Abstracts

A three year trial was conducted in a 15-year-old vineyard of cv. Aragonez in Alentejo, Portugal, to evaluate the effectiveness of selected products (azoxyostrobin (Quadris®), copper oxychloride (Cuprocil®), difenoconazole (Score®), tebuconazole (Horizon®), and two mixtures of Cuprocil + acibenzolarS-methyl (Bion®) and Score + acibenzolarS-methyl (Bion®)) against Botryosphaeria canker and Phomopsis cane and leaf spot. Each year, three spray applications were carried out: after pruning, at growth stages C/D (leaf tip visible/first leaf separated from shoot tip) and after pruning + growth stages C/D. A total of 18 treatments were applied on the grapevines in a completely randomized design. Incidence and severity were evaluated. In the last year of the trial, the number of dead plants, yield and vigour of plants were recorded. The adoption of the yearly practice of protecting pruning wounds and plants by a full crown spray at phenological stage C/D has demonstrated the capacity to reduce both diseases incidence and severity. Treated vines showed consistently low levels of incidence and severity when compared with control plants. One application of Bion + Cuprocil after pruning followed by one application of Bion + Score at phenological stage C/D was the most efficient treatment. Also, the lowest number of dead plants, the highest yield per plant and the highest percentage value for plant vigour were achieved with the same combination of products/spray application timing. As conclusion, this combination of treatments appears to be a good strategy to control Botryosphaeria canker and Phomopsis cane and leaf spot.

Influence of mustard biofumigation on growth, conidial germination and propagule recovery of Ilyonectria macrodidyma-complex species. J.E. BARBOUR1, H.J. RIDGWAY2 and E.E. JONES3. 1Faculty of Agriculture and Life Sciences, Lincoln University, PO Box 85084, Lincoln University, Lincoln, New Zealand, 7647. "E-mail: Eirian.Jones@lincoln.ac.nz"

Black foot caused by *Ilyonectria* spp. is a significant economic problem resulting in the decline and death of vines. Biofumigation using mustard has recently shown potential to reduce this disease. In *vitro* sandwich plate assays and a soil box assay were used to compare the effect of biofumigation using standard brown mustard and a recently released cultivar Caliente 199 to suppress *Ilyonectria macrodidyma*, *I. novozelandica* and *I. toresensis* isolates associated with black foot disease in New Zealand. Both mustards reduced mycelial growth and conidial germination of all isolates, but overall efficacy of the two mustards varied between experiments and is probably related to plant physiology at harvest. In combination with soil, however, mustard efficacy was reduced. Isolates within a species differed in susceptibility to biofumigation. In addition, the relative effect of biofumigation on mycelial growth versus conidial germination varied for isolates, with *I. macrodidyma* Ack1a the most susceptible isolate with regards to conidial germination but least with regards to mycelial growth. Recovery of mesh bags containing mycelial or conidial inoculum of each species after burial in mustard amended or unamended soil in the box bioassay indicated the rapid conversion of inocula into chlamydospores. Amending soil with either mustard cultivar did not change the overall dynamics of propagule conversion over time, however, it significantly affected the numbers of conidia and chlamydospores recovered from conidial inoculum after different incubation times. Mustard biofumigant crops have potential to be incorporated into an integrated strategy for management of black foot in vineyards and nurseries.

Interaction between arbuscular mycorrhizal fungi and rootstock cultivar on the susceptibility to infection by *Ilyonectria* species. E.E. JONES*1, S. HAMMOND1, C. BLOND1, D.S. BROWN1 and H.J. RIDGWAY1. 1Faculty of Agriculture and Life Sciences, Lincoln University, PO Box 85084, Lincoln University, Lincoln, New Zealand, 7647. "E-mail: Eirian.Jones@lincoln.ac.nz"

Arbuscular mycorrhizal fungi (AMF) have been shown to increase tolerance of grapevine rootstocks to black foot disease caused by *Ilyonectria* spp. The effect of pre-colonisation of different rootstocks with two AMF species on the susceptibility to *Ilyonectria* spp. was determined. Three rootstocks (3309C, 5C and Schwarzmann) commonly used in New Zealand colonised with either *Acaulospora laevis*, *Funneliformis mosseae* or untreated were grown in soil and inoculated with a mixture of *Ilyonectria* spp. isolates representing the species diversity recovered from New Zealand grapevines. After 9 months growth, root and shoot dry weight and trunk base infection by *Ilyonectria* spp., and the catabolic function of the rhizosphere microbial community using MicroResp™ was assessed. Both *A. laevis* and *F. mosseae* increased root dry weight, with no effect on shoot dry weight. Grapevine rootstocks varied in susceptibility with 5C being most susceptible. AMF species altered rootstock susceptibility, with *A. laevis* inoculation of 5C decreasing disease severity and *F. mosseae* having no effect on disease severity of this rootstock. However, *Funneliformis mosseae* inoculation of Schwarzmann decreased disease compared with *A. laevis*. In the absence of the pathogen, the catabolic function of the microbial community in the rhizosphere of 3309C and Schwarzmann differed significantly from that of 5C, but this difference was not apparent following *Ilyonectria* spp. inoculation. AMF inoculation had no effect on the carbon utilisation profile of the rhizosphere microbial community. The results suggested a direct effect of AMF inoculation on rootstock susceptibility rather
than changes in the function of the rhizosphere microbial community.

