

# Agricultura

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*since 1822*

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# From winemaking courses in Pekre to academic degree programmes at Meranovo

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## ABSTRACT

Winemaking courses in Pekre represent an important form of education during the period between the two wars and right after the Second World War. Designed for those young people waiting to take over family farms, the lectures and practical courses provided them with information on professional viticulture, winemaking and fruit-growing. Thus, they were able to promote development on their farms and boost their profitability. Free courses represented a bridge between regular education, which was at that time expensive and thus unavailable to many farmers in the difficult period between the two wars, and autodidacticism. They also represent the hard work of the authorities who realized that agricultural progress is impossible without expert knowledge. Practical training was of great importance since students spent an entire season learning and working at an estate. The process is described in great detail in the notes of a student, taking the course from March to December 1929. Winemaking courses in Pekre from 1927 to 1946 are thus also a symbolic link between the mission of the school founded during the first half of the 19<sup>th</sup> century by Archduke John von Habsburg and today's Faculty of Agriculture and Life Sciences with its University Centre for Viticulture and at the Meranovo estate. The paper discusses the development of agricultural education, which has come a long way from its basic, practical form to a university degree program of the Faculty of Agriculture and Life Sciences of the University of Maribor.

Key words: viticulture, pomology, vine nursery, education, history, Pekre

## INTRODUCTION

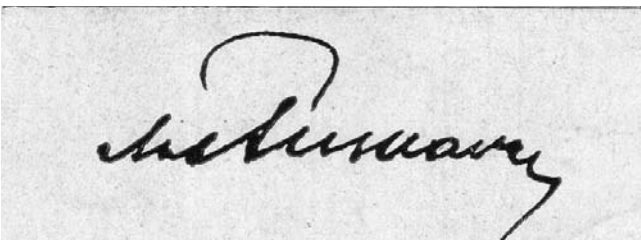
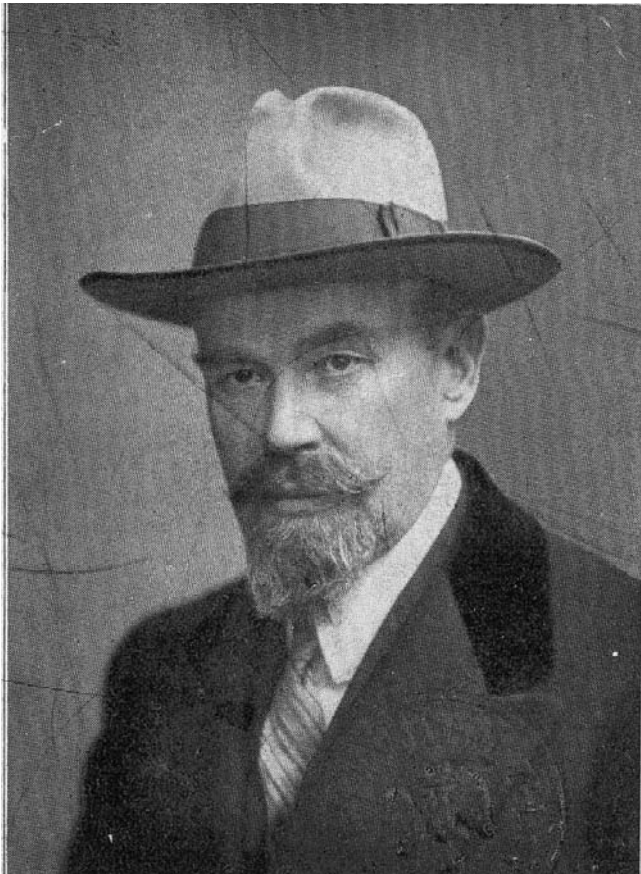
It would not be historically accurate to link the winemaking course in Pekre (the village of Hrastje) directly to the School of Viticulture established in 1832 by Archduke John of Austria at his estate. However, it cannot be denied that Pekre as well as its surrounding wine-growing regions ranging from Ruše, the Drava Valley to Zreče benefitted immensely from this educational institution due to a higher level of expertise and international acclaim. In this respect, the locations of both institutions are similar albeit both operated during different periods. The winemaking course is closely related to Anton Puklavec,<sup>1</sup> an acknowledged expert famous for his contribution to the replanting of Styrian vineyards after the phylloxera epidemic. As a member of the Styrian regional committee based in Graz at the turn of the 19<sup>th</sup> century, he helped to establish exemplary vineyards as well as vine and rootstock nurseries in Styria, among other towns in Srebrenik (Silberberg) near Leibnitz, Gornja Radgona, Kamensčak near Ljutomer, Breg near Ptuj and Krčevina near Vurberk.

## ESTABLISHMENT AND MISSION OF THE VINE AND TREE NURSERY IN PEKRE

After the 1918 subversion, the National Government in Ljubljana established its own supervision of viticulture in Lower Styria, which was based in Maribor. Anton Puklavec was appointed director and continued with his professional work and established new vine and tree nurseries as well as winemaking schools. In 1921, the National Vineyards and Tree Nurseries in Pekre and Kapela were established. At the same time, various winemaking courses were also conducted with the support of the state.

33-year old Janko Šumenjak was appointed principal of the national vine nursery in Pekre. After six years, the nursery also became an educational institution. In the November issue of the monthly newspaper called *Naše Gorice* (literal meaning: our vineyards) published in 1927, Janko Šumenjak wrote that two winemaking courses, which started on the 15 March 1927 and lasted for 9 months, were conducted in Pekre near Maribor and Kapela near Radenci. The target group were both sons of smaller landowners and sons of winemakers who, for various reasons, did not have the opportunity to acquire professional expertise. Thus, young men obtained the opportunity to obtain expert knowledge on modern findings about viticulture, oenology and fruit growing for free. For their effort, they received a monthly scholarship amounting to 100 dinars. "The main aim is to provide both theoretical as well as practical knowledge, which would represent a solid foundation for wine- and fruit-growing as well as oenology". The author is convinced that the success of this trade depends largely on the expertise of landowners. He further states that educated people will also benefit larger winegrowers who

<sup>1</sup> Anton Puklavec (Vitan near Kog 1872 – Maribor 1930). In 1890, he graduated *summa cum laude* from the School of Agriculture in Grottenhof near Graz. Later, he studied at the College of Wine- and Fruitgrowing in Klosterneuburg near Vienna. After the 1918 subversion, the National Government in Ljubljana appointed him director of the Independent Viticultural Supervision for Lower Styria based in Maribor. Additional information can be found in the Slovene book: Anton Puklavec – pozabljeni vinogradniški strokovnjak, zbornik okrogle mize, glavna in odgovorna urednica Manica Hartman, Zgodovinsko društvo Ormož, Kog, 2011.



**Figure 1: Anton Puklavec, founder of the National Vine yard in Pekre and Kapela**

will be able to hire skilled workers. "It is true that many "co-called" labourers are available, but the problem is that they lack relevant expertise, which can prove disastrous if winegrowers lack adequate knowledge themselves. At the same time, unskilled labourers are undermining the love and pleasure for winemaking due to their lack of knowledge and stubbornness<sup>2</sup>." The financing of this trade is laid down in the 1928 budget decree issued by Maribor's authorities under the heading Agricultural Education and Agricultural Establishments. The Assembly of Maribor allocated 529, 289.75 dinars to the nursery in Dramlje near Celje, Pekre, Kapela, the tree nursery in Ptuj as well as the vine and tree nursery in Vukanovec near Čakovec. During the same period, the total budget allocated to the two-year School of Fruit- and Wine-Growing in Maribor, the one-year School of Agriculture in St. Jurij near the south railroad (today's Šentjur near Celje) and the one-year Vocational School of

<sup>2</sup> Naše Gorice, a newspaper of the Society of Viticulture Maribor, illustrated monthly newspaper for the development of agriculture, Maribor, December 1928, pp. 377 – 378.

## Razglasi velikega župana mariborske oblasti.

E. br. 1660/8.

### Razglas.

Zaradi korenite praktične izobrazbe v vinarstvu in sadjarstvu se priredita od dne 15. februarja do dne 15. novembra 1928. dva devetmesečna viničarska tečaja, in sicer pri državnih trtnih nasadih in drevesnicah

- 1.) v Pekrah, pošta Limbuš, in
- 2.) v Kapeli, pošta Slatina-Radenci.

V vsak tečaj se sprejme po deset mladeničev. Pouk je v prvi vrsti praktičen in le toliko tudi teoretičen, kolikor je to neizogibno potrebno za boljše razumevanje vsakega posameznega opravila v vinogradu, sadovnjaku, trsnici, drevesnici in vinski kleti.

Gojencem gre prosto stanovanje in brezplačna kmetiška hrana; poleg tega bodo dobivali mesečno po 100 Din na roko, da si oskrbe pranje perila in razne manjše potrebščine za telesno nego kakor tudi za snaženje obleke in obuvala.

V tečaj se sprejmejo viničarski in kmetiški mladeniči iz mariborske oblasti, ki so stari najmanj 16 in ne več nego 24 let ter so telesno dovolj močni za svojeručno opravljanje vseh opravil v vinogradniškem obratu.

Primerno kolkovanim prošnjam za sprejem je treba priložiti:

- 1.) krstni list,
- 2.) zdravniško izpričevalo,
- 3.) нравstveno izpričevalo,
- 4.) obvezo staršev, da puste prosilca devet mesecev nepretrgoma v tečaju, in
- 5.) odpustnico ljudske šole.

Tako opremljene prošnje naj izroče prosilci najkasneje do dne 1. februarja 1928. osebno upravniku državnega trtnega nasada v Pekrah ali Kapeli, kjer se pač žele udeleževati tečaja. O sprejemu v tečaj bodo prosilci obveščeni takoj po gorenjem roku.

Tečajniki dobe koncem tečaja izpričevala o doseženi sposobnosti za opravila v vinogradništvu in sadjarstvu.

V Mariboru, dne 31. decembra 1927.

Veliki župan mariborske oblasti:  
dr. Schaubach s. r.

**Figure 2: Announcement published on 9 January 1928 in the official gazette of the authorities in Ljubljana and Maribor. It was signed by Dr. Franc Scaubach (Drašče – Draschitz, Carinthia 1881– Črnomelj 1954), who served as the last great mayor of Maribor between 1927 and 1929. During this period, he contributed considerably to the viticultural rules issued by Maribor's authorities, which represented an important socialist achievement. Later, he endeavoured to revive Slovene cooperatives. Source: *Enciklopedija Slovenije*, book 11, Ljubljana 1997, p. 11.**

Agriculture and Animal Husbandry in Rakičan amounted to 939,750 dinars<sup>3</sup>.

The vine nursery in Pekre was often visited by experts. On 10 September 1928, the nursery cooperate in St. Lovrenc in Slovenske Gorice (today's Juršinci) organized a visit of the School of Fruit-and Wine-Growing in Maribor, the power plant Fala, the nitrogen manufacturing plant Ruše as well as the School of Wine-Growing in Pekre, where the principal Janko Šumenjak showed the visitors American rootstock nurseries, vineyards, vine and tree nurseries, the hothouse, the school building and the wine cellar for wine tasting<sup>4</sup>.



Figure 3: The school's seal used in 1929

## IMPORTANCE OF THE WINEMAKING COURSE IN THE CONTEXT OF AGRICULTURAL EDUCATION

During this period, agricultural education in Maribor faced a severe crisis. After the reforms introduced by the Ministry of Agriculture of the Kingdom of Serbs, Croats and Slovenes in 1925, a secondary school of winemaking and fruit-growing in Maribor was established, which was the first and only one in the country. The former two-year school of winemaking was transformed into a one-year educational institution, just like other schools of agriculture in Slovenia. The school had modern equipment but produced only two generations of graduates. According to Ivo Zupanič<sup>5</sup>,

narrow-minded politicians closed it after the establishment of local authorities with the excuse that a regular two-year school is sufficient for Slovenia. Therefore, the school and the majority of its teachers moved to Bukovo near Negotin at the Serbian-Bulgarian border in 1928. "Politics is capable of anything", said Zupanič, who had been appointed member of the Royal Administration of the Ljubljana Banovina in 1930. This action represented a serious setback for Slovene agriculture. The loss was painful and impeded the development of viticultural educational, which had been conducted at a relatively high level for over half a century and ensured the availability of the highest level of agricultural education possible since university degree programmes in Slovenia were developed after WWII. This year, we do not honour only the 180<sup>th</sup> anniversary of the School of Viticulture established by Archduke John of Austria, but also the 140<sup>th</sup> anniversary of the establishment of the School of Fruit- and Wine-Growing in Maribor. This strategic move of the Styrian Regional Assembly is completely in line with European development guidelines at that time since various similar educational centres were established during that period, e.g. in Klosterneuburg near Vienna (1860), in Geisenheim near the Rhine in Germany (1872) and San Michele all'Adige in South Tyrol (1874). The famous ampelographer Herman Goethe<sup>6</sup> became the first principal of the Fruit- and Wine-Growing School in Maribor.

During this period, an extremely important professional meeting was organized. From 20 through 23 September 1876, the first Austrian symposium on viticulture took place in Maribor. Great credit for selecting Maribor as the location of this important event goes to Goethe.

Taking into account difficult social conditions during the second half of 1920s when the programme of the School of Fruit-and Wine-Growing in Maribor was shortened and tuition fees were introduced, the importance of the nine-month course in Pekre and Kapela for the development of viticulture and pomology cannot be denied.

Particular attention was paid to practical know-how, which enabled modern farming methods during a period in which a serious economic and viticultural crisis began to unfold. At that time, the retired principal of the School of Fruit-

<sup>3</sup> Decree on the budget for 1928 issued by Maribor's authorities, Source: Uradni list ljubljanske in mariborske oblasti, issue 10, 23 February 1928, pp. 116-117.

<sup>4</sup> Naše Gorice, a newspaper of the Society of Viticulture Maribor, illustrated monthly newspaper for the development of agriculture, Maribor, December 1928, pp. 377 – 378.

<sup>5</sup> Ivo Zupanič (Vajgen 1890 – Maribor 1986), expert in viticulture and oenology. He studied in Vienna and Zagreb, where he graduated from the Faculty of Agronomy and Forestry in 1921. He continued his studies in Klosterneuburg in Geisenheim. He was professor at the Fruit- and Wine-Growing School in Maribor (1922-28), principal of the School of Agriculture in Grm in Novo Mesto, (1932-36), inspector for viticulture in Ljutomer (1936-41) and Ljubljana (1941-45) as well as inspector with the Institute of Viticulture in Maribor (1946-59). He studied the Slovene grapevine assortment and wines, replanting methods, vine cultivation and the history of viticulture and wine trade. Source: Enciklopedija Slovenije (hereinafter referred to as ES), book 15, Ljubljana 2002, pp. 240-241. Additional information on Ivo Zupanič: Ivo Zupanič: 1890-1986, editor Sandra Kurnik Zupanič, University Library Maribor, Maribor, 2000.

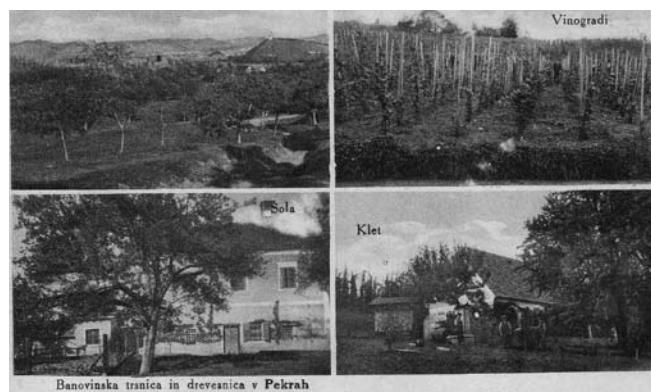
<sup>6</sup> Hermann Goethe (Naumburg 1837 – Baden near Vienna 1911), expert in viticulture, oenology and pomology and first principal of the School of Fruit- and Wine-Growing in Maribor (1872). He obtained a degree from the Academy of Agriculture in Hohenheim, served as chief gardener with the Institute of Pomology in Reutlingen, director of the School of Agriculture and Pomology Obergolitz near Dresden and as pomology professor in Karlsruhe (1865). Later he was worked in Geisenheim and became a travelling teacher of the Royal Society of Agriculture in Vienna. He was the founder of the School of Fruit- and Wine-Growing in Maribor, where he set up an experimental vineyard and selected the rootstock called *Rupestris Goethe* no. 9. In 1886, he moved to Baden near Vienna, where he became a private assistant professor of viticulture at the College of Agriculture in Vienna (Hochschule für Bodenkultur in Wien). He was manager of the Association against the Phylloxera Epidemic and co-organizer of the first Austrian Symposium on Viticulture held in Maribor in 1876. Herman Goethe was known for his organisational skills and research efforts. *Handbuch der Ampelographie* (handbook of ampelography) published in 1878 and 1887 represents one of his most important works. Between 1873 and 1882, he was chair of the International Committee for Ampelography and later the editor of various professional newspapers. Source: Gesellschaft für Geschichte des Weines; <http://www.geschichte-des-weines.de/>

and Wine-Growing Andrej Žmavc<sup>7</sup> presented his paper at the first Slovene Symposium on Viticulture held on 26 May 1929 in Krško. He discussed the need for the replanting of vineyards and said that “public vineyards, national, regional and community vineyards will have to set up larger and exemplary rootstock nurseries, which will represent the basis and guideline for privately owned rootstock nurseries, and this is possible only if winegrowers will act wisely and use advanced cultivation methods”<sup>8</sup>

This appeal to set up rootstock nurseries in order to produce high quality rootstocks became reality through the courses conducted in Pekre and Kapela. Both institutions paid considerable attention to nurseries. For this reason, many of their students became acknowledged experts on tree and vine nurseries and represented the core of this trade in the region of Podravje.

The general educational concept, which is evident from preserved lecture notes and notes on practical training, confirms this hypothesis. The curriculum included theoretical and practical knowledge on viticulture, oenology, pomology and agriculture in general. After nine months, students had to pass various exams.

The address of the school was Hrastje 6. On the first floor, there were rooms for students. On the ground floor, offices of the principal and his assistant as well as workspaces were located. On the left of the building, a hothouse and a drying room were set up.<sup>9</sup>



**Figure 4: School and estate around 1930**

The regulations for the estate of the vine and tree nursery in Pekre were formulated by senior technical assistant Božidar

<sup>7</sup> Andrej Žmavc (Kapele 1874 – Maribor 1950), oenologist and professor. Between 1897 and 1899 he attended the Vocational School of Viticulture and Oenology in Klosterneuburg near Vienna, and between 1899 and 1900 the College of Agriculture and Forestry in Vienna. Between 1903 and 1905 he improved his knowledge and skills in Germany, France and Switzerland. In 1919, he was appointed inspector with the agricultural agency of the Government of Ljubljana, between 1920 and 1928 he served as principal of the School of Fruit- and Wine-Growing in Maribor, where he introduced modernization and use of the Slovene language. He was one of the leading oenologists in Yugoslavia between the two wars, teacher of oenology, one of the founders of the Association of Viticulture for Slovenia and the editor of the newspaper Naše Gorice (1927-30). He contributed to increased quality of wine in the hospitality industry and introduced specialized terminology in the field of pomology. Source: ES, book 15, Ljubljana 2002, p. 372.

<sup>8</sup> Naše gorice, December 1929, p. 133

<sup>9</sup> Franjo Šauperl, Limbuš v ogledalu časa, Limbuš 2009, p. 161

Čulk after 1930. At that time, he was a young architect who graduated in architecture and urban planning from the Technical College in Berlin – Charlottenburg.<sup>10</sup>

## PRESERVED LEARNING MATERIA ORIGINATING FROM 1929

“By a lucky coincidence the notes of one of the course participants have been preserved. His name was Rudolf Robič, a farmer’s son from Laznica near Limbuš born in 1912. The notes remained untouched and safely stored in his suitcase for nearly 70 years. Rudolf’s sister Marija showed them to me. A diploma of his classmate Peter Jamšek from Svečena has also been preserved. The learning material consists of lecture notes on pomology, viticulture, oenology and agriculture in general. The last notebook was used as an exercise book for mathematics and geometry. The material also contains a few interesting personal notes.

Two books were used as learning material: *Vinarstvo* (Winemaking), published in 1925 by Andrej Žmavc, principal of the School of Fruit- and Wine-Growing in Maribor, and *Kletarstvo* (Oenology) published in 1924 by Bohuslav Skalicky, an agricultural councillor and principal of the National School of Agriculture in Grm near Novo Mesto.<sup>11</sup> These two books represent the most comprehensible and professional works of this period published in Slovene. As stated by the author in the preface of *Vinarstvo*, the book represents “the first Slovene textbook on winemaking”<sup>12</sup>

Interestingly, the title *Vinarstvo* (Winegrowing) is not in line with modern terminology. Nowadays, it would be referred to as viticulture since it includes information on the biology of the grapevine, nurseries, tools, pest and disease control as well as a brief overview on economics.

In addition, a diary was also found, which provides detailed insight into the practical part of the nine-month course. The first and the last entry were made on 15 March and 12 December 1929 respectively. The diary represents a comprehensive report on practical training. The entries are arranged in nine columns: date, morning, noon and evening temperature, wind direction, weather conditions, tasks accomplished, teamwork and personal notes.

<sup>10</sup> Ing. Božidar Čulk, born in 1907 in Dobrna near Celje prepared regulations for the construction of the seminary in Maribor (today’s Anton Martin Slomšek Institute) as well as drafts for the swimming complex on Maribor’s island, the building of the Town Savings Bank in Sarajevo, the building of the Sokol movement in Limbuš as well as plans and technical studies for the national health resort in Topolšica. Source: Spominski almanah slovenskih strokovnih pisateljev, publicistov in projektantov, Ljubljana 1940/41.

