

Introductory Presentation



ILLUSTRATION OF THE PurPest CONCEPT



ABOUT THE PROJECT

The main objective of PurPest is to control serious plant pests during import and to manage them in the field by developing a new sensor concept to detect pests in a timely and noninvasive manner

Define pest specific and general VOCs emitted by target pests or infested plants

Develop a state-of-the-art SSP that detects the VOCs of target pests

Test, validate and demonstrate the sensor platform under import and field conditions

Identify drivers of pest establishment and spread

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Maximize the Implementation and impact of PurPest

PURPEST WILL DETERMINE THE VOC SIGNATURE FOR THESE PESTS







Cotton bollworm (*Helicoverpa armigera*) The butterfly "Fall armyworm" (Spodoptera frugiperda)



Brown marmorated stinkbug (Halyomorpha halys)



(Phytophthora ramorum)



Pinewood nematode (Bursaphelenchus xylophilus)

Cotton Bollworm (CBW)



The *cotton bollworm (CBW)* is one of the most serious insect pests worldwide and considered a quarantine pest in Norway.

This *lepidopteran* species causes huge economic losses due to its polyphagy, extreme mobility and high reproductive potential. In addition to feeding on more than 180 plant hosts from more than 45 families, including vital global food and fibre crops, CBW has the ability of developing resistance against pesticides.

<u>NIBIO</u> will carry out experiments on CBW in Norway with the assistance of <u>NTNU</u>. <u>SINTEF</u> will carry out the VOC analysis at NIBIO's facilities.

Fall Armyworm (FAW)



The *fall armyworm (FAW)* is a *lepidopteran* insect and a major pest of maize (corn) originating from the tropical and subtropical regions of the Americas. FAW also infests more than 80 other food crops such as rice, sugarcane, sorghum, legumes, tomatoes, potatoes, tobacco, cotton, sunflowers, bananas, garlic, ginger, sweet potatoes, peppers, cruciferous plants, melon family and vegetables. FAW has recently become a devastating pest in Africa and Asia. The Food and Agriculture Organisation of the UN (FAO) considers FAW one of the most important threats to food security in these regions. FAW is predicted to migrate further and in 2018 the European Union decided to give top priority to avoiding the invasion of FAW into Europe.

<u>UNINE</u> will do experiments on the FAW in Switzerland, supplemented with field work in Mexico and Kenya, and will do their own VOC analysis to determine the compounds that should be targeted for sensors development.

Brown Marmorated Stink bug (BMSB)



The **brown marmorated stink bug (BMSB)** is an invasive and highly *polyphagous* invasive insect, which has more than 300 reported hosts, including important fruit and horticultural crops. Native to Asia, it is an emerging pest of global concern. It has spread to every Northern Hemisphere continent, most recently to Europe. In the last few years in Italy, it has caused serious economic losses to pears, peaches, kiwi, apples, hazelnuts, and several other crops, with damage exceeding 50% of the production in several occasions.

UNIPD will carry out experiments on BMS in Italy.



The oomycete genus *Phytophthora* currently comprises mostly soil - or airborne primary plant pathogens with partly extremely wide host ranges, in particular PhR and *P. cinnamomi*. In European nurseries and plantations more than 60 *Phytophthora* species have been confirmed, almost all of them considered as exotic invasive pathogens. Preliminary results from recent studies with a limited number of *Phytophthora* and plant species, respectively, indicate that both *Phytophthora* species and plants attacked by them may have species-specific VOC patterns which could be used for early detection of these pathogens.

NIBIO and **MENDELU** will capture VOCs from pure cultures and from host plants infected with single PhR isolates in Norway and the Czech Republic, respectively. In addition, plants will be co-inoculated with different pests at the same time to study the effect of multiple pests on the VOCs. JKI will support **MENDELU** with VOC collection. **SINTEF** will carry out the VOC analysis at NIBIO's facilities using a portable GC-MS, while **MENDELU** will use their GC-MS instruments.

Pinewood Nematode (PWN)



The **pinewood nematode (PWN)** has ravaged Asian pine forests for over a century and remains unstopped. In the last two decades after its arrival to the EU, where it is now classified a priority pest, PWN containment and mitigation has mobilized extensive investment. These efforts were, to date, inefficient, partly due to the outdated detection and monitoring techniques available. Pest specific VOC based systems have the potential to revolutionize current methodologies.

To implement **PurPest** in Portugal, <u>INIAV</u> will isolate VOCs that characterize PWN-infected live pines and woody packaging material, <u>UNIEV</u> will profile their chemical compositions, and <u>CNP</u> and <u>DGAV</u> will support testing the prototype sensors under relevant conditions/expertise.





PurPest aims to exploit the specific **Volatile Organic Compounds (VOCs)** released by pests or by the plants attacked by pests for the development of a **Sensor System Prototype (SSP)** to detect the VOCs and timely identify target pests.



The sensor concept is based on detection of pestspecific volatile organic compounds (VOCs) emitted by host plants invaded by one or several pests. PurPest will determine the VOC signature of *Phytophthora ramorum*, the Fall armyworm (*Spodoptera frugiperda*), the Cotton bollworm (*Helicoverpa armigera*), the Brown marmorated stinkbug (*Halyomorpha halys*) and the Pinewood nematode (*Bursaphelenchus xylophilus*).