introduction and spread, as the disease is recognized as one of the most destructive threats to citrus production worldwide. In the state of Bahia, these activities are carried out by the Bahia State Agricultural Defense Agency (ADAB) through the Citrus Phytosanitary Program, established in 2003 in recognition of the significant economic and social importance of citrus production in the state, where cultivation is predominantly carried out by family farmers. The program conducts phytosanitary surveillance, official surveys, orchard and nursery inspections, regulation of plant material movement, phytosanitary education, and the investigation of suspected occurrences of regulated pests, with the objective of maintaining Bahia free from Huanglongbing and Citrus Canker (ADAB, 2024).

The importance of these measures was highlighted in 2024, when the confirmation of a Citrus Canker outbreak in the municipality of Barreiras prompted the intensification of containment measures by ADAB and the Bahia State Secretariat of Agriculture (Seagri). These actions included the eradication of infected plants, expanded field inspections, and reinforced phytosanitary surveillance in high-risk areas (ADAB, 2024). This event demonstrates that maintaining the favorable phytosanitary status of Bahia's citrus industry depends on the continuous efforts of the official plant protection services, together with the active participation of growers in reporting suspected cases and implementing the measures recommended by official programs.

Overall, the results demonstrate that citrus production in the Northern Coast and Agreste region of Bahia (LNAB), despite its considerable economic and social importance, is subject to significant phytosanitary challenges that require consistent public policies, phytosanitary education programs, and coordinated plant protection strategies. The integration of research institutions, extension services, growers, and official plant protection agencies particularly ADAB is essential to ensure the sustainability of citrus production by maintaining orchard health, enhancing the competitiveness of Bahia's citrus industry, and preserving the phytosanitary conditions required for both domestic and international trade.

Therefore, the findings of this study reinforce the importance of maintaining permanent phytosanitary education, inspection, and surveillance programs conducted by ADAB. The integration of grower outreach activities with systematic phytosanitary surveys contributes to the early detection of potential quarantine pest outbreaks and to the preservation of the favorable phytosanitary status of citrus production in the state of Bahia.

Conclusion:-

IBGE data (2024) confirm the importance of orange, Tahiti acid lime, and mandarin cultivation in the Northern Coast and Agreste Region of Bahia (LNAB), where the production hierarchy reflects both market demand and the high adaptability of these species to the region's edaphoclimatic conditions (FUNDECITRUS, 2025; Chagas et al., 2012). These findings highlight the economic and social importance of regional citrus production and reinforce the need for continuous phytosanitary monitoring and protection strategies to ensure the sustainability of the sector.

The phytosanitary survey conducted in 137 Citrus Production Units located in the Northern Coast and Agreste Region of Bahia revealed the occurrence of a diverse group of regulated non quarantine pests, with citrus snow scale (Unaspis citri), citrus leafminer (Phyllocnistis citrella), and gummosis (Phytophthora spp.) being the most prevalent. These findings are consistent with previous studies identifying the major phytosanitary constraints affecting Brazilian citrus production (Rossetti, 2001; Batuman et al., 2020; Dario et al., 2018). In contrast, no quarantine pests of major economic importance, such as Citrus Canker (Xanthomonas citri subsp. citri) and Huanglongbing (HLB) (Candidatus Liberibacter spp.), were detected in the surveyed orchards. These results underscore the importance of maintaining phytosanitary surveillance, systematic monitoring, and phytosanitary education programs promoted by the Bahia State Agricultural Defense Agency (ADAB).

References: -

1. ADAB. Bahia State Agricultural Defense Agency. Seagri and ADAB Intensify Efforts to Control Citrus Canker Threatening Citrus Production in Western Bahia. Salvador, BA, August 20, 2024. Available at: https://www.adab.ba.gov.br. Accessed on: July 30, 2026.
2. Batuman, O., et al. Citrus Diseases: A Practical Guide. Cham: Springer, 2020.
3. Dario, G. J., et al. Phytophthora spp. in Citrus: Epidemiology and Management. Revista Brasileira de Fruticultura, 2018.
4. EMBRAPA. Practical Manual for Monitoring and Control of Tahiti Acid Lime Pests. Brasília, DF: Embrapa, 2009.
5. FAO – Food and Agriculture Organization of the United Nations. Citrus Fruits: World Production Statistics. Available at: https://www.fao.org. Accessed on: October 4, 2024.
6. FUNDECITRUS. Brazilian Citrus Industry Technical Report. Araraquara, SP: Fundecitrus, 2025.
7. FUNDECITRUS. Technical Manual for Citrus Disease Management. Araraquara, SP: Fundecitrus, 2022.
8. Gabriel, D., et al. Citrus Diseases: Diagnosis and Management. Piracicaba, SP: FEALQ, 2020.
9. IBGE – Brazilian Institute of Geography and Statistics. Agricultural Production in Bahia. Rio de Janeiro: IBGE, 2024.
10. MAPA – Ministry of Agriculture and Livestock. Normative Instruction No. 52, November 20, 2007. Brasília, DF: MAPA, 2007.
11. Müller, G. W., et al. Citrus Tristeza: Epidemiology and Control. Revista Brasileira de Fruticultura, 2019.
12. Rossetti, V., et al. Presence of Xylem-Limited Bacteria Associated with Citrus Variegated Chlorosis. Summa Phytopathologica, 1990.