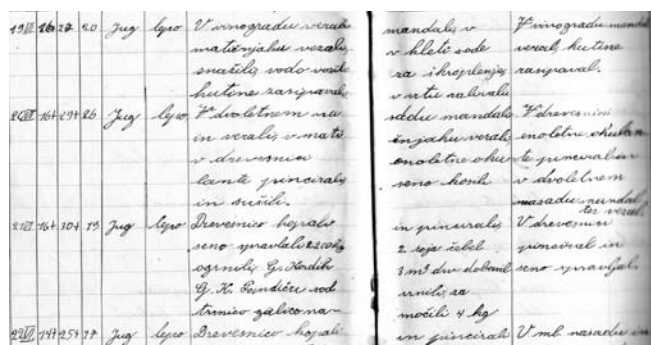
<sup>11</sup> Bohuslav Skalicky (Cerekvice nad Bystřicí, Češka 1872 – Novo mesto 1926), an expert in wine-growing and wine-making. He graduated in 1894 from the Junior College of the Viticulture and Pomology in Klosterneuburg near Vienna. From 1895, he worked in Novo Mesto, where he supervised the replanting of vineyards after the phylloxera epidemic. Between 1921 and 1926 he served as principal of the School of Agriculture in Grm. He was the leading expert in wine-growing, wine-making and fruit-growing. In addition to vineyards, he set up rootstock, vine and tree nurseries as well as wine cellars. He hosted an exhibition devoted to Slovene vines in 1909 in Prague. Source: ES, book 11, Ljubljana 1997, p. 92.

<sup>12</sup> It is an adapted and amended translation of the first part of the German book *Weinbau und Weinbehandlung* (wine-growing and wine-making) by Franz Zweifler, the last German principal of the School of Fruit- and Wine-Growing (1899-1919).



On 2 May 1929, the morning, noon and evening temperature was 6 °C, 15 °C and 14 °C respectively, wind: south-westerly, changeable weather. Under teamwork it states: “We carried out grafting, put grafts into the nursery and planted grafts in the vineyard, ploughed, harrowed and applied fertilizers.” Personal note under individual work: “I grafted and put the grafts into the nursery.” Under personal notes it says: “We have received the money.” An interesting entry was made on 16 May 1929: “We planted grafts and pruned vines. Although pruning was an unusual vineyards task for May, it makes sense when taking into account the severe frost in 1928/29, which meteorologists described as one of the sharpest in the 20th century. Frost damage was enormous and experts advised wine-growers to start pruning after the grapevines had begun to sprout.<sup>13</sup>

From 18 through 20 May, Rudolf Robič took three days off, which is evident from his diary entry. On 26 May he wrote “I didn’t go to work”, and one day later he wrote “I have received clean clothes”. On 10 June he wrote “I noticed the first flower cluster in the vineyard”, and on 24 June “The vineyards was sprayed with 1% solution of lime and sulphur and a 2% solution of blue vitriol. On the same days he also wrote “I noticed a 3-4 days old downy mildew in my neighbour’s (Ivan Robič) vineyard”. In his diary entry of 27 May he states that “vines in the nursery were sprayed with a 1% solution



**Figure 5: Rudolf Robič's diary entries (19 June – 22 June 1929)**

of blue vitriol, and ditches near the municipal spring were cleaned.” The diary entry of 28 May reads “I was at work and carried out trellising”, while the entry of 5 June reads “Jamšek sprayed vines in the nursery with a 1.5% solution of tobacco extract and a 1% solution of soft soap”. On 21 July he wrote “On Sunday we made a trip to Pohorje.” and on the 3 August “Parent grapevines were trained and apples were harvested and pressed (cider)”. In his entry of 8 August he notes that “We heard cricket chirping for the first time this year, and grapes already began to soften and colour.” On 12 August he wrote “We set up a bird-scarring rattle (Slovene term:

<sup>13</sup> Records reveal that the winter was one of the most severe in the 20th century. Over Christmas 1928, the temperature decreased considerably. Minimum temperatures were recorded between 11 and 18 January 1929. After 25 January, the temperatures rose, but on 3 February the temperature in Maribor fell to -24°C. In the beginning of March, the temperature in Maribor decreased to - 18.1°C. Due to winter frost, wine froze in poorly insulated cellars. Additional information: Miran Trontelj, *Kronika izrednih vremenskih dogodkov 20. stoletja*, Institute of Hydrology and Meteorology of the Republic of Slovenia, Ljubljana, 1997

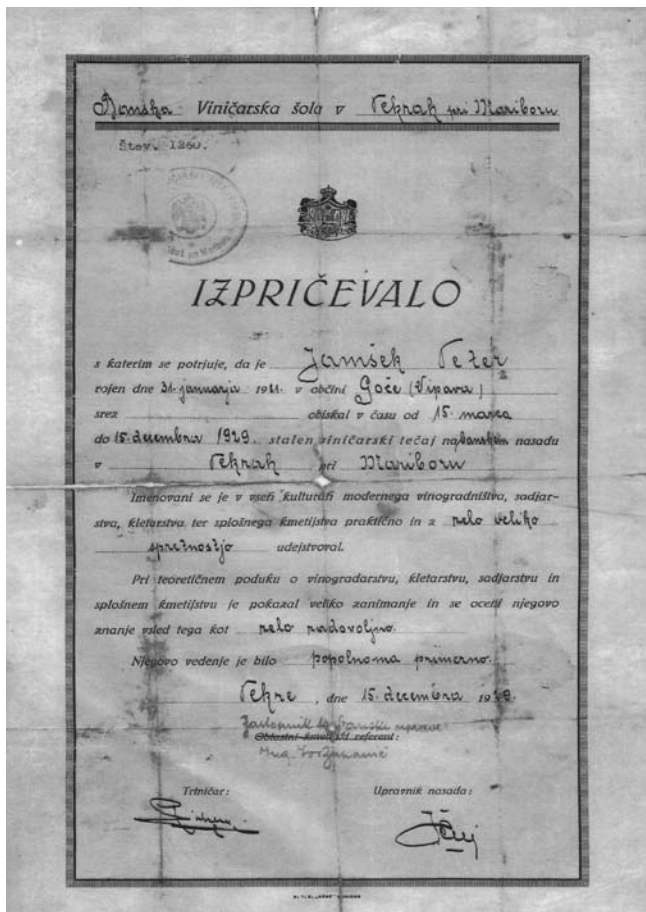
klopotec) in the vineyard” and on 5 September “We went to a trade fair in Ljubljana”. The following three entries are also extremely interesting: the entry of 23 September reads “On Monday, we made a trip from Pekre to Gornja Radgona. We visited Mr. Bovir, his champagne cellar and vineyards. We also visited Plitvica and Janežperg (Janžev Vrh). We stayed the night in Kapela. On Tuesday morning at 4 a.m., we left for Radenci by train and drove to Ljutomer where we went on foot to the vineyards of Jeruzalem and from there to Ivajnkovci and by train to Limbuš. We stayed the night in Pekre. On Wednesday morning we visited the governmental vineyard in Pekre and went to see Mr. Žigert, the caretaker at the Meranovo estate. Then we went to Limbuš to Mr. S. Robič, and in the afternoon we visited the School of Fruit- and Wine-Growing in Maribor and that was the end of our trip.”

7 October: “Determining the sugar content of must from Laznica: Šipon (Furmint) 19.3%, Laški rizling (Welsh Riesling) 21%, Zelene Silvanec (Sylvaner) 22.5%, Zelene Silvanec (Sylvaner) from Dramle (Dramlje) 17%, Zelene veltlinc (Grüner Veltliner) 22 %, Modra frankinja (Blaufränkisch) 16%, Chasses 17%, Peček 17,8%.” 10 October: “First snowfall covered Pohorje.” 30 October: “Vines were dug out from the nursery.” 6 November: “Grafts were dug out, Renski rizling (Rhine Riesling) - Riparia portalis, 1st class: 6450 exemplars.” 19 November: “We finished digging out grafts from the nursery.” 9 November: “Viticulture exam.” 11 November: “Oenology exam.” 12 December: “Pomology exam.”

In one of the books, Rudolf Robič saved a draft letter to his brother who served in the army at that time. He wrote “Dear brother, the sad nine months passed and now I feel happy again. I must inform you that I will take the last exam on 14 December. Parents are invited to be present at the exam. For the last few days we were erecting posts, and now we will be learning for the entire week. This week will therefore be the hardest but I hope everything will work out fine.” A graduation ceremony followed. The preserved diploma from Rudolf’s classmate Peter Jamšek from Svečina dates back to 15 December 1929. It was signed by Ivo Zupanič, a representative of the Royal Banovina Administration, teacher Pihler and principal Janko Šumenjak.



**Figure 6: Rudolf Robič (1912-1989), course participant in 1929 and farmer from Laznica near Limbuš**



**Figure 7: Diploma of the course participant Peter Jamšek from Svečina**

## PRESERVED LEARNING MATERIAL FROM THE ESTATE OF THE ŠUMENJAK FAMILY

A series of photos from various generations have been preserved from the estate of the deceased Mrs. Zora Šumenjak (married name: Žibert), daughter of the estate manager Janko Šumenjak. Unfortunately, not all persons on the photos could be identified. However, the photos are nonetheless interesting



**Figure 8: Group photo of course participants taken in 1930. In the middle: principal Janko Šumenjak (1888 – 1959) and on his right teacher Pihler**

since the posture of the participants reflects their pride in completing the course.

The estate manager Janko Šumenjak, born in 1888, attended the Carniolan School of Viticulture, Pomology and Agriculture in Grm near Novo Mesto between 1906 and 1907. Later, he was employed as nursery manager and national nursery labourer at St. Ana in Kremberg (today's St. Ana in Slovenske Gorice) between 1909 and 1910 and in Zrkovci between 1914 and 1919. For a short period of time, he also worked as manager in Zavrch.<sup>14</sup> In addition, he worked as correspondent for *Naše gorice*, a monthly newspaper, which was published in order to stimulate agricultural development, the periodical of the Association of Viticulture for Slovenia and the periodical of the School of Fruit- and Wine-Growing in Maribor. In October 1930, he warned wine-growers not to underestimate the role of nurseries and selection. "Scions must not merely be healthy; they must be cut off from a vine bearing well developed and healthy grapes year after year. Such grapevines are usually strong and healthy throughout their development, and therefore it is almost certain that their excellent qualities will be transferred to the propagated varieties. Especially October (before harvesting) is the appropriate month for the selection of scions. Vineyards are full of grapes. Wine-growers must take the time to mark the highest yielding varieties with plates or paint them with oil paint. If this task is carried out continually and if only scions of marked vines are used for propagation, abundant crops can be harvested to the satisfaction of wine-growers."<sup>15</sup>

An article in the November issue states: "Pekre, 27 October 1930. Grapes were harvested. The harvest can be described as average both in the quantitative and qualitative sense since the sugar content of most from multi-varietal vineyards on adequate location amounted to an average of 19%, whereas the sugar content of most produced from high quality grapes (Renski rizling (Rhine Riesling), Rulandec (Pinot gris), Beli burgundec (Pinot blanc), Silvanec (Sylvaner)) amounted to an average of 22%. The level of acidity amounting to 8-12 g/l will decrease considerably during fermentation. Despite the relatively good crop, most is difficult to sell. Merely small



**Figure 9: Parent vineyards with American rootstock, in the background Pekrska Gorca**

<sup>14</sup> The period of employment has been determined on the basis of correspondence items sent to Šumenjak's various addresses.

<sup>15</sup> *Naše gorice*, October 1930, pp. 174-175

amounts were sold for 6 - 8 dinars per litre. The cellars are full and wine-growers and other estate owners, with the exception of fruit-growers who had more luck this year, are facing an uncertain future.<sup>16</sup>

## THE UNCERTAIN FUTURE OF THE SCHOOL PRIOR TO THE OUTBREAK OF WWII AND ITS UNFORTUNATE ENDING

The second half of the 1930s gave rise to uncertainty regarding the existence of the institution in Pekre. An article in the newspaper entitled *Domovina* (homeland) states "Recently, local wine-growers are exhaustively discussing the future of the vine and tree nursery in Pekre. The estate used to belong to Benedictine monks at St. Paul in Carinthia. After the subversion, national property was expropriated, and the agricultural expert Anton Šumenjak was appointed estate manager in 1921. He renovated the abandoned estate and set up an exemplary vine and tree nursery. Large amounts of money had been spent for the establishment of this blooming institution. Recently, rumours began to spread that the estate will come into the possession of German Benedictine monks once again. This issue was discussed at the meeting of Maribor's branch of the Association of Viticulture chaired by President Dr. Josip Kranvogel. During the heated debate about burning viticultural issues, the retired school principal Mr. Godec from Limbuš stated that, according to various assertions, an institution will be established next year when the estate will come into the possession of Benedictine monks. Godec tried to convince them that the Banovina must buy the vine and tree nursery from the monks. In the opposite case, a similar institution must be established. This proposal facilitated a lively discussion, and Mr. Priol, principal of the School of Fruit-and Wine-Growing in Maribor, explained that the Banovina is aiming to keep this institution alive. However, if this could not be accomplished a similar institution shall be set up at an estate called Račji Dvor, which was bought from the Admont Abbey. Cross-border experts are expecting a feasible solution. At the same time, they are expressing their deep regret if this exemplary vine and tree nursery should be abandoned."<sup>17</sup>

Principal Priol tried to provide the worried participants with comfort. Most likely, he knew about the discussion held at the February meeting of the Banovina Council, where the above mentioned issue was debated. The request of the Society for Agriculture for the preservation of the nursery in Pekre was refused. At the budget meeting of 14 February 1938, the Banovina Council chaired by Ban Dr. Marko Natlačen also discussed the future of viticulture. The Council discussed most heavily the issue of loans for the replanting of vineyards. In his speech, the Ban emphasized that the administration will promote viticulture by enabling poor wine-growers to replant their vineyards. For this purpose, a fund amounting to one million dinars was established in order to ensure interest-free loans. "These loans will be granted only to wine-growers who cannot afford to replant

their vineyards and whose vineyards are located on grounds unsuitable for other crops. Therefore, two vine nurseries will be set up in Styria – one in the vicinity of Ptuj and the other near Šmarje. The vine nursery in Pekre near Maribor will operate until the end of 1939."<sup>18</sup>

In the year in which the nursery was suppose to close its doors, a natural disaster stroke. In August, the nursery was infested with pest – white grubs, which destroyed three quarters of 160,000 grafts. "The manager ordered to dig out two wagons full of destroyed vines. The cost of the damage definitely amounts to approximately 50,000 dinars."<sup>19</sup>

Despite clear intentions of politicians unwilling to provide loans and the pest infection, the vine and tree nursery continued to exist. Even during WWII and the first post-war years, it operated further albeit in a smaller extent. The period of wine-making courses also continued. During the war, they were conducted by Janko Šumenjak. A 1959 report in the newspaper *Ptujski Tednik* stated that nursery labourer Šoštarič had been engaged in grafting for 24 years. The work of his team and two others from the Nursery Sector of the Agricultural Cooperative in Juršinci became famous throughout Slovenia. Until a nursery was set up in Vrhpolje in Vipava, many wine-growers had to go to the region of Primorska in order to carry out grafting. Šoštarič learned how to graft at the former vine and tree nursery in Pekre, where numerous young men from Juršinci wanted to familiarise themselves with viticulture, oenology and pomology in 1943.<sup>20</sup>

Franček Holc (1914-1984) from Zagorci was another famous nursery labourer from Juršinci who expanded his knowledge in Pekre prior to the outbreak of WWII.<sup>21</sup>

After the school closed its doors by the end of 1946/47, the estate along with the buildings was handed over to the Agricultural Holding in Pekre and came, after a series of reorganisations, into the possession of the Agricultural Combine in Maribor. Later, it was taken over by the Vinag company. In accordance with the Denationalisation Law adopted in 1990s, the estate came into the possession of Benedictine monks. They bought the former school building in 2008. Here, the company Benediktinski dvor, d.o.o Limbuš, plans to build a wine cellar.<sup>22</sup>

According to a statement of the deceased Mrs. Zora Šumenjak, her father said goodbye to the last generation of course participants in 1947.

At that point, the era of the School in Pekre came to an end despite the fact that it provided future farmers and other young people with basic theoretical and practical knowledge for free or by providing a meagre scholarship. Many of them became excellent nursery experts and teachers of younger generations. In addition to their broad intellectual horizon and self-esteem, they became acknowledged experts with practical know-how. In a structured and stimulating learning

<sup>18</sup> *Slovenski gospodar*, Ljubljana, 16 February 1938

<sup>19</sup> *Slovenski gospodar*, Ljubljana, 30 August 1938

<sup>20</sup> *Ptujski tednik*, 17 April 1959

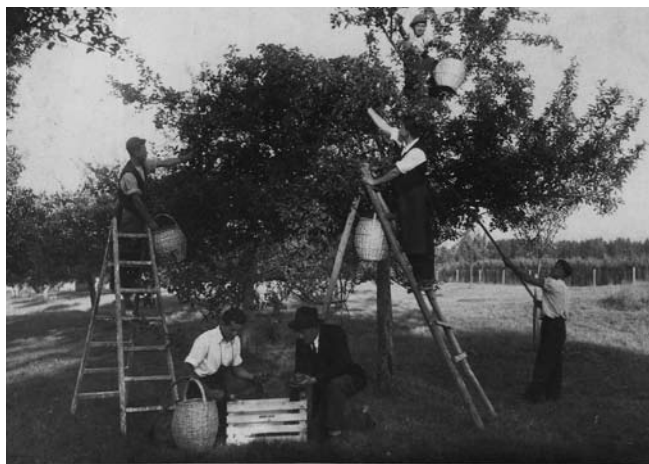
<sup>21</sup> *Tednik*, 16 August 1984

<sup>22</sup> *Franjo Šauperl*, Limbuš v ogledalu časa, Limbuš 2009, p. 123

<sup>16</sup> *Naše gorice*, November 1930, pp. 196

<sup>17</sup> *Domovina*, issue 21, Ljubljana, 5 May 1938

environment, they soon turned into people with a clear vision, which has been described by the 17 year old Rudolf Robič nicknamed Trbosov Dolfenk from Laznica near Limbuš in a letter written to his brother in 1929: “Next year, if I shall maintain my health, I will set up a vine and tree nursery provided that mother and father give their consent. At least, now I know how to carry out vineyard and other tasks correctly ...”



**Figure 10: Participants of Course in school orchard in 1930**

## FROM COURSE PARTICIPANTS TO DOCTORS OF PHILOSOPHY

In the decades following the closure of the school, the only thing left were the affectionate memories of its former pupils. Even nowadays, the former estate is being referred to as “the old school”. In the first half of the 20th century, the wider region of Pekre and Limbuš was offered a third opportunity to become an important educational centre of viticulture and oenology in 1832 (on the initiative of Archduke John of Austria). This opportunity arose due to the fact that a Junior College of Agronomy was established in 1960 in Maribor, which belongs to one of the founding member institutions of the University of Maribor. The forerunner of today’s Faculty of Agriculture and Life Sciences was transformed into a College of Agriculture, which was the only Slovene educational institution offering a four-year degree programme in agriculture. Its successor, the Faculty of Agriculture, was formally established in 1995 by a decision of the Parliament of the Republic of Slovenia. It developed into a modern educational and research institution. Unfortunately, its development was hindered due to limited space in the building on Vrbanska Street 30, for which a denationalisation request was submitted by the Diocese of Maribor. Due to the relocation of the Faculty to the Hompoš Castle in the Municipality of Hoče – Slivnica, new development opportunities arose. In 1994, the University of Maribor acquired the estate called *Pohorski Dvor* (Pohorje Court) with the belonging vineyards and buildings at Meranovo.

Due to problems during renovation, the Faculty began to operate later as planned. On the 1 December 2008, the Faculty finally moved to the new estate where hands-on training is being conducted. Students may also complete part of the

programme requirements at partner universities in order to broaden their horizon and experience life in an international learning environment. Many foreign students at various levels also attend this Faculty. Until now (in almost half a century), over 3500 students graduated from this Faculty.

Taking into account our historical heritage, the present University Centre for Viticulture and Oenology at Meranovo continues the tradition dating back to 1832. Learning contents focus on fundamental knowledge in the field of viticulture and oenology. The degree programme Viticulture and Oenology provides students with basic knowledge of optimal wine-growing, processing of grapes and maturing of wine in accordance with climate change and the European environmental guidelines. The Faculty offers practical training in grape selection, vine propagation, equipment and mechanisation, vineyard tasks as well as maturing of wine. In addition, the Meranovo estate represents an excellent learning environment for practical courses conducted under other degree programmes focusing on basic and applied sciences, such as biology, pedology, chemistry, varietal selection or climatology. These programmes provide fundamental knowledge of modern cultivation techniques and research work in the field of viticulture and oenology.

Replanted vineyards and other facilities for the processing of grapes and wine-making create a modern and high-quality learning environment. Since 2002, the vocational programme Viticulture, Oenology and Fruit-growing (since 2006/2007 as a Bologna programme) as well as various others offered by the University of Maribor are being conducted at the Meranovo estate.

Between 1994 and 2012, 104 students of either the vocational or academic degree programme have graduated. During this period, two postgraduate students obtained their MSc degree, and one student completed the master’s (second-cycle) Bologna programme. During this period, 29 exchange students from France, Spain, Portugal, Serbia, Croatia and Czech Republic attended the Faculty. 19 foreigners have passed exams in viticulture or oenology, and 10 exchange students completed their internship programmes at this estate.

In addition to the learning process, research work is also being conducted within the framework of national projects and projects with a wide range of practical applications. In terms of scientific research, considerable attention is being paid to the testing of new varieties for the production of wine or table grapes. In addition, a gene bank for a grapevine with over 400 different genotypes has been set up. While introducing new teaching and research methods, the institution is preserving both the historical memory of Styrian viticulture and the Slovene cultural heritage. The visit of Otto von Habsburg<sup>23</sup>, his wife and other family members can be considered a remarkable tribute to Archduke John of Austria. In 2002, he visited the estate at the invitation of Dr. Ludvik Toplak, the former Rector of the University of Maribor.

