Master Theses Viticulture & Fruit Growing 2019

1	**Begrünungspflanzen gegen die Reblaus**	**Compagnion plants serving as green cover in phylloxerated vineyards**
Cooperation project: BOKU Vienna (AT), DLR Neustadt (DE) **Ziel**: Suche nach Begrünungspflanzen mit repellenter Wirkung gegen Rebläuse Latenter Reblausbefall an toleranten Unterlagen kann zu massiven Störungen in der Vitalität von Reben und zu Ertragsausfällen führen. Begrünungsmanagement und der gezielte Einsatz von Pflanzen mit repellenter Wirkung werden gesucht, die die Population von Rebläusen nachhaltig vermindern können. In einem Topfversuch werden potentielle Begrünungspflanzen in einem angepassten experimentellen Design eingesetzt und die Wirkungen auf die Reblauspopulationen untersucht (Life table Parameter der Rebläuse). Darüber hinaus werden erfolgreiche Kandidatenpflanzen auf ihre Wirkung als Begleitflora zu Reben untersucht (Biomasse, Wurzelwachstum, PS-Effizienz).		
Students: All students are welcome – Alle Studierenden sind willkommen		
Start: März 2019; 6 months; UFT Tulln		
Advisors: Prof. Dr. Astrid Forneck; DI Markus Eitle		

2	**Strategien für die führe Blattreblausbekäpmfung**	**Plant management strategies against gallicole phylloxera infestation**
Cooperation project: BOKU Vienna (AT), WBS Krems (AT) **Ziele**: Vergleich von Behandlungen (verschiedenen Wirkstoffe und Konzentration) auf ihre Wirkung auf die: (1) Etablierung von Reblausgallen, (2) Etablierung der gallicolen Reblauspopulation, (3) Indirekte Wirkung auf das Pflanzenwachstum, (4) Vorkommen von Phytotoxischen Symptomen. Die Versuche werden in Kooperation mit der WBS Krems in Freiflächen durchgeführt.		
Students: All students are welcome – Alle Studierenden sind willkommen		
Start: März 2019; 6 months; UFT Tulln		
Advisors: Prof. Dr. Astrid Forneck, DI Markus Eitle		

3	RESERVED	**The influence of the timing of leaf removal application on the pollen viability, flower carbohydrate status and fruit-set rate**
Cooperation project: BOKU Vienna (AT), INRA Montpellier (FRA)		

Pre-flowering leaf removal has been shown to be effective in reducing the berry set rate in grapevines, particularly in cultivars with compact clusters. However, the results may change depending on the timing and intensity of the leaf removal.
The thesis project consists in exploring the different effects of removing 50% of the vine leaf area at different stages before flowering (i.e. E-L 15, 16, 17). Flower/inflorescences will be sampled on regular basis (every 2 or 3 days) to assess the impact of LR on the carbohydrates availability during flower development by means of HPLC. At flowering the pollen viability will be quantified and after full ripeness berry metrics (seeds/berry, berries per cluster, cluster compactness) will be measured.

Students: All students are welcome

Start: March 2019; 6 months, UFT Tulln

Advisors: Dr. Jose Carlos Herrera, Dr. Javier Tello, Prof. Dr. Astrid Forneck

4		**The influence of different leaf removal intensities on the pollen viability, flower carbohydrate status and fruit-set rate**

Cooperation project: BOKU Vienna (AT), INRA Montpellier (FRA)

Pre-flowering leaf removal has been shown to be effective in reducing the berry set rate in grapevines, particularly in cultivars with compact clusters. However, the results may change depending on the timing and intensity of the leaf removal.
The thesis project consists in exploring the different effects of removing 3, 5, 7 or 10 leaves of the vine leaf area at a defined stage before flowering (i.e. E-L 15). Flower/inflorescences will be sampled on regular basis (every 2 or 3 days) to assess the impact of LR on the carbohydrates availability during flower development by means of HPLC. At flowering the pollen viability will be assessed and after full ripeness berry metrics (seeds/berry, berries per cluster, cluster compactness) will be measured.

