IDENTIFICATION OF NEW HOST PLANTS OF SWOLLEN SHOOT VIRUS OTHER THAN COCOA IN CÔTE D'IVOIRE

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INTRODUCTION

The cocoa tree [Theobroma cacao Linnea (Malvaceae)] is a perennial plant, highly prized in the world, mainly for its beans used in the manufacture of chocolate and other products. Côte d'Ivoire has been the world's leading cocoa producer since 1977 with 2.028 million tons in 2021 (ICCO, 2022). Unfortunately, this production is threatened by the Swollen shoot disease, which is one of the most serious threats to cocoa production in Côte d'Ivoire. The pathogen of this disease is a Badnavirus called Cocoa swollen shoot virus (CSSV) which is transmitted by mealybugs (N'Guessan, 2021). The expansion of this disease would be linked to the presence of very aggressive viral strains in the orchard but also to the presence of a wide range of alternative hosts of the virus which are plant species that can host and transmit the virus to the cocoa tree through the mealybug. To face this disease, several control methods have been developed, including the identification of alternative hosts of CSSV other than the cocoa tree. In order to strengthen this component, this study focused on identifying alternative hosts of CSSV within food crops.

MATERIAL AND METHODS

- **Identification of virus reservoirs plants** (plants that host the virus over a long period of time without adverse effects): Inoculation of the 13 food crops found in Ivorian cocoa farms (*Dioscorea alata, Vigna Subterranea, Vigna Subterranea, Phaseolus Vulgaris, Glycine Max, Arachis Hypogaea, Solanum Melongena, Capsicum Annuum, Carica Papaya, Manihot esculenta, Colocasia esculenta, Abelmoschus esculentus, Corchorus olitorius and Theobroma cacao*) with the *Cacao swollen shoot Togo* B virus (CSSTBV) in the greenhouse using viruliferous Mealybugs (Fig 1 and 2) (N'Guessan, 2021). For two months after inoculation, symptoms were observed and leaf samples were collected for molecular diagnosis,.

- **Identification of the host plants of the virus** (plant which becomes a source of inoculum for the healthy plants of its environment and the virus on the host causes more or less important damages): The inoculated food crops became the sources of inoculum from which the mealybugs were trapped to acquire the virus (Fig 2). The new viruliferous mealybugs were re-trapped on healthy cocoa trees (Fig 3) to transmit the virus to them (N'Guessan, 2021). Disease symptoms were observed for two months and then samples of cocoa leaves were collected for molecular diagnosis.

- **Molecular diagnosis and amplicons Sequencing :** DNA extraction from leaf samples from food crops and cocoa trees infected (Doyle and Doyle, 1990) followed by PCR amplification (Fig 4) and sequencing of the amplicons to confirm our results.

Fig 1: Mealybug trapped on a cocoa tree infected with CSSTBV

Fig 2: Inoculation of CSSTBV to food crops

Fig 3: cocoa tree inoculated from infected food crops

Fig 4 : laboratory handling for molecular diagnosis

RESULTS

RESERVOIR AND HOST PLANTS OF COCOA SWOLLEN SHOOT VIRUS

- **Reservoir plants of CSSV Identified :** Symptoms of deformation and discoloration of the leaf of inoculated crop food (**Fig 5**). The results of molecular diagnosis of the virus revealed 12 reservoir plants with seven (07) new food crops (*Vigna Subterranea, Dioscorea alata (florido)* , *Dioscorea alata (*bêtê-bêtê), *Phaseolus Vulgaris*, *Solanum Melongena, Arachis Hypogaea* and *Abelmoschus esculentus*),

- **Hots plants of CSSV Identified :** Symptoms of discoloration of cocoa tree leaf **(Fig6**) and molecular diagnostic revealed 4 host plants of virus, *Colocasia esculenta*, *Dioscorea alata (florido)* , *Dioscorea alata (*bêtê-bêtê) and *Abelmoschus esculentus*

- **Amplicon sequencing:** Confirmation of the presence of Cocoa swollen shoot Togo B Virus (CSSTBV) in food crop and cocoa leaf samples

Leaf blisters of *Dioscorea alata (florido)*

Leaf blisters of *Solanum Melongena*

Chlorosis or yellowing of *Abelmoschus esculentus* leaves

Fig 5: Symptoms of discoloration and deformation of leaves of infected food crops

Inoculation of CSSV from reservoir plants to cocoa

Fig 6 : Symptoms of leaf chlorosis (interveinal) on a cocoa tree inoculated via crop food

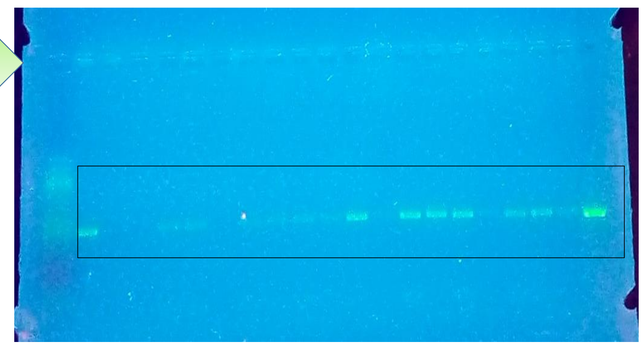

Fig 7: Amplicon on agarose gels

CONCLUSION AND PERSPECTIVE

The search for reservoir plants and hosts of swollen shoot virus in food crops has identified 7 new reservoir species and four hosts of CSSV.

The identification of host plant species of CSSV deserves to be continued in order to develop an effective control strategy against swollen shoot

RECOMMENDATIONS

Hots Plants of CSSV should be systematically removed when replanting infected cocoa farms. This is because they could be a source of inoculum to infect the cocoa tree.

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