During the past two centuries, the tradition that began with the winemaking course in Pekre and Limbuš in the first half of the 19<sup>th</sup> century developed drastically. Further courses provided farmers, nursery workers and others with detailed knowledge. During the past 140 years, an

extremely important role was being played by the School of Fruit- and Wine-Growing in Maribor and its successors. The idea of deep roots was supposed to live on despite a few unreasonable interruptions. In this respect, agricultural education is similarly tenacious as the grapevine, which gets through good and bad times. Especially nowadays, this is an insightful and important observation.

While enjoying the view from the Meranovo estate in the direction of the Styrian capital (despite dense vegetation it is still surrounded by a “crown of grapevines”, as described by Maribor’s first bishop Anton Martin Slomšek in 1859), one should remember the words of the historian and expert in classical philology Prof. Dr. Jože Mlinarič. On the basis of preserved archive material, he confirmed that grapevine is being cultivated continually for more than thousand years on the northern outskirts of Maribor, from Bresterica to Vurberk. In this region, wine-growing is an economic activity with the longest tradition. We must pay affectionate tribute to its past and demonstrate our genuine commitment and hope for the future. Thus, we will prove worthy of our famous ancestors, and maybe we will be given tribute by all those who will continue this tradition for decades and centuries to come.

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<sup>23</sup> Otto von Habsburg (Reichenau an der Rax, Austria-Hungary 1912 – Pöcking, Germany 2011). The Austrian writer, publicist, politician and eldest son of Charles I, the last Emperor of Austria and King of Hungary, the last Crown Prince of Austria-Hungary from 1916 until the dissolution of the empire in 1918. He remained the Crown Prince of Hungary until the deposition of the Habsburgs in Hungary in 1921. His full royal title was Franz Joseph Otto Robert Maria Anton Karl Max Heinrich Sixtus Xavier Felix Renatus Ludwig Gaetan Pius Ignatius von Habsburg, Crown Prince, Archduke of Austria and the Crown Prince of Hungary. He was a citizen of Austria, Germany and Croatia. Between 1922 and 2006, he was Head of the Imperial House of Habsburg. During his visit of the Meranovo estate on 24 May 2002, he was awarded the title Senator Honoris Causa of the University of Maribor for his contribution to the development of humanities and peace in Europe as well as his research work and support for the international recognition of Slovenia. The title was awarded on the proposal of the Faculty of Agriculture and Life Sciences. Source: <http://www.otto-vonhabsburg.org/> and the speech of Prof. Dr. Ludvik Toplak entitled *Beseda rektorja prof. dr. Ludvika Toplaka ob slovesnosti ob 170-letnici kmetijskega šolstva* (slavnostni nagovor), Maribor, 24 May 2002.



# An overview of ampelographic research and modifications of grapevine assortment

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## ABSTRACT

Ampelography is the science field of botany concerned with the identification and classification of grapevines. It focuses on descriptions of individual varieties and rootstocks. Due to different names attributed to particular varieties, it has been extremely difficult to identify grapevines both in practice and in expert literature. More common varieties were given various new names and synonyms. For this reason, considerable confusion has been created in terms of nomenclature. In the beginning, experts endeavoured to overcome these difficulties with the help of ampelographic collections. Later, a more systematic approach had been applied. One of the pioneers in this field had been Franz Trummer, who described in detail 282 varieties in Styria (1841). During this period, varieties from the Rhineland had been added to the assortment. Soon after, Matija Vertovec summed up descriptions of varieties according to Trummer in his publication entitled *Vinoreja* (Winegrowing) published in 1844. This publication represents the first Slovene work on viticulture. At the 1873 winegrowers' congress in Vienna, an International Ampelographic Commission was set up to international coordination of denomination of vine varieties. Names of varieties from the region of origin had been taken as the prime name, while all other names were regarded synonyms. Hermann Goethe became Managing Director of the Commission and publishes pioneering documentation into viticulture and origins of vine varieties in our latitude. This ampelographic glossary, which was drawn up in 1876 in Maribor, represents one of the Commission's first achievements. At the 1879 winegrowers' congress in Budapest, a classification system was adopted according to which all varieties were classified into three groups depending on the shape of the grapes, the shape of the leaves and the pilosity of leaves. This Congress also confirmed the procedure for grafting grapevines onto American rootstock as the most suitable way of protecting vines against phylloxera. After the onset of phylloxera, the assortment had changed considerably, and the number of varieties had been reduced. Wine-growers tried to improve the quality of wine by introducing new varieties. Following expert discussions, Anton Stiegler put forward a suggestion for the assortment in 1904, which was published in 1905 by Franz Zweifler, the principal of the School of Fruit- and Wine-Growing in Maribor. It was translated into Slovene by Ivan Bele. By that time, Franz Zweifler was already recommending that wine-growers plant only two or three varieties. The transfer of knowledge at that time played an important role in agricultural companies, experimental estates and schools, starting with the first School of Viticulture in 1832.

Key words: grapevine, ampelography, grapevine varieties

## INTRODUCTION

Ampelography (ampelos = vine; graphos = writing) is a science dealing with research into species and varieties of the genus *Vitis* L. and other grapevine varieties. It deals with the results of research into origin and classification of grapevines as well as with descriptions of individual varieties and rootstocks. Polymorphism of grape species and varieties, which represents one of the main reasons for the huge amount of synonyms, had been dictating ampelographic research for ages. The first classifications of varieties were produced by writers from Ancient Greek and Rome (Theophrastus 375-297; Vergilius 70-19; Pliny and Columella during the 1<sup>st</sup> century.). In his second book entitled *Georgics*, Vergilius described 15 varieties, while Pliny the Elder classified around 80 in his encyclopaedia entitled *Naturalis Historiae* (Natural History), which purports to cover the entire field of ancient knowledge, based on the best authorities available to Pliny. In his *De Re Rustica* (Agriculture), Columella was the first to describe in detail and classify the existing varieties, among

which a variety similar to Pinot noir in Burgundy can be found as early as in the 1<sup>st</sup> century. It is also mentioned by Pliny under the name *Vitis allobrogica*. Ancient Romans were familiar with this variety under the name *Helvenacia minor*, which was vinified as early as in the 1<sup>st</sup> century. Although the descriptions are in many aspects incomplete, they can very well be regarded as the beginnings of ampelography (Vršič, 2008). In the 15<sup>th</sup> century, Petrus de Crescentius described 40 varieties growing in the vicinity of Bologna in his *Opus Ruralium Commodorum*. Works from Varro, Columella and Palladius served as the basis for this publication. In the 16<sup>th</sup> and 17<sup>th</sup> centuries, varieties were classified by the Spaniard Monza de Herrera in his book *Agricultura generale*. After this period, various other authors followed – Baccio described the most common varieties of wine-growing countries, Cupani (*Hortus catholicus*) classified varieties from Sicily, and Garidel described varieties in the French region Provence, Estiene, Herresbach, Colerus, etc. (Truger, 1990).

According to the International Code of Botanical Nomenclature, the grapevine belongs to the *Vitaceae* family. The systematics of the *Vitaceae* family is based on the 1887 classification developed by Planchon, which contains 10 genera. Grapevine (*Vitis vinifera* L.) belongs to the genus *Vitis* L. which has more than 60 species. Only *Vitis vinifera* L. originates from Eurasia and has been spread by mankind all over the world. For many centuries, this species was being vegetative propagated, but hybridization had little impact on the assortment (with the exception of rootstocks). Nowadays, there are around 10,000 varieties, of which the majority is merely of local importance. Only a few of them are of international importance, such as Cabernet Sauvignon, Chardonnay and Pinot noir from France and Riesling from Germany.

Today, Pinot noir is the first fruit plant with a known nucleotide sequence in the entire genome (Jaillon et al., 2007). Decoding the entire genome enables the identifications of genes that impact the most important characteristics when cultivating vines, e.g. resistance to diseases. Genome identification means a new area of refinement, which will greatly impact the future of vine cultivation.

The aim of this work is to identify assortment changes in Styria (both the Austrian and the Slovene part) and the potential future modifications on the basis of an ampelographic overview. The hypothesis that ampelography, including collections and research centres transferring detailed and scientifically proven variety features, had a considerable impact on the spreading of individual varieties or grapevine assortment has been put forward.

## AMPELOGRAPHIC STUDY

### Naming of varieties

While vine cultivation spread around the globe, individual varieties had been named and new ones had been cultivated over the centuries. Due to different names attributed to the same varieties in different regions, difficulties appeared when using names or identifying varieties both in practice and expert literature. The most common varieties were attributed tenths of new names and synonyms. Thus, original names disappeared and were replaced by new ones – mostly local ones. For this reason, considerable confusion was created in terms of nomenclature. In the beginning, experts endeavoured to overcome these difficulties with the help of ampelographic collections (Olivier de Serres as early as 1600, Rosier in 1780).

Rosier began to apply this approach. He planted a collection in order to compare varieties and give them one name only. Unfortunately, his collection had not been a success, but he is nonetheless regarded as one of the first collectors. Various other collections in French wine-growing regions followed and contributed to the identification of synonyms. In the late 19<sup>th</sup> century, collections from other wine-growing regions followed, but the majority of vineyards were destroyed by the phylloxera epidemic (the largest one with 3,300 varieties in Alba, Italy). In Slovenia, grapevine assortment is closely connected not only to historical development but also to political circumstances in individual regions. The majority

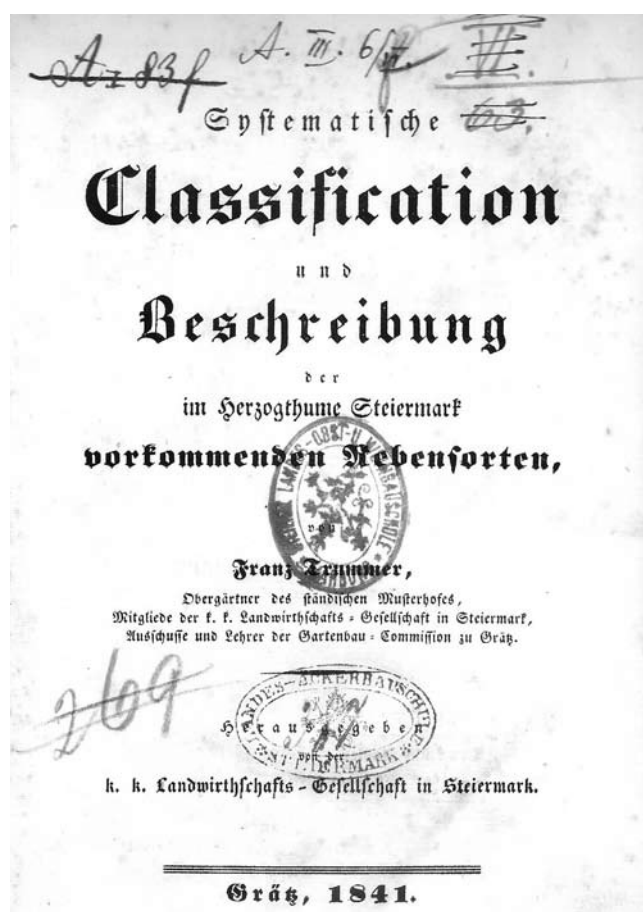


Figure 1: Ampelography by Trummer (1841)

of varieties spread to this area from other wine-growing countries (some of them quickly domesticated). There are only few indigenous varieties.

### Development of ampelography

The first descriptions of varieties and the beginnings of ampelography have already been explained in the introduction. Up to the 18<sup>th</sup> century, European descriptions focused merely on morphological characteristics of individual varieties. As early as 1661 in Leipzig, F. J. Sachs was the first to use the term “ampelography” and therefore he is regarded as the father of ampelography. The oldest and most complete description of varieties from the Austrian territory originates from 1777. It was produced by Dr. Sebastian Höbling in Prague. Although the book includes many valuable descriptions, those of varieties from the Slovene territory are lacking in detail since he focused mainly on varieties from Baden. Varieties were classified depending on colour and shape of berries. During the same year, the less useful *Viticulture-Catechismus* (*Weinbau-Katechismus*, Hildebrand, Leipzig 1777) was published. In 1782, Duhamel du Monceau described merely 14 French varieties, but he adopted a more systematic and detailed approach and included pictures of individual varieties. He laid the foundations for ampelography as a scientific discipline. An important guide to Styrian viticulture was the book *Praktisches Lehrbuch der gesammten Landwirtschaft, dem Landwirth in der Steiermark gewidmet* (Practical Textbook of Agriculture for Styrian Farmers from). It was written in 1793



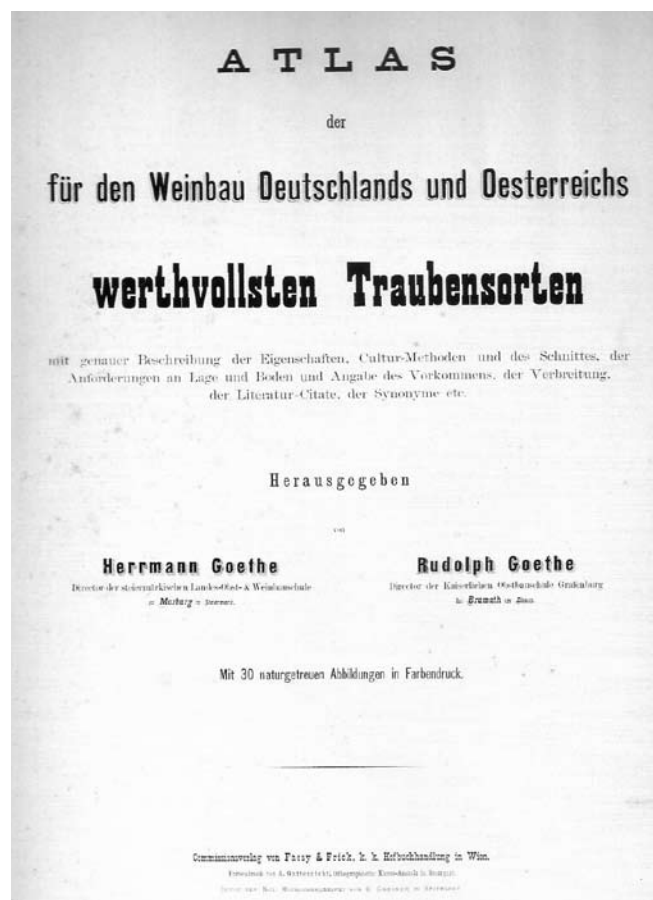
by Gottfried Mayer. In Spain, Joseph Valcarcel described 100 indigenous and foreign varieties in his book entitled *Agriculture Generale* (Truger 1990).

In the 19th century, various authors completed the above mentioned works on the basis of their own experiences and the experiences of others. In 1801 in Paris, the chemistry teacher J. A. Chaptal published a book on viticulture. In the Paris-based botanical garden Palais Luxembourg, he planted around 2000 varieties and described them in his work. One of the first most important works of this century entitled *Versuch einer Klassifikation der Weinsorten nach ihren Beeren* (An Attempt to Classify Vine Varieties Depending on Berries Characteristics) had been written by Christian Frege in 1804. In 1808, Dr. Simon Roxas de Clemente laid the scientific foundations for ampelography by describing Andalusian varieties (the French translation was published in 1815). The chapter on ampelographic terminology was of the utmost importance for the development of viticulture. In 1821, Mascon translated this work into German at the request of Archduke John of Austria. Freiherrn von Moscon aimed to describe Styrian varieties and compare them with foreign ones. For this purpose, he planted varieties from Rhineland and France in an experimental vineyard in order to identify individual varieties easily, but he never finished his project. As early as 1820, his enthusiastic successor Tomas Forreger produced a topographic-agricultural description of vineyards in Pekre and thus finished the work of his predecessor.

Many other famous ampelographers followed. In Italy, varieties were classified by Josef Acerbi (1825), in Hungary by

Franz Schams (1832 and 1833 in two parts), in Germany by Philipp Bronner, in Austria by Ritter (1821), etc. A complete and systematic description of Austrian varieties was produced by Franz Ritter in 1821, who described 40 most common varieties in the wine-growing regions of the monarchy. During this period, various experts, ampelographers and scientists focused on Styrian viticulture, which had an immense impact on the development of professional literature. These men came from the ranks of Archduke John, who developed a strong liking for viticulture.

In 1824 in Graz, Franz Xavr Rath's work was published, which provided helpful information on viticulture, nursery management in the characteristics of individual varieties (e.g. proliferation and ripening) in an extremely practical manner. Dr. Edler von Vest, a botany professor from Joanneum, came up with the suggestion to describe indigenous varieties. His proposal was accepted at the 10th meeting of the society in 1824. In 1826, he wrote the book entitled (An Attempt to Systematize Vine Varieties from Styria) at the request of the Styrian Society for Agriculture in Graz. At the request of the Archduke, Dr. Edler von Vest compiled a list of Styrian varieties, described them and alphabetically ordered their synonyms. During this period, other works were published (Gock 1836, Babo and Metzger 1836, Burger 1837, etc.), but they were not as scientifically accurate as Dr. Edler's. Especially Gock's ampelography published in A1 format with descriptions and pictures of 30 varieties sets itself apart from the others. However, his successors were the true pioneers of this period – Franz Trummer, Dr. Franz Xaver Hlubeck, who also gave lectures on agriculture at the seminary in Ljubljana (1833-1840), and Herrmann Goethe by the end of the century. Due to deficiencies concerning descriptions in existing works, a few years later (between 1835 and 1839) Franz Trummer studied in detailed the most common varieties in Styria on the basis of L. Babo's and I. Metzger's methodology. Up to this day, his 1841 *Systematische Klassifikation und Beschreibung der im Herzogthume Steiermark vorkommenden Rebensorten* (Systematic Classification and Description of Vine Varieties from the Duchy of Styria) (Fig. 1) is considered pioneering research in the field of identification and systematic classification of vine varieties. The book contains 282 varieties planted in the ampelographic garden of the Styrian Society for Agriculture in Graz, which was set up at the request of the Archduke John of Austria. This is an extremely large number for such a relatively small area. Such an assortment proves that viticulture at that time was relatively primitive. This ampelography also describes varieties grown in the Region of Dolenjska and Primorska. The publication, which was amended in 1855, contains pictures produced by the Kreuzer brothers. The pictures show characteristics of certain varieties that are nowadays extinct. This ampelography is also interesting since Slovene synonyms of varieties are written in Latin, while the rest is written in Gothic. On the basis of this fact it can be concluded that varieties with Slovene names were already known and grown in this region during that time. In today's assortment, Šipon (Furmint), Žametovka (Blauer Koelner), Rumeni muškat (Yellow Muscat) and Refošk (Refosco) are especially important, while Renski rizling (Riesling), Traminec, Sauvignon Blanc and various Pinots had just started to spread across Styria. For



**Figure 2: Ampelography by Herrman and Rudolph Goethe (1873)**

**Table 1: Varieties from the collection of the Kreuzer Brothers with German and Slovene names and names used at the Archduke's estate (Meranovo) and its surroundings**

Name (German)	Name (Slovene)	Name of the variety at Meranovo and its surroundings
Blaue Zimmttraube	Vranek (mala modrina, velika kavka)	Vranek (Pekre and the Limbuš Hills)
Blauer Blank	(velika) Modrina (plesovna)	Blank (Vrhov dol, Pekre, Hrastje, in the parish of Limbuš)
Blauer Köllner (größer)*	Žametovka (žametna črnina, modra kavčina)	Črni zelenjak, velika Plava (Pekre)
Eichenblättrige Tantowina	Tantovina (vrbovec, javšovec)	Vervovšek (Vrhov dol, Hrastje, Pekre, in the parish of Limbuš)
Gelber Muskateller*	Rumeni muškat (beli muškat)	Weisser muscateller (Pekre, Hrastje, v fari Limbuš)
Geschlitzblättriger Gutedel	Peteršiljasta žlahtnina (peteršiljka, španjol)	Španier (Meranovo, Vrhov dol, Hrastje, Pekre, in the parish of Limbuš)
Großer grüner Heiner	Zelenika (debeli zelenjak)	Zelenika (Meranovo, Vrhov dol, Hrastje, Pekre, in the parish of Limbuš)
Grüener Sylvaner*	Zeleni silvanec (mušca, zeleni klešec, zelenič)	Zelenič (Pekre, Limbuš)
Grüner Kanigl	Zeleni hrustec (krhlikovec, muhovec)	Muhovec, Jaušovec (Meranovo, Vrhov dol, Hrastje)
Helbgeschlitzblättriger Gutedel	Peteršiljasta žlahtnina (peteršiljka, španjol)	Španier (Meranovo), Grosser Španier (Vrhov dol, Hrastje, Pekre, in the parish of Limbuš)
Möhrchen*	Modri pinot (modri burgundec, modra klevna)	Blauer Burgunder (Vrhov dol pri Limbušu)
Rother Köllner	Rdeča kavčina (ranful)	Aranka Formint (Meranovo)
Rothstieliger Dolcedo*	Debeli refošk	Refosco- (Vrhov dol, Hrastje, Pekre, in the parish of Limbuš)
Schwarzer Alben	Črna belina (velika črnina, velika kavka)	Velika Kavka (Meranovo, Vrhov dol, Hrastje, in the parish of Limbuš)
Weiser Traminer	Beli Traminec	Weiser traminer (Pekre)
Weißer Schapatna	Bela šopatna (šopatna, bela modrina)	Beli Blank (Vrhov dol, Hrastje, Pekre, fara Limbuš; Šopatna (Pekre))
Weißer Wipacher	Bela lipo(v)šina (lipo(v)šina, ipavščina)	Lipovšina (Vrhov dol, Hrastje, Pekre)
Weißer Augster	Beli horvatovšček	Buday Góher (Meranovo pri Limbušu)
Weißer Barthaine	(beli, debeli) Javor (mišnjak, javšovec)	Jaušovec (Meranovo)
Weißer Gutedel*	Bela žlahtnina (veliki španjol)	Doppelte Spanische (Vrhov dol, Hrastje, Pekre, in the parish of Limbuš)
Weißer Mehlweiß	Bela topol(ov)ina (šislovec, šislovina)	Edler Javor (Meranovo); Šislovina, Šislovec (Pekre, Hrastje, Limbuš), Pokovec (Vrhov dol, Hrastje, Pekre pri Limbušu)
Weißer Mosler*	Šipon (moslovec, pošipon, maljak, mainak)	Moslovec (Pekre in the parish of Limbuš); Joannea princeps
Früher blauer Portugieser *	Portugalka (Laška modrina)	Vranik, Laška (Pekre, Limbuš)