Students: All students are welcome

Start: March 2019; 6 months, UFT Tulln

Advisors: Dr. Jose Carlos Herrera, Dr. Javier Tello, Prof. Dr. Astrid Forneck

5		**Water and light scarcity effect on the grapevine leaf anatomical and functional traits**

Cooperation project: BOKU Viticulture&Pomology and BOKU botanic Institute

Leaf anatomical traits are closely linked with several functions such as gas exchange and photosynthesis. Such traits can be modified by environmental factors like water availability and light intensity. For instance, leaves grown under shadow are expected to become larger to capture more light; on the other hand, leaves grown under drought are generally smaller to reduce the evaporative surface and thus limit the water loss. The combination of factors (i.e. drought and shadow) was never studied before in grapevines. The thesis project aims to characterize the morpho-anatomical

traits of leaves from grapevines grown un drought, shadow or a combination of both, compared against control vines grown under light and high water availability. Measurements of eco-physiology (gas exchange, chlorophyll fluorescence, light response curves) and leaf biochemistry (pigments content) represent functional traits that are expected to be altered due to modifications in the morpho-anatomy of the leaves.

Students: All students are welcome

Start: April 2019; 6 months, UFT Tulln

Advisors: Dr. Jose Carlos Herrera, Dr. Guillaume Thereaux-Rancourt, Prof. Dr. Astrid Forneck

6		**Long-term vs short-term water stress effect on Pinot Noir grape composition**

Pinot noir is a winegrape red variety cultivated worldwide. Like many other red cultivars, some degree of water stress if often desired by growers to improve quality of berry. Previous research addressed mainly the issue in arid to semi-arid climates where irrigation is necessary and long-term water deficit is a common practice in viticulture. However, it is not clear whether a short and intense water stress (more common in continental climates) could impact the berry metabolism and thus composition (positively) in a similar way of a long-term mild water stress. The thesis project aims to characterize the vine response to long-term vs short-term water stress on the plant physiology and berry composition (sugars, organic acids, phenolics) and challenge the dogma of irrigation during ripening causing a dilution effect on the berry compounds.

Students: All students are welcome

Start: April 2019; 6 months, UFT Tulln

Advisors: Dr. Jose Carlos Herrera, Prof. Dr. Astrid Forneck

7		**Physiological response of Riesling on phylloxera infestation at root and/or leaf level**

Grape phylloxera (*Daktulosphaira vitifoliae* Fitch) is a pest of commercial grapevines worldwide, originally native to eastern North America. This microscopic sucking insect feeds on root and leaf organs of grapevines and can cause plant desiccation and death. The spread and fast reproduction of phylloxera has becoming a limiting factor for wine production regions where viticulture represents a fundamental economic income. Knowledge on how the different cultivars of vines respond to the phylloxera attack, how the insect influences physiological functions, plant growth, and development is still very limited. Understanding and predicting the potential effects of phylloxera on local/authoctonous cultivars represent a challenge for the future of viticulture.

The present project is aimed at investigating the physiology and growth of grapevines under the threat of phylloxera infestation. Insect-grapevine interactions will be addressed to improve our knowledge on the pest-induced plant responses at the root, stem, and leaf level.

The main objective of the research is to disentangle the potential enhancement of the induced negative effects or eventual compensation response due to a massive attack of phylloxera on above and below-ground biomass. As host plant material 1-year-old plants of Riesling will be selected. Vines will be planted in 3 liters pots, divided in three groups and inoculated with phylloxera eggs at root, leaf or both root-and-leaf level, while a sub-sample of the plants will be keep as control. The effects of the infestation on plant physiology will be monitored through measurements of leaf photosynthesis and plant water status performed on a two-week basis. Approximately 6 weeks after infestation, leaf, stem and root samples will be collected for subsequent analyses of non-structural carbohydrates (glucose, sucrose, starch). Additional measurements will be also performed on the plant material, i.e. estimation of growth rate, counting of leaf galls and root nodosities and measurements of shoot/root biomass.
Students: All students are welcome
Start: Februar 2019; 6 months, UFT Tulln
Advisor: Dr. Tadeja Savi, Prof. Dr. Astrid Forneck

8	Geteilte Wurzeln um lokale und systemische Effekte der Nährstoffaufnahme unter Stress-Bedingungen zu analysieren	**Split-root experiment – a tool to analyse nutrient uptake regulation?**
Plants in general control their uptake of nutrients were tightly, as deficiencies as well as toxicity needs to be avoided. A split-root experiment is a tool to differentiate local and system signals in specific stress situations. Grapevine rootstocks will be treated with high bi-carbonate nutrient solutions to mimic high lime soil conditions. Physiological measurements will be conducted as well as samples collected to be further analyses. Selection of genes analysed will be based on a literature research and analysed with qPCR. Additionally HPLC will be used to determine selectively metabolites changed within the experiment. Thereby we aim to differentiate between local and system stress responses and conclude on the mechanisms behind the observed phenology.		
Students: all students are welcome		
Start: april/may 2019, UFT Tulln		
BetreuerIn: Dr. Michaela Griesser, Prof. Dr. Astrid Forneck		

