the root nodules of faba bean plants, was tested as a soil inoculum or a foliar application to trigger faba bean plants resistance against Bean yellow mosaic virus (BYMV) infection. Compared to the non-treated faba bean plants, the applications of 33504-Alex1 in either soil or foliar application significantly promoted growth and improved total chlorophyll content, resulting in a considerable reduction in disease incidence and severity as well as the accumulation level of BYMV particles in the treated faba bean plants. Furthermore, the protective activities of 33504-Alex1 were associated with significant reduction in non-enzymatic oxidative stress markers (H_2O_2 and MDA) as well as remarkably increased DPPH free radical scavenging activity and total phenolic content compared to the BYMV treatment at 20 days post-inoculation. Additionally, an increase in reactive oxygen species scavenging enzymes (SOD, CAT, and PPO) as well as induced transcriptional levels of pathogenesis-related proteins (PR-1, PR-3, and PR-5) were observed. Of the 19 polyphenolic compounds detected in faba bean leaves by HPLC analysis, gallic and vanillic acids were completely shut down in the BYMV treatment. Interestingly, the 33504-Alex1 treatment was associated with the induction and accumulation of the most detected polyphenolic compounds. Gas chromatography-mass spectrometry (GC-MS) analysis showed that hexadecanoic acid 2,3-dihydroxypropyl ester, tetraneurin-A-Diol, oleic acid, and isochiapin B were the major compounds in 33504-Alex1 culture filtrate ethyl acetate extract, suggesting it acts as an elicitor for the induction of systemic acquired resistance in faba bean plants. Consequently, the capacity of *R. leguminosarum* bv *viciae* strain 33504-Alex1 to enhance plant growth and induce systemic resistance against BYMV infection will support the incorporation of 33504-Alex1 as a biological fertilizer agent and provide a new strategy for crop protection and sustainability, and environmental safety in agriculture production.

V9

A REVIEW ON THE NOVEL DISCOVERIES OF BEGOMOVIRUSES IN OMAN. Muhammad Shafiq Shahid, Department of plant sciences, College of Agricultural and Marine Sciences, Sultan Qaboos University, Al-Khod 123, Oman, Email: mshahid@squ.edu.om

Begomoviruses (family; *Geminiviradae*) consist of viruses with single-stranded (ss) and circular genome particles. They are transmitted by whiteflies, and represent a major constraint to agricultural crops in different parts of the world. In Oman, they have been causing huge losses to crops (tomato, cucumber, watermelon and beans). Research on begomoviruses in Oman over the past few years focused on molecular characterization, phylogenetic relationship, recombination analysis, pathogenicity test on model and host plants and the development of transgenic resistant plants to these viruses. Some studies focused on the association of satellite DNA (alphasatellite and betasatellite) molecules with begomoviruses. This review highlights the latest developments in begomovirus and associated satellite DNAs discovered in Oman over the last three decades. This period encountered changes in agricultural practices and developments in virus detection technologies from morphological to the application of genome diagnostics to the emergence of high throughput DNA sequencing, capable to sequence multiple and diverse DNA molecules in parallel, enabling of millions of DNA molecules to be sequenced at a time. In addition, several tomato cultivars carrying different Ty genes of resistance to TYLCD complex were developed.

V10

SANITARY STATUS OF STONE FRUITS IN PALESTINE. Raed Alkowni[1], Imad Mohammad[1], Amina Mansour[1], Dina Najami[1], Duha Mousa[1], Riham Awad[1], Rasha Attawnah[1], Suad Aqqad[1], Tasneem Abdulkareem[1], Osama Alabdalla[2], MedhatWildAli[2] and Ala Lahlouh[2]. (1) Department of Biology and Biotechnology, Nablus, Palestine, Email: ralkowni@najah.edu; (2) National Agricultural Research Center (NARC), Jenin, Palestine.