\*the variety is still part of the Slovene grapevine assortment

this reason, Trummer had not written their Slovene equivalents. Not only the synonyms but also relevant wine-growing regions are indicated for the majority of varieties. For example, Table 1 shows varieties and their synonyms used at the Meranovo estate and the surroundings of Limbuš during the reign of Archduke John. Table 2 shows today's Slovene grapevine assortment with Slovene names according to Trummer and originating from 1841 (amended in 1855). Afterwards, Dr. Franz Xaver Ritter von Hlubeck published the book *Versuch einer neuer Charakteristik und Klassifikation der Rebensorten mit besonderer Rücksicht der in Steiermark vorkommenden* (A New Attempt to Characterize and Clas-

sify Vine Varieties from Styria). Varieties were classified into three groups depending on the shape of the grapes, the shape of the leaves and the pilosity of leaves. Two years later, he provided a description of proliferation and quality of varieties in Lower Styria. Shortly afterward, Matija Vertovec used Trummer's description of varieties in his *Vinoreja* (1845). This was the first Slovene work on viticulture, which contained not only descriptions of varieties but also data on their distribution and value. In the chapter on the assortment, he described varieties grown in Vipavsko, Goriško and Brda. He named 46 varieties, of which only a few are still in today's assortment of the Vipava wine-growing region Rebula (Ribolla Gialla),

**Table 2: Names of varieties in the Slovene grapevine assortment and their Slovene equivalents according to Trummer (1841)**

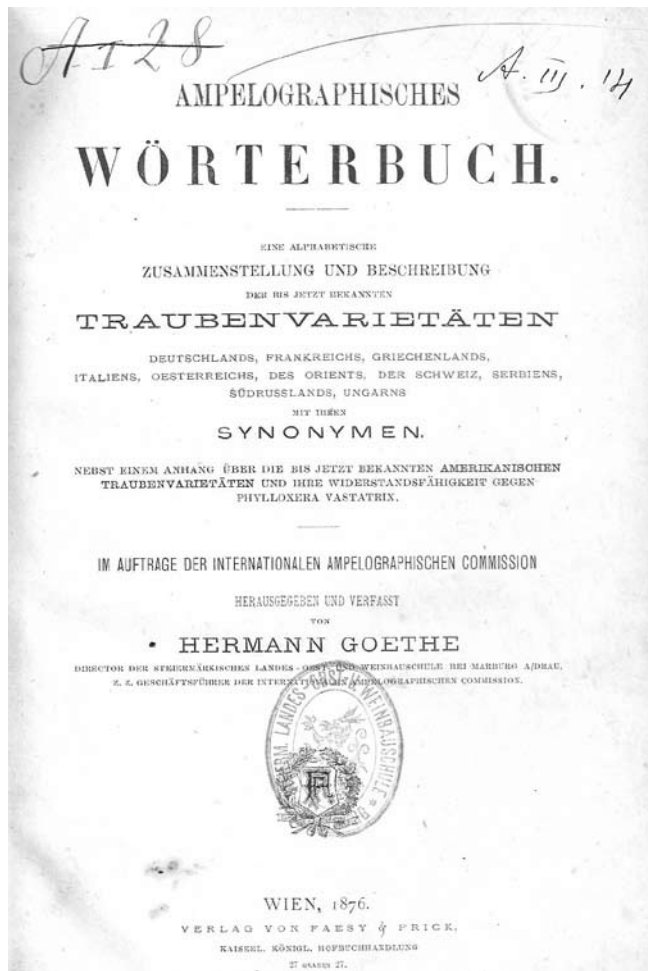
Official Slovene name	Slovene names according to Trummer (1841)
Bela žlahtnina	missing
Beli pinot	missing
Chardonnay	missing
Gamay	missing
Kraljevina	Ariavina, Sarjavina, Kralovina, Sabnina, Mavrona, Imbrina,
Laški rizling	missing
Malvazija	Malvasia
Modri pinot	missing
Portugalka	Laška modrina, Vranik, Laška
Ranfol,	Belina, Velka belina, Debela belina
Rdeča žlahtnina	missing
Refošk	Drobni rifošk, Debeli rifošk
Renski rizling	missing
Rumeni muškat	Beli muškat
Rumeni plavec,	Debeli klešic
Sivi pinot	missing
Šipon	Moslavec, Šipon, Šiponski, Šipo, Debeli šipon, Pošipon, Malnik, Mainak, Maljak
Traminec	missing
Zeleni silvanec	Mušca, Muška, Miška, Lipava, Zeleni klešec, Zelenič
Žametovka	Črnica, Černina, Černa laška, Černa spania, Černi spanier, Černi zeleniak, Kapčina, Kavčna, Kavčina, Hlapčovina, Urnik, Velka črna, Velka modrina, Velka plava, Velka sipa, Vranik, Zeleniak,
Pikolit	missing (1841), pikolit (amended in 1851)
Šentlovrenka,	missing (amended in 1851)
Pinela	Pinjela (amended in 1851)
Sauvignon,	missing
Missing varieties: Barbera, Cabernet Sauvignon, Cabernet franc, Čabski biser, Cipro, Gamay, Glera, Kerner, Klarnica, Maločrn, Merlot, Modra frankinja, Muškat ottonel, Neuburger, Prosecco, Verduc, Perlette, Pergolin, Pokalca, Poljšakica, Ranina, Rebula, Rizvanec, Scheurebe, Syrah, Viognier, Vitovska grganja, Zelen, Zeleni sauvignon, Zweigelt	

Pinela, Zelen, Malvazija (Malvasia) and Refošk (Refosco).

In 1848, Gasparen classified varieties on the basis of the temperature sum of ripening times. Later, Victor Pulliat used ripening time of Chasselas as an indicator. He classified varieties into five groups (very early, early, mid late, late and very late). Even nowadays, various authors use this classification along with the description. A French ampelography was also published in 1854 (Rendu 1854).

A third pioneer in the field of viticulture was Herrmann Goethe. His works on ampelography are of the utmost importance. Among the most important are Atlas der für den Weinbau Deutschlands und Österreichs werthvollsten Traubensorten (Atlas of the most Important Vine Varieties in

Germany and Austria) (Fig. 2), published in 1873 in cooperation with his brother Rudolf, the director of Fruit-Growing School in Alsace, and the 1876 glossary Ampelographisches Wörterbuch (Fig. 3). The latter includes a selection and description of the common varieties with German, French, Greek, Italian, Austrian, Serbian, South Russian, Hungarian and Far East synonyms as well as descriptions of American varieties and their resistance to phylloxera. Two years later, in 1878, his Handbuch der Ampelographie (Handbook of Ampelography) had been published (amended in 1887) by the international ampelographic committee with Goethe as its president. In this work, he defined ampelography as a part of agricultural botany concerned with identification of grape

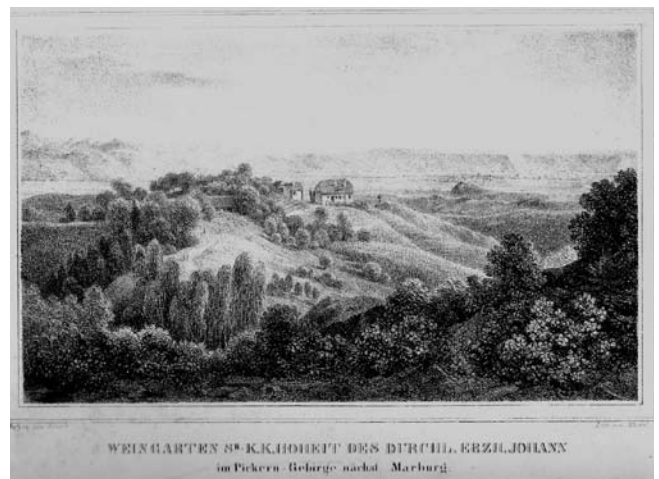


**Figure 3: Ampelographic Glossary by H. Goethe (1876)**

varieties. In 1881, he published the Styrian statistics entitled *Weinbau-Statistik des Herzogtums Steiermark* (Viticulture Statistics of Styria), in which he defined wine-growing regions in terms of soil and weather conditions. By the end of the 19th century, his works with descriptions and recommendations on the use of American rootstocks as the most effective method of combating phylloxera won widespread acclaim (Goethe 1886, 1895). From 1873 onward, he repeatedly warned against this vine pest destroying European vineyards.

An important milestone in the development of ampelography represents the largest and the most extensive ampelography published by Viala and Vermorel (1909) in France. They were compiling it for ten years, and it encompasses seven books. They described 500 varieties and listed the names of 25,000 varieties. The *Ampelografski atlas* (Ampelographic Atlas) by Zdenko Turković from 1953 (part 2 from 1960) is also being cited in world literature. It consists of 60 most important varieties and their pictures painted by the female artist Greta Turković. The pictures outdo those of other authors in terms of real-life characteristics. In 2000, Galet from France published an encyclopaedia of grape varieties. The Russian ampelography consisting of 5 books with over 2000 pages represents another extensive publication, which was being compiled from 1946 (first book) until 1955 (fifth book). The majority of photos are black-and-white.

In the 20<sup>th</sup> century, Aleweldt published his third edition



**Figure 4: Archduke John's estate (today's Meranovo) around 1835**

of the publication on grape varieties and their synonyms (1988). At the Institute for Grapevine Breeding Geilweilerhof, experts began to set up a European gene bank for grapevine (European *Vitis* Database), which currently holds 35 collections or gene banks with over 32,000 accessions (Maul et al. 2012). In addition, the Institute is in charge of the *Vitis* International Variety Catalogue.

Many of the above mentioned works, some of which were saved out of run-down attics at the last minute, are kept as rare items by the Library of the Faculty of Agriculture and Life Sciences, University of Maribor.

## Ampelographic classification

In 1873, an international ampelographic committee was established in Vienna, which took into account the name that was being used for a variety in its region of origin (all other names were considered synonyms). Ampelographic reports written by Hermann Goethe (first principal of the Fruit- and Wine-Growing School in Maribor), Victor Pulliat and Giuseppe di Rovasenda were published by the committee from 1873 onward in Maribor. After 1879, they were published in French and German by the publishing company Leykam-Josefsthal. In 1874 in Wiesloch, the foundations for the classification of varieties were laid. 335 varieties were listed, although only 288 existed at that time. In addition, 1500 synonyms were listed. During this period, forms for describing varieties (Oberlin and Rudolph Goethe) and a classification proposal were formulated.

After in-depth discussions about issues concerning the classification of varieties, the International Form for Describing Grape Varieties was adopted in the following years. The 1875 meeting in Colmar focused on terminology, which represented the basis for further work of the committee, and the presentation of statistical forms, which were later used in order to record findings on varieties in individual countries. Thus, the area of standardized classifications had begun. In addition, an ampelographic glossary had been published, which included amendments and the latest expert findings. The committee chair Herrmann Goethe was responsible for compiling this glossary in cooperation with experts from various European wine-growing regions. Carniola was repre-

sented by R. Dolenc, the principal of the School of Oenology in Slap (Goethe 1876). The majority of aspects covered by the form are still being used today, although the list has been expanded. However, the classification of varieties depending on the shape of berries was still similar to Trummer's.

The following year, at the fourth meeting of the committee, the glossary was officially presented. It represents one of the first major achievements of the committee, which was recognized by the representatives of all wine-growing regions. At the same time, the phylloxera epidemic began to destroy European vineyards. For this reason, the European grapevine assortment decreased considerably. Rootstocks and their classification became another burning issue discussed at the meetings. Rudolph Goethe presented varieties of American rootstocks at the 1876 meeting held in Maribor. In the same year, he organized the first congress of Austrian winegrowers. The importance of this meeting is demonstrated by the fact that all activities related to the congress lasted for nine days. Research findings of various European viticulture centres were presented, exhibitions and demonstrations of wine-growing and winery equipment were organized, prizes were awarded and a wine auction was held. As stated by the end of the congress, expensive capital, high interest rates, higher wages as well as higher beer and distillate sales had a negative impact on the sale of homemade wine (Goethe 1877). Was this conclusion also a prediction for the 21<sup>st</sup> century?

At the 1879 ampelographic congress held in Budapest, a classification system proposed by Hermann Goethe and Oberlin was adopted. According to this classification, varieties were divided into three groups depending on the shape of the berries and the shape and pilosity of vine leaves. Varieties were classified according to:

- shape of berries (round, flat, elongated or random shape)
- shape of leaves (with open sinuses, with closed sinuses, opened or closed sinuses)
- pilosity of leaves (hairless leaves, scattered pilosity and leaves with woolly hair)

At this congress, the use of resistant American rootstocks was announced the most effective protection against phylloxera.

## Ampelographic collections in Styria

A similar experimental station as the Graz-based vineyard was set up at the request of the Archduke John at an estate above the place of Limbuš (today's Meranovo). The vineyards were bought by the Archduke in 1822 (Fig. 4). Ten years later,

he established the School of Viticulture. During this period, the assortment had been supplemented with varieties from Rhineland and other parts of Europe. More sophisticated winegrowers planted vineyards in separate lines (fewer multi-varietal vineyards), and therefore the number of varieties per vineyard decreased. This period can be regarded as the beginning of modern viticulture. This is confirmed by today's assortment, which did not change drastically since then.

A well-known ampelographic collection or ampelographic garden was set up at the Fruit and Wine-Growing School in Maribor. Imprints of leaves of the most important varieties were made with the help of a special technique. Originals were made with normally developed leaves of already yielding varieties in Maribor's ampelographic garden. This was especially important since all varieties were grown under the same conditions, and therefore the comparison was more realistic (Goethe 1887). Almost a third of varieties planted in the garden were selected. According to Goethe, this assortment was one of the most important teaching tools. In his opinion, only a few similar institutions had planted such a large number of varieties. This fact shows the immense importance of the centre for the city of Maribor 140 years ago. The list indicates that 231 varieties grew in the ampelographic garden at that time. The garden was set up exclusively in order to facilitate the study of ampelography, esp. in order to identify the correct names of individual varieties in the flood of synonyms. Goethe also established an experimental vineyard called the Great Assortment. In addition to agricultural and ampelographic measures, the sugar and acid content of grape juice of the top 25 varieties in Styria were being monitored. With the help of these findings, the assortments of various wine-growing regions were supplemented. In his report addressing the improvement of wine quality, August Wilhelm Babo also mentions the model estate of Archduke John. He notes that the people of Styria will have to take into account the taste of buyers from abroad if they wish to sell their wine to other countries. However, he adds that this should not present a problem since weather conditions are favourable enough to produce excellent wines. Numerous pieces of evidence in the vineyards of Archduke John confirm this assumption (Kramberger 2001).

Until the second half of the 20<sup>th</sup> century, one of the largest ampelographic collections in the Balkans could be found in the vineyards owned by the School of Agriculture beneath the Kalvarija Hill. Many generations of students learned how to identify the characteristics of various varieties, whereas numerous experts (growers and selectors) used the collec-



Figure 5: Assortment of the University Centre of viticulture and enology Meranovo (June 2007)

tions in order to facilitate hybridization and select the best examples. After the vineyards had been renewed in 1980, the size of the collection decreased. They planned to enlarge it in the vine nursery of the Vinag company. At this point, the area of the most famous collection came to an end since all material had been destroyed! Anyone who either participated in this or was in any way responsible should be ashamed!

In 1994, the well-known Meranovo estate was purchased by the College of Agriculture. Later, the University Centre of Viticulture and Enology has been established. After the vineyards and the facilities had been renovated, the grapevine assortment was determined in 2000 (Fig. 5). Due to the 180<sup>th</sup> anniversary of the first School of Viticulture, the publication entitled *Sortiment vinske trte* (Grapevine Assortment) with pictures of varieties and rootstocks of the 136 exemplars from the Meranovo vineyard (Vršič and Pulko 2012) has been published. An expanded ampelographic collection (gene bank with more than 400 accessions) has also been set up, which will be presented in the next edition. We are conducting all these activities in the hope that the collection will not undergo the same tragic fate as the one beneath the Kalavarija Hill.

## Knowledge transfer

During the reign of Maria Theresa of Austria, viticulture received more consistent legal consideration. In order to improve poor economic achievements in the field of agriculture and to increase the level of expertise, a Society for Agriculture was established in Graz in 1765. Its main responsibility was to introduce new work methods and publishing expert findings, which also had an impact on viticulture. In 1778, Maria Theresa issued a patent regulating taxes and feudal duties of winegrowers.

At the initiative of Archduke John, the *Landwirtschaftsgesellschaft* (Society for Agriculture) was set up for Styria in 1819. In 1822, it already had 25 branch offices. The Society organized lectures and courses, supported the establishment of agricultural cooperatives and contributed to the development of other agricultural branches. It also provided funds for courses, while schools obtained government subsidies and teachers received relevant professional literature. Winegrowers received discounts on the purchase of planting material. In the region of Slovenske Gorice, a high priority was placed on viticulture. Around 1850, the situation was examined and the following varieties were listed: Belina (Dimiat), Šipon (Furmint), Ranfol, Zelenika, Peček (Elbling), Lipoščina, Krhlikovec, Kraljevina, Rdeča belina (Gouais Blanc), Kozji Ses, Volovsko Oko, Modra portugalka (Blauer Portugieser) etc. (Zupanič 1972).

In order to facilitate knowledge transfer, various important books mentioned in previous chapters were published. Since the majority of these works was published in German, Bleiwe's *Kmetijske in rokodelske novice* (Agricultural and Handicraft News) were of the utmost importance for the Slovene population. They contained simple advice for farmers, wine-growers and handymen. The first Slovene book on viticulture entitled *Vinoreja* was written by Matija Vertovec. Experimental stations and schools, which were established at the initiative Archduke John, played an extremely important

role for knowledge transfer in Styria. The Archduke established the first experimental station with model vineyards at the Meranovo estate (after 1822), and later the School of Viticulture (1832). The establishment of the School of Fruit- and Wine-Growing in Maribor with experimental vineyards represented an even greater achievement. 20 years later (1892), an Agricultural Experimental Station was established in Maribor, whose main responsibility was to accelerate the development of fruit- and winegrowing through scientific research. Nowadays, this mission is being continued by the University Centre of Viticulture and Enology Meranovo, Faculty of Agriculture and Life Sciences, University of Maribor.

After the outbreak of phylloxera, the importance of rootstocks increased. Especially the School of Fruit- and Wine-Growing in Maribor with Hermann Goethe as its principal played an important role. Goethe was an extremely influential expert on viticulture and member of various expert committees.

Due to the outbreak of phylloxera, Slovene experts also began to test American rootstocks. The testing procedure was described in detail by Skalicky, an enologist at Rudolfovo (today's town of Novo Mesto). In his work, he emphasizes that the publication is written on the basis of his own experiences and the experiences of other European experts. He further states that nurseries in Carniola own the most effective hybrids to be used as rootstocks for a number of years and that their excellent characteristics could have already been noted. These were esp. seedlings of hybrids brought from France by the Hungarian breeder Sigmund Teleki. In 1906, these rootstocks were sent to Slovene nurseries for testing by the monarchical Ministry of Agriculture (hybrids *V. riparia* × *V. berlandieri* Teleki no. 4, 5, 6, 7, 8 and 9). Varieties such as the Zeleni veltlinec (Grüner Veltliner), Zeleni silvanec (Sylvaner) and Laški rizling (Welsch Riesling) were grafted onto these rootstocks. Some of them were planted in new nurseries in order to ensure rootstocks for the following year. This was done especially in larger national nurseries, e.g. the main nursery in Bršlin near Novo Mesto. Some of the material was also offered to modern wine-growers (Skalicky 1907a, b). In 1912, exemplars of these rootstocks were brought to the German institute in Oppenheim, where they selected the SO<sub>4</sub> rootstock through further selection of Teleki's rootstocks. The 100<sup>th</sup> anniversary of this rootstock will be celebrated this year. These facts demonstrate the importance of research work in the field of viticulture in Slovenia although it remains unknown from which region these hybrids were brought to Germany (professional literature states Dvor).

During this period, many nurseries were established, including the first Nursery Cooperative in Juršinci in 1905, which had been established at the initiative of Franc Matjašič and his colleagues (SG 1905). In the parochial chronicles of St. Lovrenc in Slovenske Gorice state that the parish priest owned a 4-year old exemplary vineyard on the American rootstocks in 1899. At the turn of the century, social differentiation had been generated in this part of Slovenske Gorice. As noted by a teacher in the chronicles of the Primary School Juršinci, workers employed by nurseries received higher wages, while farmers lacked work force

## Changes in grapevine assortment

In the majority of vineyards around the globe, traditional varieties for a particular wine-growing region are grown. Therefore, changes in the grapevine assortment are based on long-lasting professional work. Assortments of large wine-growing regions with a large share in worldwide production usually include a relatively large number of varieties. However, the major part of wine production represents a smaller number of so-called main varieties. In the majority of European wine-growing countries, the assortment includes between one and five main varieties, whose amount represents between 45 and nearly 100% of the entire production, depending on the country.