9	Traubenwelke – welche Rollen spielen SWITCH Gene und deren Regulatoren?	**Berry shrivel – a matter of SWITCH gene regulators?**
Berry Shrivel is a physiological disorder with high economic importance and severe effects on fruit physiology and quality. Recent results revealed that a group of genes regulated at veraison are dramatically differently expression in BS berries as compared to control berries from Zweigelt. These genes have been named SWITCH genes, as their regulation is very different between the vegetative growth phase and the ripening phase. A selection of these genes should be analysed bioinformatically to identify common features within the promoter region and possible binding sites for transcription factors. Additionally the expression of candidate genes and transcription factors should be analysed with qPCR in samples collected from 2 different vegetation periods.		
Students: students with knowledge in bioinformatics and lab experience		

Start: January 2019, UFT Tulln
BetreuerIn: Dr. Michaela Griesser, Prof. Astrid Forneck

10	Effekte auf die Nährstoffaufnahme von Rebenunterlagen bei hohen Kalkgehalten	**Molecular effects of high bi-carbonate soil conditions on nutrient uptake mechanisms**
Chlorosis is a severe problem in viticulture and agriculture in general. High bi-carbonate conditions in soils have dramatic effects on nutrient uptake. The mechanisms of iron uptake are well studied in model plants like A. thaliana, but much less in known of the contribution of specific genes and enzymes in nutrient uptake of grapevine rootstocks. The experiment with 2 rootstocks was conducted 2018 and samples (roots, leaves) are stored for further analyses. In a first step a literature research should reveal a list of genes and enzymes to be further analysed. Gene expression analyses will be conducted with qPCR and enzyme activity with a florescence spectral photometer.		
Students: all students are welcome, lab experience preferred		
Start: January 2019, UFT Tulln		
BetreuerIn: Dr. Michaela Griesser, Prof. Dr. Astrid Forneck		

11	**Effizient von Unterstockpflegemaßnahmen**	**Efficiency of In-row management effects in vineyards**
In-row treatments: Dauerbegrünung (full cover), Rollhacke (new device, hash like), Fräse (rotary milling), Herbizid (Glyphosate) are frequently applied for soil management in the vineyards. Plant communities of green covers (permanent and temporal) affect the choice of treatment and determine their efficiency. Furthermore soil condition and micro climate play a role on the frequency of treatments applied in the field. We aim to understand the efficiency of different in-row management methods as well as the effects on plant physiology. The experiment was established 2018 and it will be the second year of investigation. Different parameters to describe ecophysiological interactions will be determined (soil moisture, vegetation composition and cover, soil enzyme activities, mesofauna composition, vine gas exchange)		
Students: all students are welcome		
Start: April 2019; 6 months; UFT Tulln, Vineyard in Langenlois		
Advisor: Prof. Dr. Bernhard, Dr. Michaela Griesser; E. Kührer, Prof. Dr. Astrid Forneck		

13	**Einfluss verschiedener Unterlagen auf vegetative und generative Parameter bei der Apfelsorte Topaz auf einer Nachbaufläche unter biologischen Anbaubedingungen**	**Influence of new rootstock to vegetative and generative characteristics of the apple cultivar 'Topaz' in a field trial in Eastern Austria**
The last years, the use of more vigorously growing apple rootstocks, especially for extensive and organic production and for recultivation has been discussing. They dispose of a stronger root system compared to M9, are less sensitive to voles (Arvicola terrestris), and furthermore, they are more tolerant to dry stress. In the context of the climatic change they can gain more importance in future, because their more intensive root system allows a better water and nutrient supply. This is very important in organic production, where no slightly soluble nutrients are available. The influence of some new rootstocks to the vegetative and generative characteristics (incl. fruit quality and sensory studies) of the apple cultivar 'Topaz' compared to the standard rootstock M9 are examined in an organically managed and recultivated perennial field trial in the 6. year in Jedlersdorf.		
Students: all students are welcome		
Start: april 2019;		
Advisor: Dr. Andreas Spornberger, Prof. Dr. Astrid Forneck		

14	**Untersuchungen zum Blatt-Frucht Verhältnis von *Aronia melanocarpa* in Österreich**	**RESERVED**
A Master thesis about field trials on the influence of pruning to growth, possibility of mechanical harvest and fruit quality in Upper Austria.		
Students: all students are welcome		
Start: march 2019;		
Advisor: Dr. Andreas Spornberger, Dr. Michaela Griesser, Prof. Dr. Astrid Forneck		