Stone fruits are one of the most rapid developing cultures worldwide and is a promising crop in Palestine. Even though they are still facing many challenges, and plant health is among them. This study focused on assessing the sanitary status of stone fruits addressing the diseases induced by intracellular infectious agents such as viruses that indeed represent a major threat to stone fruit industry as some of stone fruits viral diseases are considered quarantine agent. For that purpose, several field surveys and samples collection were carried out during two consecutive years 2018 and 2019 in ten governorates: Tubas, Jenin, Nablus, Tulkarem, Qalqilia, Hebron, Bethlehem, Ramallah, Jericho and Salfeet. The inspected stone fruit trees were tested in the lab using molecular (RT-PCR) and/or serological diagnostic (ELISA). techniques for the detection of any of the following viruses: Apple chlorotic leaf spot virus (ACLSV, genus *Trichovirus*, family *Betaflixiviridae*), Plum pox virus (PPV, genus *Potyvirus,* family *Potyviridae*), Prunus necrotic ring spot virus (PNRSV, genus *Illarvirus*, family *Bromoviridae*), American plum line pattern virus (APLPV, genus *Illarvirus*, family *Bromoviridae*), Apple mosaic virus (ApMV, genus *Illarvirus*, family *Bromoviridae*), Prune dwarf virus (PDV, genus *Illarvirus*, family *Bromoviridae*), Apricot latent virus (ApLV, genus *Foveavirus*, family *Betaflixiviridae*), Plum bark necrosis stem pitting-associated virus (PBNSPaV, genus *Ampelovirus*, family *Closteroviridae*). Field surveys and inspections for the detection of virus and other diseases that produce symptoms suggestive of virus infection such as. yellow spot, necrotic spot, shot hole, leaf curl, marginal leaf necrosis, shortened internodes, bushy appearance, discoloration and yellow mosaic of leaves. Almost one thousand samples were collected from all districts and tested individually for the presence of any of the above-mentioned viruses. The results showed 28.5% of the samples were positive for PNRSV. Positive ELISA result for viral disease was found in all tested districts. The level of viral infection was highest in the northern districts. Virus infection rates were 50, 43.8, 32, 27.7, 18.2, 17.6, 14.3 and 9%, in Nablus, Tulkarem, Tubas, Jenin, Ramallah, Hebron, Bethlehem and Salfeet districts, respectively. ACLSV tests showed low level of virus infection (3%); whereas only 1.6% were positive for ApLV. None of other viruses were tested positive in all fields surveyed. The survey concluded that the sanitary status of stone fruits with respect to viral infection was lower than that reported in neighboring countries. Even

though it is still higher than most countries of the Mediterranean. The study recommended the need for a certification program to prevent spread of detected viruses. In addition, it was recommended to maintain the stone fruits collection at NARC virus-free as a credible source for propagation materials.

V11

STOLBUR-BOIS NOIR IN THE NEAR-EAST: *CONVOLVULUS ARVENSIS* BINDWEED AND THE PLANTHOPPER VECTOR *HYALESTHES OBSOLETUS* HOST LOCAL '*CANDIDATUS* PHYTOPLASMA SOLANI' STRAINS IN EGYPT AND LEBANON. Pascal Salar[1], Yasmen El-Sisi[2], Fouad Jreijiri[3], Christina Mortada[3], Jean-Luc Danet[1], Ayman Faisal Omar[2], Elia Choueiri[3] and Xavier Foissac[1]. (1) INRAE, University of Bordeaux, UMR BFP, 71 avenue Edouard Bourlaux CS20032, F-33882 Villenave d'Ornon, France, Email: xavier.foissac@inrae.fr; (2) Department of Plant Pathology, Plant Pathology and Biotechnology Laboratory, Faculty of Agriculture, Kafrelsheikh University, 33516 Kafrelsheikh, Egypt; (3) Department of Plant Protection, Lebanese Agricultural Research Institute, Tal Amara, P.O. Box 287, Zahlé, Lebanon.