This relatively small assortment is the consequence of tradition and a detailed study of individual varieties in relation to soil and weather conditions, agricultural and ampelographic technology, vinification characteristics and marketing opportunities. A new variety should be introduced after all the characteristics have been studied (first as a testing variety and later as a variety for regular production).

Due to the relatively small size of Slovene vineyards, an expansion of the assortment would not make sense. This fact is also confirmed by the assortments of larger wine-growing countries. Therefore, four main varieties, which represent over two thirds of the crop, are sufficient for one wine-growing country. In addition to the selection of varieties, the selection of rootstocks is also important since it can influence the harvest of the European vine under certain conditions (phylloxera, Ca.).

The phylloxera epidemic in Europe at the end of the 19th century destroyed many vineyards, and therefore the assortment had undergone considerable changes, and the number of varieties had been limited. Wine-growers aimed to improve the quality of wine by introducing new varieties. In 1904, Anton Stieglar formulated a proposal for an assortment on the basis of the studies published in 1905 by Franz Zweifler, the principal of the School of Fruit- and Wine-Growing Maribor. Franc Matjašič from Juršinci, a teacher at this school between 1888 and 1890, was also a member of this committee. In 1893, he was appointed regional commissioner for viticulture. The Slovene translation of the assortment had been produced by Ivan Belle. Zweifler proposed the white wines Laški rizling (Welschriesling), Beli pinot (Pinot blanc), Bela žlahtnina (white Chasselas), Rdeča žlahtnina (red Chasselas), Renski rizling (Riesling), Šipon (Furmint), Rumeni muškatac (Yellow Muscat), Zeleni silvanec (Sylvaner) and Traminac (Traminer) and the red wines Modra frankinja (Blaufränkisch), Žametovka (Blauer Koelner) and Vranek. He recommended to wine-growers to grow no more than two or three varieties.

## Changes in Slovene grapevine assortment

The grapevine assortment in today's continental part of Slovenia had undergone the most profound changes in the beginning of the 19th century, when varieties were brought from the Rhineland and other European wine-growing regions. The majority of these varieties introduced by the Archduke John still represents the largest part of Slovene assort-

ment. All other acquisitions did not represent major changes although the number of varieties decreased drastically after the phylloxera epidemic. The assortment published by Franz Zweifler in 1905 does not essentially differ from today's one.

Future changes in the Slovene grapevine assortment can be expected at three levels. Firstly, experts need to answer the question whether the existing varieties in individual regions still represent an optimal solution in respect of climatic changes. In the past thirty years, the average temperature during the vegetation period increased by 2°C, while the reduction of the growth cycle (earlier maturation) has considerably impacted the chemical composition of grape juice and the quality of wine (Vršič and Vodovnik-Plevnik 2012). However, this does not mean that the assortment should be changed in individual vineyards but that some of the varieties should be moved to another location. Soil cultivation should be adapted to the climatic changes so that both erosion and the competition for water and nutritional substances are minimal (Vršič 2011). Due to global warming, varieties requiring a warmer climate may become more interesting for Slovene wine-growers. However, the question remains whether such varieties could be marketed. Another, even more difficult question is related to the introduction of resistant varieties. The approach to the introduction of changes in the European grapevine assortment has always been rather conservative, which means that changes are minor. The International Organization of Vine and Wine (O.I.V.) adopted the decision that wine may be produced only from grapes of the *Vitis vinifera* L., and not from hybrids or interspecific crossings. Nowadays, some of these varieties that have been produced through multiple interspecific crossing and backcrossing with *V. vinifera* L. are considered noble wines. However, this does not guarantee an automatic introduction of resistant varieties. All new varieties must undergo various testing procedures in order to be entered into the assortment list (Official Gazette of the Republic of Slovenia, no. 58/2002, Certification of New Varieties, Permits for Introduction of Foreign Varieties and Protection of Varieties of Agricultural and Forestry Plants Act). On the basis of a report on the wine-growing region, the authorized organization establishes the adequacy of individual varieties for a particular wine-growing region depending on the ampelographic characteristic of the variety, nature of the wine and marketing opportunities for this variety. This report is required in order for a variety to be entered into the Slovene Grapevine Assortment as an admissible variety for a particular wine-growing region (Official Gazette of the Republic of Slovenia, no. 105/2006, Wine Act). The third stage encompasses the introduction of resistant varieties for the production of table grapes. There are also certain regulations concerning the trade with table grapes of *V. vinifera* L. varieties. However, this problem is easier to solve since the size of vineyards for the production of table grapes are not subjected to a wine market order, except if one of the wine varieties is grown in order to produce table grapes. This means that such varieties may be grown for the production of table grapes if they are entered into the national assortment list.

It can be concluded that changes in grapevine assortment are introduced gradually both in Slovenia and abroad. Faster or more common changes are usually related to the style of wine and are rather the result of technological improvements

related than changes in the assortment. In Styria, the most drastic changes in the grapevine assortment were introduced in the 19th century when Archduke John started to introduce new varieties and technologies from the Rheinland. Afterwards, research in the field of ampelography became more extensive, and as a consequence a number of excellent works was published. In addition, newly established schools of viticulture facilitated knowledge transfer. The first of its kind in Styria was established 180 years ago at the Archduke's estate (today's Meranovo), which operated in the town of Hrastje near Pekre until the end of World War II.

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# Development of viticulture in Styria from time to Archduke Johann until today

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## ABSTRACT

The period of modern viticulture in Styria (winegrowing regions of today's Slovene part of Styria) began with professional expertise introduced by Archduke Johann of Austria in the beginning of the 19<sup>th</sup> century. The introduction of new technologies, new varieties and mono-varietal vineyards in rows had a positive impact on the development of viticulture. By the end of 19<sup>th</sup> century, Styrian vineyards were destroyed by various pests and moulds (phylloxera, downy mildew and powdery mildew). Therefore, the School of Fruit- and Wine-Growing was founded in 1872 in Maribor. Knowledge transfer enabled the replanting of destroyed vineyards (introduction of American rootstocks and pest control). During the first part of 20<sup>th</sup> century, the need for higher yields and the introduction of mechanisation arose. During the previous three decades of the 20<sup>th</sup> century, the highest yields in Styrian vineyards were produced through intense training systems and fertilization. The development of modern viticulture in Styria was also influenced by research work conducted by the Faculty of Agriculture and Life Sciences in Maribor. The introduction of the Guyot training system, yield reduction (below 2 kg/vine), strict realization of ampelotechnic measures and controlled used of pesticides were of crucial importance for the improvement of wine quality.

Key words: viticulture, history, Slovene part of Styria

## INTRODUCTION

Due to difficult social conditions on the countryside and the desire for change, the Society for Agriculture was established in Graz in the beginning of the 18<sup>th</sup> century (1765), which was supported by the land of Styria and the Austro-Hungarian Empire. Its main responsibilities included the promotion of rational soil cultivation through lectures and publications, the purchase of breeding livestock and agricultural mechanisations, the setting up of experimental estates and the introduction of new crops. Successful food production was required for survival. In 1767 and 1772, potatoes and polenta (coarsely or finely ground yellow or white cornmeal (ground maize) were the most common foodstuff on the countryside. The activities of the Society focused mainly on animal husbandry, bee-keeping and fruit-growing (mulberries). However, no specific measures were introduced for viticulture that was undergoing a difficult crisis. Members of the Society were mostly enthusiastic lords of manors, feudal lords, priests, officials, entrepreneurs, scholars and, only in exceptions cases, farmers. Since publications and courses were available only in German, the farmers from Slovenske Gorice did not benefit much from these activities. In 1787, Joseph II (1780-1790) dissolved the Society since he could not stand a nearly monopolistic mediator between himself and the people. During the Reign of Maria Theresa and later Joseph II, agriculture underwent considerable changes since many decrees in favour of farms were issued. However, in the region of Slovenske Gorice, agriculture was poorly developed. Especially viticulture was

ignored and winegrowers produced wine of poor quality. The price of wine fell, and the production was barely profitable. In addition to difficult economic condition at the turn of the 19<sup>th</sup> century, the war with France inflicted heavy casualties on the Styrian population. At that time, many estates whose value fell to a tenth (financial crisis) went on sale. The poor vintages of 1816 and 1817 also contributed to falling prices. Therefore, severe famine stroke in Slovenske Gorice as early as 1816. Many smaller wine-growing estates went out of business (Zupanič 1969, Mlinarič 2001).

Rath's records concerning positive experiences with Styrian viticulture and wines date back to the 19<sup>th</sup> century. He mentions that Styrian vineyards are located between point 46° and 47° N and include the region of Maribor and Celje with a mild climate favourable for wine-growing. He further states that excellent wines, such as Luttenberger, Radkesburger, Pettau, Rittersberger and others, are produced in this region. The majority of these vineyards are located between the largest Styrian rivers – Drava and Mura. There vineyards were called Windischen Bücheln or Slovenske Gorice (Rath 1824).

The aim of this paper is to discuss changes in the development of viticulture in Styria from the first half of the 19<sup>th</sup> century until today on the basis of publications on viticulture and other historical records. We proposed the hypothesis that various economic, social and environmental factors influenced the facilitation of knowledge transfer and triggered changes in technology and the development of viticulture.

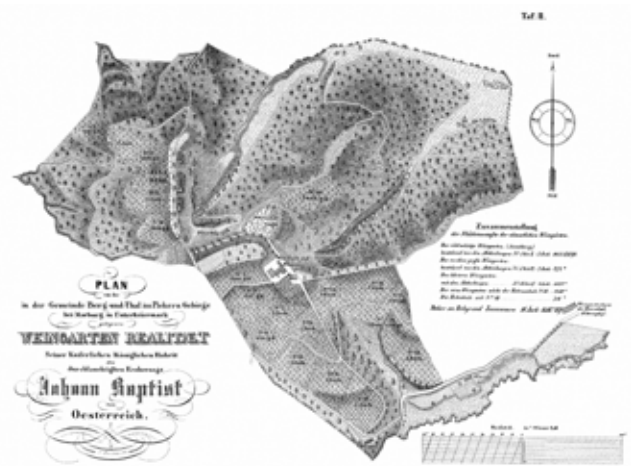
## CHANGES IN STYRIAN VITICULTURE FROM THE PERIOD OF ARCHDUKE JOHN OF AUSTRIA UNTIL THE PHYLLOXERA EPIDEMIC

In the beginning of the 19<sup>th</sup> century in Slovenske Gorice, less people worked in vineyards due to difficult economic conditions and the fast development of both industry and trade. During this period, viticulture was primitive, and grapevines were densely grown (no rows). In autumn, vineyards were full of white, red and blue varieties. Varieties were high yielding and reached ripeness late, therefore harvesting did not begin until the feast day of St. Teresa of Avila (15 October) (Zupanič 1969). During Rath's visit of Maribor's hillsides, Šipon (Furmint) was an extremely popular variety, but on the day of his visit (20 September) the grapes were extremely sour and unripe (Rath 1824).

Modern viticulture in Styria was introduced by Archduke John of Austria, the brother of the Emperor of Austria, Franz Joseph I. In Styria, the Archduke was active in various economic areas, esp. agriculture. He was a liberal and creative person, a nature lover, who married a postman's daughter, whose ancestors came from the surroundings of Ptuj. For this reason, the Archduke was almost banned from the court, where he was unpopular due to his liberal views and was thus under police surveillance (Zupanič 1969). He moved to Styria where he bought two estates: Brandhof – a forestry and livestock farm in upper Styria and another estate at Janžev Vrh (Prinčev Vrh) in Pekrske Gorice underneath Pohorje (today's Meranovo estate). The latter estate, which was nearly unprofitable, was purchased in 1822 (26 acres or 14.82 ha) (Fig. 1). Soil, where vineyards were grown, was of poor quality, and the structure was a conglomerate consisting of fine and coarse sand and gravel. At this estate, the Archduke planned to set up vineyards, which could serve as an example to the wider surroundings. Since the Archduke was very familiar with the successful viticulture of Rhineland (Germany), he facilitated knowledge transfer at his estate above Pekre (Vošnjak 1873, Zupanič 1969, Colnarič et al. 1985, Mlinarič 2001, Vršič 2002, Friedl and Friedl 2003).

The Archduke planted mono-varietal vineyards in rows. The prevailing varieties were Šipon (Furmint) and esp. new varieties, such as Renski rizling (Riesling), Rdeči traminec (Gewürztraminer), Sivi pinot (Pinot gris), Beli pinot (Pinot blanc), Modri pinot (Pinot noir) ter Laški rizling (Welschriesling). The first manager of the vineyards and wine cellar came from Rhineland (Zupanič 1969). Wine quality was the main requirement for the success and development of viticulture. Wines from this exemplary estate soon became famous, and therefore individual varieties began to spread across Styria.

On the initiative of the Archduke, the Graz-based Styrian Society for Agriculture was re-established in 1819. The Archduke himself became the first and long-term president. In order to familiarize himself with the current state of agriculture, he travelled across the country and established subsidiaries in Maribor, Ptuj, Gornja Radgona, Brežice, Celje, Mozirje and Slovenj Gradec. At meetings, representatives discussed agricultural problems and forwarded proposals to the central committee in Graz. In 1834, the Society established



**Figure 1: Map of the Meranovo estate during the period of Archduke John of Austria**

a model estate with an exemplary vineyard on the hillsides of Plabutsch near Graz for practical training and testing of new varieties for Styria. In order to enable knowledge transfer, the characteristics of varieties had to be studied. On the initiative of the Society, such studies were conducted in Styria (Zupanič 1969).

The efforts of the Society contributed to the gradual improvement of viticulture as the main trade and the only source of income on Styrian hillsides. For this reason, the first School of Viticulture was established in 1832 in Pekre (Hrastje) in order to facilitate knowledge transfer.

During the emergence of Slovene national consciousness in the first half of the 19<sup>th</sup> century, many Slovene scholars began to write in Slovene (Zupanič 1969). Professional literature on viticulture and oenology published in Slovene facilitated direct knowledge transfer. However, it must be noted that the rural population was barely literate or illiterate, and therefore knowledge was being transferred slowly.

Bleiweis' Kmetijske in rokodelske novice (agricultural and handicraft news), which were first published in 1843 in Ljubljana, also contributed to knowledge transfer. They contained practical and simple advice for farmers written in Slovene. Matija Vertovec's book *Vinoreja* (Wine-growing) was published in form of an Appendix in 1844. This was the first book on viticulture and oenology published in Slovene.

## VARIETAL CHARACTERISTICS AND DISTRIBUTION IN STYRIA FROM THE BEGINNING OF THE 19<sup>TH</sup> CENTURY UNTIL THE PHYLLOXERA EPIDEMIC

In the vineyards of Ljutomer and Ormož, the most common high yielding variety was Šipon (Pošip, Poščip, Moslovec, Mosler, Furmint). In the remaining part of Slovenske Gorice, the most common high yielding variety was Belina. In addition to these two, many other varieties were grown, including Zelenika, Modri plank, Kraljevina, Peček, Javor (Šislavec, Srana janka), Krhlikovec, Lipovščina, Tantovina, Kozji ses, Rumeni muškati (Gelber Muscateller), Zeleničič (Sylvaner), different varieties of Chasselas, Modra kavčina,

Vranek, Modra kavka, Vrbanjšek, blue and white Volovsko oko, etc. (Trummer 1841, Hlubek 1846, Baumgartner 1856, Vošnjak 1873).

The need for development, many years of experience and novel findings on viticulture had a positive impact on the existing assortment and the introduction of new varieties. In terms of preserving the existing assortment, considerable attention was paid to the quality of grapes during harvesting. According to Rath (1824), Mosler (also called Mallnigg at the Brandner estate in Slovenska Bistrica) requires the most favourable locations. Vošnjak (1873) advises that Šipon (Pošipon, Malnik, Mosler) be planted at warmer and steeper locations sheltered from north wind. He advises against the cultivation of this variety in heavy and cold soil due to poor yielding and ripening. Due to dense vegetative growth (grapevine grew on its own roots at that time), this variety was susceptible to autumn and winter frost. During flowering, grapevine was pruned. According to Hlubek (1846), Šipon (Furmint) and Belina were the most common varieties in Styria; the latter was grown in nearly half of all vineyards. Belina was also common in German wine-growing regions, where it was called Weiser Heunisch. It was praised as an early, high yielding and resistant variety. On eastern hillsides of Kozjak, Rumeni Muškat (Gelber Muscateller) was common, which represented 20% of all vineyards. Modra kavčina with its nice looking and large grapes was also extremely popular. It was used both in order to provide shade at the entrance of wine cellars and to surround vineyards. The high yielding red grape variety called Modri plank should not be grown at all due to its poor quality. Experts advised to grow the early

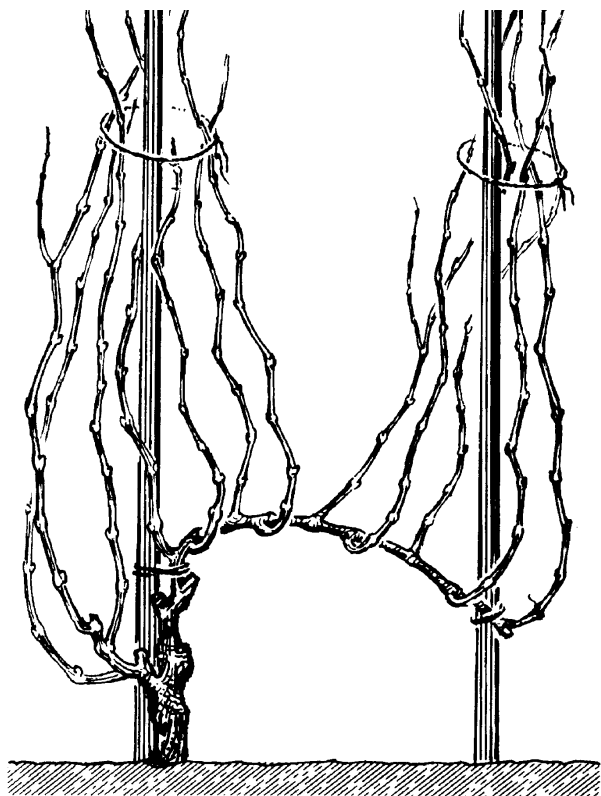
varieties Zeleni silvanec (Sylvaner) or Modra portugalka (Blauer Portugieser) at less favourable locations. High quality varieties from Rhineland were introduced gradually.

Jančar (1867) described the positive experiences of wine-growers with the new variety called Renski rizling (Riesling): “Our wine-growers are becoming more and more familiar with the advantages of Rivčekovo, which is produced in larger quantities each year; however, Šipon (Furmint), Traminec (Traminer) and Žlahtna mušica should not be ignored. Due to a lack of planting material and the popularity of Renski rizling (Riesling) in the year when the cuttings took root, two saplings were left on the grapevine, which grew up to one meter in rich soil. Successfully developed and ripe rooted cuttings were dough out and planted on a regular spot in the vineyards by digging up a 30 cm deep ditch between two vine stakes. The cutting was put into the ditch, while the shoots were drawn to both stakes. One cutting thus gave two planting sites. For the planting along wine-growing paths, the most adequate variety was Izabela grown in form of pergolas. Due to the specific taste of its grapes, bystanders did not pick the grapes. Another advantage was also its lush vegetation, which obstructed the view of the vineyard.

## DEVELOPMENT OF WINE-GROWING TECHNOLOGIES IN STYRIA FROM THE BEGINNING OF THE 19<sup>TH</sup> CENTURY TO THE PHYLLOXERA EPIDEMIC

During the first half of the 19<sup>th</sup> century, the development of viticulture was extremely slow. At that time, grapevine diseases and pests did not present serious problems. Greater damage was caused by hailstorm, frost, drought and heavy rainfall during growing season. In terms of fungal infections, the most serious problems were caused by rot during ripening. The main reason for these problems were low-growing varieties, which were already established in practice. The grapes of such varieties are near the ground, which means that the risk for the development of these diseases is higher. Vineyards with poor yields that had been left unattended were renewed in due time (Hlubek 1846, Jančar 1867). Before planting, wine-growers were advised to treat the soil thoroughly and deeply – a method already established in practice (triple-digging). The soil had to be dug up between 60 cm and 90 cm in depth. The life span of cultivated vineyards on poor soils was between 33 and 40 years and on heavy soils up to 70 years (Baumgartner 1856).