Control of leaf stripe disease leaf symptoms by specific formulations for foliar nutrition. F. CALZARANO1, V. D’AGOSTINO1, L. MUGNATI, S. SCHIFF2 and S. DI MARCO3. Facoltà di Bioscienze e Tecnologie Agro-Alimentari e Ambientali, Università degli Studi di Teramo, Via C.R. Lerici, 1, 64023 Mosciano S.A. (TE), Italy. 1Dipartimento di Scienze delle Produzioni Agroalimentari e dell’Ambiente (DISPA), Sez. Patologia vegetale ed Entomologia, Università degli Studi di Firenze, Piazzale delle Cascine 28, 50144 Florence, Italy. 2Istituto di Biometeorologia (IBIMET), CNR, Via Gobetti 101, 40125 Bologna, Italy. 3E-mail: fcalzaro@unit.it

Possible approaches for the control of esca complex diseases including both reduction of wood infections and reduction of foliar symptoms development associated with infections. On this second approach there is no viable solution available at present. Preliminary observations on the influence of grapevine nutrition on the disease, suggested the application of foliar fertilizers based on Ca chloride, Mg nitrate and Fucales seaweeds on grapevine leaf stripe disease (GLSD) symptoms. During 2010–2011 growth seasons, 9 treatments were applied in 3 vineyards in the Teramo province. The applications had a 10 day interval from the start of growth to pre-bunch closure. The protocol was planned in order to interfere with the activity of virulence factors and of the plant defense response, at the base of the typical GLSD leaf chlorosis and necrosis. Mixed and single component applications were tested in one cv. Trebbiano D’Abruzzo, and in two cv. Montepulciano d’Abruzzo vineyards. The results were always consistent and showed the highest symptoms reduction with the full components mixture, while lower effects could be obtained with partial mixtures or single components. Quality and quantity of grape production were also evaluated, showing a significant increase in the treated vineyard portion. No phytotoxic effect was ever recorded. Higher trans-resveratrol, flavonoids and druse crystals present in the treated and asymptomatic leaves suggest that the treatment enhances the defence response of the vines in general. The positive results obtained can be a promising and suitable base to assess the mechanisms involved in foliar symptoms development.

An economic case for early adoption of preventative practices for management of grapevine trunk diseases. J.D. KAPLAN1, R. TRAVADON2, M. COOPER3, V.HILLS1, M. LUBELL1 and K. BAUMGARTNER2. 1Department of Economics, Sacramento State University, 6000 J Street, Sacramento CA 95819-6082, USA. 2United States Department of Agriculture, Agricultural Research Service, Crops Pathology and Genetics Research Unit, Davis, CA 95616, USA. 3University of California Cooperative Extension, Napa County, 1710 Sesol Avenue, Suite 4, Napa, CA 94559-1315, USA. *Department of Environmental Science and Policy, University of California Davis, One Shields Avenue, Davis CA 95616, USA. *E-mail: kaplanj@ces.uc.edu

The trunk diseases Botryosphaeria dieback, Esca, Eutypa dieback, and Phomopsis dieback, significantly decrease yields and vineyard longevity in California. Despite high disease prevalence and substantial yield impacts, most growers routinely wait to adopt preventative practices until vineyards are 8+ years-old and have a 10–40% disease incidence. Grower hesitation may arise in part because the economic benefits from early adoption are difficult to predict. Published experimental trials have demonstrated disease-control efficacy ranging from 28–100%, depending on the disease, of three preventative practices (in order of increasing cost): delayed pruning, ‘hand-painting’ thiophanate-methyl (Topasim®) onto pruning wounds, and double pruning. We estimated the benefits of adopting these practices in five California regions for a vineyard with a 25-year lifespan, using economic simulations for winegrape production under varying disease-control efficacy levels (25%, 50%, 75%) and vineyard ages (3, 5, 10 years-old). In Northern San Joaquin, Northern California, and Central Coast regions, taking no action results in negative overall returns. In these same three regions, which have relatively low winegrape prices, even lower overall returns are predicted when waiting until year 10 to adopt double pruning (the most expensive practice), and assuming only 25% disease-control efficacy. In contrast, adopting practices in years 3 or 5, and assuming 50–75% disease-control efficacy, translates into positive overall returns in all regions. Further, adopting these practices in years 3, and assuming 75% disease-control efficacy, corresponds to 13 more years of positive returns (>50% increase), thereby increasing profitability to nearly 99% of those from a healthy vineyard.

Effect of the length of the pruned internode on the colonization of grapevine canes by Diplodia seriata and Phaeonomoniella chlamydospora. G. ELENA1,2 and J. LUQUE3. 1IRTA Cabris, Ctra. de Cabris km 2, E-08348 Cabris, Spain. *E-mail: georgina.elena@irta.cat

The objective of this study was to determine the effect of the length of the pruned internode on fungal survival and colonization of canes by the pathogens Diplodia seriata and Phaeonomoniella chlamydospora. In winter (January), 240 canes were pruned in a ‘Chardonnay’ vineyard leaving two different lengths between the top node and the pruning wound: 2 and 5 cm. Pruning wounds (n=20 per treatment) were either inoculated separately with a conidial suspension of the pathogens