In surveys for phytoplasma diseases in vegetable and grapevine in Egypt and Lebanon, '*Candidatus* Phytoplasma solani' was detected in diseased potato plants in northwestern Egypt and in grapevine in the Bekaa valley of Lebanon. Genotyping through sequencing the variable gene stamp mainly revealed the presence of new '*Ca.* P. solani' genotypes *stamp*8 and *stamp*14 in Egypt and Lebanon, respectively. A '*Ca.* P. solani' strain' related to strains found in western Europe was also detected in an Egyptian potato field seeded with tubers imported from Europe. Survey of wild plant reservoir and potential planthopper vectors led to the detection of '*Ca.* P. solani' genotype *stamp*8 in the field bindweed *Convolvulus arvensis* and in *Hyalesthes obsoletus* populations collected from this plant in two Egyptian governorates and of '*Ca.* P. solani' genotype *stamp*14 in *C. arvensis* and *H. obsoletus* in Bekaa valley. This data suggests that the local propagation of '*Ca.* P. solani' through an epidemiological cycle involving bindweed reservoir hosts and *H. obsoletus* planthopper vectors, is similar to what is happening in most of the European countries. Nevertheless, the European and Near-East epidemiological systems were different in two ways. First, the Egyptian '*Ca.* P. solani' strain corresponded to a *tuf*B2 genotype, a genotype spreading from *U. dioica* stinging nettles plant reservoir in Central Europe. Second, tomato plants which are common dead-end hosts for '*Ca.* P. solani' in Europe and Asia Minor were not found infected with '*Ca*. P. solani' in either Egypt or Lebanon. Instead, diseased tomato displaying stunting, proliferations, small purplish leaves and abnormal hypertrophic calyxes (big bud) turned out to be infected with '*Ca.* P. australasia' in Egypt and '*Ca*. P. trifolii' in Lebanon. This suggests either a disconnection between adult vector flight and tomato plantations or difference in feeding behavior among *H. obsoletus* populations.

V12

'*CANDIDATUS* PHYTOPLASMA OMANENSE' AS AGENT OF GRAPEVINE YELLOWS IN LEBANON: INFECTED *CONVOLVULUS ARVENSIS* BINDWEEDS MAY ACT AS RESERVOIR AND THEY ALSO HOST INFECTED POLYPHAGOUS POTENTIAL VECTORS. Xavier Foissac[1], Fouad Jreijiri[2], Pascal Salar[1], Samer Wakim[2], Jean-Luc Danet[1] and Elia Choueiri[2]. (1) INRAE, University of. Bordeaux, UMR BFP, Villenave d'Ornon, France; (2) Department of Plant Protection, Lebanese Agricultural Research Institute, Tal Amara, Zahlé, Lebanon, Email: echoueiri@lari.gov.lb

"Bois noir" (BN) phytoplasma disease of grapevine is considered as one of the most economically important grapevine yellows (GY) in the Mediterranean area and is common in Lebanese vineyards. During an investigation on BN spread carried out in June 2014 in Mansoura municipality of West Bekaa, Lebanon, a phytoplasma related to '*Candidatus* Phytoplasma omanense' was detected in a grapevine sample of cultivar Syrah, showing leaf scorch and discoloration. The phytoplasma was detected using a phytoplasma universal nested-PCR and identified through sequencing of the 1.2 kbp 16SrDNA amplicon. In spring 2015, surveys were undertaken to collect *Convolvulus arvensis* bindweeds and specimens of *Hyalesthes obsoletus* and *Reptalus* spp. Cixiidae planthoppers which are known as BN plant reservoir and BN insect vector, respectively. Bindweeds displaying stunting and color alterations as well as symptomless controls were collected from various locations in West Bekaa. In addition to '*Ca.* P. solani' the agent of BN that was detected in all locations, the '*Ca.* P. omanense' related strain previously detected in grapevine was detected in the diseased bindweeds as well as in *H. obsoletus* and *Reptalus sp.* specimens in Aammiq municipality of West Bekaa. None of the symptomless plants produced the expected amplicon. In order to discriminate this phytoplasma from '*Ca.* P. solani' and '*Ca.* P. phoenicium' which are prevalent in the Bekaa region, a 16S rDNA RFLP assay was designed. To the best of our knowledge, this is the first report of '*Ca.* P. omanense' detected in grapevine and in Cixiidae planthoppers already known to host and vector '*Ca.* P. solani' strains associated with BN disease in grapevine, respectively. Based on these results, further accurate surveys of phytoplasmas associated with grapevine yellows in the Eastern Mediterranean basin are required to prevent the spread of '*Ca.* P. omanense'. As the ecological cycle of this phytoplasma certainly involves a common weed as reservoir and polyphagous insects as vectors, it may represent a potential new threat to Euro-Mediterranean agriculture.

V13

DETECTION AND DIFFERENTIATION OF PHYTOPLASMA IN SULTANATE OF OMAN. Ali M. Al-Subhi, Rashid A. Al-Yahyai and Abdullah M. Al-Sadi, Department of Plant Sciences, Sultan Qaboos University, Al Khod, Sultanate of Oman, Email: alsubhia@squ.edu.om

Extensive field survey in the last 30 years in Oman has yielded more than 25 host plants infected with phytoplasma. These hosts include wild and cultivated plant species such as lime, alfalfa, sesame, chickpeas, radish,