In order to restore vineyards, experts recommended planting material, such as cuttings or shoots of Chasselas varieties. The advantage of planting cuttings grown in cutting nurseries is early yielding (one year earlier). Each vineyard had to have a nursery at a southern location for the propagation of high-quality varieties (Jančar 1867). According to Rath (1824), new vineyards were planted by the end of April after the soil, which had been triple-dug in winter, was levelled and treated shallowly. In practice, one or two year old cuttings with shortened roots were recommended. Rooted cuttings were planted in a ditch (30 cm deep) between 20 and 30 cm apart. Throughout the year,



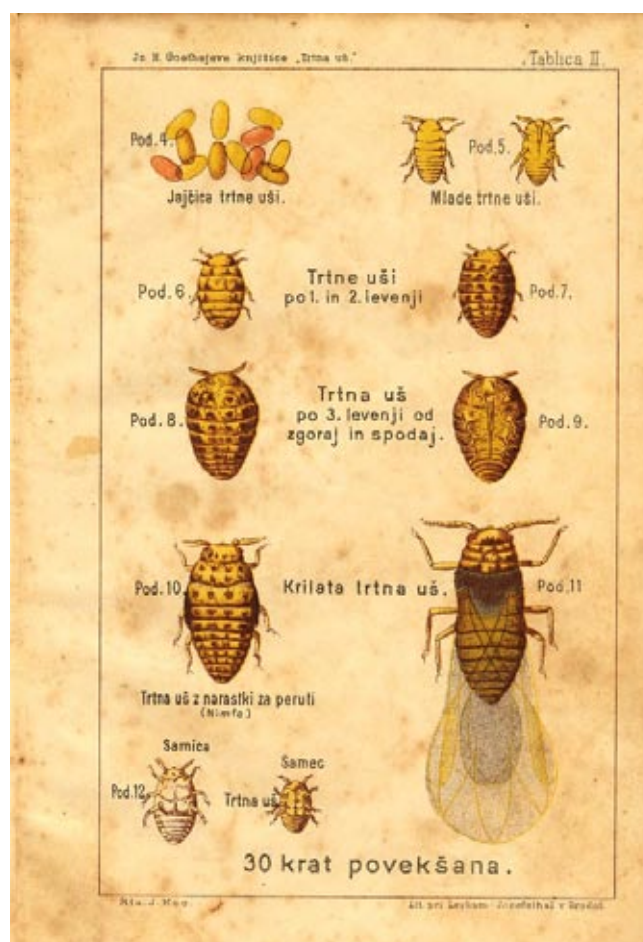
**Figure 2: Low-trained vine system originating from Rhineland (modern cultivation method in those days)**

roots were removed up to the third node so that roots on the lower node could develop. Approximately 20,000 rooted cuttings per hectare were planted. Such vineyards began to yield after the fourth year. Between individual rows, other plants such as millet or common buckwheat were planted. However, in the majority of cases soil in young vineyards was hoed (Jančar 1867). In rare cases, modern winegrowers planted new vines in rows. At the same time, the number of varieties decreased (Vršič 2001). Planting spaces increased, and the distance between individual rows was somewhere around 0.8 m and 1.2 m. The distance between grapevines in one row was between 0.7 m do 1 m (Hlubek 1846). Planting distances between grapevines were usually around 90 cm. Square planting patterns influenced the appearance of Slovenske Gorice. The living space of grapevines amounted to less than 1 m<sup>2</sup>, which means at least 10,000 planting sites per hectare. Such vineyards also receive more sunlight, and therefore wine-growers were advised to renew vineyards in this manner. Unripe grapes were the consequence of smaller planting spaces (30-45 cm) (Jančar 1867). Posts made from coniferous wood were used as support (esp. larch was extremely popular) (Hlubek 1846).

Winegrowers used steel pruning shears for pruning and hand saws for removing non-bearing wood. Particular attention was paid to the height of grapevines. The height of the trunk had to be between 15 cm and 30 cm. If the trunk was too low, the grapes grew near the ground, whereas if it was too high, the grapes turned sour. Winegrowers assumed that low grapevines grow more thickly, produce higher yields and reach ripeness earlier. The most appropriate month for pruning was February although grapevines were also pruned in autumn if the weather was good. If applying this pruning method, the wound was completely dry before bleeding, which prevented sap flow. Winegrowers made sure that bark is removed, and the rest of superfluous wood is cut off completely (Jančar 1867).

During pruning, they left 1 or 2 spurs on low branches. Sometimes they left canes or longer spurs with three or four buds. When pruning varieties from Rhineland, they began to introduce low-trained vine systems (Fig. 2). Later, this type of pruning proved to be appropriate also for other varieties in Styrian vineyards. Some wine-growers tried to train vines without support, but they attempts were to no avail (Hlubek 1846, Jančar 1867). In the event of more robust vines, they left two spurs and one cane, and in case of extremely robust vines, two spurs and two canes were left (the varieties Šilhar and Izabela). It was recommended that Renski rizling (Riesling) and other slowly growing varieties be cane trained (3, 4 or more spurs were left on the vine). The recommended length was a two node spur. On pergolas covered with robust grapevines, 1.2 m long canes were left (Jančar 1867).

Empty planting sites in yielding vineyards were filled by layering of rambling vines, such as Šipon (Furmint) and Belina. Otherwise, only varieties of poor quality had such growth, and therefore the assortment did not improve through layering (Hlubek 1846). Jančar (1867) also recommended that wine-growers choose only high-quality varieties for the preparation of shoots for ground layering or layering, whereas varieties of poor quality, such as Šilhar and Zelenika should be rooted out. In order to fill empty planting sites,



**Figure 3: Development stages of phylloxera (Goethe 1881)**

two year old cuttings were used in older vineyards, whereas rooted cuttings and one year old hardwood cuttings did not yield satisfactory results (Baumgartner 1856). Poor yielding vines and those with excessive shedding had to be re-grafted. Such vines were re-grafted 15 cm under the soil in order to prevent the development of new shoots. They were grafted onto a cleft, in which one or two scions were placed. The bud was sealed with clay and covered with a cloth. In order to transplant vines successfully, propagation in planting baskets was used. In spring, a wooden basket (jerbas) with shoots was buried into the ground near the grapevine. A supporting structure for tying shoots was erected. Next year (in autumn or spring), the shoots were cut off from the parent plant and dug out along with the basket. They were planted on the desired site. Such vines yielded as early as the next year after transplantation (Jančar 1867).

The majority of work in vineyards was completed by vineyards labourers – families with 3-5 members fit for work. In exchange for cultivating vineyards, they received a small house with two rooms and a kitchen. Usually, they had one or two cows and between 0.3 and 0.6 ha of arable land (Zupanič 1969). Everything that came from the earth put to use: wood for heating and baking bread, shoots, tips and grass for feeding livestock. In exchange they had to cultivate between 1.5 and 2.5 ha of vineyards and to dig up the soil. Others tasks, such as layering, pruning, tying and trimming, were conducted in exchange for a meagre wage. Manure was spread on the

vineyards every second or third year. Children brought it on the vineyards in small wooden basket, which they carried on their heads. Then they made small piles (between 2 and 2.5 kg per grapevine). Limestone powder or marl was added to the manure if soil was too acid (Hlubek 1846).

Vineyards were first hoed in early spring (the earlier, the better) but not later than by the end of March. Between two to three persons were enough for 0.57 ha of land. Labourers needed to hoe carefully in order not to damage the grapevines. The land was dug up again in mid-May. This time, the soil was dug up shallowly in order to loosen and aerate the top layers of soil and to remove weeds. The third hoeing took place only in exceptional cases by the end of June or in the beginning of July if large amounts of spelt grew in the vineyards (Jančar 1867). Baumgartner (1856) recommended three hoeings per year.

Especially the heavy clay soil at lower lying locations was loosened with the help thin green branches of alder and ash bound into a sheaf. According to Rath (1824), these sheaves were called Werna or Wutera. They helped to aerate the soil and thus contributed to increased mineralisation of organic matter and drainage (Hlubek 1846, Jančar 1867).

The establishment of the Styrian School of Fruit- and Wine-Growing beneath the Kalvarija Hill in Maribor in 1872 (Steiermärkische Landes Obst und Weinbau Schule) represents a significant milestone. The exemplary estate with experimental vineyards and orchards facilitated knowledge transfer. The two-year study programme was conducted in German. Slovene inhabitants without knowledge of German could enrol in a three-year programme. In this school, many wine-growers, who later managed their own estates, as well as future managers of large vineyards in Slovenia, Croatia, Italy (esp. South Tyrol) and elsewhere acquired practical knowledge.

## IMPACT OF GRAPEVINE DISEASES AND PESTS ON THE DEVELOPMENT OF VITICULTURE IN STYRIA DURING THE SECOND HALF OF THE 19TH CENTURY

In the 19<sup>th</sup> century, the outbreak of various grape diseases and pest epidemics had a major impact on the development of viticulture. It was of the outmost importance to introduce drastic and expensive changes. During this period, the most devastating fungal diseases – powdery mildew (first appeared in English greenhouses) (1845, gardener Tucker) and downy mildew (1878 in France) destroying all green parts of a grapevine – began to spread.

Powdery mildew caused great damage to vineyards during the first few years after its discovery (Zweifler 1924). As early as 1851, powdery mildew was discovered in Istria and South Tyrol, and in 1853 and 1854 also in Styria, esp. on vines trained as espaliers. The first records on powdery mildew in Styrian vineyards date back to 1855 (Baumgartner 1856), while downy mildew was first mentioned in 1880 (Babo and Mach 1881). In the beginning, powdery mildew caused massive damage. In France, where it was discovered as early as 1848 (Babo and Mach 1881), wine production decreased from an average of 45 million to an average of 11 million

hectolitres in 1854 (Žmavc 1925). Between 1848 and 1859 in South Tyrol, the price of wine increased five-fold (Babo and Mach 1881). Research works on pest control focused on efficient practical solutions, such as the use of sulphur for oidium and blue vitriol for downy mildew. During the same period, the phylloxera epidemic began to spread, which destroyed numerous vineyards (Fig. 3). According to various authors (Babo and Mach 1881, Wenisch 1922, Zweifler 1924), almost half of Styrian vineyards were destroyed between 1880 and 1900. Experts discovered that solutions must focus on a symbiosis of vine and phylloxera instead of pest and disease control (Bazille 1878, Goethe 1881). Soon it was discovered that certain American varieties are not damaged by phylloxera. For this reason, high-quality varieties were being grafted onto American rootstocks (Goethe 1878, Planchon 1878, Goethe 1881). These findings were first presented at the 1869 Congress of Viticulture in France. Experiments with American rootstocks were conducted in various vineyards across Europe (even in those regions where the phylloxera epidemic had not been confirmed yet).

One of these experimental stations belonged to the School of Fruit- and Wine-Growing in Maribor. The first experiments with resistant American rootstocks were conducted in 1874 under the supervision of the school principal Hermann Goethe, who also acted as head secretary of the International Ampelographic Committee and editor of Ampelographic Reports (Goethe 1881). In 1880, the first 1000 rootstock cuttings were sent to the town of Bizeljsko, where phylloxera was first discovered (the varieties York Madeira, Clinton, *Vitis riparia* Michaux and *Vitis solonis* Planch.). From 1888 onward, Slovene winegrowers were more familiar with the characteristics of American rootstocks. Especially the rootstock *Rupestris monticola* Buckl. was recommended. From this point, hybrids were no longer used as rootstocks (Zupanič 1969).

During the reconstruction of vineyards, vines were propagated through green grafting (in 90% of cases successful). In winter, the soil was hoed 1 meter deep. This type of tillage became a constant agricultural measure. Local varieties independent of their quality were grafted onto rooted cuttings of the above mentioned rootstocks planted in the tilled soil. For this reason, certain varieties of poor quality were transferred from the old assortment, which represented one of the disadvantages of green grafting. Hardwood cuttings of American rootstock were produced in national and regional rootstock nurseries, whereas rooted cuttings and grafts were produced in vine nurseries and tested in experimental vineyards.

Within the framework of the School of Fruit- and Wine-Growing in Maribor, field education of wine-growers was conducted by so-called travelling teachers, who organized lectures and practical workshops concerning the replanting and tending of young vineyards as well as disease and pest control. In addition, they facilitate knowledge transfer. In 1905, four such teachers were active in the region of Slovenske Gorice (Zupanič 1969).

Around 1900 in Slovenske Gorice, six nursery labourers owned the following private cutting nurseries: Slodnjak and Kupčič in Juršinci, Bouvier in Gornja Radgoni, Petek in Murščak, Rajh in Mota and Mulec in Osek. The prices of

their propagating material were slightly higher than those of regional and national nurseries. In Juršinci, the first nursery cooperative was established in 1906 (Zupanič 1969).

In addition to the phylloxera epidemic, which destroyed numerous vineyards, great damage was also caused by powdery mildew and downy mildew. They began to recommend powdered sulphur against powdery mildew, and blue vitriol for downy mildew. In order to educate wine- and fruit-growers on diseases and pest control, the book entitled *Škodljivci vinogradništva in sadjarstva* (Grape and fruit pests) was published in Slovene in 1990.

In addition, the existing assortment had to be improved. Anton Stiegler proposed a list of varieties discussed on 28 January 1904 by the following Slovenes: Matjašič, Zabavnik, Belle and Goričan (Zupanič 1969). On the basis of their decisions, Franz Zweifler compiled the first grapevine assortment for wine-growing regions listed by Hermann Goethe. He also recommended no more than 2 or 3 varieties per vineyard (Vršič 2001). Through more careful replanting, the Styrian grapevine assortment also improved gradually. Nonetheless, wine-growers also propagated varieties of poorer quality, esp. in those regions where vines were still propagated by means of green grafting.

New vineyards on American rootstocks (in these regions also called Americans) were planted in rows on steep hillsides. The recommended planting site was 1 m x 1 m. Wooden piles were still used as supporting material. Before the outbreak of WWI, only 5% of Styrian vineyards were still being replanted in accordance with the old system originating from the first half of the 19<sup>th</sup> century. Wine-growers felt great pride both in the newly replanted vineyards and the magnificent local scenery. The use of modern viticultural technology had a positive impact on the amount and quality of crops. Grapes from replanted vineyards contained a higher amount of sugar and less acidity. The reason behind the improved quality of wine was among other things the introduction of the new assortment grown on American rootstocks. The great damage caused by the phylloxera epidemic in the second half the 19<sup>th</sup> century had thus nonetheless a positive impact on the development of Styrian viticulture (Zupanič 1969).

## **DEVELOPMENT OF VITICULTURE FROM THE BEGINNING OF 20<sup>TH</sup> CENTURY UNTIL THE OUTBREAK OF WWII**

During the first years of the 20<sup>th</sup> century, considerable attention was paid to the selection and preparation of suitable land. Especially, south-eastern, southern and south-western locations with a gradient between 15° and 30° were selected. During the initial cultivation of soil (hoeing), drainage ditches were dug for the collection and drainage of rainwater. The bottom of ditches was covered with stones and wooden cascades. Drainage systems were set up for the drainage of excess soil water (clay pipes, stones, tree branches, grooves made from alder trunks). The downy mildew and powdery mildew epidemic led to the conclusion that excess water must be collected in concrete trenches (tanks) whenever possible so that it can be used for spraying. When replanting

vineyards, it was advisable to let the soil rest for 3-4 years. During this period, alfalfa or vetch was planter in order to fertilize soil. Hoeing remained the traditional tillage method (manually up to 80 cm deep, rarely 1 m deep (Žmavc 1925). During this period, the use of resistant American rootstock was already an established practice. Whip or tongue grafting became the most common propagation method, while indexing with rooted cuttings planted in vineyards was not longer in use. According to Zupanič (1969), the School of Fruit- and Wine-Growing recommended that cuttings with a longer rootstock (45 cm or more) should be planted either on steep hillsides, where rainfall flushes away the soil, or on light, sandy and permeable soil, which dries quickly. Thus, wine-growers prevented the grapevines from deteriorating. In addition, main roots grew deeper so that they were not damaged by hoeing. The planting of grafts on shorter rootstocks was recommended for hard soil, which retains water for a longer period of time and has an inadequate water-air ratio. Thus, the length of grafts was somewhere between 35 and 40 cm. During tillage, considerable attention was paid to the removal of young roots that developed from high-quality varieties.

In this period, there were various conflicting expert opinions concerning the replanting of empty planting sites. As a rule of thumb, grafts of the highest quality were used for replanting. However, simpler and less expensive propagation methods with shoots and layering were sometimes still used in practice. According to Žmavc (1925), empty planting sites in older vineyards of the School of Fruit- and Wine-Growing were replanted through layering for almost 25 years. From 1911 onwards, this was done in a systematic manner by monitoring growth and fertility of vines that had not shown any signs of withering or deterioration in 14 years.

Due to the outbreak of grape diseases and pest infestation in the second half of the 19<sup>th</sup> century, preventive measures were introduced. Therefore, wine-growers were advised to remove two or more year old bark during pruning since it does not benefit the vine and does not protect it from frost – it only provides shelter for pests during winter.

Planting distances between rows increased from 1 m to 1.2 m if the plough was pulled by draft animals. The type of growth (excessive or poor) and the slope were also taken into account. On steeper locations, at which vine growth was poorer, smaller planting distances (between 0.8 m and 0.9 m) were recommended. On the other hand, larger distances (between 1 m and 1.1 m) were recommended on flat ground. The recommended height of the training system was between 30 do 40 cm. For this reason, more training systems were recommended: different head training system with spur-pruned and cane-pruned vine (German: Pendelbogen), which originated from Rhineland (Zupanič 1969). Žmavc (1925) discussed the cane-trained vineyards using trellising, the low-trained system with trellising (short and stretched spurs with 4 to 6 buds), the training system used in Mosel and Saarland and the tendone system with vines trained high over head along a pergola. The advantages and disadvantages or trellising were described by Meissner and his colleagues (1927).

In the 1930s, wine-growers began to use trellises, which made work easier since they no longer had to erect posts

or exchange them for new ones (1600 posts/ha per year). During this period, posts were made from oak, chestnut, acacia or larch (serrated or cleft). Wooden posts were put into a wooden container (30 cm deep) with a 5% solution of blue vitriol in order to lengthen the time of impregnation. After approximately half of a post was impregnated (wood turned blue/green), they were left to dry slowly. For tying canes and spurs, esp. shoots of buttercups were recommended although shoots of Uralian willow brushes, English willows and Blue-Green willows were also suitable. During this period, bast fibres (corn husk), jute and raffia were also used for tying (Zweifler 1924, Zupanič 1948).

Due to the introduction of trellising, new solutions for the fixation of end slopes in a row had to be found. In the beginning, larger stones were used and later iron screws, which had to be located deep into the ground. Three wires were attached to wooden poles, the first one between 30 and 40 cm above the ground, the second one 30 cm above the first and the third one 30 cm above the second. Thus, trellises in Styria were around 1 m high (Žmavc 1925).

In terms of soil cultivation, the rule of thumb was that soil must be cultivated in due time in order to prevent the growth of weeds. Thus, the water-air ration was improved, which means that soil temperature increases faster and that more water can be absorbed. Vineyards on steep hillsides represented an exception since their hoeing could not be conducted from the first half of June to the first half of August. Weeds were merely cleared and left in the vineyards since this prevented soil erosion. Styrian vineyards, most of which located on steep hillsides, were first hoed deeply in order to remove surface roots. Afterwards, wine-growers hoed soil two more times shallowly. After grape harvesting, which took place in autumn, the vineyards were hoed for the fourth time. This time, the hoeing was the deepest. In addition, hilling was carried out in order to protect the vines from frost. In summer it was recommended to remove shoots emerging from hardwood or those that are too dense in order to influence the aeration of leaves and reduce the risk of disease. If one year old wood was damaged due to frost or hail, it was recommended not to remove shoots emerging from hardwood. At the same time, shoots emerging from rootstocks were removed. According to Zweifler (1924), Sauvignon varieties, whose growth is excessive, must be trimmed back more than varieties of Rhine Riesling, whose growth is less vigorous. He also mentions spur (or head) pruning, which is conducted during or immediately after flowering. Head pruning means that the top cane on the third or fourth leaf above the upper grape bunch is removed.

During staking, side shoots (or suckers) must be pinched out regularly and carefully. Topping of shoots was supposed to be conducted in mid-August in order to ensure adequate light at lower leaves and grape bunches, which had a positive impact on both grape ripening and the fruitfulness of winter buds (Belle 1900). Topping should be carried out after the lower parts of shoots began to ripen (turn brown) and when the tops stand upwards. In lower, dense and shaded vineyards in which lower leaves either turned from green to yellow or were muddy wine-growers removed such leaves in order to ensure sun exposure and reduce rotting (Zweifler 1924).

Vines were usually staked up with rye straw up to three

times per year, when the soil was not moist. According to Belle (1900), straw was stronger if rye was harvested early (before flowering). In addition to rye straw, raffia, little-leaf linden (in Haloze), jute, paper fibers, willow breaks and removable and reusable wires loops (Zweifler 1924). For young vineyards, it was recommended to mark foreign vines not belonging to the prevailing variety in the vineyard in mid-August. Such varieties were dug out, transplanted or discarded. If foreign varieties were found in older vineyards, the scions of adequate varieties were cleft grafted onto these stocks. Grafting without sealing compounds had to be carried out in early spring (in the beginning of March). During sprouting, when vines are filled with sap, this type of grafting should not be carried out (Skalicky 1924a). Consistent marking of high yielding vines to be used as scions for propagation was another extremely important task. A good positive selection was the basis for increased fruitfulness, harmonious ripening and grape quality (Zweifler 1924). In the beginning of the 20th century, forcing in hothouses was introduced. In adequately heated rooms, callus formed at the joint. For this reason, the production of scions became more expensive, but at the same time the amount of high-quality scions increased (Zupanič 1969).

## DEVELOPMENT OF VITICULTURE IN STYRIA AFTER WWII

After the outbreak of WWII, viticulture faced a serious crisis. The situation gradually improved in the 1950s. During the first post-war years, opportunities for the introduction of mechanisation arose. Novak (1949) discussed the optimization of vineyard tasks and the replacement of manual soil cultivation. He recommended the use of draft animals and mechanisation. In his opinion, manual hoeing, which represented one of the most demanding tasks and one third of the work required per year, should be replaced by machining. One year later, Novak (1950a) came to the conclusion that mechanisation is of the utmost importance due to rural migration, leaving many vineyards unattended. In addition, he noted that mechanisation should be taken into account when planning the replanting of vineyards since distances between individual rows must be large enough. In his opinion, all wine-growers who think that labourers will return to hoeing or those who wish to produce larger amounts of grapes without soil cultivation are sadly mistaken. Draft animals (bullocks or horses) and vehicles can be used (tracked vehicles, tractors, etc.). In addition, flat land (terraces, flat vineyards) was of the utmost importance. Flego (1949) also mentioned the possibilities for the development of viticulture through mechanisation. In his opinion, small properties represented the main problem for the utilisation and cost-effectiveness of mechanisation. Therefore, he recommended land consolidation by joining wine-growing estates. Too much time was spent for the transport of water, and therefore new water resources near vineyards were sought. Whenever possible, joint water sources or power-driven water tanks for spraying were set up. In terms of production planning, work norms were also introduced in this period, which led to success and further development (Novak 1949).



**Figure 4: Meranovo estate (2007)**

When replanting vineyards, wine-growers had to increase the amount of wine per hectare. According to Veselič (1949, 1950a), the five-year plan was aimed at increasing the amount of wine from 2000 l to an average of 6000 l per hectare as well as improving wine quality and cutting down the costs of production. In his opinion, the only way to achieve these goals is to select high quality parent vine. He was convinced that a good selection is required for the success of mass replanting at larger estates. In addition, he proposed the establishment of large nurseries. Novak (1950b) agreed that vineyards cannot be replanted without an elaborate plan and that positive characteristics of rootstocks must be used in order to boost production. The Institute of Viticulture Maribor drew up selection guidelines, prepared relevant methodology and an organizational basis for each part of the selection process (Veselič 1949). As early as 1947, all state-owned estates were responsible for the selection in all mono-varietal vineyards. At that time, the selection records contained over 35,880 vines of high quality. In 1949, the number increased to 100,000 vines. The Secondary School of Agriculture in Maribor conducted courses for field experts responsible for the selection.

New vineyards were planted strictly at wine-growing locations. In accordance with the 1935 Grapevine Assortment, only varieties characteristic of a particular region were planted. Vineyards were replanted after the soil had rested for two years and after it had been triple-dug correctly (between 0.8 m and 1 m deep). The recommended planting space was 1.5 m × 1.2 m and the height of the trunk amounted to 0.6 m. According to Zupanič (1948), wooden posts with 4 to 5 interwoven wires were set up 5 m apart in order to support the shoots. The posts were between 1.5 and 1.8 m in height. He mentions the so-called “Oppenheim support” as an improved type of the above mentioned supporting structure. This structure consists of two firmly attached supporting threads and one pair of movable threads underneath. According to Colnarič (1961b), supporting structures also consisted of reinforced concrete posts, which were more durable but also heavier and more expensive. Concrete posts measuring 2 m in height became the norm, which is still being taken into account nowadays.

Only selected high-quality scions on adequate rootstocks were used for the replanting of vineyards. Rootstocks were selected on the basis of a soil analysis showing the proportion

of lime, amount of nutrients and texture. Wire rods were used as supporting material since they were less expensive and enabled simpler and quicker maintenance. Prior to replanting, larger estates had to be examined by an expert who gave instructions on the selection of varieties and rootstocks, the direction of rows and planting spaces. When attending to older vineyards, all self-propagated varieties were dug out or reinoculated, and all empty planting spaces (scions in young vineyards, layers in older vineyards) were filled. In addition, wine-growers were advised to implement agrotechnical measures related in due time (ranging from winter or deep hoeing to summer hoeing). The soil was triple-dug in autumn when vineyards were manured. In order to prevent weed growth, soil was dug up between two and four times per year. Pruning had to be carried out correctly and in due time (Skvarč 1950, Novak 1957, Colnarič 1961a, b).

Among the most efficient solutions for the improvement of profitability were high-trained vine systems and larger planting spaces. Wooden posts and iron wires were used as supporting material. Findings show that high-trained vine systems yielded much heavier crops in comparison with low-trained ones (in 1948 and 1949). However, there were no major differences in terms of sugar content. For this reason, it was assumed that high-trained vine systems are of the utmost importance for the success of viticulture. In order to enhance both quality and sugar content of high-trained vine systems, fertilization was recommended on a yearly basis (Frangež 1950).

Masten (1949) noted that many wine-growers sprayed fertilizers inconsistently or too late. For this reason, an anti-downy mildew service and a network of weather stations in all lands where viticulture represented an important industry were established. The national Authority for Plant Protection with the Ministry of Agriculture linked and coordinated all activities of the network. Its main task was to call upon wine-growers to apply pesticides against downy mildew in critical periods (in newspapers or on the radio). In Slovenia, the majority of these stations (a total of 17) were located in Styria (11 stations).

In the beginning of the 20<sup>th</sup> century, grapes were supposed to be harvested in the beginning of October or in exceptional cases earlier (natural hazards during ripening). In the 1950s, the harvesting date was determined by local committees, grapes were harvested according to variety and rooting berries were separated beforehand. Grapes were transported to cooperatives or commissioned companies focusing on vinification and marketing (Gombač 1927).

During this period, wine-growers were advised to use all kinds of grape remains as an additional source of income. Following the example of Switzerland or France, pomace was processed into large amounts of cooking oil or spirit (Veselič 1950b). Large amounts of argol can be used for the production of tartaric acid, while pomace and wine lees can be used for feeding livestock (Skalicy 1924b, Veselič 1950b). According to Colnarič (1961a), in the period between 1939 and 1961, only carefully selected varieties were grafted onto American rootstocks. After WWII, the assortment still contained 20% hybrid grapes varieties and 80 % of high-quality varieties. An efficient and constant grape production still represented a major problem by the end of the 1960s.



In the period between 1930 and 1957, the average annual crop index was somewhere below 1. Between 1956 and 1961, wine-growers finally succeeded in producing a higher yield (by 5% or 10% per year). The average annual yield increased especially due to the record-breaking 1958 vintage. According to Colnarič, modern agricultural technology and high yields are of key importance for the success of viticulture (as much as 100 dt/ha was considered a realistic expectation). Styria still lacked adequate mechanisation, esp. for spraying. In addition, intense training systems were being introduced slowly, and plant protection was not implemented consistently. The initial plan envisaged that all vineyards be replanted during the first post-war years, but up to 1957 approximately 10% were replanted (during the first 15 years) due to a lack of resources. Since plans for the production of scions and replanting plans were rarely brought in line, scions could not be sold and wine-growers suffered significant losses.

In 1960, the Junior College of Agriculture was established in Maribor in order to facilitate knowledge transfer. At this school, acknowledged experts and managers obtained their degrees. They promoted and guided the development of viticulture in large socialist production plants. In the academic year 1969/1970, the school formulated guidelines for extension services in agricultural cooperatives and combines. Due to their large estates and a favourable investment policy of the state, cooperatives became the leading wine and grape producers as well as marketing specialists. Private wine-growers were able to sell their wine to large state-owned companies and usually became merely partners of cooperatives.

Grape production had to be rationalized in order to reduce costs. Terraces had to be set up at steep locations in order to ensure smooth and efficient machining. In practice this meant that distances between rows (from 2.2 to 3 m) and the breadth of terraces had to be adapted to multipurpose machining (agricultural). In the beginning of the 20<sup>th</sup> century, the importance of terracing, which had been known on the steep hillsides of Haloze for a long time, had been reduced. However, in the 1970s, terracing represented an efficient solution for the use of mechanisation in vineyards (Colnarič and Vrabl 1991, Beloglavec 2000).

During the first post-war years, vineyards were being replanted intensively. However, in the 1970s, replanting stagnated. Various wine-growing areas were abandoned or left unattended. Due to difficult economic conditions on the countryside, private wine-growers in poorer regions tried to solve their financial problems by planting hybrid grapes. According to Colnarič, the share of these varieties had been increasing up to 1970 (Colnarič 1970).

In the 1970s and 1980s, grape production doubled (Colnarič in Vrabl 1991). The new cordon training system and a stable wire support enabled greater crop load. According to Beloglavec (2000), as many as five buds per cane were left per grapevine. During this period, both training systems and technology became more advanced. All vineyard tasks had to be carried out in due time, and particular attention was being paid to pruning. Annual excessive fertilization and preventive pest control also contributed to higher yields.

The number of vines per hectare decreased (between 3000 and 4000), which was the consequence of larger distances between rows since vineyards had to be adapted to mechanisation. The

desire for larger yields remained, which caused certain late varieties to rot since wood could not fully mature (e.g. Šipon (Furmint) and Zeleni silvanec (Sylvaner)).

During the last two centuries, Styria underwent drastic changes concerning viticultural technology and viticulture in general. Favourable soil and weather conditions, such as those in Styria, represent one of the long-term requirements for the production of high quality grapes. Quality depends not only on the variety, but also on planting density, crop load, soil cultivation and various other factors, which are being explored within the framework of research studies conducted by the Faculty of Agriculture and Life Sciences of the University of Maribor. After nearly two centuries, the University Centre of Viticulture and Oenology Meranovo became a research facility (Fig. 4), where students of viticulture and oenology gain theoretical and practical knowledge and facilitate knowledge transfer.

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# Quality of Styrian wines from the period of Archduke John of Austria until today

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## ABSTRACT

The most important milestones in the quality of Styrian wines (winegrowing regions of the Slovene part of Styria) in last two centuries were: improvement of assortment and clonal selection, pest control, introduction of must clarification, proper use of sulfur dioxide and fining agents, introduction of chaptalization and correction of acidity. For the past two centuries, the style of produced wines has been changing constantly. In the 19<sup>th</sup> and the beginning of the 20<sup>th</sup> century, stable and clear bottled wine could be produced only by long standing wine maturation in wooden barrels. Therefore, the bottled wine was mainly dry and had an overaged flavor. For the production of sweet wines, the development of sterile filtration was of essential importance. The wines could be bottled earlier so they preserved their varietal aroma. Nowadays, the most important characteristics of Styrian wines are freshness and fine varietal aromatic flavor. Both in time of the Austro-Hungarian Empire and Yugoslavia, Styrian white wines were considered the best in the region. Styrian wine quality reached its peak when Slovenia gained independence due to increased competition. At the beginning of the 21<sup>st</sup> century, the introduction of modern technologies in viticulture and winemaking and their transfer into practice made Styrian white wines more competitive with wines produced in renowned regions around the globe.

Key words: wine, quality, Slovene part of Styria

## INTRODUCTION

Styrian wines are those produced in wine-growing regions of the Slovene part of Styria. Grapes and wine in this region are being produced from the period of the Roman Empire. Over the past two decades, these vineyards belonged to different countries – from the Austro-Hungarian Empire, the old and new Yugoslavia to the independent Republic of Slovenia by the end of the 20<sup>th</sup> century. A clear distinction must be made between wine-growing regions of the Slovene part of Styria and regions of the Austrian part of Styria. Prior to the dissolution of the Austro-Hungarian Empire, both wine-regions belonged to the same territory. Both the quality and the production of wine changed through time. The changes can be evaluated through professional contributions describing the development of viticulture and wine trade in this territory. At the beginning of the 19<sup>th</sup> century, the technology was not as advanced as in well-known German or French wine-growing regions. Experts, individuals (teachers, priests and doctors) and patrons (Archduke John of Austria) interested in viticulture influenced the introduction of new varieties and improvements both in vineyards and wineries.

The aim of this paper is to evaluate key factors that influenced the quality of Styrian wines during the past two centuries through an overview of professional literature.

## INFLUENCES ON THE QUALITY OF STYRIAN WINES IN THE 19<sup>TH</sup> AND 20<sup>TH</sup> CENTURIES

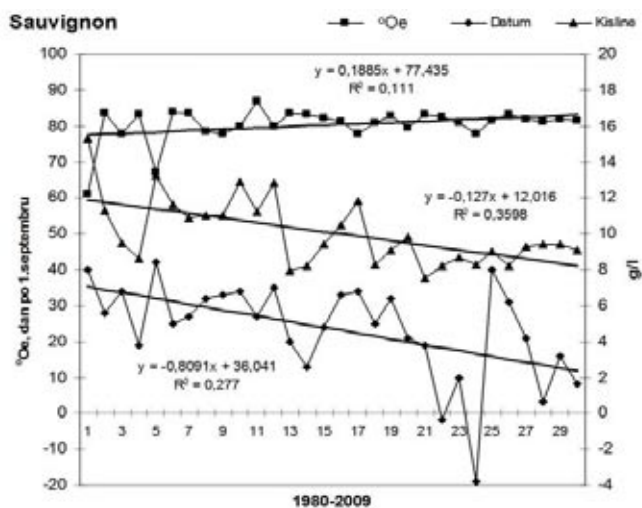
### Natural features

In the 19<sup>th</sup> century, natural features had a much greater impact on wine quality than today. In contrast to other vineyards around the globe, Styrian vineyards (in the territory of today's Slovene part of Styria) have enough sunlight and rainfall. Although the amount of rainfall varies considerably from year to year, water stress for grapevine is an extremely rare phenomenon. This enables the cultivation of white wines with a distinctive bouquet. Certain oenological procedures for quality improvement, e.g. must refinement through chaptalization and correction of acidity, were not used in the 19<sup>th</sup> century. For this reason, differences in wine quality of various vintages were greater than today. In less favorable years, the alcohol content was lower, while the level of acidity was higher. If grapevines were affected by rot, the aroma was unclear.

Over the past two centuries, cold and higher-than-average warm periods were usually shorter. Zupanič (1969) states examples of vintages from the beginning of the 20<sup>th</sup> century. Data shows that the climatic conditions varied from year to year. The lightest sour wines were produced in the vintage years 1902, 1903, 1904, 1906, 1909, 1910 and 1912. The strongest wines on the other hand were produced in the vintage years 1905, 1907, 1908 and 1911.

**Table 1: Overview of prominent vintages in the 19<sup>th</sup> and 20<sup>th</sup> centuries (Zupanič 1969, Bassermann 1975)**

VINTAGE	CHARACTERISTICS
1802	Excellent wine from Gornja Radgona
1805	The worst vintage remembered by the inhabitants: during harvesting, grapes needed to be crushed. Similar data can be found for Germany. In many regions, grapes were not harvested.
1811	Superb vintage; in Germany one of the best since 1873
1834	One of the best vintages of the 19 <sup>th</sup> century (in large amounts). Similar data may be found for German wine-growing regions.
1851	An extremely poor vintage in Germany; grapes were harvested on the 23 October! Aged wine was extremely expensive.
1854	In the beginning of June, vineyards were destroyed by hail.
1858	Heavy snowfall (one and a half meter) in the beginning of November. Excellent wine was produced from grapes harvested after thaw.
1862	Very early spring. Seedlings were visible as early as in the beginning of April.
1866	Heavy frost on 24 May, which caused great damage to vineyards at lower locations.
1869	Heavy snowfall (half a meter) on 18 October (grape harvest!). On the 30 and 31 October heavy snow fell again. Difficult harvest but good wine.
1876	Cold wind on 18, 19 and 20 May (- 3 do -5 °C) destroyed shoots at higher locations. In the next days, shoots at lower locations were also destroyed by heavy frost.
1888	Extremely persistent downy mildew in Germany; grapevines last until fall (without leaves).
1889	extremely persistent downy mildew in summer, vintage of poor quality
1890	The best vintage of the 19 <sup>th</sup> century (along with the 1834 vintage). Favourable weather conditions throughout the year.
1891	If vineyards were sprayed with chalcantite, wine was good, otherwise leaves were dry as early as mid-August and grapes did not reach ripeness.
1893	On this territory, vintage of mediocre quality; in Germany one of the best vintages due to noble rot.
1899	Small amounts of wine due to oidium.
1900	An extremely good vintage in terms of quantity; approximately one fifth was produced from so-called "Americans" (vineyards with American rootstocks)
1901	One fourth of the crop consisted of Laški rizling (Welschriesling) and Modra portugalka (Blauer Portugieser)
1909	Rich harvest, but wine of poor quality due to rot.
1914	Destroyed vineyards due to heavy hailstorm on 28 July and 15 August (at the outbreak of WWI).
1929	After a rich harvest in the previous year, in the night of 1 February, the temperature fell to - 27 °C. Even old vines froze.
1933	An extremely cold year; vine blossomed in the beginning of July.
1934	Very early harvest (by the end of September).
1951	Late frost destroyed all crops.
1958	In terms of quality, one of the best vintages of the century.
1964	Harvest of poor quality due to rot.
1971	One of the best vintage years. Some wine cellars produce high-quality wines according to the German classification (Prädikatswein)
1980	One of the worst vintage years. 1-2 was average grade given to wines from the Region of Podravje.
1982	One of the richest harvests – there were not enough barrels.
1983	A superb vintage after a century of poor harvests.
1984	One of the worst vintage years.
1985	Winter frost destroys the majority of vineyards; some were grubbed out.
1992	A dry year, superb vintage.
1993	Various wines of excellent quality due to noble rot and warm autumn wind.



**Figure 1: Sugar and total acidity content of grape juice and the recommended harvesting date for the late Sauvignon variety in the period between 1980 and 2009 (Vršič et al. 2012)**

Vintage wines with medium or low acidity were considered good. These were produced if summer and autumn were warm and dry. Harvests were rarely as rich and good as the one in 1848. In the 19<sup>th</sup> century, 1834 is considered the best vintage.

Poor vintages were produced during wet and cold years, when grapes could not be attain the required ripeness. In addition, vineyards were often destroyed by natural hazards, such as hail, spring frost or snow during harvesting. The economic situation was additionally worsened by wars and economic crises.

A few vintages that differed from the average are also worth mentioning. On 5 November 1835, the harvest failed due to heavy snowfall (one and a half meter). Usually, the quality of vintages is in inverse ration with the production harvested. However, there are also a few exceptions to this rule. In 1841, huge amounts of quality wine were produced, whereas in 1843 small amounts of sour wine were produced. Winter frost in 1929 and 1985 caused great damage to wine-growers. Abundant harvests like the one in 1928 does not automatically mean an economic advantage since prices usually fall considerably during such periods (Radmilovič 1988). Wine-growers are most satisfied if the harvest is rich and wine can be sold for a reasonable price. This happened for example in 1830 despite an extremely cold winter. Table 1 shows distinct features of vintages from the past two centuries.

Climatological data and harvesting dates reveal changed weather condition from 1990 onwards. Harvesting takes place much earlier than in the past. Chart 1 shows changes in the harvesting dates for Sauvignon. From 1980 to 2009, harvesting dates for this variety were moved up for an average of three weeks. In addition to the weather conditions, differences in wine quality heavily depend on the collection where the grapevine grows. Wine-growing regions represent a framework for the production of quality wine. The narrowest area of production, which is emphasised with regard to top-quality wines, is the wine-growing location.

## Assortment, ampelographic technology, diseases and vine pests

At the beginning of the 19<sup>th</sup> century, there were 22,975 ha of vineyards in the Slovene part of Styria. The main varieties were Belina, which represented half of the assortment. During this period, the average amount for Styria was 2500 l/ha, whereas the average amount for the high yielding varieties (Belina, Lipovščina) was 4000 l/ha. At the best locations, where the soil was rather poor, the average amount was between 10 to 30 buckets per acre (from 1000 to 3000 l/ha). If the planting density is taken into account (12,500 vines per hectare), it can be established that yields were extremely low (0.2 kg/vine), which is the consequence of “lazy” unselected grapevines, poor technology and various diseases (Zupanič 1969). On behalf of the Society for Agriculture in Graz, Franz Trummer visited all Styrian vineyards between 1835 and 1839 in order to study the grapevine assortment. He described around 300 varieties. During the phylloxera epidemic, new propagation methods were explored. In addition, the question concerning the assortment was addressed. In 1905, Franz Zweifler, the principal of the School of Fruit- and Wine-Growing in Maribor, made a selection of varieties for individual wine-growing regions on the basis of the results of a survey conducted among experts. At the 1935 wine-growers’ meeting in Maribor, a Grapevine Assortment for the Drava Banovina, in which the borders of wine-growing regions were also marked (Grapevine Assortment 1935). After the Second World War, the assortment had undergone changes from time to time. However, it did not change much (Hrček 1996).

The problem of hybrids had been present during most of the 20<sup>th</sup> century. According to the data of the Slovenian Statistical Office, between 18 and 27% of Slovene wines were produced from hybrids in the period between 1964 and 1968, esp. the regions of Posavje and Podravje. In Styria, such wines were produced mostly in regions with a poor economic structure (Haloze). A survey conducted in 1970 states that approximately 35,000 ha of wine were produced from hybrids.

Wine quality was heavily influenced by various parasites. In the beginning of the 19<sup>th</sup> century, vineyards were destroyed mostly by downy mildew and oidium. During wet autumns, vineyards were affected by rot, which reduced the quantities harvested and contributed to an unclear aroma. In the second half of the 19<sup>th</sup> century, oidium and downy mildew became even more common. Oidium caused a mould-like aroma of wine, while downy mildew stopped the developed of infected grapes and reduced the activity of leaves. Therefore, wines were light and sour. For both parasites, experts quickly found a solution – sulphur and blue stone. The phylloxera epidemic had a greater impact on the amount and price of wine than on wine quality. From the 20<sup>th</sup> century onwards, the most common parasites remained downy mildew and oidium, depending on the weather conditions. By the end of the 20<sup>th</sup> century, the demand for organic production increased. Viticulture experts were always up to date. Even before restrictive regulations concerning the use of phytofarmaceutical resources had been introduced, experts recommended limited used of copper agents and certain

**Table 2: Chemical composition of 1902-1912 vintages from Slovenske Gorice (Zupanič 1969)**

Alcohol	6.8 – 14.9 vol.%
Sugar-free extract	14.6 – 33.9 g/L
Residual sugar	0.1 – 78.1 g/L
Total acidity	4.4 – 11.4 g/L
Volatile acid	0.17 – 1.20 g/L
Glycerol	4.5 – 10.2 g/L
Ash	1.30 – 2.25 g/L

pesticides and warned against resistance caused by overuse of agents with a similar effect. The main cause of most and wine faults remains grapevine rot, which can be avoided with adequate crop load and careful cultivation. Wine faults are also caused by vinegar taint, which is the consequence of ripening in warmer conditions due to climate changes at the end of the 20<sup>th</sup> century.

## Harvesting, processing, fermentation

Zupanič (1969) described the common method of grape processing and the maturing of wine during the first half of the 19<sup>th</sup> century. The grapes were harvested without being separated according to variety. Intact grape clusters were trodden by feet or by a mill, put into wooden barrel and then into the wine press. The pomace was spaded and then pressed for another 5 to 7 times. The must was poured into

wooden barrels, where it fermented into wine. Wines were bottled directly from the lees without racking (a process for filtering the wine). Such maturation caused poor quality of wine. Owners of large estates and important German wine-growers began to introduce improvements: varieties were harvested separately, the last pressed juice was separated and used for the wine-growers' own use, most was clarified in order to slow down fermentation. Wine was racked three times (in winter, spring and autumn). Isinglass was used for clarification.

Rath (1824) described the art of producing top-quality wines. In his opinion, this is extremely difficult to achieve in Styria. He states that the assortment should include varieties with wrinkled grapes, which can turn into raisins. For the selection of red wines, wrinkled grapes are not required, but the berries must be of a dark red colour and sweet flavour. These grape characteristics enabled the production of a famous wine called Konjiška črnina (rothe Gonowizer). According to the authors, this variety exceeded all other Styrian red wines both in terms of quality and price. In terms of white grape varieties, wine-growers harvested the best-looking and ripest grapes, which were put into a barrel in the pressing facility. Grapes were separated from the stems and crushed by hand. The pomace was left for a few hours, then filtered and crushed in a small press. Wine did not clarify until June the next year.

During the first half of the 20<sup>th</sup> century, various substances in both most and wine were discovered. They were being qualitatively tested in labs, and new findings related to the production and maturation were presented. Babo and Mach (1921) discussed the fact, which had already been known by

**Table 3: Overview of important awards won by wines from the Meranovo estate**

Evaluated wine	Award type and competition
Sauvignon 2001 Sauvignon 2002 Laški rizling SJI 2006 Sauvignon 2009 LV	<b>Quality Champion</b> KŽS Gornja Radgona 2002 KŽS Gornja Radgona 2003 International University Wine Competition Maribor 2008 International University Wine Competition Maribor 2011
Sauvignon IZ 1997 Sauvignon IZ 1997 Sauvignon 2000 Sauvignon 2001	<b>Variety Champion</b> Vino Ljubljana Vino Ljubljana 1999 KŽS Gornja Radgona 2001 KŽS Gornja Radgona 2002
Sauvignon SJI 1995 Laški rizling SJI 2006 Sauvignon JI 2006	<b>Great Golden Medal</b> KŽS Gornja Radgona 1997 Vino Slovenija Gornja Radgona 2008 Vino Slovenija Gornja Radgona 2010
Sauvignon 1997	<b>Golden Medal</b> Sauvignon Forum 1998 Lednice

that time, that different strains of yeast influence the quality of wine. Therefore, they suggested that it would be wise to use selected yeast. In addition, they discussed experiments conducted at the turn of the century, in which various authors studied the influence of strains of yeast on the quality of wine. It is extremely interesting that the most pleasant aromas were produced from yeast with high fermenting capacity.

Arthold (1935) recommended adequate sulphuring of most, which prevents the development of pests. He further recommended the clarification of must and proposed the use of additional yeast. During this period, experts were already familiar with the selection of yeast according to various characteristics (cold fermentation, resistance to sulphur ...). According to Arthold's opinion, fermentation at lower temperatures retains the aroma. However, he recommended fermentation at 25-28 °C in order to reach the desired optimum for yeast.

During the second half of the 20<sup>th</sup> century, technologies related to the transport and processing of grapes became more advanced due to more extensive grape production (larger cellars). Inadequate logistics after harvesting reduced the quality of wine. Large estates were not always able to process large amounts of harvested grapes. Large cellars improved quality control concerning processing and maturation through large investments in processing capacities and modern technology. From the 1990s, private wine-growers were also introducing new methods (pneumatic press, cooling).

## Maturing of wine, new technologies, new products

In the 19<sup>th</sup> century, sulphuring with sulphur sticks was widely used since empty oak barrels must also be protected from mould. However, Vošnjak (1873) advised against excessive sulphuring of wine. In his opinion, sulphuring has a short-term effect on the preservation of wine. For this reason, he recommended adding alcohol, which was a method more often used in warmer regions (southern France, Portugal, Spain).

In this territory, wine-growers lacked proper understanding about the use of sulphur until the beginnings of the 1990s, when they expanded their knowledge of oenology. Until then, sulphuring had only been conducted when decanting wine (with sticks), which had an oxidized aroma. Up to this day, the use of sulphur compounds preserved its importance for the quality of wine. However, nowadays far more advanced methods are being introduced. Wine-growers are familiar with measuring the sulphur content and therefore the amounts of sulphur are optimal both for the quality of wine and the health of consumers.

## Clarification and bottling

Clarification used to be more important than nowadays since one hundred years ago winegrowers did not know how to accelerate clarification in order to ensure stable clarity. Clarity of wine influences its aroma. Various oenological substances (gelatine, egg white, tannin) for clarifying wines



**Figure 1: Award certificate for Traminac (Gewürztraminer), vintage 1951, from the Meranovo vineyard belonging to the estate called Pohorski dvor**

had been known for a long time. In the beginning of the 20<sup>th</sup> century, various filters were discovered. However, sterile filtration had not been possible yet. Prior to the discovery of sterile filtration, correctly produced wines had to be fully fermented. After wine had been bottled, refermentation could not occur. Clarity was achieved through multiple decanting and additional clarification, e.g. with isinglass for white wines and egg white for red wines. Prior to bottling, wine was tested for persistence. For this purpose, several half full bottles were put in a warm room for 6-8 days. If wine did not appear cloudy and dull, it was bottled (Babo and Mach 1921).

A milestone in wine clarification represents the discovery of sterile filtration, which enabled the production of stable clear wine. This technology enabled the bottling of wine with residual sugar. Sterile filtration was first introduced in Germany about the year 1930 (Troost 1988).

In this territory, the method was introduced in larger cellars esp. after the Second World War, when wine was usually sold in open containers. However, the main goal was to sell as much bottled wine as possible in order to preserve quality. In order to prevent a premature aging process, it must be stabilized and bottled as quickly as possible. The alcohol content of wines that do not undergo sterile filtration should be at least 12.5% abv. Otherwise, sterile filtration and bottling

are required (Breznik 1959, Judež 1965).

When Slovenia gained independence and the social system underwent changes, private wine-growers began to sell bottled wine. In the 1990s, due to limited knowledge of wine production and bottling, bottled wine was often cloudy and dull, which was the consequence of refermentation. Nowadays, wine production and bottling is normal routine.

## Barrels and bottles

Up to the 1980s, the majority of Styrian wine cellars used wooden barrels. Prior to the development of steel containers, large wine cellars also used concrete barrels by the end of the 19<sup>th</sup> century. Babo and Mach (1921) described such barrels stored in cellars.

In larger cellars earlier and in smaller during the 1990s, wooden barrels were gradually replaced by containers made from synthetic material (e.g. polyester) or stainless steel. The discovery of the latter has considerably changed the style of wine known until then. If wine matured for a longer period, it took on the aroma of wooden barrels even if they were in a perfect condition. Wood releases certain compounds that produce a woody aroma. This influence is smaller in the event of wines produced from premature grapes and certain aromatic varieties, whereas it is greater in the case of light, neutral wines. In comparison with a wooden barrel, stainless steel containers do not give off any smell and are also more practical in terms of maintenance – moderate fermentation, esp. with additional cooling. Wines kept in such containers have a distinctive, clear and fresh flavour. Since every coin has two sides, there are also certain problems with these containers. Due to limited aeration and greater height of the container, the aroma can be influenced by hydrogen sulphide but it can be removed.

Bottled wine used to be highly expensive for two reasons – the first one being that glass itself was extremely expensive, and the other one being the long-lasting preparations for bottling since wine had to mature for a few years before being clear enough for bottling. Due to the soaring price of bottling, only the best wines were bottled, but the investment return was high. During the first decades of the 19<sup>th</sup> century, numerous glasshouses were established on the Pohorje hillsides. In addition to glass, they also produced wine bottles, carboys and drinking glasses (Zupanič 1969).

The possibility of purchasing bottles made out of toughened glass enabled the creation of a new product – sparkling wine. Louis Kleinoscheg et Frères began to bottle it in 1853 in Gornja Radgona. Clothar Bouvier continued his work. Before the outbreak of WWII, the cellar had a capacity of 100,000 bottles of bottled wine and 50,000 of sparkling wine (Adamič 1997). In the 1960s, the majority of private wine-growers did not have adequately equipped rooms for processing and maturation. However, most of the larger cellars continued to use wooden barrels. During this period, steel tanks were rarely used. Esp. concrete tanks were used, but they were inadequate for fermentation. Wooden barrels were still most common (Colnarič 1970).

The construction of new cellars in Styria (Ormož, Ljutomer, Kapela) represents a major step forward in the modernization of viticulture. These cellars were constructed

according to the Veselič model of round buildings with multiple levels. Processing starts on the top floor, while bottling is conducted on the bottom floor. During the period from the end of the 1980s until Slovenia's independence, wine was bottled only by larger cellars, while private wine-growers grew wine, which matured in open containers. In line with the policy at the time, expertise and technology were in the possession of large state-owned cellars. Private wine-growers' knowledge of oenology was limited, and the best among them produced white wine according to the following model: manual harvesting, transport of grapes in back baskets, grape crushing and pressing with a wooden press, most clarification, chaptalization of a larger number of varieties, fermentation without selected yeast, decanting between two and three times, maturing in a wooden barrel, sale of unbottled wine. Sulphuring with sulphur sticks was carried out upon decanting. Wine-growers were not familiar with measurements of sulphur content, use of fining agents and yeast, correction of acidity, stabilization procedures and bottling. From today's professional viewpoint, wines from the cellars of private harvesters lacked sufficient sulphur content and were oxidized as early as spring or summer. However, differences in the quality of wine remained. Good wine-growers and oenologists produced wines, whose aroma would be considered oxidized nowadays, but they were clean and well balanced (acidity, alcohol, residual sugar). Wines of less skilled wine-growers had various faults and an acidic or unbalanced aroma.

## CHANGES IN WINE STYLES THROUGHOUT TWO CENTURIES

In the 19<sup>th</sup> century and later, indicators of wine quality were fairly similar to the present ones. Clarity was the most important characteristic. Bottled wine should not turn cloudy or crust. During this period, there were no filters to separate yeasts when bottling wine and therefore microbiological stabilisation was achieved through long-lasting maturation in a wooden barrel (3-4 years). During this time, potassium tartrate, proteins, tanning agents were extracted, and potential subsequent fermentation was completed (alcoholic fermentation of potential residual sugar and malolactic fermentation). In those days, clarity was thus one of the most important indicators of quality.

According to Vošnjak (1873), wine is mature if it is no longer cloudy after racking. He also mentions that strong wines from Ljutomer or Pohorje should not be bottled before the age of five.

Alcohol content is the next important quality indicator. Stronger wines were more treasured due to lower acidity (better vintages). In addition, they were less perishable, which was also of the utmost importance, esp. for bottled wine. By the end of the 19<sup>th</sup> century, sugar was too expensive to be used for the production of most. Therefore, alcohol content varied considerably between vintages.

Vošnjak (1873) compared the alcohol content of Styrian wines and wines from other countries. He states that wines from Ljutomer reach approximately 12-14% abv, while wines from Pekre (Pohorje hillside) reaches 10-13% abv. For comparison: Burgundy, Bordeaux and Rhineland wines



reach 9-11%, 9-12% and 8-10% abv respectively. During poor seasons or at unfavourable locations, wines reached merely 5-7-9% abv.

Table 2 shows differences in the chemical composition of 1902-1912 vintages from Slovenske Gorice (Zupanič 1969).

Total acidity is another quality indicator, which depends on residual sugar. Wine used to be considered top-quality if total acidity was low and mature. Since Šipon (Furmint) was considered one of the leading varieties, quality of wine from different wine-growing regions varied considerably. The strongest wines with a pleasant flavour and a “healthy” acidity level were produced in the surroundings of Ljutomer and Ormož (Zupanič 1969). Traminac contains a large amount of sugar and has a low acidity level. For this reason, it was considered an extremely strong wine of a soft flavour (Zweifler 1924).

During this period, wines with residual sugar were most popular – various folk songs refer to the “sweet taste” of wine. However, it must be noted that people rarely had the opportunity to enjoy anything sweet in those days. Sugar, honey and chocolate were too expensive, and various fruits could only be eaten in summer or autumn. Wine with residual sugar was produced only in the best vintage years or if fermentation stopped prematurely due to sudden coldness. In this case, wine lasted only until spring when it lost its sweetness and became cloudy due to higher temperatures and refermentation. In his book, Vošnjak (1873) mentions that wines from Ljutomer maintained their sweetness longer than any other wine produced in this territory. The same applies to designated varieties of superior quality (Prädikatswein under the German wine classification) that were also known in Styria during this period. Šipon (Furmint) is one of the strongest wines if grapes reach full ripeness. In autumn, when these grapes turn into raisins, late-harvest wine (so-called jagodni izbor in Slovene or Beerenauslese in German; literal meaning: selected harvest of berries) can be produced (Zweifler 1924).

Aroma is also an extremely important quality indicator. In this respect, wine from this period differs most greatly from wines produced by the end of the 20<sup>th</sup> century. The aroma of mature, robust wine was typical and extremely popular at that time. This preference developed since only mature wine, which remained in the barrel between 3 and 5 years, was clear and did not turn cloudy upon racking. At that time, the stability of clarity (also praised in folk songs) was a far more important quality indicator than nowadays. Varietal aroma appreciated by experts and consumers by the end of the 20<sup>th</sup> century was concealed by the aroma of mature wine. Long ageing of wine for the purpose of racking increased costs for wine-growers (supplies, barrels, facilities). Some of them shortened this period through pasteurisation. However, Josip Vošnjak (1873) advised against this practice since such wines did not possess the same bouquet.

Varietal aroma was commonly associated with young wines, e.g. Rumeni muškat (Muscat), which was most common in Maribor, where the conditions were favourable. This variety was extremely popular and was therefore sold for a high price (Zweifler 1924). Muscat should either be consumed as a young wine or bottled early. Long-term ageing in bottles negatively impacts the bouquet and quality.

Vošnjak (1873) also mentions the excellent Muscat produced in Kamnica near Maribor. In his opinion, Šipon (Furmint) lacked aroma and therefore Muscat or Rhine Riesling was being grown in-between rows. In certain vintage years, wines of excellent quality were produced. Their taste was sweet and strong. Wine matured after 3 to 4 years or 6-8 years (for bottled wine). In Vošnjak's opinion, the unique bouquet of wines produced on the hillsides of Pohorje exceeds all others. He states that some wine-growers grow Rhine Riesling but advises against it since its strong, but robust bouquet would spoil the natural smell of wines from Pohorje. In contrast, Jančar (1867) advocates the use of this grape variety since it produces an “aromatic and stable” wine.

In comparison with wines from Ljutomer, wines from the Pohorje hillsides were less sweet, had a higher acidity level but a stronger aroma. During this period, Brandner was considered one of the best wines of Pohorje. In terms of red wines, esp. the so-called Vinarska črnina (literal meaning: viticultural blackness), a sweet-tasting wine produced from the following varieties: Črnina, Vranek and Kavka, which has an aroma reminiscent of cinnamon (Vošnjak 1873).

Meranovo is the most famous wine-growing location on the hillsides of Pohorje. In 1822, Archduke John of Austria bought this estate and set up modern vineyards with varieties, which were up to this time unknown to local wine-growers. In the 19<sup>th</sup> century, Renski rizling (Rhine Riesling) was the most highly praised variety. Carl Ritter, a geographer from Berlin, praised the wine Johannisberger (a synonym for Rhine Riesling) that he had tasted while visiting the Archduke at his estate above Pekre (Vuk 1990). In the 20<sup>th</sup> century, they began to grow Sauvignon. Various awards and prizes won by wines from the Meranovo estate demonstrate the high quality of these wines (Table 3, Fig. 1). Nowadays, the University Centre of Viticulture and Oenology is located here. The Centre is part of the Faculty of Agriculture and Life Sciences, University of Maribor.

Quality assessment of wines produced during this period is also evident from the prescribed cadastral net return. In accordance with this assessment, wines were ranked in the following order: wines from Ljutomer, Ormož and Maribor, followed by wines from Slovenske Gorice, Radgona and Ptuj (Zupanič 1969).

In the beginning of the 19<sup>th</sup> century, quality suffered as a consequence of inadequate varietal composition (multi-varietal vineyards). Due to the different ripening times, grapes could not be harvested separately. If berry rot occurred on certain varieties, healthy berries of other varieties were also picked although they had not reached full ripeness. After new varieties had been introduced at the Archduke's initiative and grown in mono-varietal vineyards, quality was enhanced. In his Systematic Classification and Description of Grape Varieties of the Duchy of Styria, Trummer (1841) states that Renski rizling (Rhine Riesling), Šipon (Furmint) and Traminac (Gewürztraminer) are “the best white wines”, Laški rizling (Welschriesling or Italian Riesling) produces “quality strong wine”, Silvanec (Silvaner), Žlahtnine (varieties of Chasselas Blanc) and Belina are “mostly light wines”, Modri burgundec (Pinot noir) and Modra kavka are “the best red wines”, while Modra portugalka (Blauer Portugieser) and

Modri vranek are “fine red wines”. In the municipality of Zavrč in the wine-growing region of Haloze, Šipon (Furmint) was often produced as a late-harvest wine (jagodni izbor in Slovene or Beerenauslese in German (select berry harvest): overripe grapes individually selected from bunches and often affected by noble rot, making rich sweet dessert wine.). Winegrowers from Ljutomer, Ormož, Ptuj and Gornja Radgona also produced excellent wine from this variety, which was the second most common during this period (the first one being Belina). Šipon (Furmint) produced in Ritoznoj was considered wine of the highest quality. In the surroundings of Maribor (Kamnica, Kozjak), Rumeni muškat (Muscat) was extremely popular (Zupanič 1969).

Babo and Mach (1921) state that the best white wine is produced from Renski rizling (Rhine Riesling), whose bouquet is the result of overripe grapes infected with noble rot. This variety is followed by Dišeči traminec (Gewürztraminer) with with a flamboyant bouquet of lychees and Sauvignon with its pleasant aroma.

There is limited data on sensory indicators in professional literature published on the territory of the former Austro-Hungarian Empire in the 19<sup>th</sup> century. A more detailed sensory evaluation of wine was conducted by Babo and Mach (1922). Concerning the development of colour, they state that white wines develop their colour from off-green-white in young wine to yellow, straw or golden colour in old wine. Interestingly, prior to 1920, consumers praised esp. wine of golden colour, whereas wine of greenish yellow colour became popular later. Wines with brown colour shades were considered faulty. The colour of red wines should be intense with shades reminiscent of ruby or pomegranate. Red wines of too dark colour are appropriate for standardization but not consumption. When assessing the aroma of young wines, the authors distinguish between young wines with a fresh dioxidized aroma and mature wine with a firm aroma. In addition, they state that aroma is an indicator of both variety (varietal aroma) and the potential presence of noble rot. The aroma is of course also an important indicator of healthy and clear wine.

Concerning the evaluation of taste, the authors mention the systematic approach to tasting wine. The primary source of a person's ability to taste wine is derived from their olfactory senses, and therefore the sensory effect after consumption is of primary importance for the final assessment. By tasting wine, the level of fermentation and the flavour can be assessed (full-bodied, light, fresh or old). They further distinguish between different approaches depending on the purpose of tasting. Wine tasting can be conducted during maturation in order to detect any faults and to assess the adequacy for blending. Tasters had an extremely difficult task when assessing whether young wine is still cloudy or faulty (presence of hydrogen sulphide, sulphur). In addition, they had to predict the further development of such wine. Wine tasting is also conducted in order to determine wine of the highest quality. The authors also compiled a glossary of wine tasting descriptors (Babo in Mach 1922).

During the period of the Democratic Federal Yugoslavia, white wines produced in Styria were highly praised. They are of olive green colour with 11-12% abv and their aroma exhibits its varietal character. Although they taste fresh due

to a higher level of acidity, they are balanced and accessible (Radovanović 1986).

Styrian wines produced by blending two or more grape varieties characteristic of a particular region also represent an important category. The ration of individual grape varieties must be adequate in order to produce a balanced wine (Vodovnik and Vodovnik 1999). Through blending, perceived inadequacies of wines from different grapes and batches can be corrected.

Baumgartner (1856) recommends the blending of Renski rizling (Rhine Riesling) and Traminec (Gewürztraminer), while Zweifler (1924) advises to blend Zeleni silvanec (Sylvaner) produced in poor vintage years with varieties with a higher level of acidity, such as Šipon (Furmint) or Laški rizling (Welschriesling). These wines may be consumed independently or in combination with sparkling water (the Slovene term being brizganec and the German Spritzer).

In the description of wines for the Drava Banovina (Grapevine Assortment 1935), individual varieties are described in detail. Pekrčan is a “white wine with a pleasant bouquet and a unique aroma with the prevailing undertone of Rhine Riesling” produced on the hillsides of Pohorje. The aroma of Ljutomerčan is described as “distinct, pleasant and unique”, while Haložan is described as a wine of light colour, which exceeds all others in the surroundings of the Municipality of Zavrč.

After Slovenia gained independence, smaller wine-growers began to produce larger quantities, and therefore the quality of Styrian wines increased. In this context, quality is not an absolute term since it refers to various styles of wine, which are constantly changing for various reasons (often due to market conditions). In contrast to the 1990s when wine was usually produced from overripe grapes with a certain amount of residual sugar, today's wines have a clear and distinct varietal bouquet with a lower amount of residual sugar. Although demand is currently declining, vintages of specific quality will remain a market niche for wine-makers.

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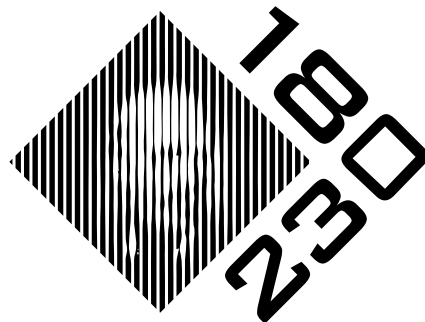
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1832-2012

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1832	180 <sup>th</sup> anniversary of the first
2012	School of Viticulture at Meranovo
1782	230 <sup>th</sup> anniversary year of the birth
2012	of Archduke John of Austria